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(71) Applicant(s):  
**Rigidal Systems Limited**  
(Incorporated in the United Kingdom)  
Unit 62, Blackpole Trading Estate West,  
WORCESTER, WR3 8ZJ, United Kingdom

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GB 2291660 A GB 2245618 A

(72) Inventor(s):  
**Peter Taylor**

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(74) Agent and/or Address for Service:  
**Derek Jackson Associates**  
The Old Yard, Lower Town, CLAINES,  
Worcs, WR3 7RY, United Kingdom

(54) Abstract Title: **Standing seam roof cladding system with integral halter bracket**

(57) A system for interconnecting metal sheets such as standing seam roofing sheets comprises a first sheet 2 deformed along an edge 8 to provide an integral tubular roofing halter and a second sheet 4 having a second edge 22 of arcuate form to fit over the tubular edge of the first sheet in a locking manner. The deformed edge of the first sheet is divided into three regions, a first upstanding portion 10, a second tubular portion 12 and a third portion 14, preferably coplanar with the sheet, extending from the second portion and adapted to be attached to a sub-structure by a clip 20. The first and second metal sheets may be coplanar. The first and second sheets may engage in a snap-fit arrangement, by sheets may be further locked together by rolling of the second overlying edge around the tubular edge of the first sheet. The third portion of the first sheet may provide attachment regions 34 of U-shaped cross-section, preferably provided by a channel, which correspond in shape to the attachment clips. The clips are preferably spaced apart along the edge and comprise profiled metal. The first region of the first sheet preferably has a sloping part 16 to provide clearance for the underlying clip when assembly. Each sheet is preferably provided with opposed first and second edges. Sheet rigidity is preferably improved by ribs and micro-ridges. The sheets may be aluminium and used on a roof, preferably attached to purlins. In use, the deformed edges of the sheets enable a standing seam roof to be constructed without separate halter brackets and without piercing the sheets by bolts etc for attachment to the roof.

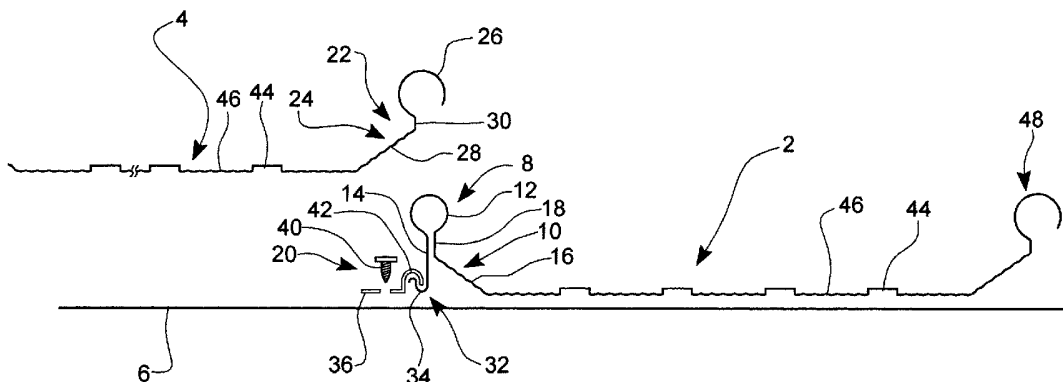


FIG 2

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date but within the period prescribed by Rule 25(1) of the Patents Rules 1995.

Original Printed on Recycled Paper

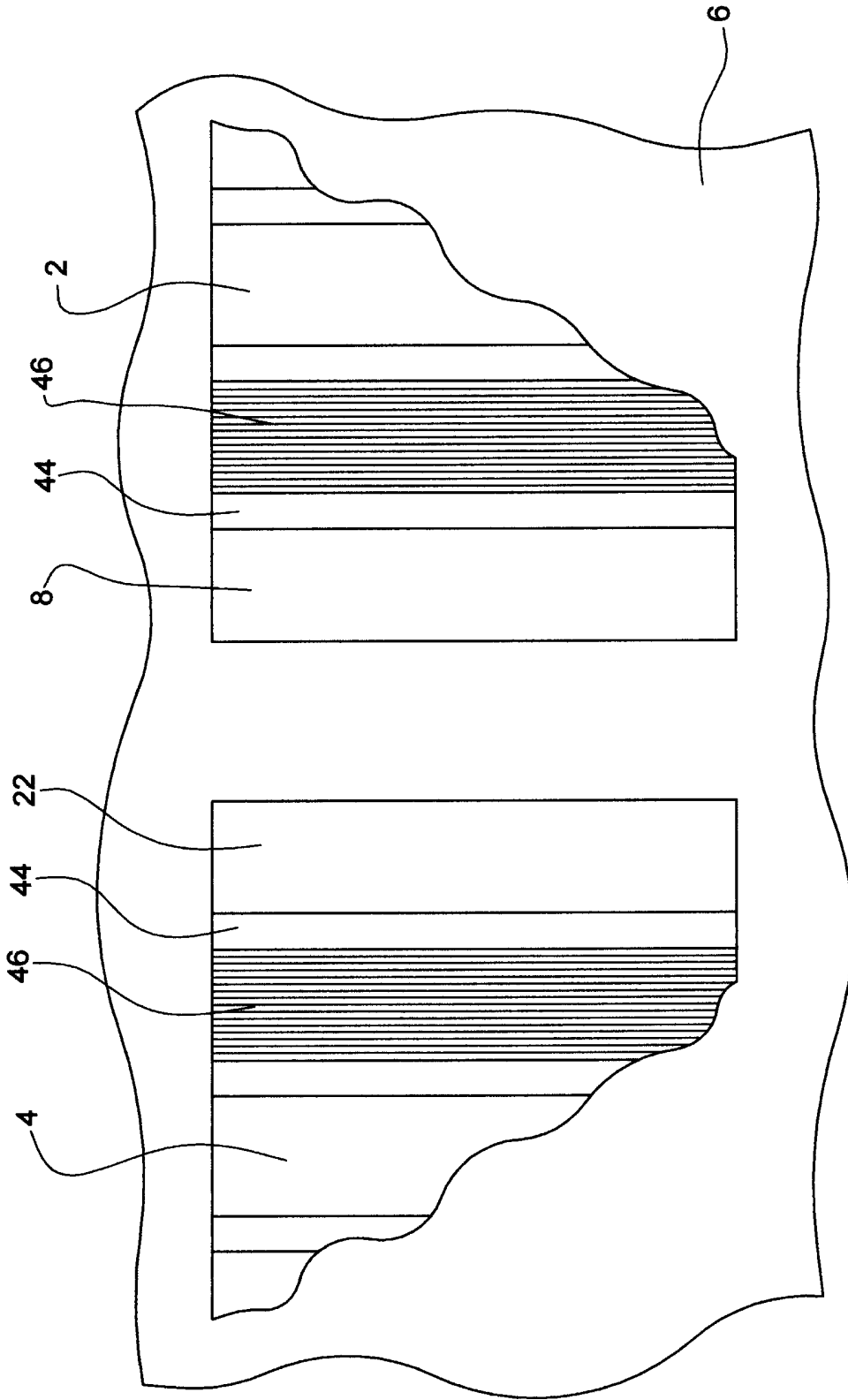


FIG. 1

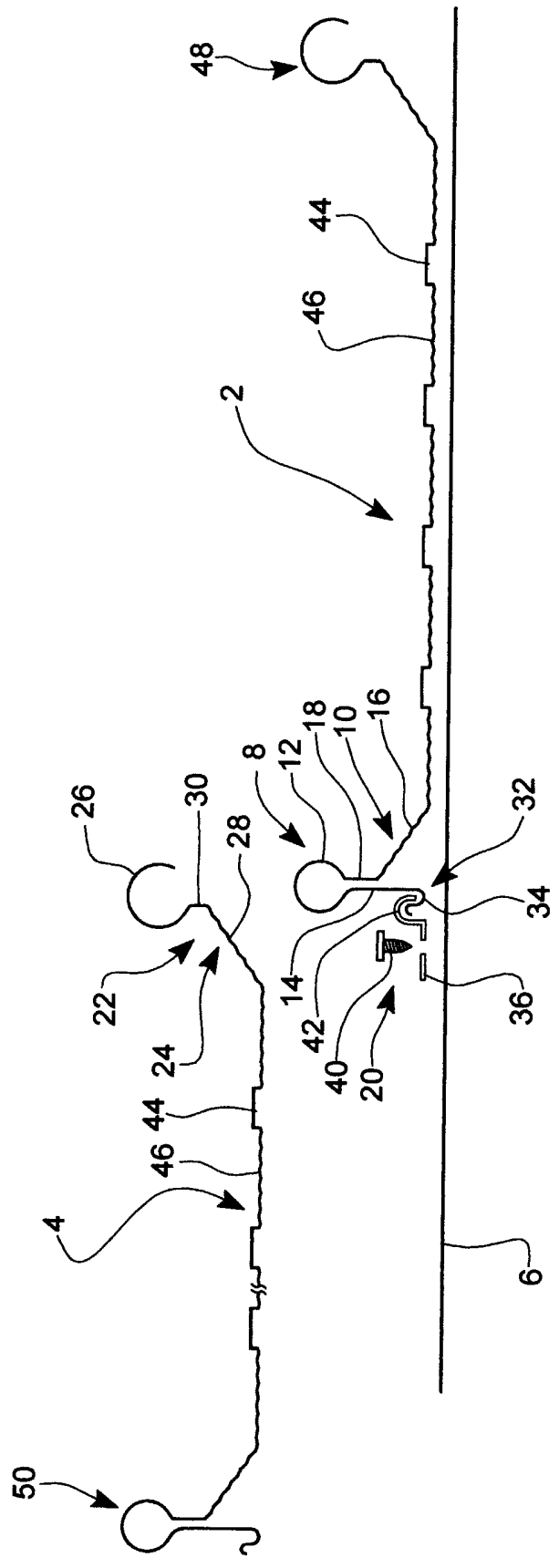


FIG 2

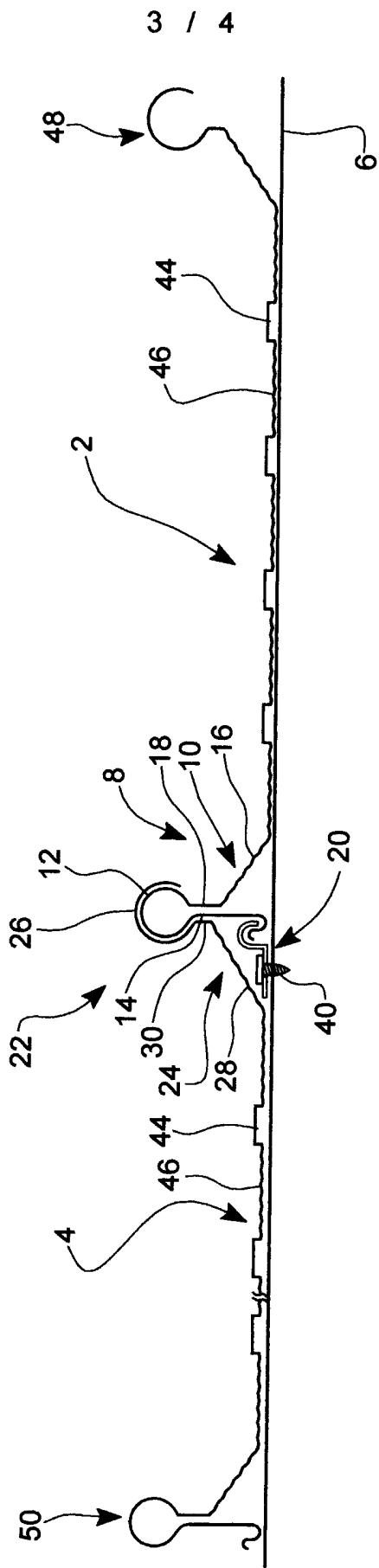


FIG 3

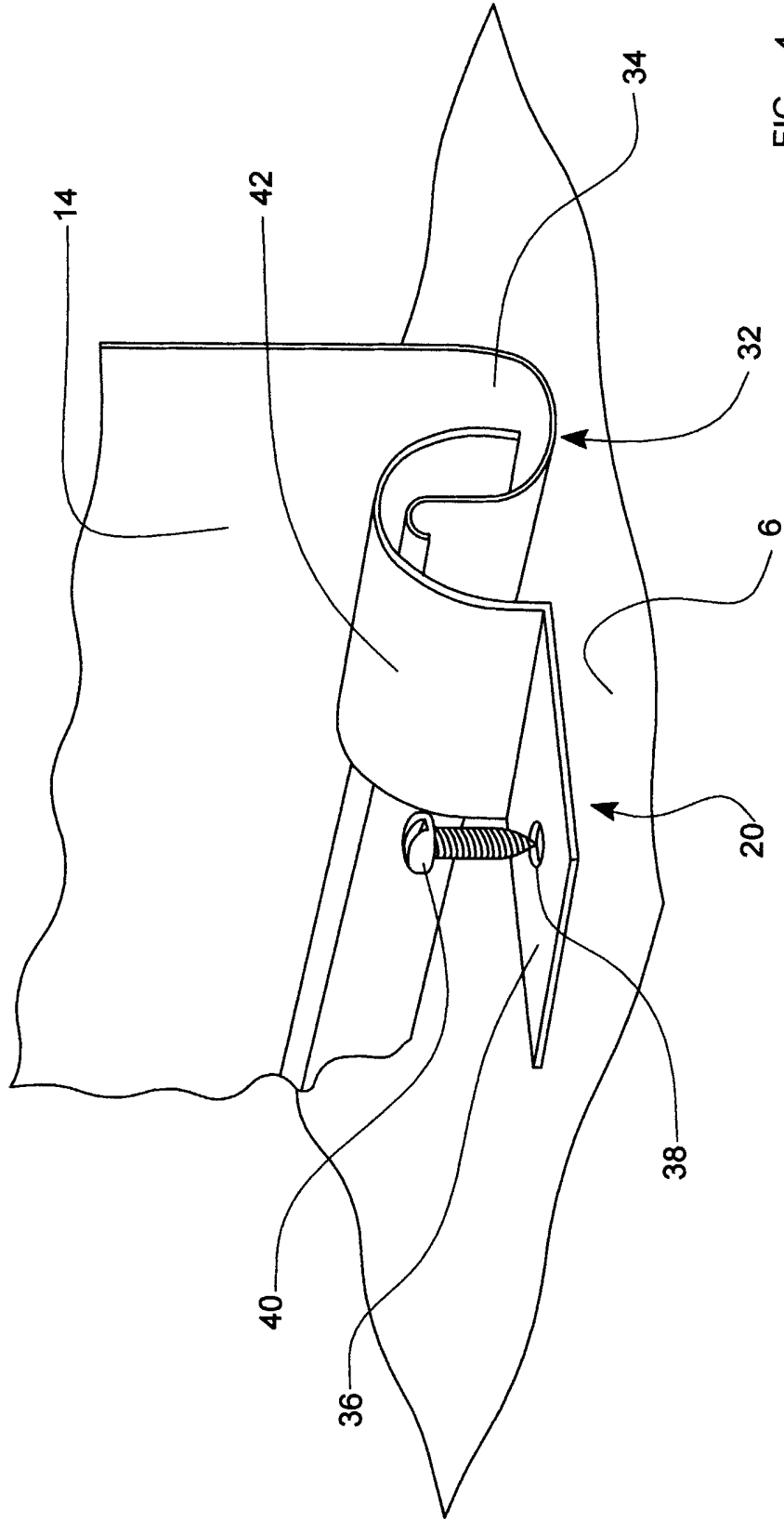


FIG 4

## SYSTEM FOR INTERCONNECTING AND SECURING METAL SHEETS

This invention concerns a system for interconnecting first and second metal sheets and for securing them to an underlying structure, without the use of fasteners penetrating the sheets. In particular, the invention concerns a system for interconnecting first and second metal sheets in the form of roofing sheets for a building and for securing them to a roofing structure of a building.

It is known to provide systems for interconnecting metal roofing sheets and securing them to an underlying structure of a building. Such systems are often referred to as standing seam systems. In one known arrangement, such as described in GB-A-2 167 101, a number of spaced-apart retaining members or halters are arranged to support the edges of runs of metal roofing sheets. The edge of one sheet extends upwardly and curves around the top of the halter, while an overlapping edge of an adjoining sheet has a corresponding upstanding edge and a curved portion which fits over the curved portion of the first edge and can be mechanically deformed by a

specially designed machine, by a process known as "zipping-up", to lock both overlapping edges to the top of the halter. This arrangement has several advantages in that it resists uplift of the resulting roof due to 5 wind and can be manufactured in almost unlimited lengths. However, it is rather expensive because of the cost of the halters.

In another arrangement, described in EP-A-0 342 044, no 10 such retaining halters are provided. One edge of a metal roofing sheet is secured at intervals along its length to an underlying roof support structure, such as purlins, and an edge of the next sheet clips over the edge of the first sheet and rolls down into the required position. 15 This has the advantage of simplicity, but has a number of disadvantages. These include the need to secure the edges with bolts or other fasteners through elongate holes provided in the longitudinal direction of the roofing sheet in order to allow for expansion and 20 contraction, and to provide covers over the elongate holes and beneath the heads of the fasteners to allow relative movement. There are also minor problems with uplift in strong winds. Furthermore, the sheets cannot

be readily curved along their length and they have to be formed off-site, which restricts the lengths available.

It is an object of the present invention to overcome or  
5 minimise one or more of the above problems.

According to the present invention there is provided a system for interconnecting first and second metal sheets and for providing securement thereof to an underlying  
10 structure, the system comprising: the first metal sheet having an elongate edge thereof profiled to provide first, second and third integral portions, the first portion extending in upstanding manner from the first metal sheet to the second portion, the second portion  
15 being of substantially tubular form, the third portion being adapted to extend from the second portion towards the underlying structure and being adapted to be secured by clip means to the underlying structure; the second metal sheet having an elongate edge thereof profiled to  
20 provide first and second integral regions, the first region extending in upstanding manner from the second metal sheet to the second region, the second region being of open arcuate form adapted to be engaged in an



overlying locking manner with the substantially tubular second portion of the profiled elongate edge of the first metal sheet.

- 5 The engaged first and second metal sheets may be substantially coplanar.

The second region of the profiled elongate edge of the second metal sheet may be adapted to be engaged in an  
10 overlying locking manner with the substantially tubular second portion of the profiled elongate edge of the first metal sheet by means of snap-fit engagement therebetween and optional subsequent mechanical forming of the open arcuate-formed second region of the profiled elongate  
15 edge of the second metal sheet whereby it is conformed around the substantially tubular second portion of the profiled elongate edge of the first metal sheet.

The third portion of the profiled elongate edge of the  
20 first metal sheet may have a lower edge arranged substantially coplanar with the first metal sheet. Such lower edge may be profiled to provide one or more attachment regions for engagement by the clip means.

The one or more attachment regions may be of substantially U-shaped cross-section.

The one or more attachment regions of substantially U-shaped cross-section may be provided by a channel extending along at least part of the lower edge of the third portion of the profiled elongate edge of the first metal sheet.

10 The clip means may comprise one or more clips, such as of metal, having a first region adapted to be secured to the underlying structure and a second region adapted to engage, such as in complementary manner, the one or more attachment regions provided by the profiled lower edge of  
15 the third portion of the profiled elongate edge of the first metal sheet. The second region of the or each clip may be of substantially inverted U-shaped cross-section.

The first region of the or each clip may be provided with  
20 one or more apertures therethrough for receiving one or more fixing means, such as one or more threaded fasteners, nails or bolts, for securing the or each clip to the underlying structure.

A plurality of clips may be provided, spaced apart along the profiled lower edge of the third portion of the profiled elongate edge of the first metal sheet.

- 5 The clip means may be formed from one or more appropriately profiled metal strips.

The first portion extending in upstanding manner from the first metal sheet and/or the first region extending in  
10 upstanding manner from the second metal sheet may comprise a sloping part and a substantially vertical part. Such sloping part may be such as to provide clearance for the clip means.

- 15 The first metal sheet may have an opposite elongate edge profiled substantially corresponding to the profiled elongate edge of the second metal sheet.

The second metal sheet may have an opposite elongate edge  
20 profiled substantially corresponding to the profiled elongate edge of the first metal sheet.

The first and/or second metal sheet(s) may be provided with one or more elongate ribs or corrugations to improve mechanical rigidity thereof.

- 5 The first and/or second metal sheet(s) may be provided with a plurality of elongate micro-ridges, such as for providing resistance to mechanical damage and/or to assist curving of the sheet or sheets when required.
- 10 The first and/or second metal sheet(s) may comprise aluminium or steel.

The first and second metal sheets may comprise roofing sheets for a building. The underlying structure may  
15 comprise a roof supporting structure of a building, such as comprising purlins.

For a better understanding of the present invention and to show more clearly how it may be carried into effect,  
20 reference will now be made, by way of example, to the accompanying drawings in which:

Figure 1 shows first and second metal sheets to be interconnected and secured to an underlying structure;

Figure 2 is a cross-sectional view of an embodiment of a system according to the present invention for  
5 interconnecting the first and second metal sheets of Figure 1 and for providing securement thereof to the underlying structure;

10 Figure 3 is a cross-sectional view of the first and second metal sheets of Figure 1 after interconnection and securement to the underlying structure by the system of Figure 2; and

15 Figure 4 shows clip means securing the interconnected first and second metal sheets to the underlying structure in the system of Figures 2 and 3.

Referring to Figures 1, 2 and 3, a system is provided for  
20 interconnecting a first metal sheet 2 and a second metal sheet 4 and securing them to an underlying structure 6. The first 2 and second 4 metal sheets suitably comprise roofing sheets for a building, in which case the

underlying structure 6 comprises a roof supporting structure of the building and may comprise purlins. The first and second metal sheets 2, 4 suitably comprise aluminium or steel.

5

The first metal sheet 2 has an elongate edge 8 thereof profiled to provide a first portion 10, a second portion 12 and a third portion 14, the portions 10, 12 and 14 being integral with one another and with the first metal  
10 sheet 2 and formed by appropriate mechanical bending and profiling of the elongate edge 8 of the first metal sheet 2. The first portion 10 extends in upstanding manner from the first metal sheet 2 to the second portion 12 and comprises a sloping part 16 and a substantially vertical  
15 part 18. The second portion 12 is of substantially tubular form. The third portion 14 is adapted to extend from the second portion 12 downwardly towards the underlying structure 6 and is adapted to be secured by a plurality of clips 20 to the underlying structure 6.

20

The second metal sheet 4 has an elongate edge 22 thereof profiled to provide a first region 24 and a second region 26. The regions 24 and 26 are integral with each other

and with the second metal sheet 4 and are formed by appropriate mechanical bending and profiling of the elongate edge 22 of the second metal sheet 4. The first region 24 extends in upstanding manner from the second metal sheet 4 and comprises a sloping part 28 and a substantially vertical part 30. The second region 26 of the profiled elongate edge 22 of the second metal sheet 4 is of open arcuate form and is adapted to be engaged in an overlying locking manner with the substantially tubular second portion 12 of the profiled elongate edge 8 of the first metal sheet 2 and such that the first and second metal sheets 2, 4 are substantially coplanar.

The second region 26 of the profiled elongate edge 22 of the second metal sheet 4 suitably engages the substantially tubular second portion 12 of the profiled elongate edge 8 of the first metal sheet 2 in snap-fit manner. Interlocking of the second region 26 of the profiled elongate edge 22 of the second metal sheet 4 with the substantially tubular second portion 12 of the profiled elongate edge 8 of the first metal sheet 2 is suitably enhanced by subsequent mechanical forming of such open arcuate-formed second region 26 whereby it is

conformed and substantially closed around the substantially tubular second portion 12 of the profiled elongate edge 8 of the first metal sheet 2 as shown in Figure 3. Such mechanical forming of the second region 5 26 is effected by a machine known per se and involves a process known in the art as "zipping-up".

The third portion 14 of the profiled elongate edge 8 of the first metal sheet 2 has a lower edge 32 arranged 10 substantially coplanar with the first metal sheet 2. The lower edge 32 is profiled to provide one or more attachment regions 34 for engagement by the clips 20. The attachment regions 34 are suitably provided as particularly shown in Figure 4 by a channel of 15 substantially U-shaped cross-section extending along at least part of the lower edge 32 of the third portion 14 of the profiled elongate edge 8 of the first metal sheet 2, and preferably along substantially the full length of the lower edge 32.

20

The plurality of clips 20 are provided spaced apart along the attachment regions 34 formed by the U-shaped channel. Each clip 20 is suitably formed from an appropriately



profiled metal strip and has a first region 36 provided  
with an aperture 38 therethrough for receiving fixing  
means 40, suitably comprising a threaded fastener, nail  
or bolt, for securing the clip 20 to the underlying  
5 structure 6. Each clip 20 has a second region 42 adapted  
to engage, such as in complementary manner, the channel  
shaped attachment regions 34 at the lower edge 32 of the  
third portion 14 of the profiled elongate edge 8 of the  
first metal sheet 2. Such second region 42 of the clip  
10 20 is suitably of inverted U-shaped cross-section.

By means of the clips 20, the interconnected first and  
second metal sheets 2, 4 are secured to the underlying  
structure 6 without the need to provide fasteners  
15 penetrating the metal sheets 2, 4.

As shown in Figure 3, the sloping part 28 of the first  
region 24 of the profiled elongate edge 22 of the second  
metal sheet 4 provides clearance for the clips 20.

20

The first and second metal sheets 2, 4 may be provided  
with one or more elongate ribs or corrugations 44 therein  
to improve mechanical rigidity thereof.

The first and second metal sheets 2, 4 may also be provided with a plurality of elongate micro-ridges 46, which provide resistance to mechanical damage to the sheets 2, 4 and also assist in enabling curving of the sheets if required, to accommodate a particular profile of the underlying structure 6.

The first metal sheet 2 may suitably have an elongate edge 48, opposite to the elongate edge 8, which is profiled substantially corresponding to the profiled elongate edge 22 of the second metal sheet 4. The second metal sheet 4 may likewise have an elongate edge 50, opposite to the elongate edge 22, which is profiled substantially corresponding to the profiled elongate edge 8 of the first metal sheet 2. With such arrangements, a series of first and second metal sheets 2, 4 may be interconnected and secured to the underlying structure 6 according to the system of the present invention.

CLAIMS

1. A system for interconnecting first and second metal sheets and for providing securement thereof to an  
5 underlying structure, the system comprising: the first metal sheet having an elongate edge thereof profiled to provide first, second and third integral portions, the first portion extending in upstanding manner from the first metal sheet to the second portion, the second  
10 portion being of substantially tubular form, the third portion being adapted to extend from the second portion towards the underlying structure and being adapted to be secured by clip means to the underlying structure; the second metal sheet having an elongate edge thereof  
15 profiled to provide first and second integral regions, the first region extending in upstanding manner from the second metal sheet to the second region, the second region being of open arcuate form adapted to be engaged in an overlying locking manner with the substantially  
20 tubular second portion of the profiled elongate edge of the first metal sheet.

2. A system as claimed in claim 1, wherein the engaged first and second metal sheets are substantially coplanar.

3. A system as claimed in claim 1 or 2, wherein the second region of the profiled elongate edge of the second metal sheet is adapted to be engaged in an overlying locking manner with the substantially tubular second portion of the profiled elongate edge of the first metal sheet by means of snap-fit engagement therebetween.

4. A system as claimed in claim 3, wherein the second region of the profiled elongate edge of the second metal sheet is additionally adapted to be engaged in an overlying locking manner with the substantially tubular second portion of the profiled elongate edge of the first metal sheet by means of subsequent mechanical forming of the open arcuate-formed second region of the profiled elongate edge of the second metal sheet whereby it is conformed around the substantially tubular second portion of the profiled elongate edge of the first metal sheet.

5. A system as claimed in any preceding claim, wherein the third portion of the profiled elongate edge of the first metal sheet has a lower edge arranged substantially coplanar with the first metal sheet.

6. A system as claimed in claim 5, wherein the lower edge is profiled to provide one or more attachment regions for engagement by the clip means.

7. A system as claimed in claim 6, wherein the one or more attachment regions is or are of substantially U-shaped cross-section.

5 8. A system as claimed in claim 7, wherein the one or more attachment regions of substantially U-shaped cross-section is or are provided by a channel extending along at least part of the lower edge of the third portion of the profiled elongate edge of the first metal sheet.

10

9. A system as claimed in any preceding claim, wherein the clip means comprise one or more clips having a first region adapted to be secured to the underlying structure and a second region adapted to engage, such as in  
15 complementary manner, the one or more attachment regions provided by the profiled lower edge of the third portion of the profiled elongate edge of the first metal sheet.

10. A system as claimed in any claim 9, wherein the  
20 second region is adapted to engage the one or more attachment regions in complementary manner.

11. A system as claimed in claim 9 or 10, wherein the second region of the or each clip is of substantially  
25 inverted U-shaped cross-section.

12. A system as claimed in claim 9, 10 or 11, wherein  
the first region of the or each clip is provided with one  
or more apertures therethrough for receiving one or more  
fixing means for securing the or each clip to the  
5 underlying structure.

13. A system as claimed in any one of claims 9 to 12,  
wherein a plurality of clips is provided, spaced apart  
along the profiled lower edge of the third portion of the  
10 profiled elongate edge of the first metal sheet.

14. A system as claimed in any preceding claim, wherein  
the clip means is formed from one or more appropriately  
profiled metal strips.

15  
15. A system as claimed in any preceding claim, wherein  
the first portion extending in upstanding manner from the  
first metal sheet and/or the first region extending in  
upstanding manner from the second metal sheet comprise a  
20 sloping part and a substantially vertical part.

16. A system as claimed in claim 15, wherein the sloping  
part is such as to provide clearance for the clip means.

25 17. A system as claimed in any preceding claim, wherein  
the first metal sheet has an opposite elongate edge

profiled substantially corresponding to the profiled elongate edge of the second metal sheet.

18. A system as claimed in any preceding claim, wherein  
5 the second metal sheet has an opposite elongate edge profiled substantially corresponding to the profiled elongate edge of the first metal sheet.

19. A system as claimed in any preceding claim, wherein  
10 the first and/or second metal sheet(s) is provided with one or more elongate ribs or corrugations to improve mechanical rigidity thereof.

20. A system as claimed in any preceding claim, wherein  
15 the first and/or second metal sheet(s) is provided with a plurality of elongate micro-ridges.

21. A system as claimed in any preceding claim, wherein  
the first and/or second metal sheet(s) comprise aluminium  
20 or steel.

22. A system as claimed in any preceding claim, wherein  
the first and second metal sheets comprise roofing sheets  
for a building.

23. A system as claimed in any preceding claim, wherein the underlying structure comprises a roof supporting structure of a building.

5 24. A system for interconnecting first and second metal sheets and for providing securement thereof to an underlying structure substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.





For Innovation

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**Application No:** GB0513809.4

**Examiner:** Dr Hazel Thorpe

**Claims searched:** 1-24

**Date of search:** 27 September 2006

## Patents Act 1977: Search Report under Section 17

### Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A	-	GB2245618 A (EUROCLAD); figures 1-4.
A	-	GB2291660 A (WU TSAN HSING); figures 1-4.

### Categories:

X Document indicating lack of novelty or inventive step	A Document indicating technological background and/or state of the art.
Y Document indicating lack of inventive step if combined with one or more other documents of same category.	P Document published on or after the declared priority date but before the filing date of this invention.
& Member of the same patent family	E Patent document published on or after, but with priority date earlier than, the filing date of this application.

### Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC<sup>x</sup> :

E1D

Worldwide search of patent documents classified in the following areas of the IPC

E04D

The following online and other databases have been used in the preparation of this search report

WPI & EPODOC