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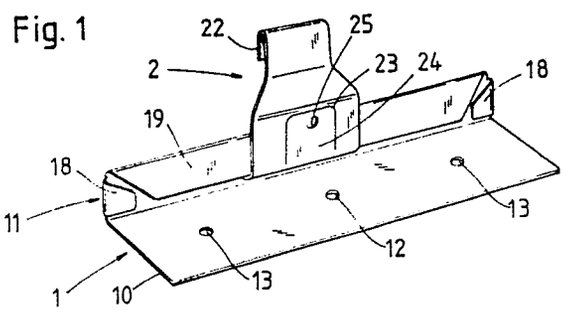
(54) Joining roofing sheets.

(57) A sliding bracket comprises a first part (1) for attachment to a support surface, and a sliding part (2) for attachment to a sheet (3), such as a roofing sheet, to be clamped to a support surface (5), the sliding part (2) being connected in a manner permitting limited sliding movement along the first part (1). The sliding part is provided with a tongue (24) permitting the sliding part (2) to be secured to the fixed part (1) or the support surface (5) by means of a nail, for instance, thus producing a fixed bracket. Alternatively only the fixed part (1) may be secured to the support surface, thus permitting the sliding part to absorb movements in the sheeting. A method of preparing roofing sheets for assembly comprises fitting brackets of the type described at specified distances along the assembly flange of the sheets. At the time of assembly the worker can then alter the function of the bracket from fixed to sliding, or vice versa, as required.

Fig. 1



EP 0 367 742 A1

Joining roofing sheets

The present invention relates to a method of producing sheets of metal, such as sheet-metal roofing, facade sheets or the like, ready for assembly, of the kind revealed in the preamble to the appended independent method claim.

The invention also relates to assembly brackets for sheets of metal of the type revealed in the preamble to the appended independent claim directed to a bracket.

When assembling sheets of metal such as roofing sheets, it is conventional to use fixed brackets to secure the sheets at certain points, and sliding brackets which keep the sheets in place against the support surface but are able to absorb movement in the roofing sheets caused by thermal expansion, for instance.

Fixed brackets are well known in practice and sliding brackets are known through Swedish patent specification No. 78 02 814-9, for instance.

One problem in this connection is that the work requires at least two different types of brackets, i.e. fixed brackets and sliding brackets. Since the sheets are often assembled on outside roofs, on facades and other uncomfortable work-sites, having to deal with two different types of brackets is particularly time-consuming and troublesome. Furthermore, the previous use of two types of bracket has prohibited machine assembly of the brackets onto the sheets since the brackets would have to be arranged in the machine with the necessary distribution between fixed and sliding brackets.

The conventional method is to manually apply the two different bracket types on the roofing sheets when they are being fitted on the roof. The distribution of fixed and sliding brackets must then be taken into consideration to ensure that they are fitted correctly and in accordance with the instructions. Since the brackets are fitted manually, there is no time to measure the distance between brackets and they are placed with a certain margin within the prescribed maximum distance. Admittedly the sheets are then more reliably anchored, but this method also entails increased costs. It would be an advantage to be able to pre-fit the anchoring brackets by machine at the maximum distance permitted. It would also be simpler to pre-fit brackets on the plates by machine in the factory or a field workshop rather than manually when the sheets are being assembled on the roof.

One object of the invention is thus to provide a bracket comprising a fixed part for attachment to a support surface, and a sliding part for attachment to a roofing sheet to be clamped to the support surface, the sliding part being connected in a manner permitting limited sliding movement along the first part.

According to the invention the sliding part is provided with a tongue permitting the sliding part to be secured against movement along the fixed part. A screw or nail can thus be inserted through the tongue into the support surface in order to secure the sliding part. The tongue may be provided with a hole for the attachment element, and the fixed part may be provided with an opening located to coincide with the hole, thus enabling an attachment element such as a screw to be easily inserted through the hole and the opening.

The sliding part preferably has a mid-section connected slidably at its lower end to the fixed part, the tongue being formed by a punched line in the mid section so that the root of the tongue is located close to the edge of the sliding part which is adjacent to the fixed part. If the tongue is located beside the part of the mid-section to be anchored to the roofing sheet, the tongue may be delivered and used in folded-down position so that it lies parallel to the base plate resting on the support surface.

When the upright mid-section of the sliding part is located approximately half way along the length of the base plate, an opening is preferably provided in the base plate, opposite the hole in the tongue and also an opening opposite the upright mid-section of the sliding part. An opening is also suitably placed at each end of the base plate. In order to secure the sliding part to the base plate a metal screw can be inserted through the hole in the tongue and the corresponding opening in the base plate, and one or more anchoring elements can be inserted into the other openings in the base plate. Often a single attachment element is sufficient, such as a screw located in the opening aligned with the mid-section of the sliding part. The fixed part of the bracket may be provided with a vertical rib the upper edge of which is bent over to form a guide along which the bent lower edge part of the sliding part can move. In this case the fixed and sliding parts are preferably made of sheet metal so that the fixed part is sufficiently rigid to be anchored at a single central point without becoming deformed.

In an alternative embodiment of the bracket the tongue is punched in the mid-section of the sliding part and can be folded out from this when the bracket is to be fitted as a fixed bracket.

Further modification will be evident to one skilled in the art. It should be particularly emphasized that the bracket may be shaped as a fixed bracket which, after manipulation, constitutes a sliding bracket, for example by the tongue being

initially joined to the fixed part by an adhesive joint, for instance, the joint being broken if the bracket is to be used as a sliding bracket.

The bracket according to the invention and modifications thereof are defined in the appended claims directed to the bracket.

The invention also relates to a method of producing sheets of metal, such as sheet-metal roofing, ready for assembly, said roofing sheets having upright flanges along their longitudinal edges, one of the flanges being intended to cover the other flange in an adjacent sheet, the other flange being intended to be secured to the support surface by means of fixed and sliding brackets. The method comprises fitting the roofing sheets at the manufacturing stage with brackets at specified distances along the second flange, the brackets comprising a base for attachment to the support surface and an upper part fitted thereon, said brackets being modifiable to either fixed or sliding brackets. To this end the brackets can be provided either with an upper part displaceable along the lower part, which is secured in relation to the base at the time of assembly, or with an upper part which is fixed in relation to the base but which can be made to slide along the base at the time of assembly.

The method according to the invention, as well as modifications thereof, is defined in the appended method claims.

The invention will be described in the following by way of example with reference to the accompanying drawings.

Figure 1 shows in perspective a sliding bracket according to the invention,

Figure 2 shows schematically a cross-section through the bracket according to Figure 1 fitted as a fixed bracket in a joint between two roofing sheets,

Figures 3 - 4 show schematically a cross-section through a prefabricated roofing sheet of conventional design, to illustrate pre-fitting of the brackets according to the invention on the roofing sheets,

Figure 5 shows schematically and in perspective another embodiment of a bracket according to the invention,

Figure 6 shows in perspective a variant of the sliding bracket according to the invention,

Figures 7 and 8 show a further embodiment of the bracket according to the invention.

Referring now to Figure 1, this shows a sliding bracket comprising a base part 1 and a part 2 slidable along the base part 1. The base part 1 consists of a sheet of metal bent to a general L shape, thus producing a base plate 10 and an upright rib 11. The upper edge 19 and end edges 18 of the rib 11 are folded again to produce a guide and end stops for the sliding part 2. The sliding part 2 is folded at its lower edge to give a folded edge 21 (see Fig. 2) which grips under the edge 19. The part 2 is also bent at its upper end to give a section 22 intended to grip the edge of an upright flange on a roofing sheet or the like to be attached to the support surface by the bracket 1. The bracket part 2 is suitably also made of sheet metal. The part 2 is provided with a punched line 23 defining a tongue 24 which can be folded down from the plane of part 2 to a position over plate 10 in the base 1. The tongue 24 is provided with a hole 25. The base plate 10 is also provided with a number of openings 12, 13 to facilitate securing the bracket 1 by means of nails or the like inserted through the holes 12, 13.

The bracket according to Figure 1 is basically a sliding bracket, the sliding part 2 being displaceable along the base 1 and thus able to absorb movements in the roofing sheets. However, if desired, the tongue 24 can be bent out to a generally horizontal position and secured to the base 1, or the support surface on which the base 1 is fitted, with the aid of nails or some other attachment element. A nail can then suitably be driven through the hole 25 in the tongue 24, said hole being located to fit over the central opening 12 in a suitable position for the sliding part 2 allowing longitudinal movement.

Figures 3 and 4, for instance, show a roofing sheet 3 shown schematically in cross-section, provided with upright flanges 31, 32 at its long edges. The upright flange 31 designed to cover the other upright flange 32 can be seen to be bent twice at 90°, whereas the other upright flange 32 need only be bent once at 90°. Figure 3 shows how a bracket 1 according to Figure 1 is hooked onto the upright flange 32 and then bent down around the position indicated by the arrow in Figure 3, to assume the configuration illustrated in Figure 4. If the base 1 of the bracket is secured to the support surface by a nail or the like, and the tongue 24 is not anchored to the base 1 or the support surface, then part 2 will be slidable along the base 1.

However, as mentioned above and as can be seen in Figure 2, the tongue 24 can be folded down, the holes 24 and 12 aligned, and a nail 40 then be driven through the holes and down into the support surface. The part 2 will then be fixed in relation to the base 1 and the support surface 5 and will then constitute a fixed bracket.

Figure 5 shows an alternative embodiment of the bracket according to the invention.

According to Figure 5, the guide for the sliding part 2 is formed by a bar 18 produced by cutting an elongate opening 14 in the upright rib 11 of the base 1.

The lower edge of the sliding part 2 is folded to form a hook which surrounds the bar 18, the

hook being secured by joints 26, such as spot welds, on each side of the tongue 24.

Figure 6 shows an alternative bracket according to the invention. This may be considered identical to the embodiment shown in Figure 1 except that the tongue 24 is arranged beside the upright mid-section 28 of the sliding part. The tongue 24 is folded out substantially parallel to the base plate 10. Since the mid-section 28 is located approximately half way along the plate 10, the hole 25 in the tongue will suitably be opposite an opening 12 in the plate 10 and the plate 10 is provided with an opening 12′ opposite the central part of the mid-section 28.

A single anchoring screw or the like fitted through the opening 12′ when the bracket is used as a sliding bracket may then be sufficient. No flexural forces will then appear when the bracket is loaded in pull-out direction. A second screw, such as a short metal screw, may be inserted into the hole 25 and opening 12 when the bracket is to be used as a fixed bracket.

However, it should be clear that it might also be sufficient to fit a single anchoring screw through the hole 25 and opening 12 when the bracket is to be used as a fixed bracket, but a pull-out load directed centrally through the mid-section 28 would then produce a torque reducing the strength of the bracket since the load line and the anchoring element would not then be aligned.

The method according to the invention includes the use of the bracket according to the invention, thus allowing conventional roofing sheets 3 according to Figures 3 and 4 to be provided with brackets in advance at the factory or in a field workshop. These brackets are then applied with the maximum distance permitted between them along the upright flange 32 and should in that case first be hooked on as shown in Figure 3 and then bent to the configuration shown in Figure 4 so that the brackets are firmly connected to the sheets. When the worker is then to assemble the sheets on the roof, he can use the brackets either as sliding or as fixed brackets, depending on the situation.

The sliding part has been shown throughout with a folded edge portion 22 allowing it to grip around the edge of a roofing sheet. However, it should be evident that welded joints are used for certain types of roofing such as stainless steel sheets, and part 2 need not therefore have a folded edge 22 since this is not necessary if part 2 is to be attached to the edge of a roofing sheet by means of seam welding.

Other embodiments are feasible. For instance the tongue 24 may be provided with two holes 25 and the plate 10 may have two corresponding openings 12. This prevents the tongue from being twisted, for instance, if the sliding part is turned in the longitudinal direction of the bracket.

Figures 7 and 8 show a bracket basically similar to that shown in Figure 6. The tongue 24 in part 2 is thus initially folded down parallel to the fixed base plate 10. The tongue 24 need not therefore be folded down when the bracket is to be changed between its two main functions. It is sufficient to insert an attachment element through the tongue, preferably through a hole 25 therein, in order to secure the part 2 against displacement along the part 1. The part 1 is then suitably provided with an opening 12 which can be aligned with the hole 25. However, contrary to the embodiment in Figure 6, the tongue 24 is located centrally in relation to the mid-section 28, so that no torque occurs when the entire bracket is anchored and part 2 is secured against displacement by means or one or two anchoring elements through the tongue and corresponding openings in the plate 10 located half way along the fixed part. The plate 10 may of course be provided with an additional opening 12′ located in the mid-region of its length, through which an anchoring screw or nail can be inserted beside the tongue 24 when part 2 is located midway along the length of part 1 and the bracket is to be used as a sliding bracket. However, an attachment element should preferably be placed in the openings 13 located at each end of the plate 10 if the bracket is to function as a sliding bracket.

The fixed part 1 as shown in Figure 7 is equivalent to that in Figure 6 or Figure 1, the end flaps 18 in Figure 1 being replaced by the ends of the edge portion 19′ defining the guide being clamped together at 18′.

The sliding part of the bracket according to Figures 7 and 8 comprise basically an upright mid-section 28 with an upper, folded edge part 22 and a lower, folded-out tongue 24. The mid-section 28 is shown provided with a guide 283, 284, 285 gripping the folded edge 19. However, it should be clear that the mid-section may be provided with loops or be shaped to form a loop around a guide beam on the fixed part, similiarly to the embodiment according to Figure 5, the edge portion 283 being joined to the mid-section portion 281, for instance,

In the embodiment shown in Figures 7 and 8 the mid-section 28 has been bent 180° in opposite directions around two separate parallel axes 282, 283, also parallel to the direction of movement of the sliding part 2, to form a guiding edge 11, 283, 284 which grips below the folded edge 19 of the fixed part, and a guiding groove 281, 282, 284 in which the edge part 19 engages. The embodiments of the bracket shown in the drawings are made of sheet-metal, parts 1 and 2 each being formed from a single piece of metal by bending operations. However, parts 1 and 2 may of course be formed

by joining two or more separately manufactured components by means of spot welding, for instance.

It should also be clear that even in the embodiment according to Figures 7 and 8 the tongue 24 may be folded out at its root. According to one embodiment the bracket can then be supplied with the tongue 24 in a position substantially parallel to the mid-section 28. This embodiment is particularly suitable if the bracket is to be fitted on thick insulating material, for instance, by means of a long screw which must be screwed into the support surface for the insulation. Such long screws are expensive and when the bracket is to be used as sliding bracket, a single anchoring located half way along the plate 10 is preferable if the mid-section 28 of part 2 is also located there. This is simple if the bracket is supplied with the tongue 24 up. When it is to be used as a fixed bracket, however, the tongue 24 can be easily folded down to the position shown in Figures 7 and 8. In conventional roofing with sheet-metal, about 10% of the brackets are usually fixed and the remainder are sliding brackets.

Several embodiments show the connection between parts 1 and 2 as a single flange connection. However, a double flange connection is stronger and thinner metal can be used for the parts.

Claims

1. A bracket for attachment of sheets of metal such as sheet-metal roofing, comprising a first part (1) for attachment to a support surface (5) and a sliding part (2) for attachment to a roofing sheet (3) or the like to be clamped to the support surface, the sliding part (2) being connected in a manner permitting limited sliding movement along the first part (1), **wherein** the sliding part (2) is provided with a tongue (24) permitting the sliding part (2) to be secured against movement along the fixed part (1).

2. A bracket as claimed in claim 1, **wherein** the sliding part (2) has a mid-section connected slidably at its lower end to the fixed part, the root of the tongue (24) being located at the slidable connection between the two parts.

3. A bracket as claimed in claim 1 or 2, **wherein** a hole (25) is punched in the tongue (24).

4. A bracket as claimed in claim 3, **wherein** the fixed part (1) has a base plate (10) with openings (12) so located that the hole (25) in the tongue can be aligned with the opening, thereafter being secured by an attachment element inserted through the opening and the hole, down into the support surface (5).

5. A bracket as claimed in any of claims 1 - 4, **wherein** the fixed part is provided with a vertical rib the upper edge (19) of which is bent over to form a guide along which the bent lower edge part (21) of the sliding part (2) can move.

6. A bracket as claimed in any of claims 1 - 4, **wherein** the fixed part has a vertical rib with a guide formed by a slot extending the fixed part, and wherein the lower part of the sliding part (2) is shaped as a loop surrounding the material of the fixed part above the slot (14).

7. A bracket as claimed in any of claims 1 - 6, **wherein** the tongue (24) is punched in the material of the sliding part.

8. A bracket as claimed in any of claims 1 - 7, **wherein** the tongue (24) is folded down parallel to the base plate (10) of the fixed part and is located beside the vertical mid-section of the sliding part.

9. A bracket as claimed in any of claims 1 - 7, **wherein** the tongue is located opposite the mid-section (28) of the sliding part (2), the bracket preferably being manufactured with the tongue parallel and close to the base plate (10) of the fixed part (1).

10. A bracket as claimed in any of claims 5 - 9, **wherein** the mid-section (28) of the sliding part (2), made of sheet metal is bent to a shape cooperating with the guide in the fixed part.

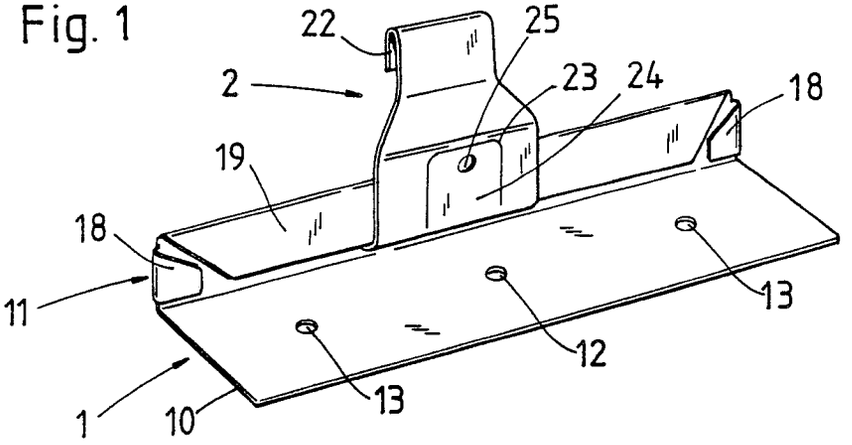
11. A bracket as claimed in any of claims 8 - 10, **wherein** an opening (12') is provided in the base plate (10), said opening being positioned centrally in relation to the vertical mid-section of the movable part when said part is located approximately half way along the length of the base plate.

12. A method of producing sheets of metal (3), such as sheet-metal roofing, ready for assembly, said roofing sheets having upright flanges (31, 32) one (31) of which is intended to cover the other, the other flange (32) being intended to be secured to the support surface (5) by means of fixed and sliding brackets, **comprising** fitting the sheets (3) at the manufacturing stage with brackets at specified distances along the second flange (32), the brackets comprising a base (1) for attachment to the support surface (5) and an upper part (2) fitted thereon, said brackets being modifiable to either fixed or sliding bracket.

13. A method as claimed in claim 12, **wherein** said brackets are provided either with an upper part (2) displaceable along the base, which is secured in relation to the base at the time of assembly of the roofing sheets, or with an upper part (2) which is secured to the base (1) but which can be made to slide along the base (1) at the time of assembly.

14. A method as claimed in claim 13, **wherein** the upper part of the bracket is provided with a tongue which can be folded out of the upper part and secured to the support surface or the base (1).

Fig. 1



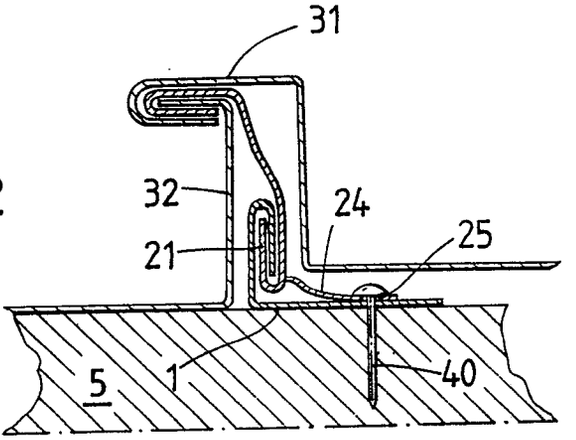


Fig. 2

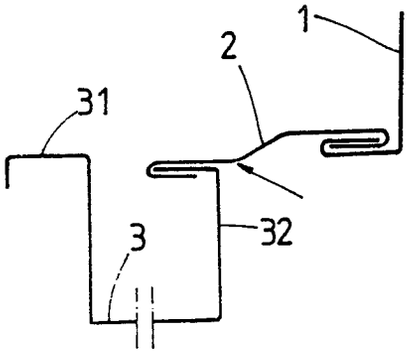


Fig. 3

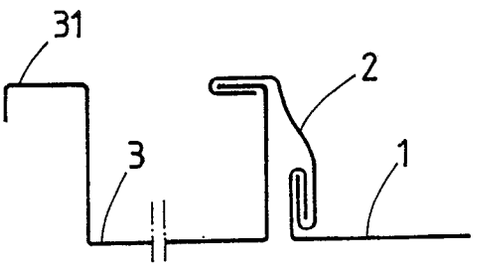


Fig. 4

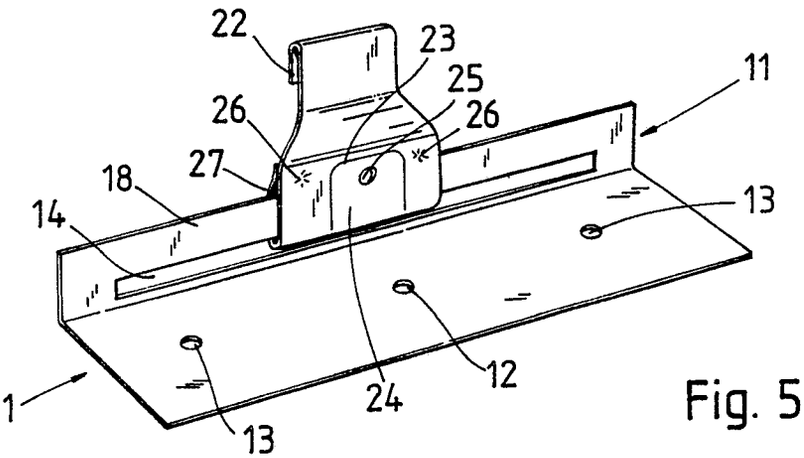


Fig. 5

Fig. 6

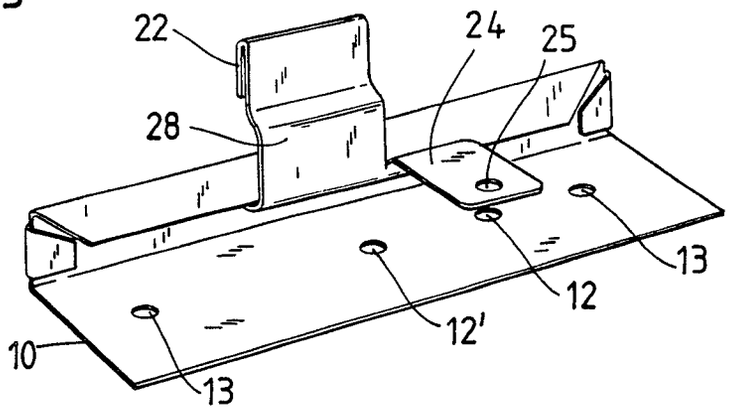


Fig. 7

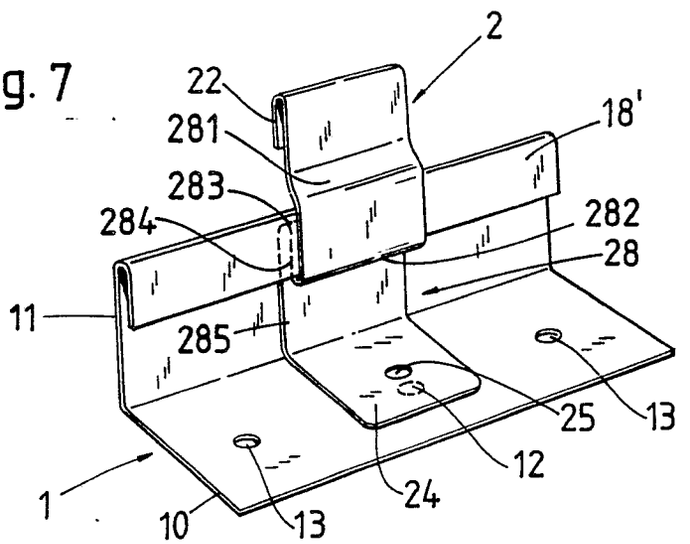
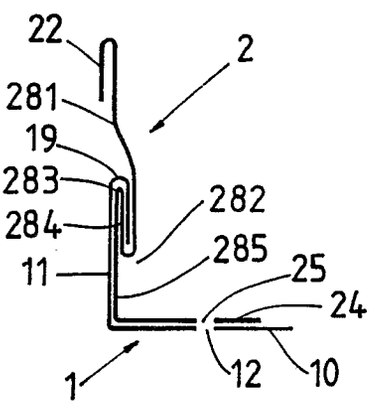


Fig. 8



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EUROPEAN SEARCH REPORT

Application Number

EP 89 85 0372

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	US-A-4 575 983 (H. LOTT - L. STROCK) * Column 3, lines 30-56; figure 2 *	1,5,6,7,10,12,13,14	E 04 D 3/362
A		2,4,9	
Y	US-A-4 034 532 (E. REINWALL) * Column 1, lines 45-64; column 3, line 58 - column 4, line 2 and lines 42-61; figures 1,7 *	1,5,6,7,10,12,13,14	
A		2,4,14	
A	WO-A-8 400 393 (B. JOHANSSON) * Page 2, line 36 - page 3, line 37; page 4, lines 21-35; figure 1 *	1,4,5,6,7,10,11	
A,P	EP-A-0 311 737 (WARD BUILDING SYSTEMS) * Column 8, lines 33-39; figures 3-5 *	1	
A	NL-A-6 715 491 (KÄHLER) * Figures 2-7 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

E 04 D 3

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23-01-1990	KRIEKOUKIS S.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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