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(54) **ROOF FLASHING CONNECTIONS**

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(75) Inventors: **Stuart Elmes**, Cambridge (GB);  
**Kak Thong Tan**, Cambridge (GB);  
**Martin Davies**, Cambridge (GB)

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Correspondence Address:  
**SUGHRUE MION, PLLC**  
**2100 PENNSYLVANIA AVENUE, N.W., SUITE**  
**800**  
**WASHINGTON, DC 20037 (US)**

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(73) Assignee: **VIRIDIAN CONCEPTS LTD,**  
Herts (GB)

(57) **ABSTRACT**

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A roof-penetrating structure for incorporating into a roof, the structure including a portion extending along one or more sides of the roof-penetrating structure for receiving an edge section of one or more sheets of flashing to provide a weather-proof connection therebetween; said portion including one or more resilient members such that, in use, the insertion of flashing into said portion automatically forces at least one of said one or more resilient members into a configuration in which they are biased against the flashing.

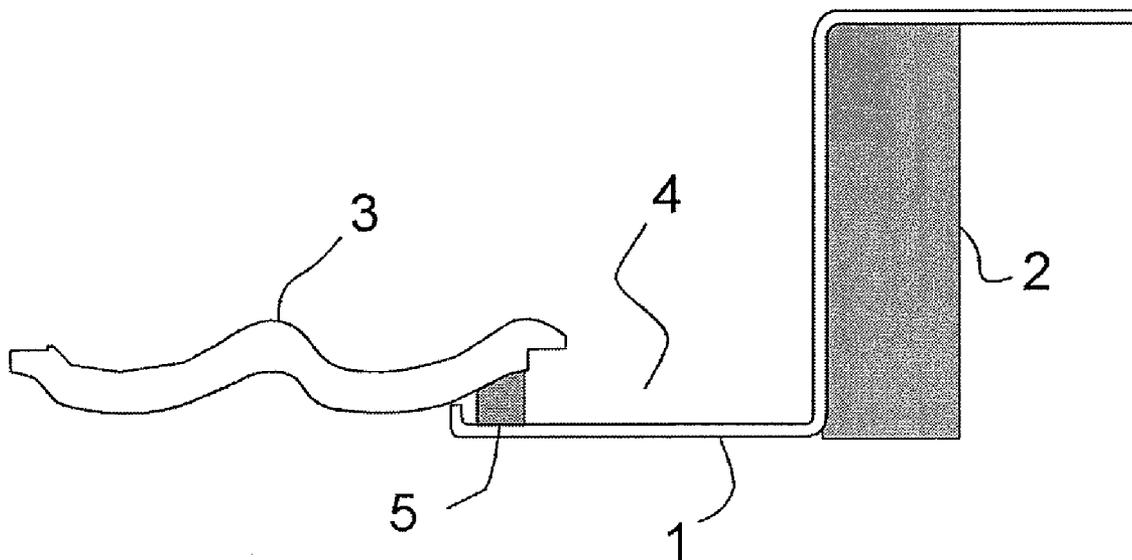


FIG 1

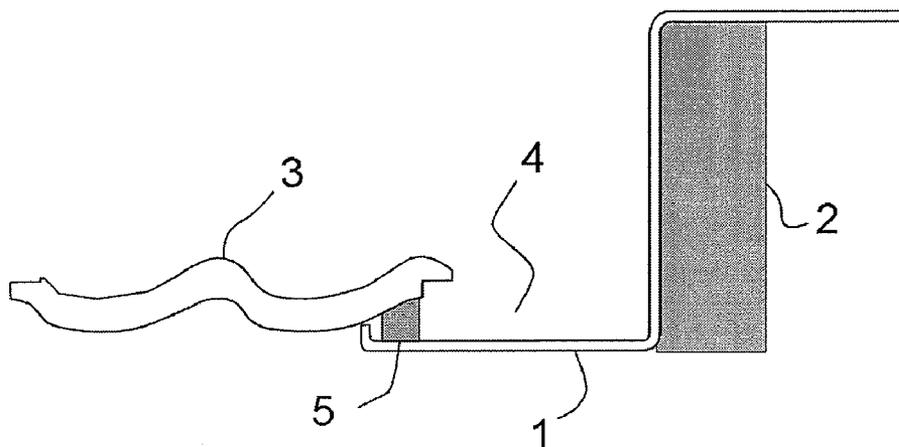


FIG 2

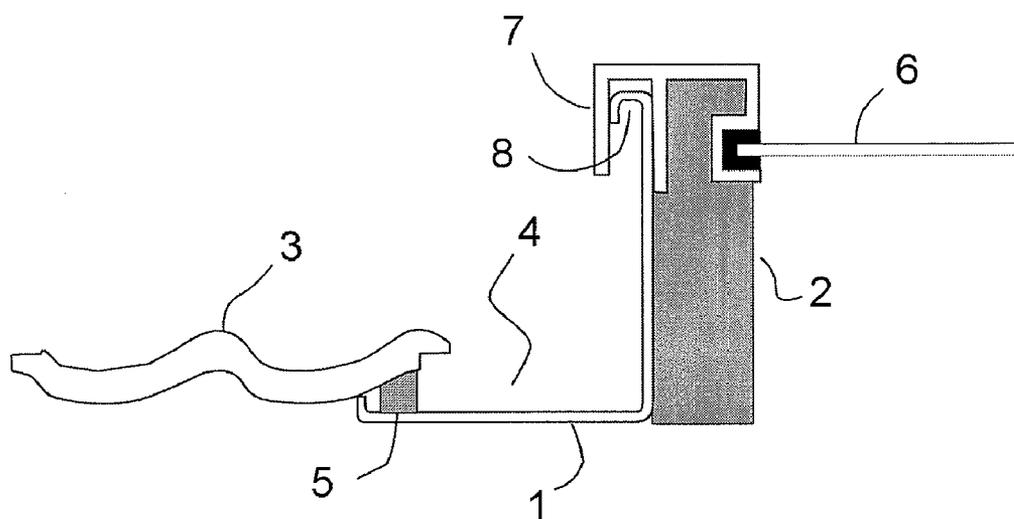


FIG 3

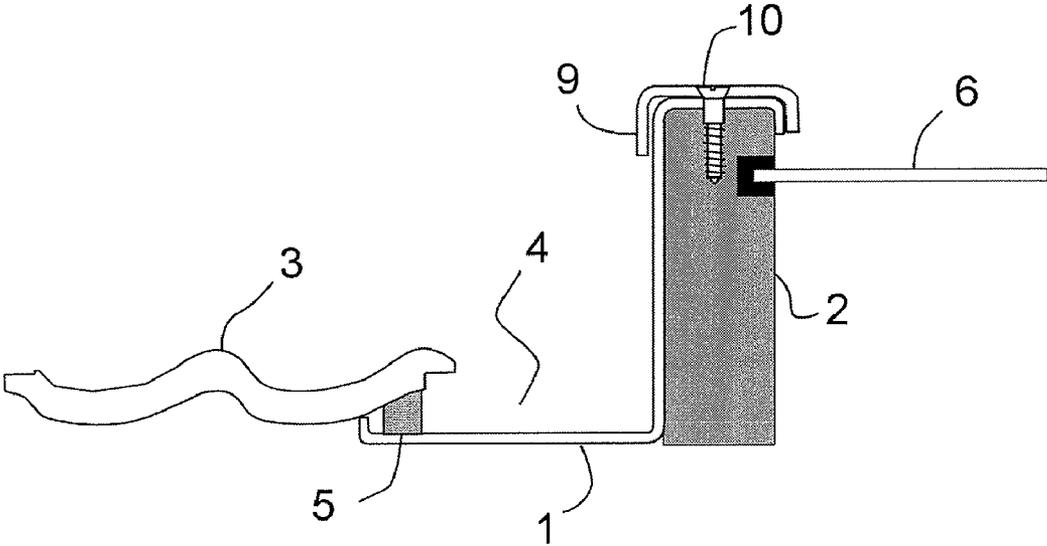


FIG 4

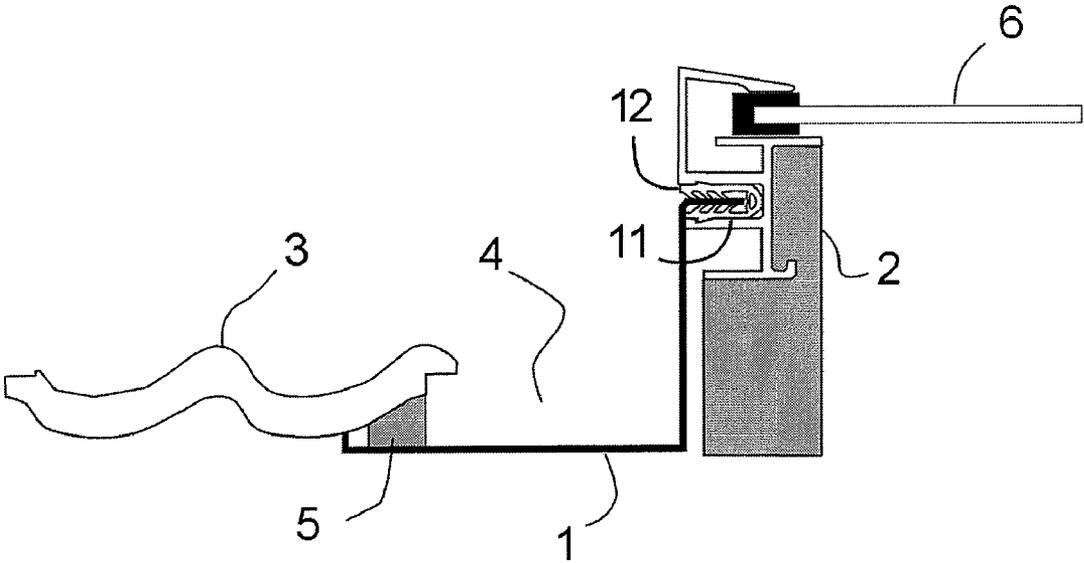


FIG 5

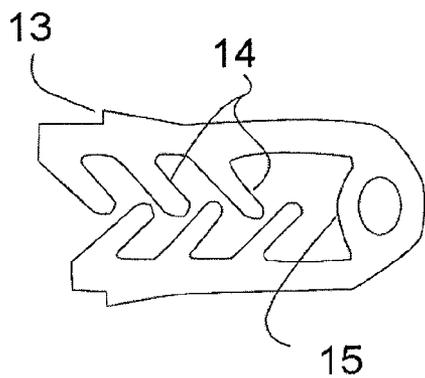


FIG 6

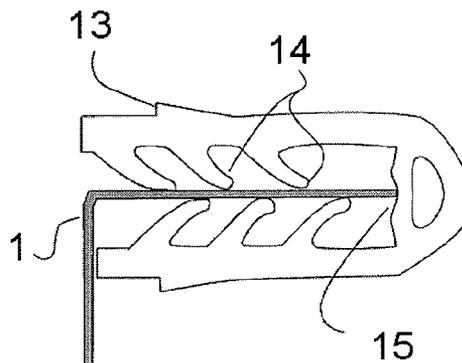


FIG 7

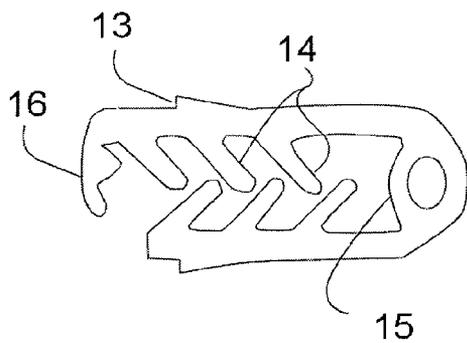


FIG 8

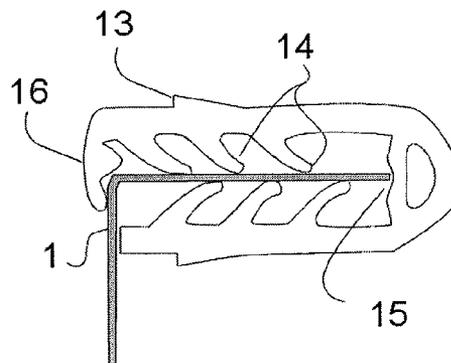


FIG 9

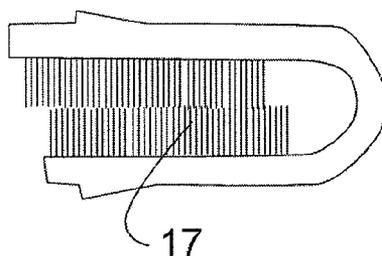
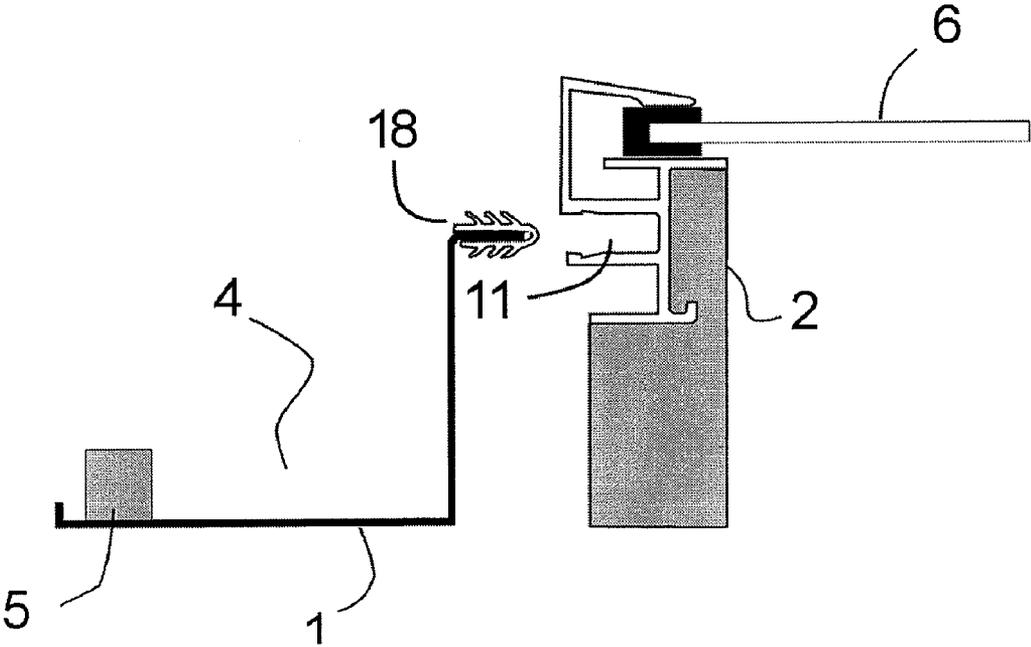


FIG 10



## ROOF FLASHING CONNECTIONS

[0001] The present invention relates to a technique for connecting a roof-penetrating structure to roof flashing, such as, for example, that used to create a weathertight seal between a roof window or solar panel and a roof covering such as tiles, slates or shingles.

[0002] The use of pre-formed flashing kits is well known in roof windows. The skilful and time-consuming job of forming lead sheet on site to make a weathertight seal between the window and the roof covering is replaced with a factory manufactured kit of parts, often made by pressing or roll forming pre-painted aluminium sheet. The kit is normally supplied in four parts—two side gutters and sections to go around the top and bottom. This approach has also been applied to solar panels.

[0003] Conventional approaches for joining roof flashing to the upstand of a roof-penetrating body are illustrated in FIGS. 1-3.

[0004] One approach, shown in FIG. 1, is to provide side gutters, and top and bottom flashing components as a continuous part of the product—pre attached in the factory. The gutter (4) between the upstand of the roof penetrating structure (2) and the tile (3) is formed by a flashing (1) that is a continuous part of the cover glass. A flexible seal (5) may be present to provide a conforming fit with the shape of the tile. This approach has particularly been adopted for roof windows and solar panels with thermoformed clear plastic covers.

[0005] With this approach, the flashing needs to be made more robust (for handling) than it needs to be for durability once installed. Also, different types of flashing may be needed for different roof coverings, requiring the manufacturer to produce different versions of the roof-penetrating structure incorporating the different types of flashing.

[0006] A second approach, shown in FIG. 2, provides a separate flashing (1) that tucks up under a skirt (7) on the rooflight or solar panel. The glazing (6) is now a separate part. Gravity keeps water out, and a return fold (8) on the flashing prevents wind-driven rain from entering.

[0007] With this approach, the flashing needs to be rotated into position, which can limit the acceptable geometry for the flashing and the skirt. Also, flashing corner pieces are particularly difficult to fit in without significant distortion of the flashing being required.

[0008] The skirt can be made a separate component that is removed prior to pushing the flashing against the side of the roof window, and then clipped back into place. Whilst this can alleviate the difficulty mentioned above, it does add to the complexity of fitment and manufacture.

[0009] A third approach, illustrated in FIG. 3, is to have a removable cover (9) on the window or solar panel. This is removed to allow the flashing to engage, and then reaffixed with nails or screws (10) to cover the flashing.

[0010] This arrangement is cheap to produce, but requires the roofing contractor to disassemble and reassemble components. This can be time consuming, and there is also the risk of the disassembled components being dropped before reassembly. This approach has particularly been used with wooden frames, where nails or screws can be used to attach the cover through the flashing.

[0011] It is an aim of the invention to provide a new technique of connecting a roof flashing to a roof-light, solar panel

or other roof penetrating structure which is simple and quick whilst providing a weather-tight and durable connection.

[0012] According to one aspect of the present invention, there is provided a roof-penetrating structure for incorporating into a roof, the structure including a portion extending along one or more sides of the roof-penetrating structure for receiving an edge section of one or more sheets of flashing to provide a weather-proof connection therebetween; said portion including one or more resilient members such that, in use, the insertion of flashing into said portion automatically forces at least one of said one or more resilient members into a configuration in which they are biased against the flashing.

[0013] In one embodiment, the resilient member(s) comprise at least one pair of resilient flap members extending from opposing sides of said portion; said pair of resilient flap members overlap with each other in their relaxed configuration; a plurality of said pairs of resilient flap members are positioned at increasing distances in the direction of insertion of the flashing; and the resilient flap members partially point in the direction of insertion of the flashing in their relaxed configuration.

[0014] In one embodiment, said portion is a component fitted into a recess in a base structure of said roof-penetrating structure; said component is provided with barbs which act to resist its removal from said recess; and said recess extends continuously around the roof-penetrating structure; said portion is a continuous component fitted about said base structure and into said recess; and said component is an extruded component.

[0015] In one embodiment, the resilient member(s) comprises bristles extending from opposing sides of said portion.

[0016] In one embodiment, said portion defines a resilient convex end-stop, which, in use, partially inverts when the edge of the flashing is forced against it.

[0017] There is also provided a solar panel or roof window comprising a roof-penetrating structure as described above.

[0018] The present invention also provides a method of incorporating a roof-penetrating structure as described above into a roof, the method comprising inserting the edge of at least one sheet of flashing into said portion, and creating a weather-proof connection between said sheet of flashing and said roof.

[0019] The present invention also provides a kit comprising a roof-penetrating structure for incorporating into a roof and one or more sheets of flashing, the structure including a portion extending along one or more sides of the roof-penetrating structure for receiving an edge section of said one or more sheets of flashing to provide a weather-proof connection therebetween; said portion including one or more resilient members such that, in use, the insertion of flashing into said portion automatically forces at least one of said one or more resilient members into a configuration in which they are biased against the flashing.

[0020] According to another aspect of the present invention, there is provided a sheet of flashing for incorporating a roof-penetrating structure in a roof, said sheet of flashing including an edge section for inserting into a receiving portion of a roof-penetrating structure to provide a weather-proof connection therebetween; said edge section of said sheet of flashing being provided with one or more resilient members such that, in use, the insertion of the sheet of flashing into said receiving portion of said roof-penetrating structure automati-

cally forces at least one of said one or more resilient members into a configuration in which they are biased against the receiving portion.

**[0021]** The present invention also provides a method of incorporating a roof-penetrating structure into a roof, the method comprising inserting said edge section of a sheet of flashing described in the preceding paragraph into a receiving portion of a roof-penetrating structure, and creating a weather-proof connection between said sheet of flashing and said roof.

**[0022]** The present invention also provides a kit comprising a roof penetrating structure and one or more sheets of flashing for incorporating said roof-penetrating structure in a roof, said one or more sheets of flashing including an edge section for inserting into a receiving portion of a roof-penetrating structure to provide a weather-proof connection therebetween; said edge section being provided with one or more resilient members such that, in use, the insertion of said one or more sheets of flashing into said receiving portion of said roof-penetrating structure automatically forces at least one of said one or more resilient members into a configuration in which they are biased against the receiving portion.

**[0023]** Hereunder follows a detailed description of embodiments of the invention, by way of example only, with reference to the accompanying drawings, in which:

**[0024]** FIGS. 1-3 are cross-sectional views of the gutter formed by the flashing between the roof penetrating structure and the roof covering according to the above-described conventional approaches.

**[0025]** FIG. 4 is a cross-sectional view similar to FIGS. 1-3 for an embodiment of the present invention.

**[0026]** FIG. 5 is a cross-sectional view of an example of the flashing gasket of FIG. 4.

**[0027]** FIG. 6 shows the flashing gasket of FIG. 5 with the flashing inserted.

**[0028]** FIG. 7 is a cross-sectional view of another example of the flashing gasket of FIG. 4.

**[0029]** FIG. 8 shows the flashing gasket of FIG. 7 with the flashing inserted.

**[0030]** FIG. 9 is a cross-sectional view of a third example of the flashing gasket of FIG. 4 with inward facing bristles.

**[0031]** FIG. 10 is a cross sectional view similar to FIGS. 1-3 for an alternative embodiment of the present invention.

**[0032]** In one embodiment of the invention, shown in cross-section in FIG. 4, a weather tight seal is made between the upstand of a solar panel, rooftop, or other roof penetrating structure (2), and a roof covering such as a tiles (3) by forming a gutter (4) with a flashing (1). The roof penetrating structure is provided with a continuous slot (11) around the outside face of its upstand (2). The slot is shaped to receive a flexible gasket (12). To secure the gasket into the slot, a barb (13) on the outside face of the gasket mates with a corresponding rebate in the slot.

**[0033]** The gasket plug is of a generally U-shaped section formed with a series of lips (14) extending into the centre, such that when a thin sheet of flashing material (1) is pushed into it, they are deflected to form a series of seals against the upper and lower faces of the sheet.

**[0034]** If the lips are made to extend beyond the centre line of the gasket, then discrepancies in the height of the flashing can be accommodated. The use of a spaced apart series of lips disrupts the path of capillarity, so water will not penetrate beyond the end of the contact face of the first lip by this

mechanism. If the lips are angled towards the closed end of the gasket they deform easily by bending when the flashing is pushed in, but resist pull out.

**[0035]** It can be seen that the advantage of this design is the ease with which the flashing is fitted. The flashing is simply pushed into the slot in the gasket until it stops against the side of the upstand, thus providing clear feedback to the fitter that it is properly in place.

**[0036]** An alternative design of gasket has an inlet cover that hangs down below the top edge of the flashing (16). The inlet cover is shaped so that as the flashing is pushed past it, a protrusion prevents its further rotation by interfering with the first lip. Once the flashing is pushed to its maximum extent, the inlet cover springs down against the flashing. This feature is useful to prevent against wind pressure opening the lips. Positive pressure on the outside acts to press the inlet cover harder against the flashing.

**[0037]** In places the flashing sections overlap each other, and there is a double thickness of flashing material pushed into the gasket. The gasket cannot perfectly conform to the change in thickness at each end of the overlap section. Consequently there will be a small gap between the flexible lips and the top and bottom faces of the flashing at these points (although the gap and the top and the gap at the bottom will be offset by the distance of the overlap). A compressible convex shape (15) at the end of the recess in the gasket seals against the edge of the flashing and provides a continuous seal at all points.

**[0038]** One variation of this embodiment would have the inside faces of the gasket made up of bristles (17), with their free end facing towards the centre. This variation could better conform to step changes in the flashing material, such as those described above.

**[0039]** Examples of suitable materials for the gasket plug are rubber and EPDM (ethylene propylene diene monomer) synthetic rubber. It can be formed by extrusion, and joined with moulded mitred corners to form a continuous loop. The design is particularly well suited to connecting the flashing to a frame formed by extrusion, for example one of aluminium. However, the slot could also be formed by routing in wood, or forming steel or aluminium sheet by roll forming.

**[0040]** An alternative embodiment of the invention, shown in FIG. 10, includes a flashing with a gasket attached to its edge (18). The fitment procedure would then be to push the flashing and gasket into a receiving slot (11) in the upstand of the roof penetrating structure.

**[0041]** With the techniques described above, a standardised roof window or solar panel can be produced that can be used with a variety of different flashing kits.

**[0042]** The above detailed description of embodiments of the present invention is provided by way of example only, and various modifications can be made to these embodiments without departing from the scope of the invention

**[0043]** The applicant draws attention to the fact that the present invention may include any feature or combination of features disclosed herein either implicitly or explicitly or any generalisation thereof, without limitation to the scope of any definitions set out above.

1-19. (canceled)

20. A roof-penetrating structure for incorporating into a roof, the structure including a portion extending along one or more sides of the roof-penetrating structure for receiving an edge section of one or more sheets of flashing to provide a weather-proof connection therebetween; said portion includ-

ing one or more resilient members such that, in use, the insertion of flashing into said portion automatically forces at least one of said one or more resilient members into a configuration in which they are biased against the flashing.

21. A roof-penetrating structure according to claim 20, wherein the resilient member(s) comprise at least one pair of resilient flap members extending from opposing sides of said portion.

22. A roof-penetrating structure according to claim 21, wherein said pair of resilient flap members overlap with each other in their relaxed configuration.

23. A roof-penetrating structure according to claim 21, including a plurality of said pairs of resilient flap members positioned at increasing distances in the direction of insertion of the flashing.

24. A roof-penetrating structure according to claim 21, wherein the resilient flap members partially point in the direction of insertion of the flashing in their relaxed configuration.

25. A roof-penetrating structure according to claim 20, wherein said portion is a component fitted into a recess in a base structure of said roof-penetrating structure.

26. A roof-penetrating structure according to claim 25, wherein said component is provided with barbs which act to resist its removal from said recess.

27. A roof-penetrating structure according to claim 25, wherein said recess extends continuously around the roof-penetrating structure, and said portion is a continuous component fitted about said base structure and into said recess.

28. A roof-penetrating structure according to claim 25, wherein said component is an extruded component.

29. A roof-penetrating structure according to claim 20, wherein the resilient member(s) comprises bristles extending from opposing sides of said portion.

30. A roof-penetrating structure according to claim 20, wherein said portion defines a resilient convex end-stop, which, in use, partially inverts when the edge of the flashing is forced against it.

31. A roof-penetrating structure according to claim 20, which is a solar panel or a roof window.

32. A roof-penetrating structure according to claim 20, which is incorporated into a roof by inserting the edge of at

least one sheet of flashing into said portion, and creating a weather-proof connection between said sheet of flashing and said roof.

33. A kit comprising a roof-penetrating structure for incorporating into a roof and one or more sheets of flashing, the structure including a portion extending along one or more sides of the roof-penetrating structure for receiving an edge section of said one or more sheets of flashing to provide a weather-proof connection therebetween; said portion including one or more resilient members such that, in use, the insertion of flashing into said portion automatically forces at least one of said one or more resilient members into a configuration in which they are biased against the flashing.

34. A sheet of flashing for incorporating a roof-penetrating structure in a roof, said sheet of flashing including an edge section for inserting into a receiving portion of a roof-penetrating structure to provide a weather-proof connection therebetween; said edge section of said sheet of flashing being provided with one or more resilient members such that, in use, the insertion of the sheet of flashing into said receiving portion of said roof-penetrating structure automatically forces at least one of said one or more resilient members into a configuration in which they are biased against the receiving portion.

35. A sheet of flashing according to claim 34, which is used to incorporate a roof-penetrating structure into a roof by inserting said edge section into a receiving portion of a roof-penetrating structure, and creating a weather-proof connection between said sheet of flashing and said roof.

36. A kit comprising a roof penetrating structure and one or more sheets of flashing for incorporating said roof-penetrating structure in a roof, said one or more sheets of flashing including an edge section for inserting into a receiving portion of a roof-penetrating structure to provide a weather-proof connection therebetween; said edge section being provided with one or more resilient members such that, in use, the insertion of said one or more sheets of flashing into said receiving portion of said roof-penetrating structure automatically forces at least one of said one or more resilient members into a configuration in which they are biased against the receiving portion.

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