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(54) Title of the Invention: **A roof waterproofing element**
Abstract Title: **Waterproofing element for roof valley**

(57) A waterproofing element 210 comprising a single sheet with two elongate channels 212a, 212b defined symmetrically about a median line, each channel having an opening 224a, 224b defined by one S-shaped rim profile and one reverse S-shaped rim profile. The profiles define an undercut forming the water channel with a wider base than the opening. Portions 214a, 214b, 214c, 214d either side of the opening define side portions on which a tile can rest. Preferably the element has capillary grooves 226a, 226b to receive rainwater drawn under the tiles. The channels may be mirror images, and the element used to provide an obscured mitred valley joint.

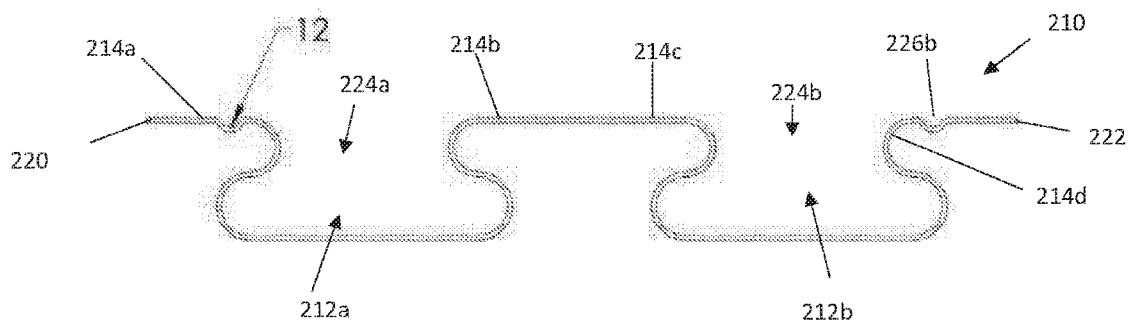


FIGURE 9A

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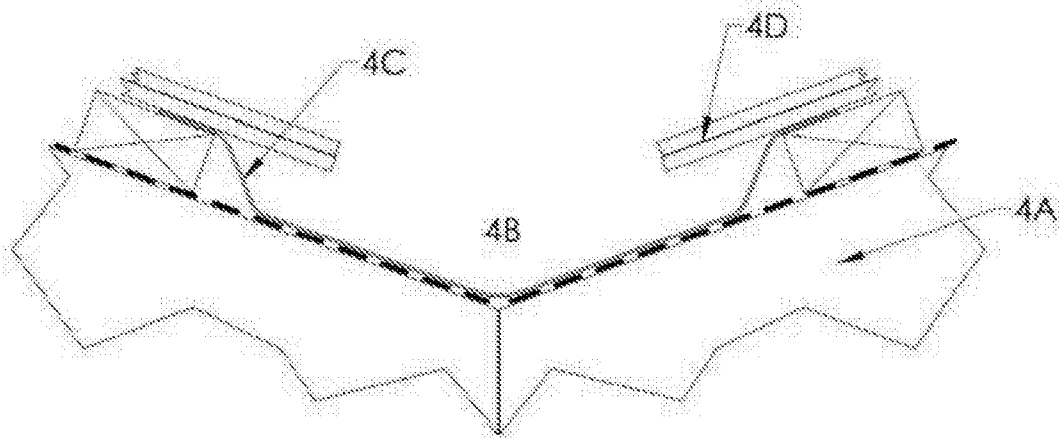


FIGURE 1

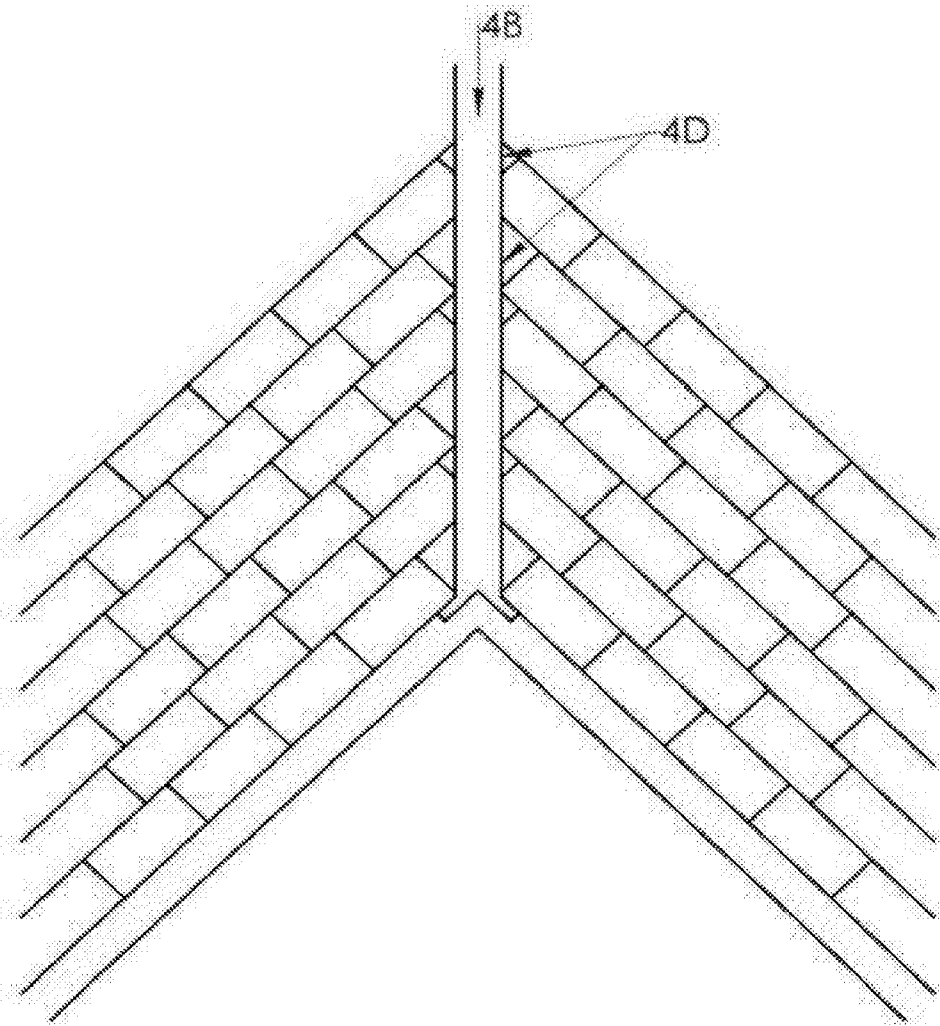


FIGURE 2

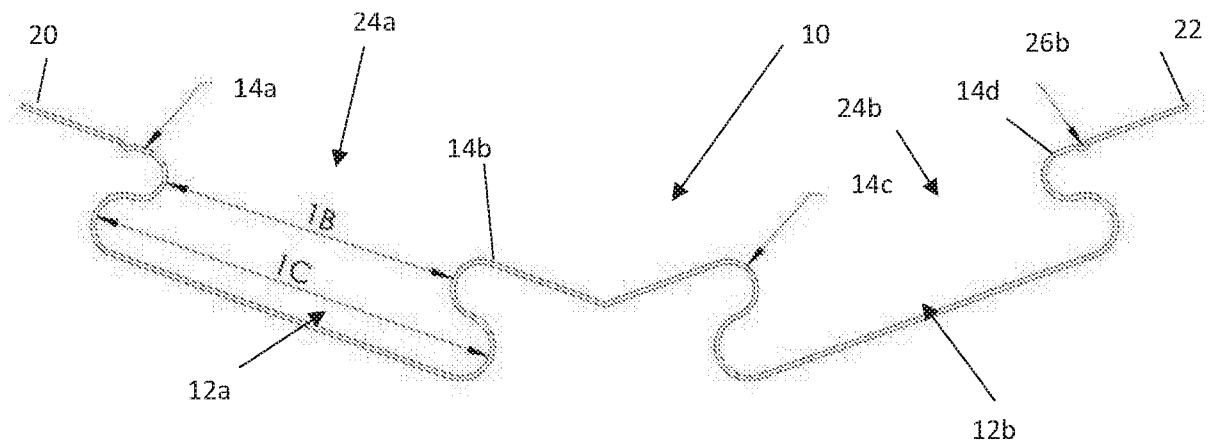


FIGURE 3A

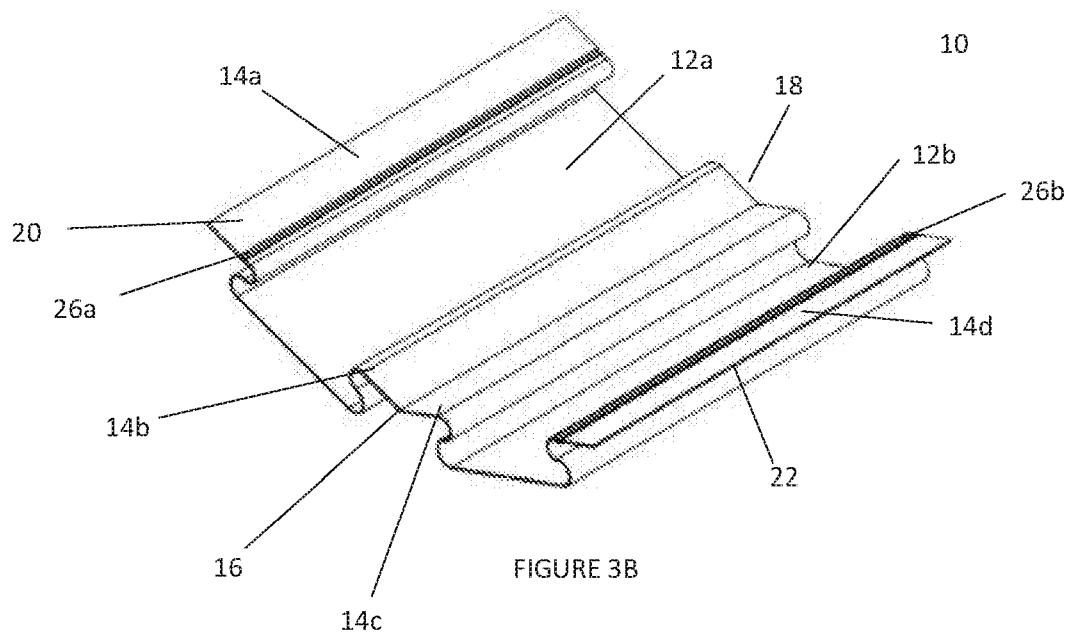


FIGURE 3B

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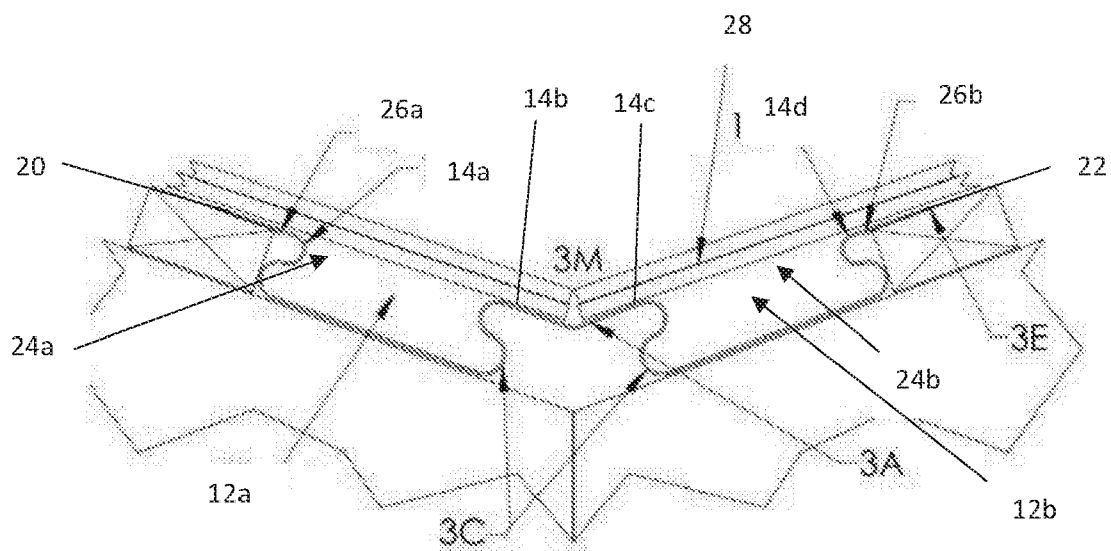


FIGURE 4

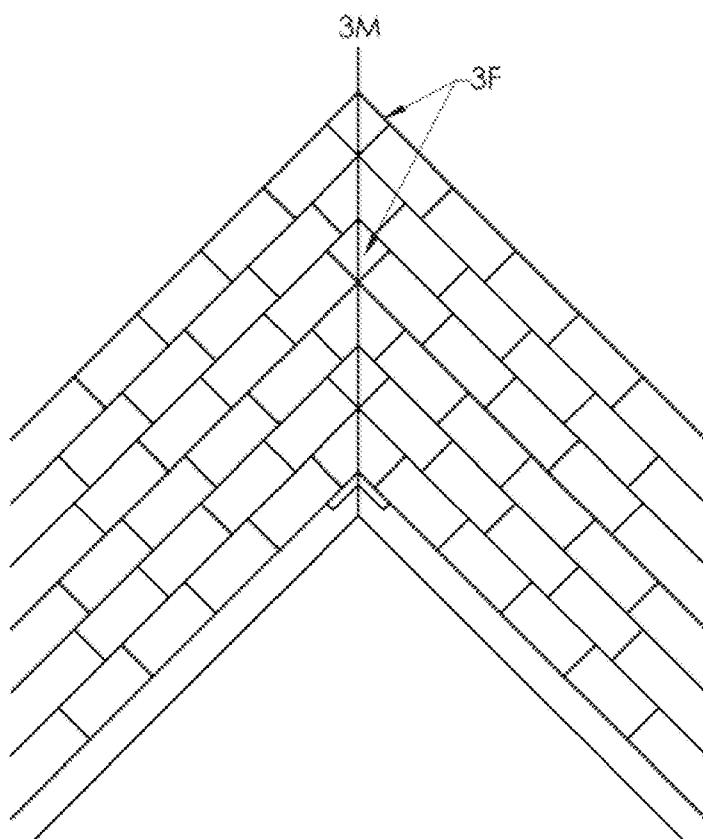


FIGURE 5

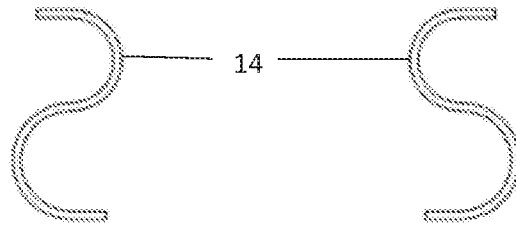


FIGURE 6A

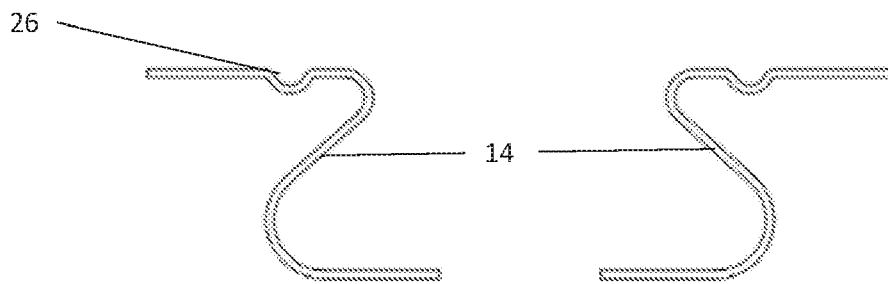


FIGURE 6B

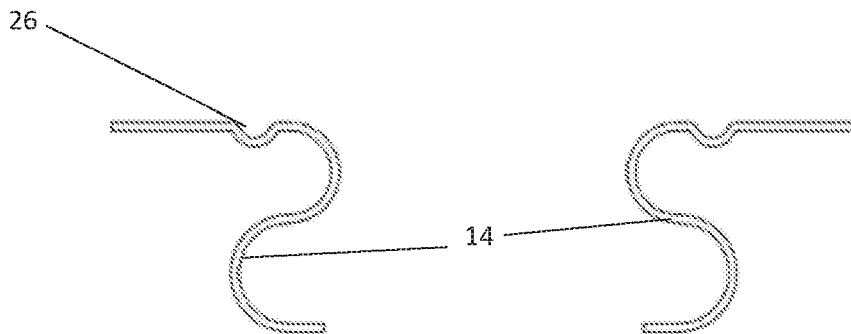


FIGURE 6C

02 11 22

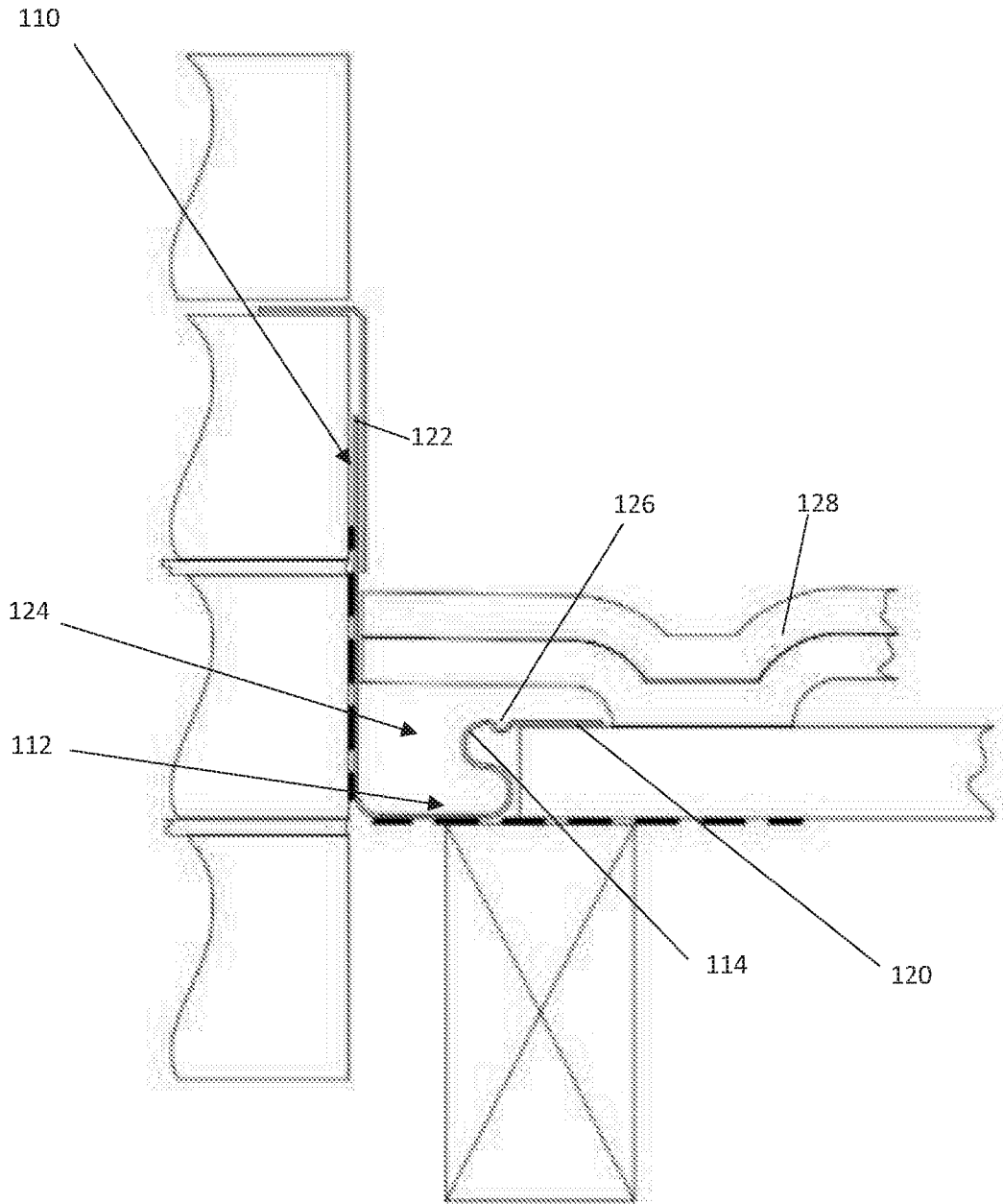


FIGURE 7

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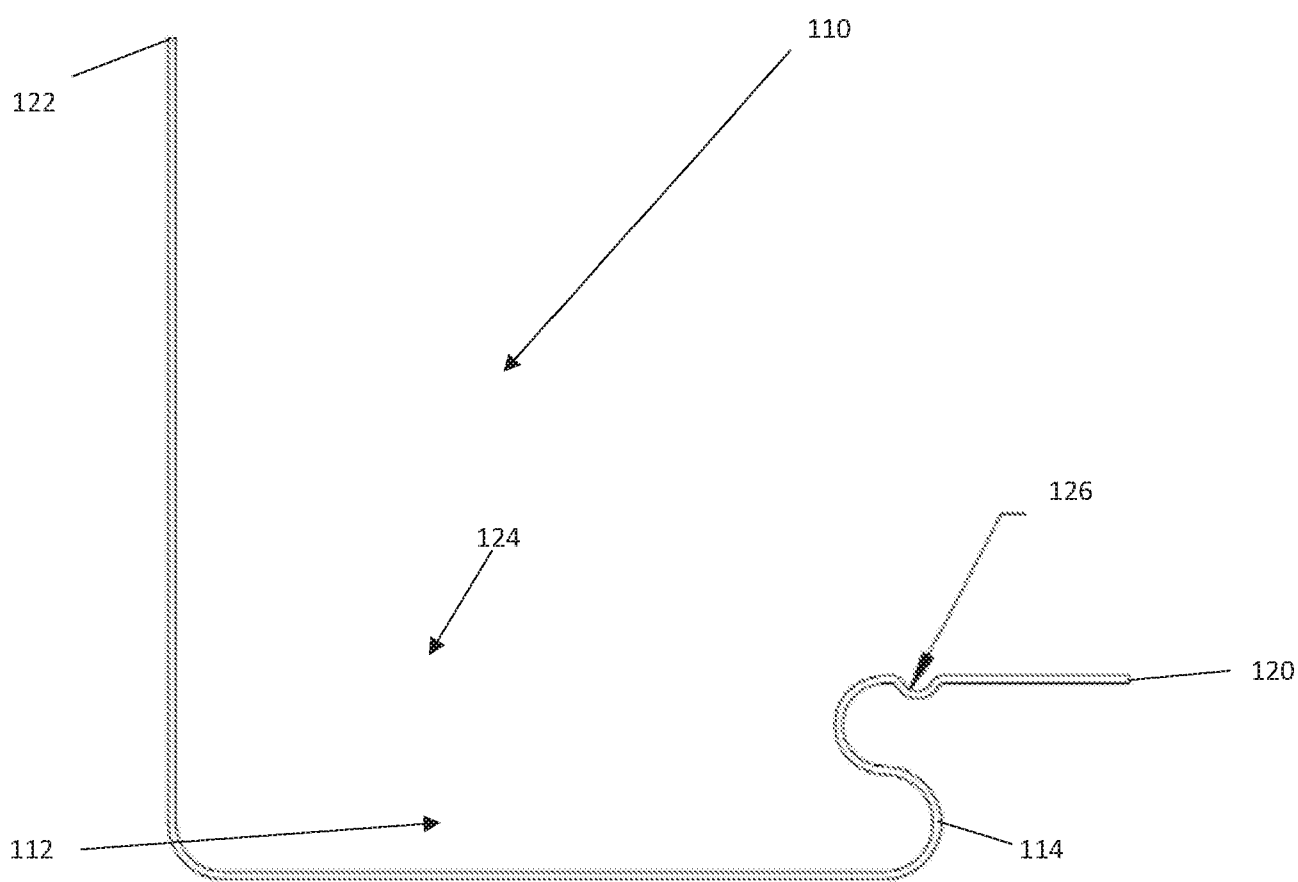


FIGURE 8A

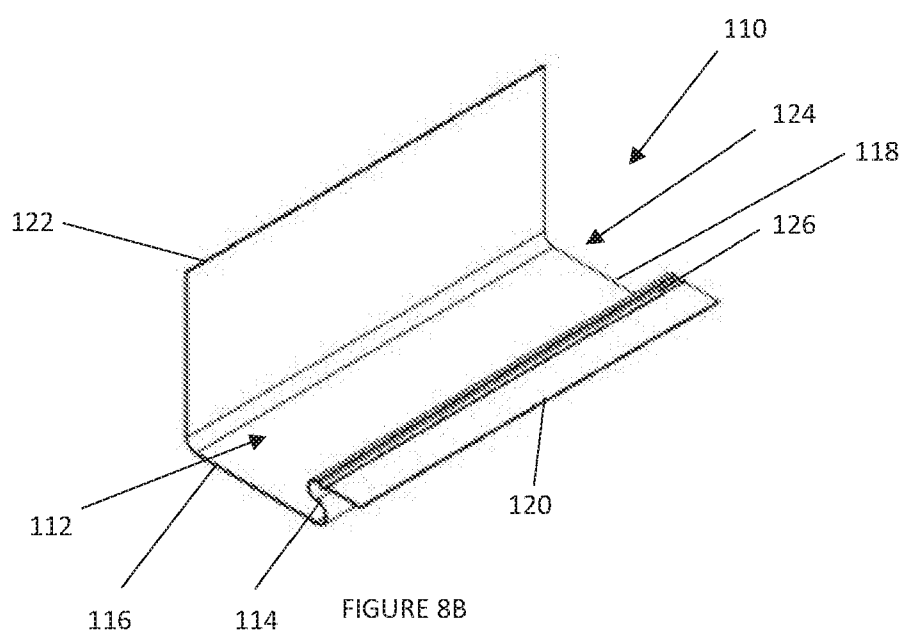


FIGURE 8B

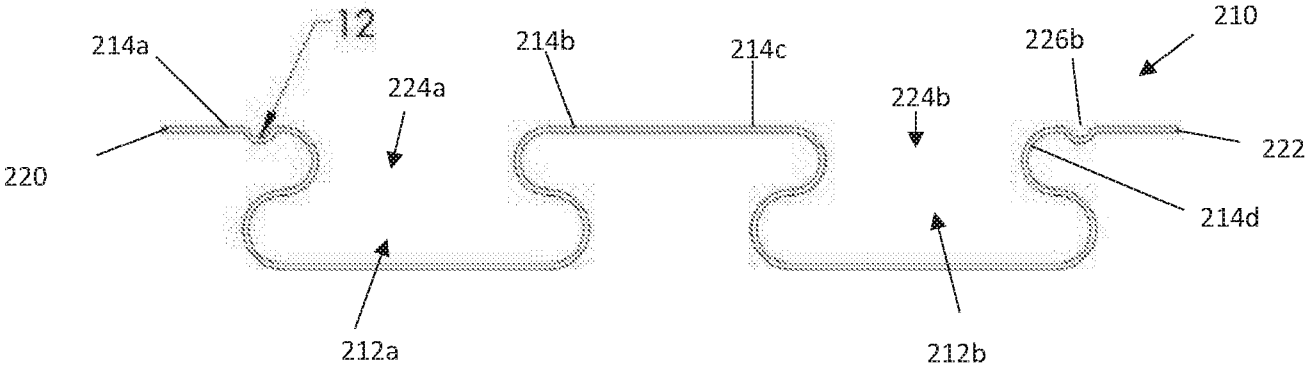


FIGURE 9A

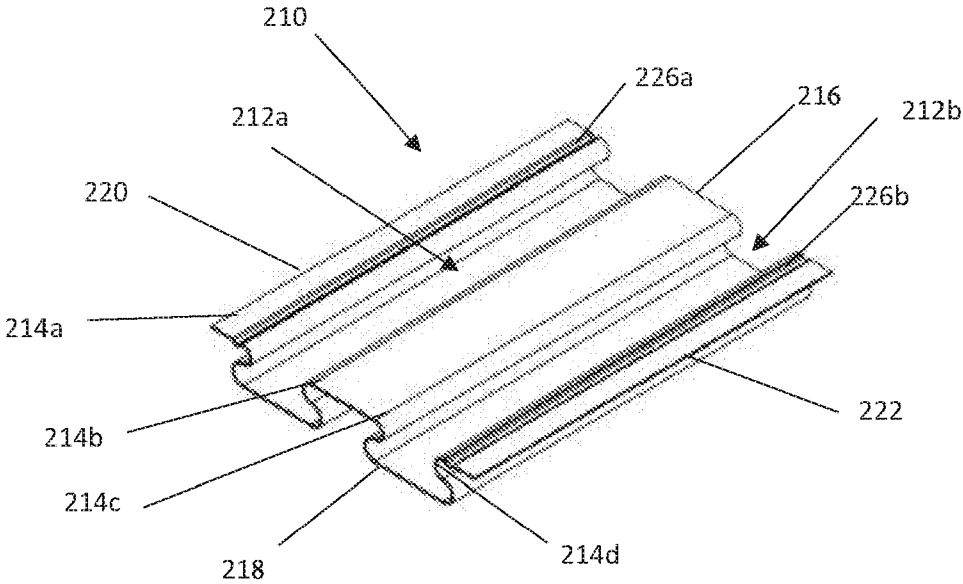
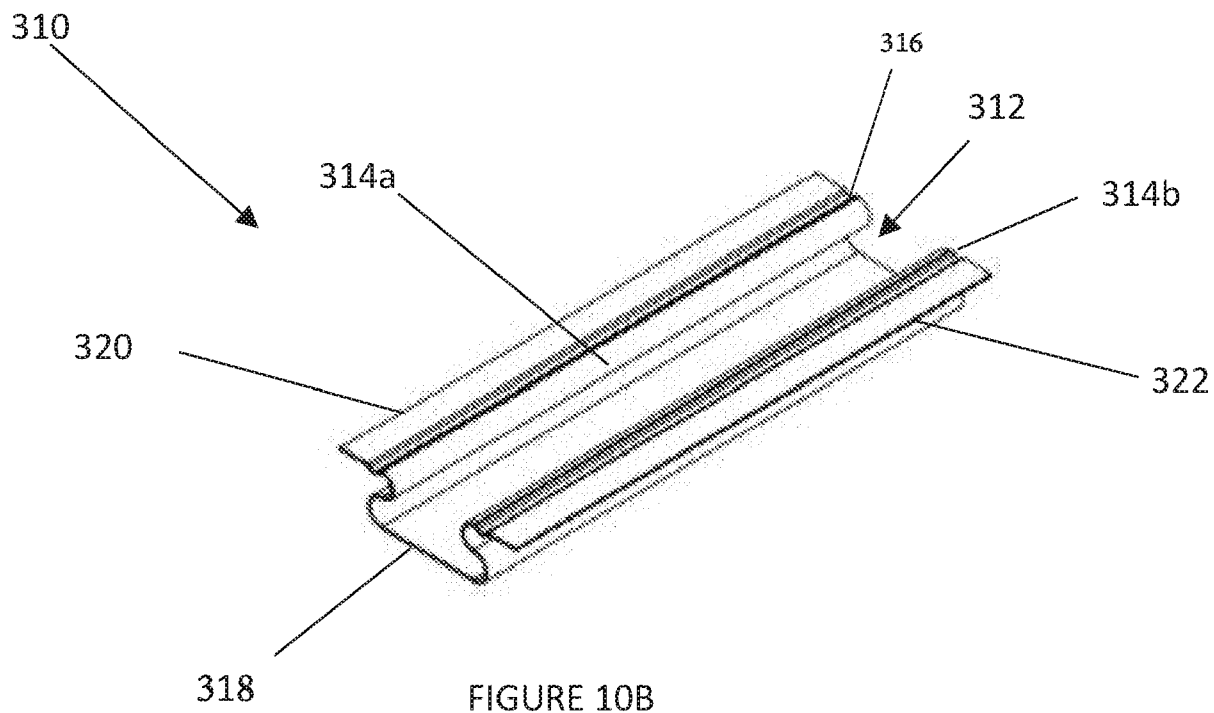
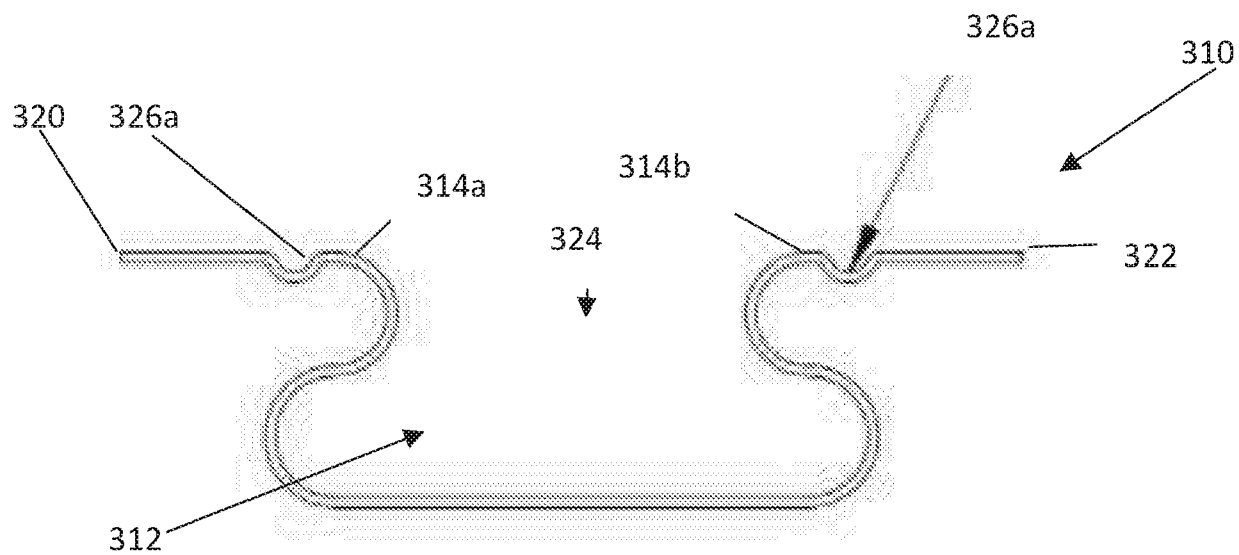
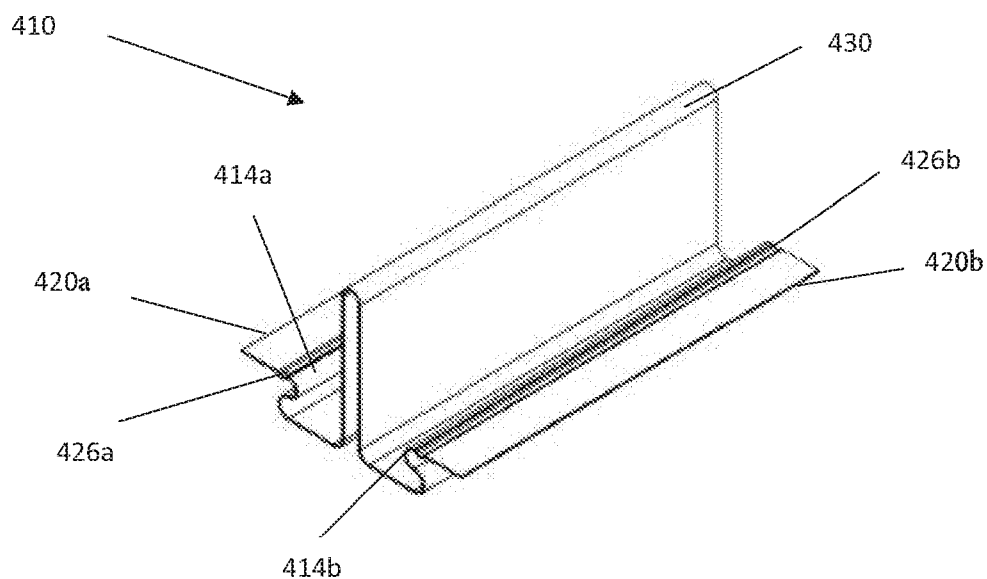
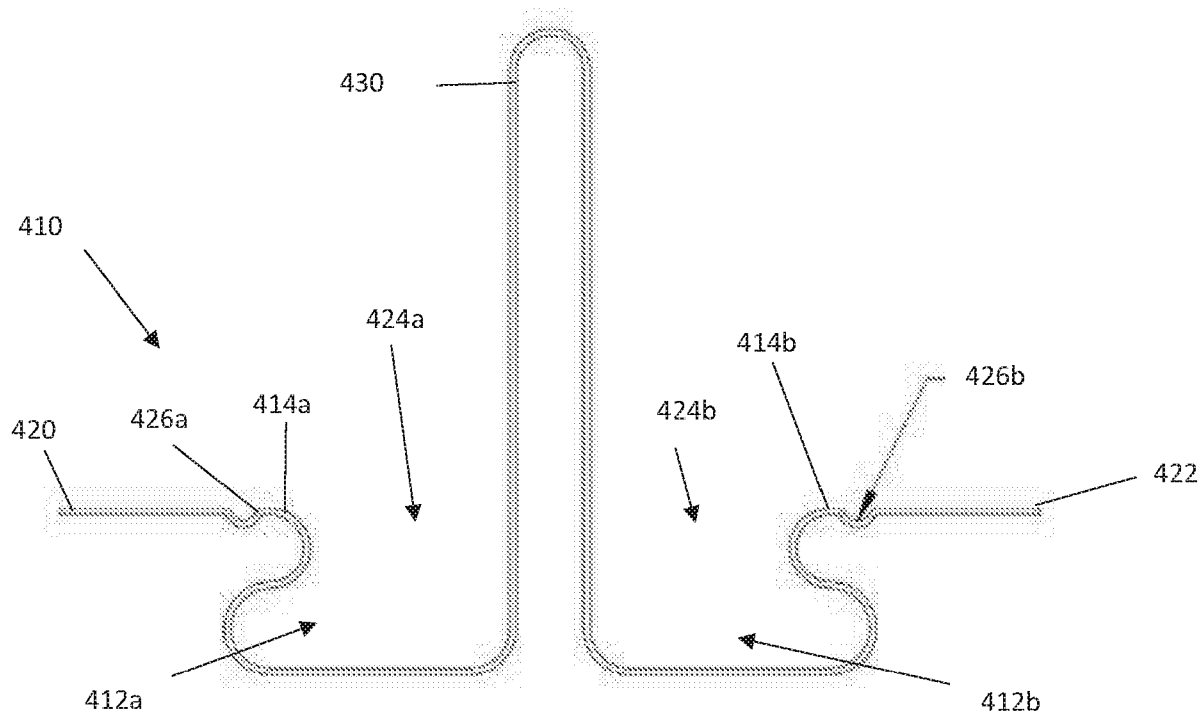


FIGURE 9B





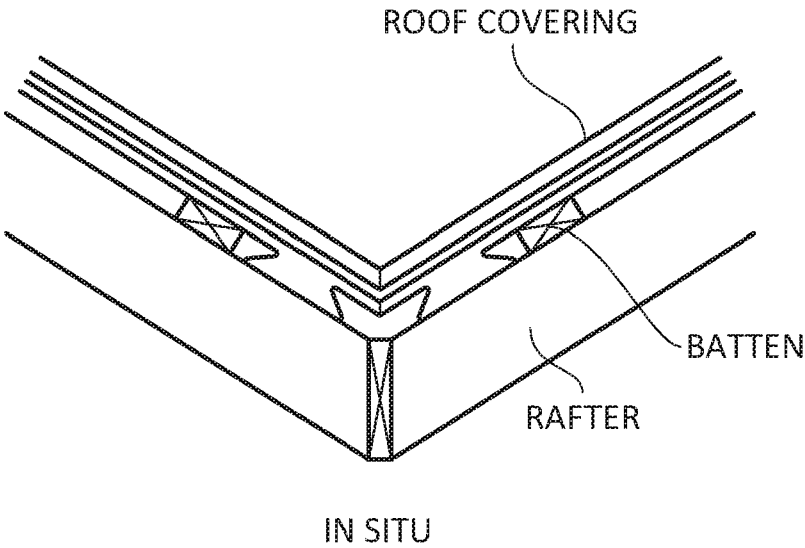


FIG. 12A

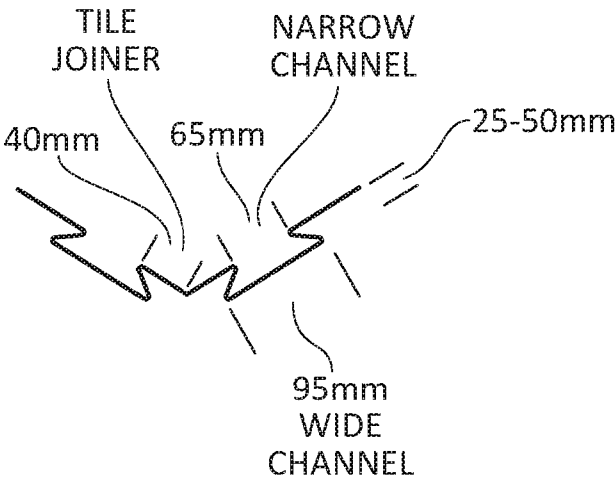


FIG. 12B

A ROOF WATERPROOFING ELEMENT

Field

The present invention relates to a roof waterproofing element, and in particular a roof waterproofing element for positioning across a compounded mitre join or valley between roof planes for improving traditional waterproofing techniques.

In particular, the present invention relates to a roof waterproofing element which enables roof covering elements on roof planes on opposing sides of a valley or compounded mitre join, to be directly mitred against each other so as to obscure the valley below.

Background of the Invention

The primary function of the roof is to keep the building dry. Conventional roofs are predominantly triangular (tent shaped) frames that are formed on the uppermost part of a rectangular shaped building, the roof covers the whole building and converges at an uppermost central point so that the outward slope that is created (the roof plane) is better able to efficiently direct rain and snow from the building. These roof frames are covered in a variety of 'roof coverings' such as clay and concrete tiles and roofing slates.

When a building has a perpendicular projection, so that the building forms an 'L' shape then this convergence of the opposed roof planes is required to be a mitred join that is compounded by the angle of the roof. This compounded mitre junction on the roof is known as the roof 'valley'. As the rainfall on the adjacent roof planes converges at the valley it is therefore a critical junction on the roof and subject to larger and more severe movements of water.

Traditionally, heritage style valleys were formed by a special arrangement of the tiles or slates whereby tiles and slates were cut and overlayed upon each other so that they appear to be swept around the perpendicular angle of the mitre. This is known as a 'swept valley'. However, the installation of these types of heritage valleys is difficult

and requires highly skilled builders and carpenters. Consequently they have been gradually and predominantly replaced using malleable lead sheeting that can be easily formed below the mitred joins in the roof coverings to form water proofing joins in the roof coverings. In recent history, as shown in Figure 1, the lead sheeting was then also laid in larger pieces onto pre-installed support planks known as 'lay boards' (as shown at 4A in Figure) to form open valley gutters (as shown at 4B in Figure 1) which are a common modern embodiment of a valley.

Despite the modern and easy to install open valley gutters the heritage style valleys remain highly desirable because of their aesthetic appearance; although they are now rarely used because of the high implementation cost and lack of skilled labour.

When installing a standard open valley lead sheeting is manually formed into position onto lay boards 4A on site so that it follows the structural mitred join of the roof, the roof coverings are cut (mitred) at the angular line either side of the valley back from the central joining line of the valley so as to form an open valley gutter or trough (as shown at 4B in Figure 1). A centre strip of approximately 150mm of the lead presents a clearly visible strip up the central line of the valley 4B. It is this strip that forms an open valley gutter to direct water off the roof.

Recent trends have seen expensive and polluting lead sheeting being replaced by a far more cost-effective pre-formed glass reinforced polyester (GRP) (4C). However due to the design, width and flexible nature of the GRP, modern GRP valleys are also required to be installed onto lay boards (4A) so that they are supported. The use of GRP open valley gutters is now commonplace, and a further modern development allows the open valley to be formed onto a raised central section of GRP that further simplifies their installation and improves the overall appearance, so that the covering is formed onto a narrow and clearly defined raised central 'rib'. In such arrangements water runs onto the rib and is directed into the water channel below.

Existing GRP valleys are formed (Figure 1) so that they are wide enough to establish a gutter that will carry the amount of water off the roof and so that they can support and interact with the roof covering to form a resilient and waterproof layer that is the roof

valley. However, so as to provide the appropriate width of water gutter it is conversely difficult to also fix smaller cut pieces of the roof coverings that simply cannot span the width of the required water gutter and can be dislodged through time, for example by wind, wildlife or debris. This technique therefore results in an unsightly wide gutter running along a valley between two roofs.

Modern production methods of preforming inline GRP valleys do not permit intricate detailing, tight bends or corners in the preformed valley because the glass fibre strands cannot easily be retained in situ during the manufacturing process. Because of this, most modern preformed GRP valleys and water gutters are manufactured in a wider format with shallower open angles as shown at 4C in Figure 1. With consideration to the cut pieces of the roof covering some modern GRP preformed valleys, that utilise a raised central section, also incorporate support sections that are used to help support the cut pieces of the roof covering and work in conjunction with a raised central rib section.

GRP is also used in other roofing applications that make allowance for the variation in different types of roof covering. Another specific use is for abutment joints, that are used predominantly for inline or vertical roofing joins in different roof coverings, that are on the same roofing plane of separate houses (such as terraced housing). Modern variations of GRP abutments are designed to allow for a variety of heights and sizes in opposing roof coverings and can again utilise a raised central strip to form a clearly defined line in the adjoining roof elevations.

In a similar application to the one mentioned above, GRP profiles can be used when a roof abuts an adjacent wall that rises above the roof plane, however these high impact profiles tend to distort or raise the required flat installation of the roof covering.

In all existing known products modern GRP valleys are of a wide profile and offer a clearly visible joining profile when installed on the roof. In all applications the length of the roof valley or the abutment can be longer than the preformed valley, therefore it is important that the preformed valley can be easily extended by overlapping the upper

part of the valley by the lower section of the extending piece. Because of this the design of the preformed valley must be such that it can overlap itself.

An object of the present invention is to provide an improved valley guttering system, that is obscured when installed, and so improves the aesthetic appearance of valleys between roof sections.

Prior Art

UK patent application GB-A-2 337 277 (Hamble side Danelaw) discloses a support device for use with a roof valley unit to support a portion of a roof tile. The device has an upstanding portion, an upper portion of which is adapted to receive a tile portion. The upstanding portion is secured to the roof valley unit by securing means such glue.

UK patent application GB-A-2 413 806 (Hambleside Danelaw) discloses a system of coplanar roof coverings that are joined using a roof gutter or strip having a primary longitudinally extending upstanding region and at least one secondary longitudinally extending upstanding portion. An edge region of each roof covering is aligned in proximity to or in abutment with a wall surface of a side of the upstanding portion.

UK patent application GB-A-2 307 922 (Hambleside Danelaw) discloses a method of installation of roof valley units at valleys between pitched roof sections. Lateral wing portions extend from respective sides of a longitudinally extending upstanding portion. Each wing portion has a lateral margin in the form of a flat sheet area which is capable, when installed in a roof valley, of being positioned beneath an end region of a batten that is fixed to the roof.

United States patent application US 2012/0096782 (Railkar et al) discloses a ridge ventilation system which includes a plurality of ridge vent sections configured to be arranged end-to-end along the ridge of a roof.

Each ridge vent section has an elongate longitudinally flexible top panel with a central portion. Edge portions terminate at extreme edges of the top panel. Ventilation grids extend beneath and along the edge portions. The space between the extreme edges of

the top panel and the ventilation grids defines an overhang which receives edges of shingles. The ridge vent sections have deflectors for deflecting blowing rain and snow to prevent water entering through the ventilation grids.

International patent application number WO-A-03/044301 (Grizenko) describes a flashing structure for mounting in a roof. Grizenko mentions that it is known to include a return bend in certain types of flashing in order to create a gutter below an upper surface of the flashing which can receive excess water and so prevent water overflowing onto tiles. The embodiments shown in Figures 8, 9 and 10 show sections of relatively flat flashings with convoluted, folded pockets.

A disadvantage of the embodiments mentioned in Grizenko is that because the channel defined by the folded flashing is relatively flat, its volume is limited in size and so the amount of excess water it can carry is limited. Also, as the volume defined by folded flashing is defined by a narrow gap between adjacent folded sheets of flashing, the channel is prone to clogging with debris.

There is therefore a need for a waterproofing element which can provide a waterproof join in roof coverings which enables the improved installation of cut pieces of roof coverings and which is capable of handling increased volume of water that are now occurring more frequently due to extreme weather events.

Furthermore there is a need for a waterproofing element which can be installed and is capable of carrying a relatively large volume of water through it without overflowing. This is becoming more important as more extreme weather events lead to days where rainfall totals exceed 50-year averages and single rainfall events can exceed 50 mm.

As these trends indicate an increase in frequency and intensity of rainfall, there is an increasing risk of floods and roofs, and guttering can become overloaded so that they may flood and fail.

Another aim is to provide a waterproofing element that is capable of being installed on a modern roof using a consequential overlapping method of installation.

Another aim of the present invention is to provide a waterproofing element on which roof tiles are laid and so in use is hidden from normal view.

Summary of the Invention

According to a first aspect of the present invention, there is provided a waterproofing element comprising a single impervious sheet with two elongate channels defined symmetrically about a median line, each elongate channel has a channel opening defined by one S-shaped (or Z-shaped) rim profile and one reverse S-shaped (or Z-shaped) rim profile, the rim profiles together define an undercut forming a water channel with a relatively wider base than the channel opening; and portions of the rim profiles, either side of the channel opening, define side portions on which at least a portion of a roof tile rests.

An advantage of the invention is that it adapted to lie below and to be hidden by a course of roof tiles, the waterproofing element,

Another advantage of the invention is that it permits central mitring of roof tiles in such a way that the waterproofing element is not visible. When installed the waterproofing element defines a self-supporting structure with a series of preformed drainage channels, each capable of transporting in excess of 10 litres of water/minute, preferably in excess of 15 litres of water/minute and most preferably in excess of 20 litres of water/minute; and which also provides covering support on which roof tiles may rest.

It is apparent therefore that even though the waterproofing element is obscured below it is capable of handling greater volumes of excess waterflow than previous guttering systems. This is achieved in one embodiment in which channels portions are a mirror image of one another and roof covering support portions are defined by upper flattened sections of the S-shaped (or Z-shaped) rim profiles.

Preferably a base of each elongate channel is flat, and this enables the waterproofing element to rest on roof battens and the channel thereby defines a gutter. As a consequence of the relatively larger width and depth of the channel a greater volume of

water is able to be carried than the channel defined by folds in the flashing, for example as shown in Figures 8 to 13 of WO-A-03/044301 (Grizenko).

Another advantage of the invention is that it collects and permits water to channel from a roof area, especially when located in a valley defined between two angled roof portion gables, with central mitring of roof tiles, in such a way that the waterproofing element is not visible.

Optionally a capillary groove is provided adjacent each of elongate channel. The capillary groove is dimensioned to receive rainwater drawn under an overlying roof covering by way of capillary action. An advantage of this to prevent creep of rainwater along an underside of a flat tile to where it might egress into a building.

Ideally the waterproofing element is formed from glass reinforced polyester (GRP) or roll-formed metal. Each of these materials flex and so ensure the elongate element is able to accommodate variations in profiles of roofs. An additional advantage is that a further V-shaped valley is defined when the waterproofing element is installed in and, because the material flexes, the angle formed is the same angle defined by the intersecting roof sections. As the waterproofing element is supported by roof battens and rafters, it is unstressed and so naturally accommodates any minor variations in roof profile, thereby defining a series of channels for uninterrupted removal of rainwater.

In some embodiments an additional drainage channel may be provided along the median line. Ideally the additional drainage channel is a V-shaped valley which forms an extra rigid median drainage channel.

The waterproofing element is preferably a longitudinal element configured to be positioned on, for example extend along, at least a portion of a valley formed between adjacent roof surfaces.

The waterproofing element preferably comprises a first end, an opposed second end, and first and second side portions extending therebetween. The longitudinal axis of the waterproofing elements preferably extends between the first and second ends thereof.

Lengths of the waterproofing element are supplied which in use are installed one atop another, with a suitable overlap, so that water flows from a first waterproofing element down into a second waterproofing element whose upper end is tucked below a lower end of the first waterproofing element.

The waterproofing element preferably comprises at least one roof covering support portion for supporting a roof covering thereon. The roof covering support portion(s) may be located at or adjacent one or more of the first and second side portions of the waterproofing element. These support portions may be defined by thicker regions of material in order to resist wear or formed with an additional layer of material bonded thereto.

Optionally the at least one roof covering support portion, for supporting a roof covering thereon, extends across at least a portion of the underlying channel.

In an alternative embodiment the waterproofing element may be asymmetric about its median line with one channel wider and/or deeper than another. Such versions of the waterproofing element may have specialised applications and be used in situations where buildings with smaller roofs (for example a porch) abut very large roofs, such as church, for example.

Preferably, the waterproofing element is composed of GRP. Other composite materials may be used. Alternatively, the waterproofing element may be formed from metal.

The roof covering support portion(s) is preferably located at or adjacent the first and/or second side portion(s) of the waterproofing element. The roof covering support portion(s) preferably extends, preferably continuously, between the first and second ends of the waterproofing element.

In one embodiment, the waterproofing element comprises a plurality of roof covering support portions, for example a two or more, for example each of the support portions being spaced from an adjacent support portion lengthwise along the waterproofing element.

In some embodiment a plurality of roof covering support portions may be spaced apart one from another along the width (between side portions) of the waterproofing element.

The roof covering support portion(s) preferably extends from, or adjacent, the first and/or second side portion(s) in a direction towards an opposing side portion of the waterproofing element.

Preferably, the waterproofing element is configured such that in use a roof covering support portion is positioned at and above the join (which is at a lowermost point of the valley) between opposed roof panels.

Preferably, the waterproofing element is configured such that in use the channel is positioned to extend in a direction substantially parallel to, but spaced apart from, the join (the lowermost point of the valley) between opposed roof panels.

Preferably the profile of the waterproofing element permits overlapping of itself by an adjacent piece so that a total installed length may be extended by overlaying pieces of waterproofing element to extend a run of guttering. Typically, individual lengths of the waterproofing element are at least 0.5 m, preferably 1.0 m and most preferably at least 1.5 m.

Because the profile of the waterproofing element is defined by two channels formed from two pairs of opposite facing S-shaped (or Z-shaped) portions, there is a natural resilience which ensures that overlaying lengths engage and interlock because their profiles match. This is known as lapping. However, two overlaying pieces may be bonded together with an adhesive or bonding agent, in order to ensure they do not slip apart. Ideally a flexible sealant is used which enables elongate expansion which occurs in warmer weather and is especially pronounced when metal experiences large temperature transitions.

In the preferred embodiment it is appreciated that , the S-shaped or Z-shaped portion located at or adjacent a first side portion is a mirror image of the S-shaped or Z-shaped portion located at or adjacent the second side portion of the waterproofing element.

The waterproofing element provides an opening, defined between a roof covering support portion and an adjacent portion of the waterproofing element or between a pair of roof covering support portions, into the underlying channels. The width of the channel (as measured in a direction extending between the opposed side portions of the waterproofing element) is preferably greater than the width of the opening (as measured in a direction extending between the opposed side portions of the waterproofing element).

Ideally the depth of each elongate channel is at least 10.0 mm, preferably at least 20.0 mm and most preferably at least 40.0 mm.

Ideally the width of each elongate channel is at least 40.0 mm, preferably at least 50.0 mm and most preferably at least 75.0 mm.

It is appreciated that the S-shaped or Z-shaped portion provide integral strength to the waterproofing element so that the waterproofing element is able to support itself and cut pieces of the roof covering, such as tiles, without the use of commonly used lay boards. This is considered to be an important advantage over existing systems as it removes the need for the additional expensive of lay boards and means that installing of the waterproofing element is quicker, thereby further reducing labour costs.

The waterproofing element therefore provides channels having sufficient dimensions to receive and transport rainwater whilst also having sufficient strength to support roof coverings, extending across the channels, on the one or more roof covering support portion(s).

As mentioned above, in some embodiments, the waterproofing element further comprises at least one capillary groove or channel configured to receive rainwater drawn under overlying roof covering(s) under capillary action.

The at least one capillary groove preferably is located at or adjacent a side portion of the waterproofing element. The at least one capillary groove preferably extends substantially parallel to the channel, for example preferably extends substantially parallel to the longitudinal axis of the waterproofing element.

The capillary groove located at or adjacent each side portion therefore enabling a degree of versatility during installation. The, or each, capillary tube forms a barrier and prevents creep of water on an underside of a tile, thereby preventing rainwater water from being blown up a roof.

The waterproofing element may comprise a capillary groove located at or adjacent one side portion thereof. The waterproofing element may comprise a capillary groove located at or adjacent the side portion configured to be positioned furthest away from the join (the lowermost point of the valley) between opposed roof panels.

The capillary groove(s) may be located adjacent the roof covering support portion(s).

The depth of the capillary groove(s) is preferably significantly less than the depth of the channel of the waterproofing element and is specifically located within the upper S or Z portion so as to not raise, lift or interfere with the line of the roof covering, in order to ensure that roof coverings are installed with a flat line appearance.

According to a further aspect of the present invention, there is provided a roof mounting system comprising a waterproofing element as herein described and one or more roof coverings mounted thereon.

The waterproofing element is configured in use to support a roof covering such that the roof covering extends in a direction across the channel (in a direction extending between side portions of the waterproofing element), for example across the opening into the channel (as defined between for example opposed roof covering support portions).

Preferably, the waterproofing element is configured such that the roof covering supported thereon extends across the channel (for example the opening into the channel) and is supported at both sides of the waterproofing element, for example by a roof covering support portion.

The waterproofing element is preferably obscured from view, underlying roof coverings mounted thereon, when installed at the valley between opposing roof planes.

Installation of the waterproofing element allows the roof covering to be open faced mitred.

The waterproofing element is preferably configured to enable roof coverings to be installed in the heritage style of closed mitre join and have the appearance of a 'stitched' application.

Preferably, the waterproofing element may be mounted without requiring a lay board to be installed.

In use, the roof mounting system is configured such that rain or storm water is transmitted across the top surface of the roof covering at the valley formed between opposing roof planes.

Preferably, the waterproofing element is configured in use to provide both a primary and secondary water barrier.

The waterproofing element of the present invention provides roof covering support portion(s) at the side(s) thereof. These roof covering support portion(s) enable the installation of cut pieces of roof covering, in particular small cut pieces of roof covering, at the valley between opposed roof panels. The cut pieces of roof covering are typically significantly smaller than the pieces of roof covering which can be installed using conventional systems.

The waterproofing element or roof mounting system may further comprise the use of an extension piece.

The waterproofing element of the present invention enables heritage style roofing to be installed. The waterproofing element may be used with a variety of different roofing materials due to the increased strength provided by the roof covering support portion(s). The waterproofing element of the present invention also has the advantage of requiring, and using, less material in production compared to traditional roof mounting systems.

Embodiments of the present invention will now be described in more detail with reference to the drawings in which:

Brief Description of the Drawings

Figure 1 is a schematic illustration of a conventional open valley trough using a conventional style valley in situ;

Figure 2 is a schematic illustration which shows a conventional open valley trough that highlights the smaller cut pieces;

Figures 3A and 3B are schematic illustrations of a waterproofing element according to one embodiment of the present invention, in which the waterproofing element comprises a pair of S-portions;

Figure 4 shows a schematic illustration of installation of a pair of waterproofing elements of Figures 3A and 3B in the valley in situ on the roof with the roof covering;

Figure 5 shows the finished roof in the stitched or closed valley application using the roof mounting system of the present invention comprising the waterproofing elements of Figures 3A and 3B;

Figures 6A-6C show sections of the waterproofing elements according to other embodiments of the present invention;

Figure 7 shows a further embodiment of the roof mounting system of the present invention comprising the waterproofing element in an in-situ wall abutment variation with the application of roof tiles;

Figures 8A and 9B illustrate the embodiment of the roof mounting system of the present invention as shown in Figure 7 for use in a wall abutment application;

Figures 9A and 9B show a further embodiment of the roof mounting system of the present invention comprising the waterproofing element in the flat application for a vertical joint or abutment;

Figures 10A and 10B show a further embodiment of the roof mounting system of the present invention comprising the waterproofing element in a straight abutment variation;

Figures 11A and 11B show a further embodiment of the roof mounting system of the present invention comprising the waterproofing element used in the straight abutment variation, in which the waterproofing element comprises a raised centre section to allow the abutment of roof coverings with a height variation; and

Figures 12A and 12B show diagrammatical views of the waterproofing element in situ (Figure 12A) and examples of the dimensions of the channel opening and base of the channel and a tile supporting portion of the waterproofing element (Figure 12B).

Detailed Description of Preferred Embodiments

As shown in Figures 1 and 2, conventionally lead sheeting is manually formed into position onto lay boards 4A on site so that it follows the structural mitred join of the roof. The roof coverings are cut (mitred) at the angular line either side of the valley back from the central joining line of the valley so as to form an open valley gutter or trough 4B. A centre strip of approx. 150mm of the lead presents a clearly visible strip up the central line of the valley 4B. It is this strip that forms an open valley gutter to transmit the water off the roof.

Despite modern and easy to install open valley gutters, the heritage style valleys remain highly desirable because of their excellent aesthetic appearance.

The present invention enables heritage style valleys to be installed at low cost and with less materials.

With reference to Figures 3A and 3B, the roof mounting system 1 comprises a waterproofing element 10 configured to be positioned within the valley formed between two roof panels. The waterproofing element 10 is composed of glass reinforced polyester (GRP). It is to be understood that the waterproofing element 10 may be composed of any suitable material, for example roll-formed metal.

The waterproofing element 10 defines a first channel 12a and a second channel 12b for receiving rainwater therein. The waterproofing element 10 further comprises four roof covering support portions 14a, 14b, 14c, 14d for supporting a roof coverings thereon.

The waterproofing element 10 has a first end 16, an opposed second end 18, a first side portion 20 and a second side portion 22. The waterproofing element 10 defines a longitudinal axis along a median line which extends between the first and second ends 16, 18.

Each of the channels 12a, 12b extends between the first and second ends 16, 18 and substantially parallel to the longitudinal axis of the waterproofing element 10. The channels 12a, 12b are spaced apart from each other. A first channel 12a is located adjacent the first side portion 20 of the waterproofing element 10. A second channel 12b is located adjacent the second side portion 22 of the waterproofing element 10.

It can be seen that each of the roof covering support portions 14a, 14b, 14c, 14d are predominantly S-shaped providing an upper portion which extends towards an adjacent roof covering support portion and across at least a portion of the corresponding underlying channel 12a, 12b. It is to be understood that the roof covering support portions may have any suitable shape, such as for example Z-shaped, provided that an upper portion of the roof covering support portion extends inwardly across at least a portion of the underlying channel 12a, 12b. Embodiments of the roof covering support portions are illustrated in Figures 6A-6C.

An S-shaped roof covering support portion 14a, 14d is located at each of the first and second side portions 20, 22 of the waterproofing element 10. A further two S-shaped roof covering support portions 14b, 14c are located adjacent to each other towards the central point of the waterproofing element.

The S-shaped roof covering support portions 14b, 14c located centrally are mirror images of each other. The upper surfaces of the S-shaped roof covering support portions 14b, 14c define an angle corresponding to the angle formed at the join between the roof panels.

Each of the S-shaped roof covering support portions 14a, 14d located at an end of the waterproofing element 10 is a mirror image of the adjacent, centrally located S-shaped roof covering support portion 14b, 14c.

Each of the S-shaped roof covering support portions 14a, 14d located at an end of the waterproofing element 10 are mirror images of each other. The upper portion of the roof covering support portion 14a, 14b, 14c, 14d extends in a direction towards the upper portion of the adjacent roof covering support portion 14a, 14b, 14c, 14d.

An opening 24a, 24b is defined between the free ends of the upper portion of adjacent pairs of roof covering support portions 14a, 14b, 14c, 14d. Each opening 24a, 24b extends into the underlying channel 12a, 12b. The width of the channel 12a, 12b (marked as 1C) is greater than the width (marked as 1B) of the corresponding opening 24a, 24b. The roof covering support portions 14a, 14b, 14c, 14d create an overhanging portion.

The waterproofing element 10 further comprises a pair of capillary grooves 26a, 26b configured to receive rainwater drawn under overlying roof covering(s) under capillary action. Each capillary groove 26a, 26b is provided adjacent the first or second side portion 20, 22 of the waterproofing element 10. Each capillary groove 26a, 26b is provided adjacent or forms part of the roof covering support portion 14a, 14b. Each capillary groove extends substantially parallel to the channels 12a, 12b of the waterproofing element 10.

In use, and as shown in Figures 4 and 5, the waterproofing element 10 is placed in position within a valley between two roof panels without the use of a lay board. The waterproofing element 10 is positioned such that the centrally located roof covering support portions 14b, 14c are positioned at and above the join between opposed roof panels. The channels 12a, 12b are each positioned to extend in a direction substantially parallel to, but spaced apart from, the join between opposed roof panels.

The cut elements of the roof covering, 28 are mounted on the waterproofing element 10, such that each cut roof covering element 28 rests on a pair of underlying roof covering support portions 14a, 14b, 14c, 14d for improved support. Each roof covering 28a, 28b is mounted so as to be supported by a roof covering support portion 14a, 14d located at or adjacent the first or second side portions 20, 22 of the waterproofing element 10 and a centrally located roof covering support portion 14b, 14c.

Each roof covering 28a, 28b extends across the underlying channel 12a, 12b.

The provision of roof covering support portions 14a, 14b, 14c, 14d for example as S-shaped portions helps to reduce the width (narrow) the opening to the channels 12a, 12b. The channels 12a, 12b can be formed within a minimal space whilst at the same time providing improved support to overlying roof coverings. As a result, the waterproofing element 10 of the present invention may be used to support smaller, cut elements of the roof covering than used in conventional roof installation systems.

It can be seen from Figure 5 that once the roof coverings have been installed, in the heritage style of closed mitre join or stitched application. The roof coverings are directly mitred against each other along the central line such that the underlying waterproofing element 10 is obscured from view. The waterproofing element 10, and in particular channels 12a, 12b, can be installed covertly so that its presence is undetectable whilst at the same time provides an efficient mechanism for waterproofing the abutment join in the elements of the roof covering and also transmitting water off the roof.

As shown in Figure 4, the capillary groove 26a, 26b is located adjacent the roof battens. In some embodiments, the capillary grooves 26a, 26b sit flush and level upon the roof battens and as such the waterproofing element 10 does not raise, lift or interfere with the continuous flat line of the roof covering 28a, 28b and as such provides a more aesthetically pleasing appearance of the roof.

The present invention provides, once installed, a waterproof mitred join in the roof coverings and to transmit the converging water out of the valley and off the roof.

Converging water (rain or storm water) will be predominantly transmitted on top of the roof covering as opposed to being predominantly transmitted through the open water channels of the valley 4B (Figure 2). The present invention ensures that low levels of rainwater may permeate through the mitred join of the roof covering and this is collected and transmitted by the widened water channels 12a, 12b in the outer curve of the water channel.

As larger volumes of storm water are able to travel on top of the roof covering, due to the provision of a mitred join, the capacity for transmitting water along the waterproofing element 10 is reduced. As such, the channels 12a, 12b provided by the waterproofing element 10 may be narrower than conventionally required.

When using flat roof coverings such as slates, it is known that water falling off the edge of the slate can run back on underneath the slates and can be further drawn under the slates by way of capillary action. The presence of the capillary grooves 26a, 26b creates a gap that will resist the passage of water that might otherwise be drawn across it through capillary action.

It is to be understood that the waterproofing element 10 of the present invention can be used in many other applications including, but not to be limited to, for example the raised section of a bonding gutter where adjoining roof coverings have a different height.

The embodiments described in Figures 7 to 11 contain a number of features in common with the embodiment of Figures 3 to 5 and for conciseness these features, such as for example the capillary groove(s), are not described again in detail.

Figures 7, 8A and 8B illustrate a further embodiment of the present invention, in which the waterproofing element 110 is used in an in-situ wall abutment. The waterproofing element 110 is substantially L-shaped. The waterproofing element 110 has a first side portion 120 providing a S-shaped roof covering support portion 114, and a second side portion 122 configured to be aligned within the wall abutment. A channel 112 is defined between the S-shaped roof covering support portion 114 and an adjacent portion of the waterproofing element 110.

An opening 124, extending into the channel 112, is defined between the free end of the roof covering support portion 114 and the adjacent portion of the waterproofing element. The width of the opening 124 is less than the width of the channel 112. A capillary groove 126 is located adjacent the S-shaped roof covering support portion 114 and is

configured in use to be located and aligned with a roof batten. Roof coverings 128 are positioned on and supported by the S-shaped roof covering support portion 114.

Figures 9A and 9B illustrates a further embodiment of the present invention providing a flat application for a vertical joint or abutment. Again, the waterproofing element 210 has a first end 216, a second end 218, and a first and second side portion 220, 222. The waterproofing element 210 provides a pair of spaced apart channels 212a, 212b. The waterproofing element 210 comprises four S-shaped roof covering support portions 214a, 214b, 214c, 214d located in similar positions as described in relation to Figures 3 to 5, however in this embodiment, the centrally located support portions 214b, 214c are adjoined to define an angle of 180 degrees (to provide a substantially planar support surface extending therebetween).

Figures 10A and 10B illustrates a further embodiment of the present invention for use in a straight abutment variation. Again, the waterproofing element 310 has a first end 316, a second end 318, and a first and second side portion 320, 322. The waterproofing element 310 provides a channel 312. The waterproofing element 310 comprises a pair of S-shaped roof covering support portions 314a, 314b which are mirror images of each other.

Figure 11A and 11B illustrates a further embodiment of the present invention for use in the straight abutment variation with a raised centre section to allow the abutment of roof coverings with a height variation. The waterproofing element 410 a pair of S-shaped roof covering support portions 414a, 414b located at opposed side portions 420, 420a, 422, 420b thereof. The waterproofing element 410 further comprises a substantially centrally located protrusion or extension 430 configured to provide the required height for abutment of roof coverings with a height variation.

Figure 12A shows a diagrammatical view of the waterproofing element in situ. Figure 12B is an example of the dimensions of the channel opening and base of the channel and the portions of the rim profiles, either side of the channel opening, that define side portions which act as support surfaces on which at least a portion of a roof covering (tile) rests.

Figure 12B shows the additional V-shaped valley that is defined when the waterproofing element is installed. As the material is preferably GRP it flexes and therefore is able to bend about its median line. This means that the waterproofing element flexes and is able to be received in a wide range of angles formed between two intersecting roofs. Furthermore, as the waterproofing element is supported by roof battens and rafters, it is unstressed and so naturally accommodates any minor variations in roof profile, thereby ensuring efficient drainage of rainwater.

It will be appreciated that variation may be made to the aforementioned embodiments without departing from their scope of protection as defined by the claims and includes, for example a building having the roof mounting system described herein.

Claims

1. A waterproofing element comprises a single impervious sheet with two elongate channels defined symmetrically about a median line, each elongate channel has a channel opening defined by one S-shaped (or Z-shaped) rim profile and one reverse S-shaped (or Z-shaped) rim profile, the rim profiles together define an undercut forming a water channel with a relatively wider base than the channel opening; and portions of the rim profiles, either side of the channel opening, define side portions on which at least a portion of a roof covering, such as a tile, rests.
2. A waterproofing element according to claim 1 comprises glass reinforced polyester (GRP).
3. A waterproofing element according to claim 1 formed from metal.
4. A waterproofing element as claimed in any preceding claim in which both elongate channels have the same width as one another.
5. A waterproofing element as claimed in any preceding claim in which both elongate channels have the same depth as one another.
6. A waterproofing element as claimed in any preceding claim in which the depth of each elongate channel is at least 10.0 mm.
7. A waterproofing element as claimed in claim 6 in which the depth of each elongate channel is at least 20.0 mm.
8. A waterproofing element as claimed in claim 6 or 7 in which the depth of each elongate channel is at least 40.0 mm.
9. A waterproofing element as claimed in any preceding claim in which the width of each elongate channel is at least 40.0 mm.
10. A waterproofing element as claimed in any claim 9 in which the width of each elongate channel is at least 50.0 mm.

11. A waterproofing element as claimed in claim 9 or 10 in which the width of each elongate channel is at least 75.0 mm.
12. A waterproofing element as claimed in any preceding claim includes a raised centre section in the form of a protrusion or extension which extends along the median line.
13. A waterproofing element as claimed in any preceding claim in which an additional drainage channel is provided along the median line.
14. A waterproofing element as claimed in claim 13 in which the additional drainage channel is a V-shaped form.
15. A waterproofing element as claimed in any preceding claim in which at least one capillary groove is provided in a side portion to receive rainwater drawn under an overlying roof covering(s) under capillary action.
16. A waterproofing element as claimed in claim 15, in which the at least one capillary groove is located at, or adjacent, a side portion of the waterproofing element.
17. A waterproofing element as claimed in either claim 15 or 16, in which the at least one capillary groove extends substantially parallel to the channel of the waterproofing element.
18. A waterproofing element as claimed in any preceding claim is provided in lengths of at least, 1.0m, preferably at least 1.5m, most preferably at least 3.0m.
19. A roof mounting system comprising a waterproofing element as claimed in any preceding claim and one or more roof coverings to be mounted thereon.
20. A roof mounting system as claimed in claim 19, in which the waterproofing element is dimensioned such that the roof covering supported thereon extends across the channels and when installed is supported on side portions of the rim profiles, either side of each channel.

21. A method of installing the roof mounting system as claimed in claim 19 or 20 in which adjacent waterproofing elements are overlaid so that a lower end, of a higher installed waterproofing element, lies atop an upper end, of a lower waterproofing element, so that an overall length of the waterproofing element is extended when installed.
22. A method of installing the roof mounting system as claimed in claim 21, in which a flexible adhesive is used to adhere two adjacent waterproofing elements that are overlaid.
23. A method of installing the roof mounting system as claimed in claim 21 or 22, in which the waterproofing element is obscured from view by the roof covering mounted thereon.
24. A method of installing the roof mounting system as claimed in claim 21, 22 or 23, in which the roof coverings form an open mitre join.
25. A building includes the roof mounting system according to either claim 19 or 20.



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Claims searched: 1-25

Date of search: 12 April 2023

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
X	1-25	WO 03/044301 A1 (GRIZENKO PAUL) Figures particularly 9, noting s-profile formed by bends 9, 29 and inverted s-profile formed by bends 31, 33
A	-	JP H07150694 A (MATSUSHITA ELECTRIC WORKS LTD) Figure 1, noting element 8 with mirrored channels
A	-	GB 2211867 A (HANCOCK CHRISTINE) Whole document noting mirrored channels 2

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^X :

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

International Classification:

Subclass	Subgroup	Valid From
E04D	0013/04	01/01/2006