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(54) **A DEVICE FOR INHIBITING WATER INGRESS IN A ROOF**

(57) A damp proofing plate installed underneath a first and second sloping slate in a roof, and supported on top of a third sloping slate in the roof. The plate is roll-formed to have a cross-section which comprises a first and second outer ridge and a first and second inner ridge in the direction of the slope of the slates. The first slate from the roof is supported on top of the plate by the first

outer ridge and the first inner ridge. The second slate from the roof is supported on top of the plate by the second inner ridge and the second outer ridge. The total height of the plate in its installed state is more than 0.5mm but less than 3mm. The plate inhibits the capillary action between the slates and water ingress in the roof is thereby inhibited.

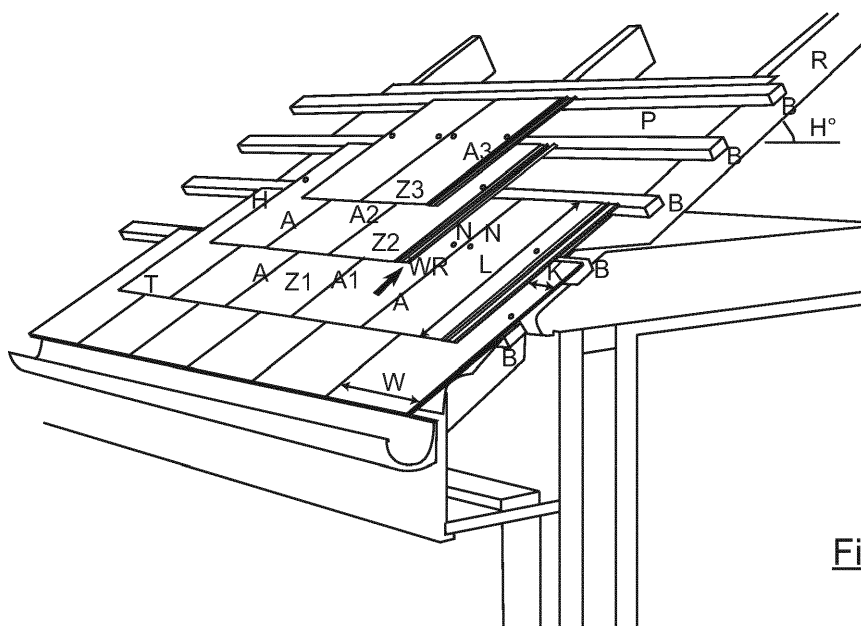


Fig. 3

Description

BACKGROUND

[0001] Roofing slates are a traditional and longstanding method of forming a durable and aesthetically pleasing roof covering. Slates are made from quarried stone that is split into thin rectangular plates that conform to several varied, yet traditional requirements of size and shape, for example an extremely popular size would have an area of 500x250mm and would be split to a thickness between 5 and 7mm. there are many other variation sizes but they all share the same principle and are installed in the same manner.

[0002] Natural slates are mounted upon timber strips known as roofing 'battens' (B) that are thus mechanically fixed laterally (usually nailed) in an opposite direction on to the timber 'rafters' (R). These rafters are used to form the roof structure. A membrane known as a tile 'underlay' (P) is laid on top of the rafters and underneath the battens to form a secondary weather barrier. The whole structure can thus be an arrangement that forms the 'roof' of a building.

[0003] In order to install the slates on the roof frames (R) the installer should first apply a secondary waterproofing membrane layer known as an underlay (P) that is laid over the rafters. On top of this underlay they should then apply strips of wood known as roofing 'battens' (B) that are fixed in a horizontal position laterally on top of the underlay and across the roofing frames or rafters (R). These battens are spaced parallel and approximately 2/5ths the length of the slate (S) and cover the whole of the roof.

[0004] The slates are placed lengthways on the battens (fig 1) adjacent to each other and form the first course or 'row' of slates (Z1). The abutment joint of these slates is known as the 'perp' (A) that being a perpendicular or vertical join that remains visible upon the roof. This perp join can be closed or open with the gap ranging from 0-5mm in width. Perp joins (A) are not sealed or waterproof and will allow rainwater to pass through them and land on the slate below.

[0005] On completion of the first row the second row (Z2) can now be installed. The length of the slate means that approximately 3/5ths of this second row of slates covers the slates on the first row that is positioned below, the covered 3/5th section of slate Z1 is called the holing margin (H) and this arrangement is known as the 'primary lap' (PL). The slates on the second row (P2) are positioned so that the perp join (A2) is placed over the centre point of the slate on the first row that is below (Z1). The centre of the slate above is covering the upper part of the perp join below (A1) in an arrangement known as 'broken bond'. The central positioning of this perp join establishes the bond (K) of the slate below, that usually being half the width of a slate.

[0006] On completion of the second row the third row (Z3) is installed similarly in a broken bond with slates Z2

in the second row directly below them. The slates on the third row (Z3) are positioned directly above and in line with the slates on the first row (Z1). The third row will also overlap the first row by some 1/5th and this is known as the 'secondary lap' (D). The complete arrangement of slates is known as 'double lap' roofing. As the slates are installed on top of the slate below then the lower 2/5 of that slate is and remains exposed to the elements and forms the visible part of the slate roof. This exposed area of slate is called the slate margin (M). The arrangement of these slates continues up the roof until the roof is fully covered in the slates.

[0007] Slates are laid in a double lap format (D) using slates of many differing sizes and gauges. The slate width (W) decides the bond (K) of the slate. The bond used in conjunction with an appropriate lap will determine the weather resistance of a roof at a given roof pitch (angle H). When rain falls onto the roof gravity will force it down (G) the slope (F) running over the slates. This water first starts to penetrate the layers of the slates when it leaves the slate above and enters the perp join (A) at the critical junction (C). The water flows through the perp join, landing on the holing margin of the slate below. This water will then 'creep' sideways (S) from this perp join, underneath the margin section (M) of the slates on either side, whilst on top of the holing gauge (H) of the slate below. This water will eventually exit at the tail of the slate (T) back onto the surface of the roof.

[0008] When the roof pitch (F) is too low, gravity (G) will be weaker and water can creep further across the holing margin (H) of the slate until it reaches either the nail holes (N) or the point of ingress (I). With the addition of a little air pressure (such as high wind), and if the gap between the slates is below 0.5mm (Q1), then 'capillary action' will draw the water even further across the slates. This action can also draw water vertically through the lap (D) at the tail of slate Z1 and thus over the head of slate Z3 causing a leak through the perp join A at the point of ingress (I). The risk of a leak is reduced if the bond (K) is wider because the water has further to creep across the slate when it passes through the layers (S) before it can reach the points of ingress (N, I). If the slates are preholed for nails then these holes are closer than the critical junction and will pose a further risk.

[0009] In higher wind conditions the water can be held onto the roof or even driven up the roof. This creates greater pressures and will increase the capillary action, forcing the water up and between the laps of the slates. The shorter the lap, the higher the risk and thus it is important that the length of this lap is increased.

[0010] Water ingress through the slates will fall onto the underlay and should run under the battens and exit the roof via the eaves tray. However, continued leaking through the slates cannot be allowed because it will saturate the battens and corrode the nails and it is batten and nail rot that is a major cause of roof failures.

[0011] Extreme weather conditions are rare, but at these times it is normal practice to allow a slight ingress

of water through the slates because the roof will soon dry. However the battens should never be persistently saturated. Accordingly, there is the need for a device that is able to inhibit such water ingress through the roof covering.

SUMMARY OF THE INVENTION

[0012] The application thus provides a slated roof comprising a damp proofing plate installed underneath a first and second sloping slate in the roof, and supported on top of a third sloping slate in the roof, according to claim 1. By placing the damp proofing plate in the roof as claimed, the plate separates the slates of the roof so that they are more than 0.5mm apart, which thus inhibits the capillary action between the slates as discussed previously. Water ingress in the roof is thus inhibited. Because the plate is roll-formed, it is also easy to manufacture.

[0013] The cross-section of the plate may further comprise a first intermediary ridge between the first outer and inner ridges, and a second intermediary ridge between the second outer and inner ridges.

[0014] Alternatively, the cross-section may comprise at least two intermediary ridges between the first outer and inner ridges, and at least two intermediary ridges between the second outer and inner ridges.

[0015] Each of these intermediary ridges help support the slates and help to further inhibit water ingress into the roof.

[0016] The cross-section may further comprise a dividing ridge between the inner ridges.

[0017] In this case, the dividing ridge may not be as tall as the remaining ridges.

[0018] The outer ridges may be inclined towards the inner ridges.

[0019] In some instances, at least one of the ridges may be shaped as a V-shaped notch, which makes the roll-formed plate easier to manufacture.

[0020] Each outer ridge may be formed by an in-turned edge of the plate.

[0021] The plate may be made of a metal.

[0022] The length of the plate in a direction perpendicular to the slope of the slates may be less than 100mm.

[0023] The application also provides a damp proofing plate for use in between sloping slates in a slated roof according to claim 11. When placed between slates in a slated roof, the plate helps inhibit water ingress into the roof.

[0024] At least one of the ridges of this plate may be shaped as a V-shaped notch.

[0025] The cross-section of this plate may further comprise a dividing ridge between the inner ridges.

[0026] In this case, the dividing ridge may be not as tall as the remaining ridges.

[0027] Each outer ridge may be formed by an in-turned edge of the plate.

[0028] The outer ridges of the plate may be taller than the inner ridges.

LIST OF FIGURES

[0029]

- 5 Fig 1 shows a perspective view of a conventional slate roof construction;
Fig 2 shows a section view of a conventional slate roof construction;
10 Fig 3 shows a perspective view of a slate roof construction incorporating the device
Fig 4 shows a section view of a slate roof construction incorporating the device;
15 Fig 5 is a section view of the device; and
Fig 6 is a perspective view of the device.

DETAILED DESCRIPTION

[0030] It has always been recognised that the perp join (A) is the place where water first enters the roofing layers.

- 20 **[0031]** The device works by sealing the perp join on the slate and thus preventing the water from entering the layers of the slates. If water does not land on the holing margin then it cannot creep to the nail holes or the point of ingress. The device has additionally the effect of extending the head lap D to D1 (fig 4) from the tail (T) of the upper slate Z3 to the head of the slate below Z2 because the point of ingress (I) at the head of Z1 is now protected using the device; for example, a roof using 500x250mm slates with a 100mm lap, will now have a sealed perp join and an effective head lap of 300mm.

- 30 **[0032]** On a regular slate roof there is often less than 0.5mm gap between the layers of the slates. As previously stated, little or no gap between the slates means that air pressure will draw the water between the slates via capillary action Q1, and this is one of the reasons that slates leak. When the device is used the slates are raised by above 1mm (Q2) and this increased gap allows the free movement of air below the slates, this releases the air pressure thus eliminating the capillary action that draws the water S. Increasing the gap above 3mm has the result of allowing wind pressure to drive rain between the layers thus limiting the height of the device.

- 35 **[0033]** By increasing the head lap D and removing the capillary action S, the weather resistance of the roof is greatly improved and slates can now be installed on many complicated, exposed or low-pitched roofs where it was not previously possible.

- 40 **[0034]** The device should be sufficiently rigid to maintain its shape and fixed position and can be made this from a nonferrous metal such as Aluminium, or made from a rigid or semi-rigid PVC.

- 45 **[0035]** The primary function of a roof is to keep the home dry. When the device is installed it only really comes into its own during storm conditions. Water is drawn between the layers of the slates via capillary action, the device raises the slates sufficiently (Q) to eliminate this capillary action that occurs at the tails of the slate through the lap D and yet it does not raise it so much

that still maintains the aesthetic appearance of a traditional slate roof. The device is also used to seal the perp join A and because it is in direct contact with the slate it is itself also subject to capillary action. Water that passes through the perp join A will land on the centre section of the device AD, wind will drive this water up the device WR until the weight of the water is greater than the wind that is forcing it upwards. More wind and rain increases the water pressure that builds to a point where it will breach the ridges (R1) at either side of the central channel causing a leak. The device incorporates 8 longitudinal ridges (R1,2) that are in contact with the underside of the slate above, that being 4 either side of the perp join A that is positioned in the centre of the device. The ridges nearest to the perp join are the primary contact points (R1) and the fold at the edge of the device is the secondary seal (R2). These four contact points or ridges on either side thus form 3 channels, the central channel AD and the drainage systems channels X at either side (SD). The water that breaches the primary ridges R1 then enters the drainage channel (X). The drainage channels in the area SD are also subject to further pressure and capillary action. The introduction of the depressed channels (X) in this drainage channel is the key factor in eliminating the capillary action because the slate is raised between the height of 1 and 3 mm thus releasing this pressure, this allows the water to drain freely from the tail of the slate using the depressions in the drainage channels shown X. Without these pressure release channels the water travels across the device and breaches the secondary seal R2 and can enter the roof.

[0036] In relation to the outer ridges R2, these are shown in Figures 5 and 6 as being taller than the inner ridges R1. In this case, each of the outer ridges R2 is deformable such that when any slate is placed on top of it, the outer ridge deforms until it has same height as its corresponding inner ridges, such that the slate is supported on both the outer ridge and its corresponding inner ridges. The benefit of having these deformable outer ridges is that they ensure a good seal between the slates and the plate.

[0037] Alternatively, the outer ridges could be the same height as the inner ridges, in which case the outer ridges would not need to be deformable.

Claims

1. A slated roof comprising a damp proofing plate installed underneath a first and second sloping slate in the roof, and supported on top of a third sloping slate in the roof;
wherein the plate is roll-formed to have a cross-section which comprises a first and second outer ridge and a first and second inner ridge in the direction of the slope of the slates;
wherein the first slate from the roof is supported on top of the plate by the first outer ridge and the first

inner ridge;
wherein the second slate from the roof is supported on top of the plate by the second inner ridge and the second outer ridge; and
wherein the total height of the plate in its installed state is more than 0.5mm but less than 3mm.

2. A roof according to any preceding claim, wherein the cross-section further comprises a first intermediary ridge between the first outer and inner ridges, and a second intermediary ridge between the second outer and inner ridges.
3. A roof according to claim 2, wherein the cross-section comprises at least two intermediary ridges between the first outer and inner ridges, and at least two intermediary ridges between the second outer and inner ridges.
4. A roof according to any preceding claim, wherein the cross-section further comprises a dividing ridge between the inner ridges.
5. A roof according to claim 4, wherein the dividing ridge is not as tall as the remaining ridges.
6. A roof according to any preceding claim, wherein the outer ridges are inclined towards the inner ridges.
7. A roof according to any preceding claim, wherein at least one of the ridges is shaped as a V-shaped notch.
8. A roof according to any preceding claim, wherein each outer ridge is formed by an in-turned edge of the plate.
9. A roof according to any preceding claim, wherein the plate is metal.
10. A roof according to any preceding claim, wherein the length of the plate in a direction perpendicular to the slope of the slates is less than 100mm.
11. A damp proofing plate for use in between sloping slates in a slated roof, wherein the plate is roll-formed to have a cross-section which comprises:

a first and second outer ridge and a first and second inner ridge;
at least one first intermediary ridge between the first outer and inner ridges, and at least one intermediary ridge between the second outer and inner ridges; and
wherein the outer ridges are inclined towards the inner ridges; and
wherein the total height of the plate is more than 0.5mm but less than 3mm.

12. A plate according to claim 11, wherein at least one of the ridges is shaped as a V-shaped notch.
13. A plate according to claims 11-12, wherein the cross-section further comprises a dividing ridge between the inner ridges. 5
14. A plate according to claim 13, wherein the dividing ridge is not as tall as the remaining ridges. 10
15. A plate according to claims 11-14, wherein each outer ridge is formed by an in-turned edge of the plate.
16. A plate according to claims 11-15, wherein the outer ridges are taller than the inner ridges. 15

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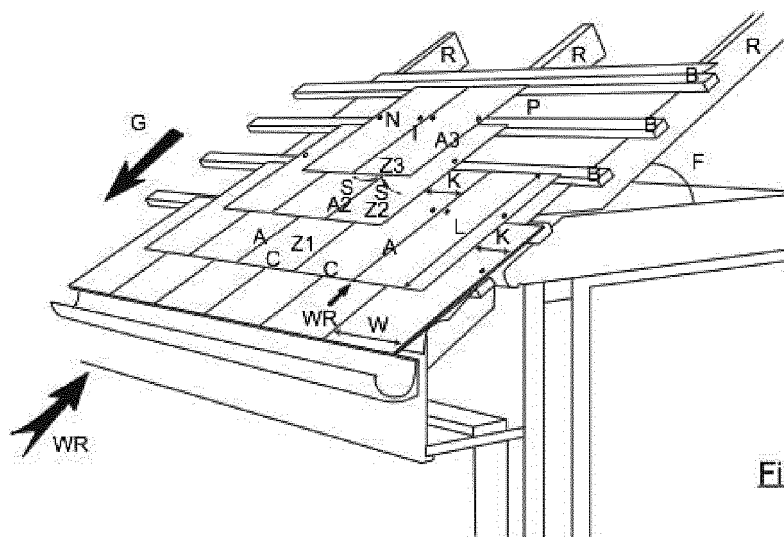


Fig. 1

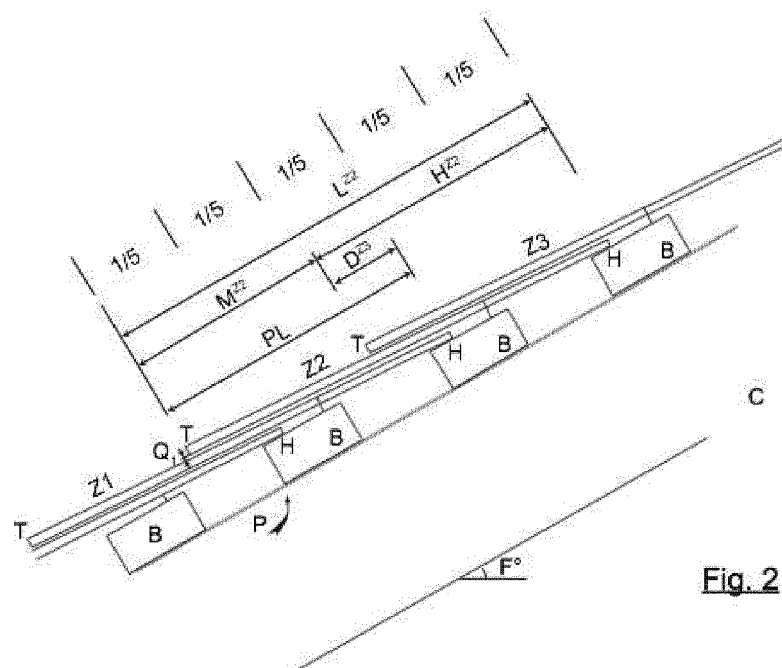


Fig. 2

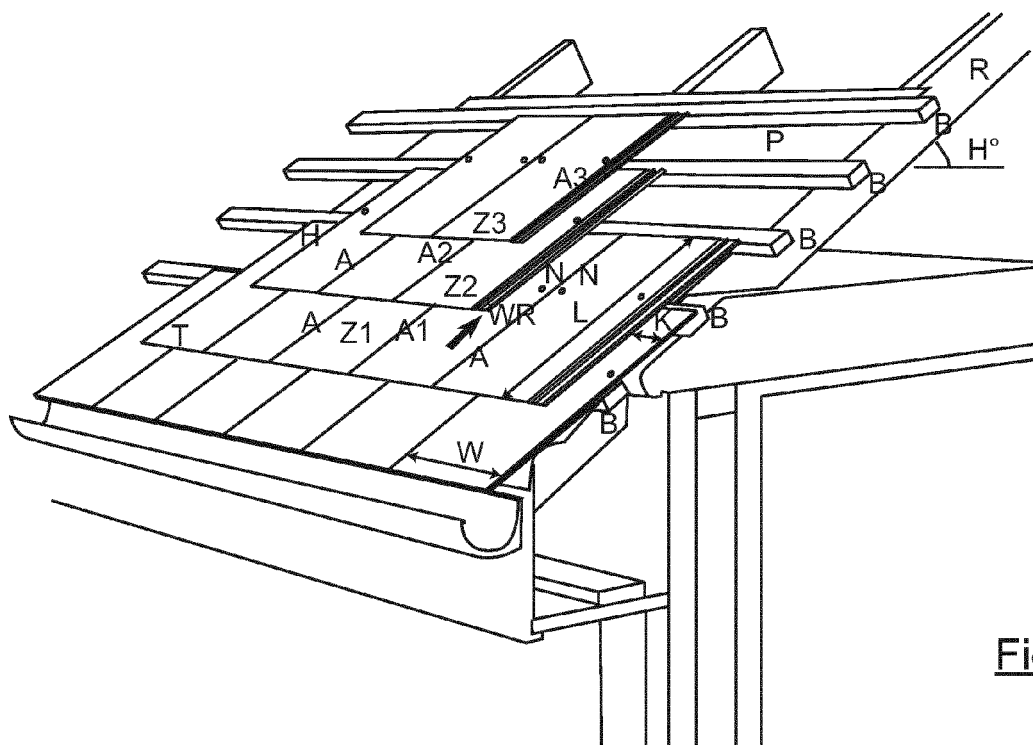


Fig. 3

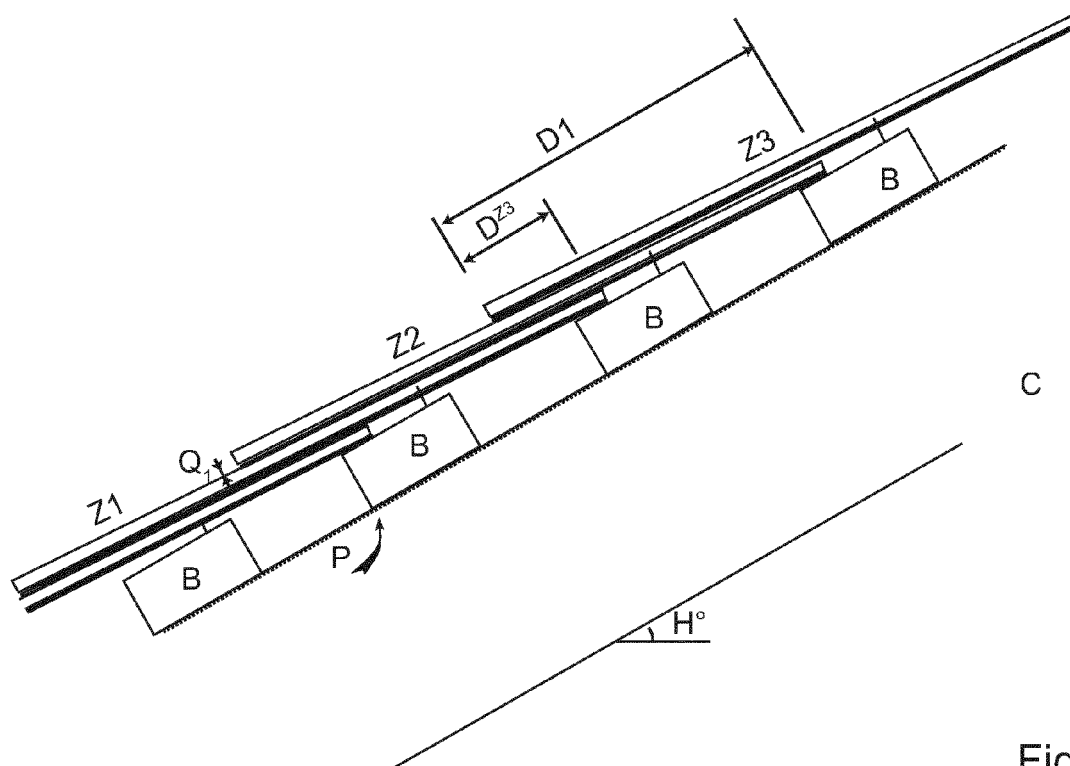


Fig. 4

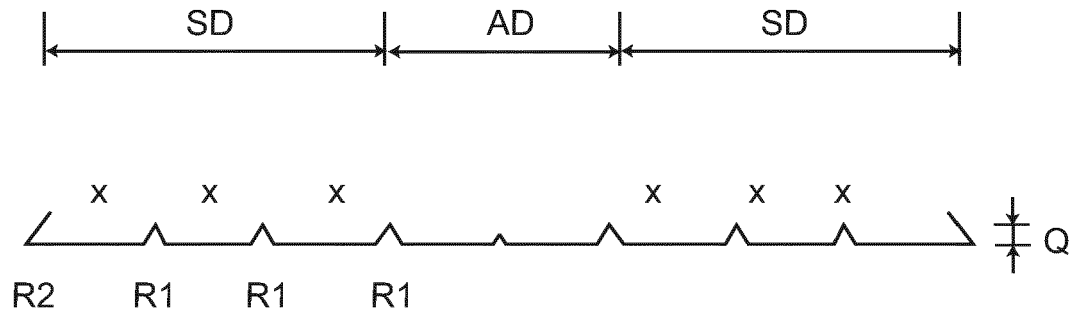


Fig. 5

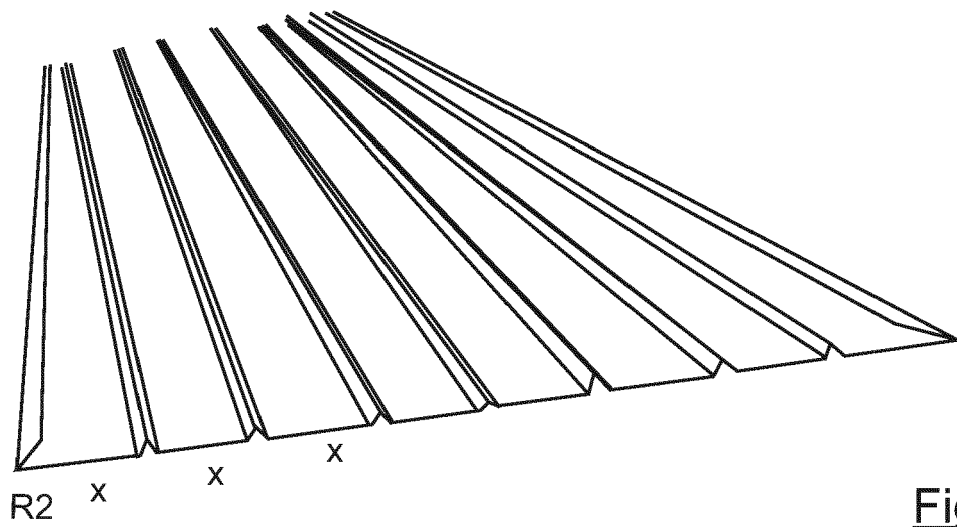


Fig. 6



EUROPEAN SEARCH REPORT

Application Number
EP 15 16 5351

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 26 August 2015	Examiner Tran, Kim Lien
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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