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(54) **DRAINAGE SYSTEM FOR A SLOPING PERIMETER OF A PITCHED ROOF**

(57) A drainage element for use in a drainage system for a sloping perimeter of a pitched roof. The drainage element includes: an opening for receiving a roof covering element at a roof-facing side of the drainage element; a side wall for guarding against ingress of water beneath the roof covering element at an outward-facing side of the drainage element opposite the roof-facing side; and a base wall that extends laterally between the roof-facing and outward-facing sides of the drainage element and longitudinally between leading and trailing edges of the

drainage element. The base wall defines an internal drainage surface for draining precipitation internally within the drainage element in a longitudinal direction towards the leading edge. The base wall further defines an external-facing surface opposite the internal drainage surface, the base wall being provided with a flow-directing means configured to direct water flowing longitudinally along the external-facing surface of the base wall in a lateral direction towards the outward-facing side of the drainage element.

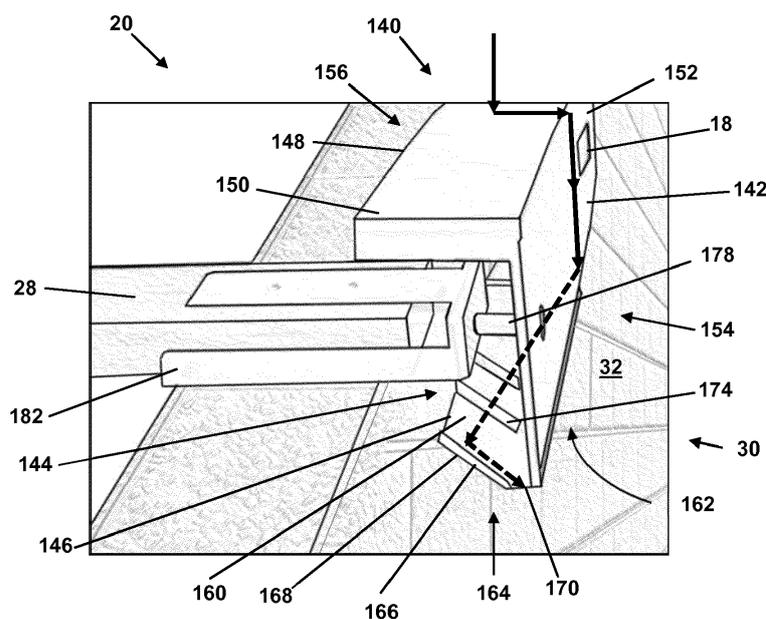


Figure 7

Description

TECHNICAL FIELD

[0001] The invention relates to a drainage system for a sloping perimeter of a pitched roof, and drainage elements for use in such a system. In particular, but not exclusively, the invention relates to a dry verge roofing system, and verge elements for use in that dry verge roofing system.

BACKGROUND

[0002] Figure 1 illustrates in perspective view a pitched roof 20 for protecting a lower space below the roof from external elements such as wind and precipitation. The pitched roof 20 includes a plurality of parallel load-bearing rafters 22 that slope from a ridge 24 at the top of the roof structure to an eave 26 at a lowermost edge of the roof structure 20, and a plurality of parallel battens 28 disposed on top of, and extending orthogonally with respect to, the rafters 22 from a left-hand verge (not shown) at the left side of the roof to a right-hand verge 30 at the right side of the roof. Each verge defines a sloping perimeter of the roof 20 and overhangs a corresponding gable wall 32. An angle between the rafters 28 and a horizontal plane defines a pitch of the roof 20.

[0003] Roof-covering elements such as tiles 34 are affixed along the battens 28 in horizontally-extending rows or courses. As can be seen in Figure 1, each course of tiles underlaps the course of tiles directly above and overlaps the course of tiles directly below, such that the tiles 34 overlap in a ridge-to-eave direction. Precipitation falling on the roof 20 is generally directed down the roof 20 over the tile 34 to a gutter 36 at the eave 26.

[0004] Gaps 38 between the tiles 34 and the gable wall 32 can be sealed with cement. This secures the gable end tiles in place, and acts as a barrier against precipitation and rodents that might otherwise enter the loft space via the gaps 38. However, applying the cement is time-consuming, cumbersome, and requires a skilled worker.

[0005] So-called 'dry verge' systems have therefore been developed that do not require cement. One example consists of verge caps, usually made from plastic, which can be placed over the side of each tile 34 at the verge 30, to embrace the tile 34 and close off the gaps 38 between the tiles 34 and the gable wall 32. An example of such a 'dry verge' system is shown in Figures 2 and 3, which illustrate, respectively, a side-facing and an eave-facing view of the right-hand verge 30 of the roof 20 shown in Figure 1. The dry verge system 100 comprises a verge cap 40, which is arranged to cover the exposed side edge of a tile 34 located at the right-hand verge 30 of the roof. The verge cap 40 is typically fixed to the verge-facing end of the batten 28, for example by nailing the cap 40 to the end of the batten 28. Alternatively, the cap 40 may also be nailed to a bargeboard

arranged at the top of a gable wall 32 of the roof, in order to secure it in place.

[0006] With reference to Figures 2 and 3, the verge cap 40 is provided with a side wall 42 arranged along an outward-facing side of the cap 40 and an opening arranged along a roof-facing side of the cap 40. A base wall 46 extends laterally between the roof-facing and outward-facing sides of the cap 40 and longitudinally between a leading and trailing edge of the cap 40. An upper wall 48 extends parallel to the base wall 46 from the side wall 42 towards the verge 30 of the roof 20 where it engages with an upper surface 50 of the tile 34. The base wall 46, the side wall 42 and the upper wall 48 together define an interior volume of the cap 40. The opening 44 is arranged to receive the tile 34 within the interior volume of the cap 40.

[0007] As is illustrated in Figure 2, the side wall 42 is arranged to cover the outer edge of the tile 34 so that the cap 40 has a good aesthetic appearance, which mirrors the outline of each tile 34. However, in order to provide an effective seal between the cap 40 and the verge 30 of the roof, the cap 40 must be positioned in close proximity to the gable wall 32 of the roof (typically, no more than 3 mm away). The cap 40 may also be positioned tightly up against the gable wall 32 in order to seal against it, as illustrated in Figure 3.

[0008] Water running down the roof tiles may be directed across an upper surface 52 of the upper wall 48 of the cap, where it will then tend to fall down an outer-surface 54 of the side-wall 42 until it collects at the edge formed by the intersection between the side wall 42 and base wall 46 of the cap 40. In the absence of wind or other external forces, the water will then drop, vertically, from the cap 40 onto the ground below.

[0009] However, in practice there will be additional forces acting on the water when it reaches the base wall 46 of the cap 40.

[0010] Firstly, due to the surface tension that forms between the water droplets and the exterior-surfaces of the cap 40, some of the water is directed to run onto the underside of the cap 40 where it then continues to run along an outward-facing surface 56 of the base wall 46 in a substantially ridge to eave direction.

[0011] Secondly, water running along the underside of the cap 40 may be directed, for example due to a side-winds wind, towards a roof-facing edge of the base wall 46 and hence towards the gable wall 32.

[0012] Thus, water droplets will in practice tend to cling to the underside of the base wall 46 and to run simultaneously in an eave-ward direction and in a roof-ward direction. This results in a particular concentration of water droplets coalescing at the corner of the base wall 46 which defines an intersection between the trailing and roof-facing edges of the base wall 46.

[0013] If the cap 40 is positioned tightly up against the gable wall 32, the water droplets may run directly onto the gable wall 32 and then vertically down the side of the building causing staining and potentially giving rise to

damp. Alternatively, if the cap 40 is slightly separated from the gable wall 32, the water droplets tend to coalesce along the roof-facing and trailing edges of the base wall 40 until each droplet becomes sufficiently large enough to overcome the surface tension with the outer surface 56 of the base wall 46, at which point the droplets drop down and may be blown onto the gable wall 32 by sideways wind. This can lead to a highly localized staining of the gable wall 32 at the trailing end of the verge cap 40.

[0014] It is an object of the present invention to provide a solution that allows precipitation, which has run onto an exterior surface of a dry verge cap to be drained from the roof without causing staining of the gable wall.

SUMMARY OF THE INVENTION

[0015] According to a first aspect of the present invention, there is provided a drainage element for use in a drainage system for a sloping perimeter of a pitched roof. The drainage element includes: an opening for receiving a roof covering element at a roof-facing side of the drainage element; a side wall for guarding against ingress of water beneath the roof covering element at an outward-facing side of the drainage element opposite the roof-facing side; and a base wall that extends laterally between the roof-facing and outward-facing sides of the drainage element and longitudinally between leading and trailing edges of the drainage element. The base wall defines an internal drainage surface for draining precipitation internally within the drainage element in a longitudinal direction towards the leading edge. The base wall further defines an external-facing surface opposite the internal drainage surface, and the base wall is provided with a flow-directing means configured to direct water flowing longitudinally along the external-facing surface of the base wall in a lateral direction towards the outward-facing side of the drainage element.

[0016] By virtue of the external flow directing means on the base wall, water flowing longitudinally along the external-facing surface of the base wall is directed in a lateral direction towards the outward-facing side of the drainage element. Thus, water on the underside of the base wall will tend to accumulate at the outward-facing side of the drainage element, rather than the roof-facing side. Hence water will congregate on the underside at a location that is displaced away from the gable wall of the roof. When the water builds up enough volume to drop from the undersurface, it will drop from the location that is displaced away from the gable wall. Thus, the falling water will not fall down the gable wall as it drops, thereby guarding against localised staining of the gable wall, and against issues that arise from damp and moisture.

[0017] The flow-directing means may be configured to disrupt the surface tension of water flowing longitudinally along the underside of the base wall to direct it in the lateral direction.

[0018] The flow-directing means may comprise a tension-disrupting surface that disrupts the surface tension

of the water flowing longitudinally along the underside of the base wall such that the flowing water tends to cling to the tension-disrupting surface. In particular, the tension-disrupting surface may be configured to attract water molecules such that the flowing water tends to cling to the tension-disrupting surface.

[0019] The tension-disrupting surface may be arranged at an angle to a longitudinal axis of the drainage element.

[0020] The tension-disrupting surface may be substantially perpendicular to the external-facing surface of the base wall.

[0021] The tension-disrupting surface may extend across at least half of the width of the base wall.

[0022] The tension-disrupting surface may be defined by at least a portion of an end surface of a leading edge of the base wall. Defining the tension-disrupting surface using the end surface of a leading edge of the base wall is particularly advantageous, as it allows the tension-disrupting surface to be defined without the need for complex features to be moulded into the external surface of the base wall.

[0023] The end surface may comprise an oblique portion that defines the tension-disrupting surface, wherein the oblique portion may be non-perpendicular to the longitudinal axis of the drainage element.

[0024] The end surface may further comprise a lateral portion that may be substantially perpendicular to the longitudinal axis of the drainage element.

[0025] A junction between the lateral portion and the oblique portion may define an accumulation point of the end surface, at which water flowing longitudinally down the external surface of the drainage element may congregate when the drainage element is in use.

[0026] The base wall may define a roof-facing edge at the roof-facing side of the drainage element and the end surface may meet the roof-facing edge at an oblique angle.

[0027] The internal drainage surface of the base wall may be provided with an internal flow-directing means configured to direct water flowing longitudinally along the internal drainage surface of the base wall in a lateral direction towards the side wall of the drainage element. The internal flow-directing means may comprise an internal ridge that protrudes from the internal drainage surface of the base wall.

[0028] The intersection between the internal ridge and a roof-facing edge of the base wall may define a substantially oblique angle.

[0029] The base wall may comprise a plurality of internal ridges arranged in mutual alignment. The or an internal ridge may be located at a leading edge of the base wall and may be aligned with a leading edge of the base wall.

[0030] The or each internal flow-directing means may extend only partially across the internal surface of the base wall in a lateral direction, to define a free-flowing region of the internal drainage surface that may be free

from internal ridges when moving in a longitudinal direction.

[0031] The free-flowing region of the internal drainage surface may align laterally with the accumulation point of the end surface of the base wall. This arrangement is particularly advantageous because water flowing both internally and externally along the base wall will be directed to the accumulation point such that a droplet at the accumulation point will accumulate water from both internal and external flow streams, giving it a larger mass and hence making it less susceptible to being blown laterally by wind towards the gable wall as it drops to the ground.

[0032] The drainage element may comprise an upper wall parallel to the base wall, the upper wall extending from the side wall towards the roof-facing side of the drainage element.

[0033] The upper wall may be configured, in use, to lie on an upper surface of the roof covering element.

[0034] A trailing end portion of the drainage element may be configured to be received within a leading end portion of an identical drainage element when a plurality of such elements are arranged for use in a roof. To this end, the trailing end portion of the drainage element may be narrower and/or shallower than the leading end portion of the drainage element. The side wall and base wall may have a stepped profile to define the narrower and/or shallower trailing end portion of the drainage element.

[0035] The invention also extends to a pitched roof structure comprising an underlying roof structure covered by a plurality of roof covering elements and defining a sloping perimeter, and a drainage system provided at the sloping perimeter. The drainage system has a drainage body defining a longitudinal drainage platform for draining precipitation in a longitudinal, eave-ward direction. The drainage system comprises a base wall having an upward-facing side that defines the drainage platform, and an underside opposite the upward-facing side, the base wall comprising a flow-directing means configured to direct water flowing longitudinally along the underside of the base wall in a lateral direction away from the underlying roof structure.

[0036] The flow-directing means may be configured to disrupt the surface tension of water flowing longitudinally along the underside of the base wall to direct it in the lateral direction.

[0037] The flow-directing means may comprise a tension-disrupting surface that disrupts the surface tension of the water flowing longitudinally along the underside of the base wall such that the flowing water tends to cling to the tension-disrupting surface.

[0038] The tension-disrupting surface may be arranged at an angle to a longitudinal axis of the drainage platform.

[0039] The tension-disrupting surface may be substantially perpendicular to the underside of the base wall.

[0040] The drainage system may comprise a plurality of interconnecting drainage elements having internal

drainage surfaces which together define the drainage platform.

[0041] In this case, the tension-disrupting surface may be defined by an end surface at a trailing end of at least one drainage element in the drainage system.

[0042] The drainage element of the pitched roof structure may be the drainage element described above.

[0043] The drainage elements may be configured such that a trailing end of a comparatively eave-ward drainage element may be received inside a leading end of a neighbouring, comparatively ridge-ward drainage element.

[0044] Within the scope of this application it may be expressly intended that the various aspects, embodiments, examples and alternatives set out in the preceding paragraphs, in the claims and/or in the following description and drawings, and in particular the individual features thereof, may be taken independently or in any combination. Features described in connection with one embodiment are applicable to all embodiments, unless such features are incompatible.

BRIEF DESCRIPTION OF THE DRAWINGS

[0045]

Figures 1, 2 and 3 of the accompanying drawings have already been described above by way of introduction to the invention. Embodiments of the invention will now be described, by way of example only, with reference to the remainder of the accompanying drawings, in which:

Figure 4 is a perspective view from the right-hand side of a pitched roof incorporating a drainage system according to an embodiment of the invention;

Figures 5 and 6 are alternative perspective views of a drainage element according to an embodiment of the invention for use in the drainage system of Figure 4; and

Figure 7 is a partial perspective view of a pitched roof of Figure 4, with the tiles removed, showing a close up of the drainage element of Figures 5 and 6.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0046] The drainage system of the invention is exemplified in the forgoing description as a dry verge system 100 for use at a verge of a pitched roof 20, the system including a plurality of drainage elements. However, the drainage system need not necessarily be used at a roof verge, but may be employed at any perimeter of a roof 20 that is sloping or inclined. The perimeter may be, for example, a verge, a gable abutment, a hip, a valley, or any other suitable sloping perimeter.

[0047] Figure 4 illustrates in perspective view a pitched

roof 20 comprising a drainage system formed of a plurality of roof covering elements in the form of tiles 34 that slope from a ridge to an eave of the roof structure. The pitched roof 20 includes a plurality of parallel load-bearing rafters 22 that slope from a ridge 24 at the top of the roof structure to an eave 26 at a lowermost edge of the roof structure 20, and a plurality of parallel battens 28 disposed on top of, and extending orthogonally with respect to, the rafters 22 from a left-hand verge (not shown) at the left side of the roof 20 to a right-hand verge 30 at the right side of the roof 20. Each verge defines a sloping perimeter of the roof 20 and overhangs a corresponding gable wall 32. An angle between the rafters 28 and a horizontal plane defines a pitch of the roof 20.

[0048] Roof-covering elements such as tiles 34 are affixed along the battens 28 in horizontally-extending rows or courses. As can be seen in Figure 4, each course of tiles 34 underlaps the course of tiles 34 directly above and overlaps the course of tiles 34 directly below, such that the tiles 34 overlap in a ridge-to-eave direction. Precipitation falling on the roof 20 is generally directed down the roof 20 over the tiles 34 to a gutter 36 at the eave 26.

[0049] Figure 4 illustrates that the roof structure 20 incorporates a drainage system in the form of a dry verge system 100 at a sloping perimeter defined by the right-hand verge 30 of the roof 20. The dry verge system 100 includes a plurality of drainage elements, exemplified here as verge elements 140 arranged along the verge 30 in a ridge-to-eave direction.

[0050] Each verge element 140 sits outboard of a course of tiles 34 to guard against ingress of water beneath the tile 34 from precipitation that is blown sideways into the gable end 32 of the roof 20.

[0051] Each element has a leading portion 150 located towards an eave 24 of the roof 20 and a trailing portion 152 located towards a ridge 24 of the roof 20. The trailing portion 152 of a lower or comparatively eave-ward element is received in a leading portion 150 of an upper or comparatively ridge-ward element so that when the verge elements 140 are arranged along the perimeter of the roof 20 outboard of the tiles 34, the elements 140 partially overlap one another in a ridge-to-eave direction.

[0052] Each verge element 40 has an internal drainage surface (not visible in Figure 4 but visible in Figure 5) that drains water away from its associated course of tiles 34. The elements 140 overlap one another to define an articulated platform that runs to the eave 26 of the roof 20. The articulated sections of the platform are defined by the successive drainage surfaces of each individual element 140. In this way, each articulated section of the platform drains water away from its associated course of tiles 34.

[0053] The verge elements 140 will now be described in more detail with reference to Figures 5 and 6, which illustrate a right-hand verge element 140 for use in a right-hand verge of a pitched roof structure.

[0054] The verge element 140 comprises a drainage body having an opening 144 at a roof-facing side 156 of

the verge element 140 that will receive a tile when the verge element 140 is in use. At an outward-facing side 154 of the verge element 140 opposite the roof-facing side 156, the verge element 140 is provided with a side wall 142 that guards against the ingress of water beneath the tile when the element 140 is in use. At the top of the element, an upper wall 148 extends laterally between the roof-facing 156 and outward-facing 154 sides of the verge element 140 and longitudinally between leading and trailing edges of the verge element 140. The upper wall 148 prevents water accessing the gap between the tile and the gable wall from above.

[0055] In this way, the upper wall 148 and side wall 142 together block access to the gap between the gable wall and the tiles to guard against the ingress of water beneath the tiles.

[0056] At the base of the element 140, a base wall 146 extends laterally between the roof-facing 156 and outward-facing 154 sides of the verge element 140 and longitudinally between leading and trailing edges of the verge element 140.

[0057] Together, the base wall 146, side wall 142 and upper wall 148 define boundaries surrounding an internal volume 158 of the verge element 140.

[0058] The base wall 146 comprises an internal-facing surface that defines the internal drainage surface 160 of the element 140. Any precipitation that does penetrate between the tile and the verge element 140 will fall into the internal volume 158 where it is drained internally within the verge element 140, down the internal drainage surface 160, in a longitudinal direction L towards the leading edge.

[0059] On the underside of the base wall 146 is an external-facing surface 162 that is opposite the internal drainage surface.

[0060] During rainfall, water falls directly onto the upper wall 148 of the verge element 140. Some of this water runs off the upper wall 148 in a lateral direction and runs down the outside of the side wall 142 until it reaches the underside of the base wall 146. Some of that water will tend to cling to the external-facing surface 162 of the base wall 146, and by virtue of gravity will tend to flow longitudinally along the external-facing surface 162 of the base wall 146 in an eave-ward direction.

[0061] According to the invention, the base wall 146 is provided with a flow-directing means that is configured to direct the water flowing longitudinally along the external-facing surface 162 of the base wall 146 in a lateral direction towards the outward-facing side 154 of the verge element 140, as will be described in more detail below.

[0062] In the embodiment now described, the flow-directing means takes the form of a tension-disrupting surface that is defined by a portion of the end surface 166 at the leading edge 164 of the base wall 146.

[0063] The end surface 166 is substantially perpendicular to the external-facing surface 162 of the base wall 146. The end surface 166 comprises two portions: an

oblique portion 168 at a roof-facing side 156 of the verge element 140 that defines the tension-disrupting surface, and a lateral portion 170 at the outward-facing side 154 of the verge element 140.

[0064] As best seen in Figure 5, the oblique portion 168 is defined by a diagonal 'cut-out' at the roof-facing corner of the leading edge 164. In this way, the oblique portion 168 of the end surface 166 is non-perpendicular to the longitudinal axis of the channel L. In particular, as the oblique portion 168 of the end surface 166 extends downwardly towards the lateral portion 170 it also extends laterally towards the outward-facing side 154 of the verge element 140.

[0065] At the roof-facing side 156 of the verge element 140, the oblique portion 168 of the end surface 166 meets a roof-facing edge 172 of the base wall 146 at an oblique angle of more than 90°. At an outward-facing side 154 of the verge element 140, the oblique portion 168 of the end surface 166 meets the lateral portion 170 of the end surface 166 at an oblique angle. Thus, the oblique portion 168 of the end surface 166 lies at an acute angle to the side wall 142.

[0066] The oblique portion 168 of the end surface 166 takes up the majority of the end surface 166 of the base wall 146, and in particular extends across at least half of the width of the end surface 166. In this way, the junction between the oblique portion 168 and the lateral portion 170 is spaced apart from the roof-facing side 156 of the verge element 140.

[0067] Returning to the internal drainage surface of the base wall 146, and referring still to Figure 5, the internal drainage surface 160 is provided with a plurality of internal flow directors in the form of mutually aligned ridges 174 that are non-perpendicular with respect to the longitudinal axis L. Each ridge 174 extends from the roof-facing side 156 of the verge element 140 in a direction that extends simultaneously downwardly towards the leading edge 164 and laterally towards the outward-facing side 154 of the verge element 140. A leading edge ridge 174a is positioned over the oblique portion 168 of the end surface 166, which serves to reinforce the leading edge 164 and to increase its tension-disrupting abilities as will be later described.

[0068] All the ridges 174 on the internal drainage surface 160 stop just short of the side wall 142 of the verge element 140. In this way, the internal drainage surface 160 comprises a free-flow region 176 at its outward-facing side 154 that is clear of flow directors. The truncation of the ridges 174 aligns with the end of the oblique portion 168 of the end surface 166, such that the free-flow region 176 of the internal drainage surface 160 aligns laterally with the lateral portion 170 of the end surface 166.

[0069] Considering the side wall 142 of the verge element in more detail, the verge element 140 also includes complementary fixing formations in the form of a hollow spigot 178 and an aperture 180, which are supported on an internal surface of the side wall 142 of the verge element 140. The spigot 178 is located towards a leading

end portion 150 of the verge element 140 and extends into the internal volume 158 of the verge element 140. The spigot 178 is hollow and has an open end. The aperture 180 is located towards a trailing end portion 152 of the verge element 140. In use, when multiple elements 140 are assembled on a roof 20 as in Figure 4, the spigot 178 of an upper verge element 140 is inserted into the aperture 180 of a lower verge element 140, and a nail or screw is driven through the hollow spigot 178 and aperture 180 and into a batten to secure the elements 140 in place.

[0070] As best seen in Figure 6, the trailing portion 152 of the verge element 140 is narrower than the leading portion 150 of the verge element 140. Put another way, the outer surface of the side wall 142 is closer to the roof-facing side 144 in the trailing portion 152 than in the leading portion 150.

[0071] To this end, the base wall 146 has an inward step that narrows the width of the verge element 140 in the trailing portion 152. The width of the step is substantially equal to the width of the side wall 142. In this way, the external width of the trailing portion 152 of the verge element 140 is substantially equal to the internal width of the leading portion 150 of the verge element 140, which allows the trailing portion 152 of one verge element 140 to fit snugly into the leading portion 150 of another verge element 140.

[0072] As best seen in Figure 6, the trailing portion 152 of the verge element 140 is also shallower than the leading portion 150 of the verge element 140. Put another way, when the verge element 140 is arranged with the base wall 146 horizontal, the external-facing surface 162 of the base wall 146 is higher in the trailing portion 152 than in the leading portion 150.

[0073] To this end, the base wall 146 has an upward step that decreases the height of the verge element 140 in the trailing portion 152. The height of the step is substantially equal to the thickness of the base wall 146.

[0074] The installation of the verge elements 140 in the roof 20 will now be described in further detail with reference to Figure 7.

[0075] Figure 7 shows a portion of the roof structure 20 with the tiles removed, and from an angle that reveals the structure of a verge element 140 underneath the tiles.

[0076] The dry verge system is typically installed at the sloping perimeter of the roof 20 when the roof 20 is tiled. The underlying roof structure 20 is first assembled and tiled and then the verge elements 140 are fixed to the roof structure 20 at the verge 30 moving from the eave 26 of the roof 20 towards the ridge 24.

[0077] The verge element 140 is attached to the roof 20 outboard of a course of tiles and at the end of a batten 28. Each verge element 140 is arranged generally parallel to the tiles, such that each verge element 140 is angled downwardly at substantially the same angle as the pitch of the roof 20. In this way, the leading edge 164 of each verge element 140 is lower than the trailing edge.

[0078] In practice, the batten 28 may be fitted with a

batten-end bracket 182 as shown. At the eaves course of tiles, the verge element 140 is slid laterally into place to embrace the course of tiles with the outermost tile extending into the opening 144 and the upper wall 148 sitting over the edge of the outermost eaves course tile. The upper wall 148 sits tight against the eaves course tile and at the trailing portion 152 lies between the tile of the eaves course and the tile of the course above. The spigot 178 is aligned with the batten 28 and the verge element 140 is nailed or screwed to the batten 28 through the spigot 178 and the batten-end bracket 182.

[0079] The next verge element 140 (not visible in Figure 7, but shown in Figure 4) is then slotted laterally into place at the verge 30 in line with the course of tiles 34 above the eaves course. The leading end of the next verge element 140 overlaps the trailing end of the eaves element 140a. More specifically, a trailing portion 152 of the eaves verge element 140a is inserted into a leading portion 150 of the next eaves element 140. The spigot 178 of the next verge element 140 is inserted into the aperture 180 of the eaves verge element 140, and the next verge element 140 is nailed or screwed to the batten 28 through the spigot 178 and the batten-end bracket 182.

[0080] When the trailing portion 152 of the eaves verge element 140a is inserted into the leading portion 150 of the next eaves element 140, the ridges 174 on the internal drainage surface 160 of the leading portion 150 of the next eaves element 140 act as spacers that space the external-facing surface 162 of the trailing portion 152 of the eaves verge element 140a away from the internal drainage surface 160 of the next eaves element 140. In this way, the ridges 174 ensure that there is a flow path for water on the internal drainage surface 160, despite the overlap between the elements 140.

[0081] Further verge elements 140 are then added, moving upwardly towards the ridge 24 of the roof 20.

[0082] Referring to Figure 7, in the embodiment shown, when the verge element 140 is installed in the roof 20, the base wall 146 stops short of the gable wall to leave a gap between the gable wall and the base wall 146 of no more than approximately 3 mm.

[0083] The flow of water around the external and internal surfaces of the drainage element will now be described in detail.

[0084] When water falls on the upper wall 148 of the verge element 140, attractive forces between the surface of the verge element 140 and the water molecules in the water droplets tends to cause the water to cling to the external surfaces of the verge element 140.

[0085] The water tends to run off the upper wall 148 of the verge element and onto the side of the verge element 140, where it runs down the exterior of the side wall 142 and down to the base wall 146.

[0086] When the water droplet reaches the base wall 146, the same attractive forces cause the droplet to cling to the external-facing surface 162 on the underside of the base wall 146, acting against the forces of gravity. A

particular surface tension is defined in the water droplet as a result of a balance between these attractive forces and gravity acting on the droplet.

[0087] The downward angle of the verge element 140 means that the external-facing surface 162 of the base wall 146 slopes downwardly towards the leading edge 164 and thus by action of gravity the water droplet with its particular surface tension flows down the external-facing surface 162 towards the leading edge 164 of the verge element 140. When a side wind blows against the roof 20 in a direction towards the gable wall 32, the side wind tends to cause the droplet to be blown towards the gable wall 32 and hence towards the roof-facing side 156 of the verge element 140. Thus, the droplet traces a path that is simultaneously eave-wards and towards the roof-facing side of the verge element 140.

[0088] Eventually, the water droplet meets the leading edge 164 of the base wall 146, where it runs over to the end surface 166. In the vicinity of the end surface 166, the water droplet is attracted to the end surface 166 in addition to the external-facing surface 162 of the base wall 146. The presence of the end surface and the additional attractive forces it creates disrupts the surface tension in the droplet. As gravity continues to pull the droplet in an eave-ward direction, the attraction between the end surface 166, the external-facing surface 162 and the water molecules cause the droplet to slide down the line of the end surface 166, and hence cause the droplet to follow the oblique part of the end surface 166 in a lateral direction away from the roof-facing side 156 and towards the outward-facing side 154 of the verge element 162.

[0089] In this way, the end surface 166 acts to direct the flow of the droplet in a lateral direction towards the outward-facing side 154 of the verge element 140.

[0090] The droplet continues flowing in this lateral direction until it meets the lateral portion 170 of the end surface 166. At the junction between the oblique portion 168 and the lateral portion 170, the droplet cannot move any further longitudinally, since attraction forces tend to make it cling to the end surface 166. Any wind blowing towards the gable wall 32 cannot blow the droplet back up the oblique portion 168 of the end surface 166, since this would require moving the droplet against the force of gravity. The droplet therefore initially tends to remain at the lateral portion 170 of the end surface 166.

[0091] Over time, multiple water droplets will follow the same path and will accumulate at the lateral portion 170 and coalesce to form a larger droplet of greater volume and mass. Since the attractive forces from the end surface 166 only act on the part of the droplet that is adjacent to the surface, the attractive force that holds the droplet against the surface will remain approximately constant, while the gravitational force pulling the droplet downwards will increase as the mass increases. Eventually, the gravitational force will overcome the attractive force, and the droplet will fall from the verge element.

[0092] When the droplet falls, it will fall from the lateral portion 170 of the end surface 166 which is at the out-

ward-facing side 154 of the verge element away from the gable wall. Thus, when the droplet falls it will be spaced comparatively far away from the gable wall 32. By contrast, if the flow-directing means were absent from the base wall 146, the droplet would tend to flow towards the roof-facing side 156 of the verge element, and would tend to fall from the roof-facing corner of the leading edge 164 of the base wall 146, where it would be comparatively close to the gable wall 32 (no more than approximately 3 mm away). Thus, in a verge element 140 of the invention, any water droplets falling from the verge element tend to fall from a position that is further from the gable wall 32. This tends to reduce the possibility of the droplets being blown onto the gable wall 32 where they might otherwise cause damp and other issues.

[0093] Furthermore, the droplets will tend to be larger and heavier when they fall from the verge element according to the invention as will now be explained.

[0094] The comparatively large size of the droplets has several contributing factors. Firstly, as already explained in detail above, the oblique portion 168 of the end surface 166 will tend to direct multiple drops towards the lateral portion 170 of the end surface 166, such that the junction between the oblique portion 168 and the lateral portion 170 acts as an accumulation point for droplets running down the external-facing surface 162 of the base wall 146. Secondly, the internal ridges 174 tend to direct water droplets that are flowing along the internal drainage surface 160 towards the free-flow region 176. The free-flow region 176 aligns with the lateral portion 170 of the end surface 166 and therefore any water draining internally along the internal drainage surface 160 will also tend to accumulate at the lateral portion 170 of the end surface 166.

[0095] Thus, both the internal and external flow directors tend to direct water to the same accumulation point at the junction between the oblique portion 168 and lateral portion 170 of the end surface 166. As a result, water is contributed from several directions, and the eventual mass of the water droplet that falls from the verge element 140 is comparatively large. The large mass of the droplet means that it is less likely to be blown against the gable wall 32 as it falls, thereby protecting the gable wall 32 further from damp and localised staining.

[0096] It will be appreciated that the dry verge system 100 described could be incorporated into any sloped perimeter of a roof 20. For example, the roof 20 may terminate in an abutment at the top of the roof 20 instead of a ridge 24 with the verge element 140 leading from the abutment to an eave, or the roof 20 may include a gable abutment.

[0097] Embodiments are envisaged in which the oblique portion 168 of the end surface 166 extends across the entire width of the base wall 146, such that there is no lateral portion 170 of the end surface 166. Embodiments are envisaged in which the oblique portion 168 of the end surface 166 is shorter than illustrated. For example, the oblique portion 168 may extend a shorter dis-

tance across the width of the base wall, so long as the oblique portion is long enough to guide the longitudinally-flowing water far enough away from the gable wall that it will not be easily blown on to the gable wall by a side wind.

[0098] The flow director need not be provided in the form of the end surface 166 of the base wall 146, but may be provided in any suitable form that is capable of directing the flow of water towards the outward-facing side 154 of the verge element. For example, the flow director may be provided as a ridge or channel formed in the external surface of the base wall 146 and arranged at an angle to the longitudinal axis L of the verge element.

[0099] The present invention is not limited to the exemplary embodiments described above and many other variations or modifications will be apparent to the skilled person without departing from the scope of the present invention as defined in the following claims.

Claims

1. A drainage element for use in a drainage system for a sloping perimeter of a pitched roof, the drainage element including:

an opening for receiving a roof covering element at a roof-facing side of the drainage element;
a side wall for guarding against ingress of water beneath the roof covering element at an outward-facing side of the drainage element opposite the roof-facing side; and

a base wall that extends laterally between the roof-facing and outward-facing sides of the drainage element and longitudinally between leading and trailing edges of the drainage element;

wherein the base wall defines an internal drainage surface for draining precipitation internally within the drainage element in a longitudinal direction towards the leading edge; and

wherein the base wall further defines an external-facing surface opposite the internal drainage surface, the base wall being provided with a flow-directing means configured to direct water flowing longitudinally along the external-facing surface of the base wall in a lateral direction towards the outward-facing side of the drainage element.

2. The drainage element of Claim 1, wherein the flow-directing means is configured to disrupt the surface tension of water flowing longitudinally along the underside of the base wall to direct it in the lateral direction.
3. The drainage element of Claim 2, wherein the flow-directing means comprises a tension-disrupting sur-

- face that disrupts the surface tension of the water flowing longitudinally along the underside of the base wall such that the flowing water tends to cling to the tension-disrupting surface.
4. The drainage element of Claim 3, wherein the tension-disrupting surface is arranged at an angle to a longitudinal axis of the drainage element.
 5. The drainage element of Claim 3 or Claim 4, wherein the tension-disrupting surface is substantially perpendicular to the external-facing surface of the base wall.
 6. The drainage element of any of Claims 3 to 5, wherein the tension-disrupting surface is defined by at least a portion of an end surface of a leading edge of the base wall.
 7. The drainage element of Claim 6, wherein the base wall defines a roof-facing edge at the roof-facing side of the drainage element and the end surface meets the roof-facing edge at an oblique angle.
 8. The drainage element of any preceding claim, wherein the internal drainage surface of the base wall is provided with an internal flow-directing means configured to direct water flowing longitudinally along the internal drainage surface of the base wall in a lateral direction towards the side wall of the drainage element.
 9. The drainage element of Claim 8, wherein the internal flow-directing means comprises an internal ridge that protrudes from the internal drainage surface of the base wall.
 10. The drainage element of Claim 9, wherein the internal ridge is located at a leading edge of the base wall.
 11. The drainage element of any of Claims 8 to 10, wherein the or each internal flow-directing means extends only partially across the internal surface of the base wall in a lateral direction, to define a free-flowing region of the internal drainage surface that is free from internal ridges when moving in a longitudinal direction.
 12. A pitched roof structure comprising an underlying roof structure covered by a plurality of roof covering elements and defining a sloping perimeter, and a drainage system provided at the sloping perimeter, the drainage system having a drainage body defining a longitudinal drainage platform for draining precipitation in a longitudinal direction towards an eave of the roof structure, wherein drainage system comprises a base wall having an upward-facing side that defines the drainage platform, and an underside opposite the upward-facing side, the base wall comprising a flow-directing means configured to direct water flowing longitudinally along the underside of the base wall in a lateral direction away from the underlying roof structure.
 13. The drainage element of Claim 12, wherein the flow-directing means is configured to disrupt the surface tension of water flowing longitudinally along the underside of the base wall to direct it in the lateral direction.
 14. The pitched roof structure of Claim 13, wherein the flow-directing means comprises a tension-disrupting surface that disrupts the surface tension of the water flowing longitudinally along the underside of the base wall such that the flowing water tends to cling to the tension-disrupting surface.
 15. The pitched roof structure of Claim 14, wherein the tension-disrupting surface is arranged at an angle to a longitudinal axis of the drainage platform.

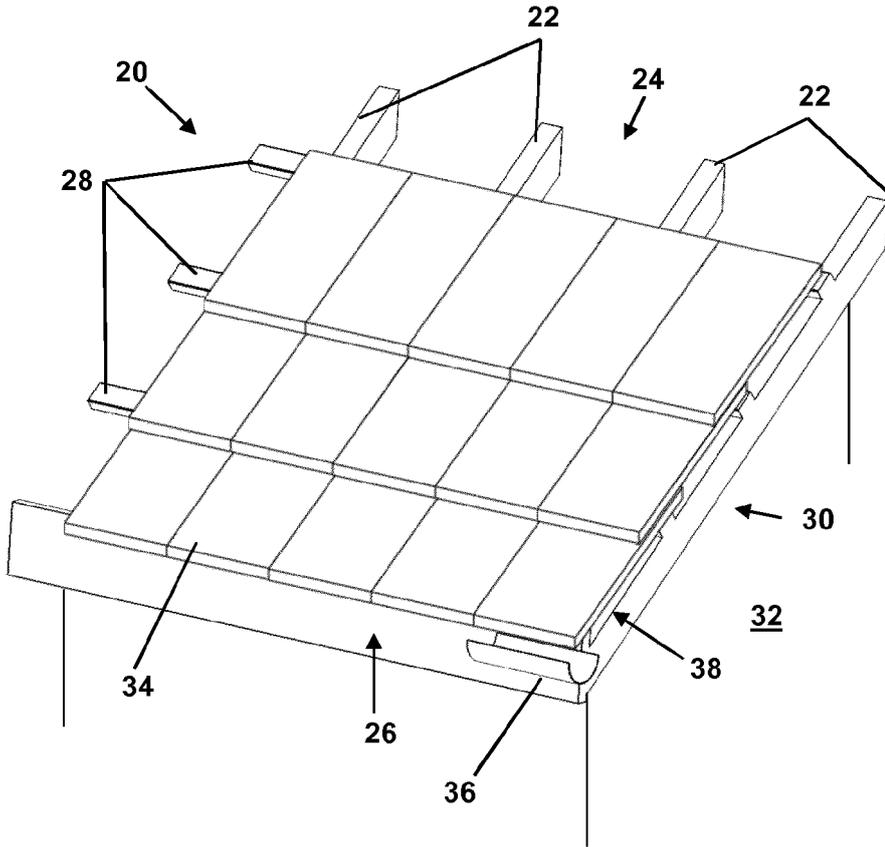


Figure 1 (prior art)

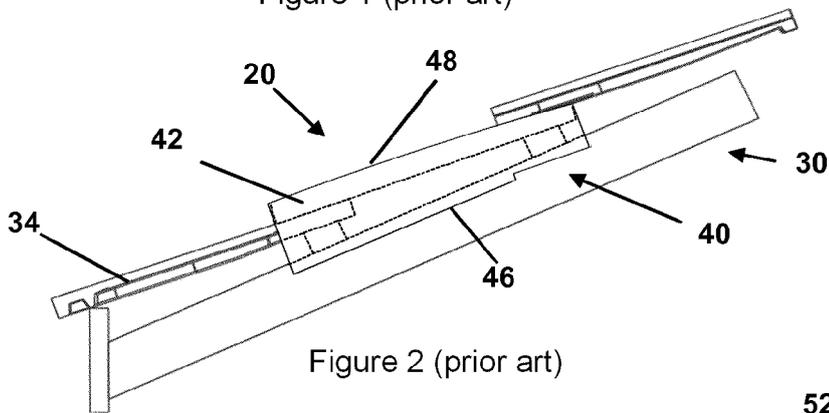


Figure 2 (prior art)

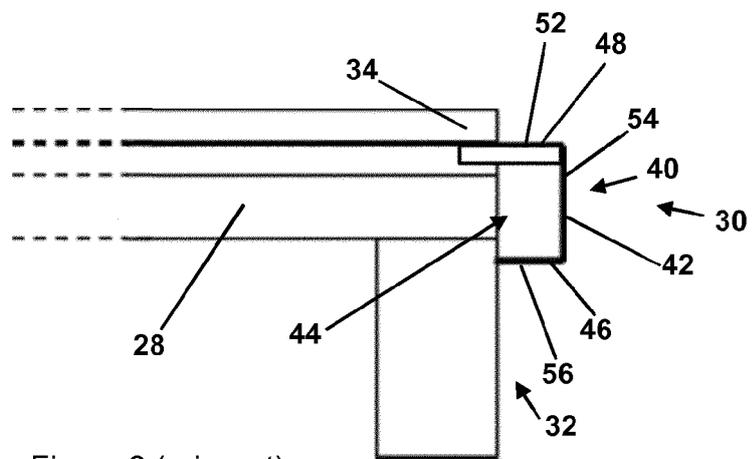
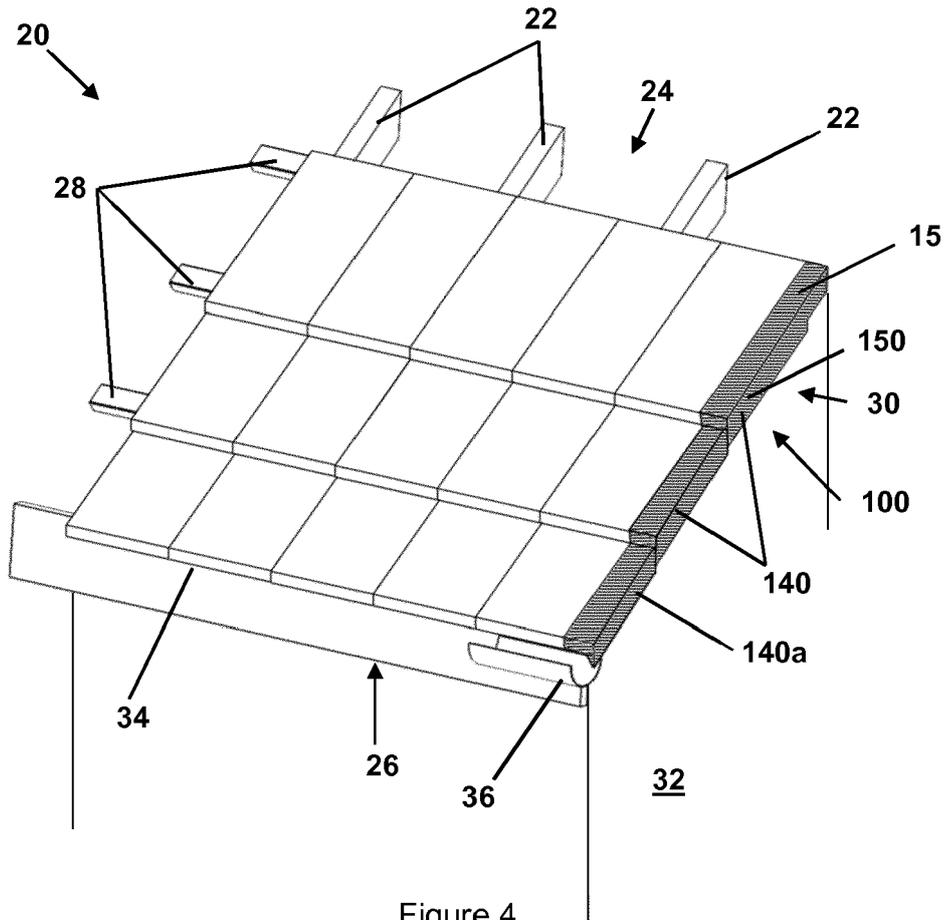


Figure 3 (prior art)



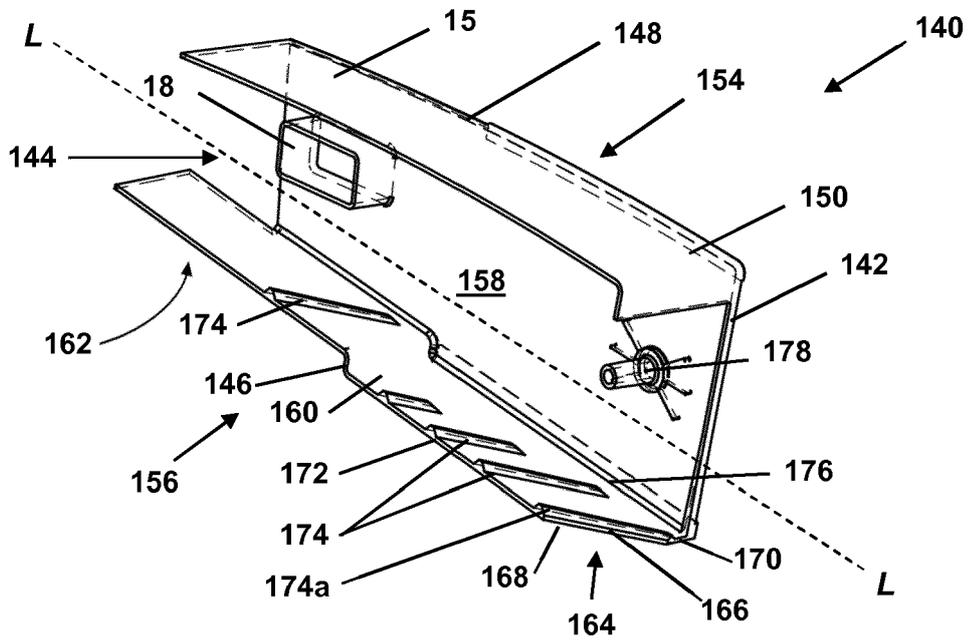


Figure 5

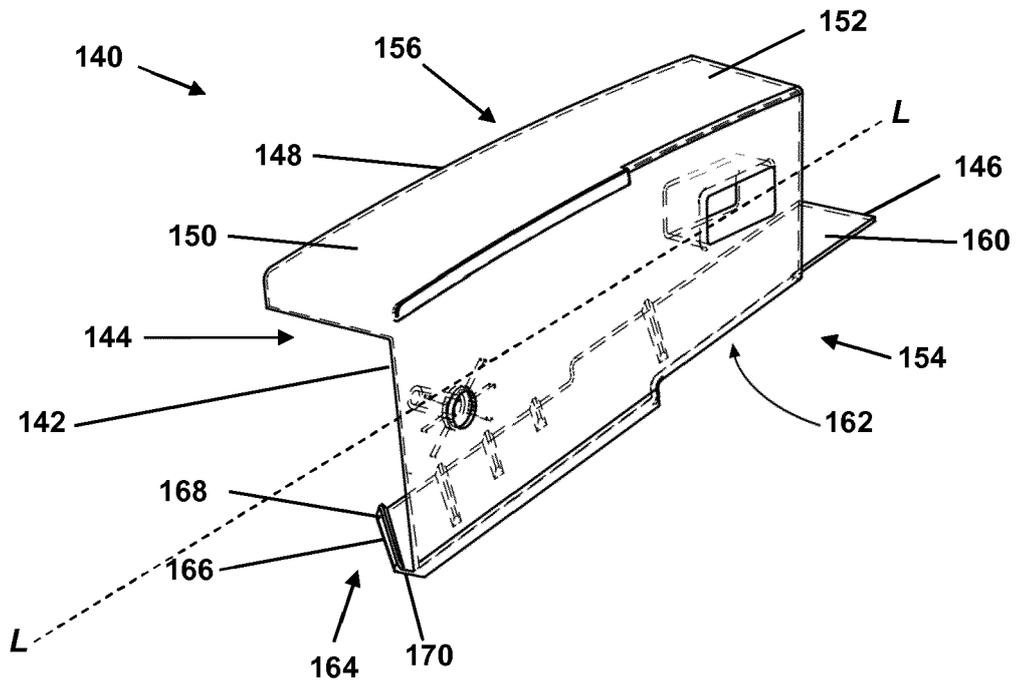


Figure 6

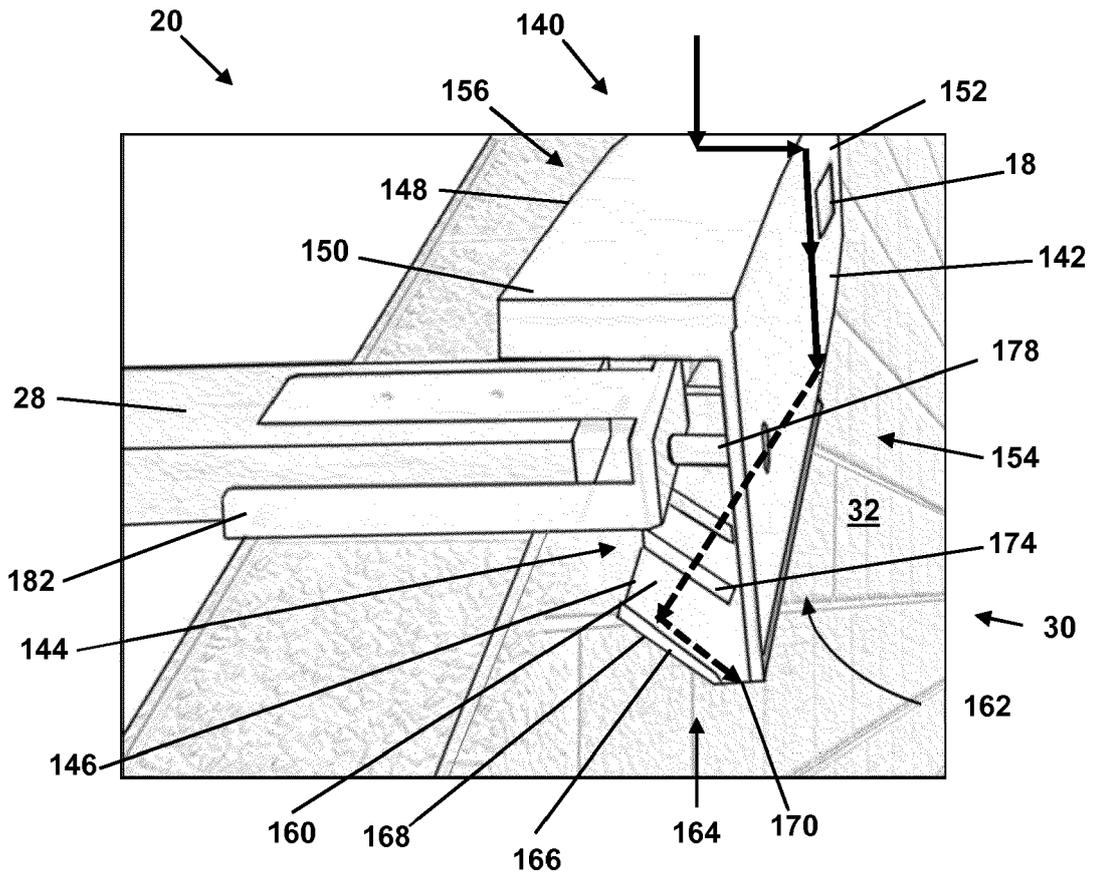


Figure 7



EUROPEAN SEARCH REPORT

Application Number
EP 17 17 4110

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Place of search The Hague		Date of completion of the search 14 August 2017	Examiner Leroux, Corentine
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