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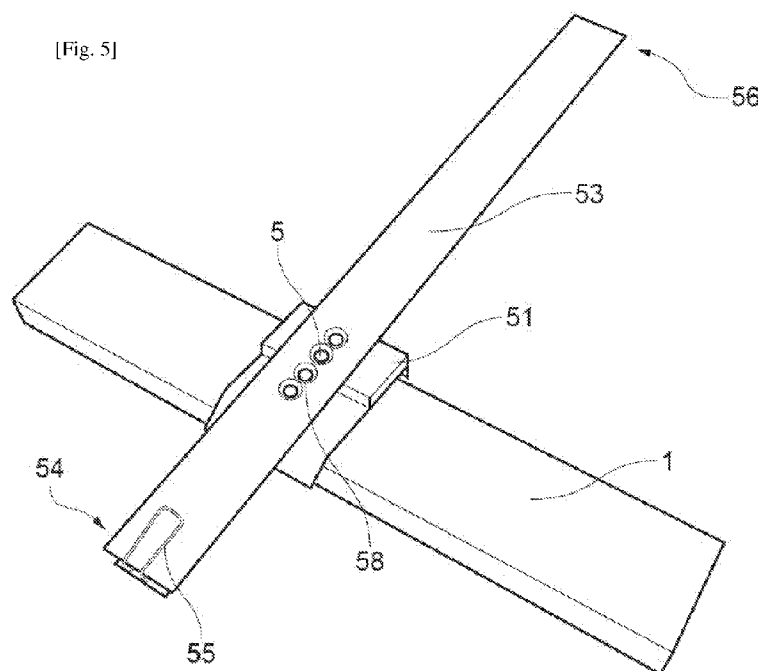
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(54) Title: ROOF TILE ATTACHMENT SYSTEM AND METHOD OF TILING A PITCHED ROOF

[Fig. 5]



(57) Abstract: The present invention provides a batten mount (51) for attaching to a first batten (1), and an elongate member (53) having a tile-securing part (55) and a fulcrum contact for engaging with a second batten (2), where the batten mount (51) is selectively attachable to the elongate member (53) at either: a first position spaced from the first end by a first distance; or a second position spaced from the first end by a second distance different from the first distance. In this way, the distance between the fulcrum contact and the point at which the elongate member is attached to the batten mount can be selected to correspond to the gauge of the roof, thereby making the roof tile attachment system appropriate for use on a number of different roofs having different gauges.

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Description

Title of Invention: ROOF TILE ATTACHMENT SYSTEM AND METHOD OF TILING A PITCHED ROOF

- [0001] The present invention relates generally to a roof tile attachment system and a method of tiling a pitched roof, and relates in particular but not exclusively to a double-lap roof tile attachment system and a method of tiling a pitched roof in double-lap arrangement.
- [0002] There are various arrangements for tiling pitched roofs, the most common being 'single-lap' and 'double-lap' arrangements. In principle, tiles may be arranged on a roof with no overlap (see [Fig.1]); however, this is rarely done as water ingress between adjacent tiles is likely, and is very difficult to guard against, particularly over the long lifetimes of such roofs. Such 'no-lap' arrangements would generally require seals between adjacent tiles, which could include moulded tongue-and-groove connectors between tiles, which would be expensive to create, and difficult to install and maintain. Furthermore, attaching the tiles to each batten introduces a further point of weakness for water ingress which cannot be addressed by peripheral seals. Moreover, in order to support these tiles on adjacent roof battens, the size of the tiles would need to be very carefully matched to the spacing of the battens, which can be particularly difficult where batten spacing varies over a roof and from one roof to another. For these reasons, 'no-lap' arrangements are not conventionally used for tiling roofs.
- [0003] Far more common are single-lap arrangements (see figures 2a, 2b, 2c), which involve a plurality of horizontal courses of tiles that include similar seals between adjacent tiles within a course, but have no such seals between courses. This is made possible by over-sizing the single-lap tiles so that they have a height that exceeds the batten spacing, thereby enabling an upper course of tiles to lay over the top of a lower course of tiles. In this way, due to the single overlap, it is not possible for water to pass through the roof between an upper and lower course. Nevertheless, seals between adjacent tiles within a course are still expensive to create, and difficult to install and maintain.
- [0004] In contrast, double-lap tiling arrangements (see figures 3a, 3b, 3c, 3d) can use plain tiles, without any form of seals between tiles. The tiles are arranged in overlapping courses such that a first course of tiles is overlapped by a second course of tiles at a greater height and is additionally overlapped by a third course of tiles at a height greater than the second course. The tiles in one course are typically laterally offset from the tiles in an adjacent course by a distance equal to half the tile width such that the gap between two tiles in one course overlaps the centre of a tile in the adjacent

course. In this way, it is not possible for water to pass through the roof between adjacent tiles, as any gap therebetween is covered by a tile above and/or below.

[0005] In particular, the term single-lap refers to there being at most a single overlapping tile, and the term double-lap refers to there being up to two overlapping tiles. The present invention may be suitable for use in single-lap and double-lap arrangements.

[0006] An accessory for single-lap arrangements is known in which a seal between adjacent tiles in a course comprises a rigid strip of water-impermeable material lying underneath the join between the tiles and overlapping both tiles. The strip is typically fixed between an upper batten and a lower batten and at least one hook or clip is attached to the lower end of the strip to support or grip the lower edges of the tiles. However, a seal of this type is only suitable for use with tiles arranged in a single-lap arrangement on a roof with a specific gauge.

[0007] According to a first aspect of the present invention, there is provided a roof tile attachment system, configured for use with a pitched roof of the type having a plurality of battens extending transversely across the roof, the system comprising: a first batten mount comprising a batten attachment part configured to attach to a first batten; and a first elongate member comprising: a tile-securing part at a first end thereof, configured to hold an edge of a roof tile; a fulcrum contact spaced from the first end, the fulcrum contact configured to be engageable with a second batten above the first batten, the second batten extending parallel thereto; and a batten mount engagement part spaced from the first end, the batten mount engagement part configured to allow selective attachment of the batten mount to the first elongate member at either: a first position spaced from the first end by a first distance; or a second position spaced from the first end by a second distance different from the first distance.

[0008] In this way, the distance between the fulcrum contact and the point at which the elongate member is attached to the batten mount can be selected to correspond to the gauge of the roof, thereby making the roof tile attachment system appropriate for use on a number of different roofs having different gauges.

[0009] The roof may be a pitched roof having a pitch angle of at least 10 degrees, in particular at least 15 degrees, more particularly at least 20 degrees. The roof may even be pitched to be vertical. The battens may be constructed from wood, metal, plastics material or a combination thereof and may comprise gaps or channels to allow drainage of moisture. The battens may be elevated or may rest directly on the roof rafters or trusses. In the current disclosure, when a batten is referred to as extending transversely across the roof, it is meant that the batten extends across the roof and is aligned approximately at right angles to the roof rafters and approximately parallel to the lower edge of the roof. When a batten is referred to as extending parallel to another batten, it is meant that the two battens are approximately parallel to one

another. Reference to a second batten above a first batten includes a second batten that is both vertically and horizontally displaced from the first batten, not merely vertically displaced. The roof may comprise additional or secondary battens which extend across the roof in other directions.

- [0010] The elongate member may be a straight bar, having a flat upper surface and/or a flat lower surface opposite the flat upper surface. The elongate member may be made of metal, wood or plastics material and may have a length of between 10cm and 1m, in particular between 20cm and 70cm.
- [0011] The first and second ends may be at respective maximum extents of the elongate member, and/or may be considered to be a region including the respective maximum extent, for example within 10%, or 5% of that respective maximum extent.
- [0012] The edge of the roof tile may be a lower edge thereof, and may comprise a peripheral portion of a largest face of a tile. For example, a tile may be substantially cuboidal, having opposing inner and outer faces that are substantially rectangular. Four additional side faces connect the inner and outer faces together, the side faces having respective areas significantly smaller than the inner and outer faces; in particular, less than 10% of the area of the inner and/or outer faces, more particular less than 5% of the area of the inner and/or outer faces, more particularly less than 3% of the area of the inner and/or outer faces. The edge of the roof tile may comprise a portion of the roof tile adjacent to only one or at least one edge of the outer face, for example within 15%, 10%, or 5% of the edge of the outer face, relative to the extent of the tile outer face in a direction perpendicular to that only one or at least one edge of the outer face.
- [0013] The tile-securing part may comprise only one, at least one or more than one hook, clip or clamp capable of receiving the lower edge of a roof tile therein and/or gripping said roof tile in such a way that the lower edge of the tile is urged towards the elongate member. The tile-securing part may additionally support the lower edge of the roof tile to prevent the roof tile from being able to slide relative the elongate member under the effect of gravity. The hook, clip or clamp may be rigidly attached to the elongate member or may be movable relative to the elongate member so as to enable easy insertion of the roof tile.
- [0014] In particular, the tile-securing part may be configured to grip and/or support a centre portion of a lower edge of a tile in a double lap arrangement, and/or may be configured to grip and/or support a lower corner of a tile in a single lap arrangement.
- [0015] The hooks, clips or clamps may be removably attached to the elongate member so that, in use, only one of either the hooks, clips or clamps configured to grip and/or support a centre portion of a lower edge of a tile in a double lap arrangement or the hooks, clips or clamps configured to grip and/or support a lower corner of a tile in a single lap arrangement may be present.

- [0016] The hooks, clips or clamps may attach to the elongate member in a rigid way or may be attached in such a way that they are movable relative to the elongate member so as to enable easy insertion of the roof tile(s).
- [0017] The roof tiles may be plain tiles or shingles without interlocking edges. The tiles may be substantially sheet-like, that is having lateral extent but comparatively little thickness. For example, the thickness of each tile may be less than 10%, in particular less than 5%, more particularly less than 3%, the lateral extent of the tile in any other direction (and/or all other directions). Accordingly, the tiles may be described in terms of a two-dimensional shape; however, it is to be understood that they are actually closer to a prism (polyhedron) or cylinder having a relatively small axial length, but having an axial cross section possessing that two-dimensional shape. For example, the tiles may be rectangular or square in shape and are typically made of clay, concrete and/or slate, but in some cases, they may comprise asphalt, wood, fibreglass and/or any other suitable material. Edges of the tile may therefore be construed as edges of the two-dimensional shape.
- [0018] The tiles may be flat; that is, having substantially no curvature in their axial surface. Alternatively, the tiles may be curved and or shaped such that both axial surfaces substantially conform to one another; that is they may be stackable.
- [0019] In some arrangements, the tiles may be photovoltaic tiles or solar thermal tiles.
- [0020] The fulcrum contact may merely be a point on the elongate member, which may be at a second end opposing the first end or may be spaced from the second end, and the fulcrum contact may merely be suitable for touching the second batten. In this way, the elongate member may pivot about the contact point.
- [0021] The batten mount engagement part may be located closer to the first end than the second end and/or fulcrum contact.
- [0022] Selective attachment of the batten mount to the first elongate member at either position means that the batten mount may be attached to the elongate member at a plurality of different positions, including the first position, the second position, and optionally other positions (for example between the first position and the second position, or beyond the first and/or second positions). The fact that the batten mount is selectively attachable to the batten mount engagement part in more than one position makes this roof tile attachment system appropriate for use on a number of different roofs having different gauges.
- [0023] The first position, second position and any further positions may be discretely defined positions or may form part of a continuum of positions within a defined range. The roof tile attachment system may include markings, indentations or some other form of visual or tactile indication to identify the different positions. Different engagement

positions may be selected so that different tile headlaps and therefore different gauges can be accommodated.

- [0024] The batten mount engagement part may comprise at least one aperture extending between the upper surface of the elongate member and a lower surface of the elongate member, for example through which fixings such as screws, nails and/or bolts can be inserted.
- [0025] The at least one aperture may comprise a plurality of through-holes. In this way, a series of discrete locations for coupling to the batten mount is achieved. The plurality of holes may comprise two holes, three holes, four holes, five holes or more holes.
- [0026] The at least one aperture may comprise an elongate slot extending through from an upper surface of the elongate member to a lower surface of the elongate member. In this way, a continuous series of locations for coupling to the batten mount can be achieved. For example, the slot may have a greater length parallel to a longitudinal axis of the elongate member than across and/or through the elongate member. In this way, fixings such as screws, nails and/or bolts may be inserted at different locations.
- [0027] The batten mount may comprise a projection configured to be insertable into the at least one aperture. The projection may comprise a peg or post, and may comprise a plurality of such pegs or posts.
- [0028] The batten mount may comprise a body into which a fixing may be driven. In this way, a fixing, such as a screw or nail, may be passed through the aperture into the body to hold the elongate member and the batten mount together. The body may include a pilot hole for easily aligning the fixing.
- [0029] The pilot hole may be a through-hole. A fixing such as a screw or nail may be used to couple the elongate member to the batten mount (e.g. forming part of, or via, the batten mount engagement part), and/or the or another fixing may be used to couple the batten mount to the batten. For example, a single screw may be used that extends through the elongate member, through the batten mount, and into the batten in question.
- [0030] The batten mount may have a flat upper surface on which a flat lower surface of the elongate member can rest. The flat upper surface of the batten mount may be configured to be screwed into and/or may be configured with one or more threaded holes therein to receive bolts, in order that the batten mount may be attachable to the batten mount engagement part means of screws or bolts.
- [0031] Alternatively or additionally, the batten mount engagement part may comprise one or more (e.g. a single or a row of) posts or pegs projecting from the lower surface of the elongate member. The flat upper surface may contain one or more holes without threads into which posts or pegs projecting from the lower surface of the elongate member may be inserted.

- [0032] The pegs or posts may be tapered and/or may form a friction engagement or interference fit with the elongate member.
- [0033] The batten mount may have lug(s)/projection(s)/finger(s)/flange(s) to locate it accurately on the top of the batten. In this way, the batten mount hangs on a batten at a predetermined location.
- [0034] The batten attachment part may be of a shape with a rectangular cutaway profile, configured to fit around a batten with a rectangular cross section in such a way as to form a friction and/or interference fit between the batten attachment part and the batten. Alternatively or additionally, the batten attachment part may comprise a pair of jaws, biased towards a closed position, configured to receive a batten therebetween and to grip said batten. Alternatively or additionally, the batten attachment part may comprise nails and/or screws and the batten mount may be attached to the batten by nailing and/or screwing into the batten.
- [0035] The batten mount may comprise a recess on an upper surface thereof upon which to receive an upper edge (opposing the lower edge) of a roof tile. In this way, alignment of roof tiles with respect to battens can be easily achieved.
- [0036] The recess may finish with a flange at its lowest point, so that when replacing a tile, the tile slides up the flange and so doesn't hit the batten. In this way, it helps align the tile during installation.
- [0037] Furthermore, single-lap and more particularly double-lap tiling arrangements suffer the disadvantage that they are slow and labour-intensive to lay. This is in part due to the large number of tiles that need to be individually attached to the battens and in part due to the care that needs to be taken to ensure that the tiles are arranged uniformly in their course, so that the lower edge of each tile is aligned with the lower edge of another tile in the same course; and that adjacent courses of tiles are suitably laterally offset from one another. A non-uniform arrangement of tiles within a course may result in gaps being present, which may allow unwanted and detrimental water ingress. Similarly, having two or more adjacent courses of tiles without a suitable lateral offset may allow water ingress where the gaps between tiles in one course overlap the gaps between the tiles in an adjacent course.
- [0038] The elongate member may comprise a flange that is configured to be overlappable with an adjacent tile. In this way, alignment of the elongate members with respect to the roof tiles can be easily achieved. The elongate member may comprise a pair of flanges, each one of the pair on a respective side of the elongate member, each respective flange for overlapping with a respective adjacent roof tile. The flange or pair of flanges may be configured to be above or below the adjacent roof tile. The elongate member may comprise an upper pair of flanges and a lower pair of flanges, each one of the upper and lower pairs on a respective side of the elongate member.

The flanges may be defined as part of the elongate member, attached to a core of the elongate member and/or attached to the elongate member.

[0039] The flanges enable a tile to be removed/inserted between a pair of elongate members, by sliding in or out, while aligning it accurately with respect to other tiles. In addition the flanges help secure the tiles against wind-lift.

[0040] The elongate member (and/or a core of the elongate member) may be hollow. In this way, weight and material may be saved.

[0041] The tile-securing part is removably attachable to a core of the elongate member. In this way, to remove a tile from an installed roof, the tile-securing part can be removed, allowing sliding of that tile out of position. Otherwise all tiles above would need to be removed. The securing part may be a sprung clip.

[0042] The removal and replacement of damaged or faulty tiles in a single-lap arrangement, and more particularly in a double-lap arrangement, is time-consuming and labour intensive and may require large portions of the arrangement to be removed, thereby exposing large areas beneath the roof to the elements while work is being carried out.

[0043] The roof tile attachment system may further comprise a plain roof tile, or a plurality of plain roof tiles.

[0044] The elongate member may have a length approximately equal to that of each roof tile, and/or the roof tiles may be arranged in single-lap arrangement.

[0045] The tiles in each double-lap course typically extend from an upper edge adjacent to an upper batten that extends transversely across the roof, and a lower edge resting on a lower batten that extends parallel to the upper batten at a lower height. A middle batten is located between the upper batten and the lower batten, and is generally equidistant from each. A tile is typically attached to the upper batten near its upper edge, or the middle batten at its midpoint, for example using nails or screws, and a lower portion of the tile is typically merely supported by the lower battens (and/or the tiles in the courses below).

[0046] When tiles are used on a roof in such a double-lap arrangement, wind may lift the lower edge of a tile, pivoting it around the fixing(s) in the upper batten, which can cause cracks or damage to the tile, and in extreme cases the tile may loosen and sometimes slip free of its fixings. This effect is more significant with double-lap tiles than single-lap tiles, due to double-lap tiles having a greater height (approximately twice the batten spacing) resulting in increased torque.

[0047] According to a second aspect of the present invention, there is provided a double-lap roof tile attachment system, configured for use with a pitched roof of the type having a plurality of battens extending transversely across the roof, the system comprising: a first batten mount comprising a batten attachment part configured to attach to a first batten; and a first elongate member comprising: a tile-securing part at a first

end thereof, configured to hold an edge of a roof tile; a fulcrum contact spaced from the first end, the fulcrum contact configured to be engageable with a second batten above the first batten, the second batten extending parallel thereto; and a batten mount engagement part spaced from the first end, the batten mount engagement part configured to allow selective attachment of the batten mount to the first elongate member at either: a first position spaced from the first end by a first distance; or a second position spaced from the first end by a second distance different from the first distance.

- [0048] In this way, roof tiles may be securely attached to a roof in such a way that the distance between the lower edge of the roof tile and the point at which it is attached to the roof is reduced, thereby reducing the amount of torque that can be generated by wind penetrating beneath the tile and reducing the likelihood of the tile being damaged or detached from the roof as a result of the wind.
- [0049] The elongate member may have a length greater than half that of the roof tile, and less than three-quarters that of the roof tile. In this context, the length of the roof tile may be its longest dimension, or its second longest dimension.
- [0050] The double-lap roof tile attachment system may further comprise a pitched roof having a plurality of battens extending transversely across the roof, spaced apart by a gauge distance, wherein the tile may have a length greater than twice the gauge and the elongate member may have a length greater than the gauge.
- [0051] In particular, the length of the tile may exceed twice the gauge distance by an overlap distance, and the length of the elongate member may exceed the gauge distance by the same overlap distance.
- [0052] It is to be understood that the above comparative measurements are to within some precision, such as 20%, 10% or 5%.
- [0053] The double-lap roof tile attachment system may comprise a plurality of such elongate members, a plurality of such batten mounts and/or a plurality of such tiles.
- [0054] According to a third aspect of the present invention, there is provided a method of tiling a pitched roof, the pitched roof having a plurality of battens extending transversely across the roof, the method comprising the steps of: providing the system of any preceding claim; attaching a batten attachment part to a first batten; selectively attaching the batten mount to the batten mount engagement part of the first elongate member at either: a first position spaced from the first end by a first distance; or a second position spaced from the first end by a second distance different from the first distance; providing a roof tile; and holding an edge of the roof tile with the tile-securing part.
- [0055] The method may comprise arranging the tiles in single-lap or double-lap arrangement.

- [0056] Optionally, the method may further comprise the step of engaging the fulcrum contact with a second batten above the first batten, the second batten extending parallel thereto. However, this may only occur when upward pressure is placed on a lower edge of a roof tile, pivoting the fulcrum contact into engagement with the second batten, by virtue of rotation about the first batten.
- [0057] The above and other characteristics, features and advantages of the present invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings, which illustrate, by way of example, the principles of the invention. This description is given for the sake of example only, without limiting the scope of the invention. The reference figures quoted below refer to the attached drawings.
- [0058] [Fig.1] shows a prior art no-lap tiling arrangement.
- [0059] Figures 2a to 2c show a prior art single-lap tiling arrangement.
- [0060] Figures 3a to 3d show a prior art double-lap tiling arrangement.
- [0061] [Fig.4] shows a cross-section through the prior art arrangement of [Fig.3d].
- [0062] [Fig.5] shows a perspective view of an elongate member for use in the present invention.
- [0063] [Fig.6] shows detail of one end of the elongate member of [Fig.5].
- [0064] [Fig.7] shows a perspective view of a batten mount for use in the present invention.
- [0065] Figures 8a to 8d show a double-lap tiling arrangement using the present invention.
- [0066] [Fig.9] shows a cross-section through the arrangement of [Fig.8d].
- [0067] The present invention will be described with respect to certain drawings but the invention is not limited thereto but only by the claims. The drawings described are only schematic and are non-limiting. Each drawing may not include all of the features of the invention and therefore should not necessarily be considered to be an embodiment of the invention. In the drawings, the size of some of the elements may be exaggerated and not drawn to scale for illustrative purposes. The dimensions and the relative dimensions do not correspond to actual reductions to practice of the invention.
- [0068] Furthermore, the terms first, second, third and the like in the description and in the claims, are used for distinguishing between similar elements and not necessarily for describing a sequence, either temporally, spatially, in ranking or in any other manner. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that operation is capable in other sequences than described or illustrated herein. Likewise, method steps described or claimed in a particular sequence may be understood to operate in a different sequence.
- [0069] Moreover, the terms top, bottom, over, under and the like in the description and the claims are used for descriptive purposes and not necessarily for describing relative positions. It is to be understood that the terms so used are interchangeable under

appropriate circumstances and that operation is capable in other orientations than described or illustrated herein.

[0070] It is to be noticed that the term “comprising”, used in the claims, should not be interpreted as being restricted to the means listed thereafter; it does not exclude other elements or steps. It is thus to be interpreted as specifying the presence of the stated features, integers, steps or components as referred to, but does not preclude the presence or addition of one or more other features, integers, steps or components, or groups thereof. Thus, the scope of the expression “a device comprising means A and B” should not be limited to devices consisting only of components A and B. It means that with respect to the present invention, the only relevant components of the device are A and B.

[0071] Reference throughout this specification to “an embodiment” or “an aspect” means that a particular feature, structure or characteristic described in connection with the embodiment or aspect is included in at least one embodiment or aspect of the present invention. Thus, appearances of the phrases “in one embodiment”, “in an embodiment”, or “in an aspect” in various places throughout this specification are not necessarily all referring to the same embodiment or aspect, but may refer to different embodiments or aspects. Furthermore, the particular features, structures or characteristics of any one embodiment or aspect of the invention may be combined in any suitable manner with any other particular feature, structure or characteristic of another embodiment or aspect of the invention, as would be apparent to one of ordinary skill in the art from this disclosure, in one or more embodiments or aspects.

[0072] Similarly, it should be appreciated that in the description various features of the invention are sometimes grouped together in a single embodiment, figure, or description thereof for the purpose of streamlining the disclosure and aiding in the understanding of one or more of the various inventive aspects. This method of disclosure, however, is not to be interpreted as reflecting an intention that the claimed invention requires more features than are expressly recited in each claim. Moreover, the description of any individual drawing or aspect should not necessarily be considered to be an embodiment of the invention. Rather, as the following claims reflect, inventive aspects lie in fewer than all features of a single foregoing disclosed embodiment. Thus, the claims following the detailed description are hereby expressly incorporated into this detailed description, with each claim standing on its own as a separate embodiment of this invention.

[0073] Furthermore, while some embodiments described herein include some features included in other embodiments, combinations of features of different embodiments are meant to be within the scope of the invention, and form yet further embodiments, as

will be understood by those skilled in the art. For example, in the following claims, any of the claimed embodiments can be used in any combination.

[0074] In the description provided herein, numerous specific details are set forth. However, it is understood that embodiments of the invention may be practised without these specific details. In other instances, well-known methods, structures and techniques have not been shown in detail in order not to obscure an understanding of this description.

[0075] In the discussion of the invention, unless stated to the contrary, the disclosure of alternative values for the upper or lower limit of the permitted range of a parameter, coupled with an indication that one of said values is more highly preferred than the other, is to be construed as an implied statement that each intermediate value of said parameter, lying between the more preferred and the less preferred of said alternatives, is itself preferred to said less preferred value and also to each value lying between said less preferred value and said intermediate value.

[0076] The use of the term “at least one” may mean only one in certain circumstances. The use of the term “any” may mean “all” and/or “each” in certain circumstances.

[0077] The principles of the invention will now be described by a detailed description of at least one drawing relating to exemplary features. It is clear that other arrangements can be configured according to the knowledge of persons skilled in the art without departing from the underlying concept or technical teaching, the invention being limited only by the terms of the appended claims.

[0078] Figures 1, 2a to 2c, 3a to 3d, and 8a to 8d are in an oblique perspective view, showing the tiles as parallelograms on the page. However, this distortion is for clarity only; the tiles they represent would be rectangular, and only appear as parallelograms due to the viewpoint chosen.

[0079] [Fig.1] shows a hypothetical no-lap tiling arrangement, which are not conventionally used for roofing due to their failure to seal effectively. Parts of four horizontal battens 1, 2, 3, 4 are shown, each spaced apart by a common gauge, with a first course of no-lap tiles 11 extending between first batten 1 and second batten 2, a second course of no-lap tiles 12 extending between second batten 2 and third batten 3, and a third course of no-lap tiles 13 extending between third batten 3 and fourth batten 4. Each no-lap tile 6 is provided with two fixings 5 anchoring it to an upper one of the respective battens 1, 2, 3, 4. If not properly sealed, water ingress would be possible at these fixings 5, or between adjacent tiles 6 (both horizontally and vertically adjacent). The no-lap tiles are sized to have a height substantially the same as the gauge of the roof.

[0080] Figures 2a to 2c show a prior art single-lap tiling arrangement. [Fig.2a] shows the same battens 1, 2, 3, 4 as [Fig.1], and shows similar single-lap tiles 26 arranged in a first course 21 extending between the first batten 1 and the second batten 2. The single-

lap tiles 26 are slightly taller than the no-lap tiles 6 of [Fig.1] (though they have the same width and thickness, though the latter is not shown), such that when secured to the second batten 2 by similar fixings 5, the single-lap tiles 26 extend entirely over the first batten, rather than simply meeting it. Thus, the single-lap tiles are sized to have a height equal to the gauge of the roof plus an overlap.

[0081] [Fig.2b] shows a second course 22 laid over the first course 21 of [Fig.2a], such that the upper edge and fixings 5 on the first course 21 are covered by the overlapping tiles 26 of the second course 22. If not properly sealed, water ingress would be possible between horizontally adjacent tiles in the same course, but not between courses.

[0082] [Fig.2c] shows a third course 23 laid over the second course 22 of [Fig.2b], such that the upper edge and fixings 5 on the second course 22 are covered by the overlapping tiles 26 of the third course 23.

[0083] Figures 3a to 3d show a prior art double-lap tiling arrangement. [Fig.3a] shows the same battens 1, 2, 3, 4 as [Fig.1], and shows similar double-lap tiles 36 arranged in a first course 31 extending between the first batten 1 and the second batten 2. The single-lap tiles 36 are much taller than the no-lap tiles 6 of [Fig.1] and the single-lap tiles of [Fig.2a]-2c (though they have the same width and thickness, though the latter is not shown), such that when secured to the second batten 2 by similar fixings 5, the double-lap tiles 26 extend entirely over the first batten by a significant margin, rather than simply meeting it or just overlapping it. Thus, the double-lap tiles are sized to have a height equal to twice the gauge of the roof plus an overlap.

[0084] [Fig.3b] shows a second course 32 laid over the first course 31 of [Fig.3a], such that the upper edge and fixings 5 on the first course 31 are covered by the overlapping tiles 36 of the second course 32. The double-lap tiles 36 of the second course 32 are horizontally off-set from the first course 31 by a distance equal to half the tile width, such that each tile 36 from the second course 32 only covers one of the fixings 5 of each of the tiles 36 from the first course 31 that it overlaps.

[0085] [Fig.3c] shows a third course 33 laid over the second course 32 of [Fig.3b], such that the upper edge and fixings 5 on the second course 32 are covered by the overlapping tiles 36 of the third course 33. The double-lap tiles 36 of the third course 32 are horizontally off-set from the second course 32 by a distance equal to half the tile width, such that each tile 36 from the third course 33 only covers one of the fixings 5 of each of the tiles 36 from the second course 32 that it overlaps, but actually covers both fixings 5 of each of the tile 26 of the first course 31 that it overlaps. Accordingly, each fixing 5 of the first course is double overlapped.

[0086] [Fig.3d] shows part of a fourth course 34 laid over the third course 33 of [Fig.3b], such that the upper edge and fixings 5 on the third course 33 are covered by the overlapping tiles 36 of the fourth course 34, in a similar manner to that discussed

above. It can be appreciated that, away from the boundaries of such an arrangement, no water penetration is possible.

[0087] Also indicated in [Fig.3d] are individual tiles 41, 42, 43 and 44, each from respective courses 31, 32, 33, 34.

[0088] [Fig.4] shows a cross-section through [Fig.3d] along line A-A. Tiles 41 and 43 from the first 31 and third 33 courses are shown in cross-section and hatched; whereas tiles 42 and 44 from the second 32 and fourth 34 courses are shown end on. Fixings 5 are shown connecting tiles 41, 42 and 43 to the battens 2, 3 and 4. An additional zeroth batten 0 is shown below the first batten 1. It can be seen that wind that lifts tile 41 adjacent to batten 0 would have a torque due to the tile height (twice the gauge plus overlap) all the way up to the fixing 5 in the second batten 2.

[0089] [Fig.5] shows a portion of a first batten 1, with a batten mount 51 mounted thereon, and coupled thereto, via fixing 5 is elongate member 53. A first end 54 of the elongate member 53 is shown to the bottom left, and includes a spring clip 55 for receiving a tile therein. An opposing second end 56 is shown at the top right. Additional through holes 58 adjacent to the fixing 5 are available for use with the fixing, in connecting the elongate member 53 to the batten mount 51, so that the relative extent of the first end 54 and second end 56 away from the first batten 1 can be varied.

[0090] [Fig.6] shows detail of the first end 54 of the elongate member 53 of [Fig.5]. The spring clip 55 is shown passing inside a cavity 60 inside the elongate member, and connecting to the elongate member 53 via holes 61 (one shown, with a matching hole on the other side). Squeezing the spring clip 55 inwards releases the spring clip from the holes 61 allowing it to be removed from the cavity 60. Flanges 63, 64, 65, 66 extend from the core of the elongate member 53 around the cavity 60. Slots 68 on each side of the elongate member permit insertion of a tile (not shown) therein, to enable alignment and secure the tiles in place.

[0091] [Fig.7] shows a perspective view of the batten mount 51 of [Fig.5], which is provided with opposing sprung arms 71 for gently gripping a batten (not shown) with an interference fit. A block 73 on the upper surface thereof provides a body into which a pilot hole 75 is formed, capable of receiving a fixing through the holes 58 in the elongate member. The block 73 does not extend across the entire upper surface of the batten mount 51, but instead a recess 77 is provided into which an upper edge of a tile may be placed, to aid alignment.

[0092] Figures 8a to 8d show a double-lap tiling arrangement using the present invention. [Fig.8a] shows the same battens 0, 1, 2, 3, 4 as above, and affixed to each are a plurality of batten mounts 51. Each batten mount is not rigidly secured to the respective batten, but is only loosely attached so that the position can be easily moved along a batten during installation. Secured by respective fixings 5 to the batten mounts

51 on the zeroth 0 and first 1 battens are a plurality of elongate members 53, each provided with a respective spring clip 55 at their first end, which is shown as a single line for clarity. The elongate members 53 rest their second end on an adjacent batten immediately above the batten upon which they are mounted.

[0093] [Fig.8b] shows a first course 81 of double-lap tiles 86, each resting with their upper edge on a recess 77 of a respective batten mount 53 on the second batten 2, and each with a lower edge held by a spring clip of an elongate member mounted (via a batten mount 53) on the zeroth batten 0.

[0094] The flanges 63, 64, 65, 66 are not shown for clarity; however, it is to be understood that each tile could be inserted into such slots 68 therebetween to assist in alignment and securing.

[0095] A further row of elongate members is secured by respective fixings 5 to the batten mounts 51 on the second batten 2. These are arranged over the first course 81 of double-lap tiles.

[0096] [Fig.8c] shows a second course 82 added in a similar manner to the first course, and a still further row of elongate member on the third batten 3.

[0097] [Fig.8d] shows a third course 83 and part of a fourth course 84 added in a similar manner to the first course.

[0098] Also indicated in [Fig.8d] are individual tiles 91, 92, 93 and 94, each from respective courses 81, 82, 83 and 84.

[0099] [Fig.9] shows a cross-section through [Fig.8d] along line B-B. Tiles 91 and 93 from the first 81 and third 83 courses are shown in cross-section and hatched; whereas tiles 92 and 94 from the second 82 and fourth 84 courses are shown side on. Fixings 5 are shown connecting tiles 91, 92 and 93 to the battens 0, 1 and 2. It can be seen that wind that lifts tile 91 adjacent to batten 0 would have a torque due to simply the overlap distance (the distance from the spring clip 55 to the fixing 5), and that any torque is counteracted by the support provided by the first batten 1.

[0100] Although the above-figures show the roof tile attachment system holding a tile centrally, for use in double-lap tiling arrangements, it is to be appreciated that a similar system may be used to hold tiles along their lateral edges in a single-lap arrangement. Such elongate members 53, would each be provided with two respective spring clips 55 at their first end, each for holding a respective corner of an adjacent single-lap tile.

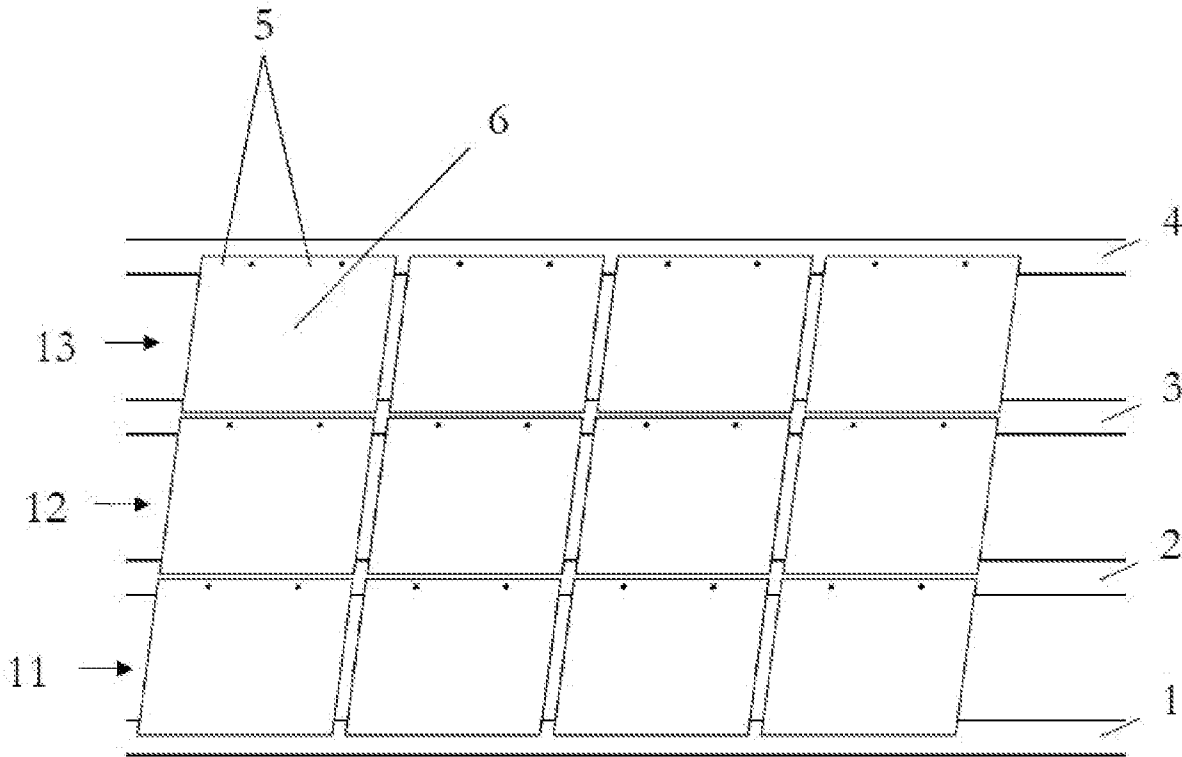
Claims

- [Claim 1] A roof tile attachment system, configured for use with a pitched roof of the type having a plurality of battens extending transversely across the roof, the system comprising:
a first batten mount comprising a batten attachment part configured to attach to a first batten; and
a first elongate member comprising:
a tile-securing part at a first end thereof, configured to hold an edge of a roof tile;
a fulcrum contact spaced from the first end, the fulcrum contact configured to be engageable with a second batten above the first batten, the second batten extending parallel thereto; and
a batten mount engagement part spaced from the first end, the batten mount engagement part configured to allow selective attachment of the batten mount to the first elongate member at either:
a first position spaced from the first end by a first distance; or
a second position spaced from the first end by a second distance different from the first distance.
- [Claim 2] The roof tile attachment system of claim 1, wherein the batten mount engagement part comprises at least one aperture extending between an upper surface of the elongate member and a lower surface of the elongate member.
- [Claim 3] The roof tile attachment system of claim 2, wherein the at least one aperture comprises a plurality of through-holes.
- [Claim 4] The roof tile attachment system of claim 2, wherein the at least one aperture comprises an elongate slot extending through from an upper surface of the elongate member to a lower surface of the elongate member.
- [Claim 5] The roof tile attachment system of any one of claim 2 to claim 4, wherein the batten mount comprises a projection configured to be insertable into the at least one aperture.
- [Claim 6] The roof tile attachment system of any one of claim 2 to claim 5, wherein the batten mount comprises a body into which a fixing may be driven.
- [Claim 7] The roof tile attachment system of any preceding claim, wherein the batten mount comprises a recess on an upper surface thereof

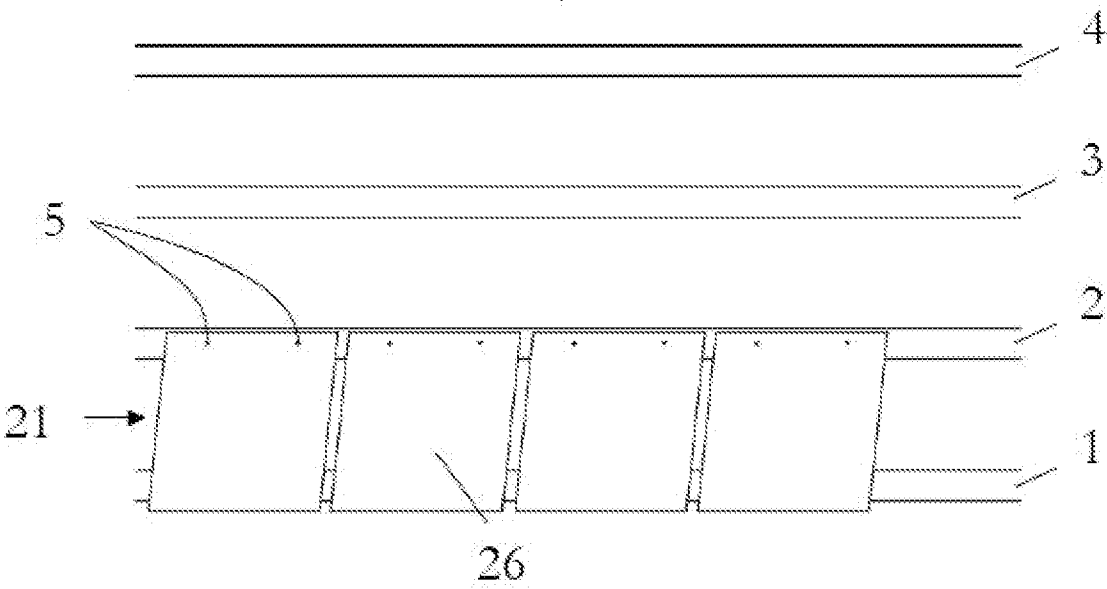
upon which to receive an upper edge (opposing the edge) of a roof tile.

- [Claim 8] The roof tile attachment system of any preceding claim, wherein the elongate member comprises a flange that is configured to be overlappable with an adjacent tile.
- [Claim 9] The roof tile attachment system of any preceding claim, wherein the tile-securing part is removably attachable to a core of the elongate member.
- [Claim 10] The roof tile attachment system of any preceding claim, further comprising a plurality of roof tiles.
- [Claim 11] The roof tile attachment system of claim 10, wherein the elongate member has a length approximately equal to that of each roof tile, and the roof tiles are arranged in single-lap arrangement.
- [Claim 12] The roof tile attachment system of claim 10, wherein the elongate member has a length greater than half that of the roof tile, and less than three-quarters that of the roof tile, and the roof tiles are arranged in double-lap arrangement.
- [Claim 13] The roof tile attachment system of claim 12, further comprising a pitched roof having a plurality of battens extending transversely across the roof, spaced apart by a gauge distance, wherein the tile has a length greater than twice the gauge and the elongate member has a length greater than the gauge.
- [Claim 14] A method of tiling a pitched roof, the pitched roof having a plurality of battens extending transversely across the roof, the method comprising the steps of:
providing the system of any preceding claim;
attaching a batten attachment part to a first batten;
selectively attaching the batten mount to the batten mount engagement part of the first elongate member at either:
a first position spaced from the first end by a first distance; or
a second position spaced from the first end by a second distance different from the first distance;
providing a roof tile; and
holding an edge of the roof tile with the tile-securing part.
- [Claim 15] The method of tiling a pitched roof of claim 14, wherein the method comprises arranging the tiles in double-lap arrangement.

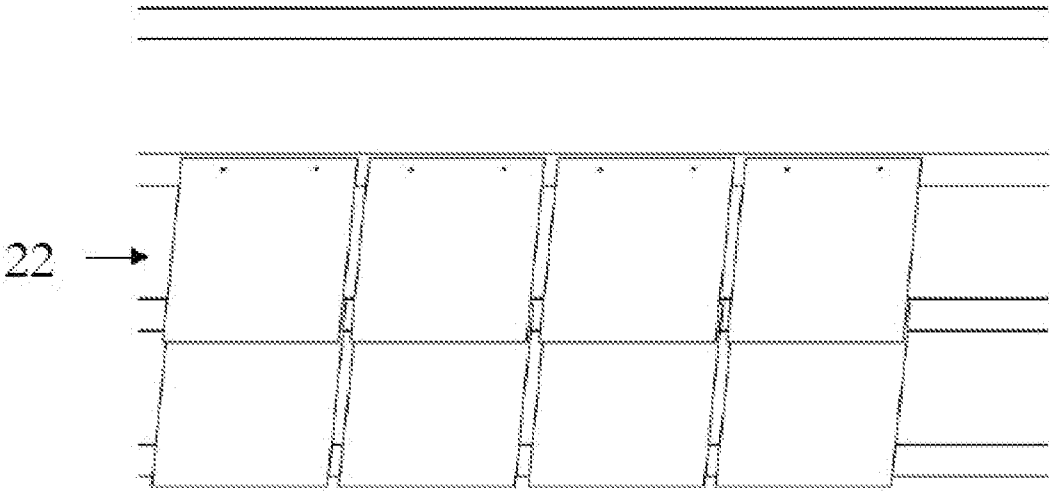
[Fig. 1]



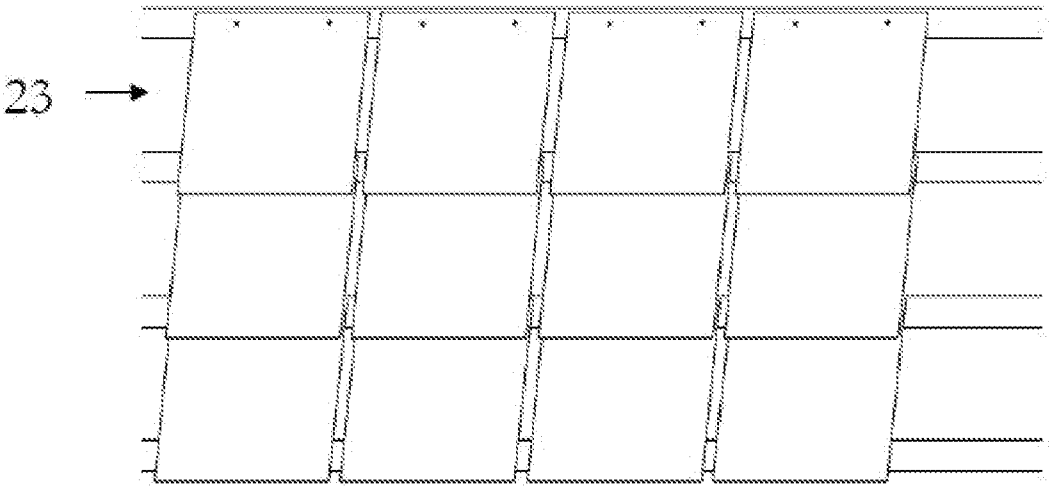
[Fig. 2a]



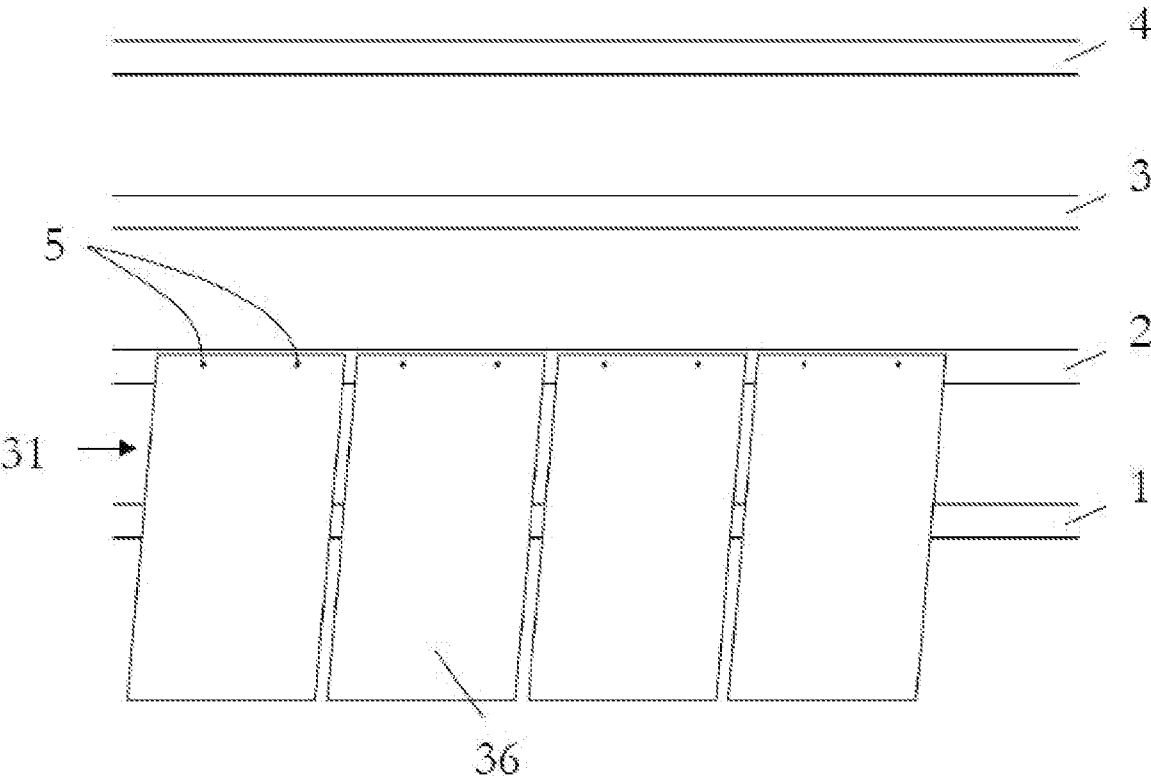
[Fig. 2b]



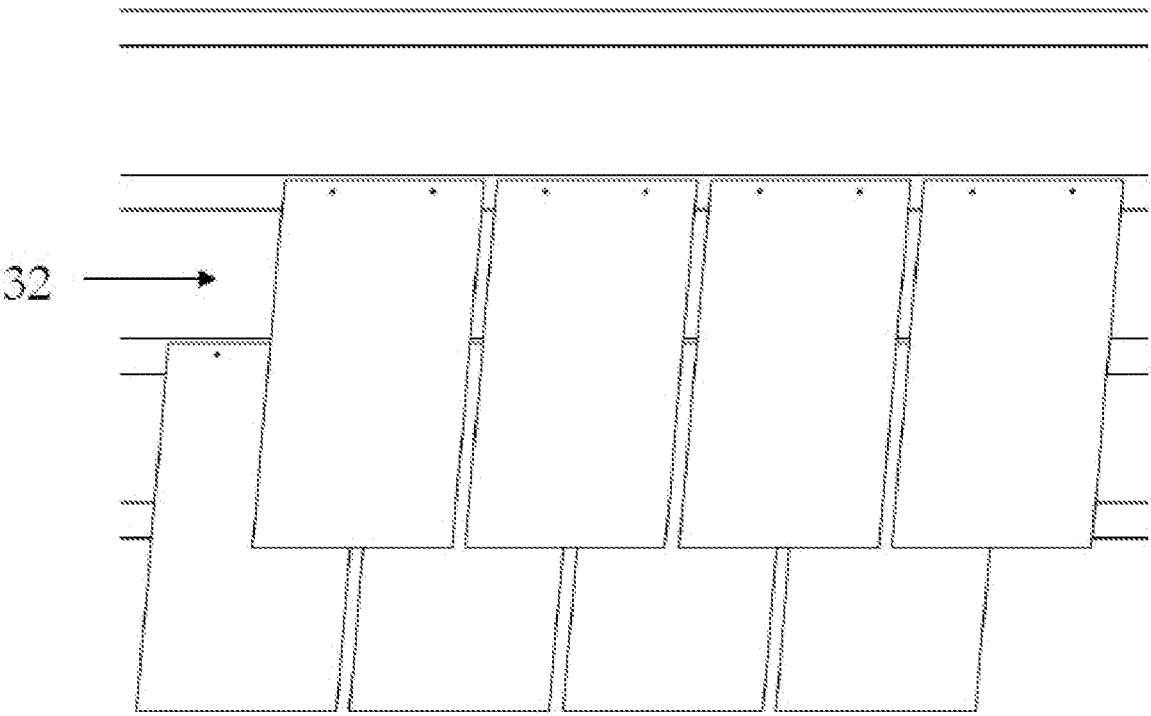
[Fig. 2c]



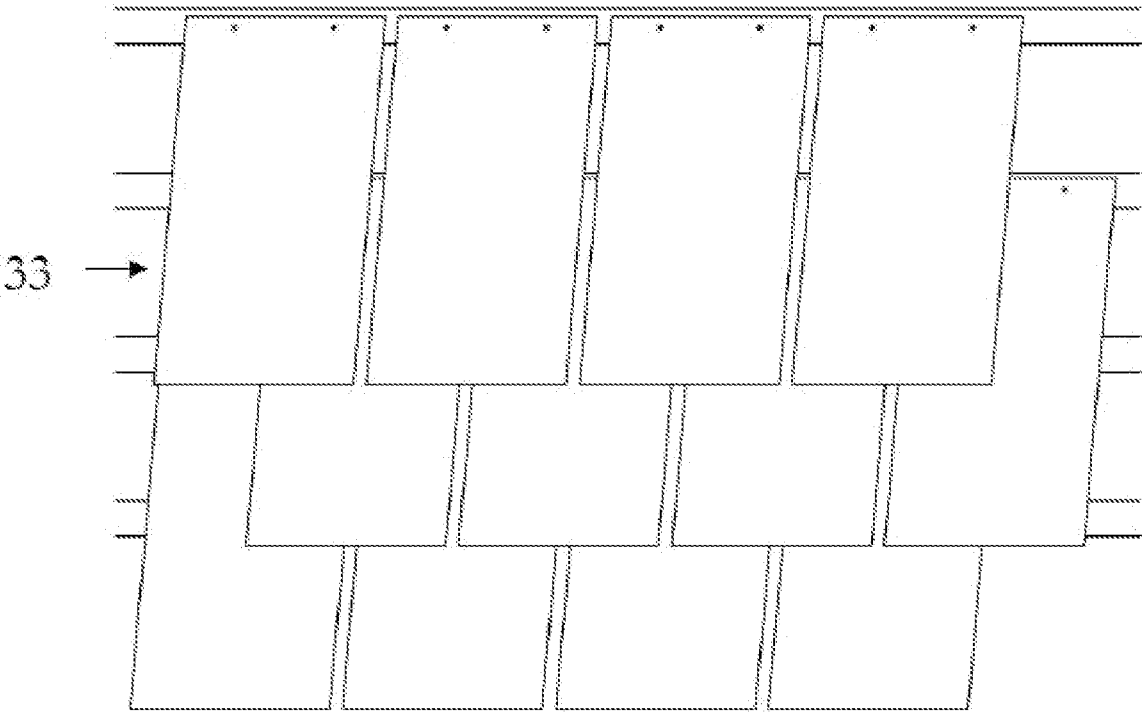
[Fig. 3a]



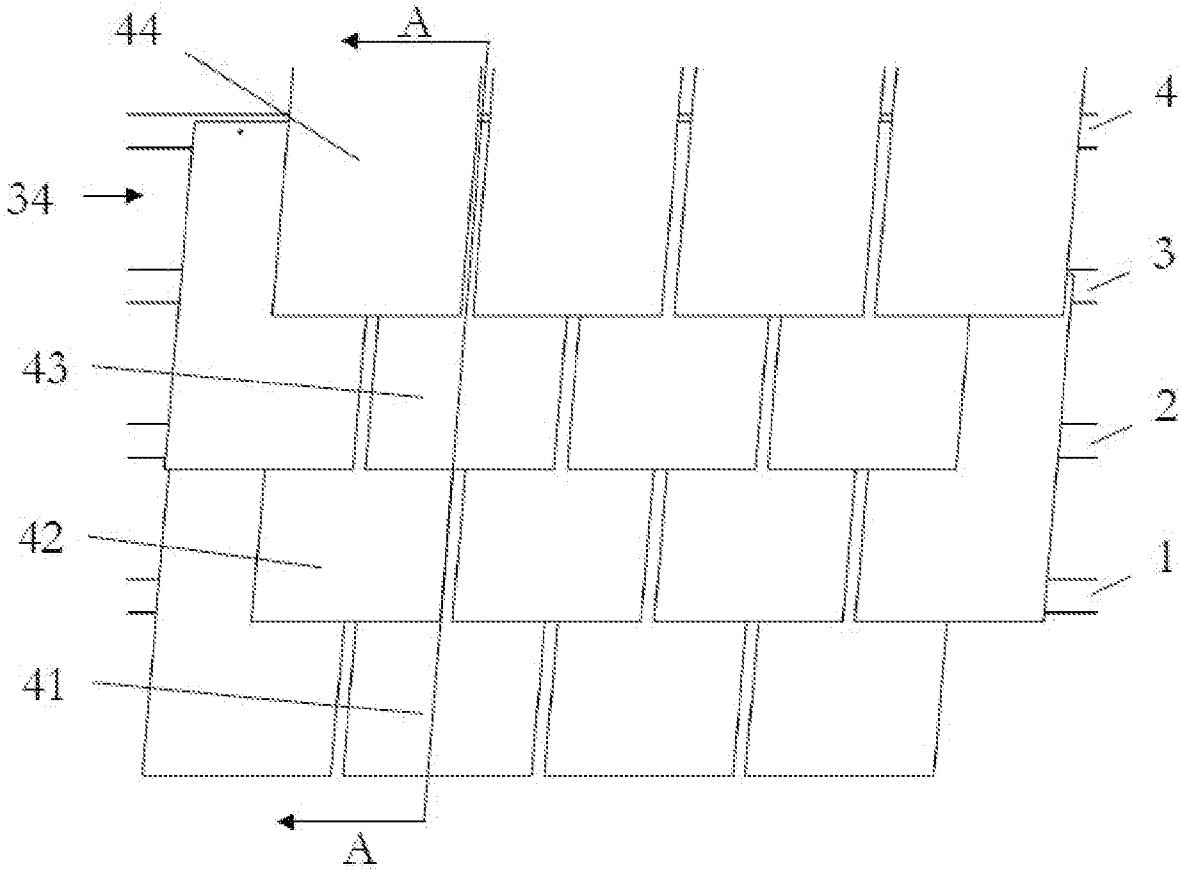
[Fig. 3b]



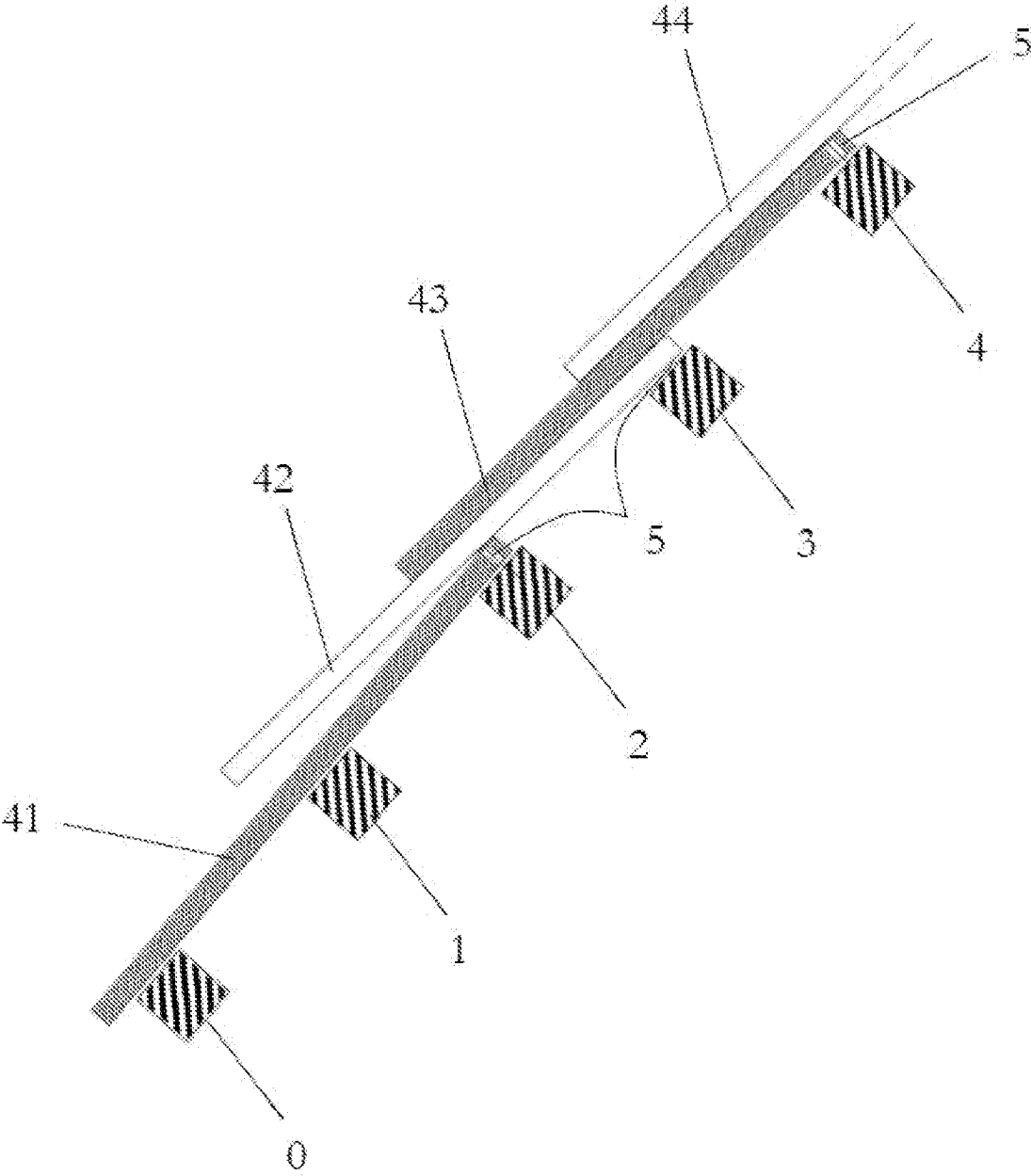
[Fig. 3c]



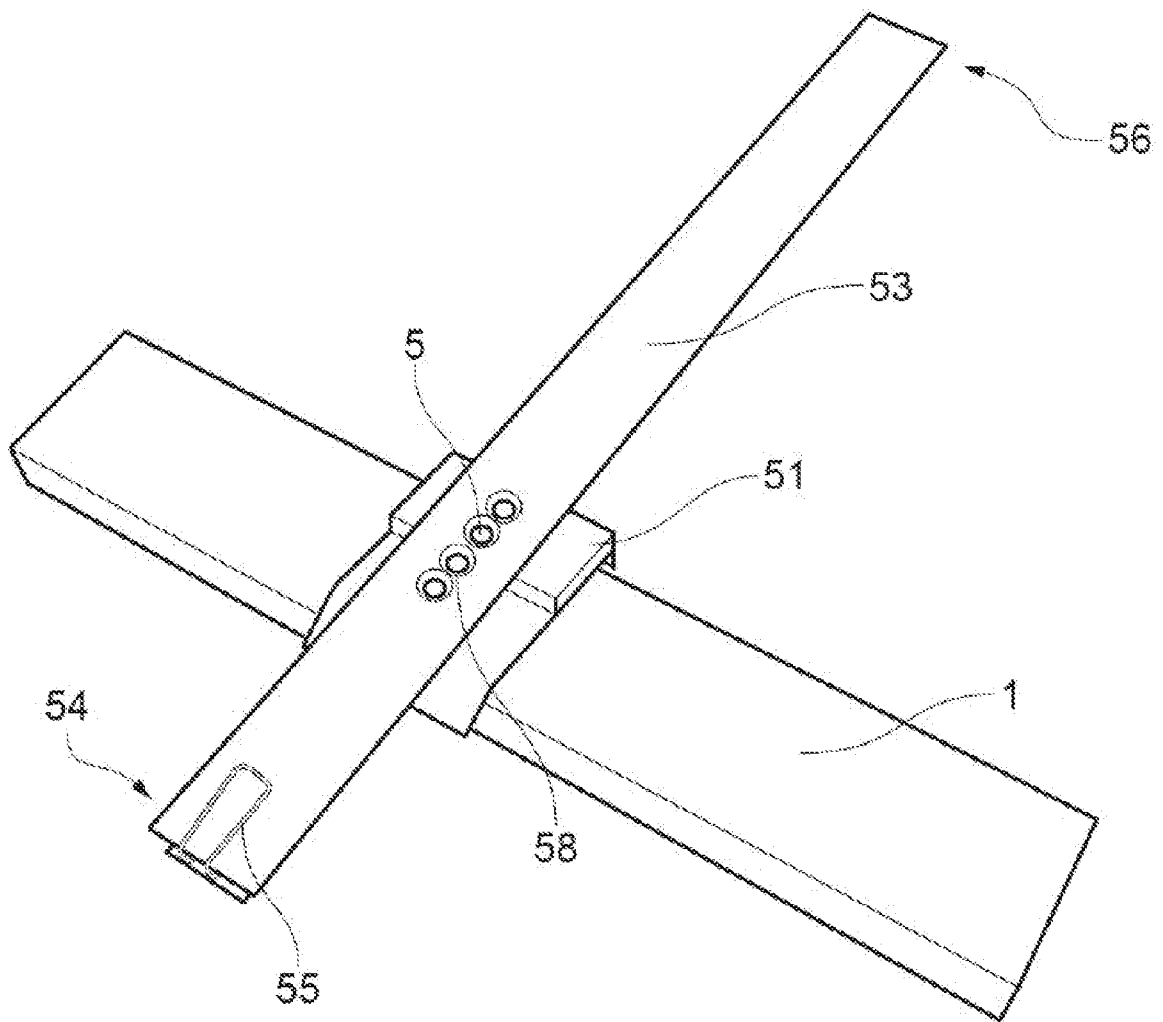
[Fig. 3d]



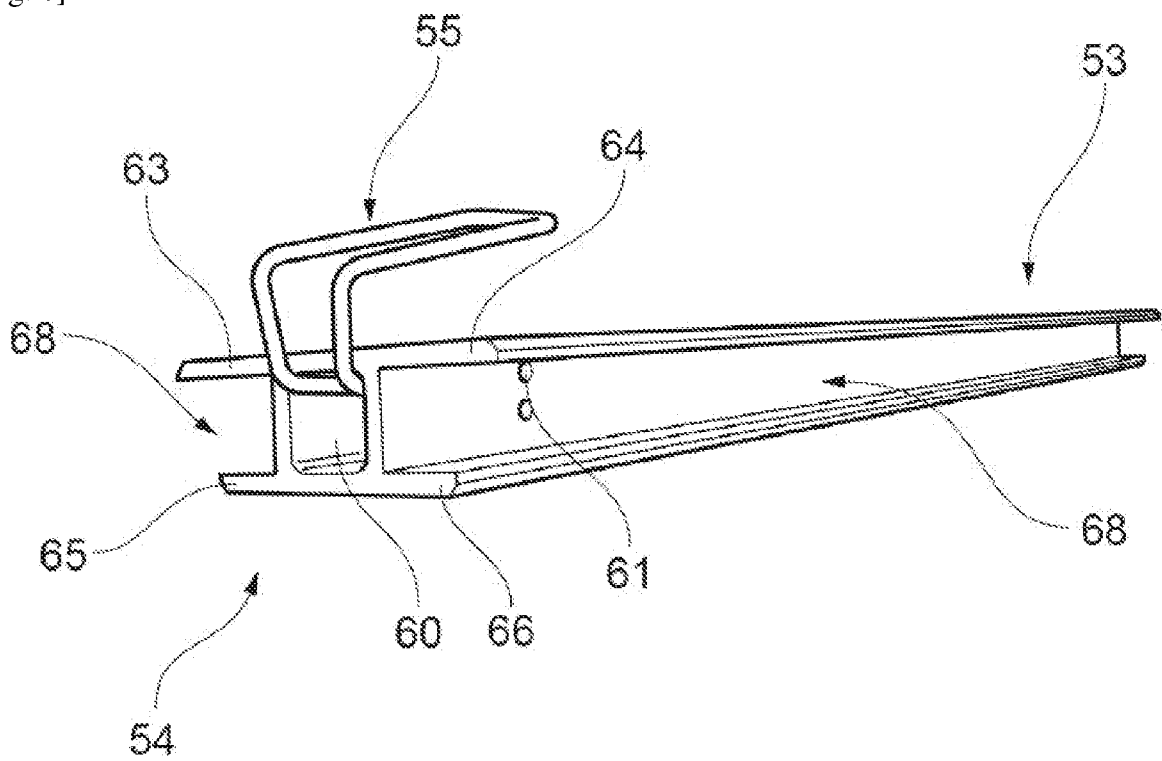
[Fig. 4]



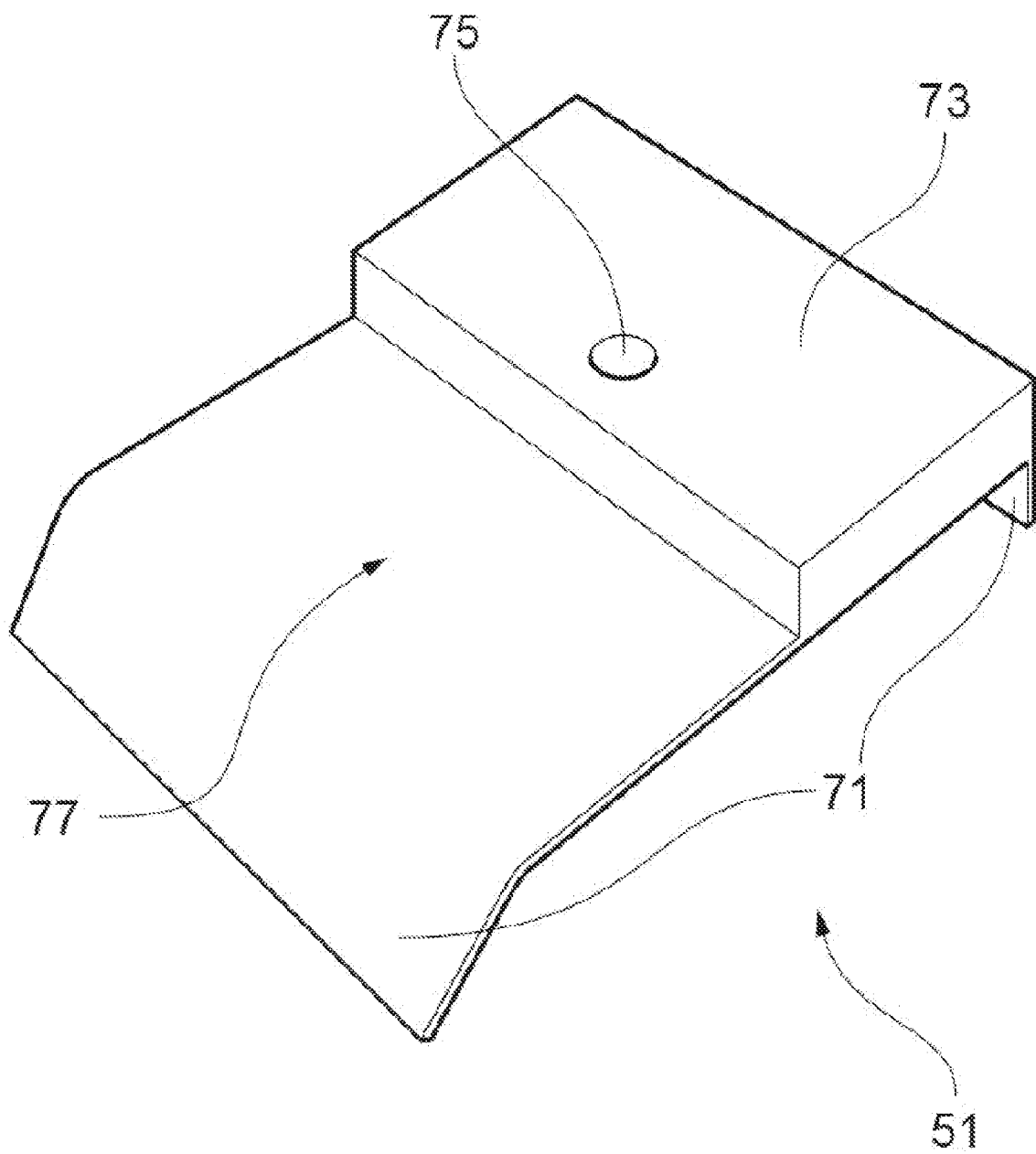
[Fig. 5]



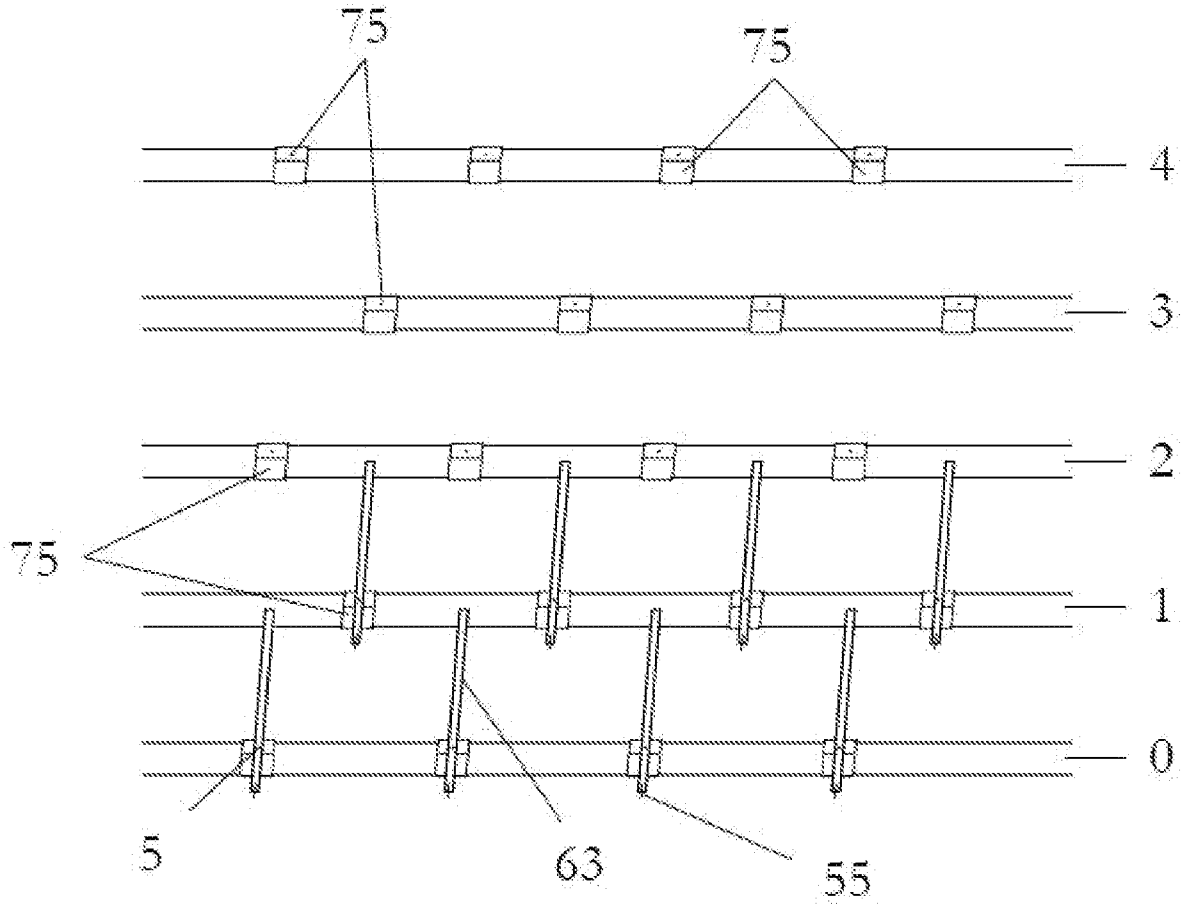
[Fig. 6]



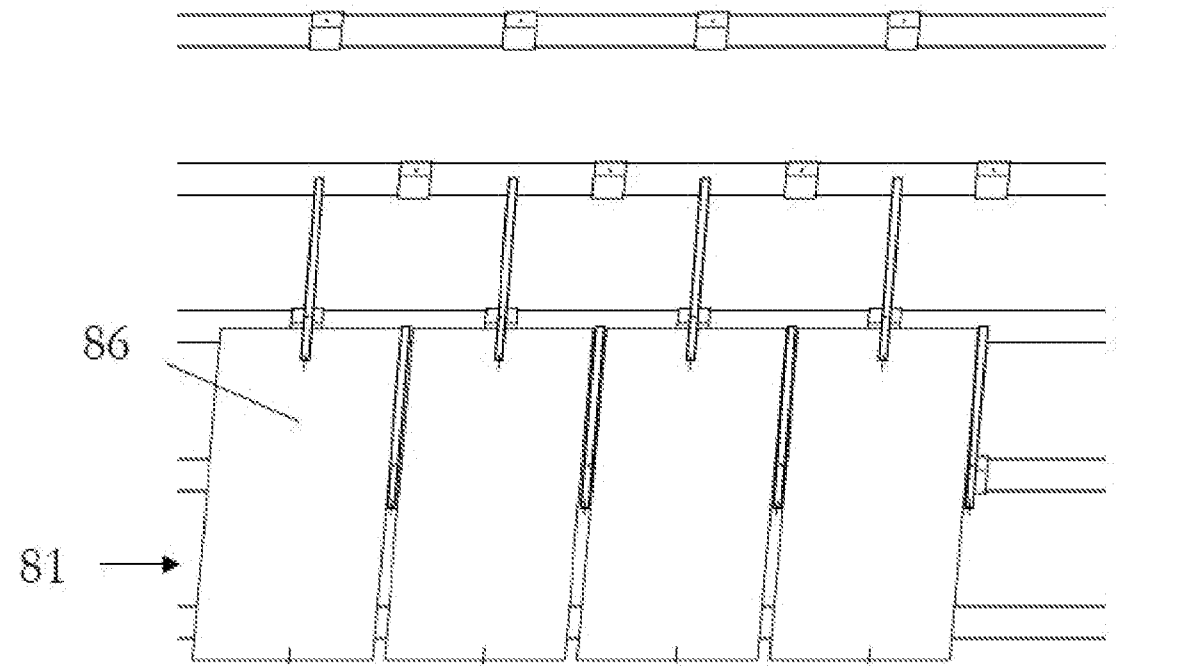
[Fig. 7]



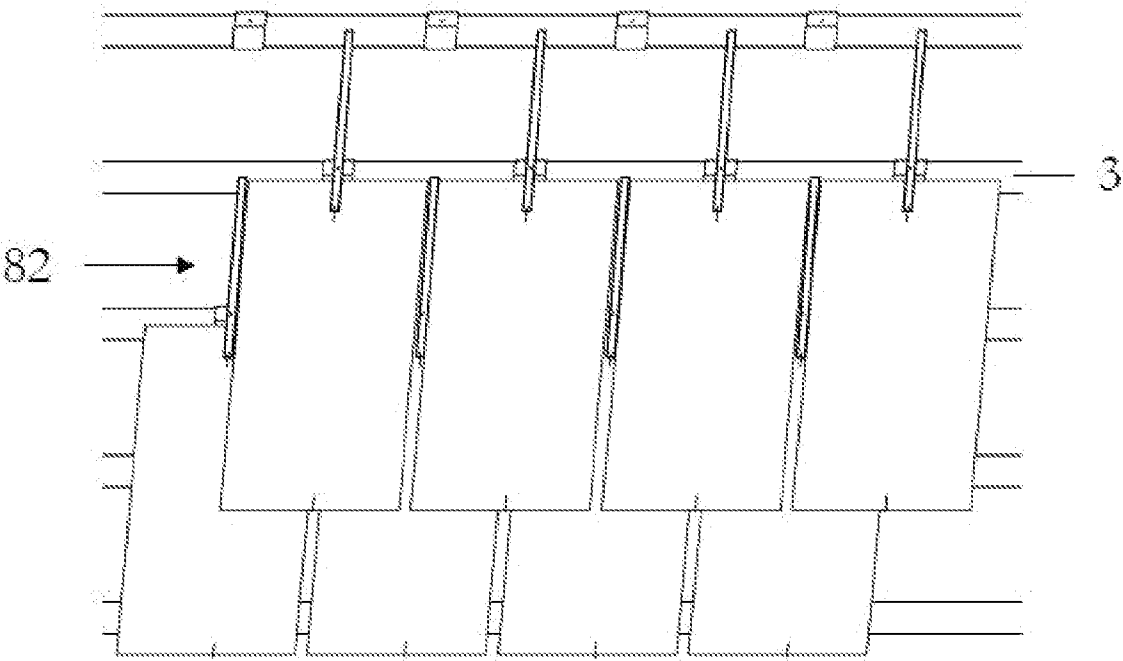
[Fig. 8a]



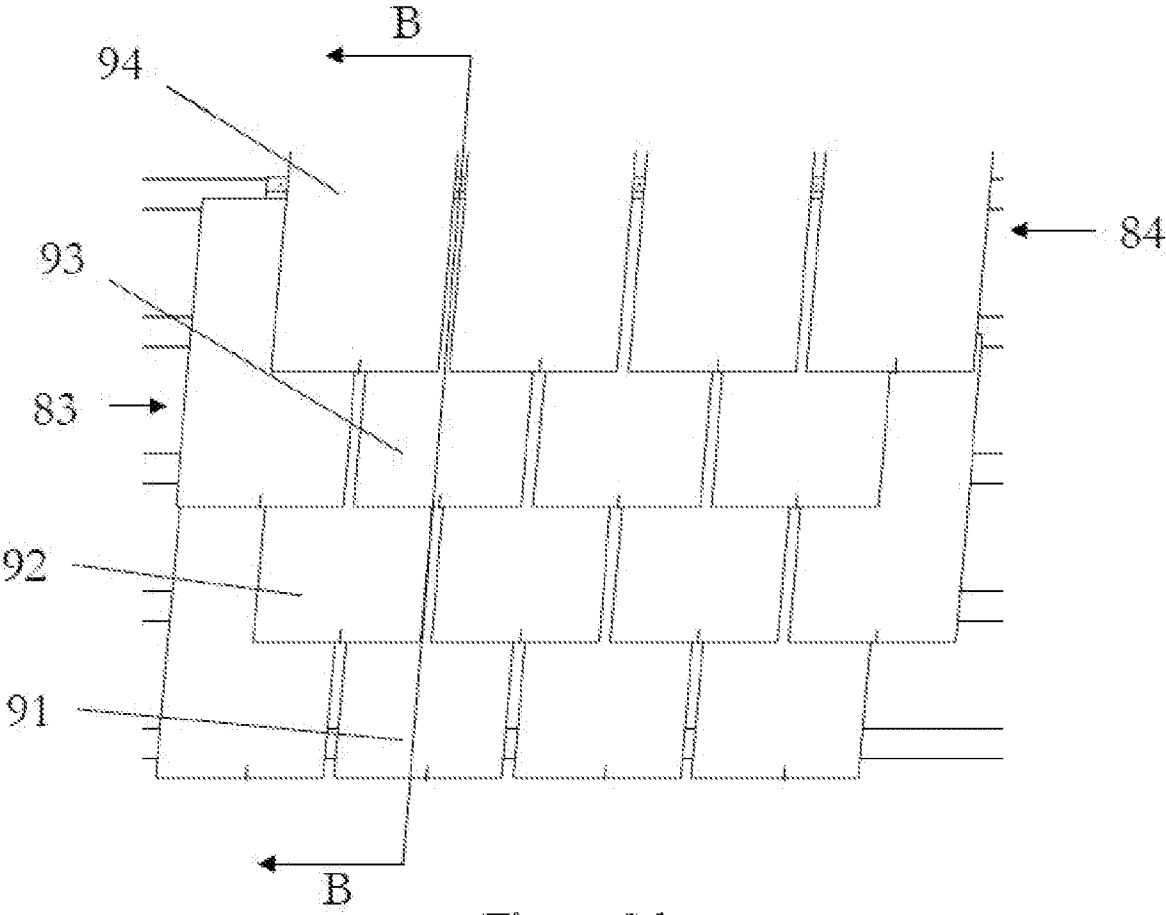
[Fig. 8b]



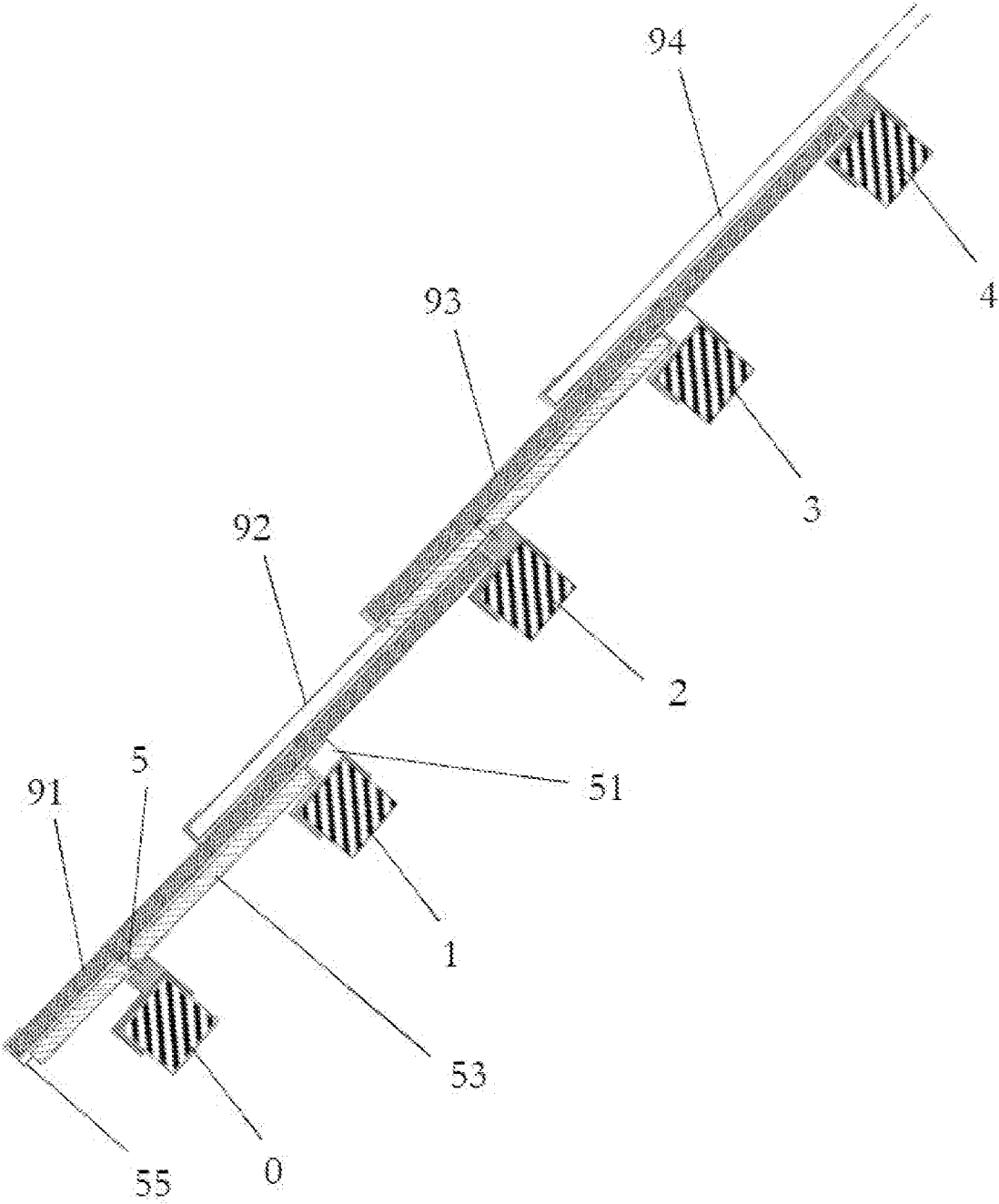
[Fig. 8c]



[Fig. 8d]



[Fig. 9]



INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2024/051073

A. CLASSIFICATION OF SUBJECT MATTER INV. E04D1/34 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) E04D		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	GB 2 324 561 A (BRODRICK BARKER NIGEL CHARLWOO [GB]) 28 October 1998 (1998-10-28) figures 1-5 -----	1 - 15
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A	GB 2 228 502 A (MCPHEE JOHN) 29 August 1990 (1990-08-29) figures 2-4 ----- - / - -	1 - 15
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 28 June 2024		Date of mailing of the international search report 12/07/2024
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Leroux, Corentine

INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2024/051073

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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