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(54) Roof covering system with (HDPE) high density polyethylene's tiles

(57) *Roof covering system with (HDPE) High Density Polyethylene's tiles,* consist of Linear Modules of Tiles (1), Ridge and Hip Profiles (3), Valley Profiles (4) and Drip Edge Profiles (5), all of them manufactured in the same material (HDPE) and characterized by the use of Linear Modules of Tiles (Several tiles visually subdivided) instead of individual tiles and by their fixing system, based in a protuberance shaped section "T" (2) in all elements of the system, that will slide in sliding profile shaped section "C", for fix this elements to roof's sheets or rafter forming roof. This system, similar in size and appearance to those built with slate tiles, draws on the experience of centuries of building this kind of roof, updating the materials used in them. In this way, while maintaining a similar aesthetic to the slate stone, is able to improve the final product built, in order to replace the slate tile roofs on projects that do not support other types of roofs by landscape integration matters.

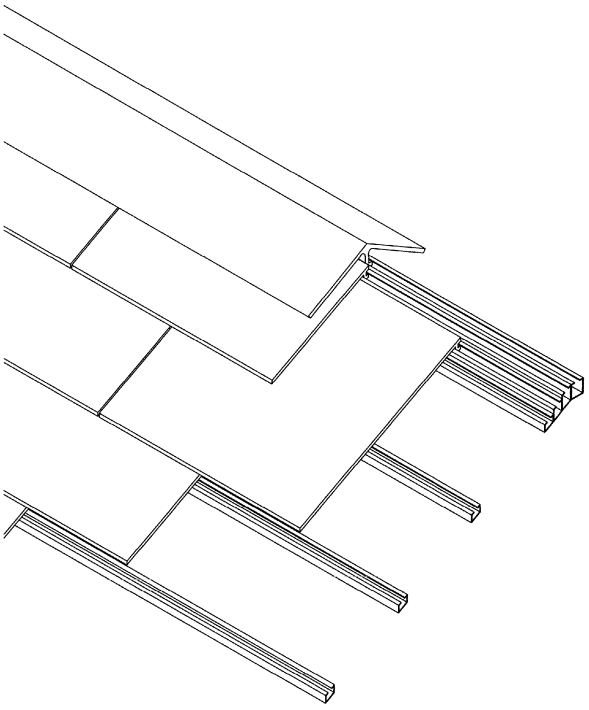

Fig. 10

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Description

Technical sector

[0001] The invention falls within the technical sector of construction, more specifically in the field of covering pitched roofs.

Technique situation

[0002] Nowadays, covering systems of pitched roofs are divided into two main groups; residential use and industrial. In turn in the first group there are three main types:

- Clay roof tiles system.
- Concrete roof tiles system.
- Slate roof system.

[0003] One covering system for pitched roofs more accepted around the world is that of slate stone tiles. This system is built by means of slate stone tiles fixed with nails and hooks to wooden battens fixed in turn to the roof sheets.

[0004] It would be desirable to find a roof cover system similar in format and appearance to those built with slate tiles, that can replace this in projects that do not support other types of roofs by landscape integration matters, but with a simpler mounting system and a material that can be easily handled and machined.

[0005] Therefore, this *Roof covering system with (HDPE) High Density Polyethylene's tiles* intends to use the experience of centuries of slate roofing, upgrading the materials used while, maintaining an outward appearance and a similar aesthetic to the slate stone, is able to improve the final product built.

Full details of the ROOF COVERING SYSTEM WITH (HDPE) HIGH DENSITY POLYETHYLENE'S TILES

[0006] The present invention is referred to a *Covering system with (HDPE) High density polyethylene's tiles,* to the materials and elements needed for the creation of this system, and to the manufacturing processes and assembly of these elements.

[0007] The High Density Polyethylene (950 Kg/m3) used in the manufacture of all the elements of the system will incorporate at least 2% carbon black as protection against photo-oxidation. This material guarantees at least 50 years of life without compromising their physical and mechanical qualities.

[0008] By means of this *Covering system with (HDPE) High density polyethylene's tiles* is achieved to lighten the weight of the roof with respect to other traditional roof covering systems.

[0009] Starting from a traditional mounting system placement overlaps slate tiles with 2/3 of the total length of the tile, and assuming a density of 2,600 Kg/m3 and thickness 4 mm slate (minimum thickness recommended), the weight per m2 of slate roof is 31.2 Kg. With the same mounting system and identical overlap's tiles, the roof of high density polyethylene's tiles has only a weight of 16.30 Kg.

[0010] Moreover, this system improves the thermal insulation of the roof due to the higher thermal resistance of HDPE tiles compared to slates tiles and also against any other covering material, either clay or concrete roof tiles.

[0011] High density polyethylene is a plastic material with a thermal conductivity of 0.38 W/mK, slightly below slate stone whose thermal conductivity value is 0.42 W/mK. Thus for a roof built with HPDE tiles 5 mm thick and three layers of overlap, plus a cavity of 10 mm, the sum of thermal resistances of both layers is 0.5447 m2K/W.

[0012] In the case of slate stone, with the same tile thickness (although the standard thickness used is 4 mm) and same layers overlap, the value of the thermal resistance is 0.5071 m2K/W, slightly lower than HDPE.

[0013] Regarding clay roof tiles, its thermal conductivity is very high, 0.76 W/mK, making the resistivity of a layer of tiles 15 mm thick reache 0.1974 m2K/W of thermal resistance.

[0014] The great advantage provided by this *Covering system with (HDPE) High density polyethylene's tiles* is the savings in assembly above traditional systems of pitched roofs, both slate or clay tiles. For example, one 3,320 mm length module of tiles is equivalent to ELEVEN slate tiles.

[0015] In addition, mounting by "sliding profiles" greatly simplifies fixing of tiles, the ridge profiles and valley profiles, compared to wooden batten systems, with steel nails and hooks that are required for a slate roof (2 steel nails and 1 hook for each tile).

[0016] Through the use of HDPE and aluminium, both materials are easily machined and cut, which does not require a high specialization by assembly workers, for this work. This is another significant saving in costs of installation. It also eliminated the frequent breaking of slate tiles through cutting and fixing with nails.

[0017] Overall, it's estimated that work yield in installation of this *Covering system with (HDPE) High density polyethylene's tiles* is triple than the work yield of traditional system of slate roofs. So the final price of finished roof can be reduced by 25%.

[0018] This is assuming a similar cost between slate tiles and (HDPE) High Density Polyethylene's tiles. The price of the slate tiles varies greatly according to grades and thicknesses, but is estimated to average 13.68 €/m2. The production of (HDPE) High Density Polyethylene by extrusion are considered values between 2.5 and 3 €/Kg. Taking an average value of 2.75 €/Kg and given a weight of 4.94 Kg/m2 (Including the fixing "Tees"), we calculate a square meter price of 13.59 €.

[0019] Finally, note that the investment cost for manufacturing the elements that shape this system can be

undertaken in stages, as the main component is the Linear Module of Tiles, so that the initial investment may be limited to production means necessary for manufacturing of such modules.

[0020] Any company engaged in the manufacture of plastic pipes or plastic profiles, which already has lines for the extrusion and cooling for HDPE, only need to purchase the extrusion tooling and cutting for the Linear Modules of Tiles.

[0021] In subsequent phases will be the acquisition of the extrusion tooling needed to manufacture the profiles.

[0022] The *Covering system with (HDPE) High density polyethylene's tiles* consist of specific manufactured elements to that system and other standard elements and standard mounting accessories.

[0023] Within the specific manufacturing for this covering system are the followings elements:

1) LINEAR MODULE OF TILES (1) MANUFACTURED IN (HDPE) HIGH DENSITY POLYETHYLENE

[0024] The tiles will be manufactured in linear modules 3,320 mm of length and 450mm wide, divided into 11 tiles of 300 mm with a cut of 2 mm separation between tiles. This cutting reaches a length of 300 mm (2/3 of total width of tile) from the lower edge of the width of this module, so that the no-cut zone will be hidden under overlap of the upper tiles. To separate the tiles in sections where the modules cannot be mounted complete, just have to continue the separation cut (1).

[0025] These modules have a protuberance shaped section "T" at the upper edge (2). This "T" is slipped in the aluminium shaped "C" profile (A) which have been previously screwed to the roof sheets or roof rafters. In this way tiles are fixed permanently to the roof but without stiffening the whole, which are free to expand and contract depending on outside temperatures.

[0026] The thickness of linear modules will be 5 mm. Similarly, the fixing "T" (2) of the tile will have the same thickness (5 mm) in every arm.

2) RIDGE AND HIP PROFILE (3) MANUFACTURED IN (HDPE) HIGH DENSITY POLYETHYLENE

[0027] Is a linear profile manufactured in 6,000 mm length with shaped section "V" inverted and the same fixing "T" (2) described in the linear module of tiles (1). This "T" is located inside the apex formed by the two arms of the profile. The arms of the "V" will be 100 mm in length and 5 mm thick. The angle formed by both arms is 30° (3).

[0028] Thus, the ridge and hip profile (3) will be used to direct the passage of water and guide it to tiles, in convex edges formed at the intersection between two sheets of roof. These convex edges are called Hips and in case of top coronation edges are called ridges.

3) VALLEY PROFILE (4) MANUFACTURED IN (HDPE) HIGH DENSITY POLYETHYLENE

[0029] Is a linear profile manufactured in 6,000 mm length with shaped section "V" and the same fixing "T" (2) described in the linear module of tiles (1). This "T" is located outside the apex formed by the two arms of the profile. The arms of the "V" will be 150 mm in length and 5 mm thick (4).

[0030] Thus, the valley profile (4) will be used to direct the passage of water and guide it outside of the roof, in concave edges formed at the intersection between two sheets of roof. These concave edges are called valleys.

4) DRIP EDGE PROFILE (5) MANUFACTURED IN (HDPE) HIGH DENSITY POLYETHYLENE

[0031] Is a linear profile manufactured in 6,000 mm length with shaped section "L" inverted and the same fixing "T" (2) described in the linear module of tiles (1). The axis of this "T" is located at 65 mm from the edge of one of the two arms forming the profile. The arms of the "L" will be 100 mm in length and 5 mm thick (5).

[0032] The drip edge profile (5) when it is used to close the join between the roof sheet and the roof edge (called eave), doesn't have influence on roof waterproofing, meets only an aesthetic function and also serves to keep inclination of the last row of tiles, which otherwise would be inclined. In this case the drip edge profile (5) is installed under the last two tiles that form the eave and must be completely covered and surpassed by these tiles.

[0033] However, when it is used in the sides of a roof sheet or in the ridge of a one sided roof, the arm where is located the fixing "T" (2) of this profile must be mounted over the tiles, to guide water over these and close the side of the roof. In addition of elements manufactured specifically for this cover system, these other materials and standard accessories are required:

1) SECTION PROFILE SHAPED "C" (A) IN EXTRUDED ALUMINIUM TO TILE FIXING

[0034] The mounting of all the specific elements of this system made of HDPE is based on inserting a protuberance shaped section "T" (2) through the slide formed by an extruded aluminium shaped section "C" profile (A).

[0035] This aluminium profile is found in market in different dimensions and thicknesses, but for this cover system requires three dimensions: 18 mm x 10 mm x 1 mm (Thickness), 18 mm x 15 mm x 1 mm (Thickness) y 18 mm x 20 mm x 1 mm (Thickness). When using the drip edge profile on the sides of a roof sheet or in the ridge of a one sided roof, will be needed in addition a fourth kind of profile "C" of 18 mm x 25 mm x 1 mm (Thickness).

[0036] The top opening forming in profile "C" (A) is 10mm in all cases, leaving us a slide loose enough to slide the fixing "T" (2) of the elements made in High Density Polyethylene.

[0037] The Profile most widely used in this covering system of pitched roofs is the 18 mm x 10 mm x 1 mm (Thickness), which used in fixing of all the HDPE profiles and in the linear tiles. The other two profiles only are used in the two last tiles rows of each roof sheet (The closest to the ridge) to equal the height of the preceding rows.

[0038] We can dispense profiles 18 mm x 15 mm x 1 mm (Thickness), 18 mm x 20 mm x 1 mm (Thickness) y 18 mm x 25 mm x 1 mm (Thickness) using only the profile 18 mm x 10 mm x 1 mm (Thickness) in all cases, supplementing the height remaining in each case (5, 10 and 15 mm) with rings, aluminium plates or wooden batten. This simplifies the mounting by using a single measure of sliding profile, but could raise slightly the price of final product.

Description of the figures

[0039]

Fig-1: Plan view of a Linear Module of Tiles (1) manufactured in (HDPE) High Density Polyethylene, which delimit the exact dimensions of the module and the separation pre-cuts of tiles.

Fig-2: Section of a Linear Module of Tiles (1) manufactured in (HDPE) High Density Polyethylene, which delimit the thickness of the module and the dimensions of the protuberance shaped section "T" (2) that will serve to slide along the profile "C" (A) fixed to the roof sheet.

Fig-3: Section of a Ridge and Hip profile (3) manufactured in (HDPE) High Density Polyethylene, which shows insertion of the protuberance shaped section "T" (2) that will serve to slide along the profile "C" (A) fixed to the roof sheet.

Fig-4: Section of a Valley profile (4) manufactured in (HDPE) High Density Polyethylene, which shows insertion of the protuberance shaped section "T" (2) that will serve to slide along the profile "C" (A) fixed to the roof sheet.

Fig-5: Section of Drip edge profile (5) manufactured in (HDPE) High Density Polyethylene, which shows insertion of the protuberance shaped section "T" (2) that will serve to slide along the profile "C" (A) fixed to the roof sheet.

Fig-6: Explanatory section and mounting detail of the Linear Modules of Tiles (1), of the Ridge and Hip profile (3) and the Drip edge profile (5) when it is used as the eave of the roof. This section delimits distances between profiles "C" (A) for fixing the Linear Modules of Tiles (1) and cited Profiles. Also delimits the overlap distances between modules and between these modules and the profiles. Also delimits the wide of the cuts in the two top rows.

Fig-7: Explanatory section and mounting detail of the Linear Modules of Tiles (1), and the Valley profile (4). This section delimits the overlap distances of the two last rows of modules over the Valley profile (4).

Fig-8: Explanatory section and mounting detail of the Linear Modules of Tiles (1), and the Drip Edge profiles (5) when they are used to close the eave of the roof and when they are used as a ridge of a one sided roof. This section delimits the distances of profiles "C" (A) for fixing of the Drip Edge profiles (%) with regard to the roofs edges.

Fig-9: Isometric perspective view of the mounting of all the elements of the *Roof covering system with (HOPE) High Density Polyethylene's tiles, which shows the placement of these elements.*

Fig-10: Isometric perspective detail of the mounting of the main elements of the *Roof covering system with (HDPE) High Density Polyethylene's tiles.*

Fig-11: Plan view of a detail of the resolution of encounters between two roof's Hips and the Ridge of the roof.

Full details of the manufacturing of the system's elements

[0040] As mentioned in the section "Full details of the ROOF COVERING SYSTEM WITH (HDPE) HIGH DENSITY POLYETHYLENE'S TILES", the specific elements of this system are the Linear modules of tiles and the profiles made of High Density polyethylene.

[0041] The procedure for manufacturing the four elements will be extrusion with cooling and consolidation in a vacuum chamber to achieve a perfect alignment of the modules and the profiles.

[0042] At the end of the cooling lines will be performed the breakup's cutting by mechanical saw.

[0043] In the Linear Modules of Tiles (1), this cut will be made in measures of 3,350 mm. Thus the Module's will have 30 mm excess for a subsequent cut more precisely that will be made together with the separation's pre-cuts of tiles.

[0044] Profiles for, Ridge and Hip (3), Valley (4) and Drip edge (5), will only be cut in measures of 6,000 mm.

[0045] The extrusion lines and vacuum chamber cooling lines required for the manufacture of the system's elements are common in manufacture of High Density Polyethylene's straight pipes. The four specific extrusion form tools (one for each element of the system) of the extrusion head will only be needed for manufacture.

[0046] The Linear Modules of Tiles (1) and the Valley profiles (4) requires the machines used to make pipe diameters (Up to 500 mm) and the Ridge and Hip profiles (3) and the Drip Edge Profiles (5) can utilise the small diameter machines (Up to 300 mm).

Full details of use mode of the system's elements

Preliminary works

[0047] Before starting the installation of the *Covering system with (HDPE) High density polyethylene's tiles* components, there should be some previous work in a

safe area (Remember that roof works are especially dangerous) even in a workshop, before raising materials to the roof.

[0048] A Previous survey of the roof must be made (It could be made in sections) to obtain a measure as exact as possible of the profiles "C" (A) required for this work.

[0049] The profiles "C" (A) that will be used, in its various measures, will be drilled in its bases before beginning works. These perforations, whose purpose is the passage of the fixing screws, will be made every 500 mm if the roof is made by smooth and continuous sheets built with long bricks or concrete slab.

[0050] Nowadays there are numerous fixing systems in market. However, as an example we bring a system integrated by Ø6 mm x 40 mm plastic anchors and Ø5mm x 45 mm countersunk flat head pozidriv wooden screws. Emphasis should be on the use of countersunk screws, to avoid jams in slide of profile "C" (A).

[0051] The diameter of holes in profiles "C" (A) for this case will be 6 mm. This diameter allows passage of the drill bit through the perforation in profile. Thus, no need to remove profile to drill the roof sheet and fix the plastic anchors.

[0052] In the case of wooden and metal rafter's roofs without roof's sheets constructed (i.e., when the roofs sheets are formed by the tiles system itself) perforations will be made depending of the structure that is be covered. Thus, separation between rafters of structure will be also separation between perforations made in profiles "C".

[0053] In that case, the diameter of holes will depend of the chosen item to fix and should be studied for each case. Although as a general rule, for fixing profiles will be employed 04,2 mm Autodrill countersunk flat head Philips screws for metal, and Ø4mm countersunk flat head pozidriv screws for wooden. In both cases the perforation diameter will be 5 mm.

[0054] Moreover, in the same previous study of the roof will be measured the total length of the two rows closest to the ridge in each roof's sheet. In this way we can cut the width of Linear Modules of tiles (1) that are required for both rows before starting the installation works.

[0055] The width of these initial rows is always the same, 186 mm for the first row and 336 mm for the second row. They can be cut in a workshop or on work site before raising them to the roof.

[0056] Also, in Linear Modules of tiles (1) that will be used in the row closest to the ridge in each roof sheet, will be the elongated the tiles separation pre-cuts up to 40 mm from the upper edge, where the fixing "T" (2) is located.

Mounting works

Fixing Profiles "C" (A)

[0057] Mounting should be started with fixing of Profiles "C" (A) that serve as sliding, starting in the upper point (Ridge) of each sheet that form the roof. Specifically, will start installing the sliding profile (The 18 mm x 20 mm x 1 mm Profile "C") used for the Ridge Profile (3).

[0058] This sliding profile should be fixed on the apex which is the meeting between sheets of roof. A small chamfer will be needed to complete the vertex by 15-20 mm. To enable us to level the sliding profile.

[0059] Then, attached to this profile, will be fixed the profiles "C" (A) of the three rows of tiles closer to the ridge in each roofs sheet (Profiles "C" 18 mm x 20 mm x 1 mm, 18 mm x 15 mm x 1 mm and 18 mm x 10 mm x 1 mm, top to bottom) to be mounted without gaps between then.

[0060] From this point you should measure the sheets of roof to stakeout the position of all the rows of tiles to be mounted at a distance of 150 mm between the axes of the sliding profiles, starting from the profile of the third row closer the ridge. In this way, a 2/3 of the width overlap is achieved by the rows of Linear Modules of each row. With this overlap, the separation pre-cuts of the tiles are always closed by the rows which are mounted under the cuts, which guarantee the waterproofing of the system.

[0061] The last sliding profile, before the Drip Edge Profile (5), must be separated between 150 to 230 mm. The profile "C" (A) of the Drip Edge will be fixed at 30 mm from the edge of the roofs sheets. Consider that the penultimate row must be overlapped at 150 mm by the upper row, and should completely cover the last row, which will exceed the eave at least 50 mm.

[0062] All profiles "C" (A), both transverse to slopes of the various roof's sheets, such as the sliding profiles of Ridges (3), Hips (3), Valleys (4) and Drip Edge (5) will be cut 50 mm before vertex that define these roof's sheets.

[0063] The next action is to mount the sliding profiles (A) of the Valleys (4) (Profile "C" 18 mm x 10 mm x 1 mm).

[0064] We will not mount sliding Profiles (A) of Hips Profiles because its mounting hinders introducing the Linear Modules of Tiles (1).

[0065] Once anchored all profiles "C" (A) (except those of the Hip Profiles) begin the mounting of HDPE's profiles and tiles.

[0066] Mounting of Valley Profiles (4).

[0067] The first mounting will be the Valley Profiles (4). These profiles will be introduced in the aluminium sliding from below, until them top in the Profiles "C" (A) of the Ridges. In the event that any Valley Profile starts in a Hip Profile and being as their sliding profiles are not mounted, the Valley profile (4) will be next to the vertex of the roof's sheet.

[0068] It leverages Profiles "C" of the Valley Profiles were cut 50 mm before vertex, to introducing in this space and in the body of the fixing "T" (2) a rod or screw that avoid the sliding of the profile because the slope. This fixation procedure was used equally in Hip Profiles.

[0069] It is very important that the stop rod or screw will be used only at the upper edge of the profile, to allow the HDPE profile to expand unimpeded along the sliding profile.

[0070] The lower edges of the Valleys profiles (4) should be left exceeding the end of the eaves for a length not less than 150 mm. The last two rows of tiles in the roofs sheet will be cut to fit it later.

[0071] It is recommended to use seamless profiles in Valley Profiles. However, if it's necessary to join two profiles (In case of a Valley over 6 m length) the upper Valley should overlap by at least 50mm the below Valley. This requires cutting the fixing "T" (2) in the lower edge of the profile, a length at least 10 mm longer than the overlap.

[0072] The bellow profile must be also fixed by means of a rod or screw, but only in its upper edge.

Mounting of Linear Modules of Tiles (1)

[0073] In this point, will start the mounting of Linear Modules of Tiles (1).

[0074] Firstly will be introduced the two lower rows of each roofs sheet around the perimeter of the roof. These two rows will have cuts in its width before mounting so that; the first row exceeds the eave by at least 50 mm. The second row will be cut 150 mm wider than the first row to fit with its edge.

[0075] The rows of Linear Modules of Tiles will be mounted in alternating position of 150 mm (1/2 width of Tile) to each other in all the roof's sheet, so that the separation pre-cut of the tiles of each row will be placed on the axis of the tiles of the previous row.

[0076] In the meeting between Linear Modules of Tiles (1) and Valley Profiles (4) these modules will advance until the apex of this profile. The line of this apex marks the angle of the cut to be performed on the edge of this Linear Modules of Tiles (1). Subsequently, the module position will be set back until its edge is overlapped on the Valley Profile (4) by 50 mm.

[0077] It is desirable that the Modules of Tiles which rest on Valley Profile be fixed to its sliding profile with a screw, in the opposite edge to this Valley Profile. In this way we ensure that it will not move when we introduce the following Linear Modules in the same sliding Profile and it will stop these modules.

[0078] In the other end, the Linear Modules of Tiles (1) will be cut at 15-20 mm from the apex of the roof's Hip, following the angle of this hip.

[0079] In a roof's sheet whose edges do not meet with other roofs sheets a Drip Edge Profile (5) with aluminium sliding profile "C" (A) of 18 mm x 25 mm x 1 mm is needed.

[0080] In this case the Linear Modules of tiles (1) will be cut at 5 mm from the sliding profile of the Drip Edge profile.

[0081] The last Linear Modules of Tiles (1) to be mounted will be the last two rows closer to ridge in each roof's sheet, which have been previously cut in width (As stated above in section of preliminary works).

Mounting of Hips Profiles (3)

[0082] After making sure that the mounting of Linear Modules of Tiles (1) is complete and have been cut in their exact measurement, so that there is no need to move any of them, the Hips Profiles (3) will be installed.

[0083] These profiles must be drilled in the body of the fixing "T" (2) before introducing them into the sliding profile, In order to place later the rod or screw to fix the upper edge.

[0084] It is recommended to use seamless profiles in Hips Profiles. However, if it's necessary to join two profiles (In case of a Hip over 6 m length) the upper Hip should overlap the below Hip by at least 50 mm. This requires cutting the fixing "T" (2) in the lower edge of the profile, a length at least 10 mm longer than the overlap.

[0085] When two Hips Profiles (3) converge (typical join of three roof's sheet) both profiles will be cut along the bisector of the angle of the join among them. The union between these two cut ends will be welded by hot air gun with HDPE welding rod.

Mounting of Ridges Profiles (3)

[0086] The last action in mounting of a roof with HDPE modules of tiles are the Ridge Profiles (3).

[0087] The Ridge Profile (3) will be introduced by the sliding profiles fixed at every upper meeting between roof's sheets.

[0088] These profiles are always mounted horizontally, so it is not necessary to fix them to their sliding profiles.

[0089] However, care must be taken in unions between profiles and finishes edges of these profiles, to avoid water leakages.

[0090] In both cases, solution is welding by hot air gun and HDPE welding rod.

[0091] The edges to be welded must be prepared for union, so that they are perfectly aligned. When attaching the edges, check to make sure there are not gaps between the profiles to be welded.

[0092] Also, a 2 mm bezel will be made at 45° in the upper side of the profiles, this allows a greater penetration of filler material without increasing the section to be welded.

[0093] To finish and close the ends of each ridge they will be "V" shaped cuts in each end to allow us to fold the two peaks formed by the cut and weld them, thus closing the end of the Ridge Profile.

[0094] To help in the folding of both peaks, make a cut along the down side of the profile to a maximum of 60-70% of its thickness.

[0095] This cut for folding and the shaped "V" cut must be make while the Ridge Profiles can move along the sliding profile, so allow us excel this profile of its final position to make these cuts.

[0096] The last action will be to weld the peaks of the Ridges Profiles and weld the unions between Ridges Profiles. Once the Ridge Profiles have been welded, these can not moved without breaking these welds.

MOUNTING VARIANT

[0097] As the main contribution of this system are the Linear Modules of tiles (1), it is allowed to make a mounting with (HDPE) High Density Polyethylene's Linear Modules of tiles and traditional Valleys and Ridges manufactured in sheet metal (Zinc, Galvanized Steel, Painted Steel, Aluminium, etc).

Claims

1. *Roof covering system with (HDPE) High Density Polyethylene's tiles,* comprising:

   Linear modules of tiles (1): The linear module of tiles is a rectangular panel or plate with transverse pre-cuts that allow subdivide panel visually in several tiles. These panels have a protuberance shaped section "T" located on the underside of an edge.
   Ridge and Hip profile (3): Longitudinal profile shaped section "V" inverted.
   This profile has a protuberance shaped section "T" located on the lower apex of the section.
   Valley profile (4): Longitudinal profile shaped section "V". This profile has a protuberance shaped section "T" located on the lower apex of the section.
   Drip edge profile (5): Longitudinal profile shaped section "L" inverted. This profile has a protuberance shaped section "T" located on the underside of horizontal plane section.
   The protuberance shaped section "T" (2) all the above elements slips in shaped section "C" sliding profiles (A) to fix these elements to the roof sheets or roof rafters.

2. *Roof covering system with (HOPE) High Density Polyethylene's tiles* according the 1 claim **characterized by** use of plastic or other material.

3. *Roof covering system with (HDPE) High Density Polyethylene's tiles* according the 1 and 2 claims **characterized by** use of Linear modules of tiles in any geometric shape variant of the tiles which form the modules.

4. *Roof covering system with (HDPE) High Density Polyethylene's tiles* according the 1, 2 and 3 claims **characterized by** use of a fixing system by slipping of a protuberance of any type or section, in sliding profiles.

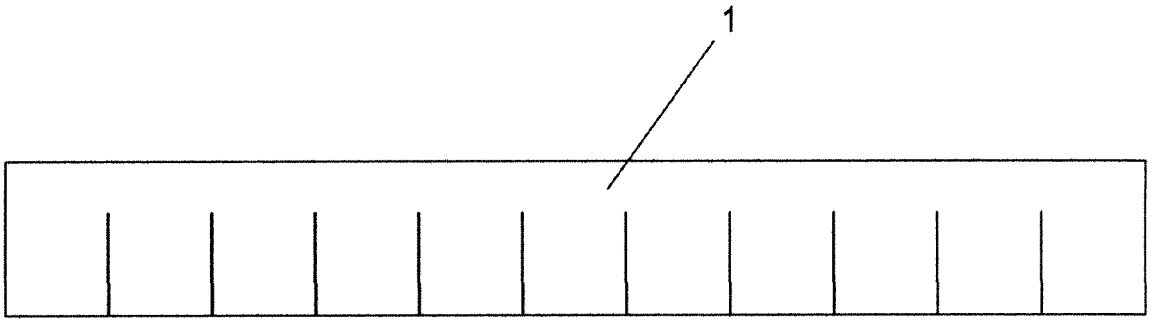


Fig. 1

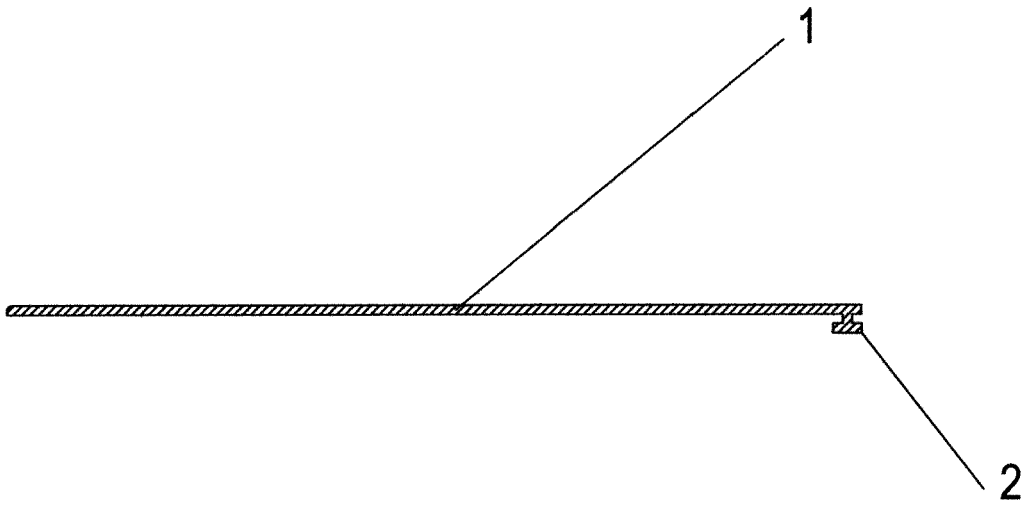
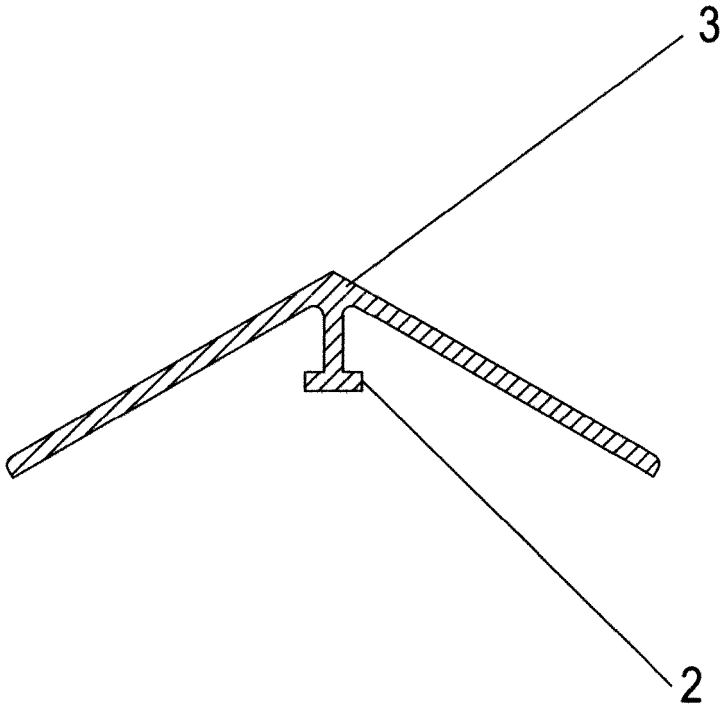


Fig. 2



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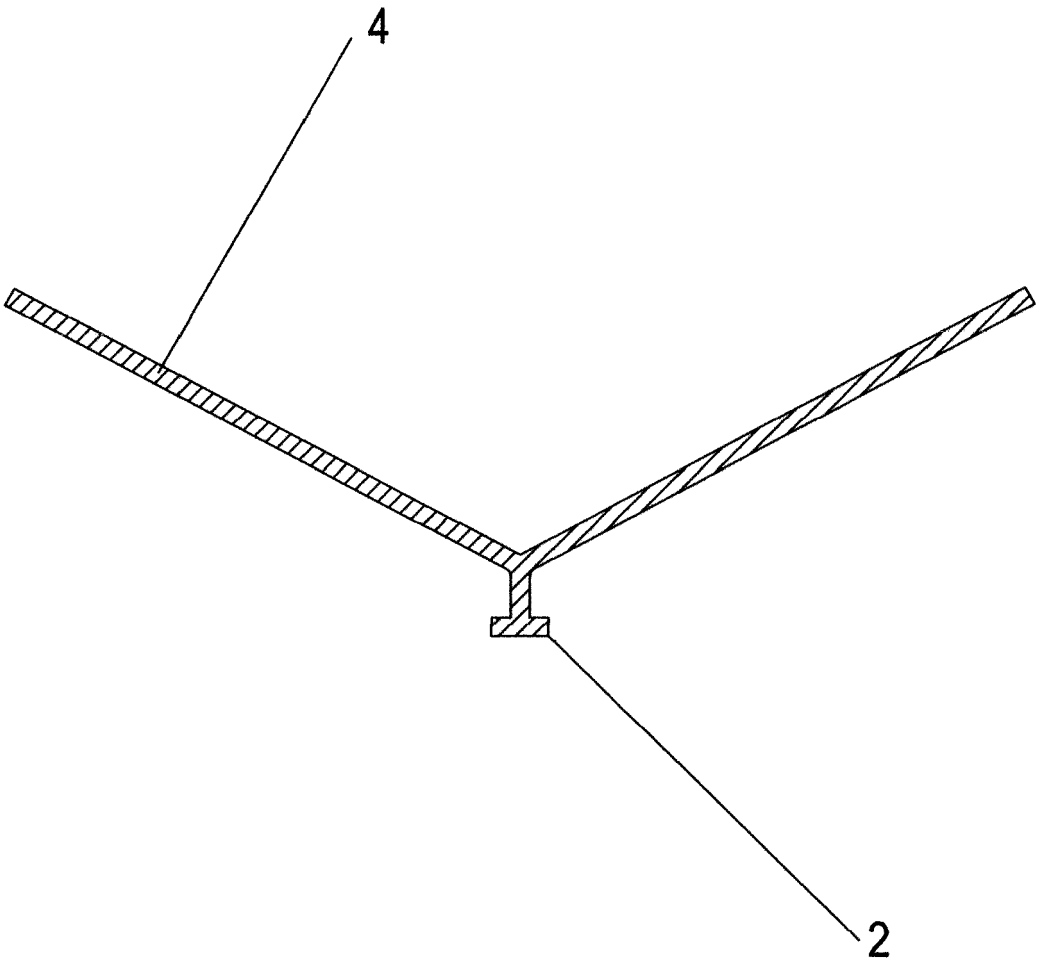

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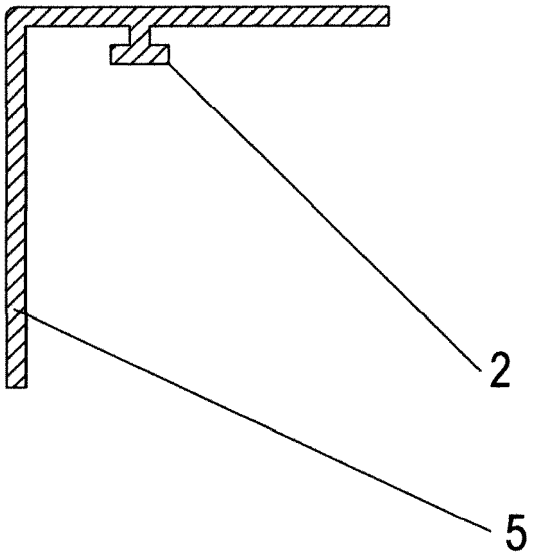

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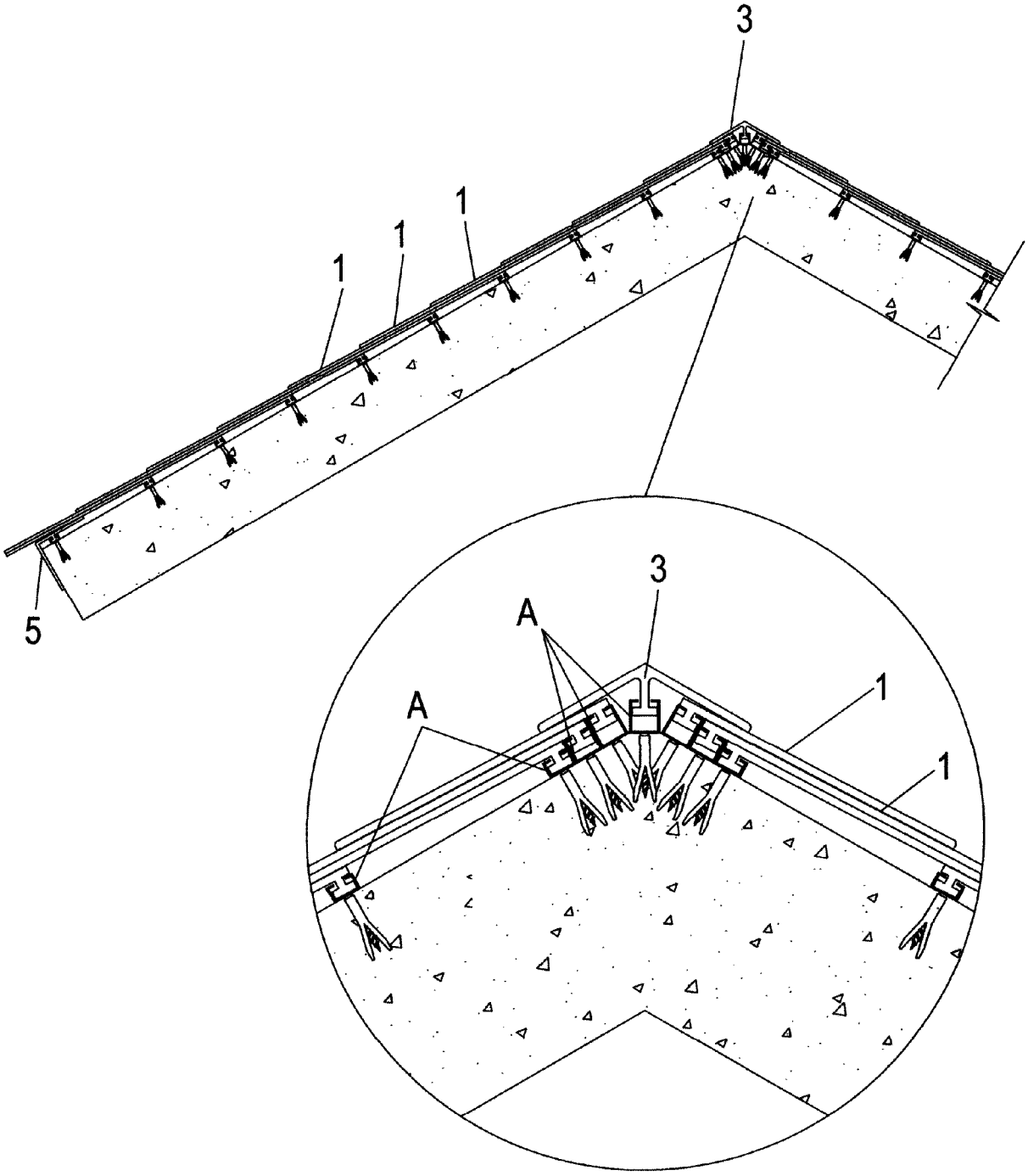

Fig. 6

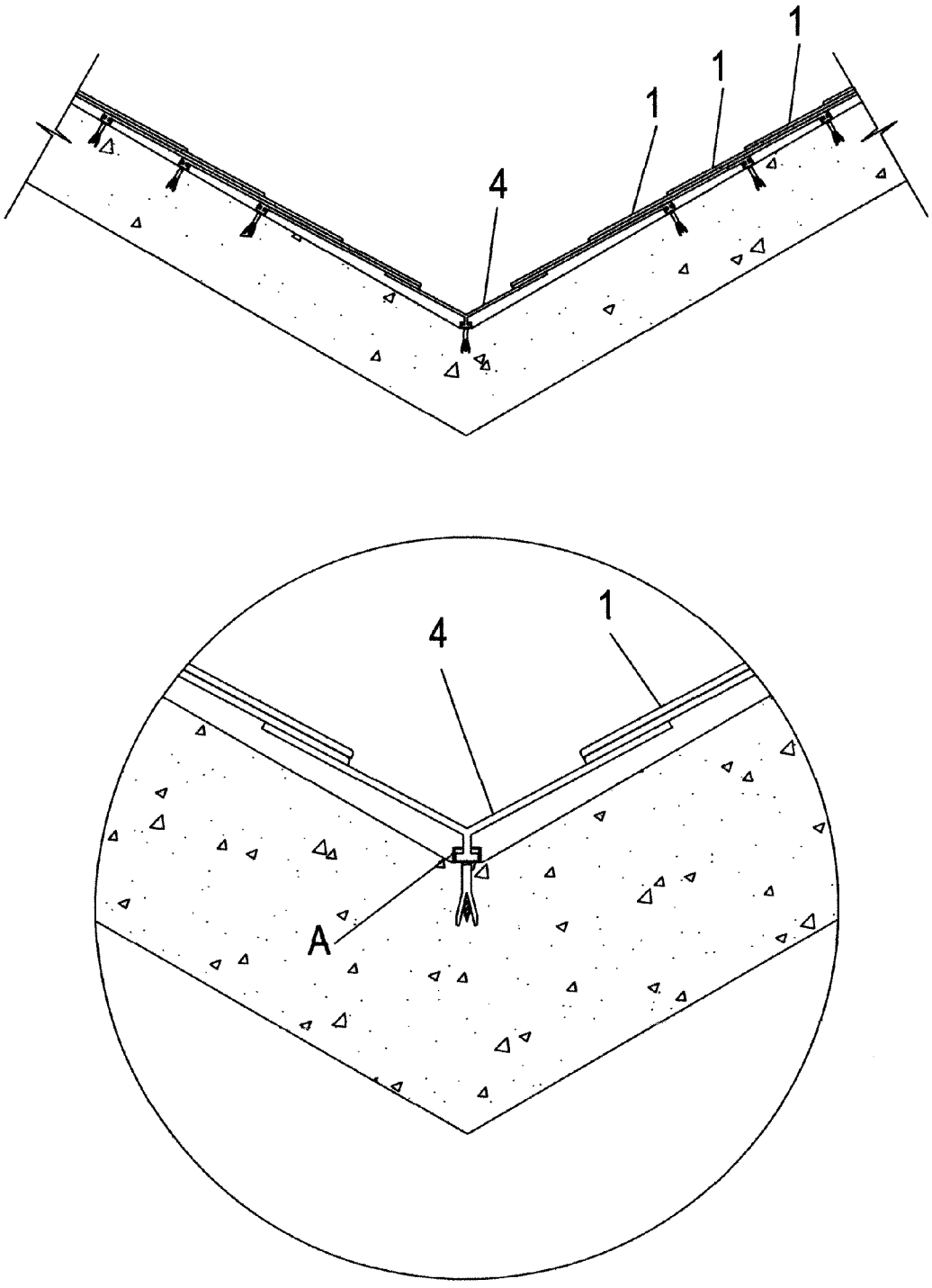

Fig. 7

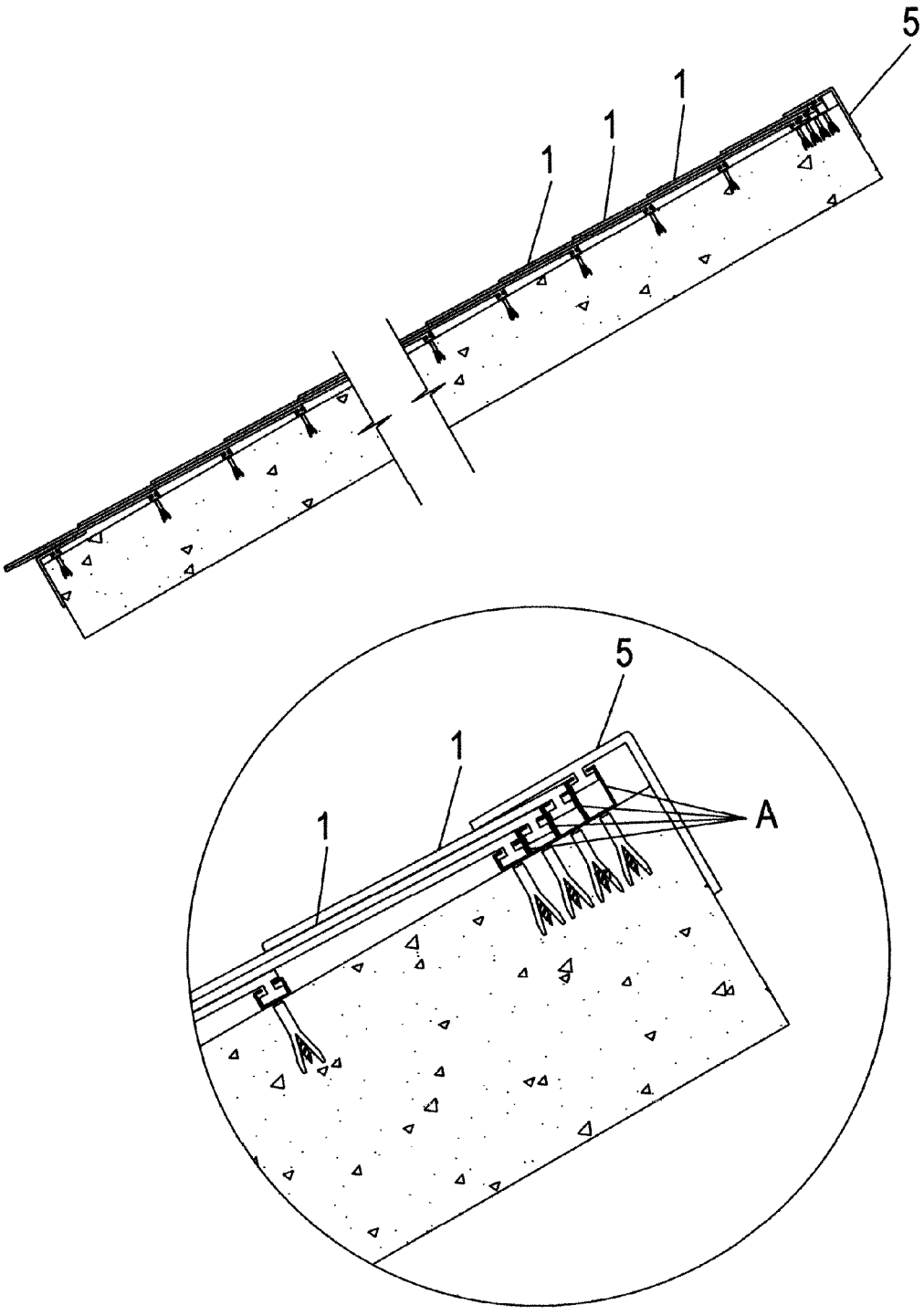

Fig. 8

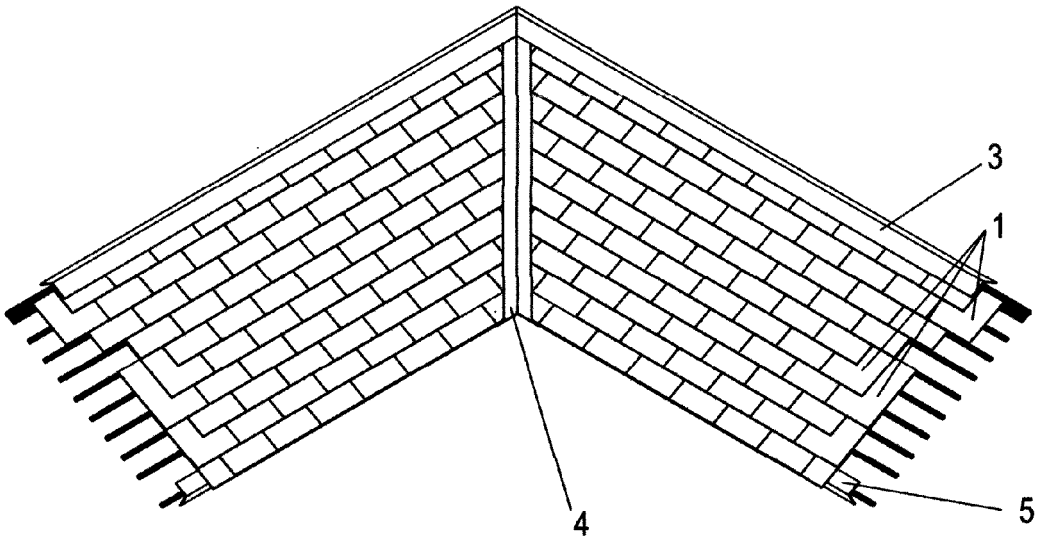

Fig. 9

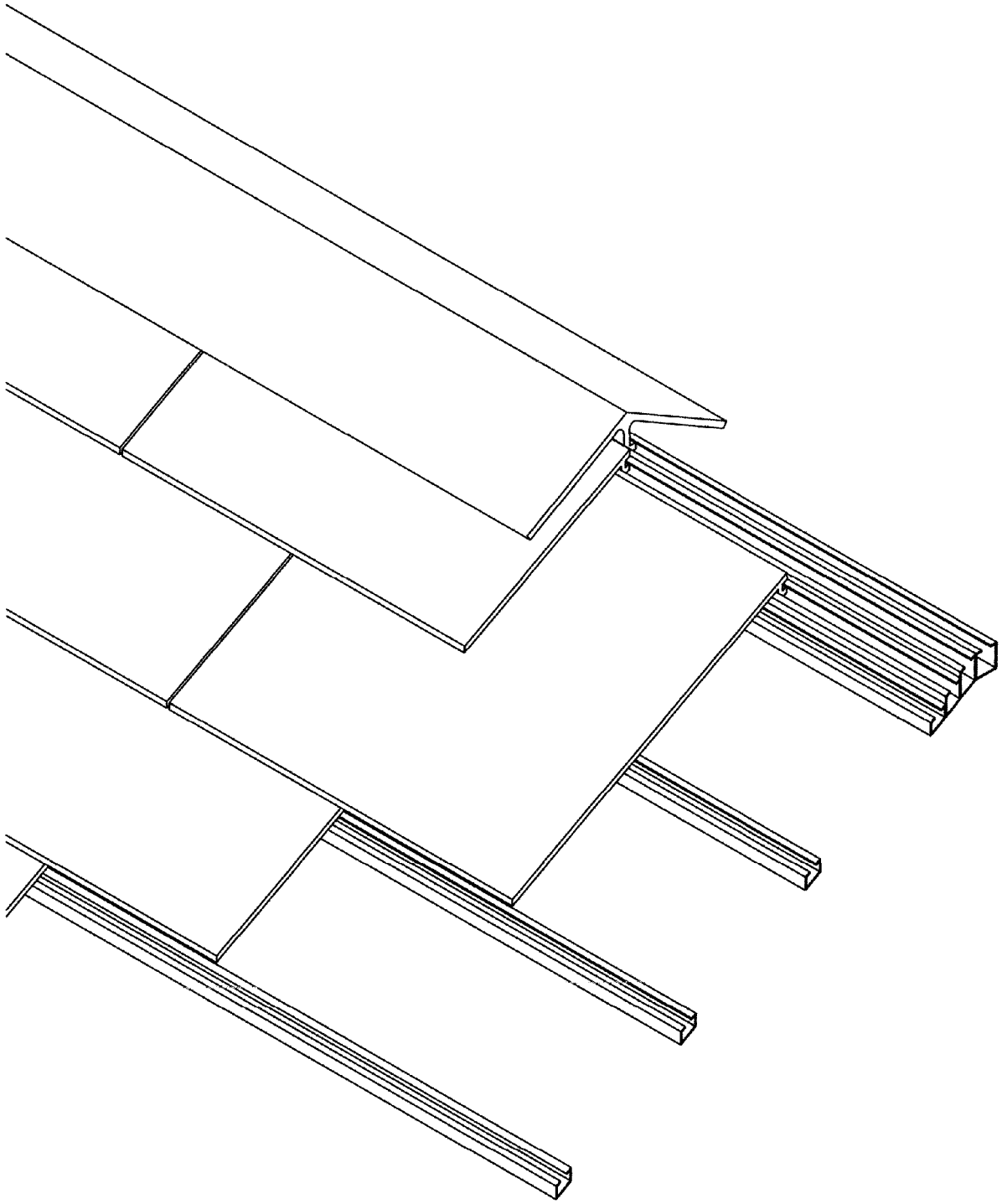

Fig. 10

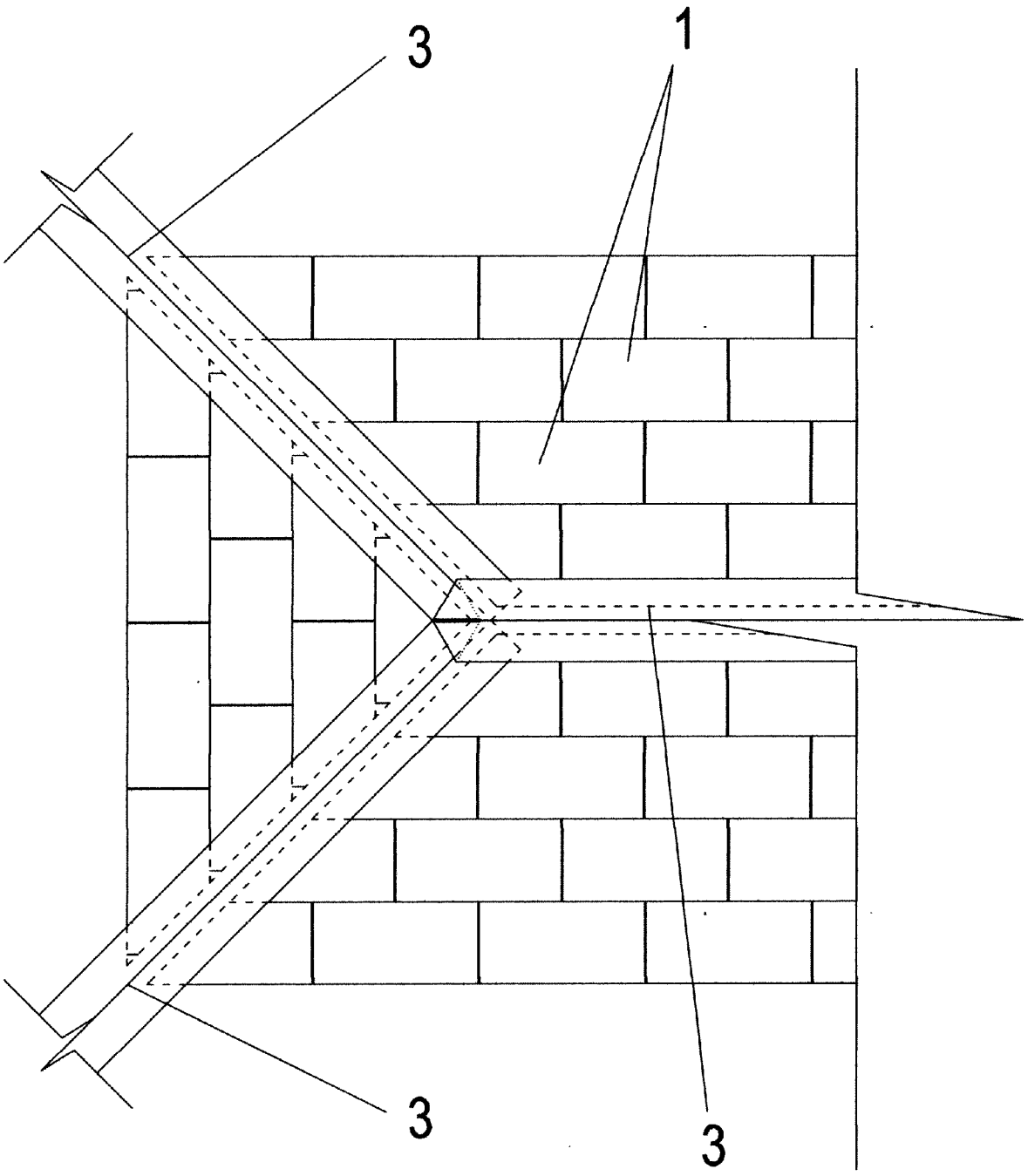

Fig. 11

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EUROPEAN SEARCH REPORT

Application Number
EP 13 38 0026

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	GB 2 444 110 A (LEE RONNIE [GB]) 28 May 2008 (2008-05-28) * the whole document * -----	1	INV. E04D1/34 E04D1/20 E04D1/26 E04D3/40 E04D12/00
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TECHNICAL FIELDS SEARCHED (IPC)

E04D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	22 October 2013	Demeester, Jan

CATEGORY OF CITED DOCUMENTS

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1

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22-10-2013

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