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(54) Roof covering element

(57) The invention relates to a roof covering element for a substantially flat roof, comprising a layer of flexible watertight material, such as bituminous material or plastic and a layer of hook material provided with hooks extending at least partially over the lower surface of the roof covering element and which is adapted to be engaged by fastening material attached to the substrate of the roof, wherein the fastening material is arranged in the form of separate pieces distributed over the surface of the roof covering element. The positions of the pieces of hook material are fixed during the production of the roof covering elements, so that these are not the dependent on the roof coverer. The invention also relates to a corresponding carrier and a corresponding substrate element to be located on a carrier of the roof and comprising a layer of fastening material extending over substantially the whole surface. The invention also provides a corresponding method.

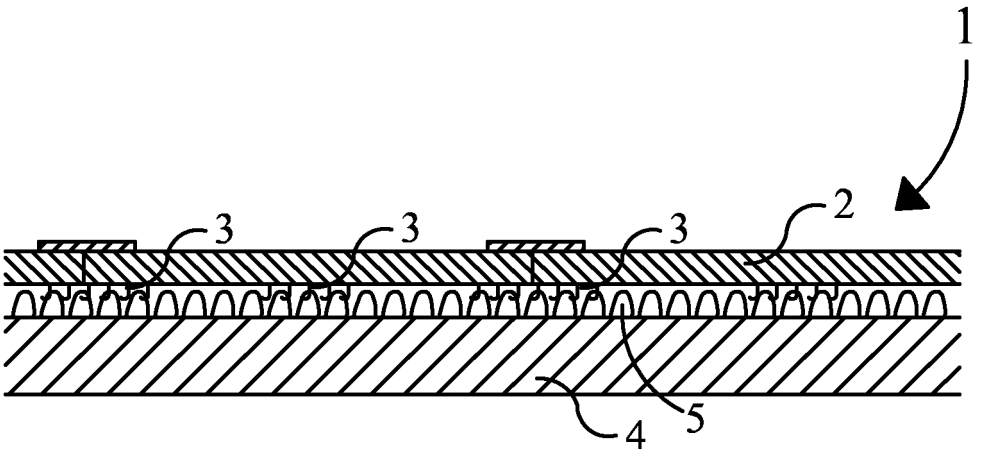

FIG. 1

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Description

[0001] The use of open fire and flames on roofs is becoming increasingly subject to regulation. It is therefore becoming increasingly more difficult to make use of roof covering material which is attached to a substrate by means of heating, for instance by burning. Various other roof covering materials are known for the purpose of obviating this drawback.

[0002] EP-A-1 953 306 thus describes a substantially flat roof comprising a substrate having a layer of fastening material of a first type extending at least over a part of the surface of the substrate and at least a layer of roof covering elements which are arranged substantially adjacently of each other and which are each provided with a layer of flexible watertight material, such as bituminous material, and a layer of fastening material of a second type which extends at least partially over the surface of the roof covering element and which is engaged by fastening material of the first type attached to the roof.

[0003] The substrate is provided here with pieces of hook material fixed to the substrate by means of screws or nails, and the roof covering elements are provided with a layer of loop material extending over the greater part of the surface. The hook material engages the loop material.

[0004] Further roof covering elements are known in the form of 'Rhepanol FT'. Such roof covering elements for a substantially flat roof comprise a layer of flexible watertight plastic and the lower side of which substantially over its surface provided of pieces of loop material with loops and which is adapted to engage fastening material provided on the roof.

[0005] The rate of fastening between the roof covering element and the carrier is dependent on the location and the number of pieces fastening material per surface area of the carrier. These pieces of fastening material are located by the roof coverer. The choice of the location and the number of these elements is highly dependent on the effort and the craftsmanship of the roof coverer. Hence it is highly variable.

[0006] The object of the invention is to provide such a roof covering element wherein the rate of fastening is more predetermined and is less prone to variations.

[0007] This object is achieved in that the fastening material is arranged in the form of separate pieces distributed over the surface of the roof covering element.

[0008] The position of the pieces of hook material is determined during the production of the roof covering elements. It is assumed that on a sufficient large section of the roof fastening material is present to ensure that each of the pieces of hook material contacts a corresponding piece of fastening material. When about 10% of the surface area of the roof covering elements is covered by hook material good results have appeared, although it will be clear that this percentage is also dependent on the expected wind load and of other variables, so that it is possible that a greater section, for instance 15% of the roof covering element is covered by hook material. Further it is attractive when the hook material has a colour different from the colour of the roof covering element. The hook material on the roof covering element is adapted to engage the loop material on the carrier. It is not excluded that the hook material is provided on the carrier which is engaged by the hook material on the roof covering element.

[0009] Another advantage of this feature is the absence of removability of the fastening material at the edges of the roof covering element to allow easy overlapping positioning thereof and to join it to the underlying structure by melting without interference of disturbing parts. Another advantage resides in the easy processability saving working time. A last advantage is the separation of the diverse materials after demolishing.

[0010] The invention provides as well a method for arranging a roof covering on a substantially flat horizontal roof, comprising the steps of fixing a layer of fastening material to the substantially flat roof and placing on the layer of loop material roof elements of flexible watertight material which are provided on their underside with fastening strips, wherein the fastening strips are manufactured from hook material adapted to engage the loop material.

[0011] Although it is possible to arrange the layer of hook material in the form of substantially rounded pieces on the layer of flexible material, it is preferred that the layer of hook material is in the shape of strips on the layer of flexible material. This simplifies mechanical positioning of the pieces of hook material. Reference is made here to WO-A-98/36139, from which are known shingles provided with one or two strips of hook material. This relates to shingles, i.e. roof covering elements only suitable for covering sloping roofs. Such shingles can thus be placed overlapping without the danger of water entry. Because the danger of water entry is considerably greater in the case of horizontal roofs, shingles are not suitable for application on horizontal roofs.

[0012] The layer of flexible material may be adapted to be placed in abutting manner. It is hereby possible to cover the whole surface of the roof without overlap. It is noted here that provisions are necessary for the purpose of providing sealing at the position of the joins between the roof covering elements. It is however also possible that the layer of flexible material is adapted to be placed in overlapping manner.

[0013] A further embodiment provides the measure that the roof covering element has an elongate form and that the fastening strips are arranged in the longitudinal direction of the roof covering element. The use of such elongate roof covering elements provides the option that they can be handled in the form of rolls and rolled out onto the roof. Such rolls are usually made by means of extrusion or by other methods where it is easy to arrange structures extending in the longitudinal direction such as fastening strips. An alternative embodiment provides a roof covering element which has an elongate form and

wherein the fastening strips are arranged in the transverse direction of the roof covering element. Although the advantage of easy arrangement of the strips is lost in this embodiment, advantages result from being able to cut from the roll more easily; when the cut extends through a fastening strip, the edge of the roof covering element can be fastened easily to the substrate.

[0014] According to another preferred embodiment, at least one fastening strip comprises at least a first and a second part which are each connected to the layer of flexible material, and which are mutually connected by a weakened joint. When the roof covering element is cut the released part of the flexible element lying on the edge, can be easily removed to release the edges to be joined to the underlying structure by melting. Often the strips will be provided of a large number of weakened joints such as perforations, located at regular intervals

[0015] According to yet another embodiment a third part has been located between the first and the second part which is releasably connected to the layer of flexible material or which is not connected to the layer of flexible material. The releasable connection allows to release the relevant part of the fastening strip from the layer of removable material and to remove it therefrom. This is important when the roof covering element is cut off and the released part of the flexible element is located at the edge, allowing a part of the flexible material to overlap an adjacent roof covering element. A comparable effect is obtained when the third part is not connected to the flexible part.

[0016] The releasability can be obtained in that thin uncoupling strips connected neither to the flexible material nor to the third parts of the fastening strips extend between the third parts of the fastening strips and the flexible material.This embodiment offers the option during extrusion of the roof covering element in the longitudinal direction of adding the thin uncoupling strips between the flexible material and the fastening strips so that in this way fastening is prevented at this position. It is however also possible to provide the fastening strips of weakened joints located at regular intervals to ease the removal of the pieces of fastening strip, for instance when shortening the roof covering element.

[0017] The fastening strips locally increase the thickness of the roof covering element. The upper surface thus becomes uneven and this may be undesirable for aesthetic and/or technical reasons. In order to prevent this, another embodiment proposes that the fastening strips are recessed over at least a part of their thickness into the layer of flexible material. The fastening strips can be arranged in numerous patterns on the flexible part of the roof covering elements. As stated above, the strips can be placed in the longitudinal direction or in the transverse direction. It is likewise possible to arrange the strips crosswise, although this will result in local thickening in the roof covering element. When the strips are arranged mutually parallel, it is recommended that the fastening strips are arranged at equal mutual distances. This is possible with fastening strips extending in both longitudinal direction and in transverse direction. The fastening strips being arranged at mutually differing distances, for instance for specific applications, is not however precluded. There are also different possibilities for the ratio of the width of the fastening strips and the mutual interspacing of fastening strips; it is thus recommended that the width of the fastening strips is smaller than the average distance between the fastening strips.

[0018] Preferably the layer of flexible watertight material comprises at least two layers, of which the lower layer is adapted to form a connection with an underlying structure in an overlap and the upper layer is adapted to withstand sun radiation. These properties are for a large part in contrast, so that it is attractive to optimize both layers separately. This leads to a better resistance of the upper layer against the influence of the weather, in combination with with the better meltability and adherence properties of the lower layer.

In a first preference the lower layer comprises SBS (styrene butadiene styrene), and the upper layer comprises polyolefins such as APAO(amorph polyalfaolefine), TPO (thermoplastic polyolefine), POCB, (polyolefine copolymeric binder) or APP (atactic polypropylene). According to another preference the layer of flexible watertight material comprises from one of those materials as a whole.

[0019] When the method of producing the roof covering elements does not allow integration of the fastening layer, it is attractive for the fastening layer to be arranged via a membrane-like carrier on the bituminous material. This can then be arranged later on the roof covering element.

[0020] The above elucidated roof covering elements are adapted for fastening to a substrate of a roof. The present invention thus also relates to a substrate as part of a substantially horizontally extending roof, which substrate is provided with a layer of fastening material which extends over substantially the whole part of the surface of the substrate. Such a substrate is therefore suitable for covering with roof covering elements which are provided with a layer of fastening material extending over a part of the surface of the roof covering element.

[0021] The fastening material, which will often be in the form of a loop material, can also be connected to a membrane like carrier, and which can be joined to the substrate. Then the membrane like carrier can be adhered to the substrate by glue, an adhesive later or in a mechanical way. Also then the combination of membrane like carrier and fastening material can be perforated.

[0022] In stead of the provision of a principally flexible structure such as a membrane, a rigid structure may be used. Hence a specific embodiment provides a carrier, comprising a rigid roof plate, onto which a layer of fastening material is applied extending substantially over the whole surface of the plate. The rigid roof plate forms a part of the roof, such as a sandwich panel onto which the roof covering element is located. It is also possible that the rigid panel is formed by a piece of insulation

material onto which the roof covering elements are located. Said insulating panel can be connected to the substrate of the roof by a screw connection or another kind of connection.

[0023] In the preceding embodiments the pieces of roof covering material are connected to the substrate without any juxtaposition of a substantial layer. When existing flat roofs are re-covered, the thermal insulation requirements for the roof are usually more stringent than the requirements applicable at the time of construction. In such cases it is attractive to increase the thermal insulation of a roof. A preferred embodiment of the present invention therefore provides a carrier to be covered by a roof covering element of the kind referred to above wherein the carrier comprises a thermal insulating roof segment adapted to located on a carrier of a roof and to be connected to the roof carrier and on the upper side whereof a layer of loop material is provided. The thermal insulating roof segment is preferably formed by PUP/PIR, EPS or a mineral wool, although other materials are not excluded.

[0024] According to another preferred embodiment the thermal insulating roof segment comprises a fastening layer on its lower surface adapted to engage a fastening layer on the roof substrate. The roof segment can be provided on both sides with hook material or with loop material when the relevant fastening layers are provided with loops or hooks, although it is however recommended that the roof segment is provided with hook material on its underside and that the roof segment is provided with loop material on its upper side.

[0025] Further it is preferred if a metal foil has been positioned between the fastening layer at the lower side and the insulation material. This foil also functions as a damp proof layer.

[0026] It is also attractive for the hook material to be arranged in the form of pieces distributed over the lower surface of the roof segment, leading to a saving of hook material.

[0027] The above sated embodiments provide in principle for the arrangement of roof covering elements, but not generally for sealing between the roof covering elements relative to each other. It is noted that some embodiments provide for overlap of the flexible material, which overlap can be fastened to the flexible material of an adjacent roof covering element. In other cases other means will have to be provided in order to form a seal. Another embodiment provides for this purpose a sealing strip for sealing joins between roof covering elements placed in abutting manner as elucidated above, comprising a strip of bituminous material which is adapted to change partially to an adhering liquid form when heated. Due to the change to the liquid form the bituminous material adheres to the adjacent roof covering elements to form a watertight seal.

[0028] The above embodiments provide a roof covered by roof cover elements of the kind referred to above, in which the roof comprises a roof substrate comprising a layer of fastening material extending over substantially the whole surface of the roof and being engaged by the layer of hook material of the roof covering elements.

[0029] According to yet another embodiment a number of roof covering elements of the type as elucidated above is located between the roof covering elements and the roof substrate, wherein the roof segment has thermally insulating properties, the roof segment is provided on its underside with hook material provided with hooks and the roof segment is provided on its upper side with a layer of loop material provided with loops.

[0030] The invention likewise provides a method for arranging a roof covering on a substantially flat horizontal roof, comprising the steps of fixing a layer of fastening material onto the substantially flat roof, placing on the layer of fastening material thermal insulating roof segments which are provided on their underside a layer of fastening material adapted to engage the fastening material provided on the roof, and which are provided on their upper side with a layer of loop material provided with loops, and placing on the layer of loop material of the roof segments roof elements of flexible watertight material which are provided on their underside with loop material.

[0031] The present invention will be elucidated hereinbelow with reference to the accompanying drawings, in which depict:

Figure 1: a cross-sectional view of a roof covering element according to the invention arranged on a substrate;
Figure 2: a bottom view of a roof covering element according to a first embodiment;
Figure 3: a bottom view of a roof covering element according to a second embodiment;
Figure 4: a bottom view of a roof covering element according to a third embodiment;
Figure 5: a cross-sectional view of a roof covering element according to a fourth embodiment;
Figure 6: a cross-sectional view of a series of roof segments which are arranged on a substrate and have a series of roof covering elements arranged thereon;
Figure 7: a perspective view of a carrier membrane on which pieces of hook material are arranged;
Figure 8: a view corresponding to figure 6, wherein the roof segments are fixed by means of mechanical means;
Figure 9: a view corresponding to figure 6, wherein a double layer of roof segments is arranged;
Figure 10: a view corresponding figure 1, wherein the roof covering elements are arranged overlapping; and
Figure 11: a cross sectional view of an insulating roof segment.

[0032] Figure 1 shows a number of roof covering elements, each designated as a whole with 1. Each roof

covering element comprises a layer 2 of bituminous material, to the underside of which are fixed a number of fastening strips 3 of hook material 3 provided with hooks. This hook material is also known under the brand name Velcro. Roof covering elements 1 are each placed on a substrate 4 which can be arranged on a wooden roof floor but which also can be formed by a metal roof floor or even by a concrete roof floor. Arranged on this roof layer 4 is a layer 5 of material provided with loops which is adapted to be engaged by the hook material. Loop material 5 is preferably formed by a non-woven material screwed onto substrate 4. Other fixing methods are not precluded. It is noted here that the fastening strips 3 extending over only a part of the lower surface of each of the roof covering elements 1 are situated at the edges of roof covering elements 1 in order to ensure that roof covering elements 1 are properly fixed at their edges.

[0033] Roof covering elements 1 are placed connecting to each other. This means that joins are present between adjacent roof covering elements 1. In order to prevent water entry via these joins, a band 6 is arranged over these joins. This band 6 can be manufactured from special material which can be connected, for instance by glueing or by heating and the thus resulting melt, to both underlying roof covering elements 1. It is however also possible to make use of ribbons of the roof covering elements 1. Owing to their preferably bituminous character these can likewise be fused or adhered to the underlying roof covering elements 1.

[0034] Figure 2 shows a bottom view of a roof covering element 1. Roof covering element 1 is rectangular and in the present example also elongate. It will be apparent that the manufacture of elongate roof covering elements is attractive in respect of production by means of extrusion and similar processes and the convenience of transport of rolls of such material. The length of the roof covering elements is therefore variable. In this embodiment the fastening strips 3 with hook material are arranged in the longitudinal direction. This direction also facilitates production because the fastening strips can be added during the extrusion process. Because the material from which layer 2 is manufactured is then in the liquid state, a connection occurs between this material and the fastening strip when cooling takes place. This embodiment also shows that fastening strips are arranged on both long sides of the roof covering elements in order to arrive at a good fixing of the edge of the roof covering elements. It is in principle not precluded at a single edge to place the fastening strip at a distance from the edge so as to leave clear a part adjoining this edge which can then for instance be used to form an overlap with the connecting roof covering element.

[0035] Figure 3 shows a bottom view of an embodiment wherein the fastening strips extend in the transverse direction. Although this results in a less easy method of production, this structure may be attractive when short fitting pieces are used; it is then possible to shorten a piece of roof covering material to a desired length and still have the cut of the shortening located in the vicinity of a fastening strip. This embodiment further shows that the fastening strips are placed with the same mutual interspacing. This is the most attractive from the viewpoint of distribution of forces, although there may be other reasons for arranging the fastening strips at different distances.

[0036] Figure 4 shows an embodiment largely corresponding to the embodiment shown in figure 3, but wherein two bands 7 extend between each of the fastening strips 3 and the actual roof covering elements 2. These bands 7, which are manufactured from a thin, preferably plastic material, have the result that pieces of fastening material 3 are locally not connected to roof covering element 2. Because the fastening strips 3 are however connected elsewhere to the roof covering elements, the fastening strips can still fulfil their function. The separate parts make it possible however to remove the fastening strips locally, for instance when the roof covering elements are cut into pieces. It is otherwise also possible to make use of pieces of band extending under only a single fastening strip.

[0037] The embodiment shown in figure 5 is provided with fastening strips 3 which are partially recessed into the material of layer 2 of roof covering element 1. Fastening strips 3 hereby no longer protrude relative to the underside of layer 2, or hardly so, and a very smooth surface is hereby realized, which may be highly desirable for aesthetic and/or technical reasons. It is noted that fastening strips 3 are received for a great part of their thickness in the underlying layer of loop material 5, even when fastening strips 3 are not recessed.

[0038] Another measure shown in figure 5 is the presence of a band 6 which is already adhered to roof covering element 1 and which serves to cover the join between adjacent roof covering elements. Logistics are simplified by already adhering this band 6 to one side of roof covering elements 1. Use can be made for adhesion purposes of heating or glueing, although band 6 can also be co-extruded in the extrusion process.

[0039] Figure 6 shows a roof construction, wherein not only roof covering elements 2 but also roof segments 8 therebetween are placed on the substrate of the roof which serve to improve the thermal insulation of the whole roof construction. Roof segments 8 are each manufactured for instance from expanded polystyrene, PUR or PIR. On their underside the roof segments are each provided with a number of fastening strips 3 which are not necessarily though preferably attached to the roof covering elements. A saving in fastening material is hereby also achieved. The upper side of each of the roof segments 8 is also provided with a layer of loop material 5. With the thus obtained configuration it is possible to arrange an insulating layer between substrate 4 and the roof covering elements.

[0040] Figure 7 shows a membrane 20 formed by a plastic sheet 21. Sheet 21 is reinforced with for instance reinforcing lines 22 which are manufactured from fibres

and arranged in a rectangular pattern. Pieces of hook material 23 are arranged on the membrane in a rectangular pattern. In this embodiment the reinforcing lines are arranged between the pieces of hook material although it is also possible to arrange the lines elsewhere. What is important is that the membrane has sufficiently little stretch so that, when the membrane is attached to the substrate, for instance with screws or nails, possibly strengthened with a rosette or plate, the pieces of hook material remain close to the substrate so that the wind cannot enter between the membrane and the substrate and, when the roof covering elements are fixed directly onto the membrane, wind cannot enter between the membrane and the roof covering element. It is however also possible for rigid roof segments in the form of insulation to be placed on the membrane. Nor is it precluded that the membrane be attached by means of a glueing or in self-adhesive manner to the substrate.

[0041] Figure 8 shows a cross-section of a roof 30 comprising a for instance wooden substrate 31 to which roof segments 32 are fixed by means of screws 33. Placed between the heads of screws 33 and roof segments 32 are plates 34 for the purpose of distributing the forces exerted by the screws over roof segments 32, which are after all manufactured from insulating material. The insulating material is formed for instance by mineral wool, expanded polystyrene, PUR or PIR. On their upper side the roof segments 32 are provided with a layer of loop material 33 extending over the whole area of roof segments 32. Arranged on the roof segments are roof covering elements 35 which are provided on their underside with pieces of hook material 36 which is in engagement with loop material 35 of roof segments 32. It is noted that the roof segments can also be formed by structural roof parts, such as by sandwich panels. These sandwich panels are then fixed directly, without interposing a substrate, onto the beam layer of the roof.

[0042] Figure 9 shows a roof at 40 comprising a substrate 41 on which two layers of insulating material are placed in the form of two offset layers of roof segments 42, 43 on which roof covering elements 44 are arranged. A layer of loop material 45 is arranged in the usual manner on the substrate. The lower layer of roof segments is provided on the underside with pieces of hook material 46 and on the upper side with a layer of loop material 47. The upper layer of roof segments is provided on underside and upper side with layers of hook material 48, 49, while roof covering elements 44 are provided on their underside with a layer of loop material 50. The associated layers of fastening material are brought into engagement with each other. The upper fastening layer, i.e. that between the upper layer of roof segments 43 and the roof covering elements 44, is here as it were 'switched', which may be attractive in many cases for reasons of availability of material. It will be apparent that the other fastening layers can also be 'switched'.

[0043] Figure 10 shows a cross-section of a substrate 4 of a roof on which a layer 5 of loop material is arranged. Placed on this layer are roof covering elements 1 which, as in figure 1, are formed by a layer of bituminous material 2 which is provided on its underside with pieces of hook material 3 which engages with loop material 5. This embodiment differs from the embodiment of figure 1 in the fact that the pieces of roof covering material 2 overlap each other. In order to obtain a liquid-tight connection between roof covering elements 2, they are connected to each other on the overlapping part by a melted join 10.

[0044] Figure 11 shows a cross sectional view of a thermal insulating roof segment 50, comprising an insulating body 51 made from PUR/PIR and which comprises layers 52, 53 from metal foil at its upper face, respectively lower face, which layers function as water tight layers. At the upper face of the roof segment 50 a layer of loop material extending over the complete surface area of the roof segment has been provided. This layer 54 may be made from non woven material. At the lower face of the roof segment 50 strips of hook material 55 have provided, on the same way as the roof covering elements according to the invention elucidated earlier.

[0045] Further figure 11 shows that the strips of hook material 55 are joined to a layer of loop material 57 connected to the substrate 56 and that a roof covering element 1 according to the invention has been provided of which the strips are joined to the layer of loop material 52.

[0046] The invention thus offers a large number of embodiments. It is thus possible for the hook material to be placed on the substrate or on the underside of the roof covering material, wherein the loop material is placed on the opposite side. It is generally recommended to arrange the hook material in pieces and have the loop material extend over the whole surface, although the reverse is likewise possible. The fastening material can be arranged on a carrier which can be connected later to the substrate, the roof segments or the roof covering material. The carrier can be transparent or be provided with openings for the purpose of determining the position of the carrier and the fastening points. The carrier, provided either with hooks or loops, can serve directly as coating for roof segments.

[0047] In the embodiments discussed above the roof covering element always comprises hook material. It is attractive, also from a viewpoint of costs to provide the underlying layer with loop material. As hook material also engages other hook material, it is also possible to replace the loop material by hook material. Hence there is always question of fastening material., understood to comprise both hook material and loop material.

[0048] Measures shown in the above embodiments can be combined with each other, even when the combination is not explicitly described or shown.

Claims

1. Roof covering element for a substantially flat roof, comprising a layer of flexible watertight material,

such as bituminous material or plastic and a layer of hook material provided with hooks extending at least partially over the lower surface of the roof covering element and which is adapted to be engaged by fastening material attached to the substrate of the roof, **characterized in that** the fastening material is arranged in the form of separate pieces distributed over the surface of the roof covering element.

2. Roof covering element as claimed in claim 1, **characterized in that** the layer of hook material is arranged in the form of strips on the layer of flexible material.

3. Roof covering element as claimed in claim 2, **characterized in that** the roof covering element has an elongate form and that the strips are arranged in the longitudinal direction of the roof covering element.

4. Roof covering element as claimed in claim 2 or 3, **characterized in that** at least one fastening strip comprises at least a first and a second part which are separated by a weakened joint.

5. Roof covering element as claimed in claim 4, **characterized in that** at the first part and the second part are both connected to the layer of flexible material and that between the first part and the second part a third part is located which is connected releasably to the layer of flexible material or which is not connected to the layer of flexible material..

6. Roof covering element as claimed in any of the preceding claims, **characterized in that** the layer of flexible watertight material comprises at least two layers, of which the lower layer is adapted to form a connection with an underlying structure in an overlap and the upper layer is adapted to withstand sun radiation.

7. Roof covering element as claimed in any of the preceding claims, **characterized in that** the layer of hook material is arranged via a membrane-like carrier on the bituminous material or on the plastic.

8. Substrate element as a part of a roof to be covered by a roof covering element as claimed in any of the claims 1-7, in which the substrate element is adapted to be located on a carrier of the roof, **characterized in that** the substrate element comprises a layer of fastening material extending over substantially the whole surface of the substrate element.

9. Substrate element as claimed in claim 8, **characterized in that** the layer of fastening material is mounted on a flexible membrane-like carrier adapted to be connected to a carrier.

10. Carrier, to be covered by a roof covering element as claimed in any of the claims 1-7, **characterized in that** the carrier comprises a rigid roof plate, onto which a layer of fastening material is applied extending substantially over the whole surface of the plate.

11. Carrier, to be covered by a roof covering element as claimed in any of the claims 1-7, **characterized in that** the carrier comprises a thermal insulating roof segment adapted to located on a carrier of a roof and to be connected to the roof carrier and on the upper side whereof a layer of loop material is provided.

12. Carrier as claimed in claim 11, **characterized in that** the thermal insulating roof segment comprises a fastening layer on its lower surface adapted to engage a fastening layer on the roof substrate.

13. Carrier as claimed in claim 11 or 12, **characterized in that** between the lower fastening layer and the thermal insulating layer a metal foil has been located.

14. Carrier as claimed in claim 11, 12 or 13, **characterized in that** the lower surface of the thermal insulating roof segment comprises fastening material is arranged in the form of separate pieces distributed over its surface.

15. Roof covered by roof covering elements according to any of the claims 1-7, **characterized in that** the roof comprise a roof carrier comprising a layer of fastening material extending over substantially the whole surface of the roof and being engaged by the layer of hook material of the roof covering elements on the roof carrier.

16. Roof as claimed in claim 15, **characterized in that**, between the roof covering elements and the roof carrier a number of thermal insulating roof segments according to any of the claims 11-14 is located, that the fastening layer on the lower surface of the thermal insulating roof segments engages a fastening layer on the roof carrier, and that the layer of hook material provided on the roof cover elements engages the layer of fastening material applied on the thermal insulating roof segments.

17. Method for arranging a roof covering on a substantially flat horizontal roof, comprising the steps of fixing a layer of fastening material to the substantially flat roof and placing on the layer of fastening material roof elements of flexible watertight material provided on their underside with a layer of hook material, wherein the fastening material of the first type is adapted to engage on the fastening material.

18. Method for arranging a roof covering on a substan-

tially flat horizontal roof, comprising the steps of fixing a layer of fastening material to the substantially flat roof, placing on said layer of fastening material thermal insulating roof segments provided on their undersides with a layer of fastening material, wherein the fastening material is adapted to engage the fastening material provided on the roof and which are provided on their upper side with a layer of fastening material and placing on the layer of fastening material roof cover elements of flexible watertight material provided on their underside with hook material which is adapted to engage the fastening material provided on the upper side of the insulating roof segments.

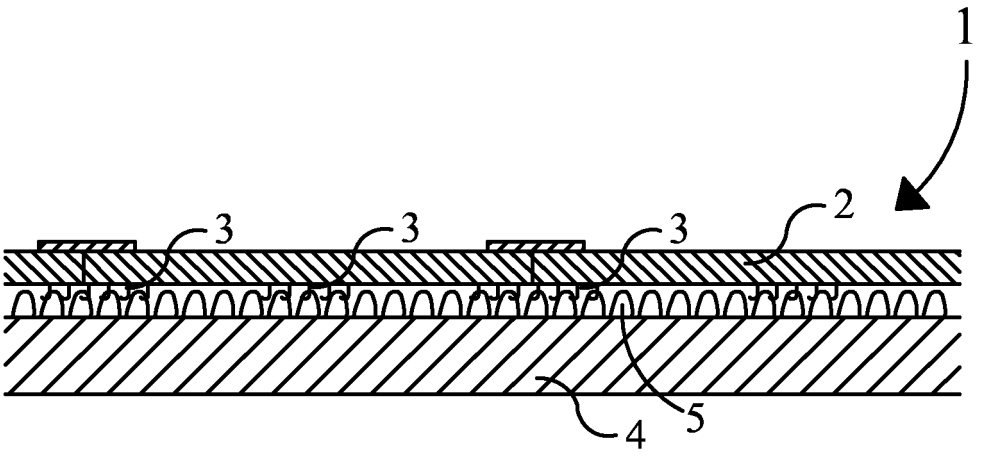

FIG. 1

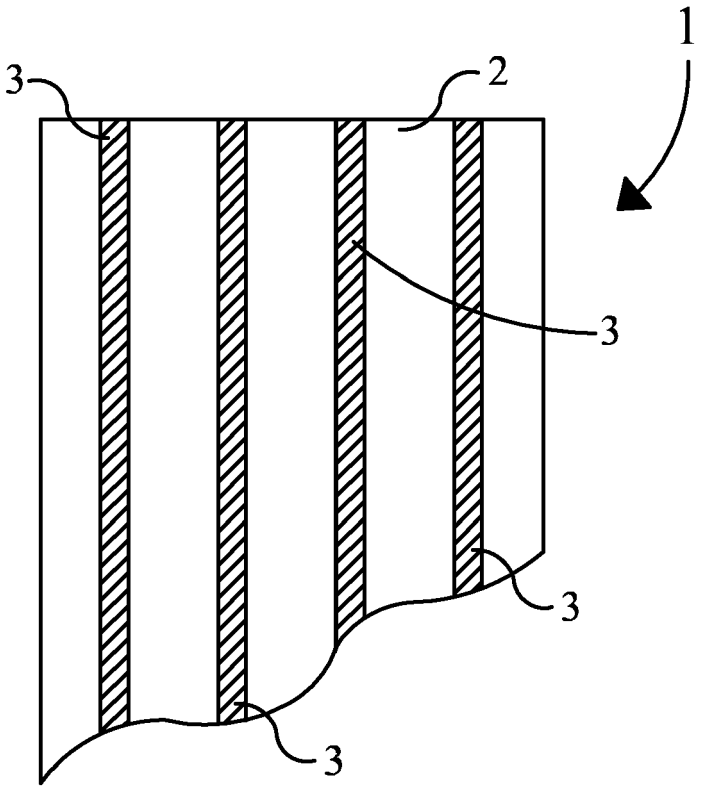

FIG. 2

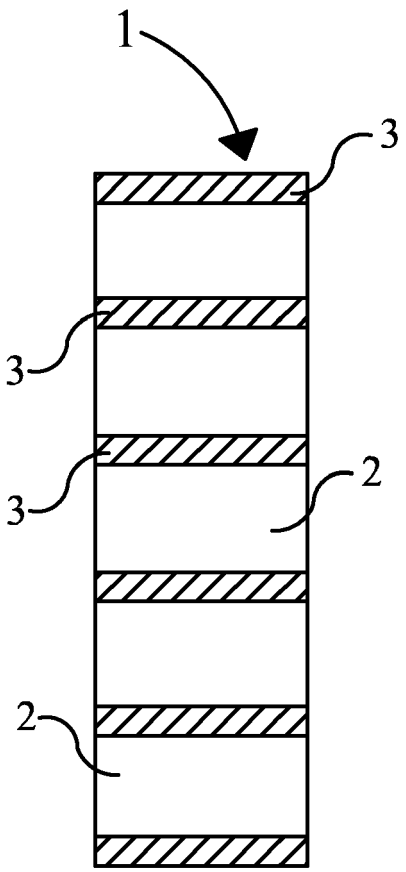

FIG. 3

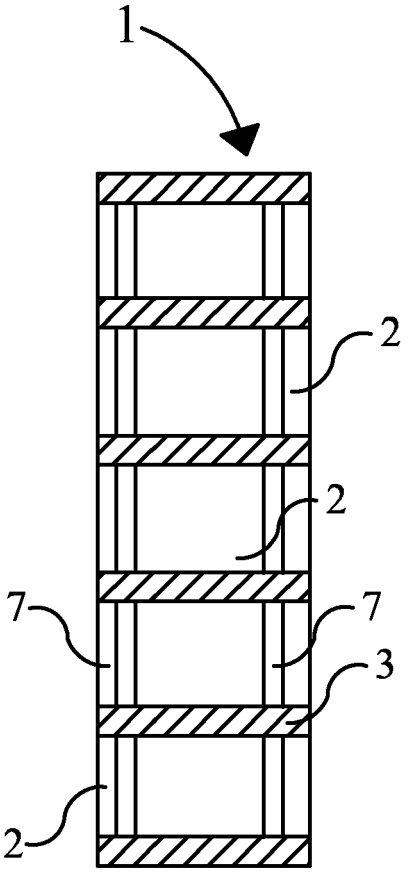

FIG. 4

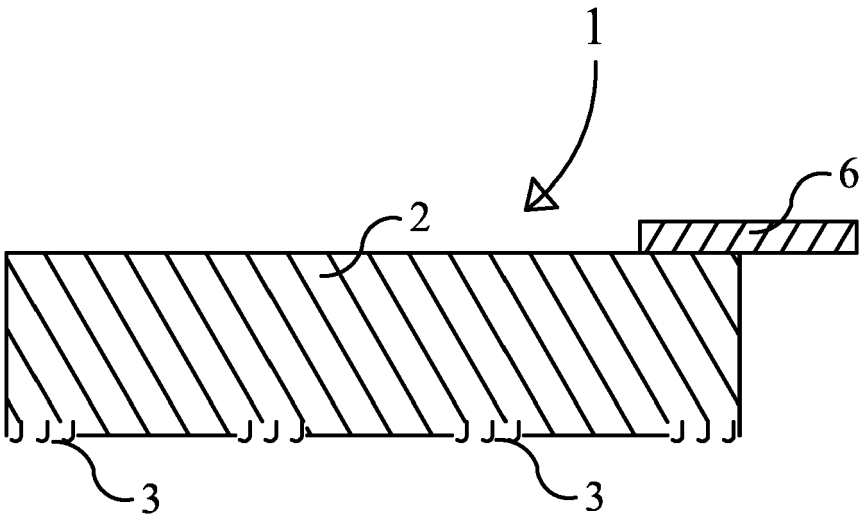

FIG. 5

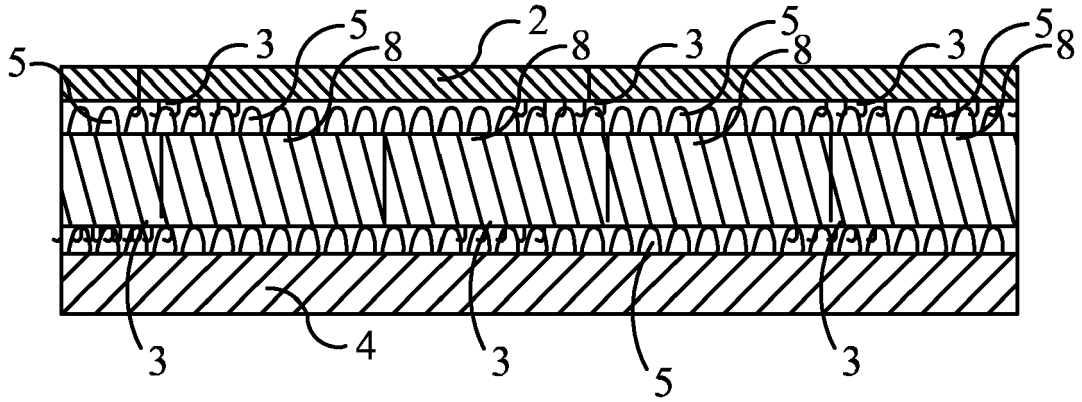

FIG. 6

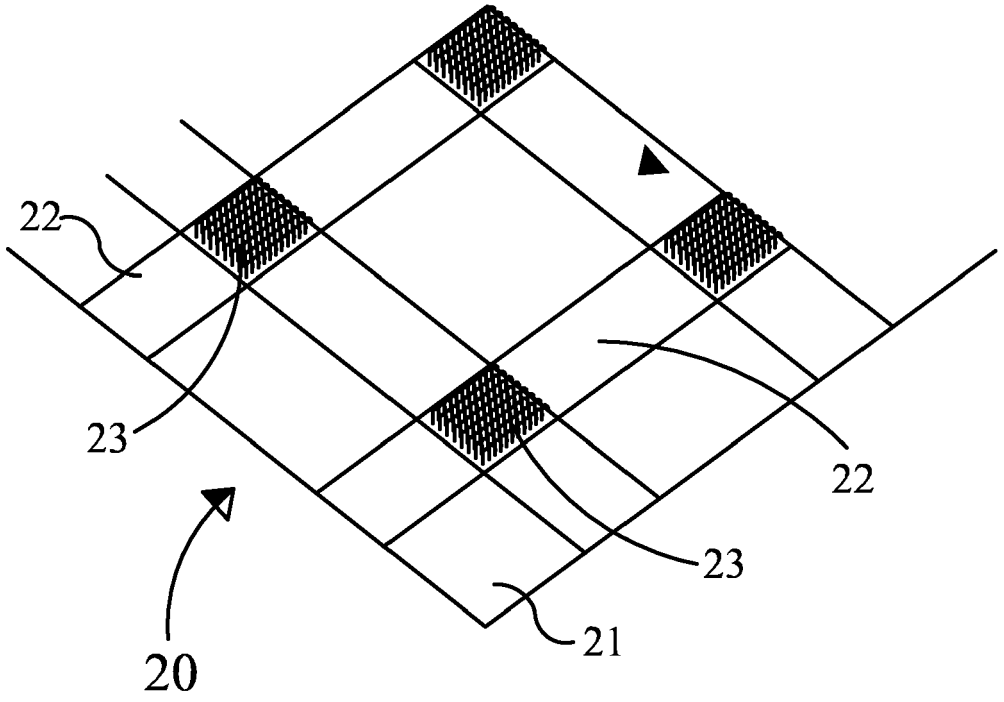

FIG. 7

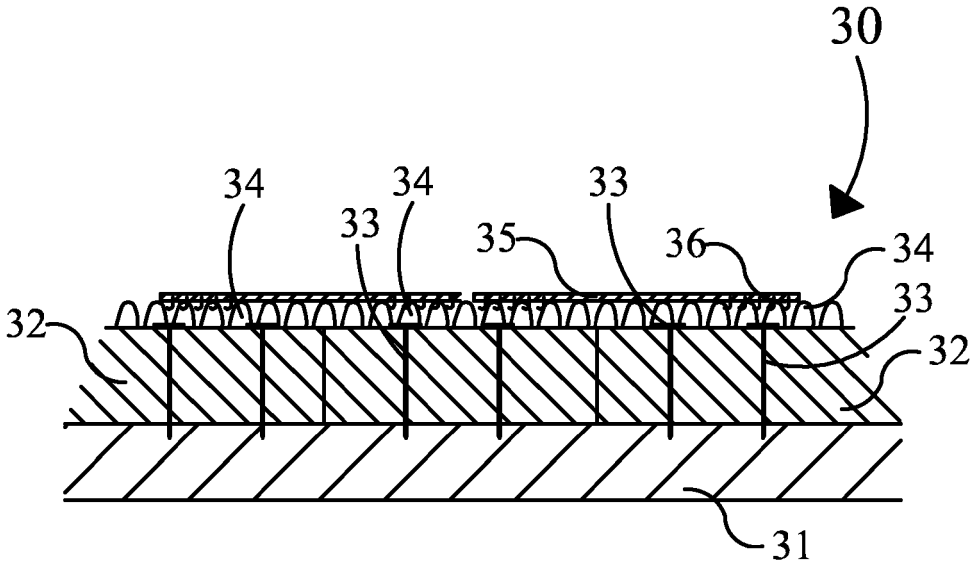

FIG. 8

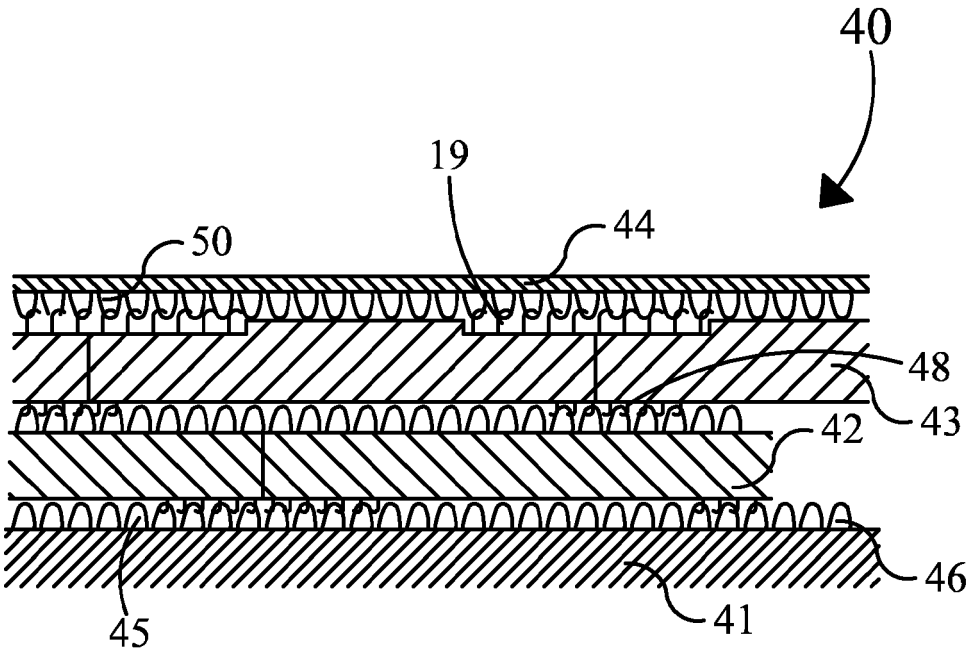

FIG. 9

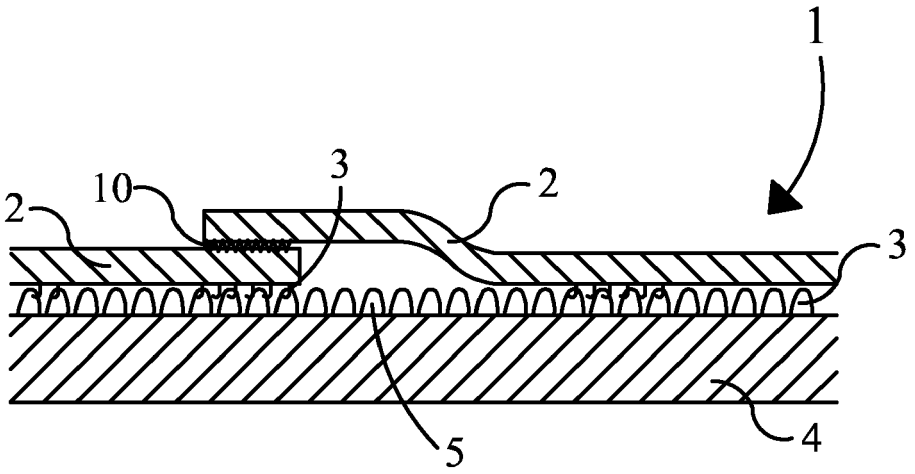

FIG. 10

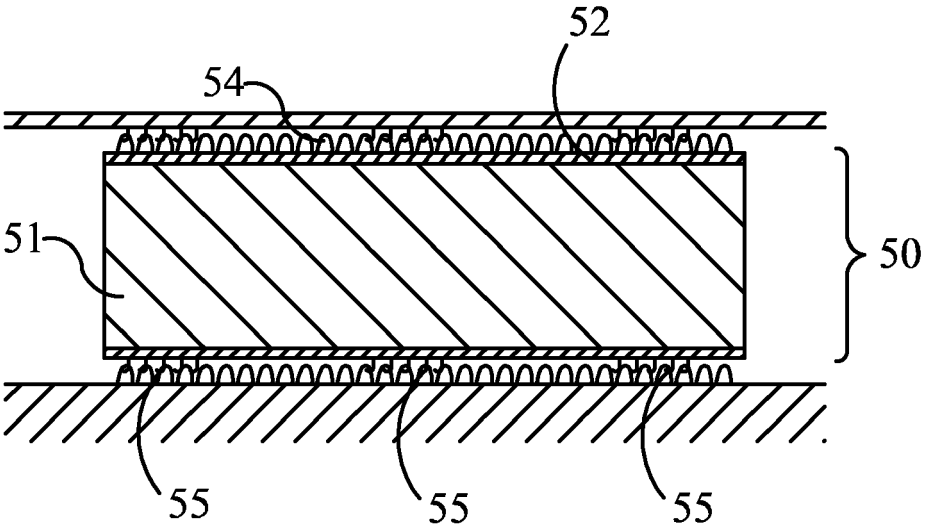

FIG. 11

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1953306 A **[0002]**
- WO 9836139 A **[0011]**