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(54) **Flexible roofing strip and method for constructing roof covering**

(57) The invention relates to flexible roofing strips (1,9) for application in a roof covering. The roofing strips (1) comprise a waterproofing layer (10) made in a substantially waterproof material with flaps (11) on opposite longitudinal sides for creating substantially watertight upstanding seams (5,16) between adjacent roofing strips (9) in a roof covering. The roofing strips may further com-

prise a reinforcement layer (12) also having flaps (13) on opposite longitudinal sides for creating overlaps of the reinforcement layers of adjacent strips (9) in the roof covering, underneath the upstanding seams (5,16) formed with the flaps (11) of the waterproofing layer (10). The invention further relates to a method for constructing a roof covering in which such upstanding seams (5,16) are created.

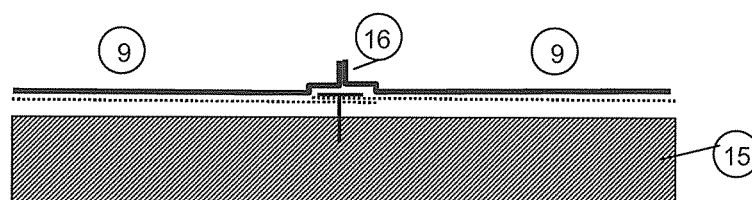


FIG. 9

Description

Technical field

[0001] The present invention relates to flexible roofing strips and a method for constructing a roof covering by means of flexible roofing strips.

Background art

[0002] At present, waterproof roof coverings on flat roofs are often constructed by means of roofing strips whose lateral edges are overlapped. These roofing strips have a layered structure comprising a reinforcement layer and a waterproofing layer attached on top of the reinforcement layer. In order to prevent leakage of rain water via the overlapping portions, the roof covering has to be laid with great care by highly skilled workers, which leads to undesirably high costs.

[0003] In an attempt to reduce these costs, in US-A-4,221,096 a method for constructing a roof covering is disclosed in which V-shaped elements are used at the seams between adjacent roofing strips. This method however introduces additional elements, which can lead to an increase in the costs rather than a reduction.

[0004] In US-A-4,833,853 use is made of mounting brackets over which the adjacent roofing strips are laid in an overlapping manner, after which a cap member is placed on top to fix the roofing strips to the mounting brackets. Such a roof covering also introduces additional elements and furthermore requires a wide overlap between the adjacent roofing strips, so that again the costs can be increased rather than reduced.

Disclosure of the invention

[0005] It is an aim of the present invention to provide a flexible roofing strip and a method for constructing a roof covering with which a substantial reduction in the overall costs of the roof covering can be achieved.

[0006] This aim is achieved according to the invention with the flexible roofing strips and the methods according to the independent claims.

[0007] In a first embodiment of the invention, the flexible roofing strip is made in a substantially waterproof material and is characterised in that the roofing strip has folded flaps on opposite longitudinal sides for creating substantially watertight upstanding seams between adjacent roofing strips.

[0008] In a second embodiment of the invention, the flexible roofing strip has a layered structure comprising a reinforcement layer and a waterproofing layer above the reinforcement layer. The waterproofing layer has loose flaps on opposite longitudinal sides of the strip which extend sideways over substantially the whole length of the strip and are provided for creating substantially watertight upstanding seams between adjacent roofing strips.

[0009] With these roofing strips, a roof covering can be constructed by means of the following method. The roofing strips are placed one after the other adjacent to each other on a roof, after which the flaps are brought together to create an upstanding seam.

[0010] With the roofing strips according to the invention, a roof covering can be made in which the waterproofing material of adjacent roofing strips no longer overlaps and no longer needs to be mechanically anchored to the roof at the seams between adjacent roofing strips. Consequently, damage to the waterproofing layer and the need for post-treatment of the waterproofing material at the seams to seal up holes after anchoring can be avoided. Furthermore, making an upstanding seam watertight is far less critical than an overlapping seam as in the prior art, so that there is no longer a need to leave the creation of watertight seams between the adjacent roofing strips to highly skilled workers. Still further, with the roofing strips of the invention, upstanding seams can be created in which no additional support parts or fasteners or other parts are needed, which can thus lead a reduction in costs on two factors: the use of parts and the construction time since no additional parts need to be mounted.

[0011] Because of the reduction in construction time for the roof covering of the invention, this becomes a less critical factor in the overall cost of the roof covering. As a result, the use of narrower roofing strips comes into perspective, which would otherwise be avoided in view of the larger number of seams which have to be sealed up. The use of narrower roofing strips can have the following advantages:

- since roofing material is commonly supplied in rolls of a given length, the narrower the roofing material, the less weight, so with the roofing strip of the invention the workers need to carry less weight;
- narrower strips are for the worker easier to carry, easier to position, easier to manipulate and easier to fix onto the roof support;
- for a given weight of the rolls, the narrower the roofing strips, the longer they are, so with the roofing strip of the invention a roof with less cross joints and thus less risk of leakage can be created.

For example, in the prior art one would not consider roofing strips narrower than 1 m, whereas with the invention one may consider to use roofing strips as narrow as 50 cm or even narrower.

[0012] Another advantage of the roofing strip of the second embodiment of the invention is that the reinforcement layer needs to be less flexible with respect to the prior art, since there is no longer a need to fold it over mounting brackets or elements to create watertight seams. As a result, a stronger reinforcement layer can be used which reduces the risk of leaks caused by personnel walking over the roof.

[0013] The upstanding seams which are created by

means of the roofing strips according to the invention furthermore have the advantage that the use of fire to seal up the seam can be avoided. As a result, the hazards for the workers and the risk of injuries can be reduced. The upstanding seams can be simply sealed by means of a suitable sealant. Preferably synthetic rubber, polyurethane based glue or self-adherent strips are used, but any other suitable sealant known to the person skilled in the art may also be used.

[0014] In the roofing strip of the second embodiment of the invention, the reinforcement layer and the waterproofing layer preferably both have loose flaps on the opposite longitudinal sides. The loose flaps of the reinforcement layer are provided for creating an overlap of the reinforcement layers of adjacent roofing strips underneath the substantially watertight upstanding seam formed by the flaps of the waterproofing layer. With these roofing strips, a roof covering can be constructed by means of the following method. The roofing strips are placed one after the other adjacent to each other on a roof while making sure that the loose flaps of the reinforcement layers overlap each other. Then, the overlapping loose flaps of the reinforcement layers are attached to each other and to the roof, for example by means of suitable fasteners. Next, the flaps of the waterproofing layers are brought together to form upstanding seams above the overlapping loose flaps of the reinforcement layers and the seams are sealed, preferably by means of a sealant as mentioned above. The advantage is that since the waterproofing layer flaps are loose from the reinforcement layer flaps, the anchoring of the roofing strips to the roof can be effected while the waterproofing layer flaps are moved out of the way, so that damage to the waterproofing layer and consequently post-treatment of the waterproofing layer to seal up holes after anchoring can be avoided.

[0015] Preferably in the second embodiment of the roofing strip of the invention, the reinforcement layer and the waterproofing layer are attached to each other in between the loose flaps by means of an adhesive. An advantageous way of manufacturing the roofing strips of the invention can for example be formed by, instead of applying the adhesive over the whole surface of the reinforcement layer as in the prior art, applying it up to a given distance of for example 5 to 10 cm, for example 7 cm, from the lateral edges of the roofing strips. In this way, the loose flaps are formed by parts of the layers where no adhesive is applied. This manufacturing method has the advantage that it is a simple modification of existing manufacturing methods. Alternatively the roofing strips of the invention may also be made in other ways. It is also not essential that the layers have the same width: the loose flaps of the waterproofing layer may be narrower or wider than those of the reinforcement layer as long as it is made sure that they are wide enough to be able to create the upstanding seam. The flaps on both sides are preferable of substantially equal width, but this is also not essential.

[0016] In all embodiments of the roofing strip of the invention, the reinforcement layer (if present) is preferably made in one of the following materials: polyester, polypropylene or glass fibre. The waterproofing layer is preferably made in one of the following materials: ethylene propylene diene monomer (EPDM), chloro polyethylene (CPE), polyisobutylene (PIB) or thermoplastic elastomer (TPE). Alternatively, the layers may also be made in any other materials deemed suitable by the person skilled in the art. Possibly, one or more additional layers may be provided underneath the reinforcement layer, in between the reinforcement layer and the waterproofing layer, and/or on top of the waterproofing layer.

[0017] In all embodiments of the roofing strip of the invention, the loose flaps of the waterproofing layer are preferably turned over and are preliminarily attached to the top side of the roofing strip. This simplifies and thus can speed up the placement of the roofing strips adjacent to each other. In the embodiment with loose flaps in the reinforcement layers as well, this makes sure that the waterproofing layer flaps are out of the way when the overlap between the reinforcement layer flaps of adjacent strips is made.

[0018] When using narrower roofing strips, it is possible to attach the roofing strips to the roof by applying an adhesive underneath substantially the whole area of the roofing strips, instead of mechanically anchoring just the overlapping flaps of the reinforcement layers to the roof. Such a full area adherence is possible in view of the reduced suction forces experienced by the narrower roofing strips.

Brief description of the drawings

[0019] The invention will be further elucidated by means of the following description and the appended figures.

[0020] Figure 1 shows a flexible roofing strip according to the first embodiment of the invention.

[0021] Figures 2 and 3 successively show how a roof covering can be constructed by means of the flexible roofing strip of figure 1.

[0022] Figures 4 and 5 show a down-folded upstanding seam which can be used at the transition from a horizontal to a vertical part.

[0023] Figure 6 shows how the ending of an upstanding seam can be sealed.

[0024] Figure 7 shows a flexible roofing strip according to the second embodiment of the invention.

[0025] Figures 8 and 9 successively show how a roof covering can be constructed by means of the flexible roofing strip of figure 7.

Modes for carrying out the invention

[0026] The present invention will be described with respect to particular embodiments and with reference 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. In the drawings, the size of some of the elements may be exaggerated and not drawn on scale for illustrative purposes. The dimensions and the relative dimensions do not necessarily correspond to actual reductions to practice of the invention.

[0027] 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 sequential or chronological order. The terms are interchangeable under appropriate circumstances and the embodiments of the invention can operate in other sequences than described or illustrated herein.

[0028] 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. The terms so used are interchangeable under appropriate circumstances and the embodiments of the invention described herein can operate in other orientations than described or illustrated herein.

[0029] 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 needs 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.

[0030] The flexible roofing strip 1 of figure 1 is made of a single layer of substantially waterproof material. It has an oblong shape, of which a cross-section is shown. The roofing strip 1 has folded flaps 2 on its opposite longitudinal sides. These flaps 2 are provided for creating substantially watertight upstanding seams with the flaps of adjacent roofing strips in the roof covering. The flaps 2 may be preliminarily attached to the top side of the roofing strip 1, for example by means of a releasable adhesive, though this is not essential. The substantially waterproof material of the strip 1 is preferably one of the following materials: ethylene propylene diene monomer (EPDM), chlorinated polyethylene (CPE), polyisobutylene (PIB) or thermoplastic elastomer (TPE), but any other material known to the person skilled in the art is also possible.

[0031] With these roofing strips 1, a roof covering can be constructed by means of the method illustrated by figures 2 and 3. An adhesive 3 is applied on the roof support 4, preferably over the whole area to be covered by the roofing strips 1, though this is not essential. The roofing strips 1 are placed one after the other adjacent to each other on the adhesive 3, such that the folded flaps 2 become located back to back. Next, the flaps 2

are brought together to create upstanding seams 5. Finally these seams 5 are sealed, preferably by means of a suitable sealant, such as for example synthetic rubber, polyurethane based glue or self-adherent strips, but any other suitable sealant known to the person skilled in the art may also be used.

[0032] The method of figures 2 and 3 may also be used for constructing a roof covering with upstanding seams starting from flexible roofing strips which are in themselves known in the art, for example roofing strips consisting of a single layer of substantially waterproof material. With such roofing strips, it has to be made sure that an edge portion of the strips remains loose from the roof support 4 to enable the creation of the upstanding seams 5.

[0033] In the roof covering of figure 3, the waterproofing material of adjacent roofing strips 1 no longer overlaps and no longer needs to be mechanically anchored to the roof 4 at the seams 5 between adjacent roofing strips. Consequently, damage to the waterproofing layer and the need for post-treatment of the waterproofing material at the seams to seal up holes after anchoring can be avoided. Furthermore, making an upstanding seam 5 watertight is far less critical than an overlapping seam as in the prior art, so that there is no longer a need to leave the creation of watertight seams between the adjacent roofing strips to highly skilled workers. Still further, with the roofing strips 1 of figure 1, upstanding seams 5 are created in which no additional support parts or fasteners or other parts are needed, which can thus lead a reduction in costs on two factors: the use of parts and the construction time since no additional parts need to be mounted.

[0034] Because of the reduction in construction time for the roof covering of figure 3, this becomes a less critical factor in the overall cost of the roof covering and the use of narrower roofing strips comes into perspective, which would otherwise be avoided in view of the larger number of seams which have to be sealed up. The width of the roofing strips 1 is preferably chosen narrower than 1 m and may even be as narrow as 50 cm or even narrower. The use of such narrow roofing strips 1 has the advantage that workers need to carry less weight, since roofing material is commonly supplied in rolls of a given length, the narrower the roofing material, the less weight. Another advantage is that narrower strips are easier to carry, easier to position, easier to manipulate and easier to fix. Yet another advantage is that the use of fire to seal up the seams 5 can be avoided. As a result, the hazards for the workers and the risk of injuries can be reduced.

[0035] After sealing, the upstanding seams 5 are preferably left standing, but may also be folded down on top of one of the roofing strips 1 like in figure 5. The folding down of the upstanding seams is for example useful at a transition from one roof part to another where these roof parts extend under a given angle with respect to each other, such as is for example shown in figure 4 for a horizontal and a vertical roof part. The ending of the

upstanding seams 5 may be further sealed by means of a small sheet 7 of substantially waterproof material, as shown in figure 6, which may be attached over the ending in any way known to the person skilled in the art.

[0036] The roofing strip 9 of figure 7 has a layered structure comprising a reinforcement layer 12 and a waterproofing layer 10 on top of the reinforcement layer 12. The waterproofing layer 10 has loose flaps 11 on opposite longitudinal sides of the strip 9. These loose flaps 11 extend sideways over substantially the whole length of the strip 9, which is shown in cross-section, and are provided for creating substantially watertight upstanding seams 16 with adjacent roofing strips 9 in the roof covering. The reinforcement layer 12 also has loose flaps 13 which extend sideways over substantially the whole length of the strip 9. The loose flaps 13 of the reinforcement layer 12 are provided for creating an overlap of the reinforcement layers 12 of adjacent roofing strips 9 underneath the substantially watertight upstanding seam 16 formed by the flaps 11 of the waterproofing layers 10.

[0037] The reinforcement layer 12 and the waterproofing layer 10 are attached to each other in between the loose flaps 11, 13 preferably by means of an adhesive, but any other adhering technique known to the person skilled in the art may also be used. An advantageous way of manufacturing the roofing strips 9 can for example be formed by, instead of applying the adhesive over the whole surface of the reinforcement layer 12 as in the prior art, applying it up to a given distance of for example 5 to 10 cm, for example 7 cm, from the lateral edges of the roofing strips. In this way, the loose flaps 11, 13 are formed by parts of the layers where no adhesive is applied. This manufacturing method has the advantage that it is a simple modification of existing manufacturing methods. Alternatively the roofing strip 9 may also be made in other ways. It is also not essential that the layers 10, 12 have the same width: the loose flaps 11 of the waterproofing layer 10 may be narrower or wider than those of the reinforcement layer 12 as long as it is made sure that they are wide enough to be able to create the upstanding seam 16. The flaps 11, 13 on both sides are preferable of substantially equal width, but this is also not essential.

[0038] The reinforcement layer 12 is preferably made in one of the following materials: polyester, polypropylene or glass fibre. The waterproofing layer 10 is preferably made in one of the following materials: ethylene propylene diene monomer (EPDM), chlorinated polyethylene (CPE), polyisobutylene (PIB) or thermoplastic elastomer (TPE). Alternatively, the layers may also be made in any other materials deemed suitable by the person skilled in the art. Possibly, one or more additional layers may be provided underneath the reinforcement layer, in between the reinforcement layer and the waterproofing layer, and/or on top of the waterproofing layer.

[0039] The loose flaps 11 of the waterproofing layer 10 are initially preferably turned over and are preliminarily attached to the top side of the roofing strip 9, though this

is not essential. The preliminary attachment can facilitate and thus speed up the placement of the roofing strips 9 adjacent to each other.

[0040] With the roofing strips 9 of figure 7, a roof covering can be constructed by means of the following method. The roofing strips 9 are placed one after the other adjacent to each other on the roof support 15. An adhesive may or may not be applied between the roof support 15 and the reinforcement layers 12 of the roofing strips 9. In any case, it is made sure that the loose flaps 13 of the reinforcement layers 12 overlap each other. Then, the overlapping loose flaps 13 of the reinforcement layers 12 are attached to each other and to the roof 15, for example by means of suitable fasteners 14. Next, the flaps 11 of the waterproofing layers 10 are brought together to form upstanding seams 16 above the overlapping loose flaps 13 of the reinforcement layers 12 and the seams 16 are sealed, preferably by means of a sealant as mentioned above with respect to the roof covering of figure 3. The advantage is that since the waterproofing layer flaps 11 are loose from the reinforcement layer flaps 13, the anchoring of the roofing strips 9 to the roof 15 can be effected while the waterproofing layer flaps 11 are moved out of the way, as shown in figure 8. In this way, damage to the waterproofing layer 10 and consequently post-treatment of the waterproofing layer 10 to seal up holes after anchoring can be avoided.

[0041] The roofing strip and the method according to figures 7-9 furthermore have the same advantages as have been described with respect to figures 1-3.

Claims

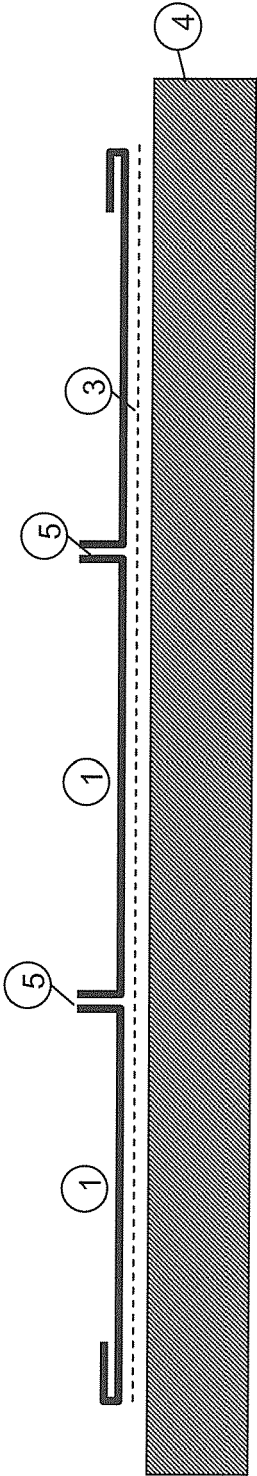
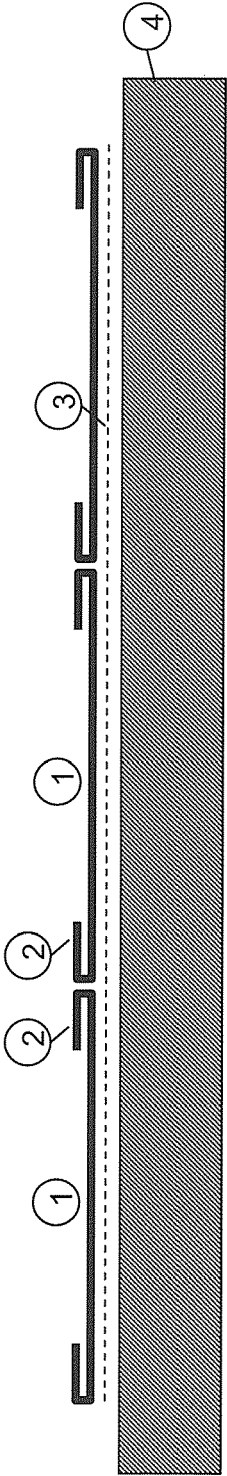
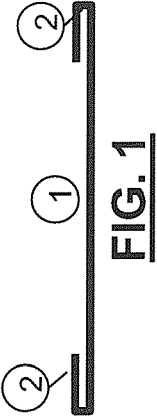
1. A flexible roofing strip (1) for application in a roof covering, the roofing strip being made in a substantially waterproof material, **characterised in that** the roofing strip (1) has folded flaps (2) on opposite longitudinal sides for creating substantially watertight upstanding seams (5) between adjacent roofing strips (1).
2. A flexible roofing strip according to claim 1, **characterised in that** the folded flaps (2) are preliminarily attached to the top side of the roofing strip (1).
3. A flexible roofing strip according to claim 1 or 2, **characterised in that** the roofing strip (1) is not wider than 1 m.
4. A flexible roofing strip according to any one of the claims 1-3, **characterised in that** the substantially waterproof material is one of the following materials: ethylene propylene diene monomer, chlorinated polyethylene, polyisobutylene or thermoplastic elastomer.
5. A flexible roofing strip (9) for application in a roof

covering, the roofing strip having a layered structure comprising a reinforcement layer (12) and a waterproofing layer (10) above the reinforcement layer, **characterised in that** the waterproofing layer (10) has loose flaps (11) on opposite longitudinal sides of the strip (9) which extend sideways over substantially the whole length of the strip and are provided for creating substantially watertight upstanding seams (16) between adjacent roofing strips (9).

6. A flexible roofing strip according to claim 5, **characterised in that** the reinforcement layer (12) also has loose flaps (13) on opposite longitudinal sides of the strip (9) which extend sideways over substantially the whole length of the strip and are provided for creating overlaps of the reinforcement layers (12) of adjacent roofing strips (9) underneath said upstanding seams (16). 5
 7. A flexible roofing strip according to claim 5 or 6, **characterised in that** the reinforcement layer (12) and the waterproofing layer (10) are attached to each other in between the loose flaps (11, 13) by means of an adhesive. 10
 8. A flexible roofing strip according to any one of the claims 5-7, **characterised in that** the loose flaps (11) of the waterproofing layer (10) are turned over and are preliminarily attached to the top side of the roofing strip (9). 15
 9. A flexible roofing strip according to any one of the claims 5-8, **characterised in that** the roofing strip (9) is not wider than 1 m. 20
 10. A flexible roofing strip according to any one of the claims 5-9, **characterised in that** the waterproofing layer (10) is made in one of the following materials: ethylene propylene diene monomer, chloro polyethylene, polyisobutylene or thermoplastic elastomer. 25
 11. A roofing strip according to any one of the claims 5-10, **characterised in that** the reinforcement layer (12) is made in one of the following materials: polyester, polypropylene or glass fibre. 30
 12. Method for constructing a roof covering by means of a plurality of flexible roofing strips (1; 9) each comprising at least a waterproofing layer made in a substantially waterproof material with flaps (2; 11) on opposite longitudinal sides of the roofing strip for creating substantially watertight upstanding seams (5; 16), **characterised in that** the method comprises the steps of: 35
- a) attaching the roofing strips (1; 9) adjacent to each other on a roof, such that the flaps (2; 11)

at the longitudinal sides of adjacent roofing strips become located back to back and form an upstanding seam (5; 16),
b) sealing the upstanding seams (5; 16).

13. Method according to claim 12, **characterised in that** step b) comprises applying a suitable sealant. 40
 14. Method according to claim 13, **characterised in that** one of the following sealants is used: synthetic rubber, polyurethane based glue or self-adherent strips. 45
 15. Method according to any one of the claims 12-14, **characterised in that** step a) comprises applying an adhesive (3) underneath the whole area of the roofing strips. 50
 16. Method according to any one of the claims 12-14, **characterised in that** the roofing strips (9) further comprise a reinforcement layer (12) underneath the waterproofing layer (10), the reinforcement layer (12) having loose flaps (13) on opposite longitudinal sides of the strip (9) which extend sideways over substantially the whole length of the strip, and **in that** step a) comprises the following steps: 55
- c) placing the roofing strips (9) adjacent to each other on a roof, such that overlaps of the reinforcement layers (12) of adjacent roofing strips (9) are created by means of the loose flaps (13) of the reinforcement layers (12),
 - d) attaching the overlapping flaps (13) of the reinforcement layers (12) to the roof by means of fasteners (14),
 - e) placing the flaps (11) of the waterproofing layers (10) of adjacent strips back to back to form upstanding seams (16) above said overlaps.



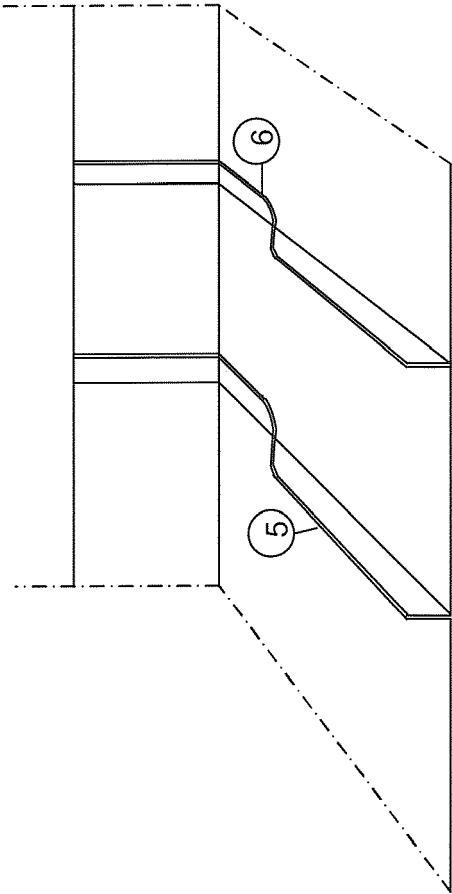


FIG. 4

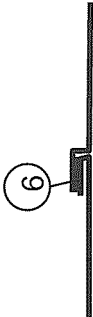


FIG. 5

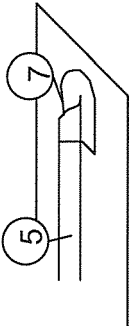


FIG. 6

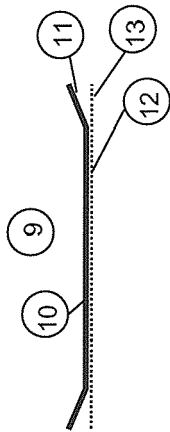


FIG. 7

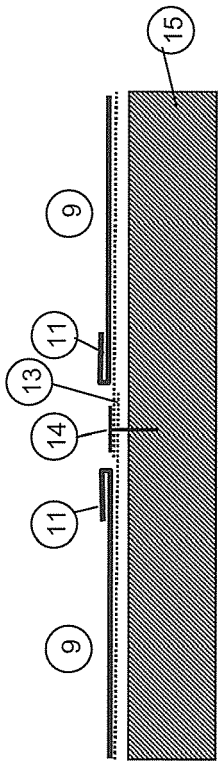


FIG. 8

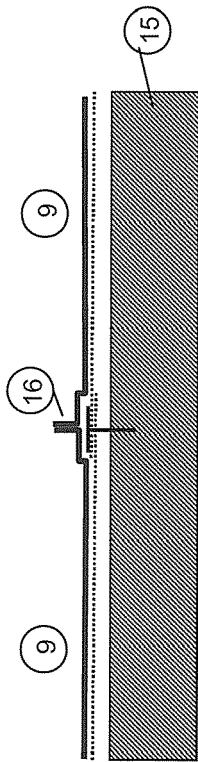


FIG. 9



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 10 0137

DOCUMENTS CONSIDERED TO BE RELEVANT			
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 28 June 2007	Examiner Vratsanou, Violandi
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 07 10 0137

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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28-06-2007

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REFERENCES CITED IN THE DESCRIPTION

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