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(54) Flashing for sealing a roof-penetrating building structure to the underroof structure

(57) The flashing members (1), (2), (3) comprise layers (w), (z) permanently connected to each other into a single structural component. The exterior layer (z) is a tight and rigid structure forming the shape of a flashing. The interior layer (w) is made of any flexible and waterproof material. The interior layer (w) has a surplus of material in relation to the exterior layer.

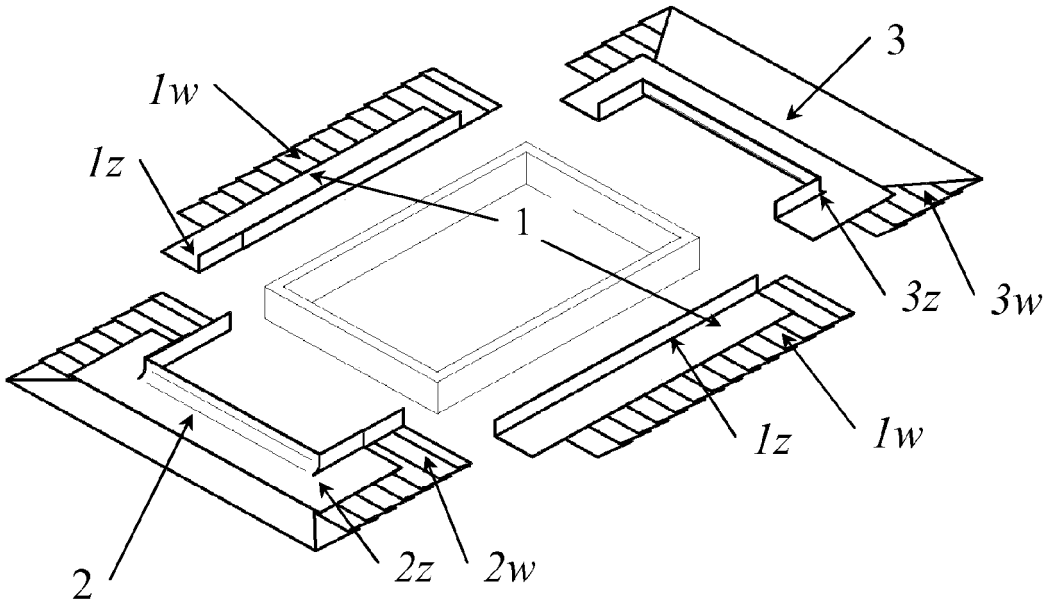

Fig. 1

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Description

[0001] The invention concerns a flashing, which comprehensively seals the connection of any roof-penetrating building structure, for instance a roof window frame, with the underroof structure.

[0002] A solution of roof window sealing with a shield comprising a water-tight covering encircling the aperture, in which the shield walls in the area of the aperture are stretched perpendicularly, and the outer walls in parallel to the roof slope is known from DE 34 42 276. A disadvantage of this solution is primarily the impossibility of tight fit of the shield to the irregular surface of the roof structure.

[0003] Also a solution of sealing the connection of roof-penetrating members to its exterior layer with members of a thin-walled, rigid and deformable material is known from DE 25 54 341. The original shape of the sealing in the form of a flat circular sector with coaxial arc-wise edges, after straightening the inner circular edge causes the formation of a surplus of material at the outside of the ring. This surplus is used, by mechanical deformation, to fit the sealing to the irregular shape of the roof exterior surface. This solution protects only against typical precipitation, but it does not ensure tightness and thermal insulation in the underroof structure layer, and moreover its assembly is labour intensive.

[0004] Also a building element is known from PCT/DK95/00157 (WO 95/28537), which in one of its embodiments consists of a uniform collar or a rim element and is fitted with foil sections basically in parallel to the roof covering. The basic purpose and function of these sections appears to be the sealing of connection of the roof covering to the roof-penetrating structure, by placing them adjacent to the insulating foil of the roof covering. This solution can be effective in many cases. However, it requires generally continuous and rather flat contact surface. However, a typical design of this part of roof covering, with a foil and battens at the exterior, does not meet this requirement without additional work consisting in partial dismantling, or at least loosening of batten fastening in the part of roof covering intended for the building element concerned. The failure to perform these operations leads to the formation of insulation discontinuity areas near battens, thus increasing the risk of moisture penetration into the interior roof covering, and at the same time enables an uncontrolled flow of air and heat losses.

[0005] Also an attachment colar for tight connection of roof-penetrating building structures, with an exterior weather-shielding membrane and with battens seated on the membrane is known from PL-P-338 074 (WO 9902799). The attachment collar consists of four mutually connected members, each being provided with edge flanges-the interior one, for fastening to the side face of the roof-penetrating structure member - and the exterior one, encompassing the battens and abutting against the membrane between the battens.

[0006] The collar members are made of segments of a flexible and water-proof material, in addition the members to be set transversely to battens are longer than the building structure members to which they are going to be connected, and are bent, for instant into folds, to adjust the length of the collar interior side edge to the length of the perimeter of the building structure for which the collar is intended. After the interior edge of the attachment collar has been mounted along the external perimeter of the building structure, the folds at the exterior edge side will unfold, so that they will encompass the battens located over the exterior membrane and adjoin the membrane between the battens.

[0007] Folded side members of the attachment collar are protected against unfolding or parting by backing with two paper strips, in addition one strip is stuck along the interior side edge of the collar member and thus it stabilises the length of the collar interior side edge, while the other paper strip is stuck at a some distance from the exterior side edge and protects folds against parting during transport and assembly of the collar. After the collar interior side edge has been connected to the building structure, the other strip should be torn apart, so that the folds at the collar exterior perimeter side can unfold freely.

[0008] The interior side edge of the attachment collar, protected with the glued-on paper strip is not durable enough. A damage to the strip during transport or erection, and unfolding of folds makes the collar unsuitable and requires it to be manually refolded while connecting it to the building structure seated in the roof. Making the attachment collar with side members folded or otherwise bent to adjust their length to the length of the building structure members to which they are to be connected requires additional time and effort and expensive folding equipment to be used.

[0009] A disadvantage of all above described solutions is the need for at least double approach to the erection of sealing devices of the connection of the roof-penetrating structure to the roof slope. Both the first sealing stage with a membrane, and the second stage in the form of an external attachment collar, require the use of special collar solutions to ensure tightness of this insulation layer.

[0010] The purpose of the invention is to implement a flashing comprehensively sealing the connection of a roof-penetrating building structure with the roofing structure, easy to install and effectively performing the function of simultaneous sealing of two layers of roofing, that is roof covering and the internal insulating membrane.

[0011] The flashing basically has the shape of a frame encircling the structure mounted in the roof, it consists of four members connected to each other during erection, which have an interior side edge, secured to the exterior of the roof-penetrating structure member and an exterior side edge, encompassing the battens and abutting against the membrane between the battens.

[0012] A distinctive feature of the invention are flashing members consisting basically of two sealing layers, in addition the purpose of the interior layer is to connect tightly the underroof structure, most often an insulating

membrane, to the exterior perimeter of the building structure. The interior layer is made of any flexible and waterproof material.

[0013] However, the interior layer of the flashing performs a typical function of external flashing, i.e. insulating from weather and sealing of the connection of the roof-penetrating structure to the roof covering.

[0014] Both layers are advantageously permanently connected to each other forming one structural component, in addition the method of connection should ensure the possibility of free separate shaping of the interior layer. It is ensured by making this layer wider than the exterior layer. It causes that an additional belt of material is formed, which allows it to be freely fitted to the roof structure. It is essential in particular near battens, where the surplus of internal layer material allows the insulation discontinuity areas to be sealed, and thus the risk of moisture penetration into the inner roof covering to be reduced and uncontrolled air flow and heat losses prevented.

[0015] The surplus of material is outside the contour of the exterior layer in a direction diverting basically perpendicularly from the line of flashing interior side edge bend. Alternatively, the interior layer of the flashing members has a surplus of material in the flashing circumferential direction, basically perpendicular to battens, initially formed by folding or pleating.

[0016] Advantageously, neighbouring flashing members are connected to each other by the lap technique. The lap joint of the members is made separately for each layer.

[0017] In addition, individual flashing members may have the third layer permanently connected to the membrane layer, basically by gluing, in the area of the interior side edge of the flashing for securing it to the roof-penetrating structure. It is essential in particular for roof windows, where this layer performs the function of thermal insulation in the crucial place where the window frame is connected to the roof structure.

[0018] An advantage of this solution is its simplicity and making the erection more efficient and much shorter as compared to the traditional double stage sealing method, where the collar sealing the inner layer and the collar sealing the connection of the roof covering to the roof-penetrating structure are installed separately.

[0019] The solution according to the invention is explained in embodiment examples in the drawings. The flashing according to the invention in the first embodiment example comprises four components, shown in fig. 1 taken apart prior to the erection. The shape the flashing takes after the assembly into a closed circuit is shown in fig. 2. To perform the sealing function the flashing needs to be secured to the roof covering and to the exterior face of the roof-penetrating structure. The complete flashing seated in the roof window frame is shown in fig. 3, and fig. 4 shows a cross-section through the flashing axis of symmetry, ready for erection.

[0020] Each flashing member consists of two layers permanently connected to each other and constituting one structural component: the interior layer **w**, after mounting on the roof adjacent to the underroof structure and the exterior layer **z** placed on battens.

[0021] The function of the exterior layer is to seal the connection of the roof-penetrating structure to the roof covering, whereas the interior layer performs the same role for sealing the connection of this structure to the membrane or foil sealing the interior structure of the roof covering. It must be possible to form and fit separately each of the layers, which is ensured by connection, advantageously with glue, only along the interior edge **V** and the part of adjacent exterior edge **H** of the flashing. It leaves the possibility of forming and fitting the interior layer **w** to the insulating membrane comprising the interior part of the roof covering.

[0022] The exterior layer **z** is advantageously made of the roof covering or sheeting material, while the interior layer is made of any flexible and waterproof foil or membrane. The general principle accepted for engineering and erection of the flashing is, independent for each layer, a lap joint of neighbouring members in a direction of the roof pitch. It means that within the layer, side members **1** partially overlap the bottom member **2**, and the top member **3** overlaps the side members.

[0023] Flashing members **1**, mutually symmetric, with a known shape and function performed, have the interior layer **1w**, the shape and size of which depends on the exterior layer **1z**, in addition the interior layer is shifted in relation to the exterior layer towards the rise of the roof by a length necessary for lap connection to the interior layer of the bottom flashing member **3** - fig.1. On the side edge **1a** perpendicular to battens, due to the irregularity of the roof covering shape resulting from the batten application, insulation discontinuity areas may occur. To ensure the possibility of tight fit of the collar to such a roof covering structure, an additional free surface of the interior layer **1w** is needed, which, most often secured with stitches, may be used for sealing in difficult places - fig.3. It is performed by making the interior layer wider in a direction parallel to the battens and the use of folding and pleating on the section of layer connection, in a direction perpendicular to the battens. It causes that a surplus of interior layer material is formed, which allows it to be freely fitted to the roof structure. It is essential in particular near battens, where this surplus allows the insulation discontinuity areas to be sealed, and thus the risk of moisture penetration into the inner roof covering reduced, and uncontrolled air flow and heat losses prevented.

[0024] The shape of the interior layer **2w** of the bottom member **2** is fitted to the known shape of the exterior layer **2z**, in addition this member requires the material allowance to be used, as in the case of the side member **1**. The principle of forming the interior layer **2w** to obtain the required surplus of material for free shaping of the membrane in the places of discontinuities and the principle of connecting the layers is identical as for the side member **1**. Dimensions of individual layers of member **2**

in a direction of the roof pitch ensure an adequate allowance for lap connection to corresponding layers of roof covering, in addition the interior layer **2w** has a surplus of material in a direction of the rise of the roof, in the places of lap connection to side members **1**, with the dimension advantageously equal to the shift of the interior layer **1w** in side members **1**.

[0025] It will not be necessary to use a surplus of the interior layer **2w** of the bottom member in the form of folding or pleating if the collar dimension in a direction of the roof pitch basically perpendicular to the battens is so small that it fits between the batten span. Thus there will be no need to seal the places of insulating membrane discontinuities.

[0026] The shape and size of the interior layer **3w** of the top member **3** are fitted to the known shape of the exterior layer **3z** of this member. As in the case of members **1** and **2**, this one requires a material allowance to be applied in a direction parallel to the battens and to be folded or pleated (excluding the special case described for member **2** in a direction perpendicular to the battens). The principle of forming the interior layer **3w** to obtain the required material allowance to freely shape the membrane and the principle of connecting the layers is identical as in the case of side member **1**. The top member **3** does not require the interior layer **3w** allowance to be used for lap connection of individual flashing members, while the dimensions of individual layers of member **3** in the direction of the roof rise ensure an adequate material allowance for lap connection with the corresponding layers of the roofing.

[0027] The flashing according to the invention in the second embodiment example, apart from members **1**, **2** and **3**, as in the first embodiment example, is fitted with an additional layer **x**, secured to its interior layer **w**, going along the whole flashing perimeter and performing the thermal insulation function. Basically it adjoins the interior edge **V** of the flashing members. The width of this layer may be fitted as needed, however it should be selected so that it encompasses most of the interior edge of the flashing and advantageously at least the same width of the surface adjoining the roof. It is a particularly advantageous solution, improving the thermal resistance in the crucial area of connection of the roof slope to the roof-penetrating structure. The thermal insulation material may be any, advantageously porous, flexible and easily compressible structure with good thermal insulation properties.

Claims

1. Flashing for sealing a roof-penetrating structure to the underroof structure, with the shape of a frame encircling the structure seated in the roof, comprising members overlapping each other, **characterised in that** the flashing members (1), (2), (3) consist of layers (w), (z), permanently jointed together into a single structural component.

2. Flashing as claimed in claim 1, **characterised in that** the exterior layer (z) is a tight and rigid structure forming the flashing shape.

3. Flashing as claimed in claim 1, **characterised in that** the interior layer (w) is made of any flexible and waterproof material.

4. Flashing as claimed in claim 1, **characterised in that** the interior layer (w) has a material surplus in relation to the exterior layer.

5. Flashing as claimed in claim 4, **characterised in that** the allowance is outside the contour of the outer layer (z) in a direction diverting basically perpendicularly from the flashing inner edge bend line.

6. Flashing as claimed in claim 4 **characterised in that** the interior layer (w(of flashing members (1), (2), (3) has a surplus material in the flashing circumferential direction, basically perpendicular to battens, initially formed by folding or pleating.

7. Flashing as claimed in claim 1 **characterised in that** the neighbouring flashing members are connected to each other by overlapping technique.

8. Flashing as claimed in claim 7 **characterised in that** the lap connection of flashing members is separate for each layer.

9. Flashing as claimed in claim 1, **characterised in that** in the part adjoining the roof-penetrating structure, it has a thermal insulation layer (x) permanently secured to the interior edges of flashing members.

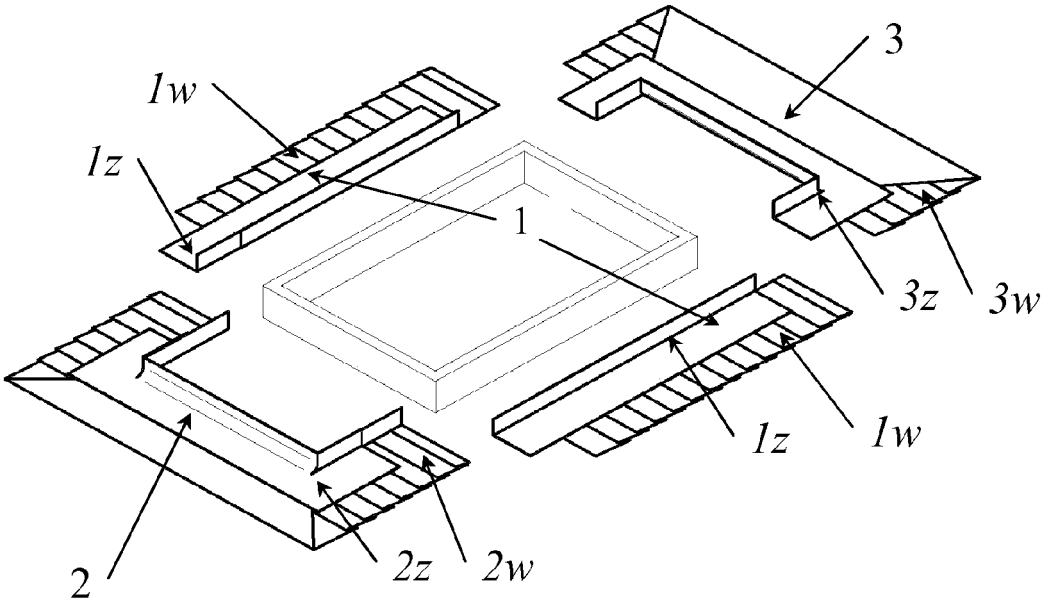

Fig. 1

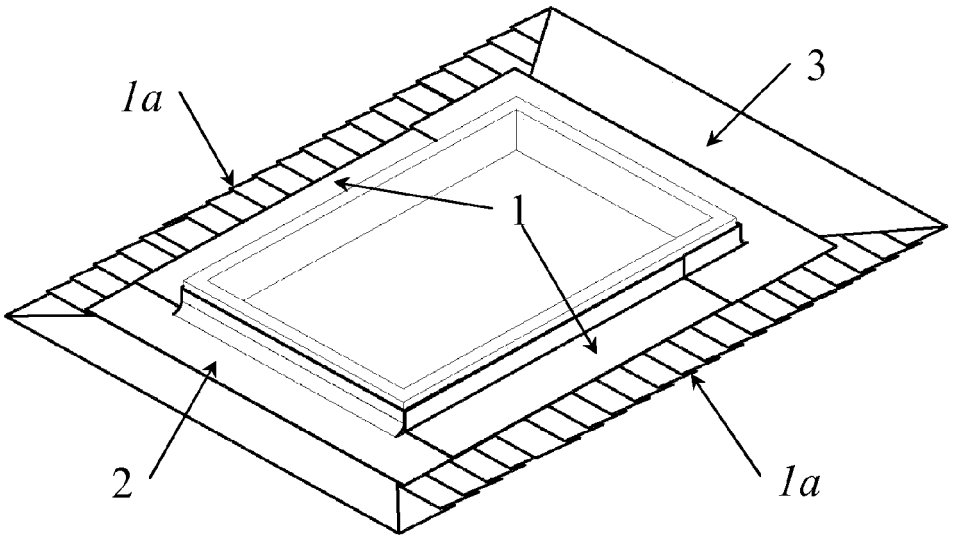

Fig. 2

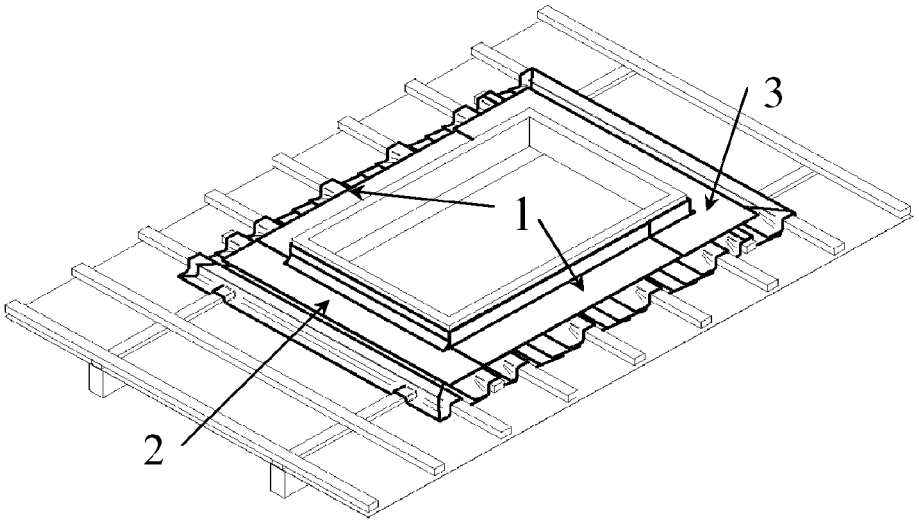

Fig. 3

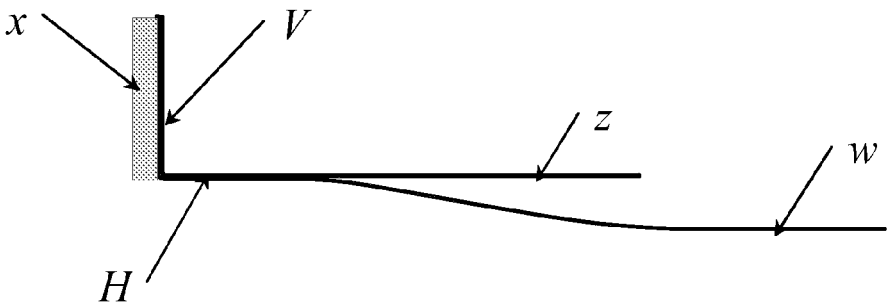

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 11 16 1011

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	31 August 2011	Demeester, Jan

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