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(54) **Sealing roof flashing for sealing the joint between roof-penetrating structure and roofing material, with penetration of the flashing**

Eindeckrahmen für Abdichtung zwischen der durch das Dach eindringenden Konstruktion und dem Eindeckmaterial, mit Durchdringung des Eindeckrahmens

Raccord d'étanchéité pour l'étanchéification de la jonction des éléments de couverture du toit et la construction pénétrant à travers le toit, avec pénétration du raccord d'étanchéité

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WO-A1-99/51835
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Description

[0001] The present invention relates to a roof flashing used for sealing the joint between the roof-penetrating structure and roofing material, wherein the flashing substantially consists of the top member, the bottom member and the side members and is equipped with means protecting against weather conditions the area where the oblong element with relatively small cross-sectional area, e.g. a bar or electric power cable, passes through the said flashing. Most often such sealing is required when electric conductors from outdoor-mounted electric devices, e.g. roller shutter, awning, or exterior roller blind, pass through the roof to indoor parts of electric system. An efficient sealing of such passage is difficult, particularly in the case of relatively thin roof coverings like flake-type or other similar roofing material, where there are no sufficiently wide gaps between individual elements of the covering. This is particularly applicable to non-demountable roof coverings, e.g. flat sheets or roofing felt, where any gaps usually constitute a potentially leaky areas.

[0002] An example of a guide-member for a cable penetrating a roof is known from US2004/244827.

[0003] From previous solutions the construction and assembly method of roof flashing is known in which the plastic sealing compound bonded to underside of the bottom member allows bonding the flashing top to the roofing material and ensures the joint tightness. The assembly of roof flashing starts in putting the bottom element in place and fitting the apron made of elastic material. The remaining elements are mounted in the order from bottom to top in such a manner that each next element overlaps the previous one. In some solutions the side members can be composed of more than one part, depending on the length of the roof-penetrating structure. In most cases such members are secured to the roof opening frame and to the battens. Due to joint tightness requirements, the auxiliary metal sheet strips are used for fixing the roof flashing to the battens. The assembly finishes with mounting of top element which requires additional fixing. In known solutions used to date this top element is fixed directly to the frame by nails or screws. Such solutions are impractical for the reason that flashing elements are flat, without any embossment, positioned parallel to the frame and pressed against it, so there is no possibility to install a power cable between side or top/bottom element of the roof-penetrating structure and side or top/bottom element of roof flashing, respectively. In such solutions the cable supplying the electric device located outside the roof window frame (basically the roof-penetrating structure) cannot be installed easily and without breaking the continuity of roof covering layer, therefore both the window structure and roof covering are exposed to unfavourable weather conditions.

[0004] The methods are known on the market for passing the feeder cable through the structure of roof window or flashings around it, wherein one of roof window flashing elements have a special hole situated in place relatively sheltered from weather conditions. In order to ensure tightness, in most cases special sealing elements, e.g. made of rubber, are used. Sometimes a sealing compound is used for this purpose. These solutions are easy in assembly, but they also have a disadvantage consisting in that the properties of sealing compound deteriorate with time due to ageing phenomena in varying atmospheric conditions, leading to compound breakages and unsealing of the joint.

[0005] Furthermore, there are also solutions known on the market, disclosed also in patent specification DE 19600949, wherein the roof window rolling shutter roll-up mechanism may be operated and driven by hand or by using electric energy, depending on the embodiment. Such solutions also have a weak point consisting in that both the electric feeder cable and the bar or a set of articulated bars must pass through the roof window frame, thus disturbing or even damaging the material structure and causing a potential leakage at the place of penetration through roof window frame.

[0006] In every described solution known the cable supplying the driving mechanism with electric power is located in sub-covering layer of the roof structure, running near the roof window or inside the structure of roof window frame and then to the source of electric power. However, it is always necessary to make an additional through-hole disturbing the structure of flashing that seal the roof structure.

[0007] The purpose of the invention is to ensure protection against weather conditions of the flashing-type joint of the roof-penetrating structure with the roof covering material, when it becomes necessary to pass an oblong element with relatively small cross-sectional area, e.g. a bar or an electric cable, through the flashing.

[0008] A sealing roof flashing according to the preamble of claim 1 is known from WO99/51835.

[0009] A distinctive feature of the invention defined by claim 1 is that in the flashing that join the roof-penetrating structure with roof covering material an additional cheap and easy to install roof-penetrating element is used, preferably made of steel sheet with suitably formed shape and ensuring tight passage of electric power supply cable coming from the electric device mounted outside the roof-penetrating structure or installed in the roof slope and going to indoor part of electric system. Such penetrating element may form a part of complete flashing set or may be added to the standard flashing set as an additional element, so the proposed solution may be used during installation of the flashing or the penetrating element may be retrofitted to the existing flashing structure. The proposed solution is not limited to sealing of just electric cable going through the roof structure, but can also be employed for efficient protecting of the area in which any oblong element with relatively regular shape and small cross-sectional area goes through the flashing. Flexible elements like electric cables, ropes etc. adapt their shape to the guiding profile of the roof-penetrating element themselves, whereas stiff elements like steel and other

metal wires require to be pre-shaped to fit to the guiding profile shape. If a stiff element with known shape has to go through the flashing, it is possible to fabricate the guiding channel of required shape earlier at the production stage.

[0010] The roof-penetrating element can be lap mounted between any two neighbouring members of roof flashing. The shape of said roof-penetrating element ensures that the basic function of flashing is performed in the place where this element is installed. The roof-penetrating element is preferably situated between side members of the flashing or in the point where the top member of the flashing joins the side member. It is also possible to install it at the point where the side member of the flashing joins the bottom member. The design of roof-penetrating element ensures that it can be mounted regardless the mounting sequence of the flashing members. This is a significant advantage of proposed solution, since it is possible to attach the roof-penetrating element to any standard flashing completely mounted on the roof with no loss of tightness.

[0011] The roof-penetrating element substantially features with the U-section shape, preferably bent from a metal sheet, with the angle between legs corresponding to the shape of adjacent flashing elements. Preferably, this angle is usually close to the right one. The horizontal leg of roof-penetrating element profile, substantially positioned in the roof plane after assembly, is lap joined with adjacent flashing elements, whereas the vertical legs are also lap joined with top surfaces of adjacent flashing elements. For the purposes of this specification, the term "horizontal leg" shall mean the leg parallel to the roof plane, and the term "vertical leg" shall mean the leg perpendicular to the roof plane.

[0012] The roof-penetrating element of the flashing has the profiled embossment in the form of half-open guiding channel which may guide the electric cables supplying the external devices mounted on the roof slope or on external side of roof window or the roof-penetrating structure. The cable or other element going through the roof in the guiding channel is pressed down during the assembly by the neighbouring flashing elements. The roof-penetrating element allows for tight penetration of a cable or other oblong, elastic or flexible element through the flashing and also allows guiding it from underside of the roof towards outside of the roof without breaking the continuity of roof covering sealing layer. The entire system will remain tight provided it is mounted on a sloping rooftop, due to typically lapped joints and lack of additional seals between elements of the flashing.

[0013] The guiding channel can be formed as the embossment in horizontal leg and/or vertical legs. The direction of guiding channel in the part where the cable goes out from the roof is preferably parallel to the bending line between the vertical leg and horizontal leg. Such limitation for the cable direction results from mounting the roof-penetrating element on a sloping roof and protects against leakages to the inside of roof covering structure, assuming typical weather conditions. From this point of view the most favourable solution is such that the guiding channel is formed in vertical leg having no direct contact with down flowing water. In such embodiment the internal outlet of guiding channel leading to under-roof space is, in most cases, perpendicular to the plane of horizontal leg. However, depending on further direction of the cable inside the roof structure, this angle may be different. The guiding channel between internal outlet and the external outlet should feature with guiding curve in the shape of gentle arc having the radius not less than the minimum bending radius of dedicated element going through the flashing.

[0014] The flashing is mounted in a typical way, i.e. the bottom member is fastened first, then side members and the roof-penetrating element with the cable inserted into guiding channel, and finally the top member.

[0015] The advantage of this solution is that it is simple and eliminates the points where the tightness of roof covering layer may deteriorate. Also, a significant advantage is that the assembly work necessary for correct and tight placement of cables is much easier and efficient, since it is no longer necessary to make penetrations (punctures) through the sealing layer, therefore a significant savings in time and labour can be obtained. Further, the possibility to replace the feeder cables, if necessary, with no need to dismantle the roof covering and breaking the tightness of covering layer, is an unquestionable merit of proposed solution.

[0016] **In the proposed embodiment,** the roof flashing according to the invention is composed of the following parts, listed here according to the assembly sequence: the bottom member (1), symmetrically located side members (2), roof-penetrating element (3) and top member (4). The expanded view of roof-penetrating element lap mounted between side member (2) and top member (4) is shown in Fig. 1, whereas the same flashing completely assembled is shown in Fig. 2. Fig. 3 shows structural details of roof-penetrating element (3), its position in the entire assembly and the way how the cable (5) goes through the roof from outside. Finally, Fig. 4 shows the roof-penetrating element (3) with the cable (5) located inside the guiding channel (31).

[0017] The roof-penetrating element (3) lap mounted between the side member (2) and top member (4) has the cross-sectional profile in the form of asymmetrical U-shape, preferably bent from metal sheet. The lap mount means that the roof-penetrating element is placed on the upper part of side member (2), and then the upper member (4) is placed on the upper part of roof-penetrating element (3) and, for the sake of tightness, simultaneously on the upper part of side member. The horizontal leg (32) of roof-penetrating element (3) is parallel to the surface of side member (2) and is pressed against this surface by corresponding surface of the top member. At the same time the vertical leg (33) contacts with vertical walls of adjacent flashing elements, i.e. the side member (2) and the top member (4). The leg opposite the vertical leg (33)

forms the edge used for standing seam joint with the roof covering and performs the same function as the corresponding part of the side member (2). In some applications this leg is superfluous and the roof-penetrating element has the form of an angle with one leg (33) vertical.

[0018] The roof-penetrating element (3) of the flashing has the profiled embossment in the form of half-open guiding channel (31) formed in the vertical leg (33); the said channel can guide the electric cable (5) going to external devices mounted on the roof slope or on external side of roof window. After mounting of the roof-penetrating element (3), the adjacent vertical leg of the side member (2) closes the guiding channel (31). The direction of guiding channel (31) in the area of external outlet (34) through which the cable (5) goes outside the roof is parallel to the bending line between the vertical leg (33) and horizontal leg (32), which means that after assembly of the flashing on the roof this direction is the same as the direction of the roof slope. A part of the guiding channel (31) in the area of internal outlet (35) through which the cable (5) goes inside the roof is perpendicular to the surface of horizontal leg (32); such angle of internal outlet (35) causes that the cable (5) goes out perpendicularly to the roof covering surface. However, other angles may be used as well, depending on specific application needs. The guiding channel (31) between the area of external outlet (34) and the area of internal outlet (35) is formed as a gentle arc with radius corresponding to the minimum bending radius of the cable (5) which penetrates the flashing.

Claims

1. Sealing roof flashing used for sealing the joint between a roof-penetrating structure and sloped roof covering material, wherein the flashing substantially consists of a top member (4), a bottom member (1) and side members (2), and the flashing has an additional roof-penetrating element (3) located between any of its members, **characterized in that** the flashing is equipped with means protecting against weather conditions the area where in use an oblong element (5) with relatively small cross-sectional area, such as an electric cable, goes through said flashing, and **in that** the additional roof-penetrating element (3) is so shaped that the cable (5) or other oblong element can tightly penetrate through the flashing.

2. Sealing roof flashing according to claim 1, **characterized in that** the shape of roof-penetrating element (3) allows for lap joining of this element with adjacent members of this flashing.

3. Sealing roof flashing according to claim 2, **characterized in that** it is made of substantially U-shaped section with horizontal leg (32) which after assembly is substantially positioned in the roof plane and remains in contact with bottom parts of adjacent members of the flashing, and the vertical leg (33) remains in contact with preferably vertical walls of adjacent members of the flashing, i.e. side member (3), top member (4), or bottom member (1).

4. Sealing roof flashing according to claim 2, **characterized in that** it is made of substantially angle-shaped section with horizontal leg (32) which after assembly is substantially positioned in the roof plane and remains in contact with preferably vertical walls of adjacent members of the flashing, i.e. side member (3), top member (4), or bottom member (1).

5. Sealing roof flashing according to claim 1, **characterized in that** the shaped half-open channel (31 for guiding the cable (5) is formed in horizontal leg (32) or vertical leg (33).

6. Sealing roof flashing according to claim 5, **characterized in that** the direction of guiding channel (31) in the area of external outlet (34) is preferably parallel to the bending line between the vertical leg (33) and the horizontal leg (32).

7. Sealing roof flashing according to claim 6, **characterized in that** the guiding channel (31) is formed in the vertical leg (33).

8. Sealing roof flashing according to claim 6, **characterized in that** the guiding channel (31) is formed in the horizontal leg (32).

9. Sealing roof flashing according to claim 7, **characterized in that** the direction of guiding channel (31) in the area of internal outlet (35) is preferably perpendicular to the surface of horizontal leg (32).

10. Sealing roof flashing according to claim 9, **characterized in that** the guiding channel (31) between the area of external outlet (34) and the area of internal outlet (35) has the guiding curve in the form of an arc with the radius not less than the minimum bending radius of dedicated element passing through the flashing.

Patentansprüche

1. Flansch mit Durchführung, zum Abdichten einer Konstruktion, die ein Dach mit einer Schrägdacheindeckung durchdringt, bestehend grundsätzlich aus einem oberen Element (4), einem unteren Element (1) und Seitenelementen (2), wobei der Flansch ein zusätzliches Durchführungselement (3) aufweist, welches zwischen seinen beliebigen Elementen untergebracht ist, **dadurch gekennzeichnet, dass** der

Flansch Schutzmittel aufweist, welche die Durchführungsstelle durch den Flansch eines länglichen Elementes mit einem relativ geringen Querschnitt, insbesondere eines Elektrokabels, vor Witterungseinflüssen schützen und dass das zusätzliche Durchführungselement (3) eine Form aufweist, die eine dichte Durchführung eines Kabels (5) oder eines anderen länglichen Elementes durch den Flansch erlaubt.

2. Flansch nach Anspruch 1, **dadurch gekennzeichnet, dass** das zusätzliche Durchführungselement (3) eine Form aufweist, die seine überlappende Montage mit benachbarten Elementen des Flansches gewährleistet.

3. Flansch nach Anspruch 2, **dadurch gekennzeichnet, dass** er insbesondere die Form eines U-Profils aufweist, dessen horizontaler Schenkel (32), welcher im montierten Zustand grundsätzlich in Dachebene positioniert wird, am Boden der benachbarten Flanschelemente anliegt, und der vertikale Schenkel (33) an den vorteilhaft vertikalen Wänden der benachbarten Flanschelemente anliegt - des Seitenelementes (2), des oberen Elementes (4) oder des unteren Elementes (1).

4. Flansch nach Anspruch 2, **dadurch gekennzeichnet, dass** er insbesondere die Form eines Winkelprofils aufweist, dessen horizontaler Schenkel (32), welcher im montierten Zustand grundsätzlich in Dachebene positioniert wird, an den vorteilhaft vertikalen Wänden der benachbarten Flanschelemente anliegt - des Seitenelementes (2), des oberen Elementes (4) oder des unteren Elementes (1).

5. Flansch nach Anspruch 1, **dadurch gekennzeichnet, dass** er in seinem horizontalen Schenkel (32) oder in seinem vertikalen Schenkel (33) einen profilierten halboffenen Führungskanal (31) für das Kabel (5) aufweist.

6. Flansch nach Anspruch 5, **dadurch gekennzeichnet, dass** die Richtung des Führungskanals (31) im Bereich des Außenaustritts (34) vorteilhaft parallel zur Biegekante des vertikalen Schenkels (33) gegenüber dem horizontalen Schenkel (32) ist.

7. Flansch nach Anspruch 6, **dadurch gekennzeichnet, dass** der Führungskanal (31) im vertikalen Schenkel (33) geformt ist.

8. Flansch nach Anspruch 6, **dadurch gekennzeichnet, dass** der Führungskanal (31) im horizontalen Schenkel (32) geformt ist.

9. Flansch nach Anspruch 7, **dadurch gekennzeichnet, dass** die Richtung des Führungskanals (31) im Bereich des Innenaustritts (35) vorteilhaft senkrecht zur Fläche des horizontalen Schenkels (32) ist.

10. Flansch nach Anspruch 9, **dadurch gekennzeichnet, dass** der Führungskanal (31) zwischen dem Bereich des Außenaustritts (34) und des Innenaustritts (35) eine Führungskurve in Form eines Bogens aufweist, dessen Radius nicht kleiner als der minimale Biegeradius des den Flansch durchdringenden dedizierten Elementes ist.

Revendications

1. Raccordement avec passage, étanchant l'assemblage de la construction pénétrante par un toit à revêtement de toiture inclinée, composée en principe d'un élément supérieur (4), d'un élément inférieur (1) et des éléments latéraux (2), le raccordement a un élément auxiliaire de passage (3) situé entre ses éléments quelconques, **caractérisée en ce que** le raccordement possède des moyens de préservation contre les conditions atmosphériques, l'endroit de pénétration l'élément longitudinal à relativement pas grand coupe par le raccordement, en principe d'un câble électrique, et l'élément auxiliaire de passage (3) possède une forme permettante la pénétration étanche du câble (5) ou d'un autre élément longitudinal, par le raccordement.

2. Raccordement selon la revendication 1, **caractérisée en ce que** l'élément de passage (3) a une forme assurante son assemblage par recouvrement avec les éléments adjacents du raccordement.

3. Raccordement selon la revendication 2, **caractérisée en ce qu'**elle possède un profil en principe de profilé en U, dont le bras horizontal (32), en assemblage positionné en principe dans le plan du toit, adhère au fond des éléments adjacents du raccordement, et le bras vertical (33) adhère aux parois favorablement verticales des éléments adjacents du raccordement - l'élément latéral (2), l'élément supérieur (4) ou l'élément inférieur (1).

4. Raccordement selon la revendication 2, **caractérisée en ce qu'**elle possède un profil en principe d'une cornière, dont le bras horizontal (32), en assemblage positionné en principe dans le plan du toit, adhère aux parois favorablement verticales des éléments adjacents du raccordement - l'élément latéral (2), l'élément supérieur (4) ou l'élément inférieur (1).

5. Raccordement selon la revendication 1, **caractérisée en ce qu'**elle a dans le bras horizontal (32) ou dans le bras vertical (33), un canal profilé demi-ouvert de guidage (31) de câble (5).

6. Raccordement selon la revendication 5, **caractérisée en ce que** la direction du canal de guidage (31) dans la zone de sortie externe (34) est favorablement parallèle au bord de pliage du bras vertical (33) par rapport au bras horizontal (32).

7. Raccordement selon la revendication 6, **caractérisée en ce que** le canal de guidage (31) est formé dans le bras vertical (33).

8. Raccordement selon la revendication 6, **caractérisée en ce que** le canal de guidage (31) est formé dans le bras horizontal (32).

9. Raccordement selon la revendication 7, **caractérisée en ce que** la direction du canal de guidage (31) dans la zone de sortie interne (35) est favorablement perpendiculaire à la surface du bras horizontal (32).

10. Raccordement selon la revendication 9, **caractérisée en ce que** le canal de guidage (31) entre la zone de sortie externe (34) et la zone de sortie interne (35) a une courbe de guidage en forme d'arc à rayon non moindre du rayon minimal de pliage de l'élément dédié, pénétrant par le raccordement.

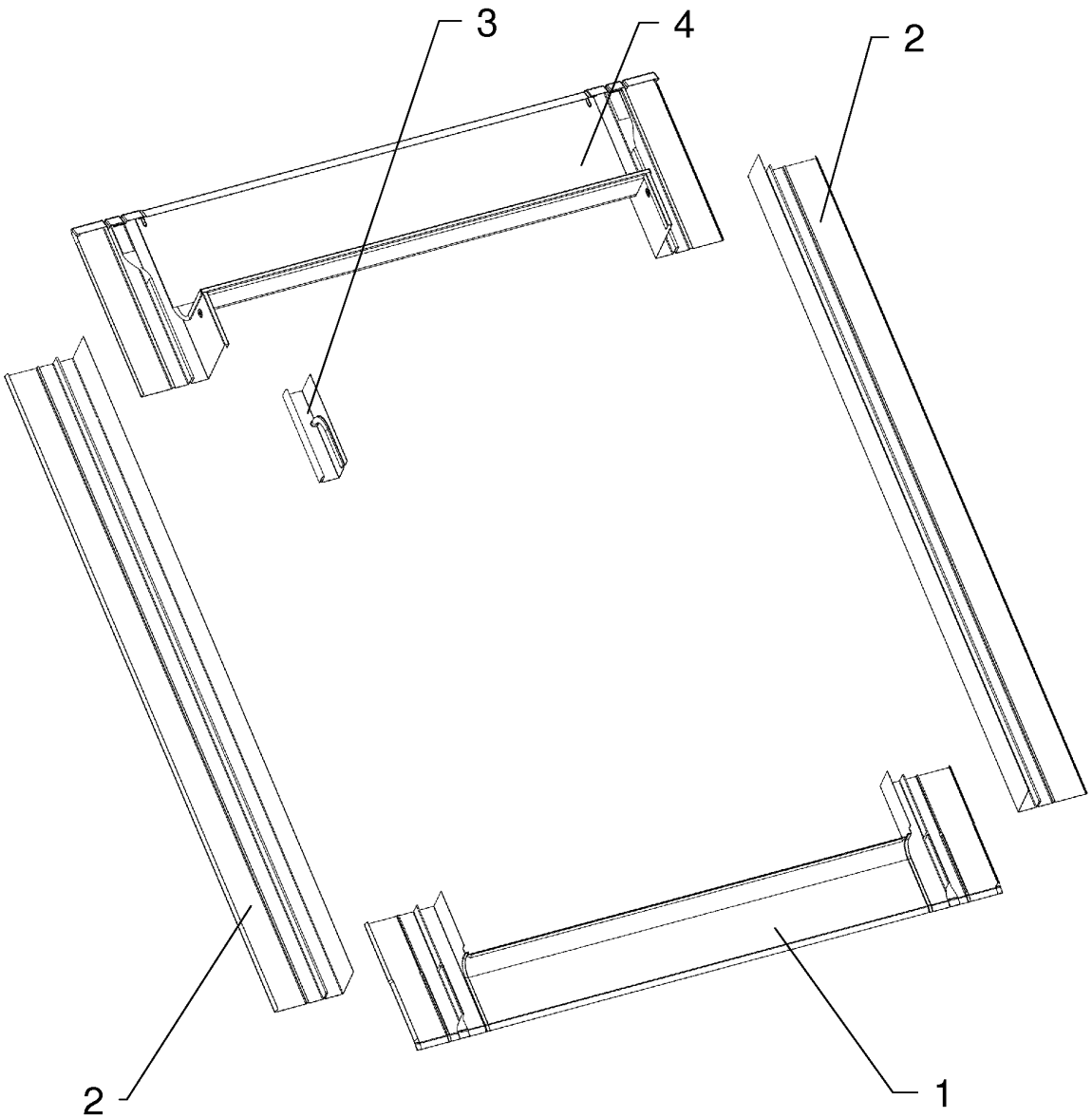

Fig. 1

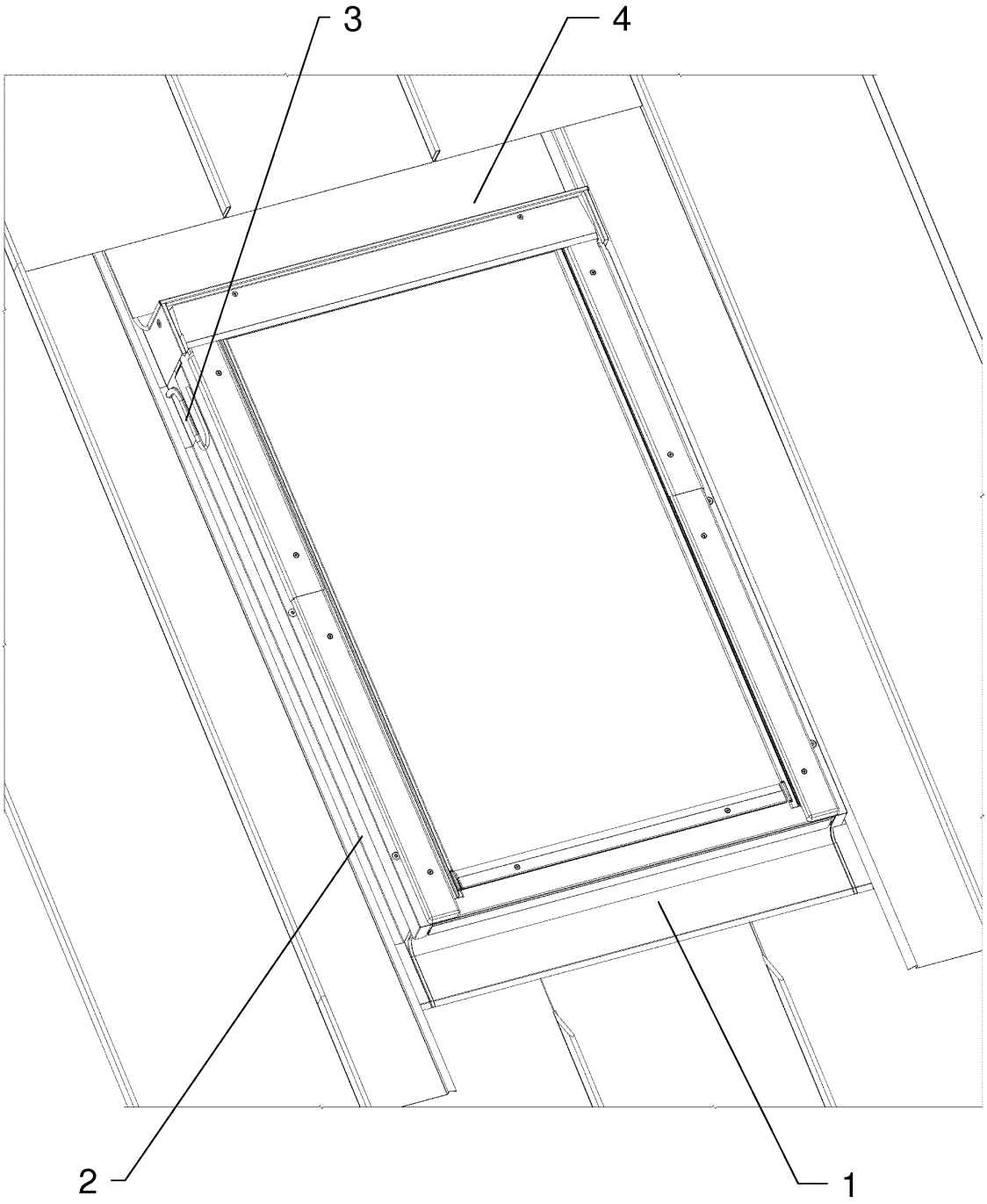

Fig. 2

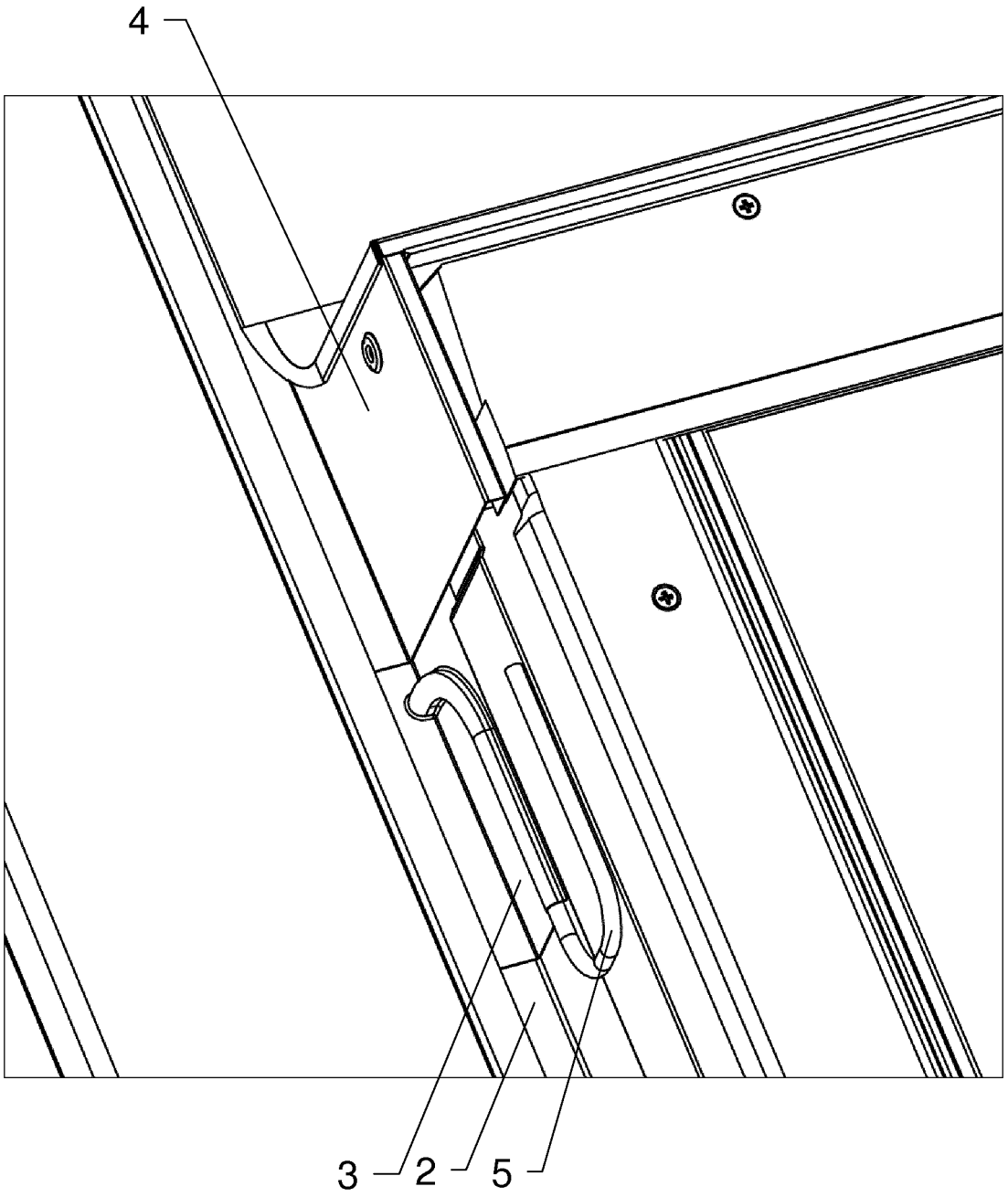

Fig. 3

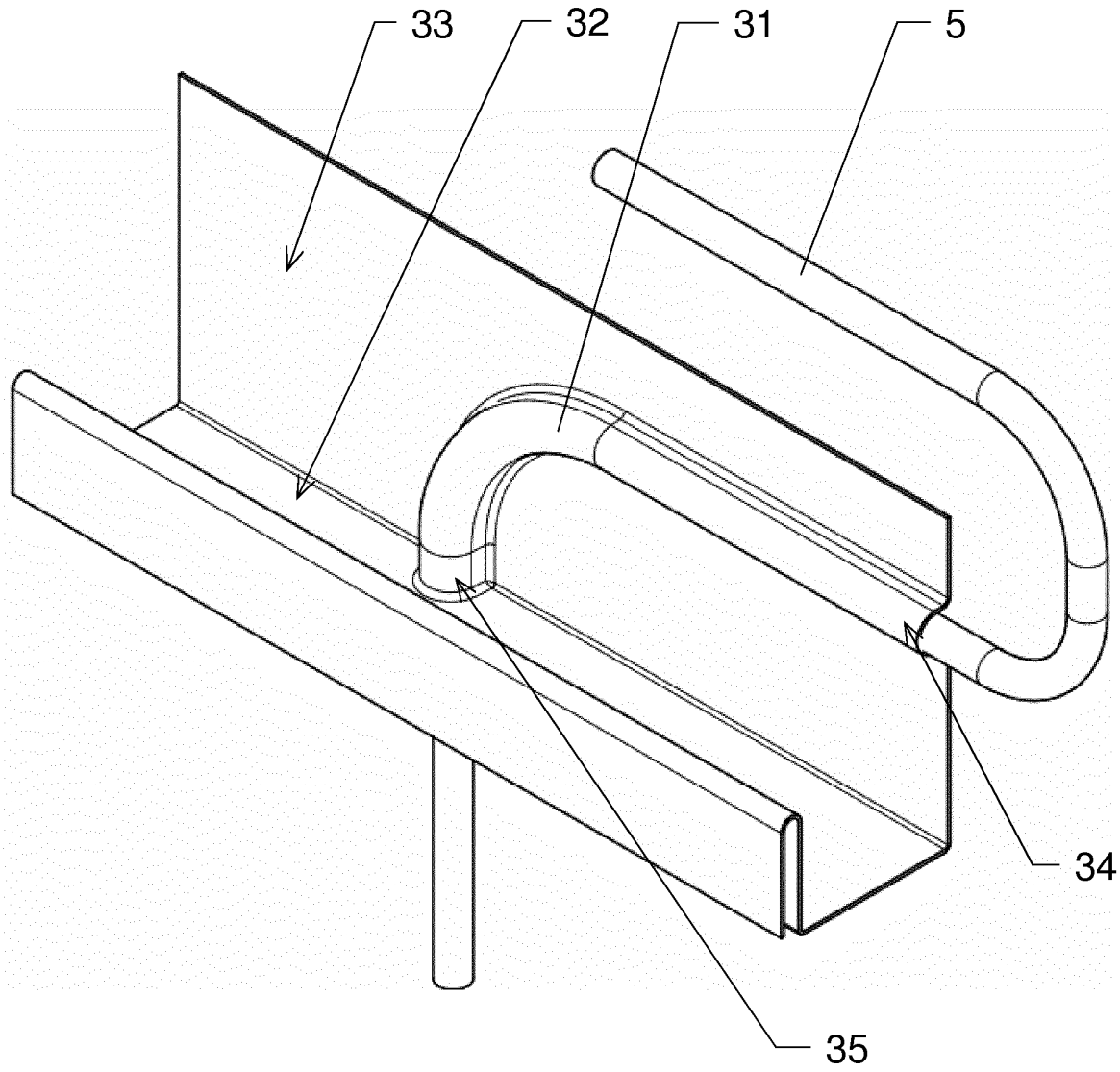

Fig. 4

REFERENCES CITED IN THE DESCRIPTION

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