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(54) **Flashing member and frame for a roof-penetrating building part**

(57) A flashing member, having a flange sealing the joint of a structure penetrating the roof, wherein an arm (5) of the flange element adjacent to the building structure has incisions, generally perpendicular to the external edge of the arm (5), constituting fixing elements (6). The

fixing elements together with the adjacent incisions (k) have an equal width ($l + 2k$) and are arranged along the edge of the arm (5). Connecting two neighboring members (4) of the flange consists in joint bending of the overlapping fixing elements (6).

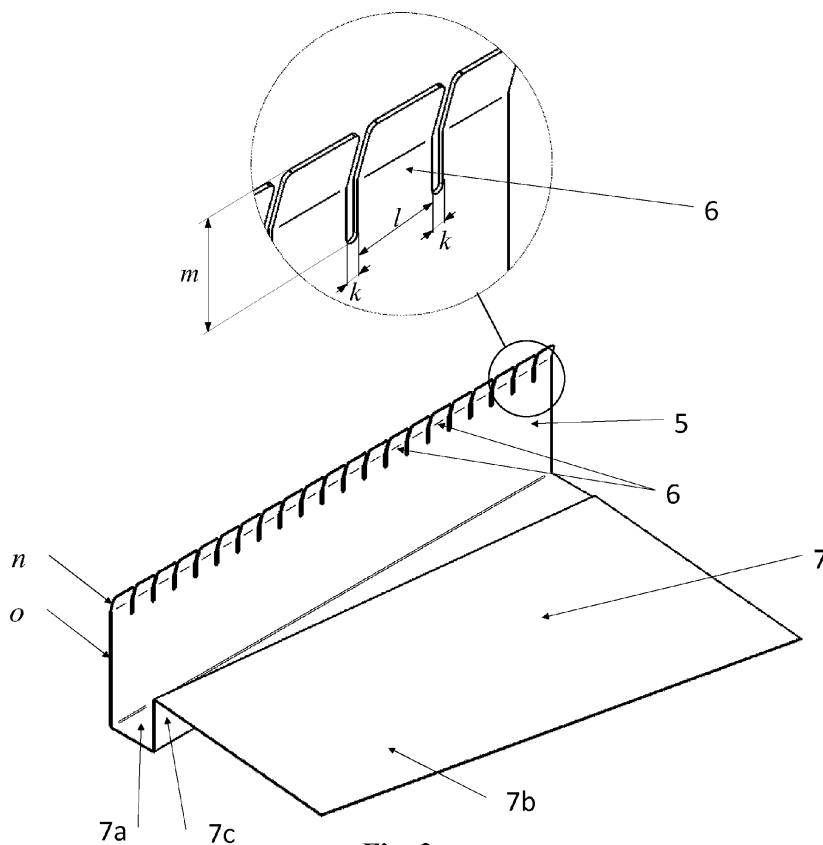


Fig. 3a

Description

[0001] Subject of the invention is a flange consisting of separate members connected together during assembly on the roof, sealing the joint of the roofing with the adjoining elements of the sheet metal framing being a part of the building structure passing through the roof. Such a structure can be e.g. a frame of a roof window or roof hatch, or of another structural element of the building. The basic function of the frame is securing the joint from precipitation like rain, snow, etc.

[0002] A solution known from the patent application WO 99/51835 and the patent specification US 6 457 279 consists of a weather protecting sheet-metal frame sheathing of the joint of a part of the building penetrating the roof with the adjoining roofing, which is a geometrically complex shape element including vertical arms provided with formed profiling serving to tack it to the next similar element of the flashing. The drawback of that solution is the intricate process of cutting-out the sheet-metal element, and the fact that the element cannot have more than two vertical arms provided with formed profiling to connect it with the next element, which limits the possibility of adjusting longitudinally two overlapping elements. The method of profiling the edge perpendicular to the roof causing geometrical stiffening hinders in practice their free and manual bending. This necessitates using special hand tools and entails additional time and labor outlay.

[0003] Known is a solution described in the patent specification US 4 951 431 in which one of the examples of execution features adequately formed elements of the flashing fitting generally parallel to the roof plane. These elements, being standard angle shapes, are easy to manufacture and their fitting consists in lapped setting in the angle between a part of the building penetrating the roof and the roofing, with subsequent fixing them to the external part of the structure passing through the roof. The method of fixing two elements together described in one of the examples of execution consists in using a suitably shaped part in form of a clip fitted perpendicularly on to the edges of these elements. The drawback of that solution is that this element, on its surface parallel to the roof surface, has no water draining groove, which, in case of increased water inflow to be drained in heavy rainfall, can cause leakage to the inside of the roofing. It is also disadvantageous that the solution does not provide durable fixing to the roofing. These elements are fixed to the roofing only by being pressed down by the weight of the roofing in the part parallel to the roof, and the perpendicular surfaces are joined together by means of clips.

[0004] In another example of execution the properly shaped elements are connected together and to the structural element by screwing or nailing them to the structural element passing through the roof surface. The disadvantage of that solution consists in possible leaking precipitation water under the roofing through nail or screw

holes, and the necessity to use special tools for assembly, thus entailing additional time and labor outlay.

[0005] Known is also a solution described in the patent specification SE 416 072, in which the element is shaped similarly to metal roof sheeting commonly called trapezoid roofing. In one of the application examples that element is made as a corner bent element, and on the plane parallel to perpendicular plane of the structural element passing through the roof surface the element has an incision (a chamfer) making it possible to bend and connect that part of the element with the perpendicular edge of the next element. This limits the application of that solution to corrugated roofing only. The disadvantage of that solution is lacking the possibility to effectively fasten the element to the roofing surface structure or to the shielding elements of the structure passing through the roof surface.

[0006] The aim of the invention is making the flange as an element of the flashing of scale-type roofing, the flange consisting of members connected together during assembly on the roof, and sealing off the joint of the roofing with the adjoining elements of the flashing being a part of the building structure penetrating the roof. In view of the peculiarity of scale-type roofing, where the elements of the roofing have to be segmental, the flange sealing the named joints consists of members the form and size of which is fitting the particular roofing element.

[0007] That kind of roofing requires assembling the flange in concert with the roofing by placing the successive layers starting by the lowest one. The separate flange members are usually fastened by covering their arm parallel to the roofing surface by the following layers, while the edge abutting to the external surface of the structure penetrating the roof is usually being fixed by nails or screws. Since, however, the emergence on the market of roof windows made of PVC shapes, using such type of fastening became inadvisable. It became thus necessary to develop a fastening system including connecting and fixing elements being a part of the flange and eliminating altogether screws and nails as fasteners. The flange according to the invention enables easy and durable manual assembly of both the whole flange as of its particular parts without additional tools. The flange in the form and shape of a whole framing of the structure penetrating the roof consists basically of three types of parts — the bottom flange, the top flange, and the symmetrical side strips consisting of members, the size of which depends on the size of the corresponding roofing elements.

[0008] The shape of the members of the side strips, basically in form of the letter L, enables their overlapping connection in the direction of the roof pitch. The essential and indispensable feature of these members is providing tight and durable protection against weather on the connection of the part of the building penetrating the roof with the adjacent roofing.

[0009] The distinguishing feature of the invention consists in the shape of the fixing elements, which connect the contiguous members of the flange in an effective and

durable manner. The toothed fixing elements, made by crosswise incisions on the external edge of the arm adjacent to the external surface of the building structure penetrating the roof, are an integral part of the particular members of the flange.

[0010] In order to block effectively any relative movement of two adjacent flange members it is enough to provide each with at least one fixing element. When joining a flange consisting of a greater number of members, it is indispensable to provide them with at least two fixing elements to maintain locking on both ends, i.e. with the preceding and the subsequent member. Upon placing the adjacent members of the flange it is possible and essential to arrange them so, that the fixing elements are in line, with no full overlapping being required. This enables easy manual bending of two fixing elements jointly and it follows from the construction that the natural bending axis is the line passing through the bottoms of the incised slots. The lock created in that manner blocks any relative movement of the connected members of the flange.

[0011] In view of the fixing technique it is indispensable that the total width of the fixing element and the incisions adjacent to it enables joint bending. That condition is advantageously satisfied by keeping the condition that the sum of the widths of the fixing element and the adjacent incisions is the same in the corresponding flange members being joined. Full blocking of any relative movement of two flange members is being advantageously achieved by providing equal widths of the fixing elements and at the same time minimizing the widths of the adjacent incisions.

[0012] Applying a greater number of fixing elements along the edge of the flange member allows increased freedom in relative longitudinal arrangement; however, the minimum pitch is the spacing between the fixing elements. Full ease in determining the relative longitudinal placing of members is given by providing fixing elements on the whole length of the edge. The essential condition for free longitudinal arrangement of the flange members is keeping, preferably, an equal width of the fixing elements and a pitch, which is one of the multiples of the sum of the width of a single fixing element and the incision width. The constant arrangement of the fixing elements and their width enabling easy manual bending shall however be provided on at least that part of the flange member, which overlaps the next one.

[0013] When the fixing elements are arranged uniformly it is possible to bend any number of locks so made, as required locally.

[0014] A distinguishing feature of the invention is also the water draining groove created in the arm of the member generally laying on the roof surface, lying parallel to the roof pitch direction. That groove, functioning as a gutter, consists in its cross-section view of three sides. The bottom side is preferably parallel to the plane formed by the upper surface of the battens, and the sides, preferably perpendicular to the bottom, act at the same time as gut-

ter sides for the drained water, also fixing and locking any crosswise movement. The side of the groove, which is closer to the bending edge of the whole member, is preferably an extension of the member arm adjacent to the building structure passing through the roof. The opposite side, basically parallel to the first one, connects the groove bottom with the further part of the member, which is a flat surface parallel to the surface the roofing elements and the dimensions of which are fitting these elements. The actual thickness of the roofing elements and their overlapping manner of assembling on the roof causes an out-of-parallel of the plane formed by the battens in relation to the plane of arranging the roofing elements. The existing angle is accounted for in the flashing element, i.e. the bottom is parallel to the battens, while the side overlapping the roofing element is parallel to that element.

[0015] The solution according the invention is described in the drawings of an example of execution, in which fig. 1 presents the flange in disassembled state, fig. 2 — the flange assembled into a closed loop, fig. 3a — a side member with fixing elements made on the whole length of the arm, in its state before assembling, fig. 3b — a side member with two fixing elements in its state before assembling, fig. 4 — the joint of two flange members before bending the fixing elements, and fig. 5 — the joint of two flange members after bending the fixing elements.

[0016] The invented flange in the first example of execution, in its state before assembling, is shown in fig. 1, and consists of four main parts: the bottom flange **1**, the top flange **2**, and the side strips **3** consisting of the side members **4** the size of which depends on the size of the corresponding roofing element. The number of members of the side strips **3** does not depend on the construction of the flange, but on the size of the structure penetrating the roof and the number of rows of the small-size roofing elements. The dimension of the flange in the direction parallel to the battens is constant and depends on the corresponding dimension of the penetrating structure. This means that the top flange **2** and the bottom flange **1** have constant widths, determined by the manufacturer.

[0017] The shape of the flange upon joining its parts into a closed loop is shown in fig. 2. In order to achieve the sealing function of the flange in the case of scale-type roofing, it is indispensable to assembly it by the overlapping method jointly with assembling the roofing, starting by the bottom flange **1**, then by the side strip **3** consisting of the side members **4**, and ending by laying the top flange **2**, which, beside its fixing to the adjoining side members in its part covered and sealed by the roofing elements, is to be secured to the battens.

[0018] The manner of durably connecting together the adjacent members using the fixing elements **6** is the same for all parts of the flange.

[0019] Fig. 3a shows a particular side member **4** in its state before assembling. The arm **5** of the flange member adjoining the building structure is made with incisions having the width **k** resulting from the applied fabrication

technology, and the incisions are normally perpendicular to the external edge of the arm **5**. The incisions form a series of toothed fixing elements **6**, having preferably an equal width l , and being spaced with a pitch which is one of the multiples of the sum of the width of one fixing element **6** and the incision width k . The height of the fixing elements m is preferably small, but taking in account the possibility of bending them by hand.

[0020] Connecting two members together, as they are shown in fig. 4 before bending the fixing elements, consists in overlapping the members as necessary for the given roofing, and then shifting one of them a bit longitudinally so as to achieve covering of the selected number of the fixing elements of the overlapping side members **4** to be joined. In the case of the preferable uniform arrangement of the fixing elements on the length of the flange member, fitting is achieved on all overlapping fixing elements **6**. This makes it possible to select freely the number of fixing elements to be manually bent, which is shown in Fig. 5. Additionally, in order to facilitate manual bending of the fixing elements **6**, the arm **5** adjacent to the structure penetrating the roof is pre-bent by a small acute angle deflecting it away from the surface of the structure, creating the edges n and o . The bending line is parallel to the external edge of the arm **5**, and the distance between them is preferably not greater than the height m of the fixing elements.

[0021] The second arm **7** of the side member adjacent to the roofing surface consists of two non-parallel surfaces: the bottom one **7a** parallel to the surface made by the structural element of the roofing, the surface **7b**, parallel to the plane of the laid roofing element, and of the third, connecting surface **7c**, perpendicular to the two preceding ones. The surfaces **7a** and **7c** intersect at the line, which is parallel to the battens. The relative position of the bottom surface **7b** and the surfaces adjacent to it, i.e. the connecting surface **7c** and the arm abutting to the structure passing through the roof, creates a water draining channel. The surface **7a** is basically parallel to the plane formed by the structural elements of the roofing, while the surface **7b** is basically parallel to the elements of the roofing. The water draining channel constitutes moreover an element stiffening and locating the relative position of the members of the flange. In conjunction with the fixing elements **6**, upon bending them jointly, it forms a lock blocking all degrees of freedom of the flange members, stopping any relative movement.

[0022] The described constructive solution enables fast, proficient, and effective joining of the consecutive members to each other, with no use of tools, which results in considerable economy of time and labor outlay. The solution makes it generally possible to adjust the elements of the flashing to the majority of commercially available small-size roofing elements.

[0023] The flange according the second example of execution is structurally equal to the flange of the first example. The difference consists in applying the side element of the flange according to fig. 3b, having a mini-

mum number fixing elements. It is a solution less universal, but having the advantage of lesser manufacturing costs. Considering the standardization of roofing elements, one can adjust the spacing between the fixing elements to typical lengths of small-size roofing elements.

[0024] The arm **5** of the flange member adjacent to the building structure has two fixing elements **6** spaced so as to fit the applied solution of the roofing structure. The fixing elements **6** are made by two twin cuts with a width k as described in the first example, and a spacing making it possible to bend by hand the so formed tooth. The distance between the incisions determines the width l of the fixing element. Keeping equal the dimensions m , l , and k safeguards the possibility to bend jointly the fixing elements, having previously adjusted the side members **4** and forcing overlapping of the fixing elements. The remaining functional and constructive features are the same as in the first example of execution.

Claims

1. Flange sealing the joint of a structure penetrating the roof with the abutting external scale-type roofing, consisting of overlapping elements, the elements generally consisting of two perpendicular arms, with the first arm adjacent to the external surface of the structure penetrating the roofing surface, and a second arm generally perpendicular to the first one and adjacent to the elements of the roofing surface, **characterized in that** the arm (5) of the flange member adjacent to the structure penetrating the roofing surface has incisions, generally perpendicular to the external edge of the arm (5), constituting fixing elements (6).
2. Sealing flange according claim 1 **characterized in that** it has at least two fixing elements (6).
3. Sealing flange according claim 2 **characterized in that** the total length of the width (l) of a single fixing element and the width of the neighboring incisions (k) is the same in all fixing elements (6).
4. Sealing flange according claim 3 **characterized in that** the fixing elements (6) constitute a series with a toothed structure and uniform spacing being one of the multiplicities of the sum of the width of a single fixing element (l) and the width (k) of the incision.
5. Sealing flange according claim 1 **characterized in that** the adjacent flange members are connected together by joint bending of two mating fixing elements (6).
6. Sealing flange according claim 5 **characterized in that** the adjacent flange members are connected to-

gether by joint bending of the fixing elements (6) perpendicularly to the direction of the incision.

7. Sealing flange according claim 1 **characterized in that** the arm (5) adjacent to the structure passing through the roof, preferably parallel to the surface of the external structure, is partly pre-bent away from the surface of the structure, where the length (*n*) of the edge determined by the distance of the bending line from the external edge of the arm is not greater than the height (*m*) of the fixing elements (6).

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8. Sealing flange according claim 1 **characterized in that** the arm (7) of the member of the side strip adjacent to the roof surface consists of two non-parallel surfaces (7a) and (7b) intersecting at a line basically parallel to the battens and of the connecting surface (7c) basically perpendicular to them.

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9. Sealing flange according claim 1 **characterized in that** the relative position of the bottom surface (7a) and of the adjoining surfaces (7c) and the arm (5), creates a water draining channel.

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10. Sealing flange according claim 1 **characterized in that** the surface (7a) is basically parallel to the surface formed by the structural elements of the roofing and the surface (7b) is basically parallel to the elements of the roofing.

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11. Sealing flange according claim 3 and 6 **characterized in that** the fixing elements (6), upon joint bending, and the surfaces constituting the water draining channel form a lock blocking all degrees of freedom of the relative movement of the flange members.

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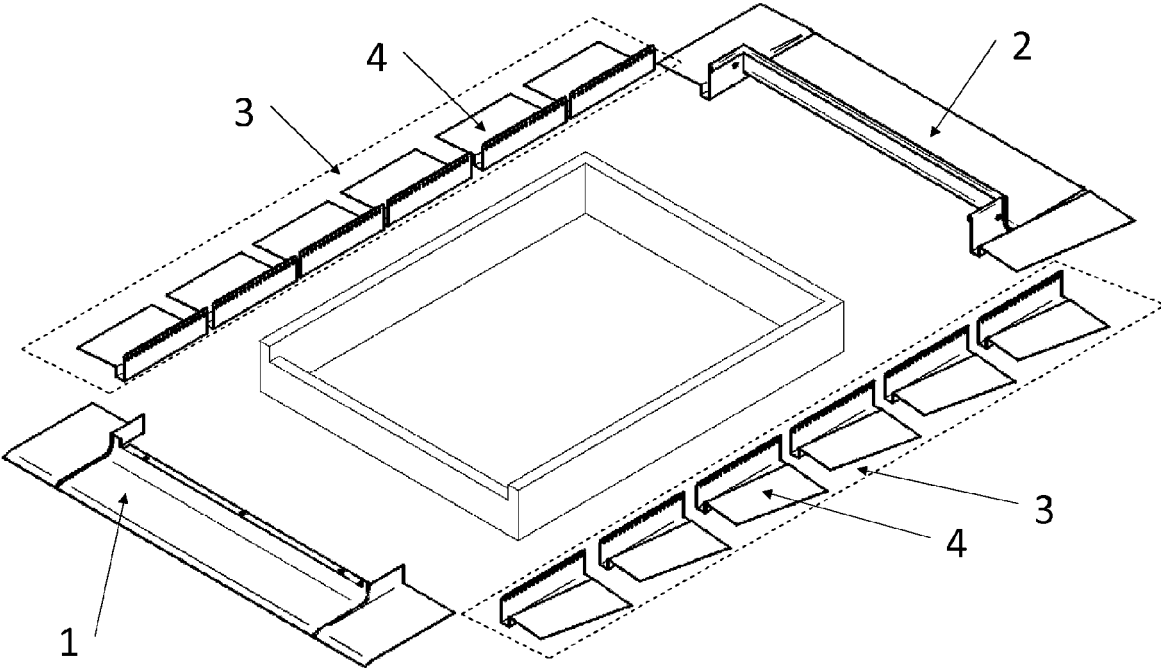


Fig. 1

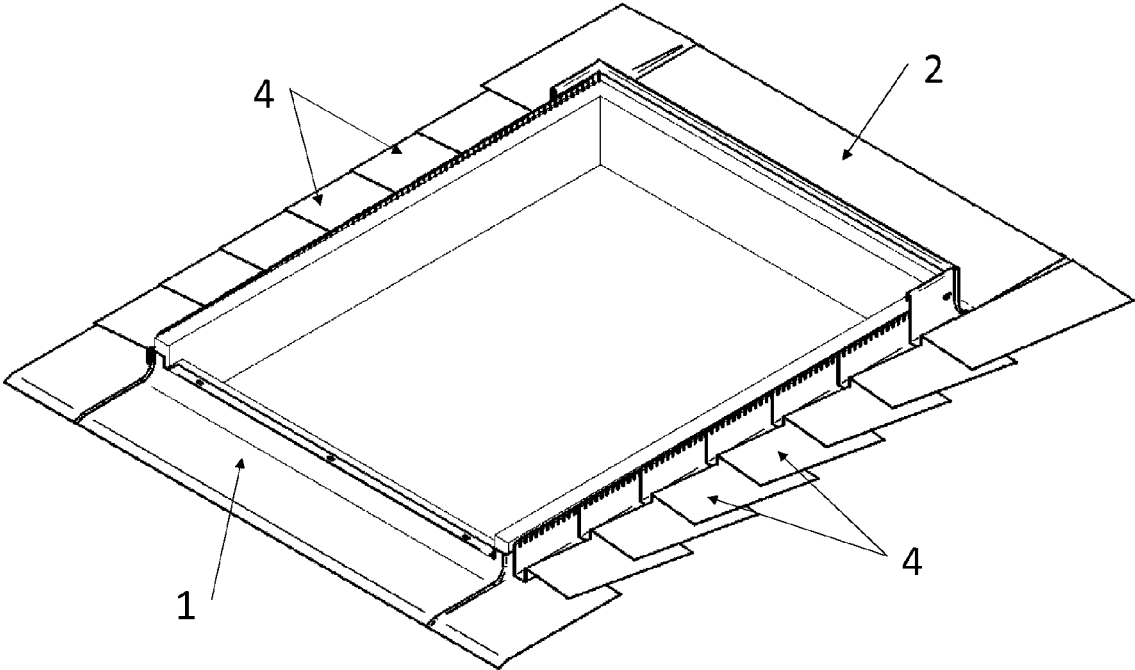


Fig. 2

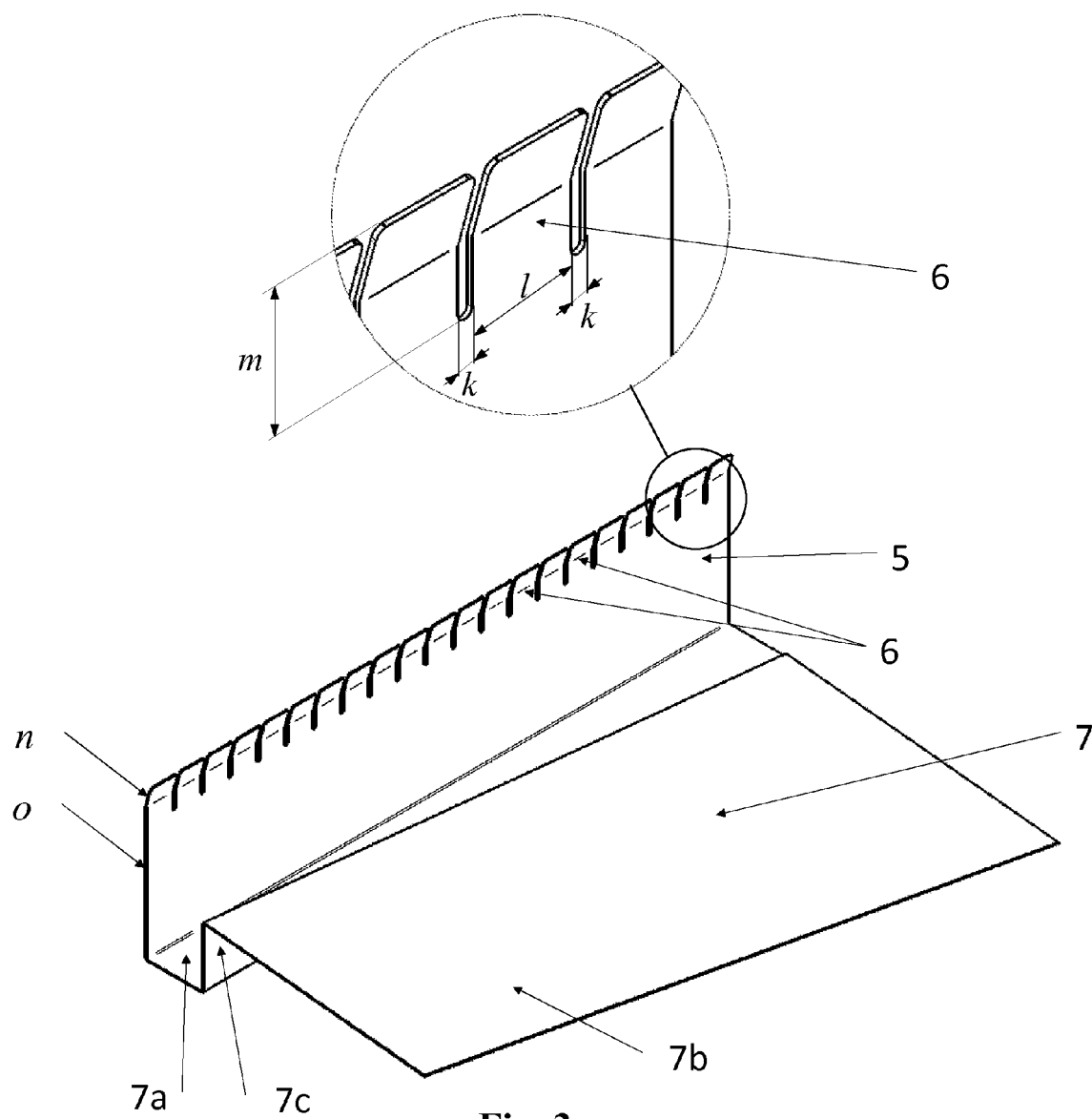


Fig. 3a

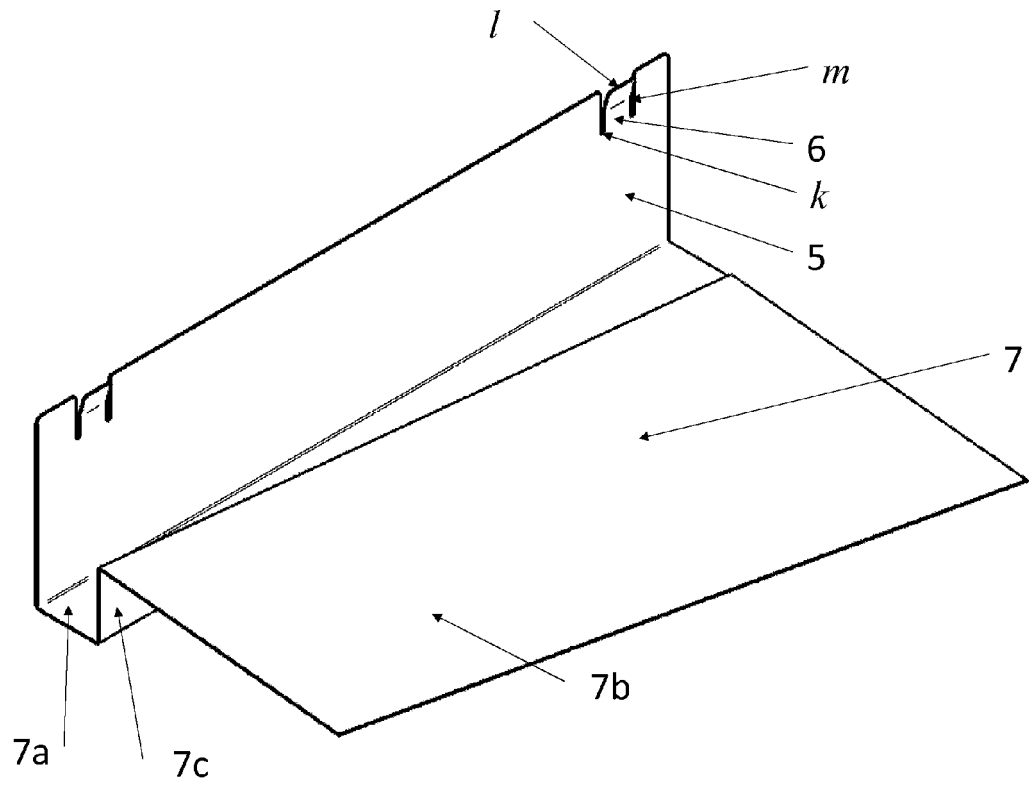


Fig. 3b

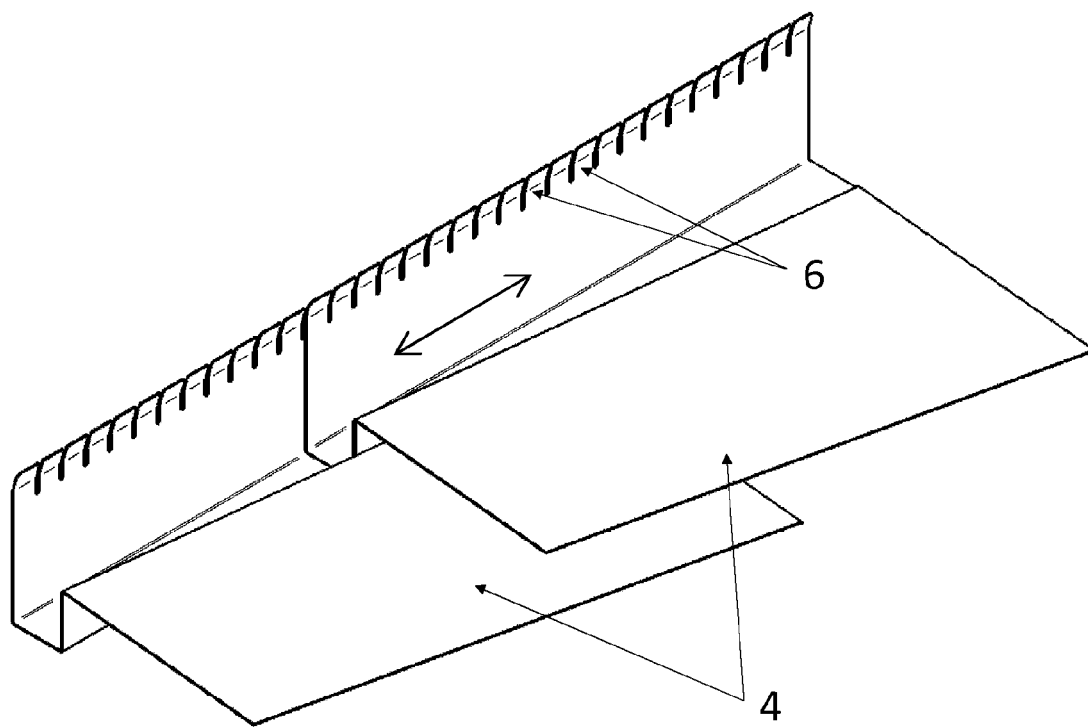


Fig. 4

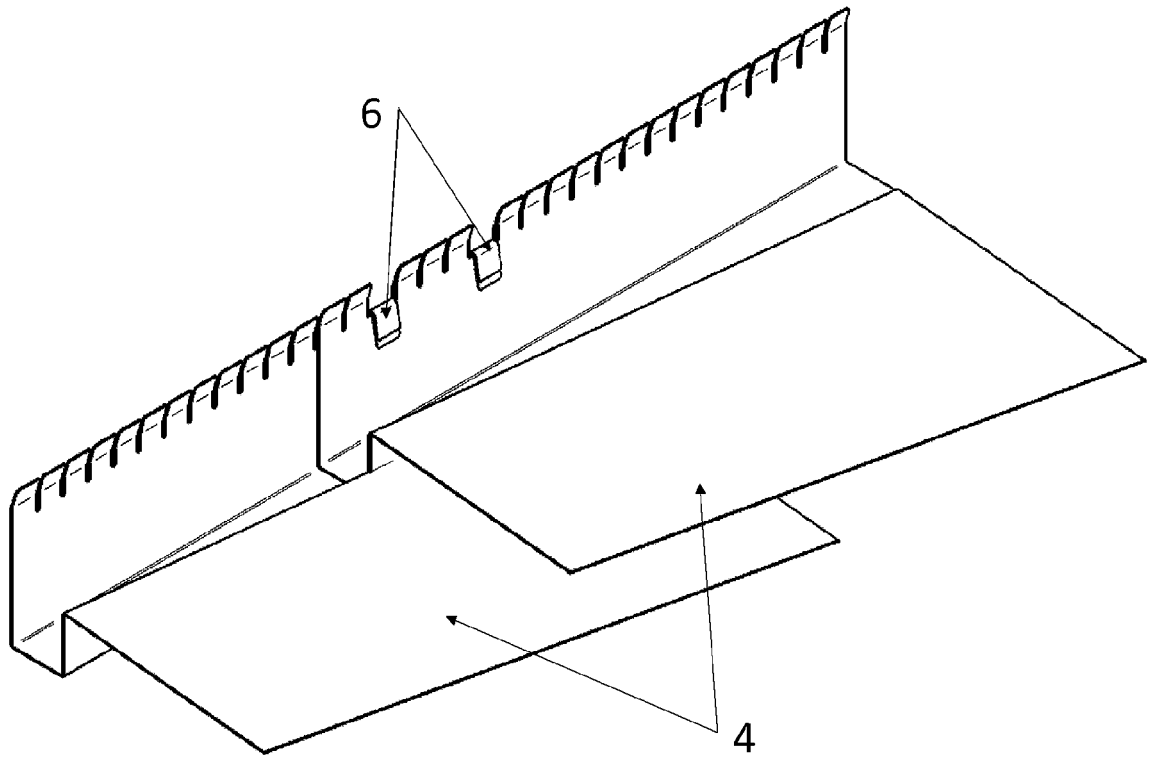


Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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