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(54) **ROOF WINDOW WITH IMPROVED COVERING ARRANGEMENT AND METHOD OF PROVIDING A ROOF WINDOW WITH IMPROVED COVERING ARRANGEMENT**

(57) In a roof window, a covering arrangement is provided including a frame side covering element (11) having a top portion (111) and an end edge (115) and a sash side covering element (12) having a top portion (121) and an end edge (125) facing the end edge (115) of the frame side covering element (11) to form a gap (15), said covering arrangement being configured to cover at least said hinge (10) in the closed position of the sash (2). The covering arrangement includes first and second transition elements (13, 14) connected to the sash and frame side covering elements (12, 11) near or at the respective end edge (125, 115). The first transition element (13) connected to the sash side covering element (12) has a first venturi portion (138) configured to face an interior side of the top portion (112) of the frame side covering element (11) in the closed position of the sash (2) to provide a constricted section between an inner channel section (17) and an outer channel section (16), nearest said cap (15), the second transition element (14) connected to the frame side covering element (11) and comprising a flat portion (141) and a second venturi portion (142) to be located opposite the first venturi portion (138).

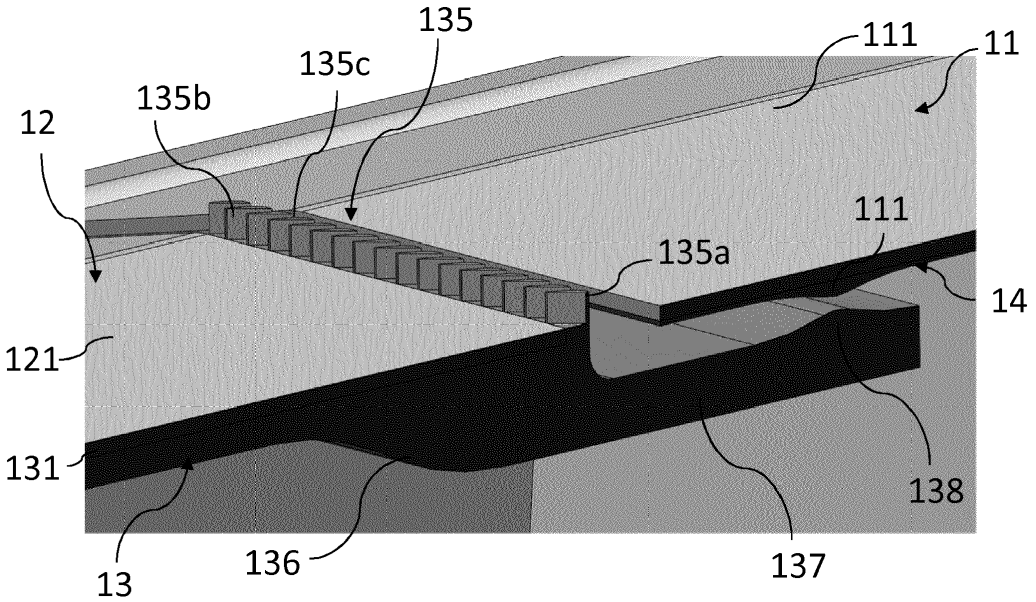

Fig. 10

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Description

Technical Field

[0001] The present invention relates to a roof window, particularly for installation in an inclined roof surface, comprising a frame, a sash configured to be moved between a closed position and an open position, in which the sash assumes an angle relative to the frame, a set of hinges, and a covering arrangement including a frame side covering element having a top portion and an end edge, and a sash side covering element having a top portion and an end edge facing the end edge of the frame side covering element to form a gap, said covering arrangement being configured to cover at least said hinge in the closed position of the sash. The invention furthermore relates to a method of providing a roof window with improved covering arrangement.

Background Art

[0002] Basically, roof windows may be provided in a number of varieties and include more or less complicated structures in order to allow opening of the sash and to fulfil other functions, such as ventilation, while permitting cleaning of the outside of the pane from inside the building. The varieties include roof windows of the pivoting type, the hinge axis being either located at the centre or displaced from the centre of the window, and top-hung roof windows that pivot for cleaning by means of an intermediate frame.

[0003] These requirements are made possible by the provision of a hinge with a particular pattern of movements, which in turn makes it possible to establish an overlap between the covering element fastened to the frame and the counterpart covering element fastened to the sash in the closed position of the roof window. In such a hinge, the covering elements thus generally comprise at least two parts, one for covering the sash hinge part and one covering the frame hinge part. The covering elements are designed to protect the hinge and interior parts of the window from amongst other things weather, dirt and grime, since this may cause the hinge to rust and in worst case cause the window to leak rain water and thereby possibly cause damage. The two covering elements are designed to allow an angular motion relative to each other, while opening and closing the window. The covering elements are typically made of metal which is well-known to possess excellent strength and wearability properties. In order to improve the weather-tightness of the covering assembly, Applicant's European patent No. EP 1 070 179 B1 describes how a joggled connection member on the sash cover element is inserted under the end of the frame cover element to provide a pressure relief chamber to prevent water penetration. While this solution has proven to function well, it can be difficult to control the exact configuration of the elements of the covering assembly in the mounted condition on the roof window, due to the unavoidable manufacturing tolerances.

Summary of Invention

[0004] It is therefore the object of the invention to provide a roof window, in which the weather-proofing of the covering arrangement is improved and made more consistent.

[0005] In a first aspect, this is achieved with a roof window of the kind mentioned in the introduction, which is further characterised in that the covering arrangement includes at least one separate transition element connected to one of the frame side covering element and the sash side covering element, near or at the respective end edge of the frame side covering element or the sash side covering element, and that said at least one transition element is configured to influence the flow conditions at or near the gap in the closed position of the sash.

[0006] By providing one or more separate transition elements at or near gap between the frame and sash covering elements, the invention is based on the recognition that it will be more or less impossible to eliminate the gap between the respective end edges of the frame and sash side covering elements in the closed position of the sash, due to the presence of manufacturing tolerances and provides an alternative means of preventing water and other precipitation from entering below the frame and sash side covering elements. Without wishing to be bound by theory, it is believed that influencing the flow conditions at or near the gap, in the closed position of the sash, provides for sufficient influence on the flow of wind-impacted precipitation to form an outgoing stream of air to counteract penetration of water through the gap.

[0007] In a presently preferred embodiment, the at least one transition element includes a first transition element connected to the sash side covering element and having a first venturi portion configured to face an interior side of the top portion of the frame side covering element in the closed position of the sash to provide a constricted section between an inner channel section and an outer channel section, nearest said cap. In such a constricted section, the venturi effect will occasion a reduction in the pressure and an ensuing increase of the velocity of the air stream. Expressed in another way, this will have the effect of drawing any precipitation in the form of rain, snow etc. in the direction towards the outdoor, i.e. the external side of the side covering elements. In a further development of this preferred embodiment, a second transition element is connected to the frame side covering element and comprising a flat portion and a second venturi portion to be located opposite the first venturi portion in the constricted section between the inner channel section and the outer channel section in the closed position of the sash. This will enhance the venturi effect even further.

[0008] In another presently preferred embodiment, the first transition element comprises a breaker portion con-

figured to be located in the gap between the respective end edges of the frame side covering element and the sash side covering element in the closed position of the sash. Again, without wishing to be bound by theory, it is believed that the upstanding breaker portion will enhance the flow conditions even further to prevent in-flow of water under the covering arrangement.

[0009] In a second aspect, a method of providing a roof window with improved covering arrangement is devised.

[0010] Other presently preferred embodiments and further advantages will be apparent from the subsequent detailed description and drawings.

Brief Description of Drawings

[0011] In the following description embodiments of the invention will be described with reference to the schematic drawings, in which

Fig. 1 is a perspective view of a roof window, seen from the interior side and in an open position, including a prior art covering arrangement;

Fig. 2 is a perspective view, on a larger scale, of a prior art covering arrangement;

Fig. 3 is a partial perspective view of an embodiment of the covering arrangement of a roof window according to the invention;

Figs 4 and 5 are partial perspective views, seen from different angles, of an embodiment of the covering arrangement of the roof window according to the invention;

Figs 6 and 7 are partial perspective views, seen from different angles, of a first transition element of the covering arrangement in an embodiment of the roof window according to the invention;

Fig. 8 is a partial perspective view of a second transition element of the covering arrangement in an embodiment of the roof window according to the invention;

Fig. 9 is a plan view of the second transition element of Fig. 8;

Fig. 10 is a partial perspective sectional view of the covering arrangement of Figs 6 to 9; and

Fig. 11 is a partial sectional view of the covering arrangement of Fig. 10.

Description of Embodiments

[0012] In a manner known per se, the window comprises a sash 2 carrying a glazing in the form of a pane 3 and a frame 1. The window is intended to be built into a surface, which is inclined with respect to the horizontal, typically a roof, and the window will in the following be referred to as roof window. At a position between the top and centre of the window, there is a hinge connection between the frame 1 and the sash 2. The hinge connection in Fig. 1 comprises a set of hinges, of which one hinge 10' is visible. The same operation as described above and from here on is also true for the type of hinge described in the Applicant's pending Danish patent application No. PA 2015 70717 filed on 06 November 2015. Other hinges that the invention is applicable to include pivot hinges are for instance disclosed in Applicant's EP 1 038 083 B1 and EP 1 781 883 B1, which are very versatile as regards operational areas and adaptation of components. Examples of roof windows incorporating such adapted hinges are shown in Applicant's published European patent applications EP 2 770 146 A1 and EP 2 770 149 A1. From a closed position, the user operates the operating device of the window. The operating device typically comprises a handle (not shown) connected with the sash bottom member and/or an operating and locking assembly including a ventilation flap at the sash top member with a lock mechanism to interact with a striking plate on the frame top member. As will be described in further detail below, the hinge 10 exerts a moment on the sash 2, and in combination with the force, and hence moment, exerted by the user operating the operating device, the moment resulting from the weight of the sash 2 and pane 3 is overcome, along with any frictional forces present. All in all, the opening operation entails that the sash 2 is moved from a closed position to an open position as represented by Fig. 1, in which the sash plane forms an opening angle with the frame plane. Closing the window from the open position entails the opposite movement of the sash 2. It is possible to position the sash 2 in a number of arbitrary opening positions, in which the sash 2 is held stable relative to the frame 1. The sash 2 is also able to be rotated substantially through 180° to allow cleaning of the outside of the pane 3 from the inside of the building in which the roof window is installed.

[0013] The frame 1 and sash 2 is each formed by four members of which one frame side member 1a and one sash side member 2a are indicated. The sash 2 is openable with respect to the frame 1, as the sash 2 may be moved from a closed position, in which e.g. the sash side member 2a is substantially parallel with the frame side member 1a, to an open position, in which the sash side member 2a forms an angle with the frame side member 1a. During this movement the sash 2 rotates about a hinge axis α situated at the hinge connection. As indicated in Fig. 1, the hinge axis α is located between a centre axis and the top of the roof window, preferably in the interval 1/3 to 2/3 of the distance between the centre axis and the top, most preferred substantially at 1/2 of the distance between the centre axis and the top. Other positions of the hinge axis are of course conceivable, for instance at the centre of the roof window.

[0014] When referring to the Figures, the terms up, down, upwards, downwards, top and bottom are taken relative to how the figures are displayed, that is having the frame arranged in a lying position with the covering elements facing upwards. A front view is taken from the hinge and viewing towards the frame. A view from behind is therefore taken as viewed from the frame towards the hinge. A direction longitudinal is, if nothing else is men-

tioned, longitudinal along the length of the frame. It is to be understood that the arrangement shown in a horizontal orientation is not the normal orientation as the window is installed.

[0015] To protect the interior and the components of the window itself and to ascertain weather-proof transition to the surrounding roofing, the roof window comprises a covering, including flashing members (not shown), cladding and covering elements of which a frame side covering element 1b' and sash side covering element 2b' are shown. The parts of the covering of the prior art roof window are connected to the frame and the sash, and to the hinge in a hinge and covering assembly as described in detail in the above-mentioned embodiment of EP 2 751 354 B1. The prior art depictions of Figs 1 and 2 correspond to Applicant's published European patent application EP 3 252 250 A1. As seen in these figures, connection of the frame side covering element 1b' and sash side covering element 2b' to the respective hinge part of the hinge 10' is carried out by a snap anchor 60', 70'. Referring back to Fig. 2, in which it also emerges how the frame side covering element 1b' and sash side covering element 2b' interact with each other; a cranked portion 2c' of the sash side covering element 2b' ensures a tight and flush transition between the sash side covering element 2b' and the frame side covering element 1b' in the closed position of the roof window. At the same time, the movement pattern of the hinge allows that the sash side covering element 2b' is able to be retracted from its position under the frame side covering element 1b' during the opening movement of the sash 2 relative to the frame 1, and conversely, be inserted under the frame side covering element 1b' at the final stage of the closing movement.

[0016] In the following, a covering arrangement of embodiments of the roof window according to the invention will be described in some detail. Reference will be made to the roof window as comprising the frame 1, the sash 2 configured to be moved between a closed position and an open position, in which the sash 2 assumes an angle relative to the frame 1, and a set of hinges 10 corresponding to the components described in the above.

[0017] Thus, the covering arrangement includes a frame side covering element generally designated 11 having a top portion 111 and an end edge 115. A sash side covering element generally designated 12 has a top portion 121 and an end edge 125 facing the end edge 115 of the frame side covering element 11 to form a gap 15. It is understood that the dimensions of the gap 15 will vary according to manufacturing tolerances, not only due to the covering arrangement itself but also of other components of the roof window. Furthermore, a gap is present between the two side covering elements 11, 12 both when the sash is open and closed, but in the following, the gap 15 will referred to as the space between the end edges 115, 125 of the respective frame and sash side covering elements. The covering arrangement is configured to cover at least the hinge (not shown) in the closed position of the sash 2, but also other components of the roof window such as the frame and sash side members. Each of the frame and sash side covering elements 11 and 12 has an external side facing the outdoor and an internal side facing the indoor.

[0018] According to the invention, a central feature is that the covering arrangement includes at least one transition element 13, 14 connected to one of the frame side covering element 11 and the sash side covering element 12, near or at the respective end edge 115, 125 of the frame side covering element 11 or the sash side covering element 12.

[0019] In the embodiment shown, the at least one transition element includes a first transition element 13 connected to the sash side covering element 12 and having a first venturi portion 138 configured to face an interior side of the top portion 112 of the frame side covering element 11 in the closed position of the sash 2 to provide a constricted section between an inner channel section 17 and an outer channel section 16, nearest said cap 15.

[0020] More specifically, the first venturi portion 138 is formed on a flange portion 137 of the first transition element 13, said flange portion 137 being formed in conjunction with an offsetting portion 136 adjacent a top portion 131 configured to abut an interior side of a top portion 121 of the sash side covering element 12 near the end edge 125 thereof.

[0021] In principle, the first transition element may be formed in any suitable manner; however, it is preferred that the first transition element 13 as shown has an inner side portion 133 to match a corresponding inner side portion 123 of the sash side covering element 12. Furthermore, the first transition element 13 here has a drain portion 134 to match a corresponding drain portion 124 of the sash side covering element 12 and to be positioned in extension of a corresponding drain portion 114 of the frame side covering element 11. Finally, the first transition element 13 comprises an extended portion 139. The extended portion 139 ensures safe retention and guidance of the first transition element 13 in the cooperation with the sash and frame side covering elements 12, 11.

[0022] Another advantageous feature of the shown embodiment of the invention is that the first transition element 13 comprises a breaker portion 135 configured to be located in the gap 15 between the respective end edges 115, 125 of the frame side covering element 11 and the sash side covering element 12 in the closed position of the sash 2. The breaker portion 135 here comprises a breaker back plate 135a extending at the end edge 125 of the sash side covering element 11 and protruding above the external side of the top portion 121 thereof. Furthermore, the breaker portion 135 comprises a plurality of breaker vanes 135b, preferably located at an angle to said breaker plate 135a, forming a corresponding plurality of breaker vane interstices 135c. In the case of rain and other precipitation, some of the resultant water will flow in the drain portions 114, 134, 114 whereas some of the water will flow along the top portion

of the frame side covering element 11, then meet with the breaker back plate 135a, and finally be distributed by the breaker vane interstices 135c.

[0023] Referring in particular to Figs 8 to 11, a second transition element 14 is connected to the frame side covering element 11 and comprising a flat portion 141 and a second venturi portion 142 to be located opposite the first venturi portion 138 in the constricted section between the inner channel section 17 and the outer channel section 16 in the closed position of the sash 2.

[0024] As the transition element or elements 13, 14 are provided separately from the sash and frame side covering elements 12, 11, a connection must be carried out in order to retain the components to each other. In principle, this could be performed by traditional mechanical techniques such as snap locking or friction engagement, possibly in support of adhesive connections.

[0025] Preferably, however, each transition element 13, 14 is connected to the respective sash or frame side covering element 12, 11 by the use of a) engraving an interior surface of the covering element to provide an engraved surface with at least one cavity by subjecting the covering element to a laser beam at a polar angle; and b) attaching the at least one transition element 13, 14 to the covering element 12, 11 by introducing a portion of the transition element into the least one cavity. Details of such joining techniques are found in Applicant's co-pending international application No. PCT/DK2017/050356 and the contents thereof are incorporated herewith by reference.

[0026] It is even possible to form the transition element or elements 13, 14 integrally with a snap anchor (corresponding to above prior art elements 60' and 70') configured to connect with a corresponding receiving section of a respective hinge part of the set of hinges.

[0027] Finally, it is also possible to include further elements into the selection of transition elements, including sealings. Such sealings may for instance include flaps forming one-way valves, allowing water present under the covering elements to exit but blocking the passage of water and other precipitation from entering.

[0028] The invention is not limited to the embodiments shown and described in the above, but various modifications and combinations may be carried out.

List of reference numerals

[0029]

1	frame
	1a frame side member
2	sash
	2a sash side member
3	pane
1b'	prior art frame side covering element
2b'	prior art sash side covering element
10'	hinge
60', 70'	prior art snap anchors
11	frame side covering element
	111 top portion
	112 outer side portion
	113 inner side portion
	114 drain portion
	115 end edge
12	sash side covering element
	121 top portion
	122 outer side portion
	123 inner side portion
	124 drain portion
	125 end edge
13	first transition element
	131 top portion
	133 inner side portion
	134 drain portion
	135 breaker portion,
	135a breaker back plate
	135b breaker vanes
	135c breaker vane interstices
	136 offsetting portion
	137 flange portion
	138 first venturi portion
	139 extended portion
14	second transition element
	141 flat portion
	142 second venturi portion
15	gap
16	outer channel section
17	inner channel section

Claims

1. A roof window, particularly for installation in an inclined roof surface, comprising
a frame (1),
a sash (2) configured to be moved between a closed position and an open position, in which the sash (2) assumes an angle relative to the frame (1),
a set of hinges (10), and
a covering arrangement including a frame side covering element (11) having a top portion (111) and an end edge (115), and a sash side covering element (12) having a top portion (121) and an end edge (125) facing the end edge (115) of the frame side covering element (11) to form a gap (15), said covering arrangement being configured to cover at least said

hinge (10) in the closed position of the sash (2),
characterised in that
the covering arrangement includes at least one separate transition element (13, 14) connected to one of the frame side covering element (11) and the sash side covering element (12), near or at the respective end edge (115, 125) of the frame side covering element (11) or the sash side covering element (12), and that said at least one transition element (13, 14) is configured to influence the flow conditions at or near the gap (15) in the closed position of the sash (2).

2. A roof window according to claim 1, wherein the at least one transition element includes a first transition element (13) connected to the sash side covering element (12) and having a first venturi portion (138) configured to face an interior side of the top portion (112) of the frame side covering element (11) in the closed position of the sash (2) to provide a constricted section between an inner channel section (17) and an outer channel section (16), nearest said cap (15).

3. A roof window according to claim 2, wherein the first venturi portion (138) is formed on a flange portion (137) of the first transition element (13), said flange portion (137) being formed in conjunction with an offsetting portion (136) adjacent a top portion (131) configured to abut an interior side of a top portion (121) of the sash side covering element (12) near the end edge (125) thereof.

4. A roof window according to claim 2 or 3, wherein the first transition element (13) has an inner side portion (133) to match a corresponding inner side portion (123) of the sash side covering element (12).

5. A roof window according to any one of claims 2 to 4, wherein the first transition element (13) has a drain portion (134) to match a corresponding drain portion (124) of the sash side covering element (12) and to be positioned in extension of a corresponding drain portion (114) of the frame side covering element (11).

6. A roof window according to any one of claims 2 to 5, wherein the first transition element (13) comprises an extended portion (139).

7. A roof window according to any one of claims 2 to 6, wherein the first transition element (13) comprises a breaker portion (135) configured to be located in the gap (15) between the respective end edges (115, 125) of the frame side covering element (11) and the sash side covering element (12) in the closed position of the sash (2).

8. A roof window according to claim 7, wherein the breaker portion (135) comprises a breaker back plate (135a) extending at the end edge (125) of the sash side covering element (11) and protruding above the external side of the top portion (121) thereof.

9. A roof window according to claim 8, wherein the breaker portion (135) comprises a plurality of breaker vanes (135b), preferably located at an angle to said breaker plate (135a), forming a corresponding plurality of breaker vane interstices (135c).

10. A roof window according to any one of claims 2 to 9, wherein the at least one transition element includes a second transition element (14) connected to the frame side covering element (11) and comprising a flat portion (141) and a second venturi portion (142) to be located opposite the first venturi portion (138) in the constricted section between the inner channel section (17) and the outer channel section (16) in the closed position of the sash (2).

11. A roof window according to any one of the preceding claims, wherein said at least one transition element (13, 14) is connected to the respective sash or frame side covering element (12, 11) by the use of a) engraving an interior surface of the covering element to provide an engraved surface with at least one cavity by subjecting the covering element to a laser beam at a polar angle, $\alpha 1$; and b) attaching the at least one transition element (13, 14) to the covering element (12, 11) by introducing a portion of the transition element into the least one cavity.

12. A roof window according to claim 11, wherein said at least one transition element (13, 14) is formed integrally with a snap anchor configured to connect with a corresponding receiving section of a respective hinge part of the set of hinges.

13. A method of providing a roof window with improved covering arrangement, comprising the steps of:

providing a frame (1) and a sash (2),
providing a covering arrangement including a frame side covering element (11) having a top portion (111) and an end edge (115), and a sash side covering element (12) having a top portion (121) and an end edge (125),
providing at least one transition element (13, 14),

a) engraving an interior surface of at least one of said covering elements (11, 12) to provide an engraved surface with at least one cavity by subjecting the covering element to a laser beam at a polar angle, $\alpha 1$; and
b) attaching the at least one transition ele-

ment (13, 14) to the covering element (12, 11) by introducing a portion of the transition element into the least one cavity.

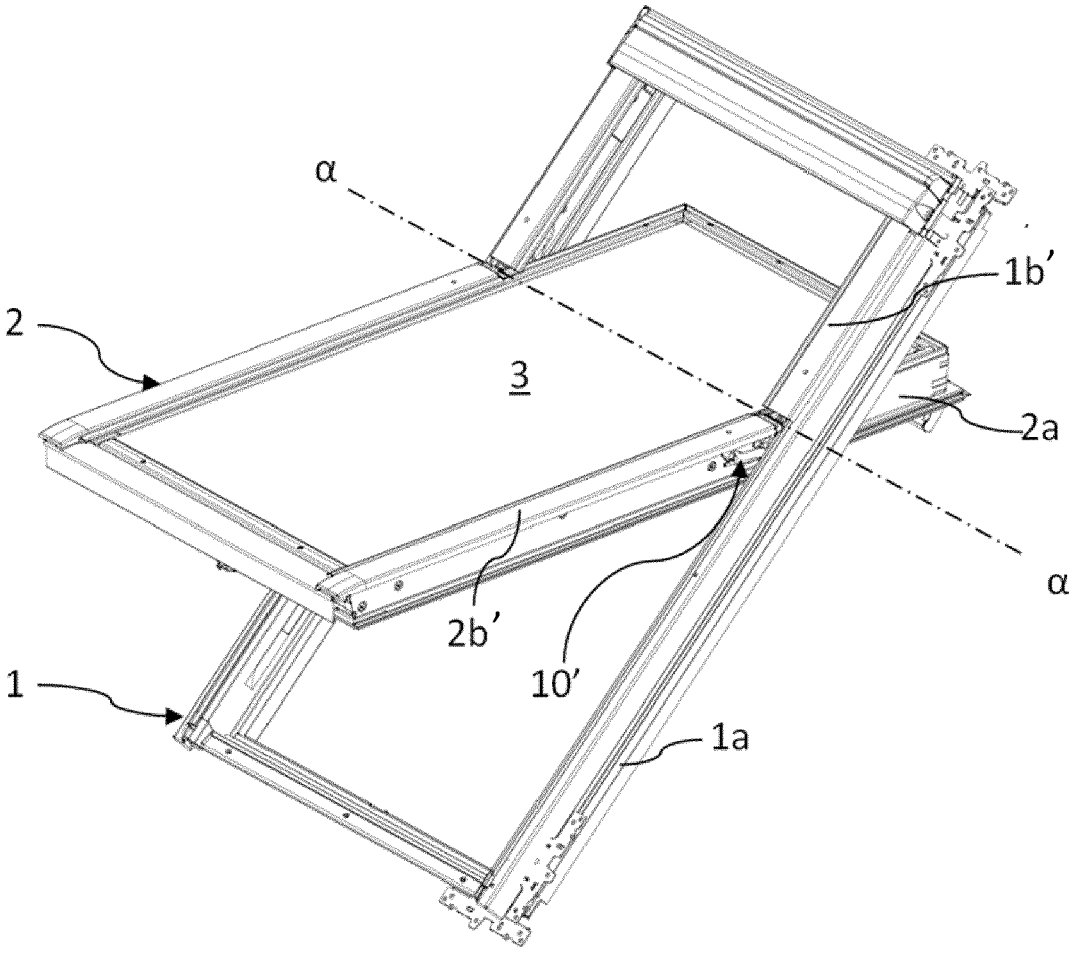

Fig. 1 (Prior art)

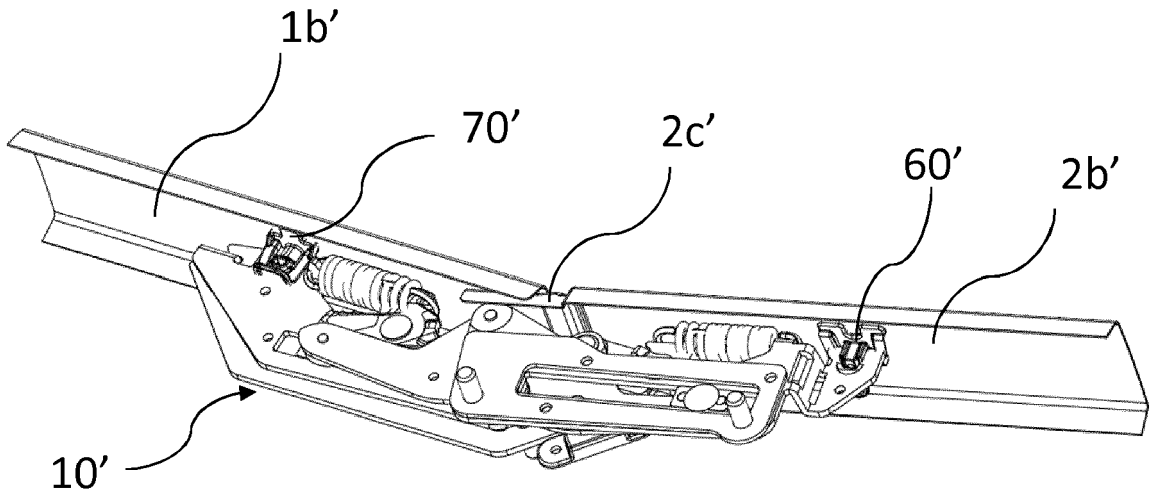

Fig. 2 (Prior art)

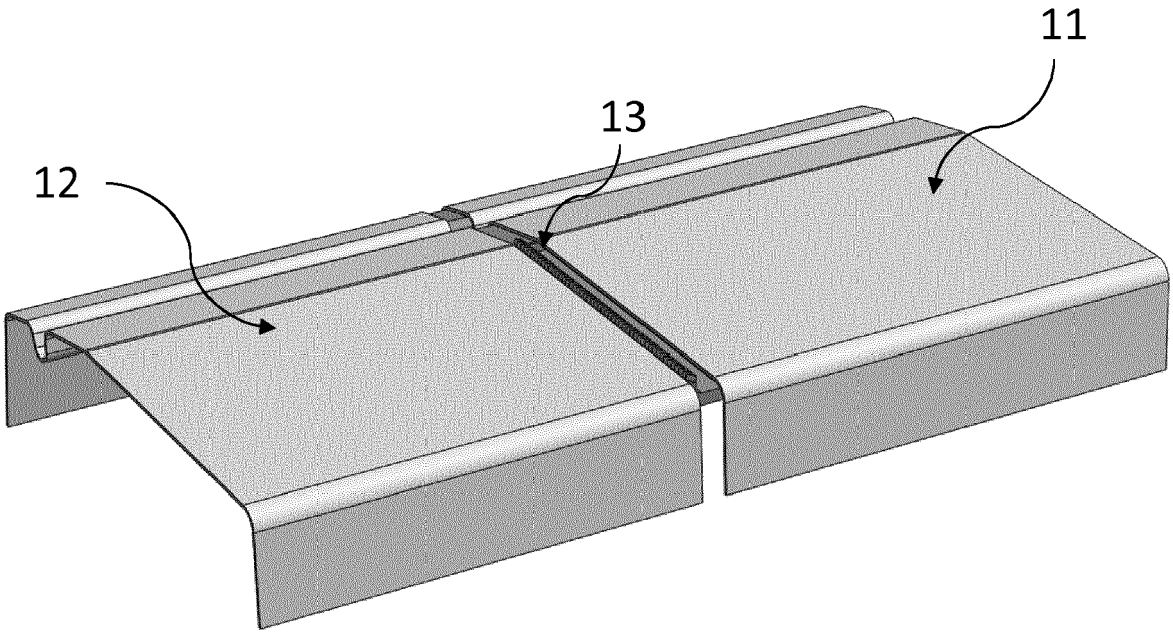

Fig. 3

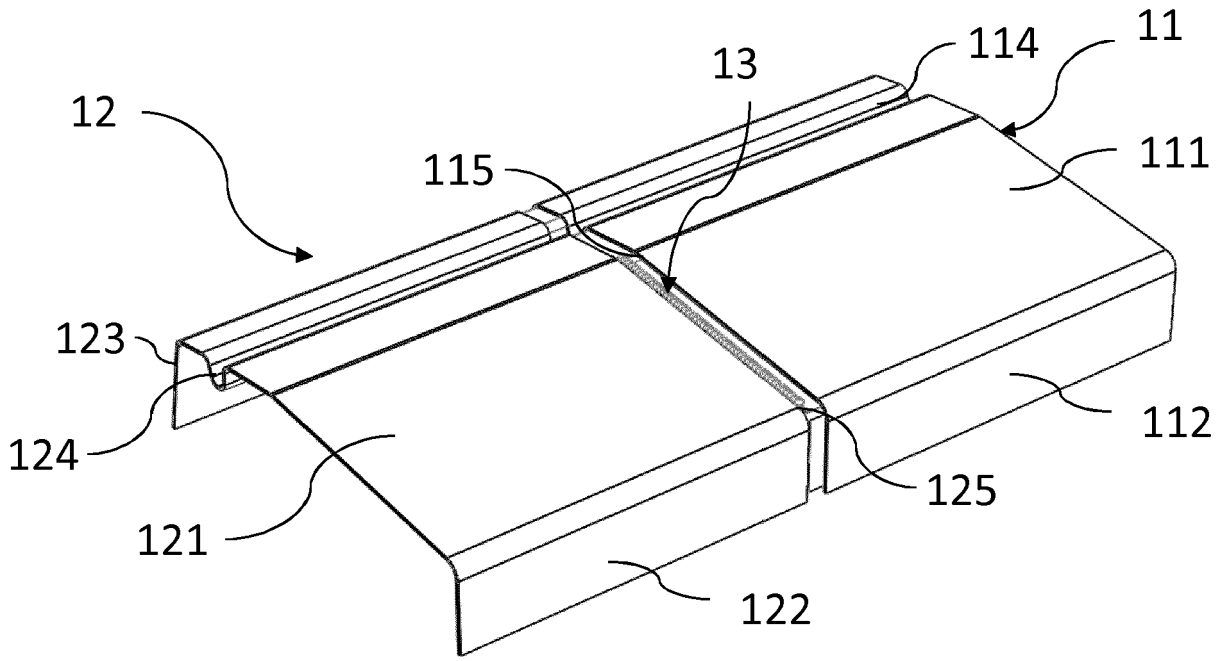
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Fig. 4

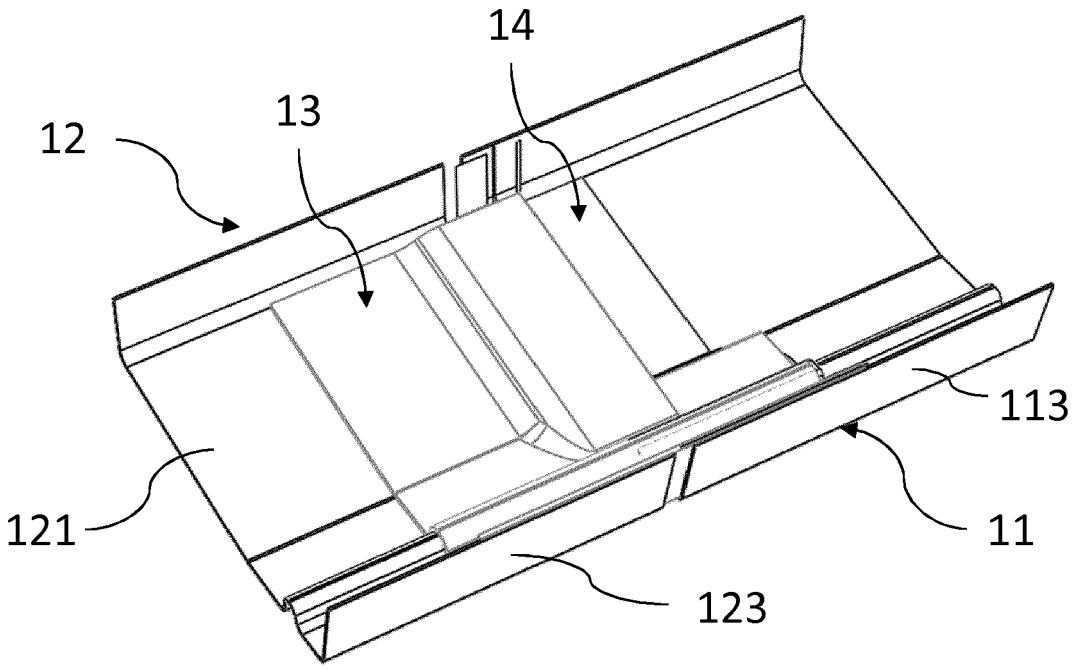
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Fig. 5

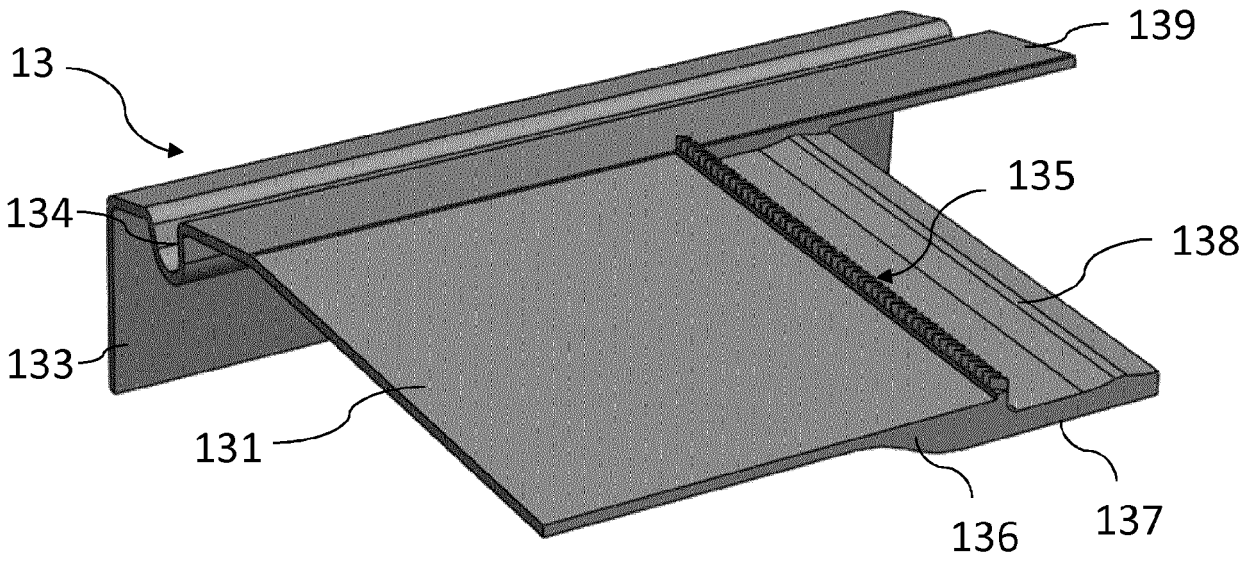


Fig. 6

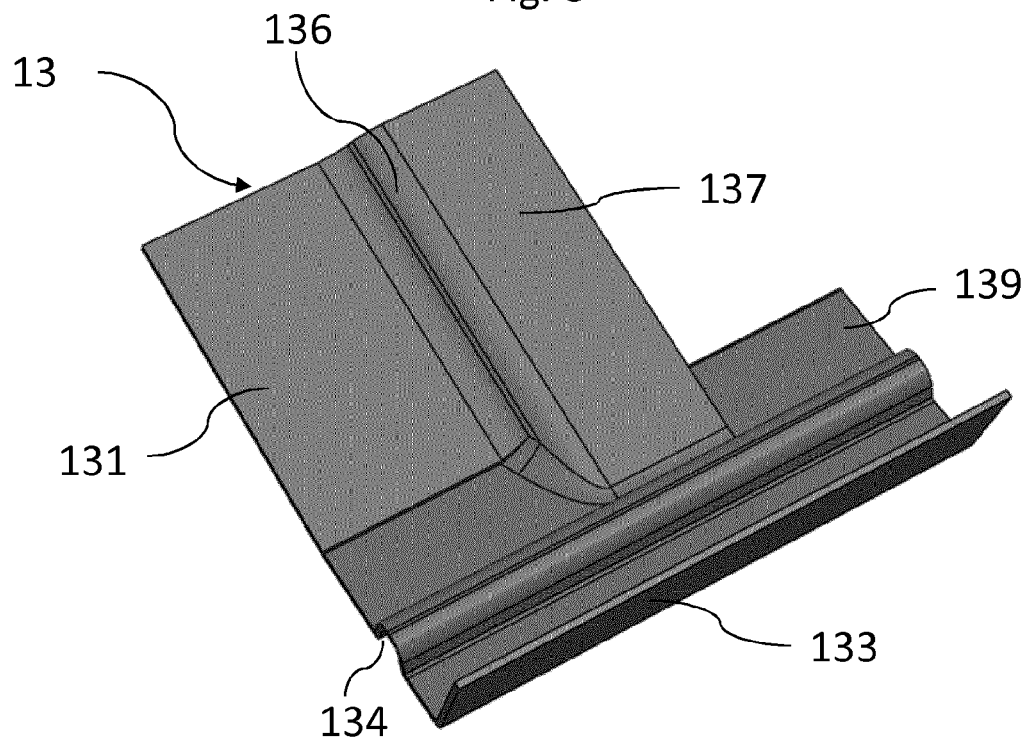


Fig. 7

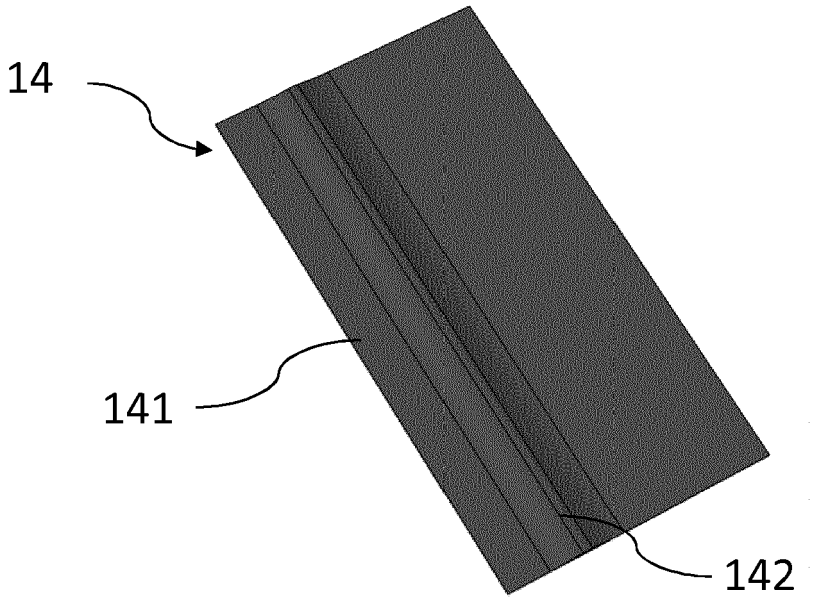


Fig. 8

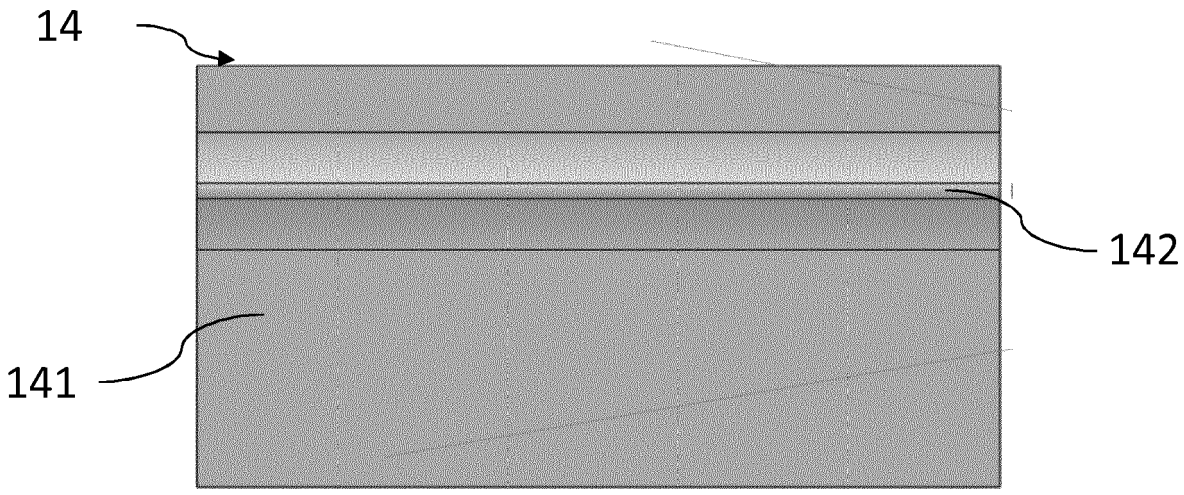
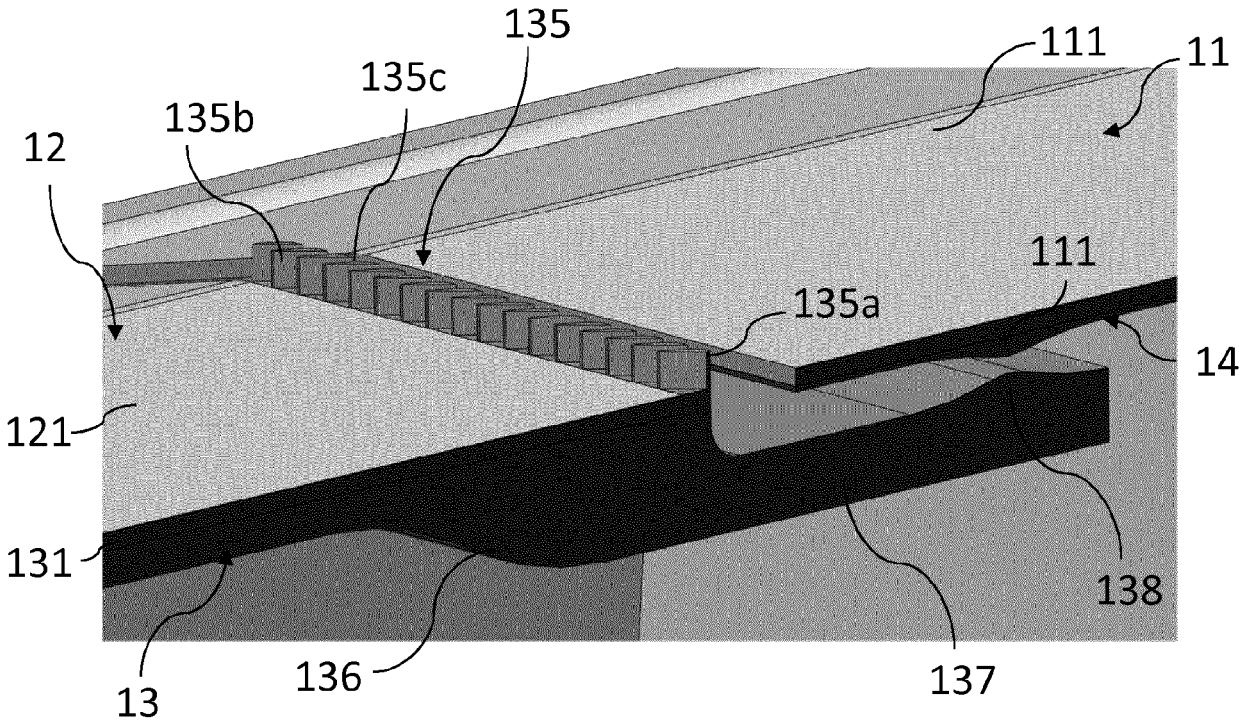


Fig. 9


135
111
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135c
135b
12
111
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121
131
138
13
136
137

Fig. 10

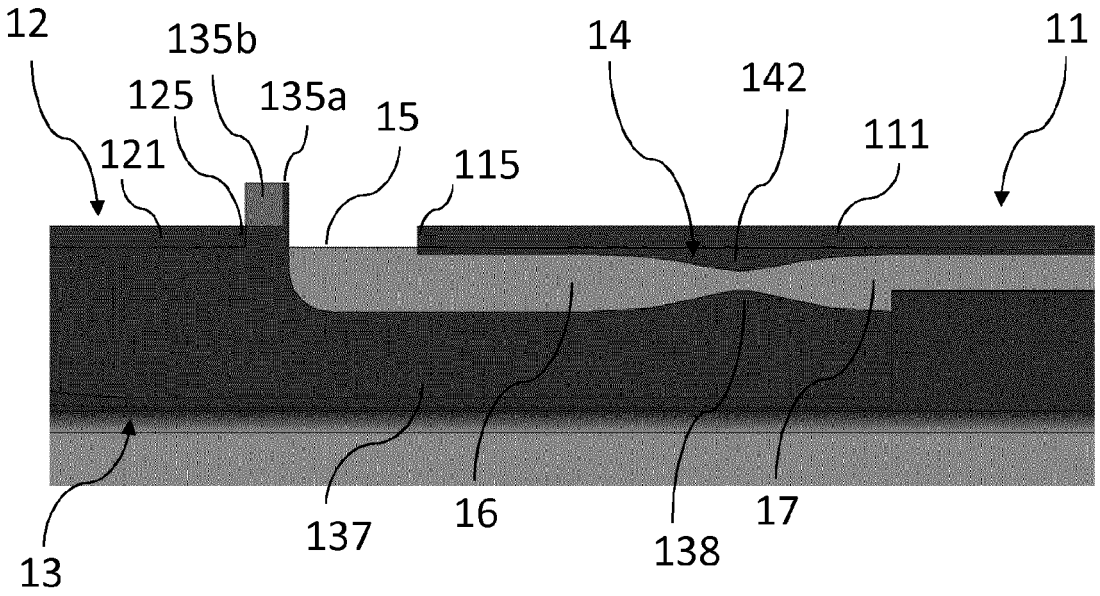
12
135b
14
11
125
135a
15
142
121
115
111
13
137
16
138
17

Fig. 11

REFERENCES CITED IN THE DESCRIPTION

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