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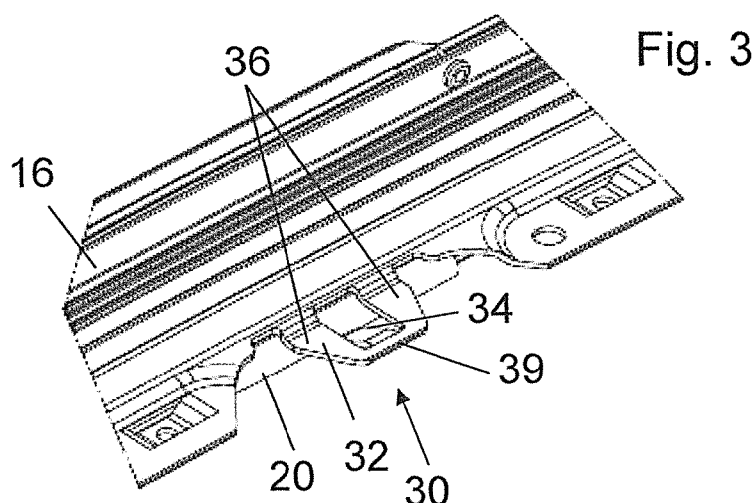
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(54) **Title:** FRAME FOR A SLIDING ROOF OF A VEHICLE



(57) **Abstract:** A frame (10) for a sliding roof of a vehicle is proposed, comprising at least one guide rail (16) for guiding a movable roof element, at which guide rail at least one holding device (30) is arranged for fastening a cable or cable harness (28). The guide rail (16) and the holding device (30) are designed in one piece.

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Frame for a sliding roof of a vehicle

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The present invention relates to a frame for a sliding roof of a vehicle having the features of the preamble of claim 1.

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Known frames for sliding roofs of vehicles or sliding lifting roofs of vehicles are often composed of several frame elements and include, among others, guide rails which extend in the longitudinal direction of the vehicle concerned and which in particular serve for traversing a cover element which serves for selectively closing or at least partially uncovering a roof opening that is designed in a roof of the vehicle concerned. In addition, drive elements for the cover element normally are guided in the guide rails. The guide rails are generally connected via at least one transverse strut which extends in the roof transverse direction, and which can be a front frame part.

20

In order to guide electric lines, more precisely, cables or cable harnesses, at the frame, it is in addition known that the frame elements, in particular guide rails, are provided with corresponding holding devices. The holding devices are separate parts which are connected to the frame of the sliding roof of a vehicle, in particular to the guide rail concerned, via corresponding fastening means, for example latching elements.

25

Various disadvantages are connected to using such holding devices. In this way, for example connecting or fastening the holding device to the guide rail of the frame or to the frame is a potential weak point or point of fatigue which can negatively influence the total life span of the frame or at least increase the likelihood of maintenance or repair work. In addition, when manufacturing the frame, initially the holding device has to be fastened to the frame or to the guide rail of the frame and, subsequently, the cable or the cable harness has to be fastened to the holding device. These are, however, manufacturing steps which are particularly hard to be automated and, therefore, are

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manually performed in many cases or at least have to be supervised. This in turn affects the production costs of the frame.

In conclusion, using separate holding devices for fastening cables or cable harnesses quite often leads to the cables or cable harnesses being fixed in a way which is not
5 sufficiently secure.

The invention is based on the task of proposing a frame for a sliding roof of a vehicle, which frame can be produced more quickly and at a lower price and includes an improved long-term stability or resistance to wear and an improved fastening for cables or cable harnesses.

10 This task, in accordance with the invention, is solved by the frame for a sliding roof of a vehicle in accordance with claim 1.

The frame according to the invention thus comprises at least one guide rail for guiding a movable roof element, wherein at least one holding device for fastening a cable or a cable harness is arranged at the guide rail and the guide rail and the holding device are
15 designed in one piece.

Since the corresponding guide rails per se already are molded parts with a complex shape, the holding device can be produced together with the guide rail concerned according to known methods, such as a die casting or an extrusion method. In addition, designing the guide rail of the frame in one piece including the holding device allows
20 for fastening a cable or a cable harness directly at the guide rail, without using a further separate component which still has to be fastened to the guide rail. Consequently, the number of potential points of rupture or fatigue is reduced and, simultaneously, it is made possible to easily, quickly and securely fasten a cable or a cable harness when assembling or manufacturing the frame, which positively affects the manufacturing
25 times.

In accordance with an advantageous embodiment of the frame according to the invention, the holding device includes a base bar which adjoins a side element of the guide rail, said side element being formed by a side wall or the like. By means of the base bar, the direct arrangement or the one-piece design of the holding device and of the

guide rail can on the one hand be achieved. In other words, the base bar also serves the function of a transition between the guide rail and the parts of the holding device which bring about the fastening. On the other hand, the base bar per se makes it possible that the cables or cable harnesses to be fastened can be fastened at the holding device, and
5 thereby also being fastened at the guide rail of the sliding roof frame of a vehicle, in simple steps since a certain distance to the actual guide rail is generated by means of the base bar.

In addition, it is furthermore advantageous if the base bar is designed to be U-shaped and is arranged at the guide rail, in particular at the side element of the guide rail, with
10 both ends of the U-shape. Here, a base forms the connection between the two legs of the base bar. By means of the U-shaped configuration of the base bar, a stable and secure arrangement of the holding device at the guide rail is, on the one hand, made possible and, in addition, a material-saving configuration of the base bar is achieved.

It is also advantageous if the holding device includes a clamping arm which is arranged
15 at a side of the base bar that is spaced apart from the guide rail. By arranging the clamping arm at a side of the base bar that is spaced apart from the guide rail of the sliding roof frame of the vehicle, it is ensured that the cable or the cable harness is inevitably fastened or clamped in a position which is located between the guide rail and the end of the base bar that is spaced apart from the guide rail. In other words, by means
20 of the clamping arm, a compact construction of the guide rail and, simultaneously, a space-saving fastening of the cable or of the cable harness is achieved. In the most general sense, the clamping arm make it possible that the cable or the cable harness is fastened at the guide rail of the sliding roof frame of the vehicle in a self-securing manner. Here, the clamping arm exerts a clamping force onto the cable or the cable
25 harness.

In the case of a U-shaped configuration of the base bar, it can correspondingly be particularly advantageous if the clamping arm branches off from the base between the two legs of the base bar. Thereby, a stable connection between the base bar and the clamping arm can be achieved. For example, the U-shape of the base bar and the
30 clamping arm can further be shaped from a planar tab in only one stamping process,

which tab approximately presents the shape of a semicircle or of a parable before the stamping process.

It is also advantageous for the frame of the sliding roof of a vehicle if the clamping arm includes a free end which points in the direction of the guide rail. This configuration
5 also leads to a particularly compact construction of the guide rail and hence of the entire frame and, in addition, makes it possible to arrange or fasten the cable or the cable harness in a space-saving way and to receive the same securely in the holding device.

In a special embodiment of the frame according to the invention, the free end of the clamping arm includes a bent end which serves for contacting the cable or the cable
10 harness to be fastened or to be clamped. The bent end can also facilitate fastening the cable or the cable harness because it is possible to easily and intuitively insert the cable or the cable harness or to bring the same into contact with the deformation. In addition, the bent end can also bring about an improved fastening or a better fastening effect of the cable or of the cable harness per se in the area of the free end of the clamping arm
15 since the bent shape or bend partially encloses the cable or the cable harness, it hence being possible for the fastening effect or the clamping effect to act onto the cable or the cable harness in a stronger form since the forces can act on a larger part of the surface of the cable or of the cable harness.

An additional advantageous configuration makes provision for the clamping arm and
20 the base bar to be respectively dimensioned such that a cable or a cable harness can be fastened between the clamping arm and the side element of the guide rail. In other words, for example, the clamping arm almost touches the side element of the guide rail, starting from the base bar, and that the space for receiving and fastening the cable or the cable harness between the clamping arm and the side element of the guide rail is only
25 procured in that the clamping arm is deformed away from the side element of the guide rail by means of an elastic deformation. As soon as the force acting from the outside for deforming the clamping arm is not exerted anymore, the clamping arm will correspondingly return to its original shape towards its initial position until the cable or the cable harness, which is located between the clamping arm and the side element of the guide
30 rail, applies a corresponding counteracting force. By means of the remaining elastic restoring force of the clamping force, correspondingly the clamping effect on the cable

and, consequently, the fastening between the side element of the guide rail and the clamping arm is generated.

It is also advantageous if the side element of the guide rail includes a recess for bringing a cable or a cable harness into contact, wherein the recess is in particular substantially
5 arranged on the same level as the free end of the clamping arm. In this configuration, the correct position or contacting of the cable or of the cable harness at the side element of the guide rail can easily be identified and a corresponding fastening of the cable can easily and securely be produced and maintained.

In order to further improve the fixing of the one cable or of the cable harness at the
10 guide rail of the frame, in relation to the longitudinal direction of the guide rail, a tab for at least partially enclosing a cable or a cable harness can be arranged on at least one side of the holding device, wherein the guide rail and the tab are designed in one piece. Expediently, the tab merges into the side element of the guide rail. The tab further is advantageously dimensioned such that the cable or the cable harness can run between
15 the tab and the side element of the guide rail. Thereby, it is achieved that the cable or the cable harness takes up a certain position on a side or on both sides of the holding device. In addition, a compact or space-saving guiding of the cable or of the cable harness is achieved thereby. In addition, the fastening effect of the holding device can thereby be supported.

20 A further embodiment in addition makes provision for a projection to be arranged at the guide rail between one tab each and the holding device, wherein the guide rail and the projection are designed in one piece and the tab, the holding device and the projection are arranged with respect to one another such that the cable or the cable harness has a U-shaped profile between the tab and the holding device. This means that both by
25 means of the holding device and by means of the tab or the tabs, the position of the cable or of the cable harness relative to the guide rail is respectively specified or defined. In addition, the projection is designed at the guide rail such that the end of the projection that is spaced apart from the guide rail is farther from the guide rail than the positions of the cable or of the cable harness relative to the guide rail, which positions
30 are defined or specified by means of the tabs and by means of the holding device. By means of this configuration and the resulting U-shaped profile of the cable or of the

cable harness between the tab or the tabs and the holding device, an improved clamping of the cable at the guide rail of the frame is achieved. Simultaneously, the cable is secured in its longitudinal direction against slipping or sliding.

Further advantages and advantageous configurations of the subject-matter of the invention can be taken from the description, from the drawing and from the claims.

In the drawing, one exemplary embodiment of a frame for a sliding roof of a vehicle according to the invention is illustrated in a schematically simplified way and will be explained in more detail in the following description. In the figures:

- Figure 1 shows a frame for a sliding roof of a vehicle in a comprehensive illustration;
- Figure 2 shows a detail of a perspective view of a guide rail for a sliding roof of a vehicle in accordance with the state of the art;
- Figure 3 shows a perspective detail of a guide rail for a sliding roof of a vehicle according to the invention;
- Figure 4 shows a view from above onto the guide rail according to Figure 3;
- Figure 5 shows a section through the guide rail according to Figure 4 along a line A-A in Figure 4 together with a cable which is fastened thereto; and
- Figure 6 shows a detail of a perspective illustration of the guide rail according to Figure 3 together with the cable which is fastened thereto.

In Figure 1, a frame 10 of a sliding roof of a vehicle is illustrated which can be utilized with a roof of a vehicle provided with a roof opening that can selectively be closed or at least partially uncovered by means of a cover element of the sliding roof, which is not illustrated in more detail. The frame 10 consists of two transverse elements 12, i.e. of one frame front part and one frame rear part, and two longitudinal elements 14, which are respectively designed as a guide rail 16. The guide rails 16 serve for guiding the cover element and drive elements for the cover element.

Figure 2 shows a detail of a guide rail 16 of the frame of a known sliding roof of a vehicle. The guide rail 16 comprises a bottom element 18 and a side element 20 which forms a lateral wall of the guide rail 16 lying on the outside in relation to the frame. At the side element 20 of the guide rail 16, tab-like crosspieces 22 having recesses 24 are arranged on the outside. A separate holding device 26 for fastening a cable 28 can be introduced into the recesses 24 of the crosspieces 22 and be latched, as illustrated in Figure 2. When producing the frame, the separate holding device 26 has to be fastened at the guide rail in a separate step. In addition, fastening the separate holding device 26 at the crosspiece 22 of the guide rail 16 is critical regarding material wear and/or fatigue.

In contrast to this, according to the invention, a frame for a sliding roof of a vehicle is proposed which comprises a guide rail 16 which is schematically illustrated in Figures 3 to 6. The guide rail 16 which is designed in accordance with the invention, corresponding to the guide rail according to the state of the art which is illustrated in Figure 2, also includes a side element 20 which is formed by a side wall located on the outside and a holding device 30 for fastening a cable or a cable harness, which holding device is arranged on the outside of the side element 20. However, the holding device 30 is designed in one piece with the side element 20 and hence with the guide rail 16 which is embodied as a die-casted part or as an extrusion part. Figure 3 further shows that the holding device 30 comprises a base bar 32 which is U-shaped in the view from above as well as a clamping arm 34. The U-shaped base bar 32 has two legs 36 which merge into the side element 20 of the guide rail 16. The clamping arm 34 branches off from a base 39 of the base bar 32, which base connects the two legs 36, and points in the direction of the side element 20 with its free end. In other words, the base bar 32 forms a tab whose legs 36 are arranged in the side element of the guide rail 16. The tab or the base bar 32 is arranged in a plane which runs parallel to a plane in which movable parts of the sliding roof of a vehicle are guided by means of the guide rail 16. The clamping arm 34 is a notch of the tab.

As it can in particular be taken from the view from above according to Figure 4, the dimensions of the base bar 32 and of the clamping arm 34 of the holding device 30 are dimensioned such that a free end 40 of the clamping arm 34 only presents a small

distance to the side element 20 of the guide rail 16. This distance is smaller than a diameter of a cable 28 which is seized at the holding device.

Figure 5 shows a section through the guide rail 16 according to Figure 4 along a line A-A. Figure 5 correspondingly shows the profile of the guide rail 16. Apart from the bottom element 18 and the side element 20, the guide rail 16 comprises a further side
5 element 42 which is arranged on the inside in relation to the frame. As it is schematically illustrated in Figure 5, the clamping arm 34, which is for example designed to be resilient, presses the cable 28 in the direction of the side element such that it is seized between the clamping arm 34 and the side element 20 of the guide
10 rail 16.

Alternatively, in a manner not illustrated, provision can be made for the clamping arm 34 to press the cable 28 against the lower side of the U-shaped base bar 32, thus generating a clamping force without including the side element 20 of the guide rail 16. In addition, a combination of the preceding options is also conceivable, in which the
15 clamping arm 34 presses the cable 28 both against the lower side of the base bar 32 and against a part of the side element 20 of the guide rail 16, thereby generating a clamping force. The latter case is not illustrated in the figures, either.

In accordance with Figure 4, the free end 40 of the clamping arm 34 which is in contact with the cable 28 is bent slightly downwards. In addition, the side element 20 of the
20 guide rail 16 includes a channel-like recess 44 which is engaged by the cable 28, whereby an exact positioning at the side element 20 of the guide rail 16 is achieved. The recess 44 can be seen to be a part of a round notch, whereby cables or cable harnesses having a circular or round cross-section can precisely be positioned in the recess 44. the fastening effect or the clamping effect of the holding device is particularly
25 advantageously influenced by the free end 40 of the clamping arm 34 that is bent downwards and by the recess 44 of the side element 20 because the clamping forces can act on a large area of the cable 28. Thereby, the risk is reduced that the cable 28 slips. Simultaneously, by means of the free end 40 and the recess 44 of the side element 20, positioning the cable 28 is also simplified during mounting.

Figure 6 shows a perspective view of a detail of a guide rail 16 of a frame 10 for a sliding roof of a vehicle, wherein, apart from the perspective illustration of the surface, the profile, as sketched in Figure 5, has also been incorporated into the illustration of Figure 6. In addition, Figure 6 shows the path of the cable 28 in the holding device 30.

5 The cable 28 is fastened to the guide rail 16 by the holding device 30. By means of the elastic deformation of the clamping arm 34 and by introducing the cable 28 in the space between the side element 20 of the guide rail 16 and the clamping arm 34 as well as by means of the shape of the free end 40 of the clamping arm 34 and of a recess 44 which is approximately on the same level and which has the shape of a channel of the side
10 element 20, the cable 28 is clamped between the free end 40 of the clamping arm 34 and the side element 20 of the guide rail 16, is pressed against the lower side of the base bar 32 and is hence securely fixed.

As it can be taken from Figure 6, in relation to the longitudinal direction of the guide rail 16 one tab 46 each is arranged on both sides of the holding device 30, which tab
15 partially encloses the cable 28. The tabs 46 merge into the side element 20 of the guide rail 16 in one piece. By means of the tabs 46, it is achieved to position the cable 28 at the guide rail 16. The tabs 46 obtain a further function in connection with projections 48 which are respectively arranged between the tabs 46 and the holding device 30. The projections 48 are also designed in one piece together with the guide rail and are
20 located, as is shown in Figure 6, at or on the side element 20 of the guide rail 16. By means of the concerted dimensioning of the holding device 30, the tabs 46 and the projections 48, the cable respectively obtains a U-shaped profile when being passed through between a tab 46 and the holding device 30, which profile is generated by means of the projections 48. In particular in the longitudinal direction of the cable 28,
25 the twofold U-shape or the W-shape provides for a fixing of the cable as against the guide rail between the tabs 46. By means of the one-piece embodiment of the tabs 46 and/or of the projections 48 with the guide rail 16, it is also made possible to produce the corresponding guide rails 16 or frames in a time-saving and cost-efficient way.

As it can be seen from Figure 5, the holding device 30 can easily be designed when
30 producing the guide rail 16, for example by means of extrusion or pressure spray casting and, if required, subsequent pressing and/or stamping/bending methods. Thereby, using

separate holding devices is omitted and the problems which are connected with fastening separate holding devices at the guide rail, such as fatigue and wear, do not apply. The corresponding step for fastening the holding device at the guide rail can also be omitted.

List of reference numerals

	10	frame
	12	transverse element
	14	longitudinal element
5	16	guide rail
	18	bottom element
	20	side element
	22	crosspiece
	24	recess
10	26	separate holding device
	28	cable
	30	holding device
	32	base bar
	34	clamping arm
15	36	leg
	39	base
	40	free end
	42	side element
	44	recess
20	46	tab
	48	projection

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Claims

- 10 1. A frame for a sliding roof of a vehicle, comprising at least one guide rail (16) for guiding a movable roof element, at which guide rail at least one holding device (30) is arranged for fastening a cable or a cable harness (28), characterized in that the guide rail (16) and the holding device (30) are designed in one piece.
- 15 2. The frame for a sliding roof of a vehicle according to claim 1, characterized in that the holding device (30) includes a base bar (32) which adjoins a side element (20) of the guide rail (16).
- 20 3. The frame for a sliding roof of a vehicle according to claim 2, characterized in that the base bar (32) is designed to be U-shaped and merges into the guide rail (16), in particular into the side element (20) of the guide rail (16), with its two legs (36) which are connected to each other via a base (39).
- 25 4. The frame for a sliding roof of a vehicle according to claim 2 or 3, characterized in that the holding device (30) includes a clamping arm (34) which branches off from a side of the base bar (32) that is spaced apart from the guide rail (16).

5. The frame for a sliding roof of a vehicle according to claim 4 in connection with claim 3,
characterized in that
the clamping arm (34) branches off from the base (39).
- 5 6. The frame for a sliding roof of a vehicle according to claim 4 or 5,
characterized in that
the clamping arm (34) includes a free end (40) which points in the direction of
the side element (20) of the guide rail (16).
- 10 7. The frame for a sliding roof of a vehicle according to claim 6,
characterized in that
the free end (40) of the clamping arm (34) includes a bent end for coming into
contact with a cable or a cable harness (28).
- 15 8. The frame for a sliding roof of a vehicle according to any one of the claims 4
to 7,
characterized in that
the clamping arm (34) and the base bar (32) are dimensioned such that a cable or
a cable harness (28) can be clamped between the clamping arm (34) and the side
element (20) of the guide rail (16).
- 20 9. The frame for a sliding roof of a vehicle according to any one of the claims 2
to 8,
characterized in that
the side element (20) of the guide rail (16) includes a recess (44) for bringing a
cable or a cable harness (28) into contact, which recess is in particular
substantially designed on the same level as the free end (40) of the clamping
25 arm (34).

10. The frame for a sliding roof of a vehicle according to any one of the claims 2 to 9,
characterized in that
along the guide rail (16), on at least one side of the holding device (30), a
5 tab (46) is arranged for at least partially enclosing a cable or a cable
harness (28), wherein the guide rail (16) and the tab (46) are designed in one
piece.
11. The frame for a sliding roof of a vehicle according to claim 10,
characterized in that
10 between a tab (46) and the holding device (30), a projection (48) is arranged at
the guide rail (16), wherein the guide rail (16) and the projection (48) are
designed in one piece and the tab (46), the holding device (30) and the
projection (48) are arranged with respect to one another such that the cable or
the cable harness (28) presents a U-shaped profile between the tab (46) and the
15 holding device.

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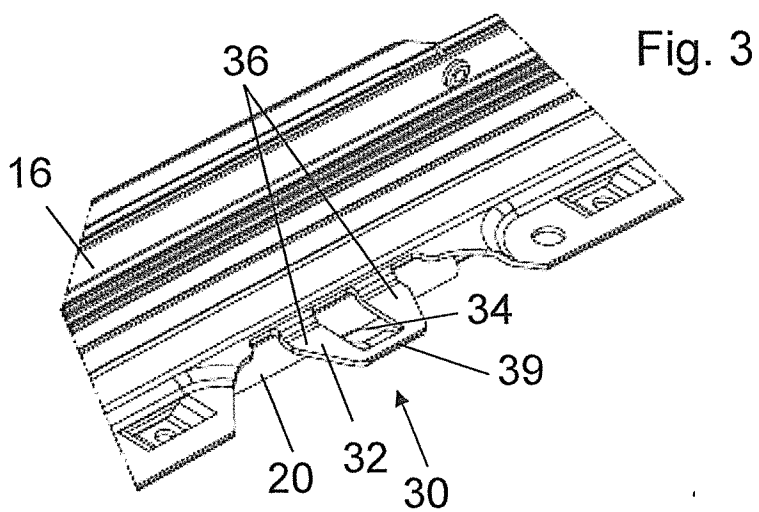
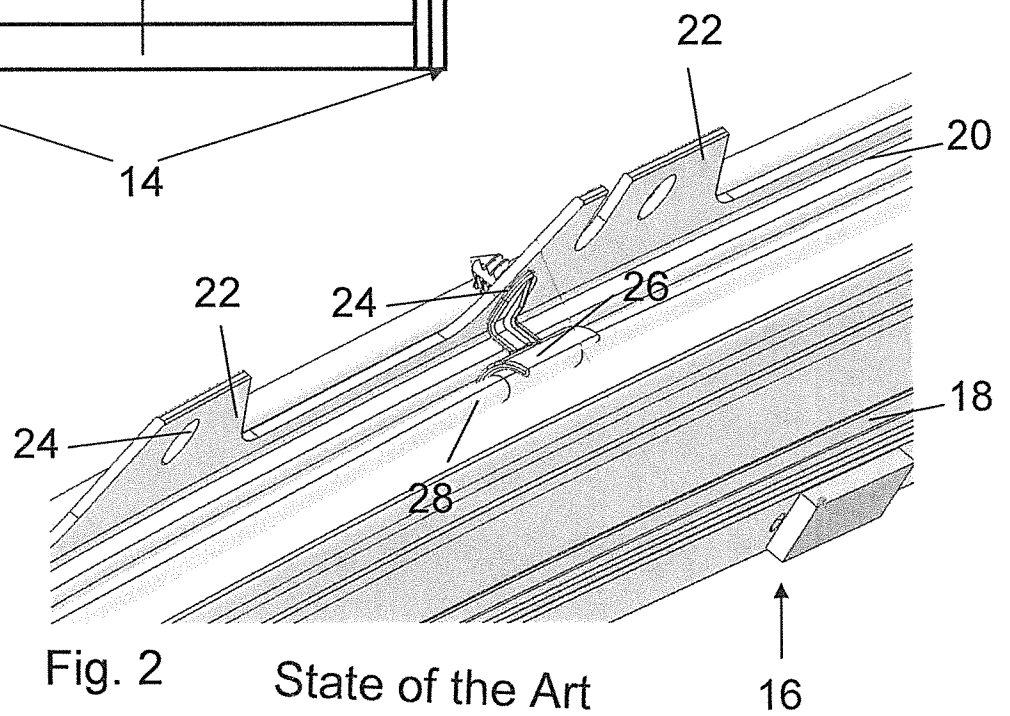
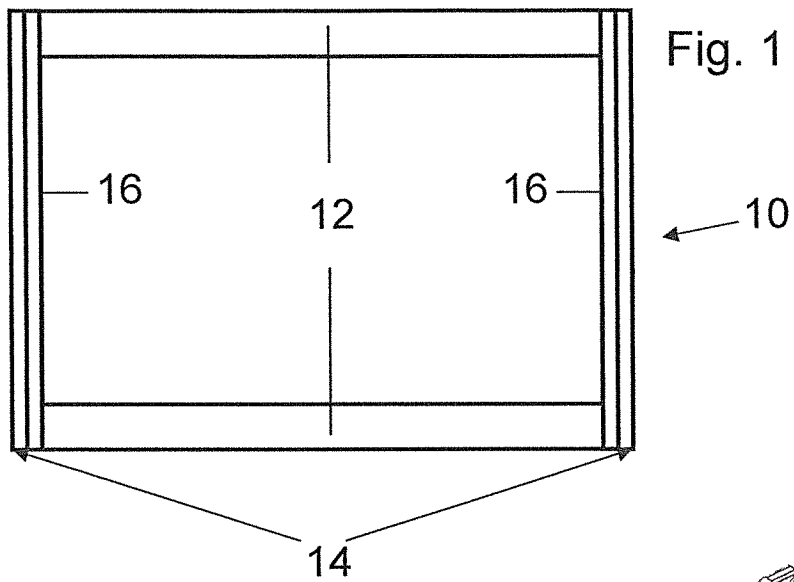


Fig. 4

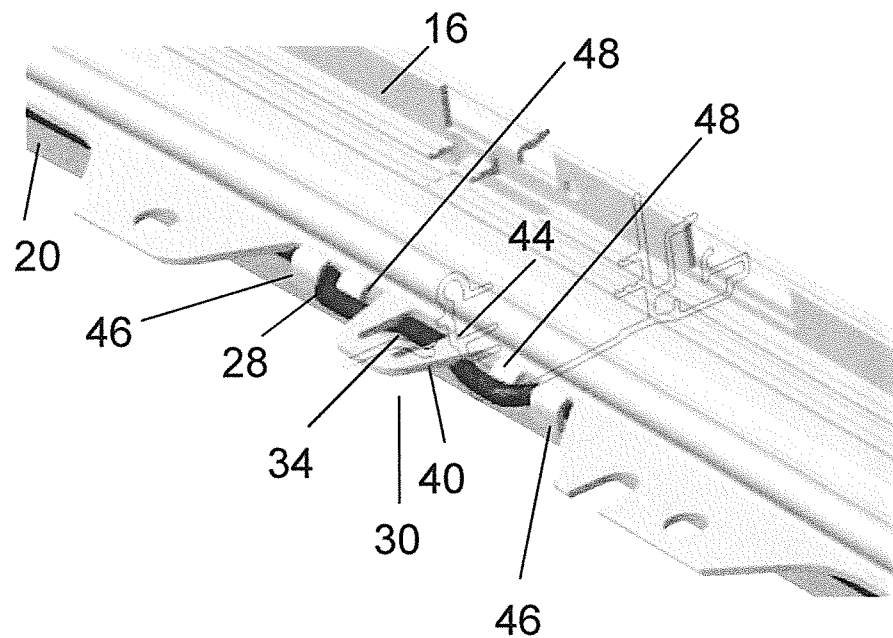
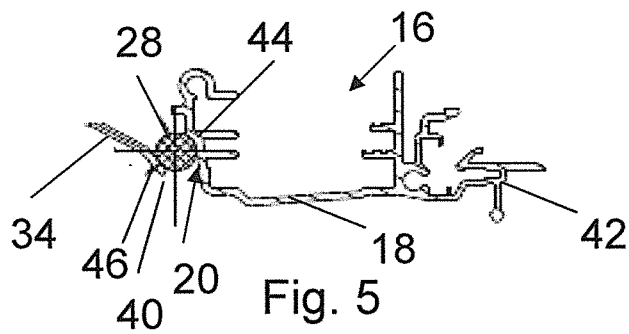
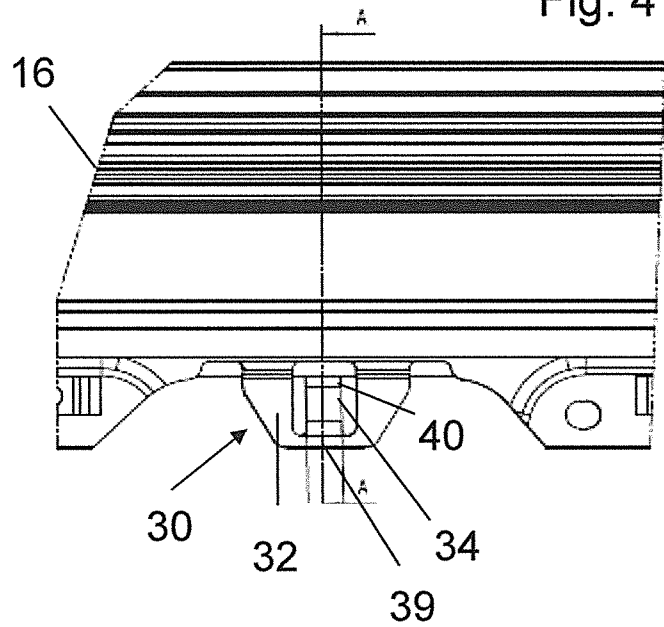


Fig. 6

INTERNATIONAL SEARCH REPORT

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PCT/EP2014/065447

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60J7/057 B60R16/02
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B60J B60R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C.



See patent family annex.

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INTERNATIONAL SEARCH REPORT

International application No

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