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(54) **A CONNECTOR ELEMENT FOR USE IN A FLASHING ASSEMBLY FOR ROOF WINDOWS MOUNTED SIDE-BY-SIDE AND A CONNECTOR SET INCLUDING SUCH A CONNECTOR ELEMENT**

(57) A connector element (5) for use in a flashing assembly for roof windows, has an exterior side (511), an interior side (512), a first end (513) intended for facing the window and a second end (514), two side walls (52) extending between the first and second ends and forming a gutter (53), and at least two flanges (54a, 54b) projecting from the interior side (512) adapted for engagement with a mounting bracket arrangement for two different roof windows mounted side-by-side, and where the con-

connector element (5) comprises at least one point of attachment (531) adapted for engagement with a flashing member. Each side wall (52) is provided with a, preferably elongated, attachment element (57) on an outer side (521) facing away from the gutter (53), said attachment elements (57) being adapted for engagement with a corresponding attachment element on an extension element or adaptor element.

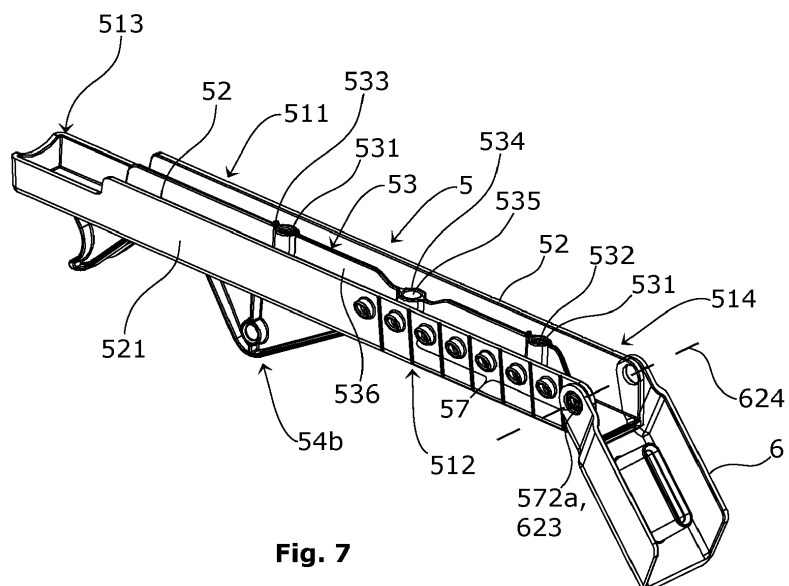


Fig. 7

Description

Technical Field

[0001] The present invention relates to a connector element for use in a flashing assembly for roof windows mounted side-by-side comprising at least two flashing members each having a leg intended for being arranged so that it projects away from the window frame, where the connector element has an exterior side intended for facing the exterior in the mounted state, an interior side intended for facing the roof in the mounted state, a first end intended for facing the window, a second end intended for facing away from the window, two side walls extending between the first and second ends and forming a gutter extending in a longitudinal direction and being open towards the exterior side, and at least two flanges projecting from the interior side adapted for engagement with a mounting bracket arrangement including at least two mounting brackets associated with two different roof windows mounted side-by-side, and where the connector element comprises at least one point of attachment adapted for engagement with an engagement section of a flashing member. The invention further relates to a connector set including such a connector element.

[0002] Such a connector element is known from WO 2015/028030 A1 and has proven to work very well when mounting flashing assemblies on groups of windows with frames made from glass fibre reinforced polymers or materials, which are not well suited for receiving screws. This connector element is, however, only suitable for very specific installation situations and requires precise mounting. WO 2015/028030 A1 does suggest that the connector element is slightly elongate by means of a simple adaptor element, which is wrapped around the interior side and the side walls of the connector element at its second end and is attached by means of two bendable tongues which are folded over small recesses in the edges of the side walls and into the gutter. The adaptor thereby extends as a straight elongation of the gutter.

Summary of Invention

[0003] It is therefore the object of the invention to provide a connector element, which can be used in a broader range of installation situations, and a method for mounting a flashing assembly, which increases the versatility of the connector element.

[0004] This object is achieved with a connector element where each side wall is provided with a, preferably elongated, attachment element on an outer side facing away from the gutter, said attachment elements being adapted for engagement with a corresponding attachment element on an extension element or with corresponding attachment members of an adaptor element. The attachment element preferably comprises a first series of attachment members, said first series being preferably a part of a second larger series of attachment

members.

[0005] Providing for the attachment of an extension element allows the use of a standard connector element e.g. in installation situations, where the windows are mounted on an upstand, which is wider than usual, and where the flashing members therefore have to project relatively far from the outer side of the window in order to cover the upstand.

[0006] Providing the attachment elements on the outer sides of the side walls provides for making the extension element of a mouldable material such as a plastics material since bendable tongues, which would require the material to be metal such as steel or aluminium, are avoided.

[0007] Providing the attachment element as an element elongated in the longitudinal direction has the advantage that the extension element may be attached at several points with a mutual distance in the longitudinal direction whereby a more secure fastening is obtained in relation to bending forces acting on the assembled connector element and extension element e.g. due to wind load or the weight of snow lying on flashing members supported by the connector element and the extension element.

[0008] Providing the attachment element as a series of attachment members may provide several further advantages. One is that the extension element may be attached to several attachment members at each side thus providing a particularly reliable interconnection of the connector element and the extension element. Another advantage, when the first series of attachment members are a part of a second larger series, is that the attachment members may allow the extension element to be attached to the connector at several different positions, thereby allowing adjustment of the total length of the connector element and the extension element to the specific installation situation.

[0009] The provision of the attachment members on an outer side of the connector element facing away from the gutter entails that they do not hinder the passage of water through the gutter when the connector element also serves drainage purposes as will be described in detail below. Furthermore, flashing members may be arranged with flanges projecting over the edges of the side walls and into the gutter in order to provide an interconnection between the flashing members and the connector element without colliding with the attachment members.

[0010] The attachment members may be embodied in several ways including the use of a hook and loop type fasteners, but will often include male and female parts on the connector element and on an extension element or adaptor element, respectively, or vice versa.

[0011] In one embodiment, the attachment elements are adapted for snap-locking engagement. This may be achieved either by virtue of a snap-locking engagement between the actual attachment elements or by force-fitting the engagement between the extension element or adaptor element and the connector element, so that one

set of attachment elements snaps onto the other and passively secures the engagement between the two elements.

[0012] The latter option is particularly advantageous if e.g. the extension element is made with two side walls extending substantially in parallel with the side walls of the connector element in a mounted state and forming a gutter extending in continuation of the gutter of the connector element in a mounted state, a first end of the extension element being adapted for engaging the second end of the connector element and a second end of the extension element being adapted for facing away from the connector element, and where the width of the gutter of the extension element at its first end is larger than the width of the connector element at its second end, so that the first end of the extension element may embrace the second end of the connector element in the mounted state. This embodiment of the extension element may, however, also be used with other types of attachment elements.

[0013] In one embodiment one of the attachment elements or attachment members and the corresponding attachment elements or attachment members comprise protrusions protruding from the respective side wall and the other of the attachment elements or attachment members and the corresponding attachment elements or attachment members comprise recesses in the respective side wall.

[0014] Thus in one embodiment, the attachment members on the connector element have the shape of truncated cones, which are fitting into corresponding hollow cones on side walls of the extension element or adaptor element. If making one or both sets of cones elastic by forming them from an elastic material or by providing slots or the like allowing sections or the cones to yield, a snap-locking engagement between the cones may be provided.

[0015] If making the extension element or adaptor element so that its first end may embrace the second end of the connector element in the mounted state as described above, cone-shaped attachment members may advantageously be obliquely truncated so that the side of the cone facing the exterior side of the connector element extend further from the outer side of the side wall than the side of the cone facing the interior side of the connector element. The oblique end surface of the truncated cone may then serve as a guide for the attachment of the extension element or adaptor element by gradually forcing the side walls of the extension element or adaptor element aside during mounting thereof until the attachment members on the connector element snaps into the attachment members on the extension element or adaptor element. In order to ease mounting, a section of one or both side walls of the extension element at the first end may be offset so that the section of the gutter in the extension element extending along the offset section(s) has a larger width than the rest of the gutter in the extension element. Offsetting sections, particularly adjacent

to the free edges of the side walls, will help guide the connector element into the extension element and/or prevent that the side walls of the extension element are exposed to too high bending forces when being forced over the attachment members on the connector element as will also be described with reference to the drawing below.

[0016] It is noted that when providing for the first end of the extension element to embrace, and thus overlap, the second end of the connector element the embracement may per se provide for overall rigidity of the connected elements provided an attachment element is positioned centrally relative to the overlap. Such attachment element may be substantially punctual, i.e. not elongated. However, the provision of an elongated attachment element will per se be provided for, and will thus add to, the overall rigidity of the connected elements.

[0017] The attachment members should be of a design which provides them with sufficient strength to maintain the interconnection of the connector element and the extension element even when the flashing assembly is subjected to heavy loads, such as high wind loads or the weight of snow. It is, however, possible to add a reinforcement element adapted for reinforcing the connection. In one embodiment, a reinforcement element is arranged to extend along the connector element and the extension element in the mounted state, and the connector element and/or the extension element is/are provided with further attachment members adapted for providing a connection to the reinforcement element. The further attachment members may simply be holes extending through the connector element and the extension element and being aligned in the mounted state so that a bolt or like fastener may be passed through them, but other types of attachment members such as snap-locking members or hook-and-loop type fasteners may also be employed, or the reinforcing element may be attached using glue, adhesive or even welding.

[0018] The reinforcement element may be a simple strip of material or have a more complex shape, including a gutter-shape element adapted to embrace the outer and interior sides of the connector element and the extension element at least over a section of their length. It may be of metal, plastic or any other material having a sufficient bending strength to stabilize the joint between the connector element and the extension element.

[0019] The connector element according to invention may be provided one or more, preferably two or more, raised sections in the gutter, said raised section(s) being adapted for serving as point(s) of attachment for an engagement section of a flashing member as is also known from the connector element described in WO 2015/028030 A1. Providing the points of attachment on raised sections means that they are kept a distance from any water in the gutter, thus both protecting the fasteners used for securing flashing members to the connector element and reducing the risk of water entering the construction at the points of attachment.

[0020] The raised sections may be simple cylindrical bosses, but more complex designs are also possible, for example to provide a larger area of support for the flashing member or a larger contact area with the bottom of the gutter.

[0021] Often the use of two points of attachment for an overlaying flashing member to the connector element is appropriate, but the connector element may nonetheless be provided with three or more raised sections. This will allow the same connector element to be used for several different installation situations by using one pair of raised section in one installation situation and another pair in another installation situation.

[0022] In order to provide stiffness to the connector element and/or to present the raised sections from being pulled loose from the connector element one or more of the raised sections may be mutually interconnected or connected to a bottom of the gutter by a wall extending substantially in parallel to one or both side walls.

[0023] It will in principle be sufficient to provide the connector element with one or two raised section, but in order to increase the versatility of the connector element three or more raised sections may be provided corresponding to different installation situations. During mounting only the raised section, which are positioned suitably for the specific installation situation, are used.

[0024] Similar considerations apply to the extension element, which may also be provided with raised section of the same or similar type as the connector element.

[0025] Another way of increasing the versatility of the connector element is to provide it with weakenings and/or cutting guides in the side walls and/or bottom of the gutter adapted for aiding in the removal of a part of the connector element. In this way the connector element may easily be shortened and adapted for installation purposes, where the standard length is too long. Removing part of the connector element may involve the removal of one or more raised sections, which are not needed for the installation situation in question.

[0026] The extension element may also be provided with such weakenings and/or cutting guides in order to be able to shorten it, even if the connector element is not provided with weakenings or cutting guides.

[0027] In a preferred embodiment the engagement between the attachment members of the adaptor element and the connector element is adapted for allowing the adaptor element to be adjusted to different angular positions relative to the longitudinal direction about an axis, which is substantially perpendicular to the side walls of the connector element. Thus in an embodiment the engagement between the attachment members of the adaptor element and the connector element is adapted for allowing the adaptor element to rotate about an axis, which is substantially perpendicular to the side walls of the connector element. Hereby is obtained a possibility of adapting the connection set for support of a flashing having a second leg, which is not extending straight from the first leg, but which is extending at an angle from the

first leg. It should be noted that the side walls are not necessarily exactly parallel but might e.g. diverge from the interior side to the exterior side. Accordingly, the language "substantially perpendicular to the side walls" should be interpreted as referring to an average.

[0028] In a preferred embodiment the adaptor element is, like the connector element may be, provided with one or more raised section(s), said raised section(s) being adapted for serving as point(s) of attachment for an engagement section of a flashing member.

[0029] In a further embodiment one or more such raised section(s) are of an elongate configuration allowing several possible points of attachment for an engagement section of a flashing member. This enhanced the versatility of the connector set.

Brief Description of Drawings

[0030] In the following the invention will be described in closer detail with reference to the drawing where

Fig. 1 is a perspective view of two windows mounted side-by-side on an upstand;

Fig. 2 is an enlarged perspective partial view sectioned vertically along line X in Fig. 1 and showing a lower part of the left window;

Fig. 3 is an enlarged side view of the lower part of the right window in Fig. 1 seen in direction of arrow Y in Fig. 1;

Fig. 4 is an enlarged side view of an upper part of the right window in Fig. 1 seen in direction of arrow Y in Fig. 1, omitting flashing members;

Fig. 5 shows a section corresponding to the view of Fig. 2, but seen as a side view in direction of arrow Y in Fig. 1;

Fig. 6 is a view corresponding to Fig. 5, but illustrating use of an extension element;

Fig. 7 is a top perspective view of a lower connector element with a short adaptor element;

Fig. 8 is a top perspective view of an upper connector element;

Fig. 9 is a bottom perspective view of the elements of Fig. 7;

Fig. 10 is a bottom perspective view of the element of Fig. 8;

Fig. 11 is a side view of the lower connector element as seen in Fig. 4;

Fig. 12 is a top perspective view of the lower connector element with an extension element and a long adaptor element;

Fig. 13 is a top perspective view of the upper connector element with an extension element and a long adaptor element;

Fig. 14 is a side view of the elements of Fig. 12;

Fig. 15 is a side view of the elements of Fig. 13;

Fig. 16 is a top perspective view of the extension element of Figs. 12-14;

Fig. 17 is a bottom perspective view of the extension

element of Figs. 12-14;

Fig. 18 is a side view of the extension element of Figs. 12-14;

Fig. 19 is top perspective view of the long adaptor element of Figs. 12-14;

Fig. 20 is bottom perspective view of the long adaptor element of Figs. 12-14;

Fig. 21 is top perspective view of the short adaptor element of Figs. 7 and 9;

Fig. 22 shows a section along line XXII-XXII in Fig. 14; and

Fig. 23 shows a section along line XXIII-XXIII in Fig. 15.

Description of Embodiments

[0031] Fig. 1 shows two roof windows 1 mounted side-by-side on a so-called upstand 2, which is a load-bearing frame construction typically formed on a roof 211 with limited inclination as described for example in EP 2472027 A2. It is, however, to be understood that the present invention works equally well in other installation situations, where the flashing assembly and mounting brackets are of a different configuration.

[0032] In accordance with the inclination of the windows relative to horizontal in their mounted position each window 1 has an upper part 11 and a lower part 12 at either end of the window relative at what is herein arbitrarily defined as a longitudinal direction. It is noted that in Fig. 1, line X is extending along said longitudinal direction.

[0033] The upstand 2 comprises a top surface 21 and a circumferential external surface 22. On the top surface 21 beams 23 are mounted for supporting mounting brackets of a mounting bracket arrangement for mounting the windows 1.

[0034] Each window 1 comprises a pane element 13 supported by a sash structure (not shown), which is connected to a frame 14 in a manner known per se, and the mounting bracket arrangement comprises a mounting bracket 3 provided at each corner of the respective windows 1, see also Fig. 2. A covering and flashing assembly 4 includes a plurality of flashing members 41-46 used for bridging the gap between the windows 1 and the building surface in which they are mounted. Thus in the present example the plurality of flashing members 41-45 covers the gap between the windows 1 and the upstand 2 and the top surface 21 of the latter. Further the covering and flashing assembly 4 comprises a plurality of different covering members 46 used to cover exterior surfaces of the windows 1 in a manner known per se.

[0035] In the embodiment shown the plurality of flashing members comprise lower flashing members 41 extending along lower sides of the windows 1, upper flashing members 42 extending along upper sides of the windows 1, upper corner flashing members 43, side flashing members 44 and lower corner flashing members 45. The respective flashing members comprise a first leg, or por-

tion, arranged so that it projects away from the window frame 14 and a second leg, or portion, arranged to extend in extension of the first leg, but in a direction towards the building surface in which the windows are mounted.

Thus, for illustration, the lower flashing members 41 each comprises a first leg 411 and a second leg 412.

[0036] The mounting brackets 3 are in the present embodiment of a design, known per se from WO 2015/028030 A1, with two plate members 31, 32 extending in parallel away from the window frame 14 and these plate members are separated by intermediate members in the form of tubular spacer members 331 (Figs. 3 and 4) extending between holes 332 in the respective plate members. The spacer members may be used as guides for bolts (not shown) used for interconnection the mounting brackets of the two windows mounted side-by-side to contribute to the stability of the group of windows or as points of attachment for other parts of the window such as operators (not shown) arranged on the outer side of the window frame.

[0037] The side plates 31, 32 of the mounting brackets 3 each comprise a proximal side plate 31, which is proximal relative to a longitudinal vertical centre plane of the window (not shown), and a distal side plate 32, which is distal relative to said longitudinal vertical centre plane. Thus, when two windows are mounted side-by-side, the respective distal side plates 32 of the two windows will abut against each other, as it is known per se. Thus Fig. 2 shows two mounting brackets 3 comprising respective distal side plates 32a and 32b, where the distal side plate 32a belongs to the right window as seen in Fig. 1 and the distal side plate 32b belongs to the left window as seen in Fig. 1. Correspondingly the two mounting brackets 3 comprise proximal side plates 31 a and 31 b, respectively. It should be noted that the distal side plates are not shown in Figs. 3 and 4.

[0038] The mounting brackets 3 are utilised for assisting support of the plurality of flashing members 41-45. To this effect the mounting brackets 3 are carrying connector elements 5, 5' supporting, in the embodiment shown, the first legs 411 of adjacent flashing member and especially adjacent edges of the first legs of such adjacent flashing members. As shown in Figs 2, 3 and 5 an adaptor element 6 may be connected to the connector element 5 to support the second legs 412 extending from said first legs 411. As shown in Fig. 6 an extension element 7 may be used to extent the connector element 5 e.g. in case of a very broad upstand 2' with a very wide top surface 21'. The adaptor element 6 and the extension element 7 will be described in more detail below.

[0039] The connector elements are herein disclosed in two slightly different embodiments, namely the lower connector element 5 and the upper connector element 5' provided for attachment at the lower part 11 of the windows and the upper part 12 of the windows, respectively. The connector elements 5, 5' are shown uninstalled in Figs. 7-11 where the lower connector element 5 in Fig. 11 is shown alone and in Figs. 7 and 9 is shown

with an adaptor element attached.

[0040] Each connector element 5, 5' has an exterior side 511, 511' seen in Figs. 7 and 8, respectively, intended for facing the exterior in the mounted state, an interior side 512, 512' seen in Figs. 9 and 10, respectively, intended for facing the roof 211 in the mounted state, a first end 513, 513' intended for facing the window 1, a second end 514, 514' intended for facing away from the window 1, two side walls 52, 52' extending between the first and second ends 513, 513'; 514, 514' and forming a gutter 53, 53' extending in a longitudinal direction and being open towards the exterior side 511, 511'. Thus, the two side walls 52, 52' are mutually opposite side walls positioned respectively on either side of the gutter 53. Preferably the gutter 53, 53' extends substantially rectilinearly, especially in the second end 514, 514' of the connector element 5, 5'. Each connector element 5, 5' further has a pair of flanges projecting from the interior side 512, 512' adapted for engagement with the mounting bracket 3.

[0041] The two flanges of the pair of flanges of either connector element 5, 5' comprises a right flange 54a, 54a' and a left flange 54b, 54b' where the right and the left flange of either pair are recessed similarly but are mirror inverted relative to each other. Thus the flanges are provided with transverse ribs 541 along parts of their periphery, i.e., said ribs extending in the embodiment shown away from a longitudinal centre plane of the respective connector element. In either flange a through hole 55 is provided, tubular reinforcements 551 corresponding to the ribs 541 being provided at the holes 55.

[0042] The flanges are provided with recesses 561, 562 as illustrated in general in Fig. 11.

[0043] When mounting the connector elements 5, 5' on the mounting brackets 3 the right and left flanges 54a, 54a'; 54b, 54b' are inserted between the respective distal and proximal side plates of adjacent mounting brackets 3. Thus as illustrated in Fig. 2 the right flange 54a of the lower connector element 5 is inserted between the proximal side plate 31 a and the distal side plate 32a of the right window, and the left flange (not seen in Fig. 2) is inserted between the proximal side plate 31 b and the distal side plate 32b of the left window.

[0044] The recesses 561 and 562 are shaped for the connector elements 5, 5' to engage with the tubular spacer members 331 to position the connector elements 5, 5' correctly relative to the windows 1 with a tactile response for a person installing the connector elements as it is also described in the above mentioned WO 2015/028030 A1. The flanges 54a, 54a'; 54b, 54b' and recesses 561, 562 are shaped in accordance with elements, such as mounting brackets, with which they are intended to cooperate for installation.

[0045] The ribs 541 and the tubular reinforcement element 551 provide the flanges 54a, 54a'; 54b, 54b' with an overall width substantially corresponding to the distance between the respective proximal and distal side plates whereby, in the installed position of the connector

elements 5, 5', the lateral position of the connector element 5, 5' is fixed. A pin (not shown) or a like fastening means may, when the connector element 5, 5' has reached its installed position, be inserted through holes 333 in the side plates 31 a, 32a, 32b, 31 b and the holes 55, 55' in the two flanges 54a, 54a'; 54b, 54b' whereby the connector element 5, 5' is fixated in its position.

[0046] The first ends 513 and 513', respectively, of the lower connector element 5 and the upper connector element 5' are somewhat different as is appears from Figs. 7 and 8. Thus the extreme end of the first end 513 of the lower connector element 5 has a reduced height for said end to be arranged underneath another member of the window in the installed position. The extreme end of the first end 513' of the upper connector element 5', on the other hand, has two bends to provide an oblique section 501 for extending in abutment against the frame 14 of the window at its upper part 11, as seen in Fig. 4, and a substantial perpendicular section 502 to fit with the covering members. Also the flanges 54a, 54b of the lower connector element 5 and the flanges 54a', 54b' of the upper connector element 5' are slightly differently recessed as it appears from the figures to provide for correct installed positions for the respective connector elements.

[0047] Centrally in the gutter 53, 53' the connector elements 5, 5' are provided with a number of raised sections. In the upper connector element 5' three raised sections 531 are provided and in the lower connector element two such raised sections 531 are provided. These raised sections 531 are adapted for supporting an overlaying flashing member, such as upper flashing member 42 or lower flashing member 41 and are provided with openings 532 adapted for receiving screws or like fasteners penetrating through the flashing member, in a manner known per se. Thus the raised sections 531 serve as points of attachment for the flashing members. In specific embodiments three or more raised sections may be provided corresponding to different installation situations. In the embodiments shown the raised sections 531 are each provided with two small projections 533, one on either side of the opening 532. These projections are adapted for fitting into depressions (not shown) in the flashing members, so that the person mounting the respective flashing member will get a tactile feedback when it is in place. It is also possible to provide only one or some of the raised sections 531 with projections 533 and only one projection 533 per raised section 531 may be provided.

[0048] The raised sections 531 extends from the bottom of the gutter 53 to a level slightly above the level of the side walls 52, 52' to ensure that the overlaying flashing element is not distorted when secured by means of screws, or the like, inserted into and fastened in the openings 532 of the raised sections 531.

[0049] Further second raised sections 534 are provided. In the embodiments shown, one second raised section is provided in each of the upper and lower connector

element 5, 5'. These second raised sections likewise have openings, which however are through holes 535 which have a larger bore than the former openings 532 to allow bolts or screw for nuts to pass through for reasons to be explained below.

[0050] The raised sections 531 and 534 are mutually interconnected and are connected to the bottom of the gutter 53 by a central wall 536. The central wall 536 provides for additional strength while allowing any water that might run into the gutter 53 to pass to the extreme end of the second end 514, 514' of the connector element 5, 5'.

[0051] According to the present invention the connector elements 5, 5' are provided with attachment elements 57 on the outer sides 521, 521' of the side walls 52, 52' i.e. on the sides of the walls 52, 52' facing away from the gutter 53, 53'.

[0052] In one aspect, and in one embodiment, a series 571 of six attachment members 572 provides an attachment element for the extension element 7. Thus the series 571 provides an elongated attachment element.

[0053] In the embodiments shown the attachment members 572 are provided as protrusions protruding from the outer side of the respective side wall 52, 52' and having the shape of truncated cones, which further in the shown embodiments are obliquely truncated so that the side of the cone facing the exterior side of the connector element extend further from the outer side of the side wall than the side of the cone facing the interior side of the connector element.

[0054] In another aspect, and in one embodiment, the attachment member 572a at the extreme end of the second end 514, 514' of the connector element 5, 5' provides an attachment member for attachment of the adaptor element 6.

[0055] In order to enhance the versatility of the connector elements 5, 5', in the embodiment shown, series 573, 573' of 8 and 11, respectively, attachment members 572 are provided equidistantly on the respective outer sides 521, 521'. Other numbers of attachment members in the respective series may be provided. Between adjacent attachment members 572 on the respective outer sides 521, 521' weakenings and/or cutting guides 574 are provided to provide for shortening the connector elements 5, 5' should the need arise. When an extreme part of the second end of the connector element has been removed by breaking or cutting the connector element at one of the weakenings and/or cutting guides 574 others of the attachment members 572 will provide for attachment of the extension element 7 or the adaptor element 6.

[0056] The connector element 5, 5' will in use, in the embodiments shown, provide support e.g. for the first leg 411 of the lower flashing members 41 or the upper flashing member 42.

[0057] To provide for support of the second leg 412 of said flashing members the adaptor element 6 may, as mentioned, be attached to the connector element 5, 5'.

[0058] Two embodiments of the adaptor element are

shown herein, namely a long adaptor element 6 shown in Figs. 1-3, 5-6, 12-15, 19-20 and 23 and a short adaptor element 6' shown in Figs. 7, 9 and 21. In practical use an adaptor element 6, 6' having an appropriate length in accordance with the geometric conditions of the circumstances may be chosen and other lengths than disclosed herein may be provided.

[0059] To illustrate the present invention, the long adaptor element 6 will be described in the following. Subsequently the differences between the two embodiments of the adaptor element will be explained.

[0060] Thus, referring to Figs. 1-3, 5-6, 12-15, 19-20 and 23 the adaptor element 6 comprises a part forming a gutter 61 with a bottom 611 and side walls 612. The gutter 61 is a little wider than the gutter 53, 53' of the connector element 5, 5'. At a first end 621 the adaptor element 6 is provided with flanges 622 in extension of the side walls 612 but slightly offset towards a longitudinal centre plane of the adaptor element and thus the flanges 622 are offset, relative to the side walls 612, towards each other. The flanges 622 are provided with openings 623 adapted to receive the attachment members 572a, or correspondingly attachment members 772a at an extreme end of a second end 714 of the extension element 7, whereby the openings 623 constitute two corresponding attachment members for engagement with the respective attachment members 572.

[0061] It should be noted that although Fig. 23 shows a section of an extreme end of the extension element 7 and the adaptor element 6, the picture would be identical if the section had been through the extreme end of the second end of the connector element 5, 5' carrying the adaptor element 6 since the extreme ends of the connector element 5, 5' and the extension element 7, respectively, are identical as it will be explained below.

[0062] Since, in the embodiments shown, the attachment members 572, 772a are round in a cross-section parallel to the respective side wall 52, 52', and the openings 623 are also round, the engagement between the attachment members 572a, 772a and the corresponding attachment members, i.e. the openings 623, allows the adaptor element 6 to rotate around an axis 624 extending through the openings 623 in the respective flanges 622, i.e. an axis 624 perpendicular to the longitudinal direction of the adaptor element 6 as well as of the connector element 5, 5' or the extension element 7, and thus the axis 624 is substantially perpendicular to the side walls 52, 52' of the connector element 5, 5'. Hereby the adaptor element 6 may be adjusted to different angular positions relative to said longitudinal directions, as it is e.g. seen from a comparison of Figs. 12 and 13 and of Figs. 14 and 15, respectively. It should be noted that the side walls 52, 52' are not exactly parallel but diverges slightly from the bottom of the gutter 53. Accordingly, the language "substantially perpendicular to the side walls" should be interpreted as referring to an average.

[0063] Since the attachment members 572 are shaped as obliquely truncated cones a wedging effect is obtained

when the adaptor element 6 is assembled with the connector element 5, 5' (or the extension element 7, as will be explained) by lowering the connector element 5, 5', interior side 512, 512' first, in between the flanges 622 of the adaptor element 6, whereby the flanges 622 and the side walls 52, 52' are elastically deformed until the attachment members 572 on the opposite side walls 52, 52' snap into the openings 623 in the likewise opposite flanges 622, the flanges 622 and side walls 52, 52' returning to their original positions. Thus a force-fitting engagement between the adaptor element 6 and the connector element 5 is obtained due to the forces of the side walls 52, 52' and the flanges 622, respectively, and the attachment members 572a and the openings 623 are per se passively secured in their mutual engagement.

[0064] As an alternative to the wedging effect obtained by the oblique truncation of the attachment members 572 a wedging effect might be obtained by obliquely recessing the inner sides of the flanges 622 adjacent the openings 623, which the attachment members 572 will slide over and pass when the connector element and the adaptor element are assembled.

[0065] Alternatively, attachment elements might be provided on the side walls 52, 52' and the flanges 622, which would actively secure their mutual engagement.

[0066] Centrally in the gutter 61 of the adaptor elements 6 two raised sections 631, 633 are provided to provide for points of attachment for the flashing members supported by the adaptor element 6. Thus a single point of attachment is provided by a first raised section 631 having a round through hole 632 for receiving a screw or like fastener. A second raised section 633 has an elongated through hole 634 and thus provides a multiplicity of points of attachment within the extension of the elongated hole 634.

[0067] Referring to Figs. 7, 9 and 21 the short adaptor element 6' is seen to be mainly identical to the long adaptor element 6 except for the fact that its part forming the gutter 61' is shorter than the corresponding part of the long adaptor element 6 and accordingly the first raised section 631 has been left out. The flanges 622 of the short adaptor element 6' are identical to the flanges of the long adaptor element 6.

[0068] The short adaptor element 6' may be used in installation situation where the long adaptor element 6 would be too long.

[0069] As mentioned installation situations may arise where one or both of the connector elements 5, 5' are too short relative to the width of the first leg 411 of the respective flashing members. For such situations the present invention provides an extension element 7 an embodiment of which is shown in Figs. 6, 12-18 and 22-23.

[0070] The extension element 7 comprises two side walls 72 extending substantially in parallel with the side walls 52, 52' of the connector element 5, 5' when the extension element 7 is mounted on the connector element 5, 5', and the side walls 72 form a gutter 73 extend-

ing in continuation of the gutter 53, 53' of the connector element 5, 5' when so mounted. The extension element 7 has a first end 713 adapted for engaging the second end 514, 514' of the connector element 5, 5' and a second end 714 adapted for facing away from the connector element 5, 5'.

[0071] In its second end 714 the extension element 7 is practically identical to the connector element 5, 5' in the second end 514, 514' thereof in the sense that, in the respective second ends, the dimensions of the cross-section of the gutter 73 of the extension element 7 are identical to the dimensions of the cross-section of the connector element 5, 5', the extension element 7 is provided with first and second raised sections 731 and 734 similar to the raised sections 531 and 534 of the connector element 5, 5', said first and second raised sections 731 and 734 being mutually connected by a central wall 736 providing strength to the extension element 7 while allowing any water in the gutter 73 to drain off to the extreme end of the second end 714 of the extension element 7. Thus the first raised sections comprise openings 732 and small projections 733 corresponding respectively to the openings 532 and the small projections 533 and the second raised sections 734 comprise through holes 735 corresponding to the through holes 535. Further the second end 714 of the extension element 7 is provided with attachment members 772, which preferably, but not necessarily, are positioned equidistantly on outer sides 721 of the side walls 72 of the extension element 7. Preferably the attachment members 772 are identical to the attachment members 572. Finally, between adjacent attachment members 772 weakenings and/or cutting guides 774 are provided.

[0072] Accordingly, an adaptor element 6, 6' may be connected to the extension element 7 like to the connector element 5, 5', and the extension element 7 may be shortened in the same way as described with reference to the connector element 5, 5'.

[0073] The first end 713 of the extension member 7 is provided for connection with the connector element 5, 5' as follows.

[0074] At the first end 713 the width of the gutter 73 of the extension element 7 is larger than the width of the connector element 5, 5' at its second end 514, 514', so that the first end 713 of the extension element 7 may embrace the second end 514, 514' of the connector element 5, 5' in the mounted state. Thus the side walls 72 and the bottom of the gutter 73 are offset at the first end 713 of the extension element 7 to provide for said first end 713 embracing the second end 514, 514' of the connector element 5, 5'. The inner sides of the side walls 52, 52' and the inner sides of the side walls 72 are flush when the extension element 7 is mounted on the connector element 5, 5' and likewise are the bottoms of the respective gutters 53/53' and 73.

[0075] Each side wall 72 of the extension element 7 has at its first end 713 on an inner side facing the gutter 73 a corresponding attachment element 77, which in the

mounted state, as shown in Figs. 6, 12-15 and 22 is in engagement with the attachment element 57 on the adjacent side wall 52, 52' of the connector element 5, 5'. The corresponding attachment element 77 of the extension element 7 is provided by a section of the side walls 72 at the first end 713 which has a recess 775 to provide a clear space for four attachment members 572, when the extension element 7 is in the mounted position shown in e.g. Figs. 14 and 15, and around the recess 775 two openings 776 are provided which are adapted to receive respective attachment members 572, 572a. Thus, due to the position of the offset of the side walls 72 of the extension element 7 relative to the position of the attachment element 77 the opening 776a closest to said offset will engage the attachment member 572a at the extreme end of the second end 514, 514' of the connector element 5, 5' and the other of the two openings 572 will engage with the 6th attachment member 572 counted from said extreme end. It should be understood that this count is due to the actual dimensions selected for the present embodiment which dimensions might well be changed for another embodiment.

[0076] Thus, the attachment member 572a at the extreme end of the second end 514, 514' of the connector element 5, 5' and the 6th attachment member 572 counted from said extreme end together provide an elongated attachment element. It should be noted that in an alternate embodiment said two attachment members might be substituted by a single elongate element with the same overall elongate extent as the said two attachment members provided the recess 775 was expanded correspondingly to merge with the two openings surrounding it in the embodiment shown.

[0077] It is noted that when providing for the first end of the extension element to embrace, and thus overlap, the second end of the connector element the embracement may per se provide for overall rigidity of the connected elements provided an attachment element is positioned centrally relative to the overlap. Such attachment element may be substantially punctual, i.e. not elongated. However, the provision of an elongated attachment element will per se be provided for, and will thus add to, the overall rigidity of the connected elements.

[0078] The sections or parts 777 of the side walls 72 of the extension element 7 adjacent the openings 776, opposite the bottom of the gutter 73 are slightly offset outwardly. This facilitates assembly of the extension element 7 and the connector element 5, 5', which are assembled similarly to the way the adaptor element 6, 6' is assembled with the connector element 5, 5', or with the extension element 7, whose parts relevant for assembly with the adaptor element are identical to the parts of the connector element relevant for assembly with the adaptor element, as explained above. Thus for assembly of the extension element 7 and the connector element 5, 5' the latter is lowered, interior side 512, 512' first, in between the side walls 72 of the extension element 7. Due to the attachment members 572 being shaped as obliquely

truncated cones a wedging effect is obtained when the attachment members 572 abuts on the upper edge of the side walls 72 above the respective openings 776 and the connector element 5, 5' is pressed further towards the bottom of the extension element 7. Hereby the side walls 72 of the extension element 7 and the side walls 52, 52' of the connector element 5, 5' are elastically deformed until the attachment members 572 snap into the respective openings 776, the flanges 622 and side walls 52, 52' returning to their original positions. In the present embodiment the attachment members 572 are dimensioned to suit assembly with the adaptor element 6 but for assembly with the extension element 7 the attachment might preferably be shallower to limit the forces involved in the assembly process. An effect similar to the effect of providing shallower attachment members is obtained by the offset of said parts 777 of the side walls 72 of the extension element 7 adjacent the openings 776, opposite the bottom of the gutter 73 i.e. at the free edges of the side walls 72.

[0079] Offsetting sections or parts 777, as mentioned, particularly adjacent to the free edges of the side walls 72, will help guide the connector element 5, 5' into the extension element 7 and/or prevent that the side walls 72 of the extension element are exposed to too high bending forces when being forced over the attachment members 572 on the connector element 5, 5'.

[0080] As an alternative to the wedging effect obtained by the oblique truncation of the attachment members 572 a wedging effect might be obtained by obliquely recessing or chamfering the inner sides of the above mentioned parts 777 of the side walls 72 of the extension element 7 adjacent the openings 776, opposite the bottom of the gutter 73, which the attachment members 572 will slide over and pass, when the connector element and the extension element are assembled.

[0081] As explained in the above mentioned WO 2015/028030 A1, the flashing members to be supported by one connector element 5, 5' e.g. the lower flashing members 41 may be provided with bent edges extending into the gutter 53 of said connector element 5, and an intermediate flashing member will be provided to cover the bent edges and the connector element. Such procedure is also possible with the present embodiment. Alternatively, one edge of a lower flashing element 41, e.g. the right edge as seen in Figs. 1 and 2, may be provided with a bent edge 47 extending in an installed position into the gutter 53 and the left edge of the adjacent lower flashing element 41 may be straight to extend across the gutter 53 and the bent right edge of the adjacent lower flashing member, thus overlapping the latter. The straight edge may in such case receive fasteners 48, such as screws, see Fig. 1, penetrating the straight edge, preferably through prefabricated openings surrounded by a raised bead, as it is known in the art, and into the raised projections 531 provided in the connector element 5 to receive such fasteners 48. It is noted that any such bent edges of the lower flashing elements, and correspondingly for

the upper flashing elements, will lead any water that might penetrate between said flashing elements in to the gutter 53, 73, 61 provided the connector element 5, 5' and any present of the extension element 7 and the adaptor element 6.

[0082] In such embodiment, in order to lock the position of the right bent edge 47 in the longitudinal direction a notch 49, see Fig. 5, may be provided in said right bent edge 47 and a protrusion 58, see Fig. 22, may be provided in the gutter 53 at the bottom and at the inner side of the left side wall, along which the right bent edge of the lower flashing member will extend, whereby the notch 49 may straddle the protrusion 58 to have its position locked in the longitudinal direction. Of course the protrusion 58 should not be so extensive that it would block the passage of water along the bottom of the gutter 53.

[0083] The second raised sections 534 and 734 found in the connector element 5, 5' and in the extension element 7, respectively, may be used to attach a reinforcement element (not shown) adapted for extending along the connector element and the extension element in the mounted state. It is noted that the second raised sections 534, 734 extends to a lower level from the bottom of the respective gutter 53, 73 than the first raised sections 531 and 731. Thus space will be left, below the flashing members, for a heads of screws to be inserted in the through holes 535, 735 to extend from the inner sides of the connector element and the extension element, pass through openings in the reinforcement element and receive nuts or the like (openings in the reinforcement element might be threaded holes) to fix the reinforcement element to the connector element and the extension element. Thus such screws would constitute further attachment members adapted for providing a connection to the reinforcement element.

[0084] The assembled elements: the connector element 5, 5', possibly the extension element 7 and/or the adaptor element 6, 6' provides together an unbroken gutter extending from the connector element 5, 5' to the extreme end of the second end 714 of the extension element 7 and/or the end of the adaptor element 6 opposite the flanges 622 thereby leading any water that e.g. might penetrate between adjacent lower flashing elements 41 into the connector element 5 or between adjacent upper flashing elements 42 into the connector element 5' onto the roof 211 surrounding the upstand 2, 2'.

[0085] The different elements of the connector set, i.e. the connector element 5, 5', the adaptor element 6, 6' and the extension element 7 are preferably made from plastic, such as acrylonitrile butadiene styrene (ABS), polyethylene (PE), polypropylene (PP) or polyvinylchloride (PVC), but other materials including metals and composites and combinations thereof may be employed as long as they are able to withstand the conditions on a roof. Different materials may be used for the three different elements.

[0086] In the embodiments described herein different features may be used alone or in combination. Thus the

configuration of the interior side of the different elements, especially of the connector element with its flanges, may be varied according to the actual installation situation the connector element should be provided for without influencing the configuration of the attachment elements for connecting the different elements. Further the interior of the gutters may be varied and especially the position of any points of attachment for flashing members may be varied to correspond to actual flashing members to be supported by means of the connector element, etc. Also it is noted that the arrangement of the points of attachment, including the central wall, in the interior of the gutters may be used in connector elements and connector sets having different attachment elements or attachment means for mutual connection of the elements of the connector set. Thus the features of raised sections in the gutter being mutually interconnected and/or connected to the bottom of the gutter by a wall extending substantially in parallel to one or both side walls may be used in connector elements or extension elements not necessarily comprising the feature of an attachment element being provided on an outer side of a side wall.

[0087] A distinctive feature is the provision of the attachment elements on the outer side of the side walls of the connector element, whereby additional elements, such as the adaptor element and the extension element may be mounted or installed without any elements thereof extending into the interior of the gutter of the connector element to risk colliding with bent edges of flashing members extending in to said gutter.

[0088] The connector element 5, 5' is shown herein as used with roof windows mounted on a so-called upstand and adapted for riding on the window mounting brackets as described also e.g. in WO2015/02830. Thus the connector element serves as a point of attachment for one or more flashing members and for draining off water, which has accumulated at the joint between two neighbouring windows. It is, however, to be understood that the connector element according to the present invention may also be used in other installation situations, where the flashing assembly and mounting brackets are of a different configuration.

[0089] The skilled person will understand that though herein the attachment elements 57 and/or attachment members 572 are presented as protrusions protruding from the outer sides of the respective side walls 52, 52', 72 and the corresponding attachment elements 77 are described as depressions or openings 776, 776a; 623 in inner sides of respective side walls 72 or flanges 622, the opposite arrangement would also be possible according to the invention, i.e. the outer sides of the respective side walls 52, 52', 72 would comprise depressions or openings and the inner sides of respective side walls 72 or flanges 622 would comprise protruding protrusions.

[0090] Thus the invention is in no way limited to the exact embodiments described herein, but only by the scope of the claims.

Claims

1. A connector element for use in a flashing assembly for roof windows (1) mounted side-by-side comprising at least two flashing members (41) each having a leg (411) intended for being arranged so that it projects away from the window frame (14), where the connector element (5) has an exterior side (511) intended for facing the exterior in the mounted state, an interior side (512) intended for facing the roof (211) in the mounted state, a first end (513) intended for facing the window (1), a second end (514) intended for facing away from the window (1), two side walls (52) extending between the first and second ends and forming a gutter (53) extending in a longitudinal direction and being open towards the exterior side, and at least two flanges (54a, 54b) projecting from the interior side (512) adapted for engagement with a mounting bracket arrangement including at least two mounting brackets (3) associated with two different roof windows (1) mounted side-by-side, and where the connector element (5) comprises at least one point of attachment (531) adapted for engagement with an engagement section of a flashing member (41), **characterized in that** each side wall (52) is provided with a, preferably elongated, attachment element (57) on an outer side (521) facing away from the gutter (53), said attachment elements (57) being adapted for engagement with a corresponding attachment element (77) on an extension element (7) or with corresponding attachment members (623) of an adaptor element (6).
2. A connector element according to claim 1, wherein the attachment element (57) comprise a first series (571) of attachment members (572), said first series (571) being preferably a part of a second larger series (573) of attachment members (572).
3. A connector element according to one or more of the preceding claims, where the attachment element (57) is adapted for snap-locking engagement with the corresponding attachment element (77) on the extension element (7) or with the corresponding attachment members (623) of an adaptor element (6).
4. A connector element according to one or more of the preceding claims, where the attachment element (77) comprises attachment members (572) having the shape of truncated cones, preferably obliquely truncated so that the side of the cone facing the exterior side (511) of the connector element extend further from the outer side of the side wall (52) than side of the cone facing the interior side (512) of the connector element.
5. A connector element according to one or more of the preceding claims, further comprising weakenings and/or cutting guides (574) in the side walls and/or bottom of the gutter adapted for aiding removal of a part of the connector element.
6. A connector element according to one or more of the preceding claims, where one or more, preferably two or more, raised sections (531) are provided in the gutter (53), said raised section(s) being adapted for serving as point(s) of attachment for an engagement section of a flashing member (41).
7. A connector element according to claim 6, where one or more of the raised sections (531) are mutually interconnected or connected to a bottom of the gutter by a wall (536) extending substantially in parallel to one or both side walls (52).
8. A connector element according to claim 6 or 7, where three or more raised sections (531) are provided corresponding to different installation situations.
9. A connector set including a connector element according to any of claims 1-8 and an extension element (7) having two side walls (72) extending substantially in parallel with the side walls (52) of the connector element (5) in a mounted state and forming a gutter (73) extending in continuation of the gutter (53) of the connector element (5) in a mounted state, a first end (713) of the extension element (7) being adapted for engaging the second end (514) of the connector element (5) and a second end (714) of the extension element (7) being adapted for facing away from the connector element (5), and where the width of the gutter (73) of the extension element (7) at its first end (713) is larger than the width of the connector element (5) at its second end (514), so that the first end (713) of the extension element (7) may embrace the second end (514) of the connector element (5) in the mounted state, each side wall (72) of the extension element (7) having at its first end (713) on an inner side facing the gutter (73) a corresponding attachment element (77), which in the mounted state is in engagement with the attachment element (57) on an adjacent side wall (52) of the connector element (5).
10. A connector set according to claim 9, where a section of one or both side walls (72) of the extension element (7) at the first end (713) is offset so that the section of the gutter (73) in the extension element (7) extending along the off-set section(s) has a larger width than the rest of the gutter (73) in the extension element.
11. A connector set according to one or more of claims 9-10, further including a reinforcement element adapted for extending along the connector element and the extension element in the mounted state, and

where the connector element and/or the extension element is/are provided with further attachment members (534; 734) adapted for providing a connection to the reinforcement element.

12. A connector set according to one or more of claims 9-11, where the extension element (7) is provided with at least one attachment member (772, 772a) on a outer side (721) facing away from the gutter (73), said attachment member (772, 772a) being adapted for engagement with a corresponding attachment member (623) on a further element (6), said attachment members (772, 772a) preferably being adapted for snap-locking engagement with corresponding attachment member (623) on said further element (6), and preferably said attachment members (772, 772a) each having the shape of a truncated cone, preferably obliquely truncated so that the side of the cone facing the exterior side (511) of the connector element extend further from the outer side of the side wall than side of the cone facing the interior side (512) of the extension element, and/or where two or more raised sections (731) are provided in the gutter (73) of the extension element (7), said raised section(s) (731) being adapted for serving as point(s) of attachment for an engagement section of a flashing member (41), said raised sections (731) possibly being interconnected by a wall (736) extending substantially in parallel to one or both side walls (72), and/or where the side walls (72) of the extension element (7) are provided with weakenings and/or cutting guides (774) adapted for aiding in the removal of a part of the extension element (7).
13. A connector set including a connector element according to any of claims 1-8 or a connector set according to claim 12, and an adaptor element (6) that is provided with at least two corresponding attachment members (623) each adapted for engagement with an attachment member (572a) on opposite side walls (52) of the connector element (5).
14. A connector set according to claim 13, wherein the engagement between the attachment members of the adaptor element (6) and the connector element (5) is adapted for allowing the adaptor element to be adjusted to different angular positions relative to the longitudinal direction about an axis (624), which is substantially perpendicular to the side walls (52) of the connector element.
15. A connector set according to claim 14, where the engagement between the attachment members of the adaptor element and the connector element is adapted for allowing the adaptor element to rotate about said axis (624), which is substantially perpendicular to the side walls of the connector element.

16. A connector set according to one or more of claims 13 to 15, where the adaptor element (6) is provided with one or more raised section(s) (631, 633), said raised section(s) being adapted for serving as point(s) of attachment for an engagement section of a flashing member (41).

17. A connector set according to claim 16, where one or more raised section(s) (633) are of an elongate configuration allowing several possible points of attachment for an engagement section of a flashing member.

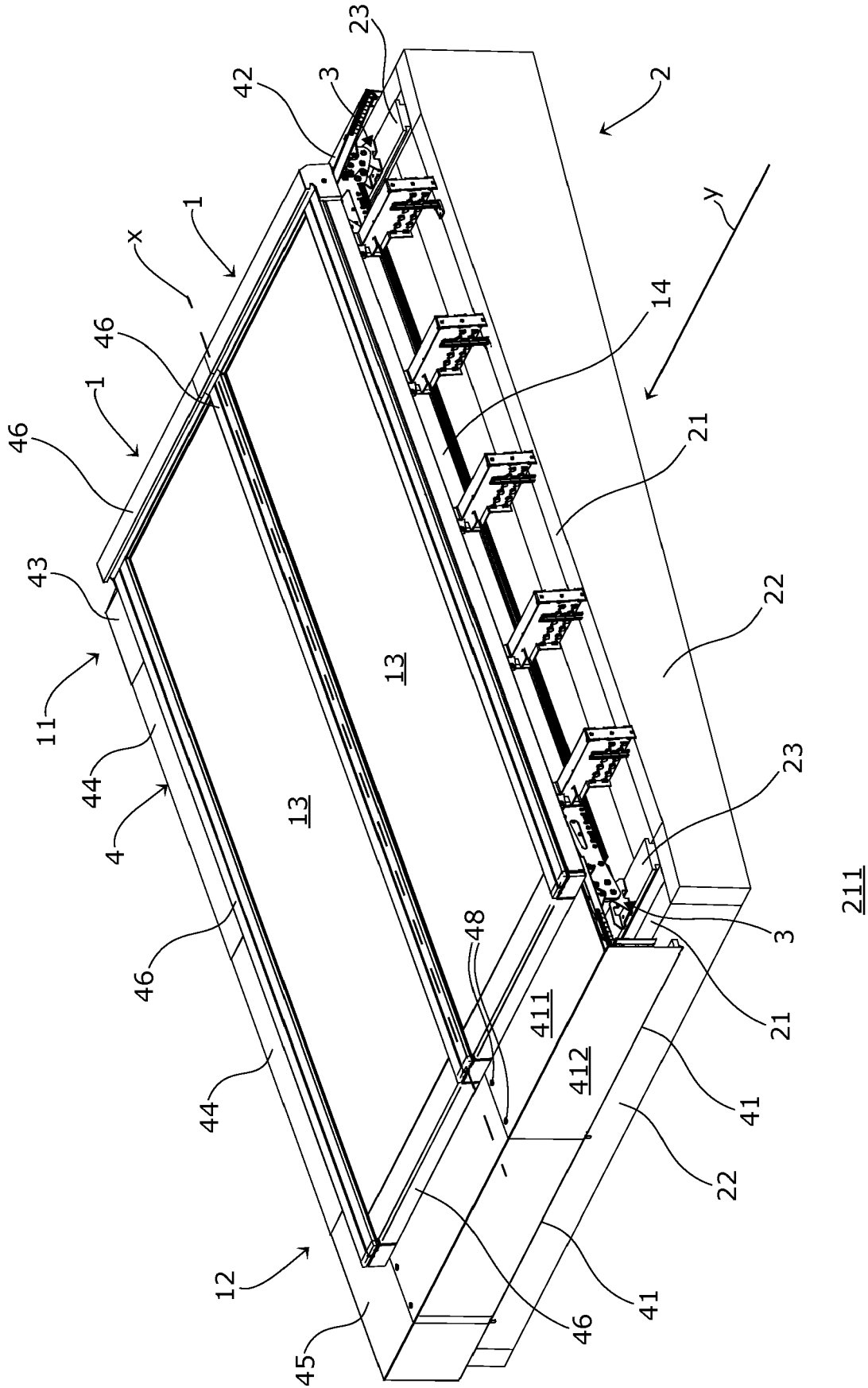


Fig. 1

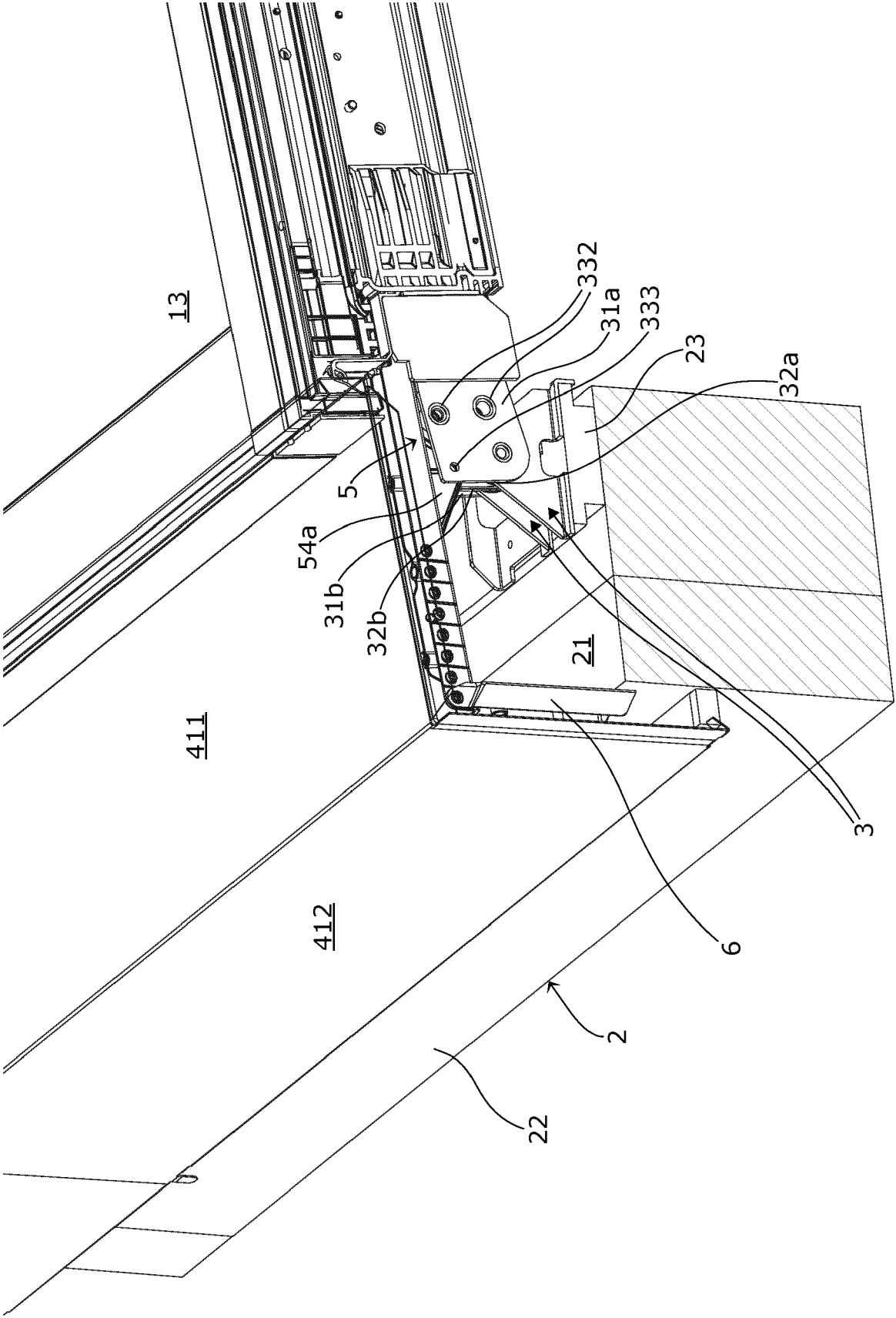


Fig. 2

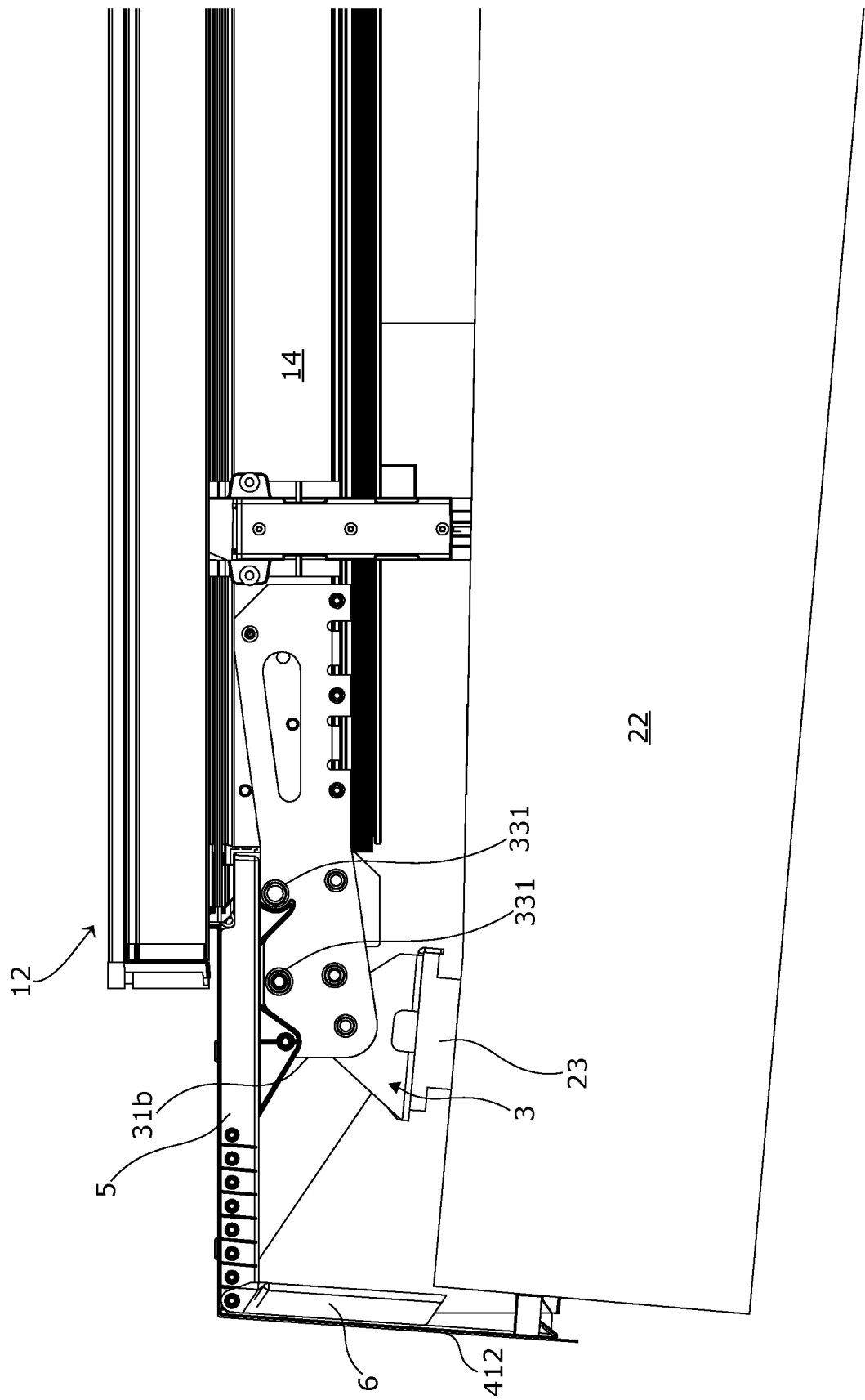


Fig. 3

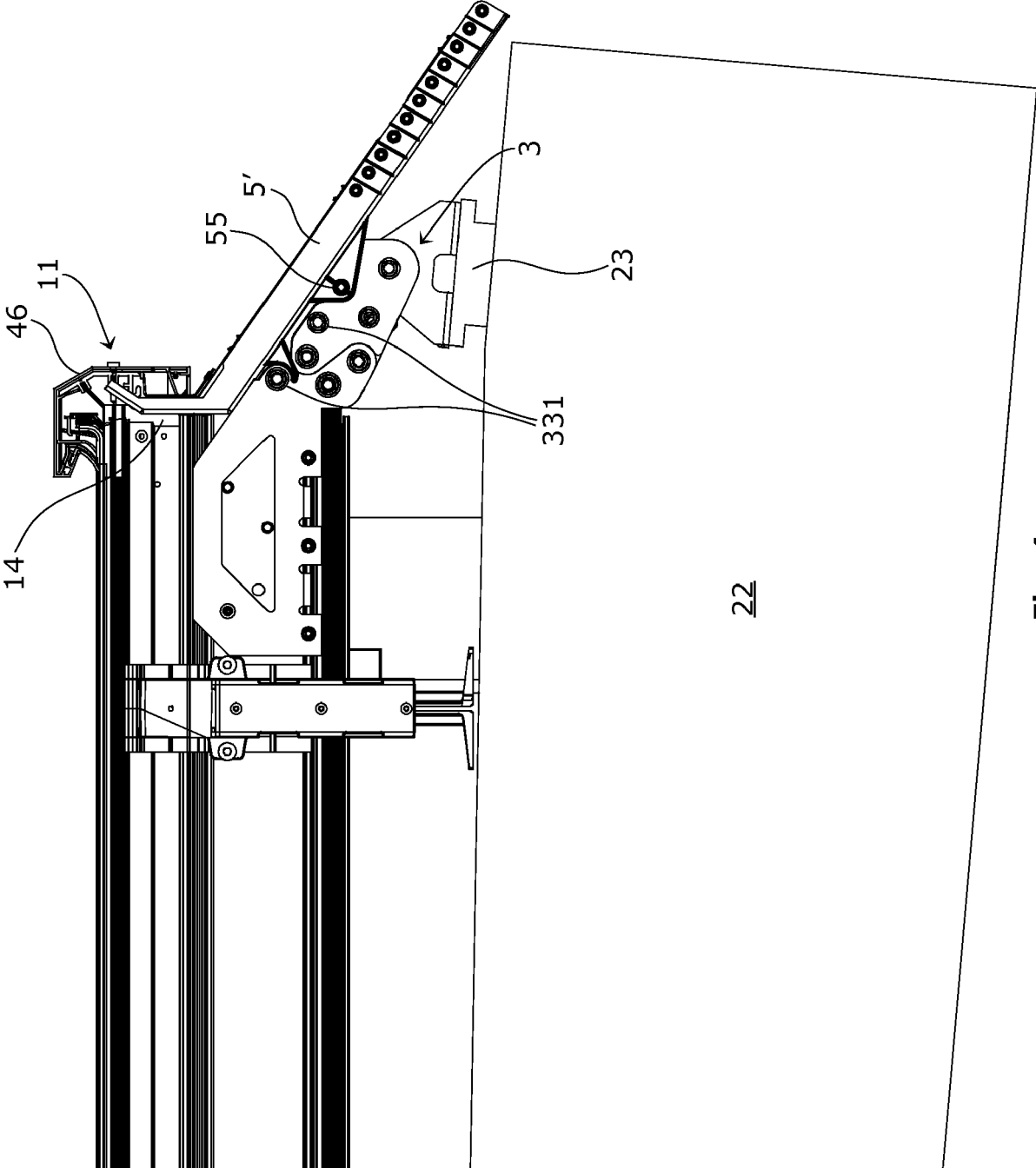


Fig. 4

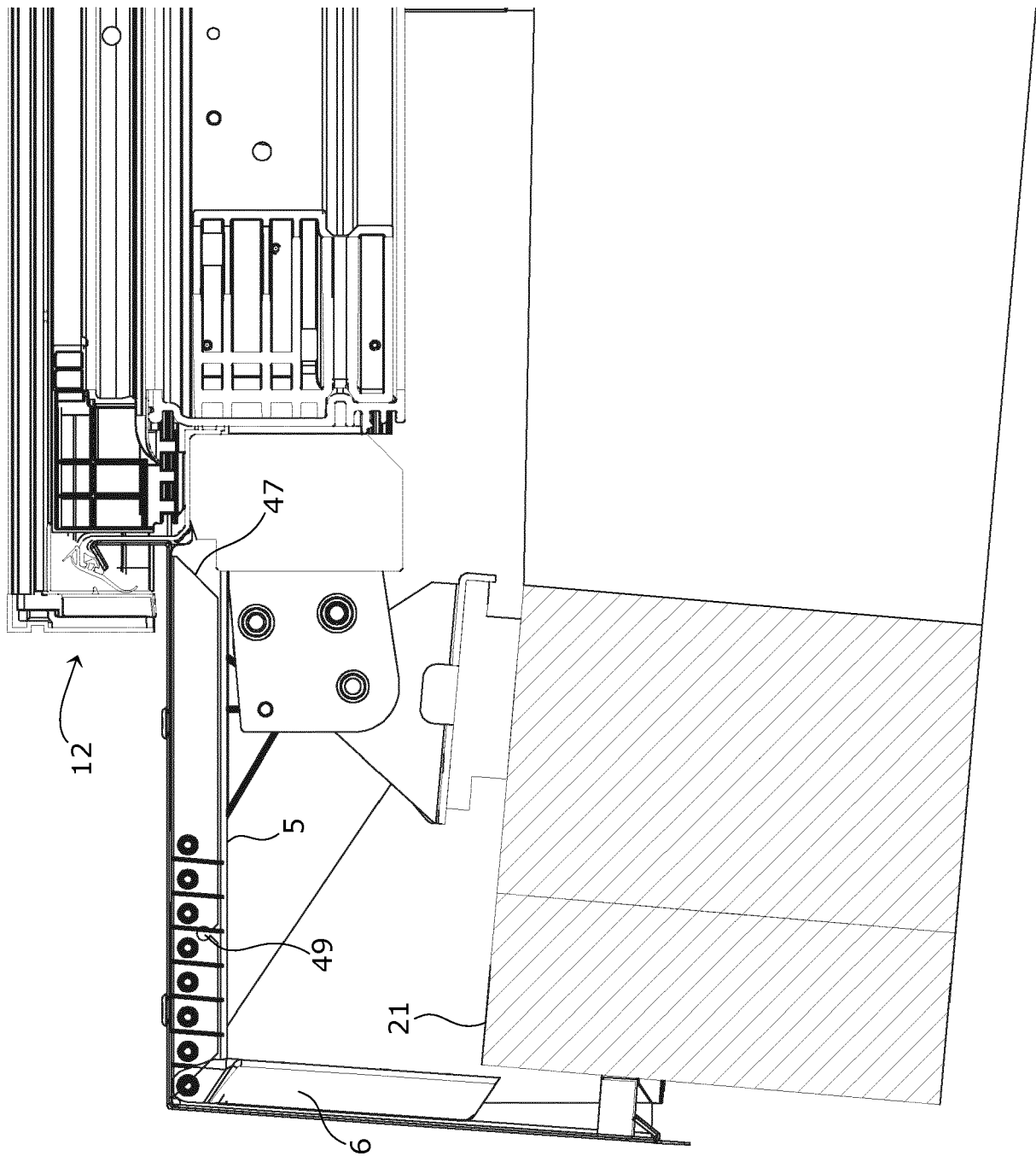


Fig. 5

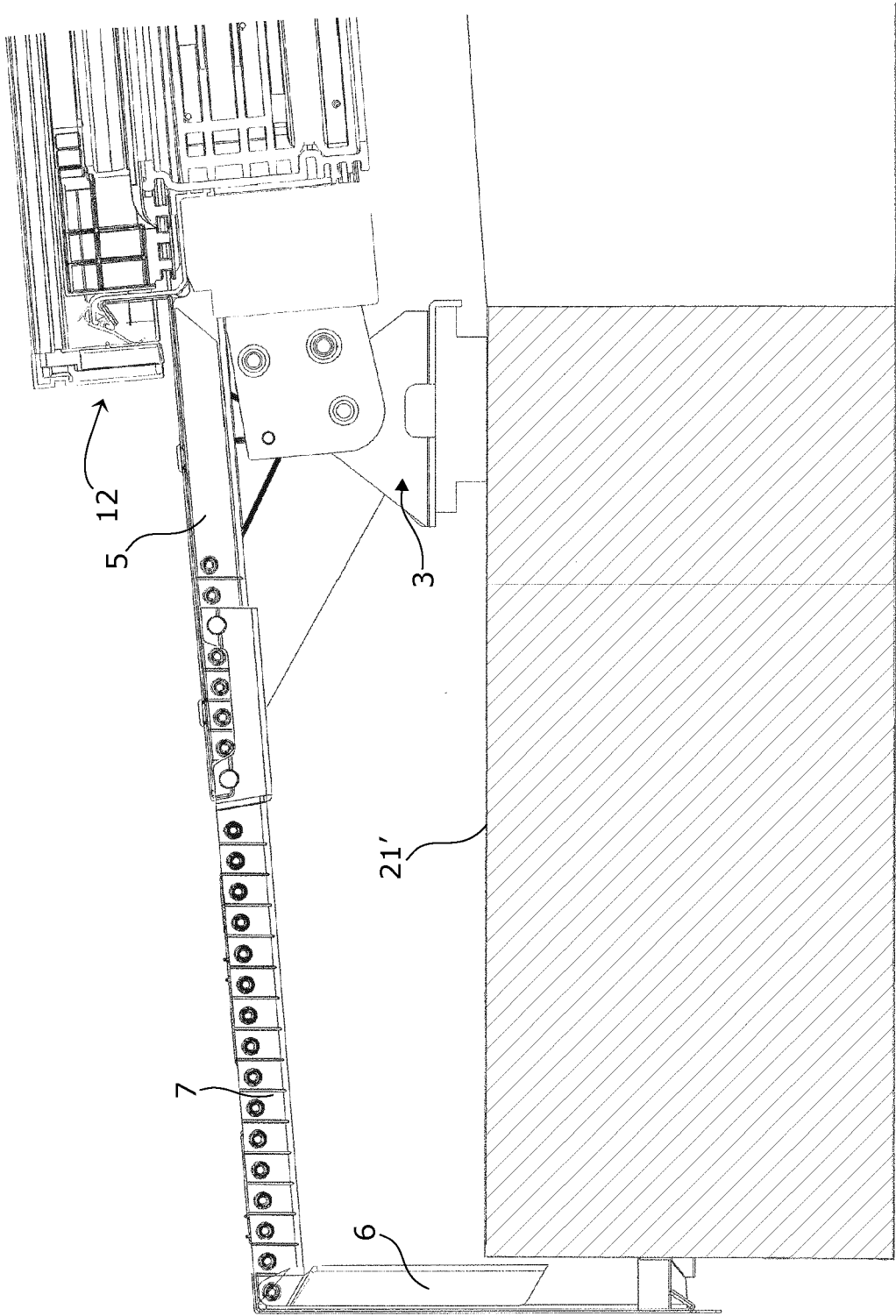


Fig. 6

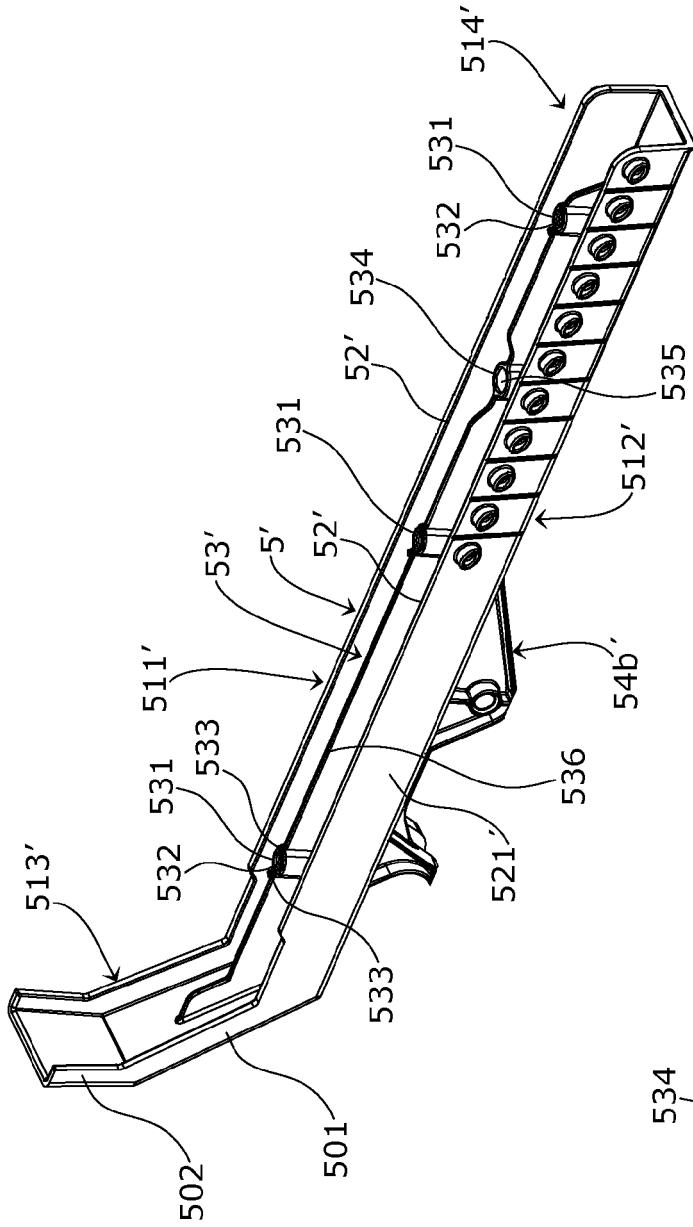


Fig. 7

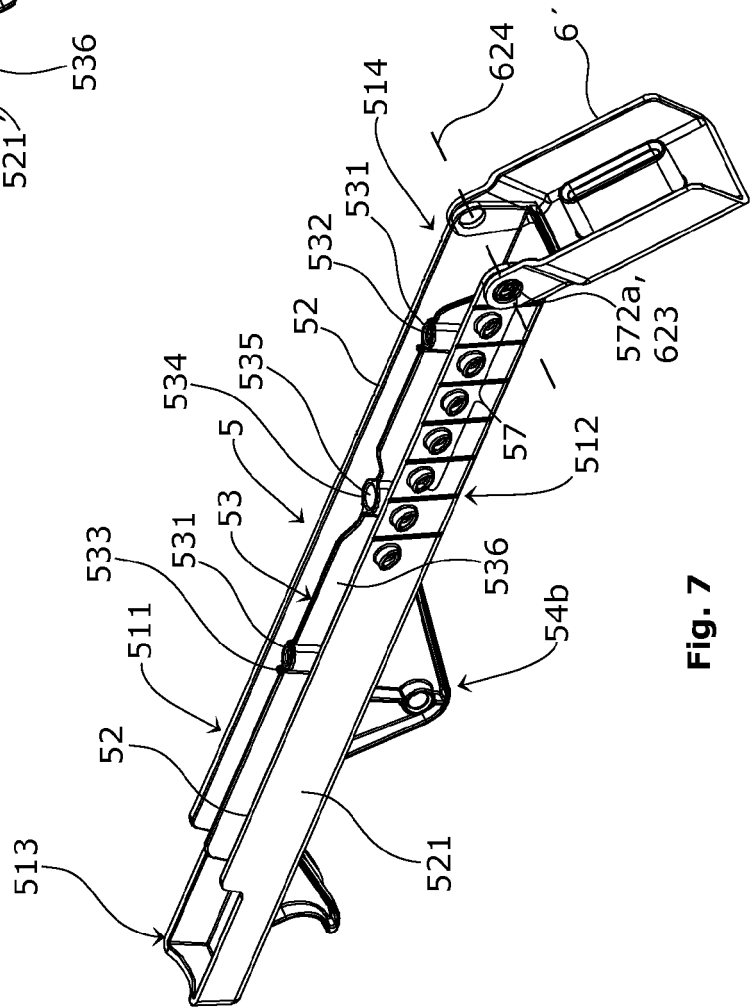
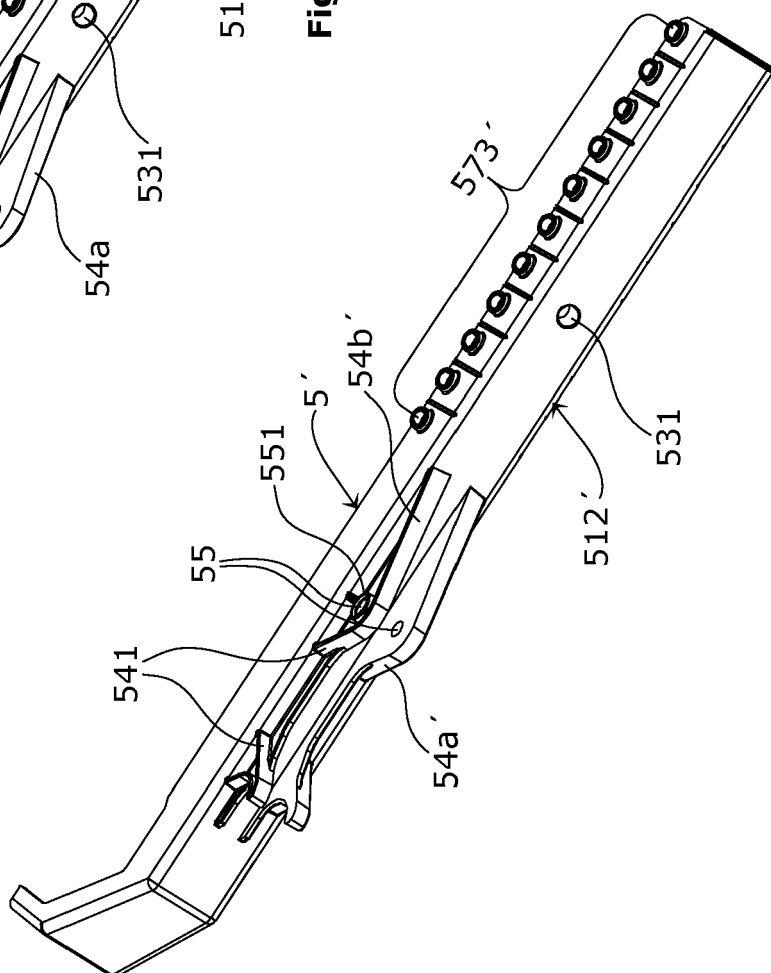
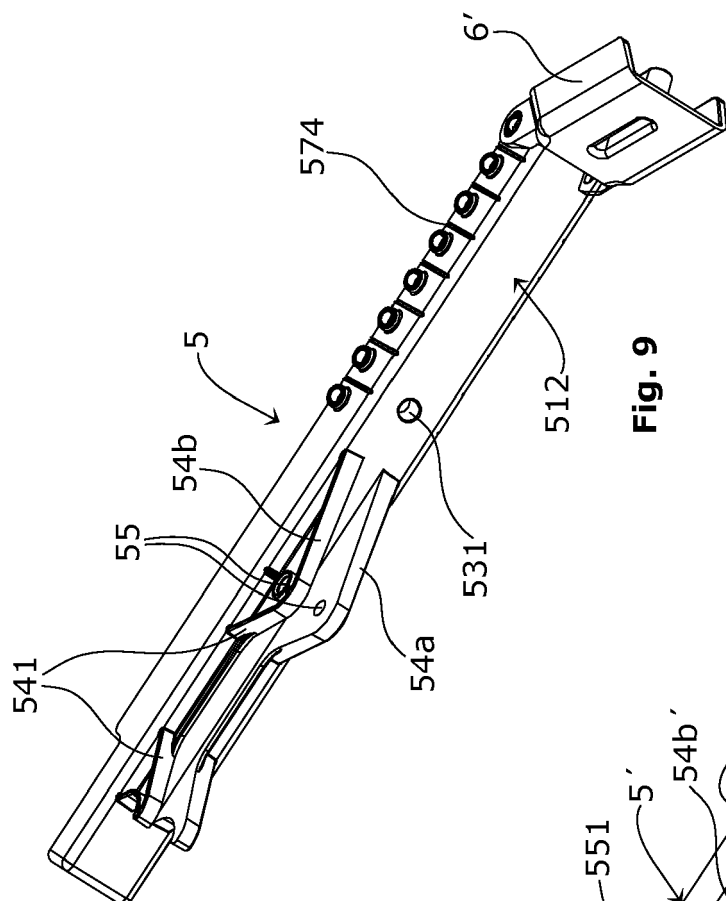


Fig. 8



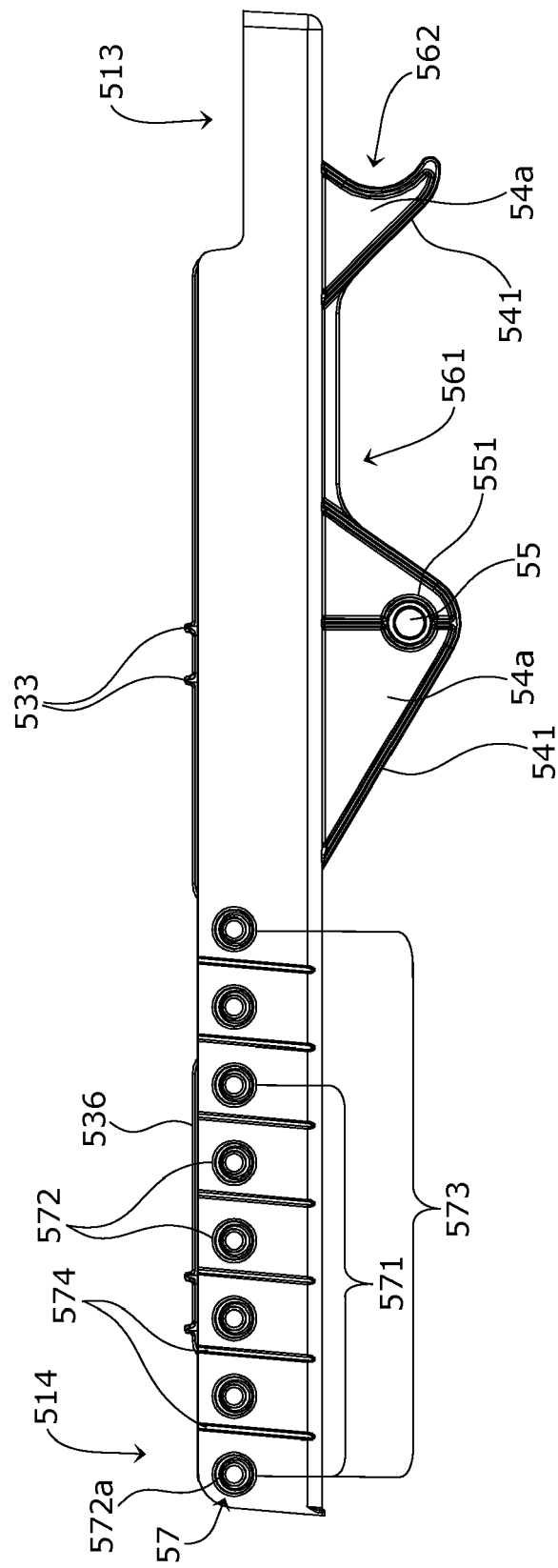
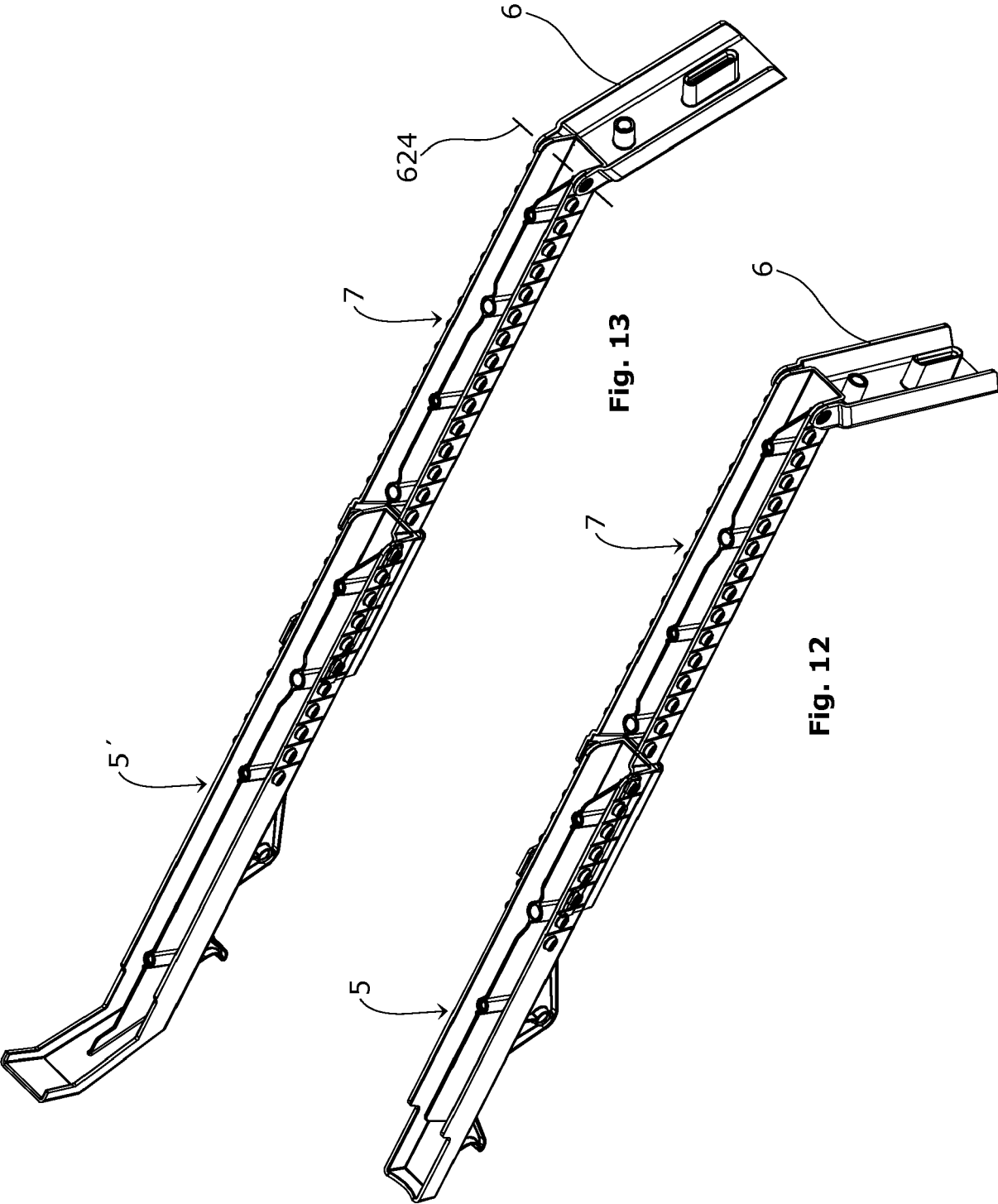
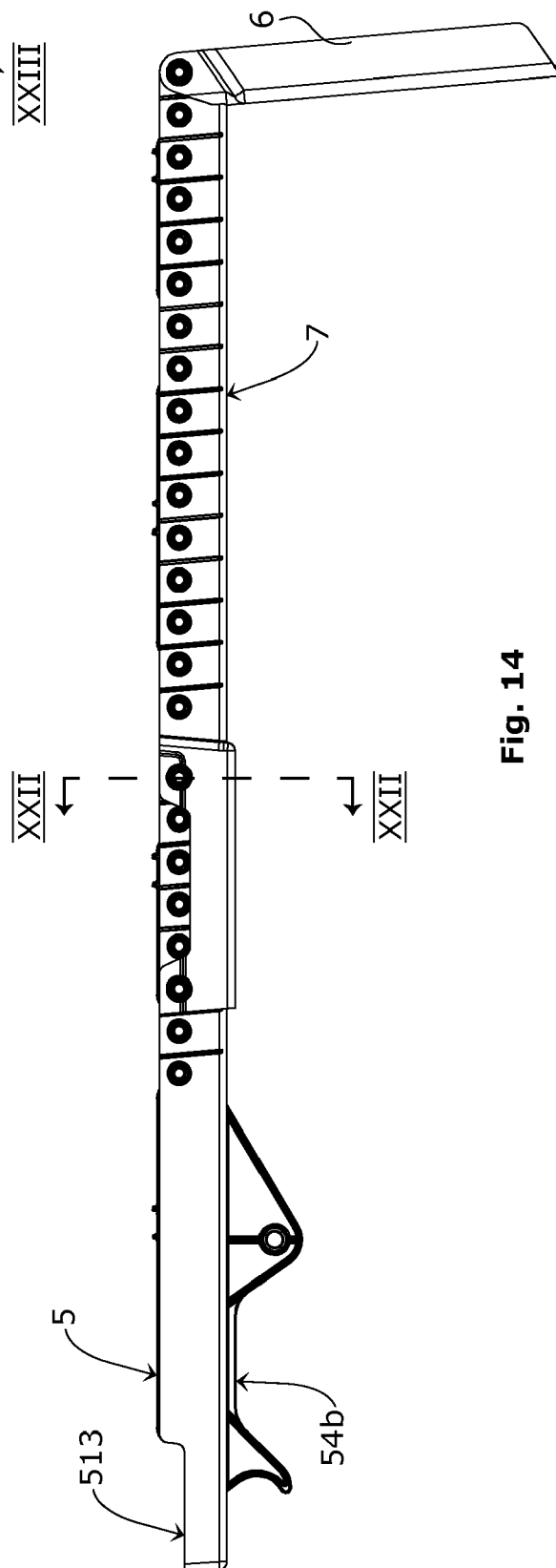
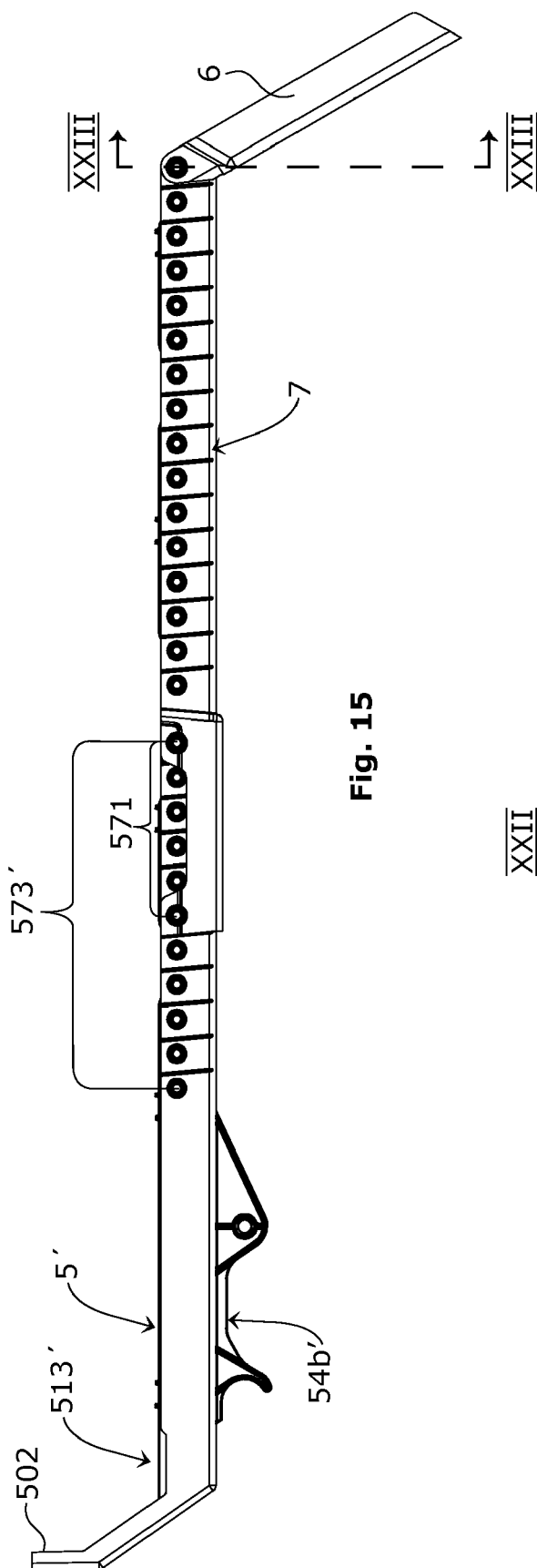
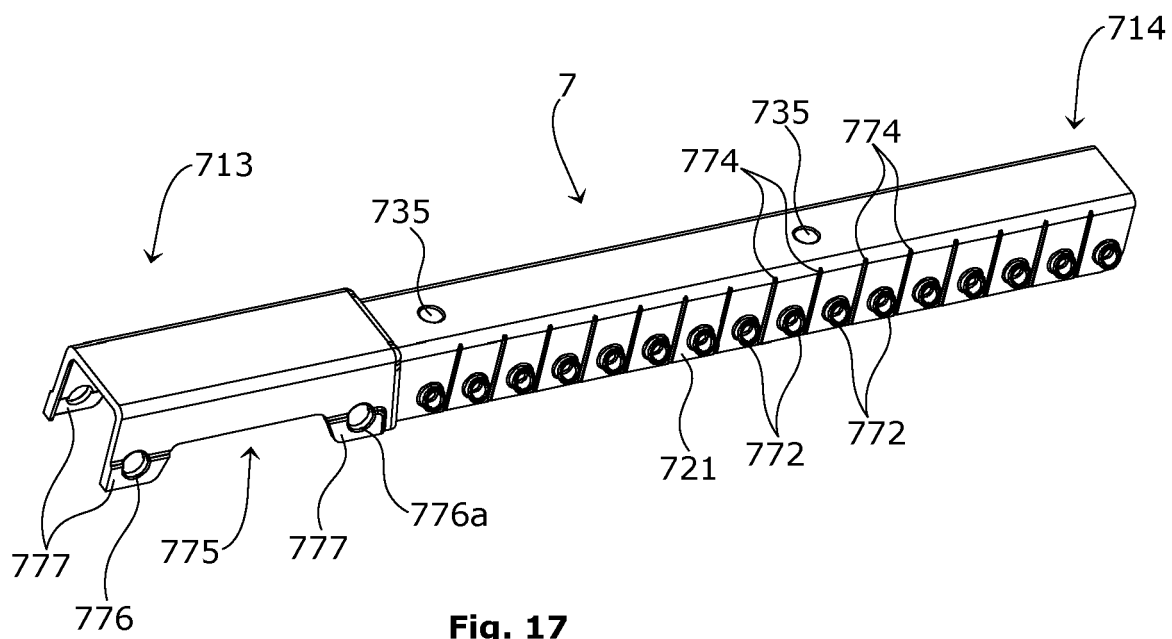
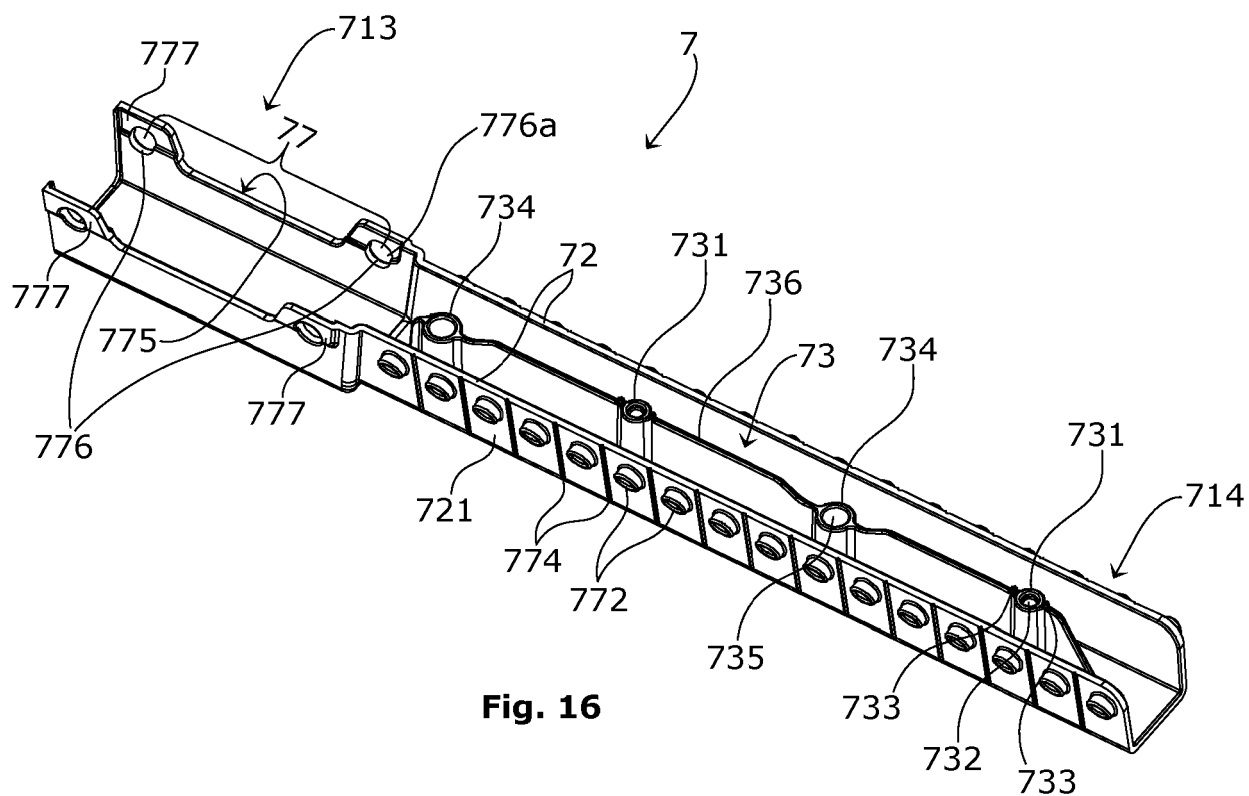
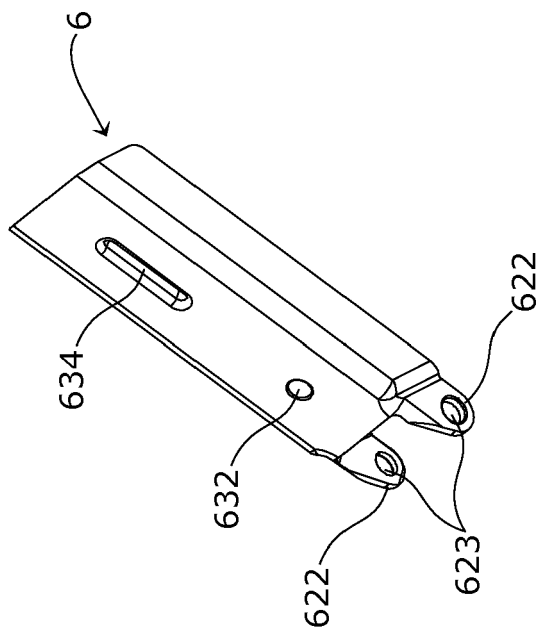
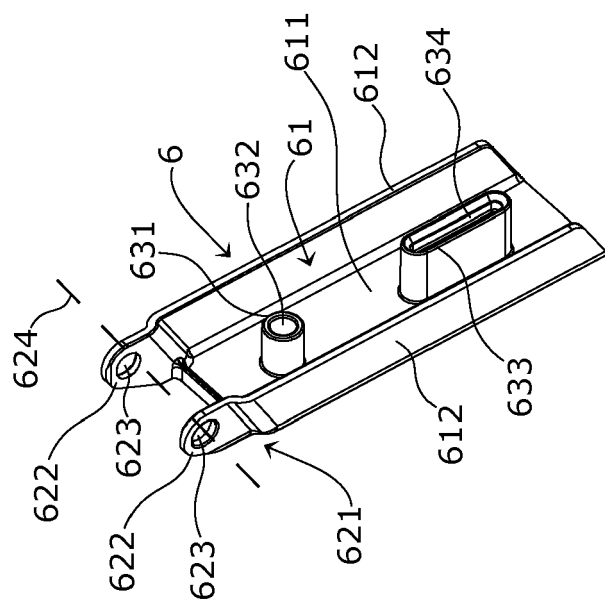
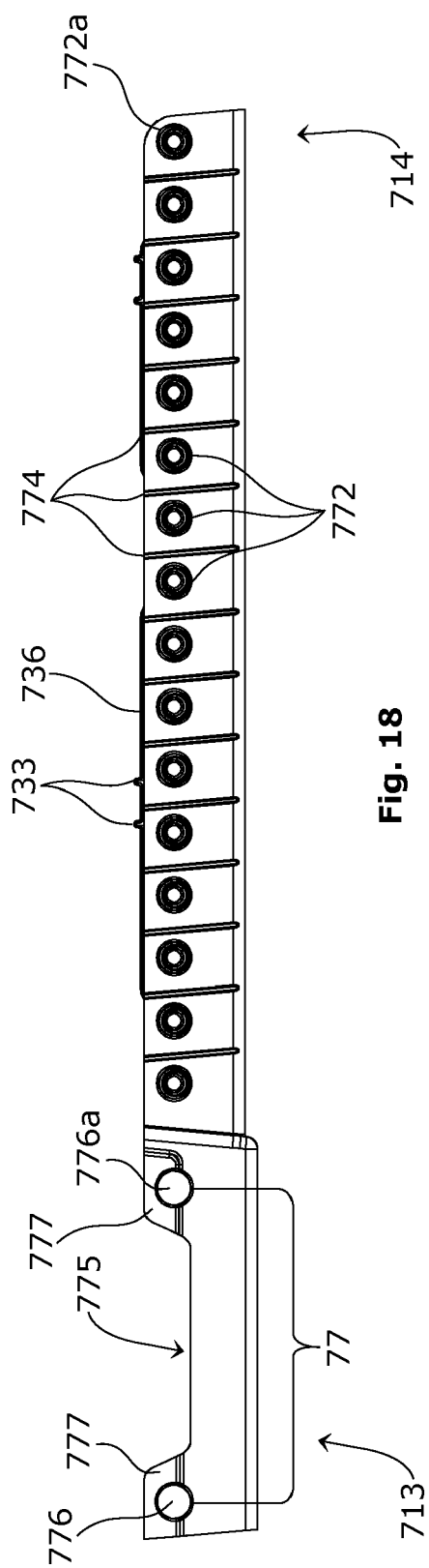


Fig. 11









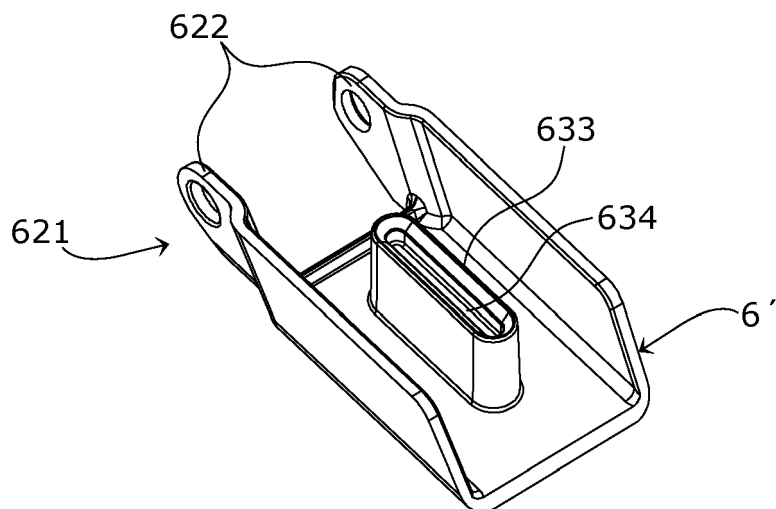


Fig. 21

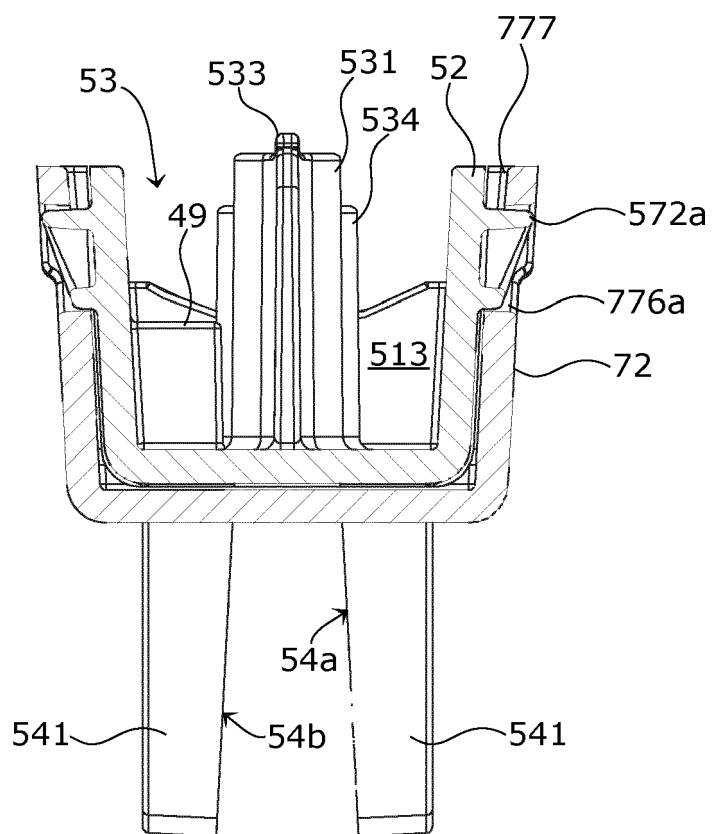


Fig. 22

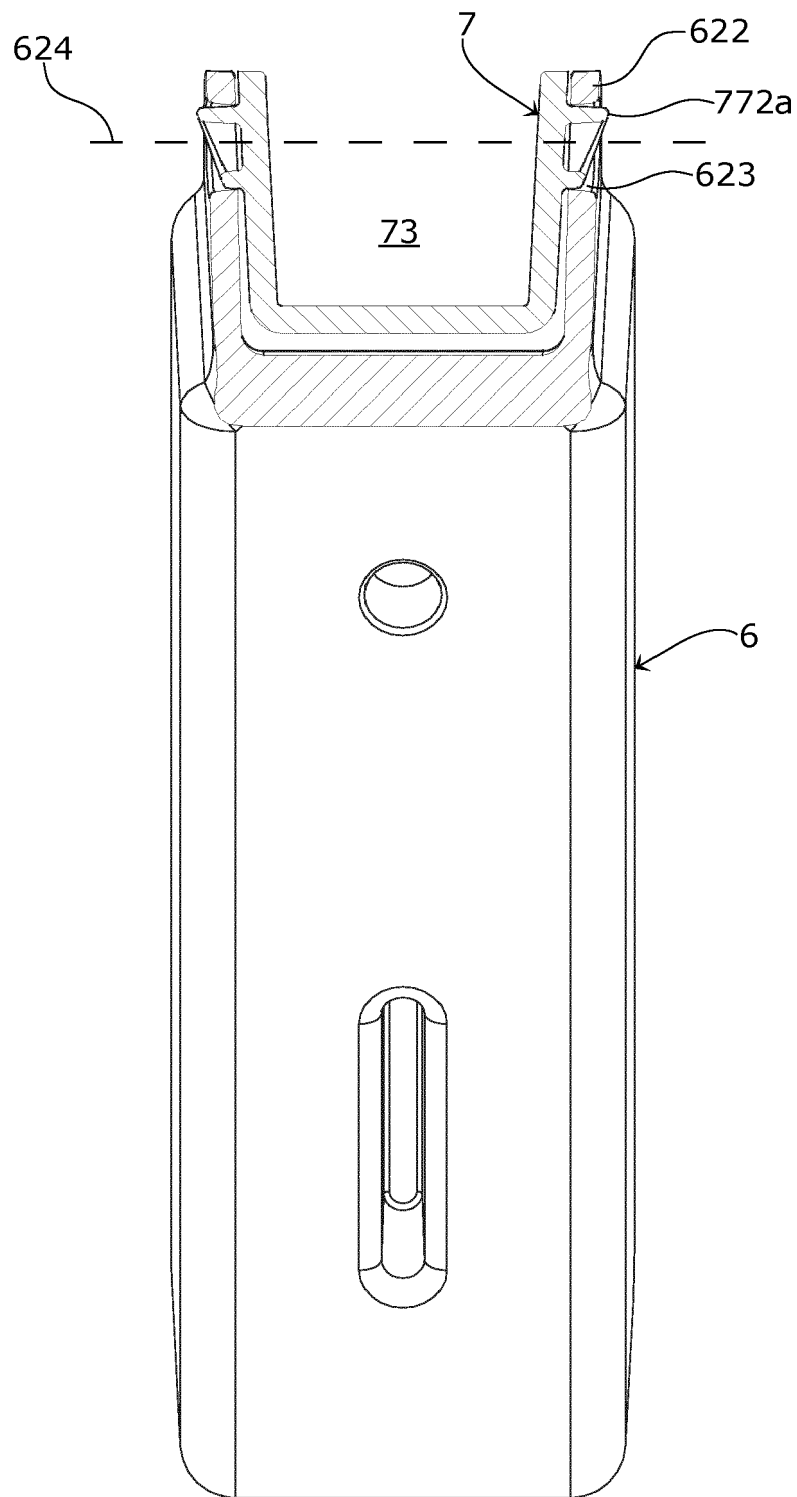


Fig. 23



EUROPEAN SEARCH REPORT

 Application Number
 EP 17 18 4485

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	* page 4, lines 12-13 - page 8, lines 13-17; figures 3,11-13 *	9-17	E04D13/147
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