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(54) **A window or door structure with a mounting bracket for connecting the fixed frame of the structure to a wall opening**

(57) A window or door structure which is suitable for being mounted in an opening in a wall, said window or door structure comprising a fixed frame (50;170) being of the type with a groove (51;171) arranged along at least a portion of the outer periphery of the fixed frame (50;170) and where said window or door structure comprises at least one mounting bracket (1;20;60;70;150) suitable for connecting said fixed frame (50;170) to said opening. The mounting bracket comprising a first area (4) which is fastened to the fixed frame (50;170) and a second area (5) which is arranged to be fastened to said opening. The first area comprises at least a first flange (6) and a second flange (7) which protrude from the first area (4), said flanges (6,7) are arranged one on each side of a first plane (A) which is parallel to the plane of the window or door structure and where the first flange (6) is in contact

with at least a portion of a first inner side of said groove (51;171) and the second flange (7) is in contact with at least a portion of a second inner side of said groove (51;171) which is opposite the first inner side of said groove (51;171) and where the bracket (1;20;60;70;150) is arranged such that the contact area between the first flange (6) and the first inner side of said groove (51;171) and the contact area between the second flange (7) and the second inner side of said groove (51;171) are arranged exclusively one on each side of a first axis (C) which is perpendicular to the plane of the window or door structure. The contact between the first flange (6) and the first inner side of the groove (51;171) and the contact between the second flange (7) and the second inner side of the groove (51;171), forms a path of contact, the angle between the average tangent of the path of contact and the plane of the window or door structure being less than 40°.

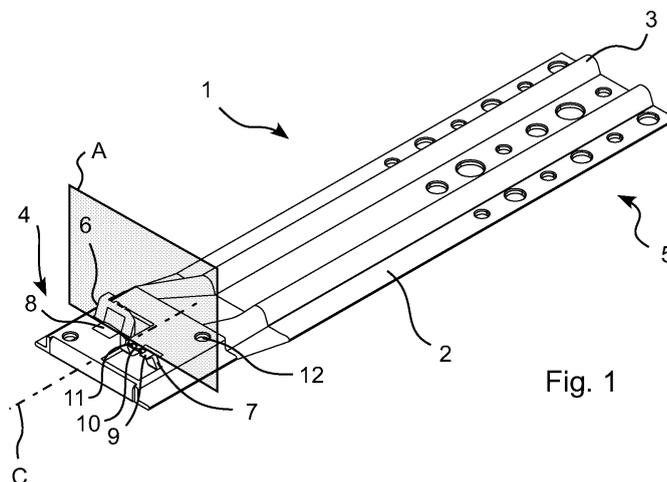


Fig. 1

**Description**

**[0001]** The current invention relates to a window or door structure which is suitable for being mounted in an opening in a wall, said window or door structure comprising a fixed frame being of the type with a groove arranged along at least a portion of the outer periphery of the fixed frame and arranged such that the longitudinal axis of the groove is parallel with the plane of the window or door structure and where said window or door structure comprises at least one mounting bracket suitable for connecting said fixed frame to said opening, said mounting bracket comprising a first area which is fastened to the fixed frame and a second area which is arranged to be fastened to said opening when the window or door structure is mounted in the opening, and where said first area comprises at least a first flange and a second flange which protrude from the first area, said bracket being arranged such that the flanges protrude from the first area on the side of said mounting bracket which is facing the fixed frame, said flanges are arranged one on each side of a first plane (A) which is parallel to the plane of the window or door structure and where the first flange is in contact with at least a portion of a first inner side of said groove and the second flange is in contact with at least a portion of a second inner side of said groove which is opposite the first inner side of said groove and where the bracket is arranged such that the contact area between the first flange and the first inner side of said groove and the contact area between the second flange and the second inner side of said groove are arranged exclusively one on each side of a first axis (C) which is perpendicular to the plane of the window or door structure.

**[0002]** It should be noted that in the description the focus is on window assemblies, however it should be clear to the person skilled in the art that the mounting bracket of the invention can also be used to mount door frames in wall openings.

**[0003]** In the current specification, the term "groove" should be understood as a longitudinal recess having an essentially constant cross section taken along a plane which is perpendicular to the longitudinal axis of the groove. The term "flange" should be understood as an element which protrudes from the main body portion of the bracket and having a surface which can press up against the inner side of the groove. In the context of the current specification, the flange could take many forms, both straight, curved, asymmetric, symmetric, etc.

**[0004]** Furthermore, the phrase "exclusively one on each side of a first axis" should be understood as meaning that the two areas of contact are located completely on each their own side of the first axis. There is no overlap between the two areas of contact when seen along a direction which is parallel to the first axis. It should also be mentioned that the phrase "arranged one on each side of an axis" should be understood as meaning arranged one on each side of a plane which comprises the axis.

Description of related art

**[0005]** Mounting brackets for mounting a window or door assembly in a wall opening are known in many different forms. Many brackets are attached to the fixed frame of the window or door assembly via screws/nails and are also fixed to the wall opening via screws/nails. An example of this type of bracket is shown in DK 176245 B1 (Friis).

**[0006]** Lately many window and door assemblies have been manufactured from composite materials and metal. In these types of materials, it is often possible to form a track in a portion of the fixed frame which has two co-planar flanges. Many brackets have therefore been disclosed which can engage with the flanges of such a track. Some examples of such brackets are disclosed in DE 6913297 (Schenning), EP 1 806 469 A2 (Fuchs), EP 1 688 577 A2 (Mallebay) and GB 2 291 455 A (Wilson).

**[0007]** A problem with the first type of bracket is that it can be difficult to mount the bracket on the window frame since the person mounting the bracket has to hold the bracket in one hand while fastening the bracket to the window with the screws/nails. This can be a complicated procedure especially if the window needs to be stabilized during the mounting as well.

**[0008]** The second type of bracket discussed above is only suitable for use with frames having a track with two co-planar flanges which the bracket can engage. However, for frames which are made of wood, the brackets can't be used since it is not possible to make thin and strong flanges in a wooden frame which would be suitable for the known types of brackets. Furthermore, certain types of composite materials are very strong, but are also very brittle. In these types of materials, it is also not possible to make thin flanges which will be robust enough to be used together with such brackets.

**[0009]** Another example of a known bracket is disclosed in DE 30 39 484 A1 (Schwarzer). This bracket is used on wooden frames. A tooth on the bracket is arranged in a groove in the frame. The bracket is then rotated 90° and the tooth is forced into the sides of the groove. However, this type of bracket creates quite a bit of damage on the frame due to the large tooth which needs to cut into the frame. This can weaken the frame. Furthermore, this type of bracket can't be used together with composite frames. Another problem with this type of bracket is that over time, the tooth will press itself more and more into the groove and the frame will become loose.

**[0010]** Another known bracket is disclosed in DE 2 245 156 A1. This bracket is used to mount a steel window sill to an opening in a wall. The bracket comprises a first linear flange and a second curved flange opposite the first linear flange.

**[0011]** The bracket is mounted in a square groove in the steel window sill by rotating the bracket around one end of the linear flange. This causes the curved flange to slide along the opposite side of the groove. The bracket

is held in place by teeth which allow the curved flange to slide along the groove in one direction, but prevent the curved flange from sliding along the groove in the opposite direction. Once the bracket is rotated into place, it is not possible to remove the bracket without damaging the groove and/or the bracket. This type of bracket will only work with grooves which are quite wide and will not work with narrow grooves and/or with grooves where the entrance of the groove is narrower than the body of the groove, for example dovetail grooves.

#### Summary of the invention

**[0012]** It is therefore one aspect of the current invention to provide a mounting bracket as mentioned in the opening paragraph which is better than the mounting brackets known in the art.

**[0013]** This aspect is provided by a mounting bracket according to the opening paragraph where the contact between the first flange and the first inner side of the groove and the contact between the second flange and the second inner side of the groove, when seen in cross sections through said flanges taken along a plane which is perpendicular to the longitudinal axis of the groove, forms a path of contact, the angle between the average tangent of the path of contact and the plane of the window or door structure being less than  $40^\circ$ . In different embodiments, the angle could also be less than  $30^\circ$ , less than  $20^\circ$ , or less than  $10^\circ$ . In this way, it is possible to distribute the forces which are applied to the groove in the frame by the flanges of the bracket over a larger area having a component which is parallel to the plane of the window or door structure. The smaller the angle between the contact path and the plane of the window or door structure, the greater the component of the contact area which will be parallel to the plane of the window or door structure. It is also possible in this way to build the groove without thin flanges. This makes it possible to use the bracket in softer materials such as wood and less robust materials such as fibreglass while still being able to support large loads.

**[0014]** Please note that the phrases "path of contact" and "average tangent" are discussed in greater detail in the detailed description of this specification.

**[0015]** Another way of describing the relationship between the flanges and the groove, is that the projection of the area of contact between the outer surface of the flange and the inner side of the groove onto a first plane which is parallel to the plane of the window or door structure is greater than the projection of said area of contact onto a plane which is perpendicular to the plane of the window or door structure and which is parallel to the longitudinal axis of the groove. In one embodiment, the ratio between the two projections could be greater than or equal to 2 to 1.

**[0016]** In one embodiment of the mounting bracket, at least one of the flanges of the mounting bracket could be arranged such that the flange's dimension which is par-

allel to the longitudinal axis of the groove to which the bracket is connected is greater than the flange's dimension which is perpendicular to said longitudinal axis of the groove and parallel to the plane of the bracket. In this way, the flange can be made longer than it is wide and the flanges can therefore be made quite narrow. The flange's dimension which is perpendicular to the plane of the bracket could also be made greater than the dimension of the flange which is perpendicular to the longitudinal axis of the groove and parallel to the plane of the bracket. In this way, the groove to which the bracket is connected can be made quite narrow.

**[0017]** Due to the arrangement of the flanges, the mounting bracket could be arranged such that a vector between a point on the first flange and a point on the second flange has a component in a direction parallel to the longitudinal axis of the groove to which the bracket is connected which is at least twice as large as the width of the groove. In this way, a large contact area between the flanges and the groove can be provided without requiring a wide groove.

**[0018]** In a further embodiment, the longitudinal axis of the area of contact between the first flange and the first inner side of the groove and the longitudinal axis of the area of contact between the second flange and the second inner side of the groove could be arranged parallel to each other and to the longitudinal axis of the groove. In this way, the two areas of contact can be made quite large and give a good support in a direction which is perpendicular to the plane of the window or door structure. It should be noted that in one particular embodiment the first and second flange are arranged parallel to each other.

**[0019]** In a preferred embodiment, the bracket could be arranged such that the area of contact between the first flange and the first inner side of the groove which forms an angle of less than 45 degrees to the plane of the window or door structure and/or the area of contact between the second flange and the second inner side of the groove which forms an angle of less than 45 degrees to the plane of the window or door structure are/is greater than  $20\text{mm}^2$ . Larger values than  $20\text{mm}^2$  could also be imagined, for example greater than  $30\text{mm}^2$ , greater than  $40\text{mm}^2$  or greater than  $50\text{mm}^2$ . By providing a large contact area between the flange and the groove, the flange is prevented from being pressed into the material of the groove over time. This keeps the connection between the groove and the bracket firm even after multiple loadings.

**[0020]** In one embodiment, the mounting bracket could be arranged such that the flanges of the mounting bracket are arranged such that when the mounting bracket is held such that the first axis (C) is at an angle to an axis which is perpendicular to the plane of the window or door structure, the maximum distance between the flanges in a direction which is perpendicular to the plane of the window or door structure is less than when the bracket is held such that the first axis is parallel with the axis which

is perpendicular to the window or door structure. In this way, the flanges can be inserted in a groove without damaging the sides of the groove and then rotated into the groove to fasten the bracket to the groove. This also allows the flanges to be used together with a dovetail groove.

**[0021]** In one embodiment, the groove in the fixed frame could be a dovetail groove where the inner sides of the groove each form an angle to the plane of the window or door structure of between 5 and 45 degrees. In another embodiment, the groove in the fixed frame could be a square groove where the two opposing inner sides of the groove each form an angle to the plane of the window or door structure of 0 degrees.

**[0022]** Another way of describing the connection between the flanges of the mounting bracket and the groove is that the two flanges of the mounting bracket could be arranged such that the outer surfaces of the flanges press up against the inner sides of the groove. This provides a good support between the flanges and the groove.

**[0023]** In one embodiment, the fixed frame could comprise a wooden portion or a composite portion and the groove could be placed in the wooden or composite portion of the fixed frame.

**[0024]** It can also be noted that the above embodiments have focussed on the combination of a window or door structure and a mounting bracket. However, independent claims directed to the mounting brackets alone as described in this specification could also be formulated.

**[0025]** For example, a claim could be formulated as follows: "A mounting bracket suitable for connecting a window or door frame to an opening in a wall, said bracket comprising a body portion with a first area which is to be connected with the frame when the bracket is attached to the frame and a second area which is to be connected to the opening in the wall when the bracket is attached to the wall opening, said bracket comprising two flanges which protrude from the first area, said two flanges being arranged exclusively one on each side of a first plane which is arranged parallel with the longitudinal axis of the bracket and perpendicular to the first area and one on each side of a second plane which is perpendicular to the first plane and perpendicular to the first area, characterized in that said flanges are arranged such that the projection of said flanges onto the second plane is greater than the projection of said flanges onto a plane which is parallel to the first area." Furthermore, the ratio between the two projections could be greater than 2 to 1 or greater than 3 to 1. In another example, the bracket as mentioned above could comprise at least one projection projecting from at least one of said flanges in a direction which is perpendicular to the second plane.

**[0026]** It should be emphasized that the term "comprises/comprising/comprised of" when used in this specification is taken to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other fea-

tures, integers, steps, components or groups thereof.

**[0027]** For example, in the embodiments shown in the figures, there are two distinct flanges. But it could also be imagined that each flange could be made up of a number of smaller flanges, rods, columns, flaps, etc... Together, they form a compound surface which can press up against the side of the groove. Also, it should be understood that the two flanges could be joined together such that they are integrally formed, but still act as two flanges each having an area of contact which press up against the sides of the groove.

#### Brief description of the drawings

**[0028]** In the following, the invention will be described in greater detail with reference to embodiments shown by the enclosed figures. It should be emphasized that the embodiments shown are used for example purposes only and should not be used to limit the scope of the invention.

**[0029]** Figures 1-5 show a top perspective view, a bottom perspective view, a top view, a side view and a bottom view respectively of a first embodiment of a left hand (when seen from the inside of the window) mounting bracket according to the invention.

**[0030]** Figures 6-7 show a top perspective view and a bottom perspective view respectively of a first embodiment of a right hand (when seen from the inside of the window) mounting bracket according to the invention.

**[0031]** Figures 8-9 show two different perspective views of a window assembly comprising a bracket according to figures 1-5 mounted on the left side of the window assembly and a bracket according to figures 6-7 mounted on the right side of the window assembly.

**[0032]** Figure 10 shows a left side view of the window assembly shown in figures 8-9.

**[0033]** Figure 11 shows a right side view of the window assembly shown in figures 8-9.

**[0034]** Figure 12 shows a top view of the window assembly shown in figures 8-9.

**[0035]** Figure 13 shows a detail left side view of the connection between the bracket and the window frame of the window assembly shown in figures 8-9.

**[0036]** Figure 14 shows a detail right side view of the connection between the bracket and the window frame of the window assembly shown in figures 8-9.

**[0037]** Figure 15 shows a detail top view of the connection between the left hand bracket and the window frame of the window assembly shown in figures 8-9.

**[0038]** Figure 16 shows a detail top view of the connection between the right hand bracket and the window frame of the window assembly shown in figures 8-9.

**[0039]** Figures 17-21 show a top perspective view, a bottom perspective view, a top view, a side view and a bottom view respectively of a second embodiment of a left hand (when seen from the inside of the window) mounting bracket according to the invention.

**[0040]** Figures 22-24 show a top perspective view, a

top view in the mounted position and a top view in a mounting position respectively of a third embodiment of a left hand (when seen from the inside of the window) mounting bracket according to the invention.

**[0041]** Figures 25-27 show top views of a fourth embodiment of a bracket, showing an engagement element in three different positions.

**[0042]** Figures 28-31 show a top perspective view, a top view, a side view and a detailed side view respectively of a fifth embodiment of a mounting bracket according to the invention.

**[0043]** Figures 32-33 show a top perspective view and a side view respectively of the mounting bracket shown in figures 28-31 when assembled with a support element.

**[0044]** Figures 34-35 show the support element shown in figures 32-33 in a top perspective view and a side view respectively.

**[0045]** Figure 36 shows a top perspective view of a window structure with two brackets as shown in figures 28-31 to be mounted to one side of the fixed frame of the window structure and two brackets and support elements as shown in figures 32-33 to be mounted on the bottom side of the fixed frame of the window structure.

**[0046]** Figures 37-42 show schematic representations of different embodiments of grooves and corresponding flanges which illustrate the term "path of contact" used in the specification and the claims.

#### Detailed description of the embodiments

**[0047]** The mounting bracket 1 shown in figures 1-5 is a mounting bracket for mounting a window assembly in an opening in a wall. Figures 8-16 show details of how the mounting bracket achieves this purpose. Figures 8-16 will be described in more detail later on in this specification.

**[0048]** The mounting bracket of figures 1-5 is a left hand bracket. That is to say, the bracket is designed to be mounted on the left hand side of a window assembly when the window is seen from the inside. It should be noted that the bracket can also be mounted on the right hand side of a window assembly, but will not have the same effect. This feature will be discussed in more detail later on in this specification.

**[0049]** The bracket 1 is formed from a plate like material such as metal sheet which is stamped and bent into the proper shape. The bracket comprises an elongated body portion 2. In order to make the body portion stiff, ribs 3 are formed along the longitudinal axis of the body portion. The bracket has a first area 4 which is connected to the window frame when the bracket is mounted on a window frame and a second area 5 which is connected to the wall opening when the bracket is connected to a wall opening. At the second area 5 there are a number of holes through which screws and/or other types of fasteners can be mounted to fasten the bracket to the wall opening.

**[0050]** At the first area 4, the bracket comprises two

flanges 6, 7 which protrude from the first area on the side of the bracket which will be facing the window frame when the bracket is mounted on a window frame. As it can be seen from the figures, the flanges are formed by making a C-shaped cut in the material of the bracket at the first area and then bending the flange up. The flanges in this particular embodiment are essentially rectangular planar flanges. The flanges are in the current embodiment arranged exclusively one on each side of the centre axis C of the bracket and one on each side a plane A which is parallel to the plane of the window assembly when the bracket is mounted on the window assembly. It should be mentioned that in this particular embodiment, the centre axis of the bracket is aligned with an axis which is perpendicular to the plane of the window assembly when the bracket is mounted on the window assembly.

**[0051]** The flanges are arranged such that the plane of the flange is arranged at an angle to the plane of the window assembly. In the current example, the two flanges are each angled the same amount from the plane of the window assembly, but in opposite directions. This can be seen when looking at the flanges from the side of the bracket (see figure 4), where it can be seen that the flanges form a V shape with respect to each other. In order to strengthen the flanges, against forces which attempt to bend the flanges, a support rib 8 has been formed in the centre of each flange.

**[0052]** The flanges have also been formed with three protrusions 9, 10, 11 extending from the ends of each of the flanges. The protrusions extend in a direction which is perpendicular to the plane of the window assembly when the bracket is mounted on the window frame. In the current embodiment the protrusions also extend perpendicular to a plane of symmetry between the two flanges. As can be seen from especially figures 3 and 5, there is one large protrusion 9 near the side of the bracket when seen from the top or bottom, and two smaller protrusions 10, 11 near the centre of the bracket when seen from the top or bottom.

**[0053]** The bracket also comprises two holes 12 in the first area of the bracket. These holes can be used for screws which can further fasten the bracket to the window frame if it is necessary. It can also be seen from the figures that the bracket at the first area of the bracket has been formed into a box like structure. This gives extra strength to the bracket.

**[0054]** The mounting bracket 20 shown in figures 6-7 is the mirror image of the bracket shown in figures 1-5 and is therefore designed to be mounted on the right hand side of a window assembly when the window is seen from the inside. The bracket of figures 6-7 won't be described in detail, but the reader is referred to the description of the bracket in figures 1-5. The reference numerals on figures 6-7 are the same reference numerals that are used in figures 1-5.

**[0055]** Figures 8-16 show different views of how the brackets 1, 20 are attached to a window frame 50. The window frame 50 is comprised of four wooden frame el-

elements 50a, 50b, 50c, 50d. A groove 51 is arranged along the periphery of the window frame of two of the frame elements 50a, 50c. In many cases, a groove will be formed around all four frame elements. The groove of the current embodiment is a dovetail groove. By dovetail groove, is meant a groove which is narrower at its entrance than in its interior. Usually the sides of a dovetail groove form an angle to the plane of symmetry of the groove of between 5 and 40 degrees.

**[0056]** A left hand bracket 1 is mounted on the left hand side of the window frame when seen from the inside of the window and a right hand bracket 20 is mounted on the right hand side of the window frame when seen from inside the window. The left hand bracket 1 is shown in a position just before it is fastened to the frame and the right hand bracket 20 is shown after it has been fastened to the frame.

**[0057]** As can be seen from the figure, see especially figures 10 and 13, the left hand bracket is rotated clockwise about 20 degrees from the horizontal. In this position, it can be seen that the maximum distance between the flanges 7 and protrusions 9,10,11 in the direction which is perpendicular to the plane of the window assembly is less than when the bracket is rotated into the horizontal position. The horizontal position is shown in figures 11 and 14. This change in distance is especially clear when comparing figures 15 and 16. When the bracket is rotated away from the horizontal (figure 15), it is possible to insert the flanges of the bracket into the groove in the frame. Once the flanges have been inserted as shown in figures 15, the bracket can be rotated, back into the horizontal position (figure 16). In this way, the flanges are pressed up against the inner sides of the groove and the protrusions are pressed into the wooden material of the frame. In this way, the protrusions "bite" into the frame and hold the bracket fastened to the frame.

**[0058]** In addition, the protrusions have the effect of increasing the friction between the bracket and the frame in the direction which is parallel to the longitudinal axis of the groove. This allows the bracket to support a portion of the window's own weight when the window is mounted in the window opening. If enough brackets are used with respect to the weight of the window, it is possible to eliminate the need for brackets mounted at the base of the window. The protrusions also increase the friction between the bracket and the groove in a direction which is perpendicular to the longitudinal axis of the groove and parallel to the plane of the window structure. This ensures that the bracket cannot easily be pulled out of the groove. This is especially important for grooves which have sides which form very small angles to the plane of the window structure, for example square grooves.

**[0059]** It can also be seen from figure 16 that the flanges press up against the inner sides of the groove since the distance between the flanges in a direction perpendicular to the flanges is essentially equal to the width of the groove. It could be noted that in the current embodiment, the flanges have an angle which is equal to the

angle of the sides of the groove. However, it could be imagined that the flanges have an angle which is slightly larger to the plane of the window than the angle of the sides of the groove. When the flanges are inserted in the groove, the flanges would be bent towards each other and there would therefore be an elastic force which holds the flanges against the sides of the groove. However, the distance between the flanges at their base and the width of the opening of the groove should be equal.

**[0060]** The contact between the inner sides of the groove and the flanges, is furthermore spread out over an area. As can be seen from, for example, figures 14 and 16, the contact area between the first flange 6 and the groove and the contact area between the second flange 7 and the groove are arranged exclusively on either side of the centre axis C of the bracket. In this way, when the bracket is rotated about a point which lies centred between the two contact areas, for example on the centre axis C of the bracket, the maximum distance between the flanges and protrusions in a direction which is perpendicular to the longitudinal axis of the groove and perpendicular to the plane of the window structure becomes smaller. As can be imagined, if the contact areas of the flanges were overlapping, then the overlapping portions would cause the maximum distance between the flanges in the above mentioned direction to increase when the bracket were rotated.

**[0061]** It can also be noted that by arranging the flanges of the mounting bracket such that the areas of contact between the sides of the grooves and the outer surfaces of the flanges are arranged exclusively one on each side of a first axis which is perpendicular to the plane of the window structure and one on each side of a first plane which is parallel to the plane of the window structure, the outer surfaces of the flanges move towards the inner surfaces of the groove during mounting in a direction which is close to perpendicular to the plane of the window structure. In other words, the bracket can be rotated about a point which is essentially centred between the outer surfaces of the flanges (or essentially centred between the areas of contact between the outer surfaces of the flanges and the inner sides of the groove). In this way, the protrusions on the flanges can be forced into the material of the fixed frame in a direction which is close to perpendicular to the plane of symmetry of the groove. This prevents the protrusions from causing a large amount of damage to the fixed frame. By comparing the current embodiment to for example the solutions of DE 2 245 156 and DE 30 39 484 A1, one can see that the protrusions of the current embodiment are forced into the fixed frame with very little damage to the fixed frame instead of making a large cut into the fixed frame. This is also useful if other forms of friction enhancing elements are used, for example glue or double sided tape. Since the outer surfaces of the flanges move towards the inner sides of the groove almost perpendicularly without any significant sliding motion, glue or tape could be used to anchor the flanges in the groove. Glue or tape would not

work with a solution as disclosed in DE 2 245 156 A1.

**[0062]** When seen in a cross section through the flange and groove taken along a plane which is perpendicular to the longitudinal axis of the groove, the contact between the outer surface of the flange and the inner side of the groove occurs along a contact path. As can be seen from, for example, figure 16, this contact path assumes an angle to the plane of the window assembly which is quite small. In the prior art where the bracket engages with flanges on the frame profile, the path of contact is usually arranged at an angle of 90° to the plane of the window assembly. In this way, one ends up with thin and fragile flanges if the frame profile thickness is to be minimized. However, by arranging the contact path at a smaller angle to the plane of the window assembly, the contact area can be increased and the forces on the frame minimized. It should also be noted that if the contact path were curved, then according to the invention, the average of the tangent of the contact path would be at an angle of less than 90° to the plane of the window assembly. It should be noted that the tangent is defined as the first derivative of the contact path and the tangent of a straight line is therefore the straight line itself.

**[0063]** Figures 37-42 show some schematic representations of different flanges and grooves which illustrate how the phrase "path of contact" should be interpreted. It should be noted that the figures show the two flanges in the same cross section, even though the flanges are not overlapping. However for the sake of illustration both flanges are shown in the same cross section. In the "real" world, a cross section through the first flange on a plane which is perpendicular to the longitudinal axis of the groove would show the "path of contact" of the contact area between the first flange and the first side of the groove and a cross section through the second flange along a parallel plane would show the "path of contact" of the contact area between the second flange and the second side of the groove. It should also be noted that the area of contact is not explicitly shown in the figures since the figures are cross sections, but it could be imagined by the person skilled in the art that the flanges are in contact with the sides of the groove over an area which can be called the contact area.

**[0064]** Figure 37 shows a portion of a frame 100 and a portion of a bracket 101. The frame has a dovetail groove 102 having a first inner side 103 and a second inner side 104 opposite the first inner side 103. The groove also has a bottom 105. The bracket has a first flange 106 and a second flange 107. The two flanges have outer surfaces 108 and 109 respectively which are arranged at an angle to a plane which is parallel to the plane of the window structure. The two outer surfaces 108 and 109 are also arranged symmetrically to each other. The outer surfaces 108 and 109 are, in the current embodiment, arranged such that they are parallel to the inner sides of the groove. As can be seen from figure 38, when the flanges are arranged inside the groove, the outer surfaces of the flanges lie up against the inner sides

of the groove. In this way two areas of contact are formed between the inner surfaces of the groove and the outer surfaces of the flange. In the cross section as shown in for example figure 38, the contact area is represented by two thick two dimensional lines 110 which can each be called a "path of contact". In this case, the tangent to the path of contact forms an angle to the plane W of the window structure which is approximately 15 degrees.

**[0065]** In figure 39, the prior art type of bracket and groove are shown, as known from for example DE 6913297U. In this case the path of contact 111 is arranged along a line which is perpendicular to the plane W of the window structure. In figure 40, the bracket has been slightly twisted in the groove and the base of the flanges have come into contact with the inner sides of the groove. However, the path of contact is now composed of a first path 111 which is perpendicular to the plane of the window frame and a second path 112 which is parallel to the plane of the window frame. The average tangent to this compound path of contact will be greater than 45 degrees to the plane W of the window structure since the first path 111 is longer than the second path 112.

**[0066]** Figure 41 shows another example of a path of contact. In this example, the path of contact 115 forms an angle to the plane of the window structure of zero degrees. Figure 42 shows another example of path of contact 120 which is curved. In this case the average tangent to the path of contact is less than 40 degrees.

**[0067]** It should be noted that the average tangent can be found by taking the tangent at a suitable number of equally spaced points along the path of contact and dividing by the number of points used. This can be easily found via calculus and a person skilled in the art of mathematics will be able to find this measure easily.

**[0068]** The design of the flanges whereby the flanges press up against opposite inner sides of the groove, has the effect of securing the bracket in the groove such that the frame cannot move relative to the bracket in the direction which is perpendicular to the plane of the window. This ensures that the bracket can support the window when it is exposed to wind loads. Furthermore, by spreading the contact between the flanges and the sides of the groove out over an area the bracket is prevented from pressing into the sides of the groove. This will keep the bracket securely fastened to the groove over time.

**[0069]** As mentioned previously, the brackets can be made as left handed or as right handed brackets. When a left hand bracket is mounted on the left hand side of the window, the weight of the window will cause the protrusions to be forced deeper into the wood of the frame. This would also make it possible to fasten the bracket to the wall opening at its second end with a single bolt because the bracket would be able to support a moment at the interface between the groove and the bracket. However, this would cause large moments to be applied to the groove in the frame. If the frame were not strong enough, the bracket could damage the frame. Therefore, in most cases, two screws would be used to fasten the

bracket to the wall opening. In this way, the bracket acts as a beam solidly connected to the wall opening and most of the moments would be applied to the wall opening.

**[0070]** If the left hand bracket were mounted on the right hand side of the window, then the weight of the window would cause the protrusions to withdraw from the wood. However, it could be mentioned that when the left hand bracket is mounted on the right hand side of the window, then the bracket would hold itself in position due to gravity, during the mounting of the bracket on the frame. The bracket would even hold itself in position before the protrusions have been forced into the wood of the frame. Therefore, in embodiments which don't have protrusions which bite into the frame, it might be desirable to use a left hand bracket on the right hand side of the frame in order to ease mounting of the brackets on the frame.

**[0071]** In the above example, the brackets have been mounted to the left and right hand sides of the window. However, within the scope of the invention, it could also be advantageous to mount the brackets to the top and/or bottom of the window. For example, when a side hung window is attached to a wall opening, there are loads in the frame which run sideways due to the moment applied by the window sash on the window frame. In this case, a bracket according to the current invention could be mounted on the top of the frame to support the forces which are present in the top and bottom frame members.

**[0072]** For example, if the window assembly shown in figure 8 were a side hung window where a window sash was hinged on the right hand side of the window when looking out of the window, there would be forces which would cause the window frame to want to rotate counter clockwise when looking out the window. In this case, a left hand bracket could be mounted to the top frame element and/or a left hand bracket could be mounted to the bottom frame element. It should be noted that figure 8 shows top and bottom frame elements without a groove, however, a groove could be added if brackets were to be added to the top and/or bottom frame element.

**[0073]** The second embodiment of a bracket 60 shown in figures 17-21 is almost identical to the bracket 1 shown in figures 1-5. It is also a left hand bracket. The major differences between the bracket 60 of figures 17-21 and the bracket 1 of figures 1-5 is that the flanges 6,7 have two smaller support ribs 61,62 instead of one larger support rib 8 and there is only one protrusion 63,64 per flange instead of three as in the previous embodiment. It can also be seen that the protrusion 63 which is arranged at the top of the bracket when the bracket is mounted on the frame, is formed to provide more support to the protrusion with a curved portion 65 below the protrusion. In this way, the protrusion is strengthened. This allows the protrusion to bear more load in a direction which is parallel to the longitudinal axis of the groove.

**[0074]** The third embodiment of a bracket 70 shown in figures 22-24 is very similar to the bracket 1 shown in figures 1-5 and is also a left hand bracket. Please note

that the elongated body portion of the bracket is not shown in figures 22-24 in order to simplify the figures. The major differences between the bracket 70 of figures 22-24 and the bracket 1 of figures 1-5 is that the instead of having bent up metal flanges as in figures 1-5, the "flanges" 6,7 of the third embodiment are two surfaces of a single solid protrusion 71. The solid protrusion 71, has two flat surfaces 6,7 which will engage with the inner sides 74 of the groove when the bracket is rotated into place. On the side of the flanges 6,7 there is a curved surface 72,73. This curved surface helps in pressing the bracket into the groove when the solid protrusion 71 is made slightly larger than the groove. This allows the protrusion 71 to securely wedge in place in the groove.

**[0075]** We note that in the current embodiment, the surfaces 6,7 are shown as being flat and smooth. However, it could be imagined that the surfaces 6,7 are provided with small protrusions or other friction enhancing means in order to more securely grip onto the inner sides of the groove.

**[0076]** The fourth embodiment of a bracket shown in figures 25-27 is very similar to the bracket shown in figure 22-24, but in order to simplify the figures, only the solid protrusion 81, the inner sides 82 of the groove and the longitudinal axis L of the bracket are shown in the figures. The main body of the protrusion 82 is formed as a protrusion having a generally oval shape. On either side of the major axis of the oval protrusion, flanges 6,7 are arranged.

**[0077]** When the bracket is to be mounted in place, the solid protrusion is inserted into the groove as shown in figure 25 with the longitudinal axis of the bracket at around 80 degrees to the plane which is perpendicular to the longitudinal axis of the groove. In this position, the dimension of the solid protrusion perpendicular to the groove is less than the width of the groove. When the bracket is rotated clockwise in the figures the oval protrusion wedges into the groove. When the major axis of the oval is perpendicular to the longitudinal axis of the groove, see figure 26, the oval disk slightly deforms the groove because the width of the oval protrusion at the major axis is slightly larger than the width of the groove. When the bracket is further rotated, the groove springs back because the major dimension of the oval has been passed. A slight rotation more and the flanges come into contact with the sides of the groove, see figure 27. In this way, the solid protrusion is held firmly in the groove and can't fall out. When the bracket is to be removed, the bracket must be forcefully rotated in order to rotate the major dimension of the oval protrusion past the inner sides of the groove.

**[0078]** In this way, the solid protrusion 81 is formed such that it has a position in which it is locked in place and can only be removed by the application of a certain amount of force. This self locking action can be attributed to the fact that the distance from the centre of the protrusion to the perimeter of the solid protrusion has at least four peaks, instead of just two as would be the case with

a simple oval. In the embodiment shown, along the direction of rotation, the first peak is slightly lower than the second peak.

**[0079]** Figures 28-31 show some different views of a fifth embodiment 150 of a mounting bracket. This bracket is again very similar to the bracket shown in figures 1-5, therefore the bracket will not be discussed in great detail, only the main differences between the brackets will be mentioned. The person skilled in the art will be able to appreciate the smaller differences between the brackets. It should be noted that the bracket shown in figures 28-31 is a right hand bracket when seen from the inside of the window frame in contrast to the bracket shown in figures 1-5.

**[0080]** The main difference between the fifth embodiment of the bracket 150 and the first embodiment of the bracket 1 is that the flanges 151, 152 are arranged perpendicular to the plane of the bracket instead of at an angle. In this case, the bracket is designed to be inserted in a square groove instead of in a dovetail groove. The outer surfaces 153, 154 of the flanges are designed to lie up against the inner sides of the groove when the bracket is mounted to the fixed frame. A single protrusion 155, 156 is arranged on each flange. The protrusions being arranged at the outer most portions of the flanges and be arranged perpendicular to the plane of the flanges.

**[0081]** Another difference between the first embodiment of the bracket 1 and the fifth embodiment 150 is that the first area 157 of the bracket is flat and not box shaped. However a number of strengthening ribs 158 have been formed in the first area to strengthen the first area.

**[0082]** Figures 32 and 33 show two different views of a mounting bracket 150 as shown in figures 28-31 which is assembled together with a supporting bracket 160. The supporting bracket can be used in cases where the bracket 150 is required to support a load which is perpendicular to the plane of the bracket itself. This could be, for example, when the bracket is mounted to the bottom frame element of a window frame and where the bracket should support the weight of the window frame. This situation is shown in figure 36. The mounting bracket 150 can be attached to the supporting bracket 160 via self tapping screws screwed through the bracket and the support bracket.

**[0083]** The window structure 170 shown in figure 36 schematically shows four fixed frame elements 170a, 170b, 170c and 170d. A square groove 171 is arranged in three frame members 170a, 170c, 170d. Two brackets 150 are mounted to the left side of the window when seen from the inside (the right side in the figure) and two brackets 150 are mounted to the bottom frame element 170d. The two bottom brackets 150 are supported by supporting brackets 160. Note that in figure 36, the brackets mounted to the left side of the window frame are right hand brackets as described above. Since the weight of the window is being supported by the brackets on the

bottom of the frame, right hand brackets are used on the left side of the frame to make mounting of the brackets in the groove easier as discussed previously.

**[0084]** Figures 34 and 35 show two detailed views of the supporting bracket 160. As can be seen from the figures, the support bracket 160 comprises a first rail portion 161 in which the second area of the bracket can be arranged. The rail portion 161 is provided with flange elements 162, 163, 164 which guide and hold the second area of the mounting bracket attached to the rail portion. The rail portion is connected to a triangular flange 165 arranged perpendicularly to the rail portion and which provides the support force to the mounting bracket. The triangular flange 165 is attached to a mounting flange 166 which would be attached to the wall in which the window opening is arranged. In a typical situation, the wall is comprised of an inner wall and an outer wall. The space between the inner and outer walls is filled with insulation. The mounting flange 166 would be attached to the outwardly facing surface of the inner wall in the hollow between the inner wall and the outer wall. The person skilled in the art will understand this type of construction.

**[0085]** As mentioned previously the embodiments shown in the figures have only shown a limited number of different embodiments which are covered by the scope of the invention. The person skilled in the art will be able to develop other embodiments based on the teachings of the current invention.

**[0086]** For example, in the embodiments shown, the groove has been a dovetail groove. However, the invention will also cover grooves having a square cross section for example. In this case, the flanges could be made spring loaded so that they are firmly pressed against the sides of the groove when the bracket is mounted in the groove.

**[0087]** Another example is that the embodiments shown in the figures all have protrusions which act as large hooks which press into the material of the frame. However embodiments of brackets which don't have such large hook like protrusions could also be imagined. For example one could imagine small protrusions in the main body of the flange which could press out and dig into the sides of the groove.

**[0088]** If the brackets should be used together with a frame material other than wood, for example fibreglass or metal, large protrusions which dig into the material will not be the best solution. However, in this case, other types of friction inducing means could be used to allow the bracket to support vertical loads. For example, one could use glue or other type of adhesive. One could also imagine that a number of recesses were formed in the sides of the groove of the frame element, with which a large protrusion could engage when mounted on the frame.

**[0089]** It can also be mentioned that the current embodiments are all elongated, however, the bracket could have another form than elongated. For example, the

bracket could be square or triangular. In addition, the flanges have all been shown as flat planar flanges, however, it could also be imagined that the flanges were curved and that the inner sides of the groove were curved a similar amount.

**[0090]** It should also be mentioned that the current embodiment has been related to a window having a window frame with four frame elements. However, the brackets can also be used to mount a door in a wall opening. As will be known to the person skilled in the art, door frames are typically comprised of two side frame elements (jamb), a top frame element (head) and a bottom frame element (threshold). In the most common cases, the bracket according to the invention will be mounted to the left and right side frame elements (jamb). In many cases, the top and side frame elements will be identical and will have a groove at their outer side, whereas the bottom frame element will be different and not have a groove on its outer side.

### Claims

1. A window or door structure which is suitable for being mounted in an opening in a wall, said window or door structure comprising a fixed frame (50;170) being of the type with a groove (51;171) arranged along at least a portion of the outer periphery of the fixed frame and arranged such that the longitudinal axis of the groove is parallel with the plane of the window or door structure and where said window or door structure comprises at least one mounting bracket (1;20;60;70;150) suitable for connecting said fixed frame (50;170) to said opening, said mounting bracket comprising a first area (4) which is fastened to the fixed frame and a second area (5) which is arranged to be fastened to said opening when the window or door structure is mounted in the opening, and where said first area comprises at least a first flange (6) and a second flange (7) which protrude from the first area, said bracket being arranged such that the flanges protrude from the first area on the side of said mounting bracket which is facing the fixed frame, said flanges are arranged one on each side of a first plane (A) which is parallel to the plane of the window or door structure and where the first flange is in contact with at least a portion of a first inner side of said groove and the second flange is in contact with at least a portion of a second inner side of said groove which is opposite the first inner side of said groove and where the bracket is arranged such that the contact area between the first flange and the first inner side of said groove and the contact area between the second flange and the second inner side of said groove are arranged exclusively one on each side of a first axis (C) which is perpendicular to the plane of the window or door structure **characterized in that** the contact between the first flange and the first inner side of the groove and the contact between the second flange and the second inner side of the groove, when seen in cross sections through said flanges taken along a plane which is perpendicular to the longitudinal axis of the groove, forms a path of contact, the angle between the average tangent of the path of contact and the plane of the window or door structure being less than 40°.
2. A window or door structure according to claim 1, **characterized in that** at least one of the flanges (6,7;151,152) of the mounting bracket (1;20;60;70;150) is arranged such that the flange's dimension which is parallel to the longitudinal axis of the groove to which the bracket is connected is greater than the flange's dimension which is perpendicular to said longitudinal axis of the groove (51) and parallel to the plane of the mounting bracket.
3. A window or door structure according to claim 1 or 2, **characterized in that** the mounting bracket (1;20;60;70;150) is arranged such that a vector between a point on the first flange (6;151) and a point on the second flange (7;152) has a component in a direction parallel to the longitudinal axis of the groove (51;171) to which the bracket is connected which is at least twice as large as the width of the groove.
4. A window or door structure according to any one of claims 1-3, **characterized in that** the longitudinal axis of the area of contact between the first flange (6;106;151) and the first inner side (103) of the groove (51;102;171) and the longitudinal axis of the area of contact between the second flange (7;107;152) and the second inner side (104) of the groove (51;102;171) are parallel to each other and to the longitudinal axis of the groove.
5. A window or door structure according to any one of claims 1-4, **characterized in that** the area of contact between the first flange (6;106;151) and the first inner side (103) of the groove (51;102;171) which forms an angle of less than 45 degrees to the plane of the window or door structure and/or the area of contact between the second flange (7;107;152) and the second inner side (104) of the groove (51;102;171) which forms an angle of less than 45 degrees to the plane of the window or door structure are/is greater than 20mm<sup>2</sup>.
6. A window or door structure according to any one of claims 1-5, **characterized in that** the mounting bracket (1;20;60;70;150) is formed from a metal plate element (2) and that the flanges (6,7;151,152) are stamped and bent away from the plane of the bracket.
7. A window or door structure according to any one of

- claims 1-6, **characterized in that** the mounting bracket (1;20;60;70;150) is arranged such that at least one flange (6,7;151,152) has a friction enhancing element (9,10,11; 63,64;155,156) which is arranged to increase the friction between the flange and the side of the groove (51;171) which the flange is in contact with, the friction being increased in the direction which is parallel to the longitudinal axis of the groove.
8. A window or door structure according to any one of claims 1-7, **characterized in that** the mounting bracket (1;20;60;70;150) is arranged such that at least one flange (6,7;151,152) has a friction enhancing element (9,10,11; 63,64;155,156) which is arranged to increase the friction between the flange and the side of the groove (51;171) which the flange is in contact with, the friction being increased in the direction which is perpendicular to the longitudinal axis of the groove and parallel to the plane of the window or door structure.
9. A window or door structure according to claim 7 or 8, **characterized in that** the friction enhancing element (9,10,11; 63,64; 155,156) is a protrusion which is attached to the flange and which protrudes from said flange in a direction having a component which is perpendicular to the plane of the window or door structure, said protrusion being arranged to protrude into a recess in the inner side of the groove (51;171) of the frame element.
10. A window or door structure according to any one of claims 7-9, **characterized in that** the protrusion (9; 63,64;155,156) is in the form of a hook which cuts into the fixed frame (50;170) when the mounting bracket is mounted on the fixed frame.
11. A window or door structure according to any one of claims 1-10, **characterized in that** flanges (6,7; 151,152) of the mounting bracket are arranged such that when the mounting bracket (1;20;60;70;150) is held such that the first axis (C) is at an angle to an axis which is perpendicular to the plane of the window or door structure, the maximum distance between the flanges in a direction which is perpendicular to the plane of the window or door structure is less than when the bracket is held such that the first axis is parallel with the axis which is perpendicular to the window or door structure.
12. A window or door structure according to any one of claims 1-11, **characterized in that** the groove (51) in the fixed frame (50) is a dovetail groove were the inner sides of the groove each form an angle to the plane of the window or door structure of between 5 and 45 degrees.
13. A window or door structure according to any one of claims 1-11, **characterized in that** the groove (171) in the fixed frame (170) is a square groove were the two opposing inner sides of the groove each form an angle to the plane of the window or door structure of 0 degrees.
14. A window or door structure according to any one of claims 1-13, **characterized in that** the two flanges (6,7) of the mounting bracket (1;20;60;70;150) are arranged such that the outer surfaces of the flanges press up against the inner sides of the groove.
15. A window or door structure according to any one of claims 1-14, **characterized in that** the fixed frame (50;170) comprises a wooden portion or a composite portion and that the groove (51;171) is placed in the wooden or composite portion of the fixed frame.

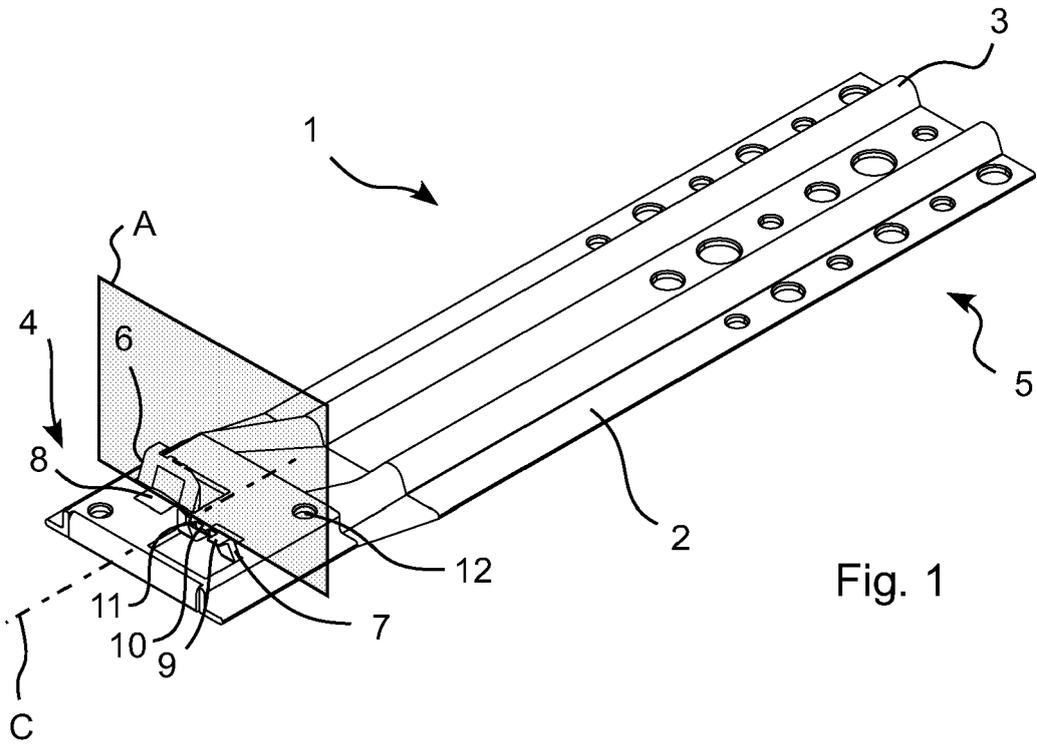


Fig. 1

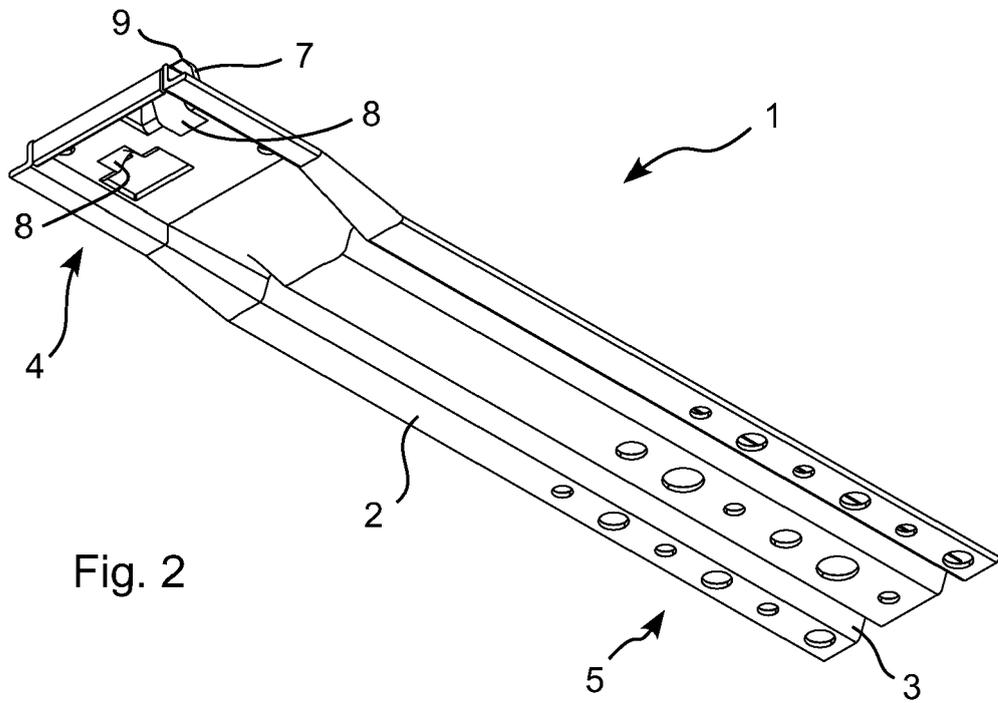


Fig. 2

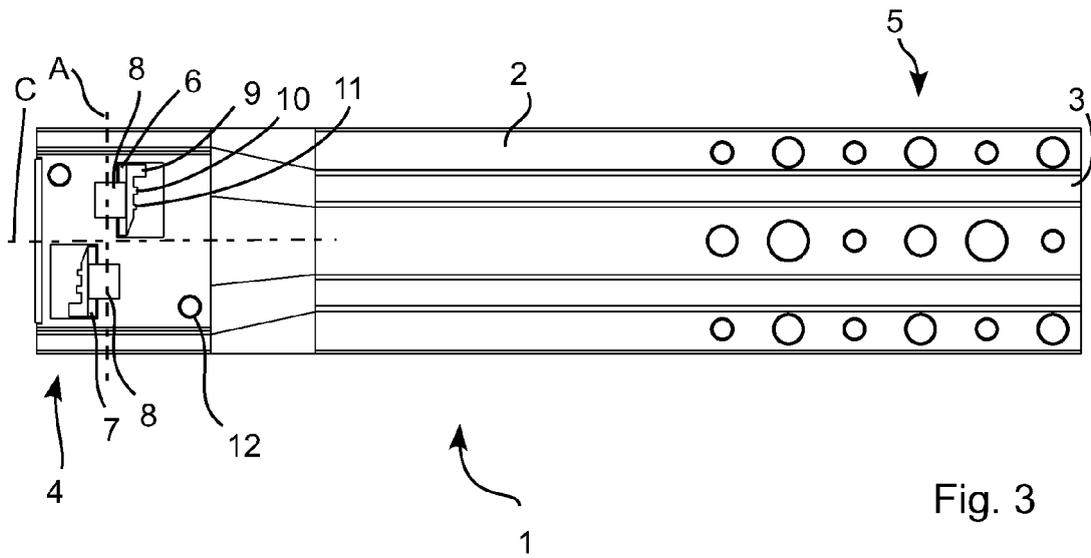


Fig. 3

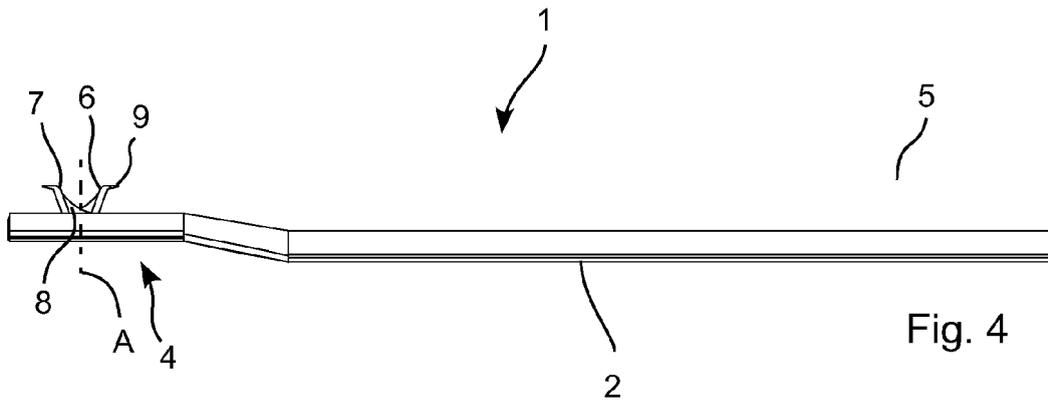


Fig. 4

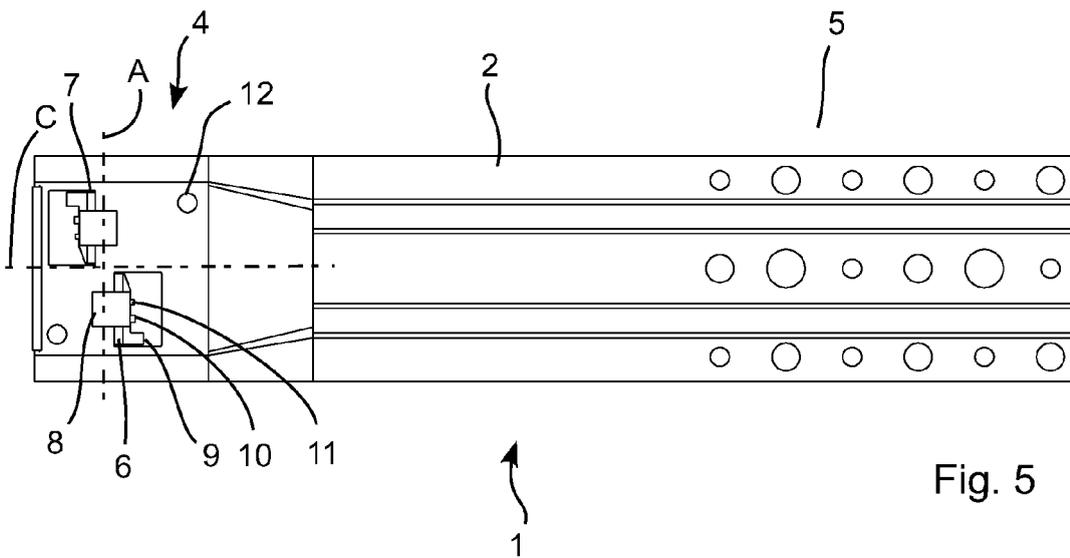
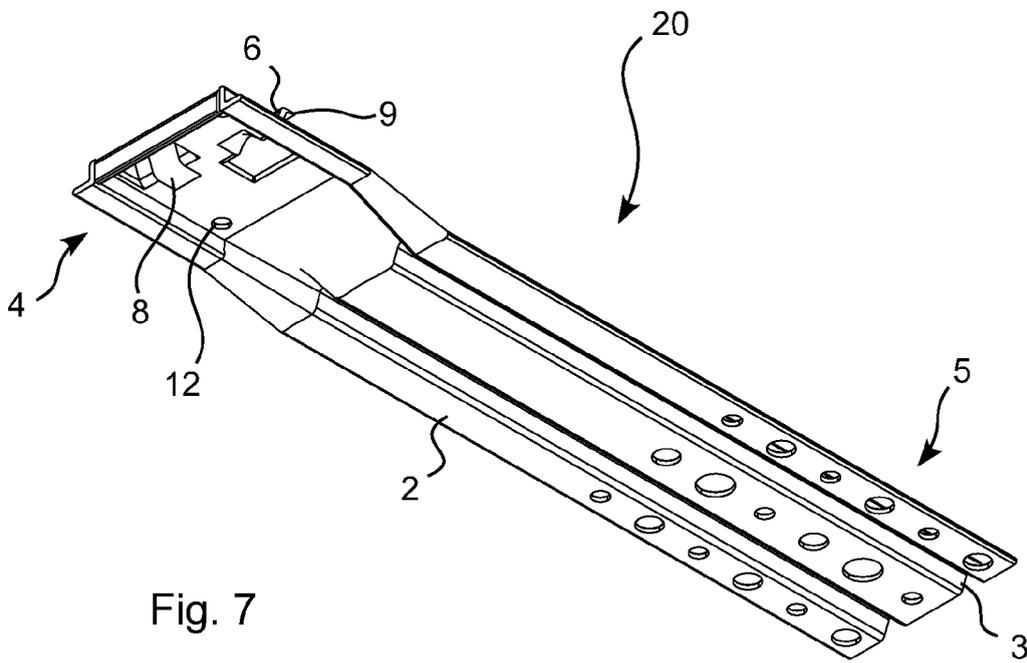
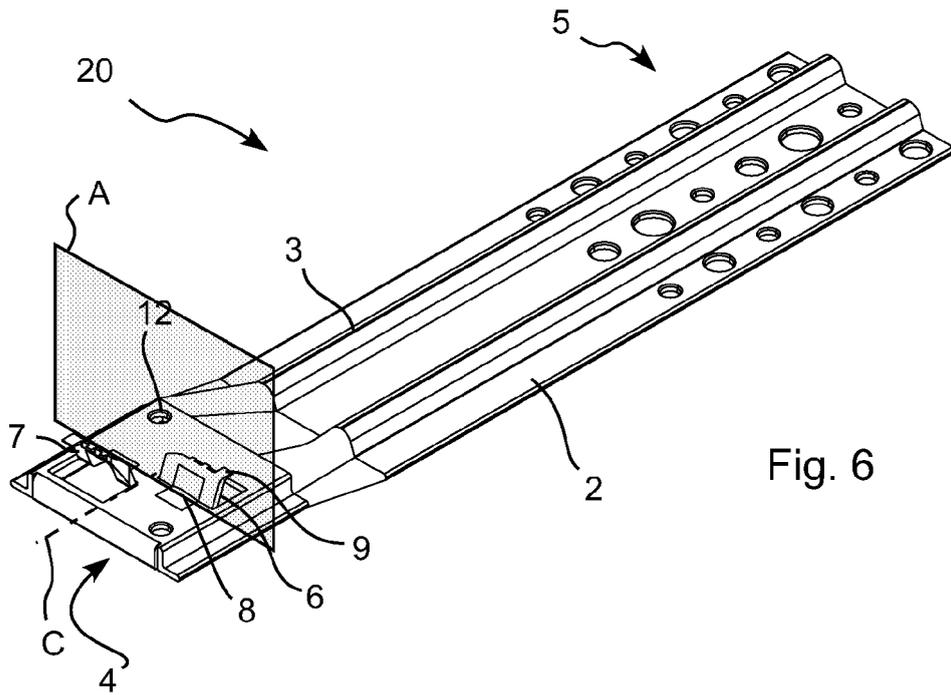


Fig. 5



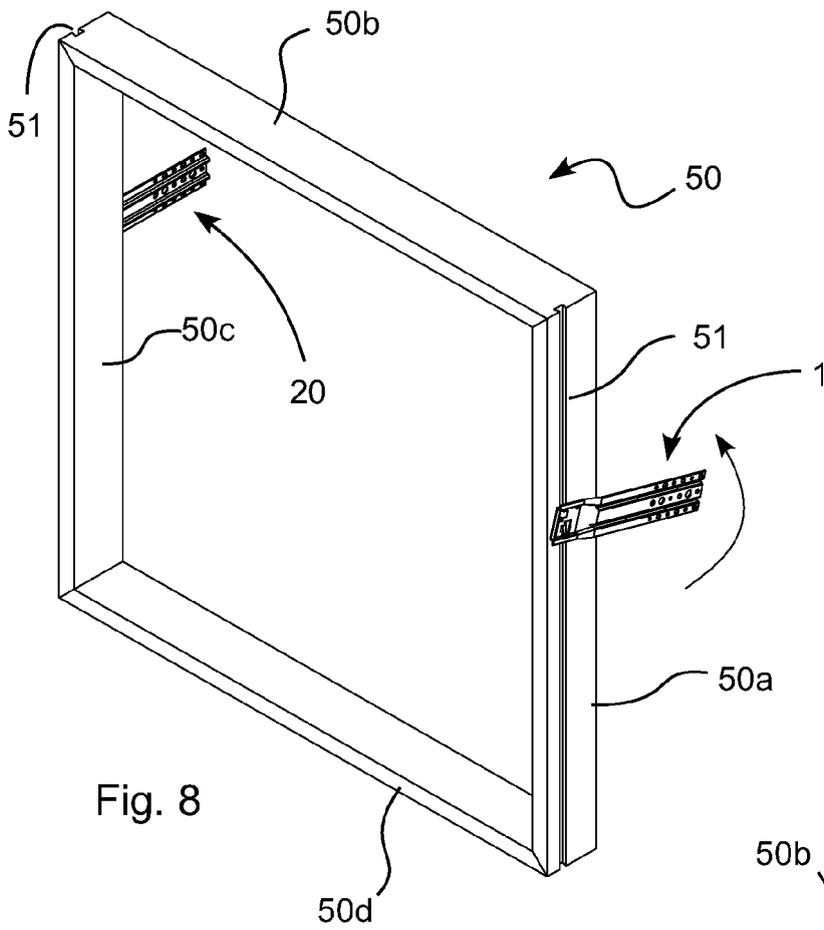


Fig. 8

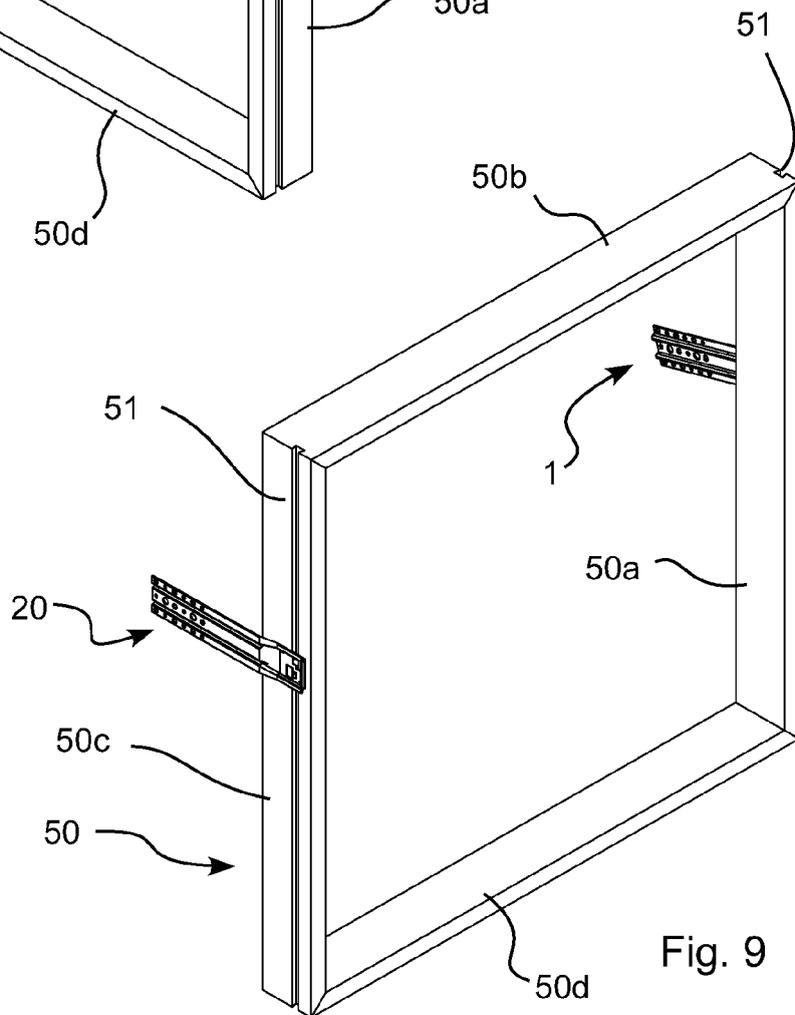


Fig. 9

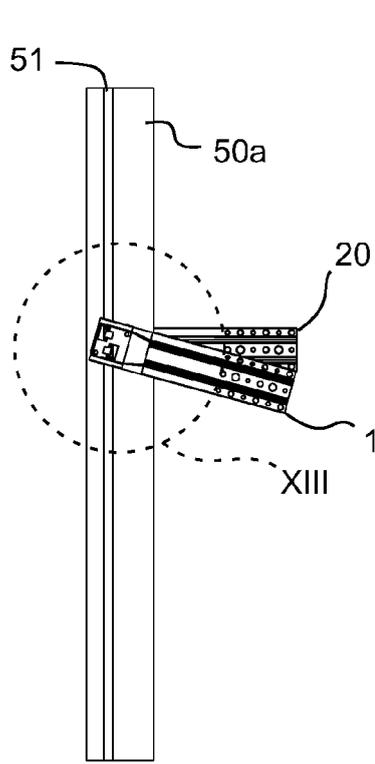


Fig. 10

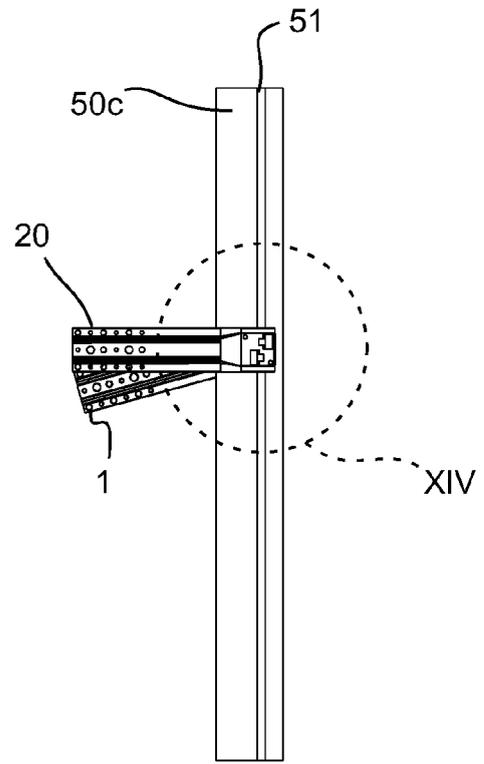


Fig. 11

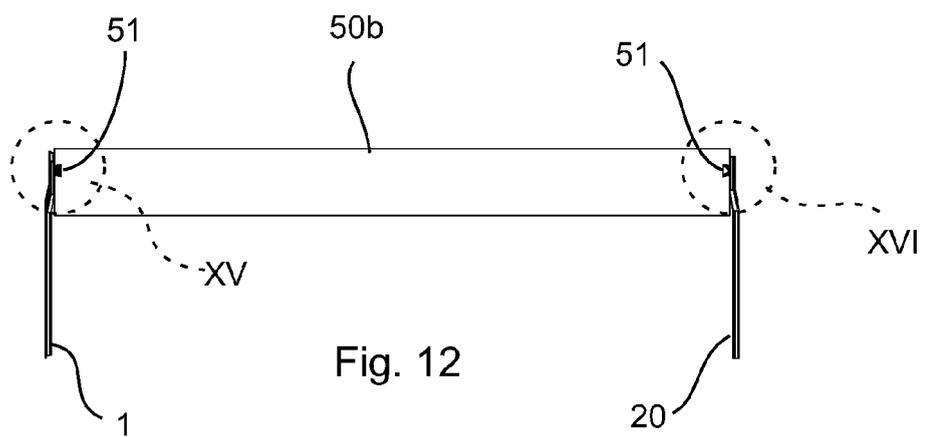


Fig. 12

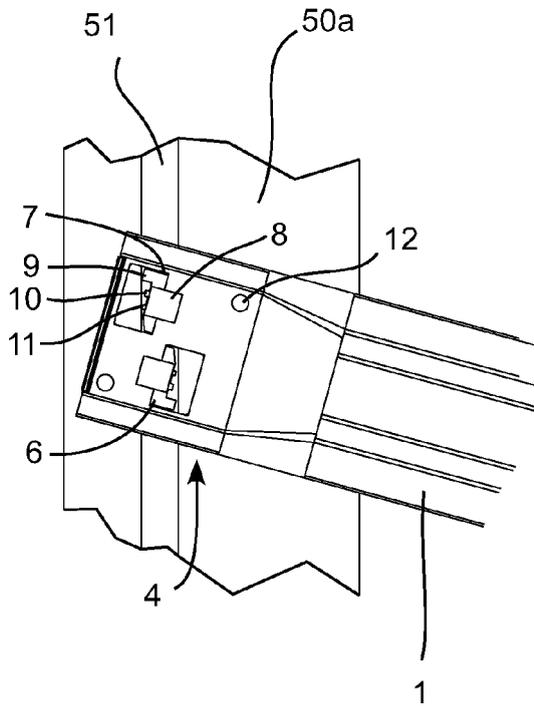


Fig. 13

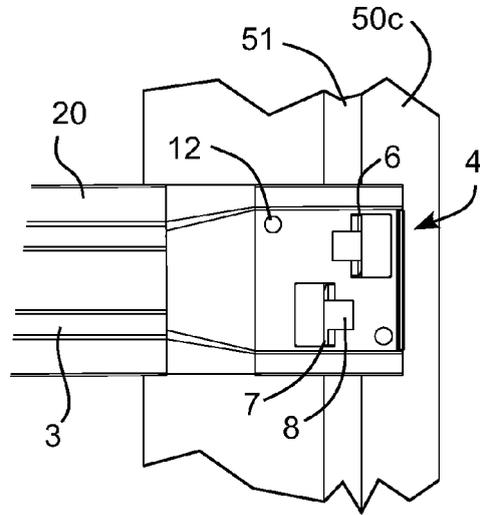


Fig. 14

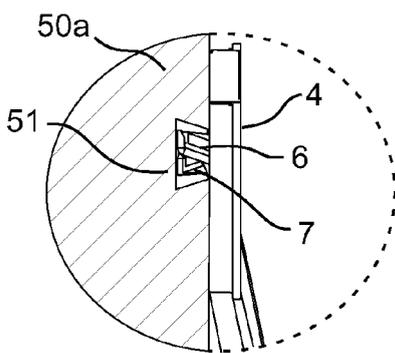


Fig. 15

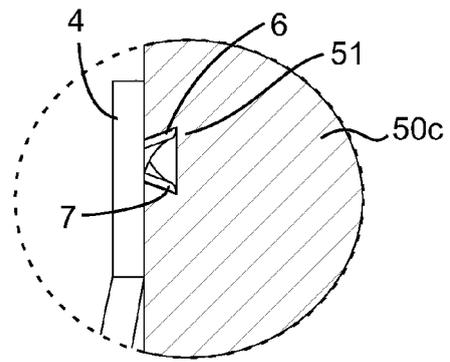
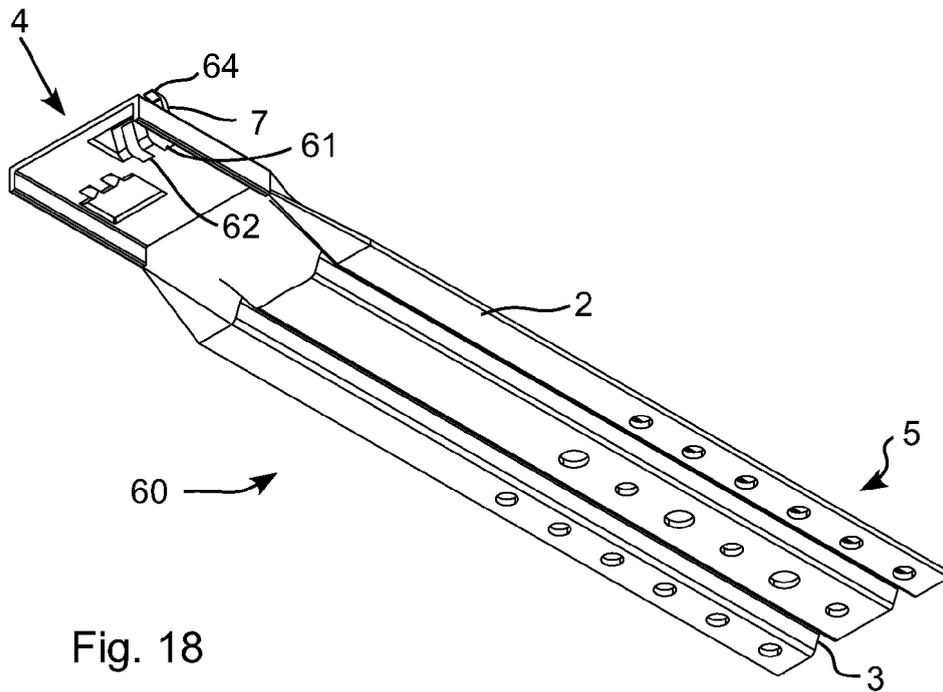
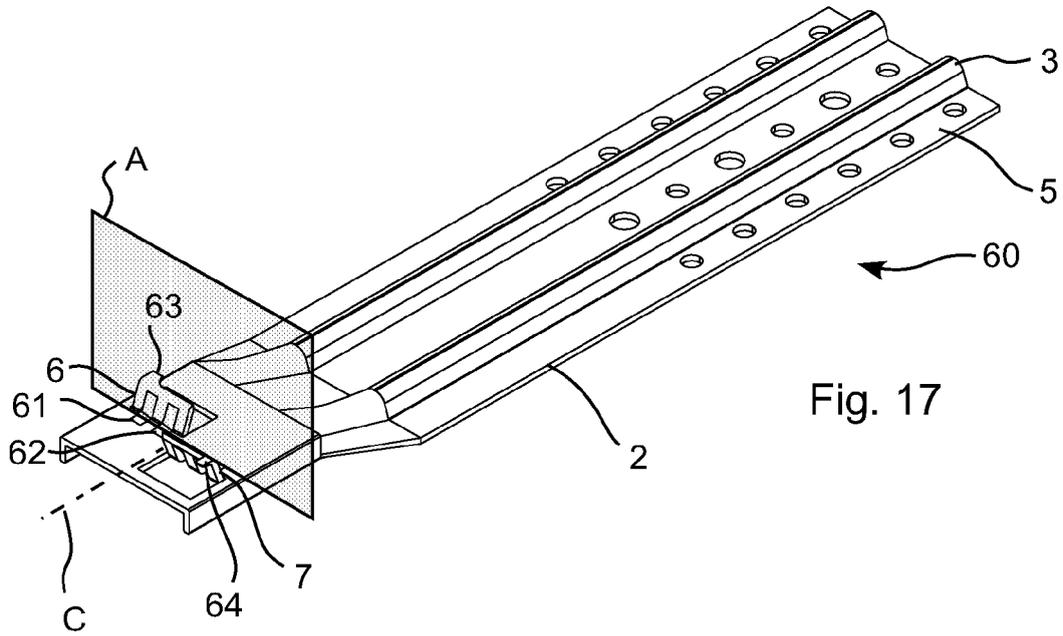


Fig. 16



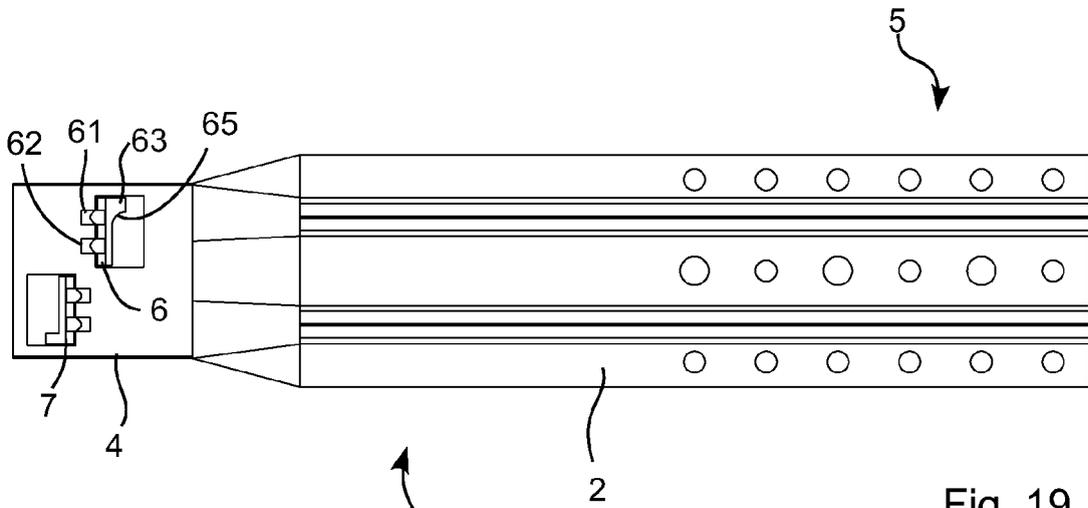


Fig. 19

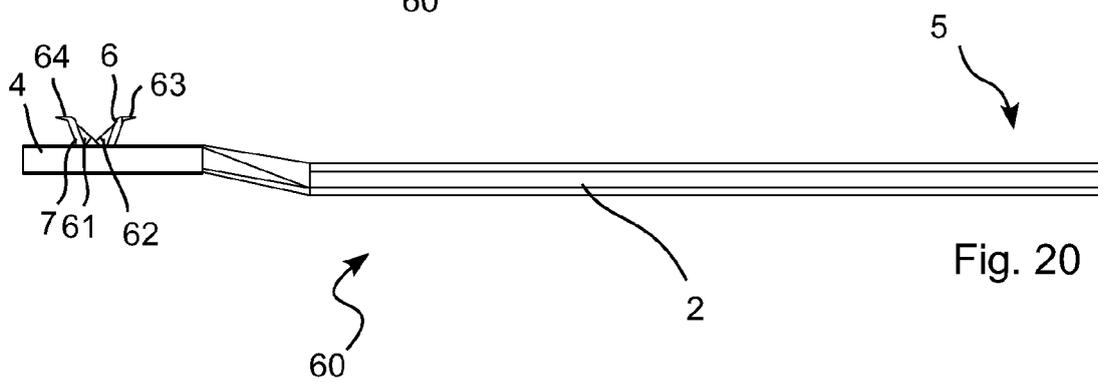


Fig. 20

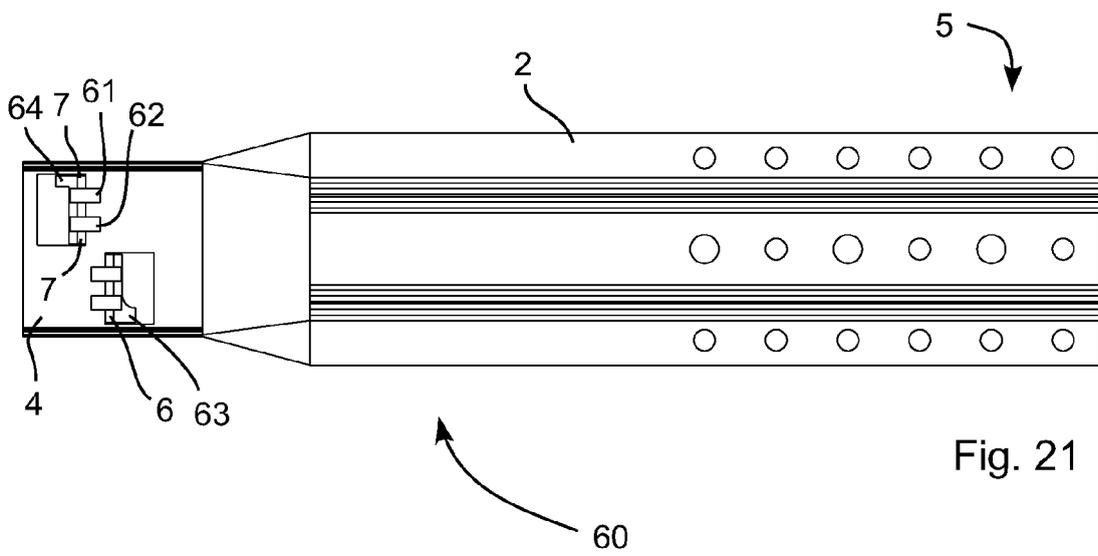


Fig. 21

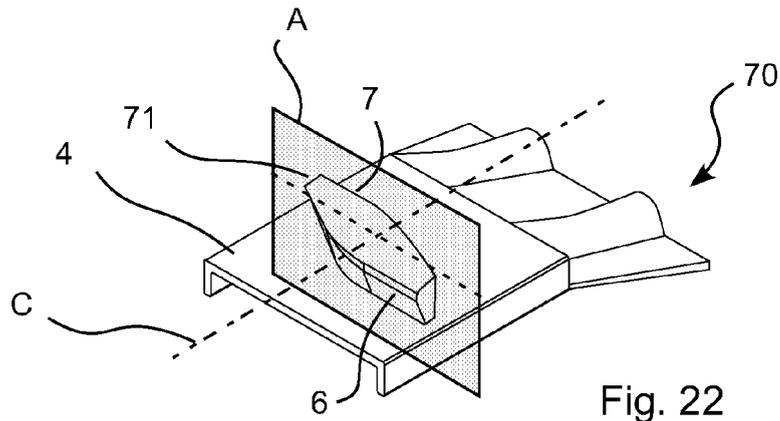


Fig. 22

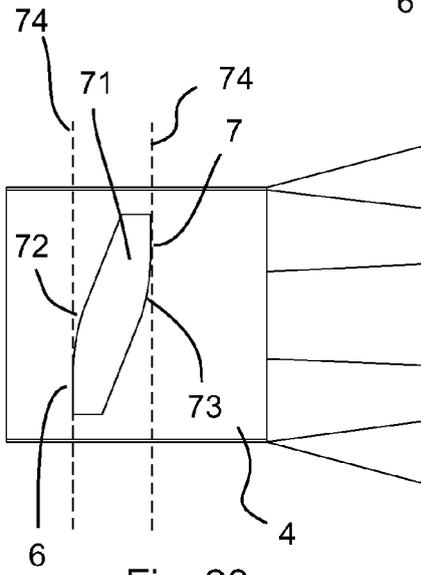


Fig. 23

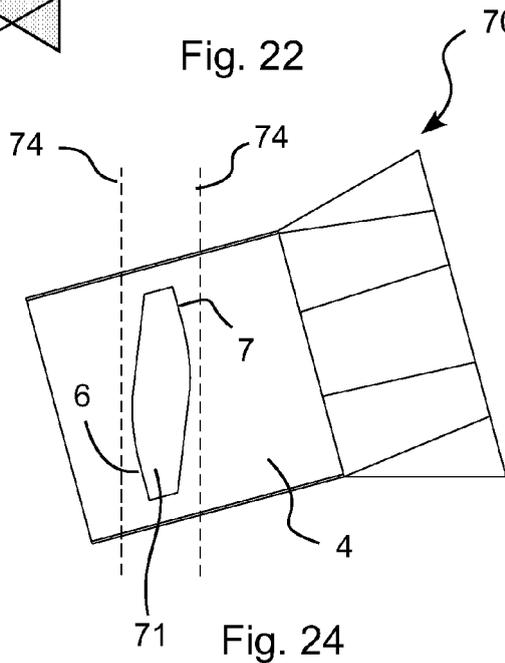


Fig. 24

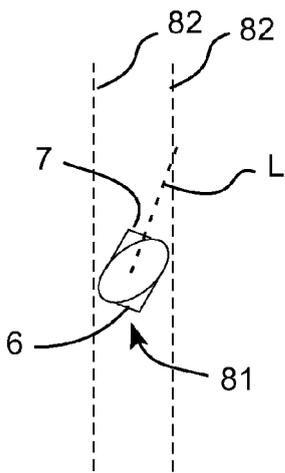


Fig. 25

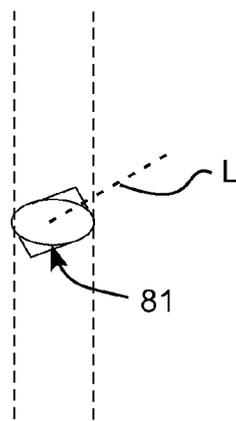


Fig. 26

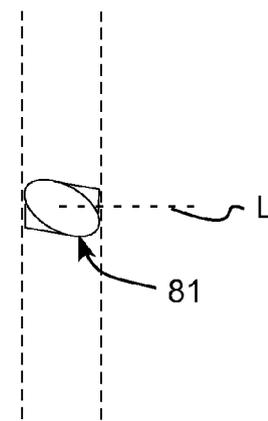


Fig. 27

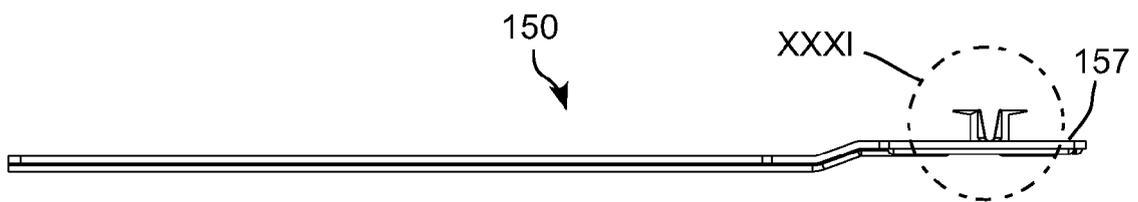
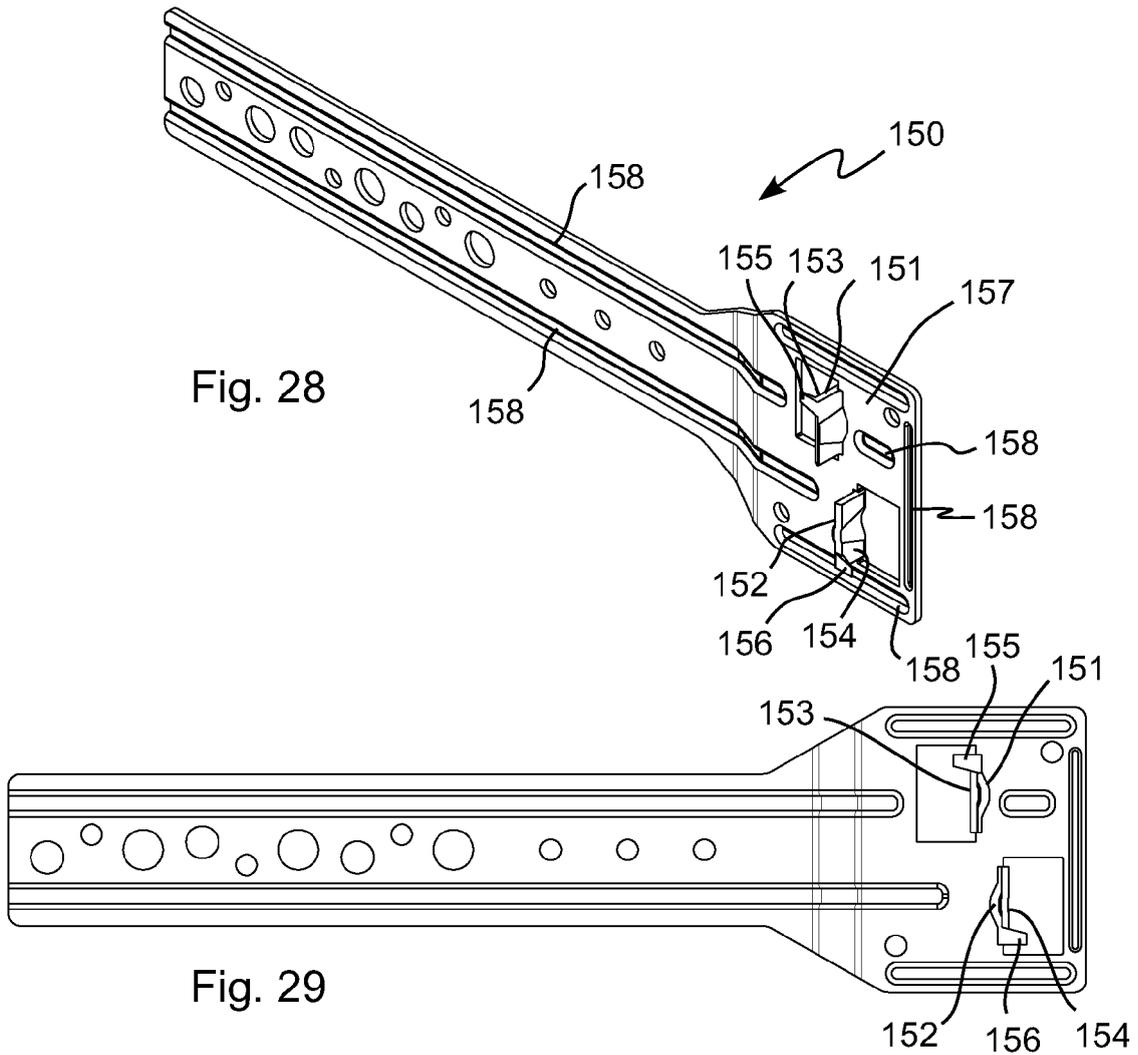


Fig. 30

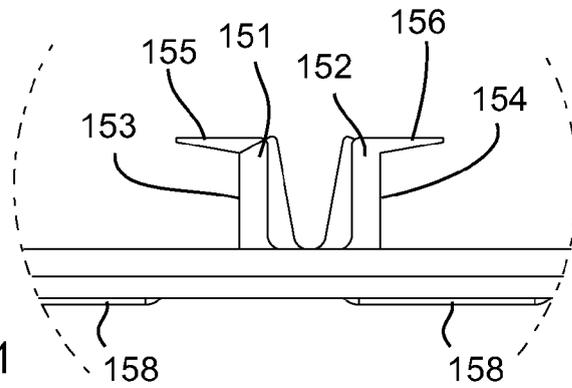
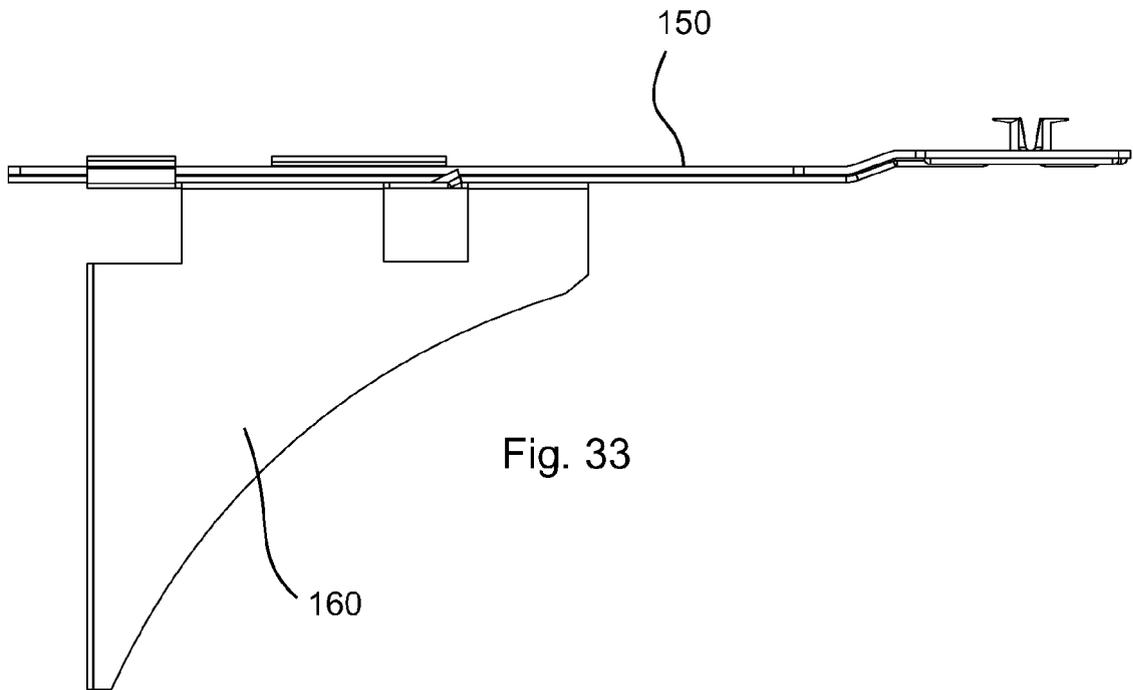
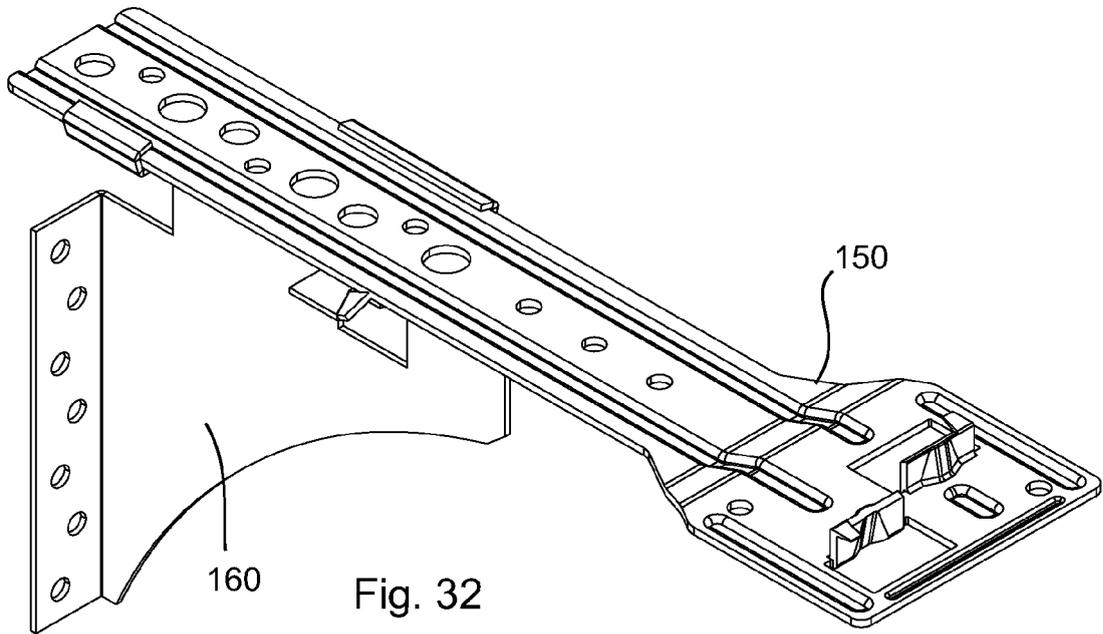
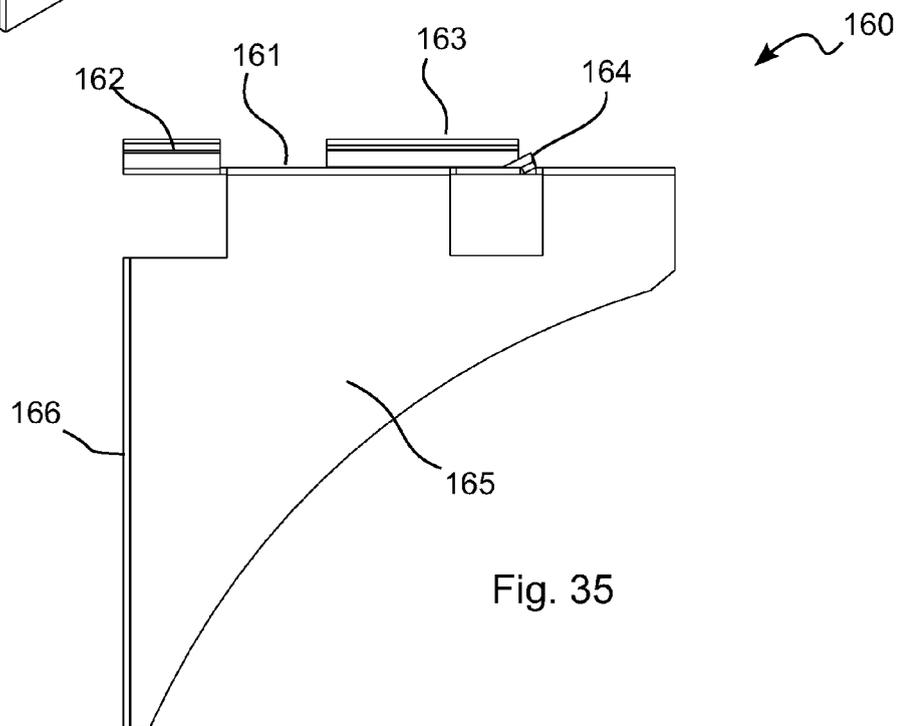
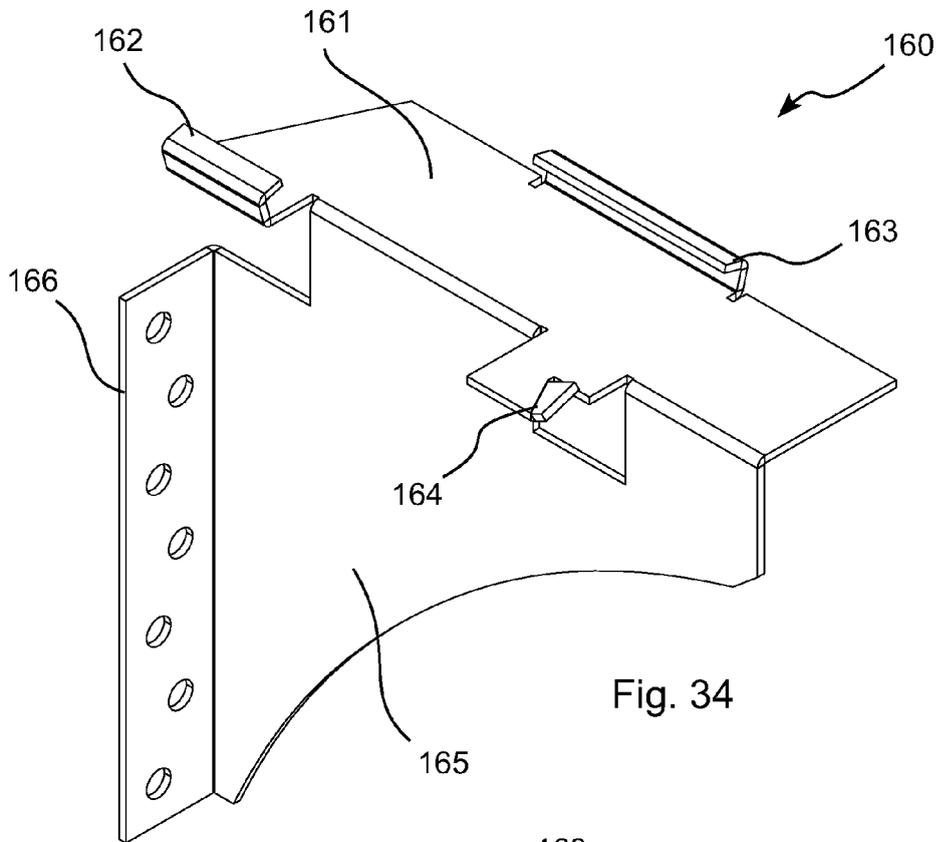
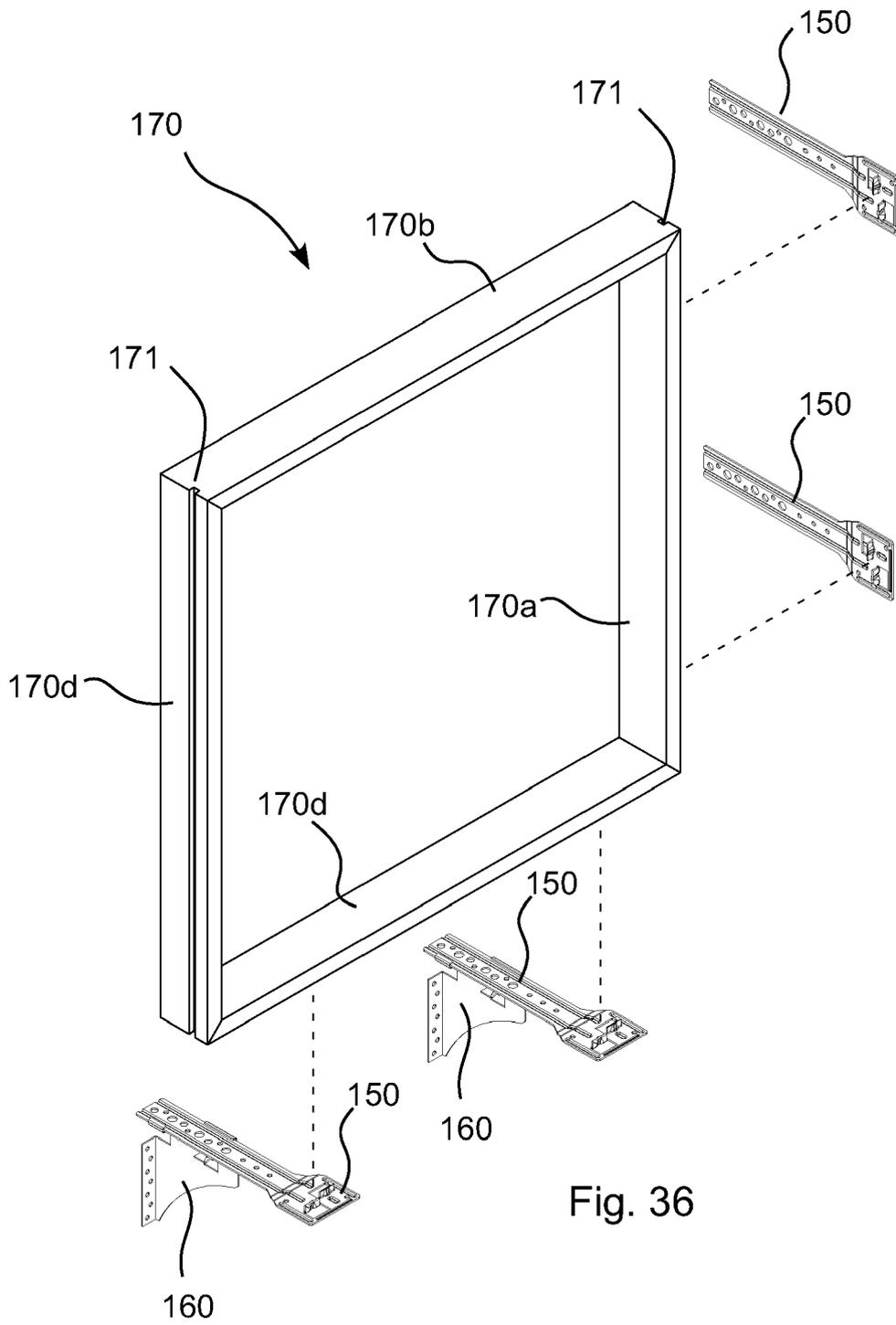


Fig. 31







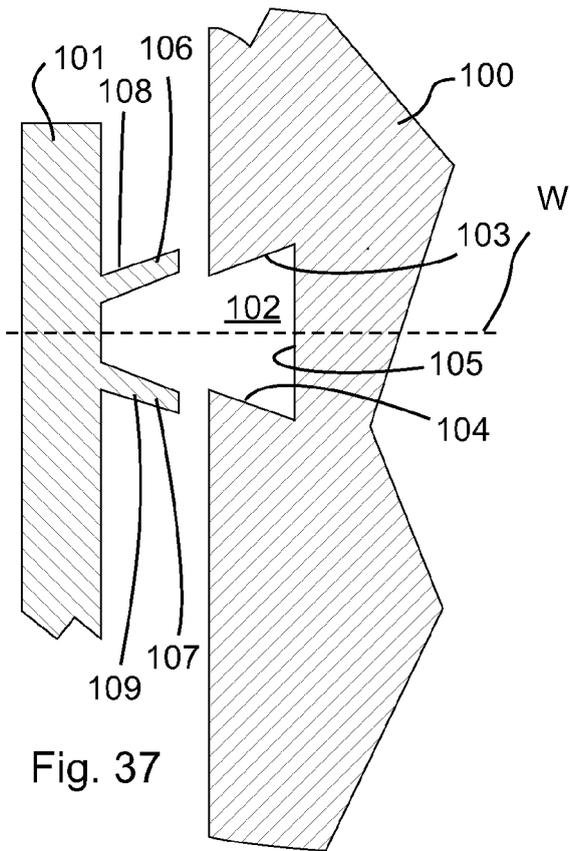


Fig. 37

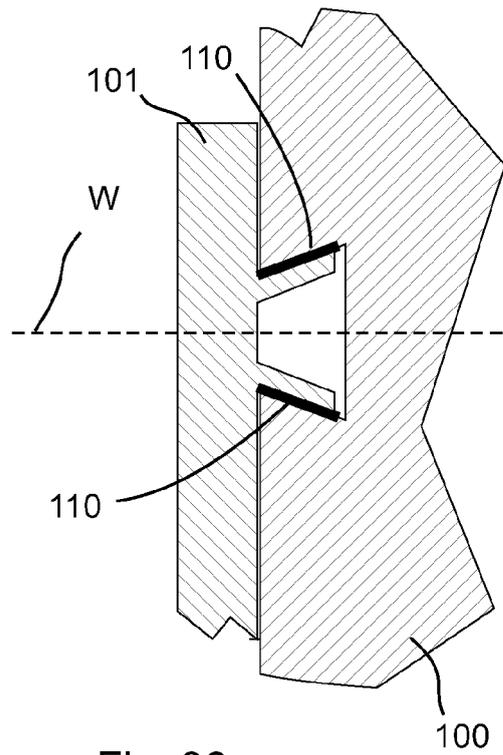


Fig. 38

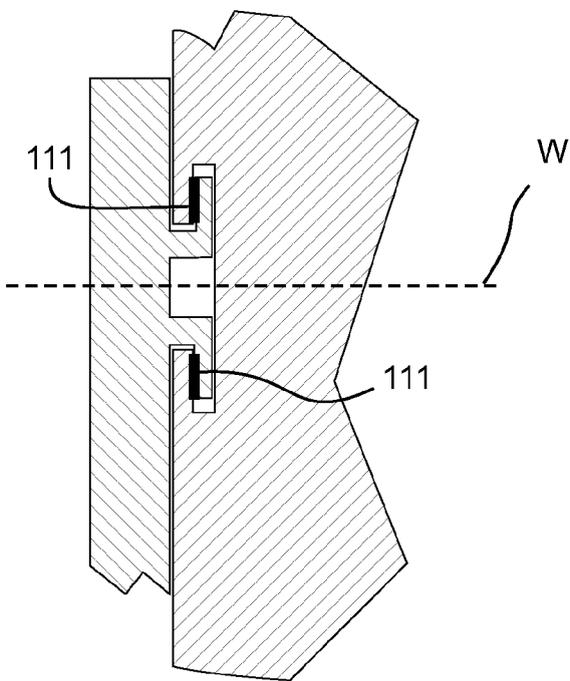


Fig. 39

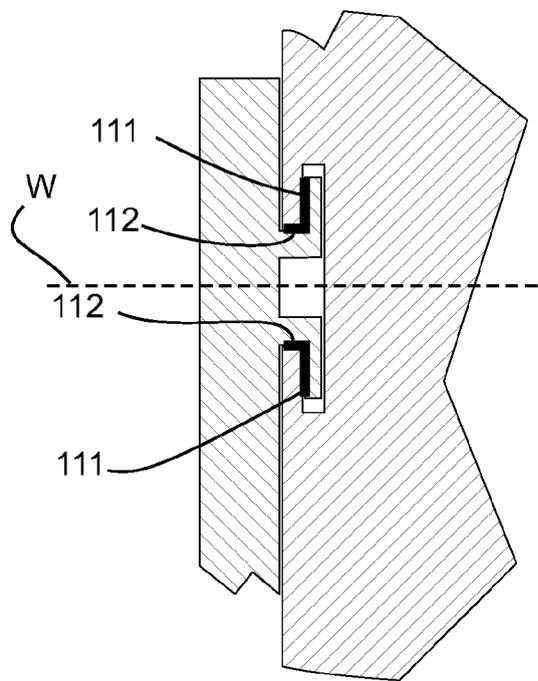


Fig. 40

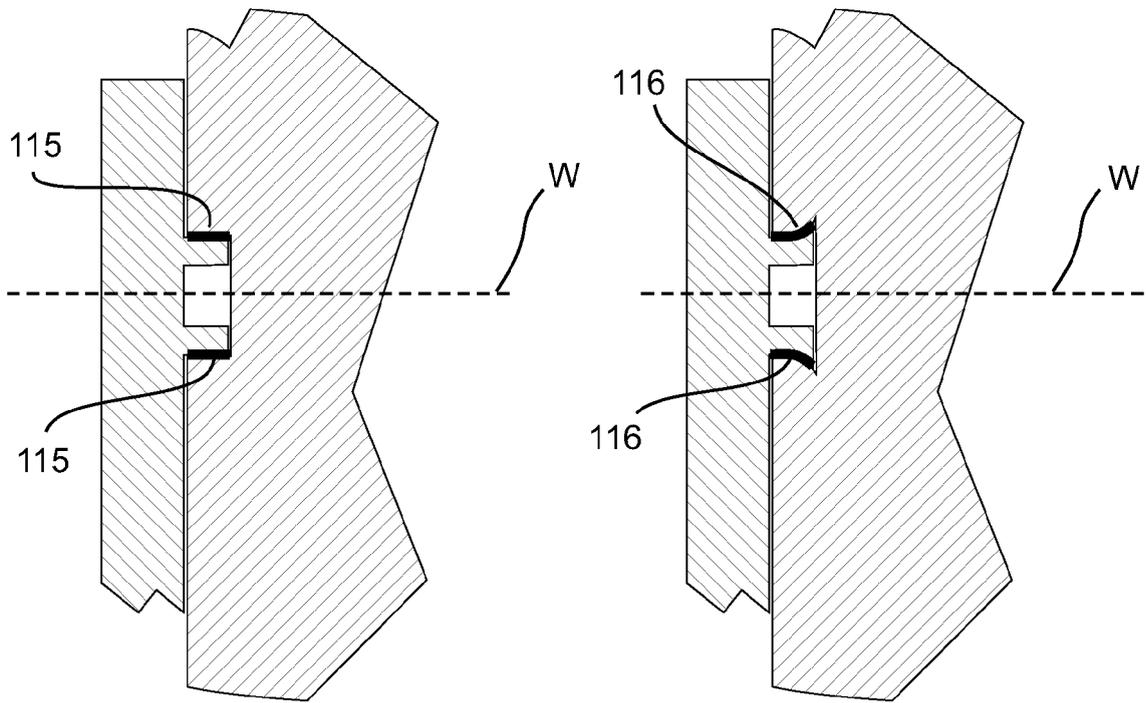


Fig. 41

Fig. 42



EUROPEAN SEARCH REPORT

Application Number  
EP 09 15 4138

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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			TECHNICAL FIELDS SEARCHED (IPC)
			E06B
The present search report has been drawn up for all claims			
Place of search <b>Munich</b>		Date of completion of the search <b>24 June 2009</b>	Examiner <b>Tänzler, Ansgar</b>
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

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24-06-2009

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DE 6913297	U	31-07-1969	NONE	
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**REFERENCES CITED IN THE DESCRIPTION**

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