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- A request for correction of the description has been filed pursuant to Rule 139 EPC. A decision on the request will be taken during the proceedings before the Examining Division (Guidelines for Examination in the EPO, A-V, 3.).
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(54) **SUSPENSION DEVICE FOR REVERSIBLE WINDOW WITH FRAME INTEGRATED PROFILED ELEMENT**

(57) A window suspension device comprising at least two pivot arms (32, 33, 34), a guide and a slide (50), wherein the pivot arms can be rotatably mounted on a frame (10) for movement in respective movement planes that are mutually parallel and mutually perpendicular to a rotational axis for a window sash (20) that can be fitted rotatably to the frame by means of the pivot arms, and wherein the slide can be affixed to the sash and adapted for displaceable accommodation in the guide provided in the frame. The guide includes an open channel (40, 40') that accommodates the movement plane of at least one of the pivot arms (33) so as to enable the insertion of at least a part of this pivot arm into said channel.

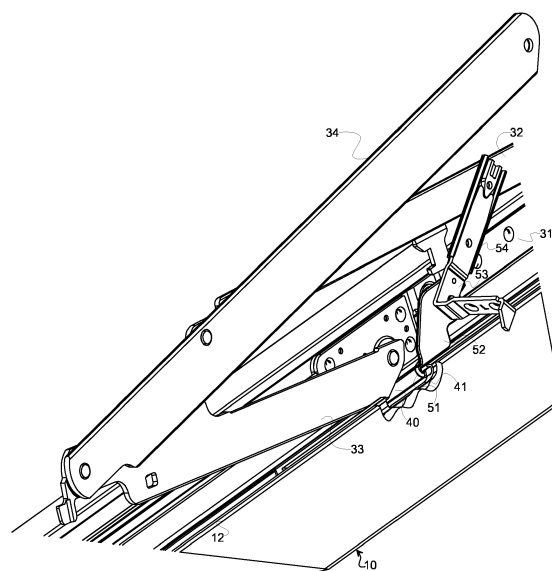


Fig. 2

Description

FIELD OF INVENTION

[0001] The present invention relates to a suspension device for reversible windows. The invention also relates to a window that includes such a window mounting device.

BACKGROUND OF THE INVENTION

[0002] Reversible windows are widely used in dwellings and in public buildings. In addition to enabling these windows to be opened for weathering purposes the frames of such windows can also be rotated through an angle in the proximity of 180° either about a vertical or a horizontal axis so as to turn the outwards side of the window inwards. This enables, among other things, the outer surface of the window to be turned so that a person standing inwardly of the window can readily clean the window glass.

[0003] In one type of reversible window, the upper or the lower end of the window sash is guided for vertical movement in vertical channels disposed in the side members of the window frame. The window sash is secured to the side members of the window frame by means of two hinge mechanisms or fittings and can be rotated about a horizontal axis defined by axle pins on the hinge mechanisms. Displacement of the vertically displaceable end of the sash upwards or downwards will be corresponded by the other end of the sash simultaneously moving outwards as the sash is rotated about the horizontal axis. In another type of reversible window, one side of the sash is guided for displacement in horizontal channels disposed in the upper and the lower frame members, so as to enable reversible rotation about a vertical axis.

[0004] In the case of windows of this nature, dimensioning of the frame, the sash and also of the fittings are of great importance. At the same time as these components must have sufficient rigidity and mechanical strength for their allotted purposes, it is desirable that they will have the smallest possible dimensions. One factor of particular importance is the so-called ledge depth that constitutes the distance between the outermost surface of the frame and the outwardly facing surface disposed inwardly of this surface, facing towards the sash and in sealing abutment with the sash when the window is closed. This latter surface is normally referred to as the sash abutment or stop surface. In order to be able to keep the cross-sectional area of the frame members, and then particularly the cross-sectional depth as small as possible, it is desirable to minimize the ledge depth.

[0005] In order to keep handling simple, it is also desirable that the hinge mechanism and the sash are well balanced, so that as little work as possible is required to rotate the sash through 180° and then back again.

[0006] The hinge mechanism should also be able to

be fitted readily to standard frames and sashes without requiring special modification thereof. It is of course greatly important that the hinge mechanisms are strong and reliable. It is also of particular importance that the gap between the frame and the sash can be kept as small as possible also in the presence of the intermediate hinge mechanism in place. For reasons of manufacturing economy with regard to the hinge mechanism and also with regard to the fitted window it is desirable that one and the same type and size of hinge mechanism can be used in the manufacture of windows whose sizes vary within the widest possible limits.

PRIOR ART

[0007] EP 0 542 050 A1 describes a window fitting where the upper or lower end of the sash is guided displaceably along the frame and can be turned through 180° about a horizontal axis. The fitting includes a hinge mechanism which is attached to a side member of the frame by means of a frame plate. The hinge mechanism includes a first and a second pivot arm that each has a first end which is pivotally attached to the frame plate and a third pivot arm which is pivotally attached in the proximity of a first end to the second ends of the first and second pivot arms. The third pivot arm also includes a shaft pivot that defines the rotational axis of the sash and that is placed at the second end of the third pivot arm.

[0008] At the fitting described in EP 0 542 050 A1 the upper end of the sash is guided by a pin which projects outwardly from the sash and which is guided in a vertical groove disposed in the frame plate, the opening of which groove faces towards the opposing side member of the frame.

[0009] GB 2 074 227 A describes a fitting which includes pivot arms and a slide which is guided in a channel-shaped mounting plate that has slide-guiding walls. A pivot arm is arranged at the mounting plate and movable outside of the guide walls.

BRIEF DISCLOSURE OF THE INVENTION

[0010] One object of the present invention is to provide an improved suspension device for reversible windows. Another object of the invention is to provide such a suspension device which will enable such a suspension device to include pivot arms that can be given a high degree of stiffness and width in relation to the cross-sectional dimensions of the frame.

[0011] These and other objects of the invention are achieved with a suspension device of the kind defined in the preamble of claim 1 and having the special technical features defined in the characterizing clause of said claim.

[0012] The suspension device includes a window frame, at least two pivot arms, a slide, and a guide which includes an open channel formed of a profiled element, which profiled element includes two mutually opposing

side walls, wherein said pivot arms can be pivotally affixed to a frame for movement in respective movement planes that are mutually parallel and perpendicular to a rotational axis for a window sash which can be affixed pivotally to the frame by means of said pivot arms and which slide is fixable to the sash and arranged to be displaceably received by the guide arranged at the frame. The profiled element is formed as an integrated part of the window frame. The guide comprises an open channel which accommodates the movement plane of at least one of the pivot arms such as to allow the insertion of at least a part of the at least one pivot arm into the channel. Thus, according to the present invention, the open guiding channel or the track is disposed inwardly of the window sash instead of at one side thereof as in the case of known suspension devices. Since the channel is disposed in the plane in which at least one of the pivot arms moves it is possible for this pivot arm to move into the said channel, for instance when the window is moved to a closed position. In the case of earlier known suspension devices the pivot arms are disposed between the outwardly facing surface of the frame and the sash abutment surface disposed inwardly of said outermost surface, i.e. within the so-called ledge depth. This means that the combined width of the guide arms in the movement direction, i.e. at right angles to the window plane, must be less than or equal to the ledge depth. This places a limitation with respect to the width and therewith to the stiffness of the guide arms for each given maximum thickness at right angles to the window plane of the frame. Correspondingly, each increase in the combined width of the guide arms requires a corresponding increase in the thickness of the frame. This limitation is avoided or reduced by means of the inventive suspension device since a part of at least one guide arm can be accommodated by the track and therewith pass by the abutment surface in an inward direction. The suspension device is therewith given a larger degree of freedom with respect to width, and therewith with respect to the rigidity and mechanical strength of the pivot arms than what has been possible hitherto.

[0013] Because part of at least one pivot arm is able to extend beyond the abutment surface and into the channel there is also afforded a greater degree of freedom in the choice of position at which the pivot point on the frame around which said pivot arm rotates. This results in a greater degree of freedom in the selection of a beneficial movement pattern for the pivot mechanism as a whole.

[0014] The open channel is delimited by a guide wall which, in coaction with the slide, guides the movement of said slide. This enables the accommodation of a part of the pivot arm in the channel opening and, at the same time, provides slide guide means by abutment with the inner surface of the guide wall so as to prevent movement of the slide in an outward direction. The outwardly facing side of the guide wall is also able to coact with a corresponding part of the slide therewith preventing movement of the slide in an inward direction.

[0015] The guide is formed as an integral part of the frame. This enables exclusion of a separate profiled element, therewith further reducing the number of components required when fitting the window to the frame.

[0016] The suspension device will also conveniently include a first fixating part by means of which the slide is fixated, and a second fixating part which is firmly fixable to the sash. The first and the second fixating parts are preferably arranged to provide releasable fixation of the first fixating part to the second fixating part when the sash is fixed to the frame by means of the pivot arms. This greatly facilitates mounting of the sash and the suspension device to the frame. The first fixating part will conveniently include a tongue and the second fixating part will include a rail into which the tongue can be snapped firmly by insertion of the tongue. This provides a simple and reliable construction with which the window can be readily fitted and readily dismantled.

[0017] The suspension device probably includes a long arm and a short arm which can be fixed rotatably to the frame, and a sash arm which is rotatably fixed to the long arm and to the short arm and pivotally fixable to the sash, wherein at least a part of the short arm can be inserted into the open channel. The embodiment having three such pivot arms enables the achievement of a beneficial pattern of movement from the aspect of balance and power absorption aspect. Furthermore, this embodiment enables the short arm that takes-up the largest pressure forces to be made broader and therewith stiffer.

[0018] The invention also relates to a window that includes such a suspension device, as defined in the accompanying claim 5.

[0019] Further objects relating to and benefits afforded by the present invention will be apparent from the following detailed description of examples of embodiments of the invention and from the following claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] There will now be described by way of example an embodiment of the invention with reference to the figures of the accompanying drawings, wherein

Figure 1 is a longitudinally sectioned view of a frame, a window sash and a suspension device according to one embodiment of the invention.

Figure 2 is an enlarged view in perspective in which certain parts of the frame shown in figure 1 have been removed and shows the suspension device in a different position.

Figures 2a and 2b are cross-sectional views of the frame and of a part of a suspension device according to two somewhat different embodiments of the invention.

Figures 3a and 3b are perspective views which illus-

trate mounting of a part of the suspension device in accordance with the invention, wherewith figure 3a illustrates a part of the sash and figure 3b also illustrates part of the frame.

DETAILED DESCRIPTION OF AN EMBODIMENT OF THE INVENTION

[0021] The figures of the accompanying drawings illustrate different parts and embodiments of a suspension device according to the present invention. Each figure illustrates solely one suspension device, although it will be understood that a reversible window is affixed to a frame by means of two mutually opposing suspension devices. The figures also show how a window that can be rotated about a horizontal axis is affixed to the frame by means of said suspension device. It will be understood, however, that the inventive suspension device can also be used to mount windows that can be reversed about a vertical axis.

[0022] Figure 1 illustrates a frame 10, a sash 20 and a suspension device 30 according to a first embodiment of the invention. The frame 10 includes an outwardly facing surface 11 which in the illustrated case lies in generally the same plane as the outer surface 21 of the sash when the window is closed. However, the outwardly facing surface of the frame may alternatively lie outside the outer surface of the sash. The frame also has an abutment surface 12 for the sash, which abutment surface is parallel with the outer surface 11 and disposed inwardly thereof.

[0023] The suspension device 30 includes a frame plate 31 which is affixed to a side member of the frame 10. A first pivot arm, the so-called long arm 32 is pivotally mounted to an upper part of the frame plate 31. A second pivot arm, the short arm, 33 is pivotally affixed to a lower part of the frame plate 31. A third pivot arm, the sash arm 34 is pivotally affixed to the free ends of the respective long arm 32 and the short arm 33. The sash arm 34 includes a pin 35 (see figure 3a, 3b) with which the sash 20 is pivotally affixed to the sash arm 34. The short arm 33 also includes a recess 33a in which the lower end of the long arm 32 is supportably received when the window is closed. This counteracts the tendencies of the pivot arms to rotate inwards during initial movement of the window as it is opened from a closed position. The long arm 32 and the short arm 33 are disposed in the same plane, which plane also constitutes the plane in which these pivot arms move. The sash arm 34 is arranged in a plane which constitutes the movement plane of the sash arm and which is parallel with and slightly offset laterally to the movement plane of the long arm 32 and the short arm 33. The movement plane of the pivot arms 32, 33, 34 is perpendicular to the pin 35 and to the axis of rotation of the sash.

[0024] The suspension device 30 also includes a guide in the form of an open channel 40. The channel 40 is disposed straight inwardly of the long arm 32 and of the

short arm 33, so that the movement plane of said arms will extend through the channel opening and is received in the channel 40.

[0025] In the case of the embodiments illustrated in figure 2 and in figure 3b, the channel 40 is formed by a profiled element 41 accommodated in a recess in the frame 10, said recess extending inwardly from the abutment surface 12. The profiled element 41 includes mutually opposing side walls 42, 43 and a guide wall 44 which extends to some extent from one side wall 43 in a direction towards the other side wall 42. This results in the formation of the opening of the channel 40 between the free end of the guide wall 44 and the side wall 42. The two side walls 42, 43 are mutually joined by a bottom wall 45 from which there projects a barbed fixing flange 46. The profiled element 41 is affixed to the frame 10 by inserting the fixing flange 46 into a fixing deepening of the recess in the frame, wherewith the barbs engage with the side walls of the fixing deepening. This enables the profiled element to be readily fitted, by simply pressing said element 41 into the recess and the fixing deepening in the frame.

[0026] Figure 3a illustrates a somewhat differently formed open channel 40'. This channel 40' is formed by a profiled element 41' together with the frame 10. The profiled element 41' is accommodated in a recess in the frame but lacks the side wall 42 shown in figure 3b. Instead, the channel 40' is formed by a side wall 43' and a frame surface that opposes a side wall 43', said opposing frame surface constituting a side delimiting surface of the recess. A hook-shaped guide wall 44' extends from the side wall 43' in a direction towards the side limiting surface of the recess, so as to define there between an opening of the channel 40'. Similar to the profiled element 41, the profiled element 41' includes a bottom wall 45' from which there extends a barbed fixing flange 46' which is received in a fixing deepening.

[0027] In both of the examples illustrated in figures 3a and 3b, the outwardly facing surface of the guide wall 44, 44' is located in the same plane as the frame abutment surface 12, so that the outer surface of the guide wall 44, 44' will constitute a part of the abutment surface for the sash. According to one embodiment not shown, it is also possible to arrange the profiled element on an outwardly facing flat surface of the frame, instead of in a recess. This outwardly facing surface of the profiled element's guide wall can then itself form the abutment surface for the sash. This obviates the requirement of working operations or other steps required in providing the frame with a recess for accommodating the profiled element. However, the profiled element can be omitted such that the open channel is formed instead as an integrated part of the frame.

[0028] As will best be seen from figure 2, the suspension device 30 also includes a slide 50 which is guidedly received in the open channel 40. For the sake of clarity figure 2 illustrates a position of the slide 50 and the position of the pivot arms, 32, 33, and 34 of the suspension

device which would not normally be assumed when a sash is mounted to a frame by means of the suspension device. The slide 50 includes a hooked end 51 which is guidedly supported by both the outside and the inside of the guide wall 44 of the profiled element. The end 51 of the slide thus extends through the channel opening and can be guided for displacement in the longitudinal direction of the channel 40. In the case of the example illustrated in figures 2 and 3b the slide 50 is guided laterally by abutment with the side wall 42 and the side wall 43 and/or the free end of the guide wall 44. In the case illustrated in example 3a, the slide is guided laterally primarily as a result of engagement-coaction between the hooked parts of the guide wall 44' and the end 51 of the slide. The slide 50 also includes a flat part 52 which is rotatably connected to a first fixating part 53. As will best be seen from figures 4a and 4b, the first fixating part 53 includes a tongue which can be snapped securely into a second fixating part 54 which has the form of a rail that is screwed firmly to the sash 20. When fitting the sash 20 to the frame 10 it is hereby possible to first fit the sash and its pivot arms 32, 33, 34 to the frame. Prior to joining together the first fixating part 53 and the second fixating part 54 the end part 51 of the slide can be inserted separately or rotated into the open channel 40. The first fixating part 53 and the second fixating part 54 can then readily be joined together so as to fixate the position of the slide relative to the sash. This greatly facilitates fitting of the device since only the released first fixating part 53 need be rotated into the open channel.

[0029] As will best be seen from figures 1 and 2, part of the short arm is moved into and received by the open channel 40 when the window is moved to a closed position and to a reversed position. This enables the width of the short arm 33 to be widened parallel with the movement plane of the short arm without increasing the ledge depth of the frame.

[0030] Although the suspension device has been described above with reference to exemplifying embodiments, it will be understood that the invention is not restricted to these embodiments and that variations are possible within the framework of the subsequent claims. For instance, the suspension means may also be used for windows that are pivotal about a vertical axis. In such instances, the pivot arms and the guide including the open channel may, instead, be disposed in the horizontal upper and lower members of the frame. As indicated in figure 1, the channel may also be disposed in both side members and upper and lower members irrespective of whether the sash is pivotal about a vertical axis or a horizontal axis. This affords a particularly significant benefit, since the frames can be produced identically with a peripherally or circumferentially open channel irrespective of whether the frames will later be used for fitting windows that are pivotal around a vertical or around a horizontal axis. The frames and the sashes with which the suspension device is used may be produced from a number of different materials, such as wood, metal or plastic mate-

rials, and from combinations of these and other materials. Instead of being affixed to the frame by means of a frame plate, the pivot arms may be fixed directly to the frame. The number of pivot arms may also be varied and may include more or fewer than the three arms illustrated in the above examples. If considered desirable, it is possible to insert more pivotal arms than the short arm into the open channel when the window is moved to a closed position or to some other position. This also enables said arms to be made wider and therewith stiffer than would otherwise be possible.

Claims

1. A reversible window suspension device comprising a window frame, at least two pivot arms (32, 33, 34), a slide (50) and a guide which includes an open channel (40) formed of a profiled element (41), which profiled element includes two mutually opposing side walls (42, 43), wherein said pivot arms can be pivotally fixed to the frame (10) for movement in respective movement planes that are mutually parallel and perpendicular to a rotational axis for a window sash (20), which by means of the pivot arms is rotatably fixable to the frame and wherein the slide is fixable to the sash and arranged to be displaceably received by the guide arranged at the frame, **characterized in that** the profiled element is formed as an integrated part of the window frame and that the open channel (40) accommodates the movement plane of at least one of the pivot arms (33) and is delimited by a guide wall (44) which extends to some extent from a first (43) of said side walls towards a second (42) of said side walls, thereby forming an opening of the open channel (40), between the free end of the guide wall (44) and the second side wall, which guide wall (44), in coaction with the slide (50), guides movement of said slide (50), wherein the channel (40) and said pivot arm (33) are adapted to permit the insertion of at least a part of said pivot (33) arm into the channel (40), through said opening, past the guide wall (44).
2. A suspension device according to claim 1, comprising a first fixating part (53) to which the slide (50) is fixed, and a second fixating part (54) which can be fixed firmly to the sash (20), which first and second fixating parts are adapted to permit releasable fixation of the first fixating part to the second fixating part when the sash is affixed to the frame (10) by means of the pivot arms (32, 33, 34).
3. A suspension device according to claim 2, wherein the first fixating part (53) comprises a tongue and the second fixating part (54) comprises a rail to which the tongue can be snap-fitted by insertion of the tongue into the rail.

4. A suspension device according to any one of claims 1-3, comprising a long arm (32) and a short arm (33) which can be mounted rotatably to the frame (10), and a sash arm (34) which is pivotally fitted to the long arm and to the short arm and can be mounted rotatably to the sash (20), wherein at least a part of the short arm can be inserted into the open channel (40, 40'). 5
5. A window comprising a sash (20) and a suspension device (30) according to any one of claims 1-4. 10

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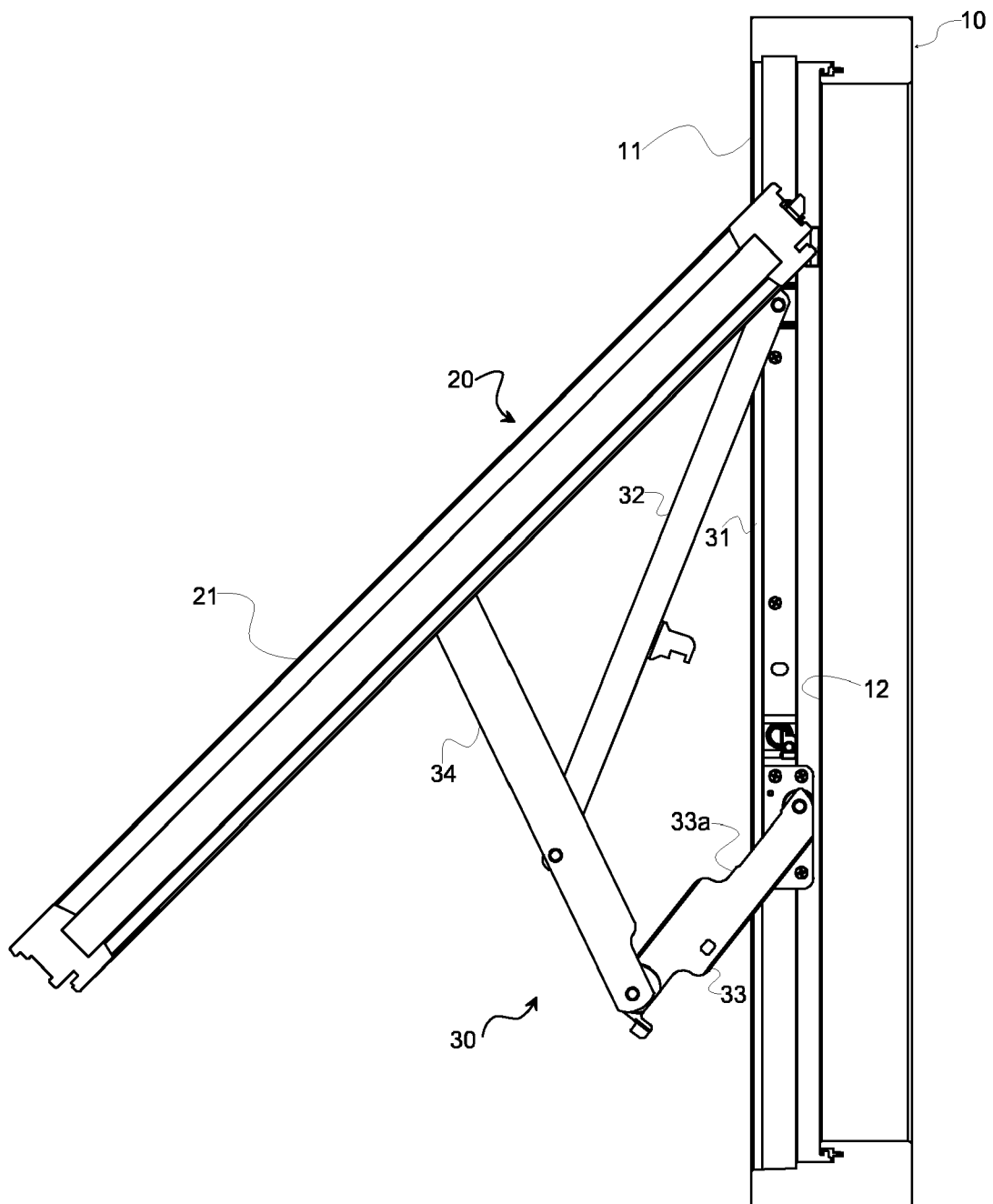


Fig. 1

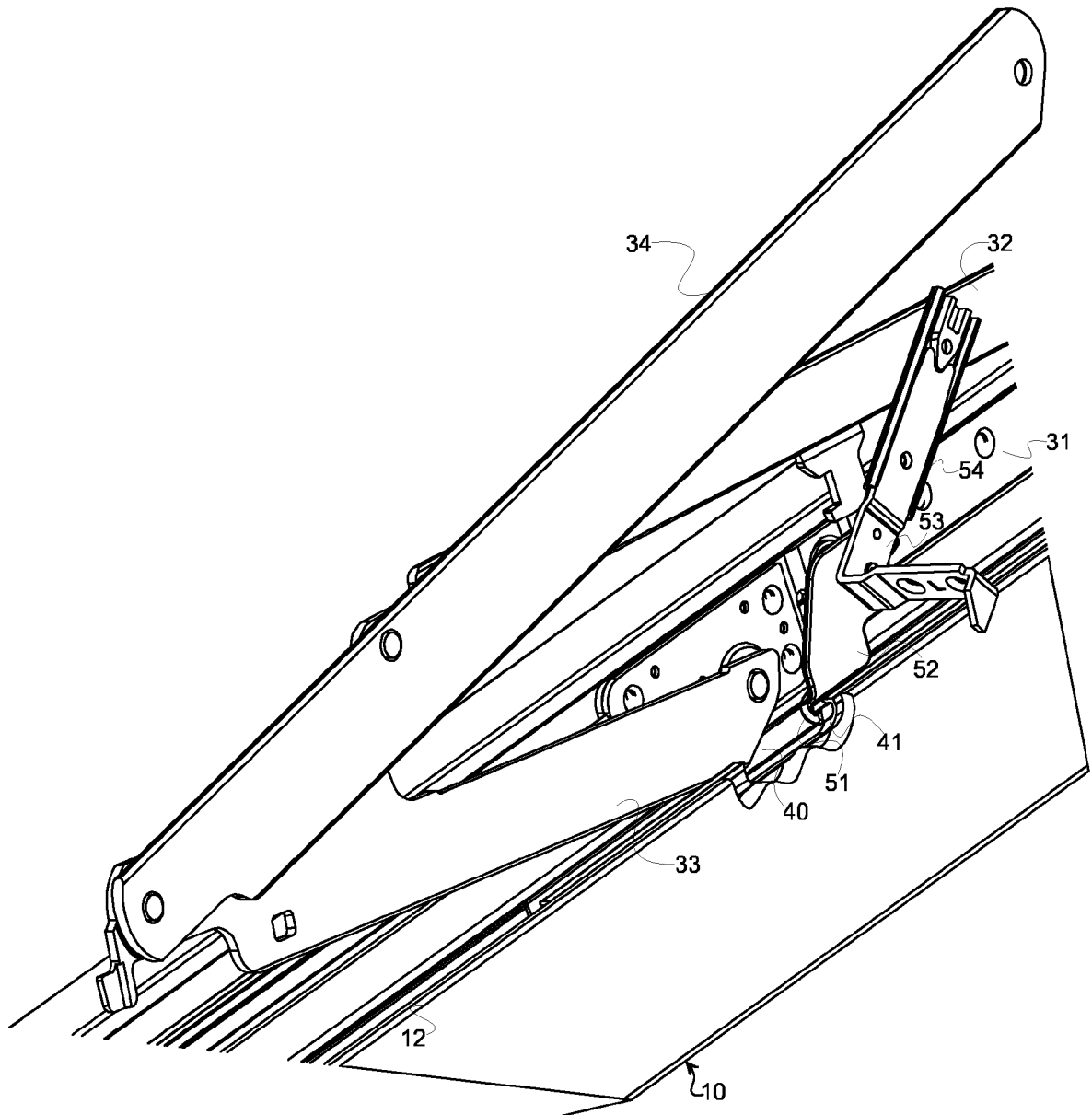


Fig. 2

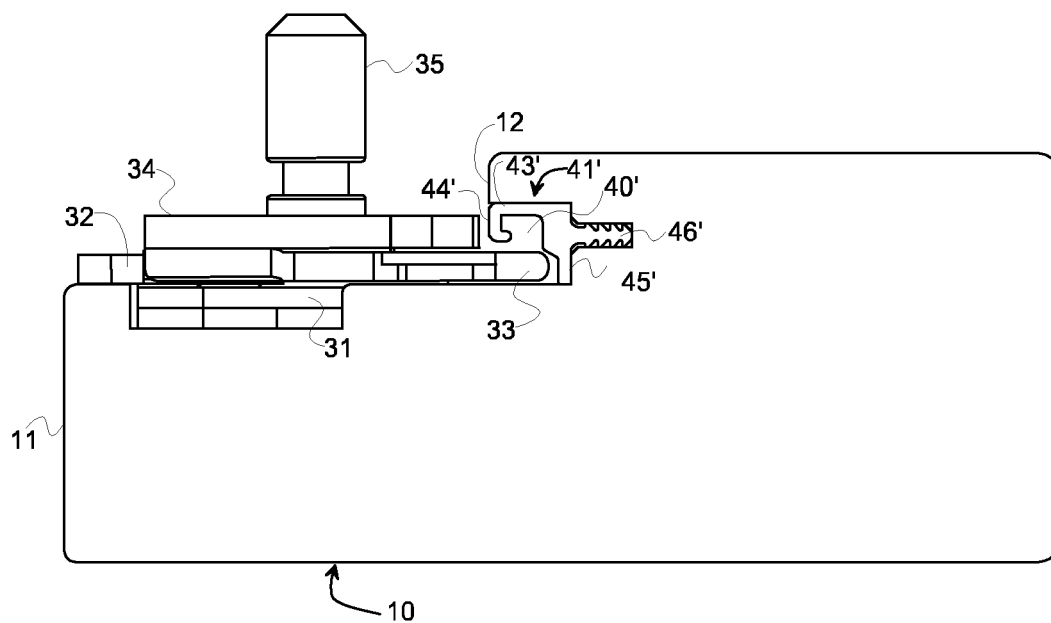


Fig. 3a

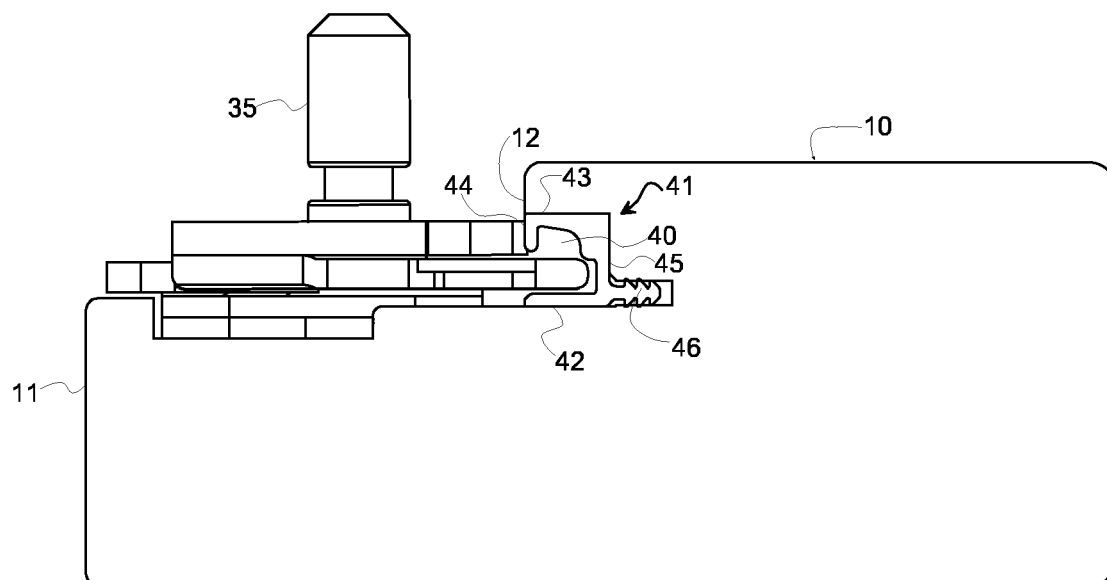
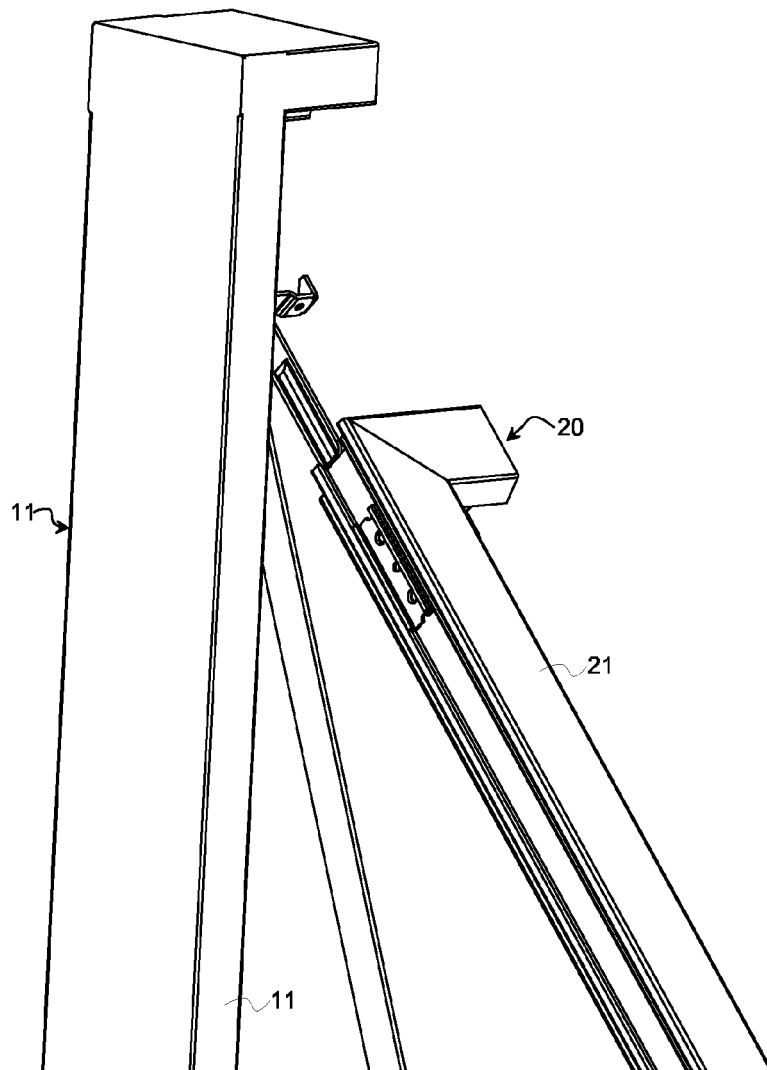
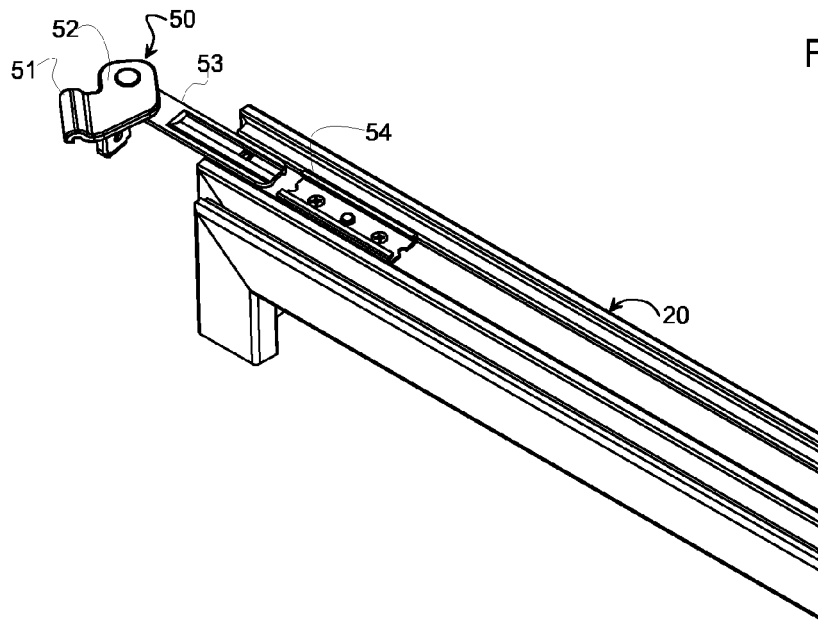


Fig. 3b





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Application Number
EP 15 16 4265

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 3 September 2015	Examiner Klemke, Beate
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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The members are as contained in the European Patent Office EDP file on
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