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(54) **INTRUSION-SAFE ROOF WINDOW**

EINBRUCHSICHERES DACHFENSTER

FENÊTRE DE TOIT SÉCURISÉE CONTRE LES INTRUSIONS

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Description

TECHNICAL FIELD

[0001] The disclosure relates to a roof window comprising a sash and a frame adapted for receiving the sash. The sash is optionally suspended from the frame by means of suspension arms, and the sash is configured to pivot around a pivot axis by means of an actuator, so as to open the sash towards an outer side of the window.

BACKGROUND

[0002] Conventional roof windows are both difficult to install as well as move between open and closed positions due to their location on top of a building.

[0003] It is known in prior art to provide roof windows with electrically operated actuators, allowing one or several roof windows to be moved between open and closed positions by means of remote control, see e.g. WO 02/31304 A1. The use of electrically operated actuators furthermore allows automatic operation for indoor temperature regulation or automatic closing of an open window due to changing weather conditions.

[0004] Electrically operated actuators require electrical connections etc., which preferably are made prior to window assembly at roof level and wherefore prior art roof windows oftentimes are installed as one unit. A complete roof window unit is, however, very heavy and difficult to install for that reason alone.

[0005] A further option is to fit the electrically operated actuator mainly to the frame of the window, and to provide means for connecting the sash to the frame and to the electrically operated actuator which means can be relatively easily assembled at roof level. This facilitates a roof window which can be installed in two units, significantly reducing the weight of the unit to be installed.

[0006] US 2011/302843 shows a roof window wherein the actuator is connected mainly to a frame side member. The actuator comprises a drive chain, in other words a push-pull chain, which has a rigid predetermined shape when flexed in one direction while being coilable for storage in a housing in the opposite direction. The actuator push-pull chain is visibly connected to the inner surface of a sash side member, by means of a number of components such as brackets and pins.

[0007] DE 10 2016 203452, DE 202 04 224, and DE 20 2010 000269 show windows with similar actuator solutions, wherein the actuator is connected mainly to the frame bottom member, and the actuator push-pull chain is visibly connected to the inner or side surface of the sash bottom member, by means of a number of components such as brackets and pins.

[0008] However, an intruder attempting to enter a building through such a roof window could remove the outer cladding which covers the gap between the sash and the frame, and thereafter access and disconnect the electrically operated actuator from the sash, allowing the sash to be opened manually by the intruder.

SUMMARY

[0009] It is an object to provide a roof window having improved intrusion safety.

[0010] The foregoing and other objects are achieved by the features of the independent claim. Further implementation forms are apparent from the dependent claims, the description, and the figures.

[0011] According to a first aspect, there is provided a roof window comprising a sash and a frame adapted for receiving the sash, the sash comprising two sash side members connected to a top sash member and a bottom sash member, the sash optionally being suspended from the frame by means of suspension arms, the sash being configured to pivot around a pivot axis so as to open the sash towards an outer side of the window, each optional suspension arm extending at least partially between a sash side member and a frame side member, the roof window further comprising at least one actuator adapted for pivoting the sash between a closed position and open positions, the actuator being adapted for securing the sash in the closed position, the actuator comprising a push-pull chain and a bracket, the bracket being rigidly connected to a first end of the push-pull chain, a second end of the push-pull chain being received in an actuator housing connected to the frame, a releasable connection pin with a first pin end and a second pin end, the bracket comprising a first opening adapted for receiving the releasable connection pin, the releasable connection pin releasably connecting the bracket to at least one of the side sash member and the suspension arm, said releasable connection pin extending in a direction substantially parallel with the pivot axis through the first opening and through at least one of a second opening in the sash side member and a third opening in the suspension arm, and with the first pin end being arranged closer to a center of the sash than the second pin end, and locking means engaging the first pin end, the locking means being configured for preventing the releasable connection pin from being removed from at least one of the second opening and the third opening.

[0012] This solution provides a roof window having an actuator one end of which is easily connected to the sash of the roof window after the frame, and subsequently the sash, have been installed in the roof. The actuator is connected to the sash from the inside of the building, i.e. an inner side of the window, or from the exterior of the building, i.e. the outer side of the window. After installation, however, the connection between sash and actuator can no longer be accessed from the exterior when the window is closed, even after having removed any outer cladding. Furthermore, the remainder of the actuator is arranged completely within a housing, located within the frame. The housing, and hence the actuator, can neither be seen nor easily accessed after the frame has been installed in the roof, and therefore the solution is both aesthetically

pleasing as well as safe seen from an intrusion prevention perspective.

[0013] In a possible implementation form of the first aspect, the first pin end is configured for engaging the locking means, facilitating secure interlocking between the releasable connection pin and the locking means.

[0014] In a further possible implementation form of the first aspect, the push-pull chain comprises a plurality of coupled links, wherein a last link at the first end of the push-pull chain forms the bracket, allowing the main part of the actuator, including a part of the bracket, to be at least partially collapsed or wound together within the housing.

[0015] In a further possible implementation form of the first aspect, the releasable connection pin extends through the second opening of the sash side member, the first pin end and the locking means being arranged in a recess within the sash side member, the second pin end being arranged between the frame side member and the sash side member, facilitating use of the actuator in a window where the sash is suspended directly from the frame without the use of suspension arms and providing the locking means at a location which is unreachable from the exterior of the building when the sash is closed.

[0016] In a further possible implementation form of the first aspect, the releasable connection pin extends through the third opening of the suspension arm, the second pin end being arranged between the frame side member and the suspension arm, which facilitates a reliable and loadbearing solution where the releasable connection pin interconnects the suspension arm and the sash side member.

[0017] In a further possible implementation form of the first aspect, the releasable connection pin extends through the third opening of the suspension arm, the first pin end and the locking means being arranged between the suspension arm and the sash side member, the second pin end being arranged between the frame side member and the suspension arm, which provides an aesthetically pleasing solution which can neither be seen from the interior of the building nor accessed from the exterior of the building, but which still can be easily accessed at installation.

[0018] In a further possible implementation form of the first aspect, the suspension arm comprises a ledge extending parallel with the third opening, the ledge at least partially covering a gap between the suspension arm and the sash side member such that access to any components located in the gap is prevented.

[0019] In a further possible implementation form of the first aspect, the locking means comprises at least one of a threaded nut, a spring, a clip, a slider, and a pin, all being reliable and easy-to-operate mechanical solutions for interlocking components.

[0020] In a further possible implementation form of the first aspect, the second pin end comprises an enlarged portion too large to pass through at least one of the first opening, the second opening, and the third opening, and wherein the first pin end comprises a throughgoing channel, extending perpendicular to a center axis of the releasable connection pin, for receiving a part of the locking means, which facilitates a simple and reliable way of interlocking components without, e.g., having to rely on moving parts.

[0021] In a further possible implementation form of the first aspect, the actuator further comprises a protective casing adapted for enclosing the locking means and the first pin end, further obstructing access to the locking means from the exterior as well as providing protection against external influence such as ingress of dirt, weather conditions, or unintentional mechanical forces such as accidental bending.

[0022] In a further possible implementation form of the first aspect, the casing comprises two casing halves, one casing half comprising an access opening allowing access to the locking means such that the locking means can be released from the releasable connection pin, facilitating a secure solution which still allows for simple connection of the actuator to the sash.

[0023] In a further possible implementation form of the first aspect, each suspension arm has an upside-down U-shaped cross-section enclosing the locking means and the casing, an open end of the U-shape being at least partially directed towards an adjacent frame side member, allowing the actuator to be connected to the sash without difficulty during installation at roof level.

[0024] In a further possible implementation form of the first aspect, the locking means is accessible through a wall opening in a wall of the U-shaped cross-section, the wall extending adjacent the sash side member, allowing the suspension arm to provide sufficient support for the sash while still allowing access to the locking means during installation.

[0025] In a further possible implementation form of the first aspect, the actuator is adapted for pivoting the sash in relation to the frame against a load of the sash, the load mainly being caused by the weight of the sash, the push-pull chain being adapted for bending freely in a first direction, past a configuration in which the push-pull chain forms a straight line, and only to a limited extent past the straight line configuration in a second opposite direction, the bracket providing a support point for supporting the load of the sash, the support point being laterally offset from the longitudinal extent of the push-pull chain so that the load of the sash urges the push-pull chain to bend in the second opposite direction, the first opening being oblong and the longitudinal extent of the first opening being aligned with the longitudinal extent of the push-pull chain, the releasable connection pin being allowed to move in the first opening in the direction of the longitudinal extent of the first opening, the longitudinal extent of the first opening being aligned with the longitudinal extent of the push-pull chain. This solution provides an actuator which is stabilized by means of a stabilizing force, generated by the load of the sash, and which assists in preventing accidental collapse of the push-pull

chain of the actuator.

[0026] In a further possible implementation form of the first aspect, the bracket comprises a fourth opening adapted for receiving a pre-loading pin, the pre-loading pin extending through the fourth opening and connecting the bracket to the sash, the load of the sash urging the push-pull chain to bend in the second opposite direction by the pre-loading pin applying the load of the sash onto the bracket, allowing the pre-load applied on the push-pull chain, and induced by the load of the sash, to be progressive and change in response to a change in the load of the sash.

[0027] This and other aspects will be apparent from the embodiments described below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] In the following detailed portion of the present disclosure, the aspects, embodiments and implementations will be explained in more detail with reference to the example embodiments shown in the drawings, in which:

Fig. 1a shows a schematic perspective view of a roof window in accordance with one embodiment of the present invention;

Fig. 1b shows a schematic perspective view of a roof window in accordance with a further embodiment of the present invention;

Fig. 2 shows a perspective side view of a suspension arm and a thereto connected actuator in accordance with one embodiment of the present invention;

Figs. 3a and 3b show sectional perspective front and rear views of the suspension arm and the actuator shown in Fig. 2;

Fig. 3c shows a partially exploded bottom view of the suspension arm and the actuator section shown in Figs. 3a and 3b;

Figs. 4a and 4b show perspective front and rear views of a section of the actuator shown in Figs. 3a to 3c;

Fig. 4c shows an exploded front view of the actuator section shown in Figs. 4a and 4b;

Fig. 5a shows a sectional perspective view of the suspension arm and the actuator shown in Fig. 2;

Fig. 5b shows a partially exploded view of the suspension arm and the actuator shown in Fig. 5a;

Fig. 6a shows a perspective front view of the suspension arm and the actuator shown in Figs. 5a and 5b;

Fig. 6b shows a perspective rear view of the suspension arm and the actuator shown in Fig. 6a.

DETAILED DESCRIPTION

[0029] Figs. 1a and 1b show a roof window comprising a sash 1 and a frame 2 adapted for receiving the sash 1, the sash 1 being configured to pivot around a pivot axis A so as to open the sash towards an outer side of the window, i.e. towards the exterior of a building. The sash 1 comprises two sash side members 1a, 1b connected to a top sash member 1c and a bottom sash member 1d. The sash 1 may be suspended directly from the frame 2 or, optionally, suspended from the frame 2 by means of suspension arms 3. Each optional suspension arm 3 extends at least partially between a sash side member 1a, 1b and an adjacent frame side member 2a, 2b.

[0030] At least one actuator 4 is provided to pivot the sash 1 between a closed position and several open positions, open positions being shown in Figs. 1a and 1b. The actuator 4 is furthermore adapted for securing the sash 1 in the closed position.

[0031] As shown in more detail in Figs. 2 and 4a, the actuator 4 comprises a push-pull chain 5 and a bracket 6, the bracket 6 being rigidly connected to a first end 5a of the push-pull chain. A second end 5b of the push-pull chain is received in an actuator housing 7 connected to the frame 2, as shown schematically in Fig. 1a. As the sash 1 is closed, the push-pull chain 5 is withdrawn, completely or almost completely, into the actuator housing 7 by an electrical motor (not shown). The push-pull chain 5 is maintained in the withdrawn position by means of the motor or any other suitable locking means, such that the sash 1 is maintained in the closed position until the actuator 4 is activated in order to move the sash 1 to an open position.

[0032] The push-pull chain 5 comprises a plurality of coupled links 13, as shown in Fig. 2. In one embodiment, the last link 13a at the first end 5a of the push-pull chain forms the bracket 6. In a further embodiment, the bracket 6 is a separate component connected to the last link 13a of the push-pull chain 5.

[0033] The bracket 6 comprises a first opening 9 adapted for receiving a releasable connection pin 8, the releasable connection pin 8 having a first pin end 8a and a second pin end 8b as shown in Figs. 3a to 3c.

[0034] The releasable connection pin 8 connects the bracket 6 releasably to at least one side sash member 1a, 1b and suspension arm 3, as shown in Figs. 5a and 5b as well as 6a and 6b. The releasable connection pin 8 extends in a direction substantially parallel with the pivot axis A, through the first opening 9 in the bracket and through at least one of a second opening 10 in the sash side member 1a, 1b and a third opening 11 in the suspension arm 3. As the releasable connection pin 8 connects the bracket 6 to the side sash member 1a, 1b and/or

the suspension arm 3, the first pin end 8a is arranged closer to the center C of the sash than the second pin end 8b.

[0035] Locking means 12, shown in Figs. 4b and 4c, engage the first pin end 8a such that the releasable connection pin 8 is prevented from being removed from the second opening 10 and/or the third opening 11, as well as from the first opening 9. The locking means 12 comprises at least one of a threaded nut, a spring, a clip, a slider, and a pin.

[0036] The first pin end 8a is configured for engaging the locking means 12 by means of a section having a reduced diameter arranged at the first pin end 8a, as shown in Fig. 3c, or, as in a further embodiment, by means of a throughgoing channel 14 which extends perpendicular to the center axis CA of the releasable connection pin 8, and which receives a part of the locking means 12 such as, e.g., one leg of a spring as shown in Fig. 4b.

[0037] In one embodiment, the releasable connection pin 8 extends through the second opening 10 of the sash side member 1a, 1b, and the first pin end 8a and the locking means 12 are arranged in a recess within the sash side member 1a, 1b. The recess extends from the inner surface of the sash, i.e. from the surface closest to the center C of the sash 1, in a direction towards the closest frame side member 2a, 2b. The second pin end 8b is arranged between the frame side member 2a, 2b and the sash side member 1a, 1b. The releasable connection pin 8 extends, in other words, through the first opening 9 and the second opening 10.

[0038] If the window also comprises suspension arms 3, the second pin end 8b may be arranged either between the frame side member 2a, 2b and the suspension arm 3, or between the suspension arm 3 and the sash side member 1a, 1b. If the second pin end 8b is arranged between the frame side member 2a, 2b and the suspension arm 3, the releasable connection pin 8 also extends through the third opening 11 of the suspension arm 3, i.e. the releasable connection pin 8 extends through the first opening 9, the third opening 11, and the second opening 10.

[0039] In one embodiment, the releasable connection pin 8 extends through the third opening 11 of the suspension arm 3, and the first pin end 8a and the locking means 12 are arranged between the suspension arm 3 and the sash side member 1a, 1b. The second pin end 8b is arranged between the frame side member 2a, 2b and the suspension arm 3. The releasable connection pin 8 extends, in other words, through the first opening 9 and the third opening 11.

[0040] As shown in Figs. 3a to 3c, 5a to 5 b, and 6a to 6b, the suspension arm 3 may comprise a ledge 3a extending parallel with the center axis of the third opening 11, such that the ledge 3a at least partially covers any existing gap between the suspension arm 3 and the sash side member 1a, 1b. The ledge effectively covers the interior space of the suspension arm such that any components at least partially surrounded by the suspension arm can only be accessed from the interior of the building, i.e. from an inner side of the window.

[0041] The second pin end 8b comprises an enlarged portion too large to pass through the first 9 and second 10 openings or the first 9 and third 11 openings, or even the first 9, second 10, and third 11 openings, such that the releasable connection pin 8 can only be withdrawn from the openings 9, 10, 11 in one direction, i.e. in the direction extending from the first pin end 8a to the second pin end 8b. The first pin end 8a receives a part of the locking means 12, which prevents the releasable connection pin 8 from being withdrawn from the openings 9, 10, 11 in the direction extending from the first pin end 8a to the second pin end 8b. The locking means 12 has to be released from the first pin end 8a in order to be able to withdraw the releasable connection pin 8 from the openings 9, 10, 11.

[0042] As shown in Figs. 3b, 3c, and 5b, the actuator 4 may comprise a protective casing 15 adapted for enclosing the locking means 12 and the first pin end 8a. The casing 15 comprises two casing halves interlocking with each other such that a void is formed between the casing halves, the void accommodating the locking means 12 and preferably the first pin end 8a. One casing half comprises an access opening 15a which allows access to the locking means 12, from the interior of the building, such that the locking means 12 can be released from the releasable connection pin 8. Correspondingly, the other casing half comprises an opening allowing the releasable connection pin 8 to pass through and enter the void formed by the two casing halves. In one embodiment, shown in Figs. 3a to 3c, each suspension arm 3 has an upside-down U-shaped cross-section enclosing the locking means 12 and the casing 15. The two parallel legs of the U-shape are of different heights, the shorter leg extending the open end of the U-shape. The open end of the U-shape is at least partially directed towards the closest frame side member 2a, 2b, i.e. the frame side member 2a, 2b arranged adjacent the suspension arm 3 when the window is in the closed position. The locking means 12, arranged such that it is enclosed by the U-shaped suspension arm 3, is accessible through a wall opening 16 in a wall 3b of the U-shaped cross-section. The wall 3b extends adjacent the sash side member 1a, 1b, and essentially perpendicular to the ledge 3a. The wall 3b corresponds to the longer of the two parallel legs of the U-shape.

[0043] In one embodiment, the actuator 4 is adapted for pivoting the sash 1 in relation to the frame 2 against a load L of the sash 1, the load L mainly being caused by the weight of the sash 1 but possibly also by external conditions such as snow resting on the sash or wind. The push-pull chain 5 bends freely in a first direction D1, at least partially towards the pivot axis A, past a configuration in which the push-pull chain forms a straight line 5c, shown in Fig. 2, such that at least the main part of the push-pull chain 6 can be collapsed and wound together.

The push-pull chain 5 can bend only to a limited extent past the straight line 5c configuration in a second opposite direction D2, allowing the push-pull chain 5 to form an arc. The bracket 6 provides at least one support point S for supporting the load L of the sash 1, as shown in Figs. 4a to 4c. The support point S is laterally offset from the longitudinal extent of the push-pull chain 5 so that the load L of the sash 1 urges the push-pull chain 5 to bend in the second opposite direction D2.

[0044] The first opening 9 is preferably oblong and the longitudinal extent of the first opening 9 aligned with the longitudinal extent of the push-pull chain 5. The releasable connection pin 8 is allowed to move in the first opening 9 in the direction of the longitudinal extent of the first opening 9.

[0045] The bracket 6 may comprise a fourth opening 17 adapted for receiving a pre-loading pin 18. The fourth opening 17 is essentially a U-shaped recess having an open end 17a, facing away from the push-pull chain 5, allowing the pre-loading pin 18 to exit the fourth opening 17 in one direction. The pre-loading pin 18 extends through the fourth opening 17 and connects the bracket 6 rigidly to the sash 1. The load L of the sash 1 urges the push-pull chain 5 to bend in the second opposite direction D2 by the pre-loading pin 18 applying the load L of the sash 1 onto the bracket 6.

[0046] The center axis CA of the connection pin 8 and the center axis CA2 of the pre-loading pin 18 extend parallel with each other and substantially parallel with the pivot axis A.

[0047] The open end 17a of the fourth opening 17 allows the pre-loading pin 18 to at least partially exit the fourth opening 17, in a direction parallel with the longitudinal extent of the oblong first opening 9, if the load L applied by the sash 1 is reduced or reversed.

[0048] In one embodiment, the roof window further comprises a connecting plate 19 connected to at least one of the sash 1 and the suspension arm 3. The connecting plate 19 comprises connection openings 20 aligned with the oblong first opening 9 and the fourth opening 17, such that the connection pin 8 and the pre-loading pin 18 may extend through the connection openings 20.

[0049] The bracket 6 may comprise first and second parallel bracket plates 6a, 6b, arranged such that the oblong first opening 9 in the first bracket plate 6a is aligned with the oblong first opening 9 in the second bracket plate 6b, and the fourth opening 17 in the first bracket plate 6a is aligned with the fourth opening 17 in the second bracket plate 6b, The bracket 6 encloses the connecting plate 19 at least partially such that the first and second bracket plates 6a, 6b extend on opposite sides of the connecting plate 19.

[0050] In one embodiment, the actuator 4 further comprises chain support means 21, connected to at least one of the sash 1 and the frame 2. The chain support means 21 provide a stabilizing force F onto the push-pull chain 5 perpendicularly to the longitudinal extension of the push-pull chain 5, such that the stabilizing force F urges the push-pull chain to bend in the second opposite direction D2, as shown in Fig. 2.

[0051] In one embodiment, the roof window is a top-hung roof window comprising one actuator 4, the actuator 4 being arranged adjacent a frame bottom member 2d.

[0052] In a further embodiment, the roof window is a center-pivoted roof window or a top-hung roof window comprising two actuators 4, each actuator 4 being arranged adjacent one frame side member 2a, 2b.

[0053] The present roof window has several benefits. For example, it enables large opening angles. Another benefit is having a large load capacity which remains stable with changing roof angles and during high load conditions (any push-pull situations which occur). A further benefit is that the push-pull chains can be placed substantially out of sight at the sides of the window, allowing the window to have a slenderer appearance and providing a better view. Additionally, the need for window load balancing by springs is reduced, such that the springs do not need adjustment or may be entirely omitted. Another benefit is that the push-pull chain actuator may keep the window closed without additional need for a window lock. Furthermore, the window installation process and the process of connecting the push-pull chain(s) is enhanced. Finally, the push-pull chain is burglar protected while still enabling service of the window.

[0054] The various aspects and implementations have been described in conjunction with various embodiments herein. However, other variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed subject-matter, from a study of the drawings, the disclosure, and the appended claims. In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measured cannot be used to advantage.

[0055] The reference signs used in the claims shall not be construed as limiting the scope.

Claims

1. A roof window comprising a sash (1) and a frame (2) adapted for receiving said sash (1), said sash (1) comprising two sash side members (1a, 1b) connected to a top sash member (1c) and a bottom sash member (1d), said sash (1) optionally being suspended from said frame by means of suspension arms (3), said sash (1) being configured to pivot around a pivot axis (A) so as to open said sash towards an outer side of said window, each optional suspension arm (3) extending at least partially between a sash side member (1a, 1b) and a frame side member (2a, 2b),
said roof window further comprising:

at least one actuator (4) adapted for pivoting said sash (1) between a closed position and open positions, said actuator (4) being adapted for securing said sash (1) in said closed position,
said actuator (4) comprising a push-pull chain (5) and a bracket (6), said bracket (6) being rigidly connected to a first end (5a) of said push-pull chain, a second end (5b) of said push-pull chain being received in an actuator housing (7) connected to said frame (2),
a releasable connection pin (8) with a first pin end (8a) and a second pin end (8b),
said bracket (6) comprising a first opening (9) adapted for receiving said releasable connection pin (8),
said releasable connection pin (8) releasably connecting said bracket (6) to at least one of said side sash member (1a, 1b) and said suspension arm (3), said releasable connection pin (8) extending in a direction substantially parallel with said pivot axis (A) through said first opening (9) and through at least one of a second opening (10) in said sash side member (1a, 1b) and a third opening (11) in said suspension arm (3), and with said first pin end (8a) being arranged closer to a center (C) of said sash than said second pin end (8b), and
locking means (12) engaging said first pin end (8a), said locking means (12) being configured for preventing said releasable connection pin (8) from being removed from at least one of said second opening (10) and said third opening (11) .

2. The roof window according to claim 1, wherein said first pin end (8a) is configured for engaging said locking means (12) .

3. The roof window according to claim 1 or 2, wherein said push-pull chain (5) comprises a plurality of coupled links (13), wherein a last link (13a) at said first end (5a) of said push-pull chain forms said bracket (6).

4. The roof window according to any one of the previous claims, wherein said releasable connection pin (8) extends through said second opening (10) of said sash side member (1a, 1b), said first pin end (8a) and said locking means (12) being arranged in a recess within said sash side member (1a, 1b), said second pin end (8b) being arranged between said frame side member (2a, 2b) and said sash side member (1a, 1b) .

5. The roof window according to claim 4, wherein said releasable connection pin (8) furthermore extends through said third opening (11) of said suspension arm (3), said second pin end (8b) being arranged between said frame side member (2a, 2b) and said suspension arm (3).

6. The roof window according to any one of claims 1 to 3, wherein said releasable connection pin (8) extends through said third opening (11) of said suspension arm (3), said first pin end (8a) and said locking means (12) being arranged between said suspension arm (3) and said sash side member (1a, 1b), said second pin end (8b) being arranged between said frame side member (2a, 2b) and said suspension arm (3).

7. The roof window according to any one of the previous claims, wherein said suspension arm (3) comprises a ledge (3a) extending parallel with said third opening (11), said ledge (3a) at least partially covering a gap between said suspension arm (3) and said sash side member (1a, 1b).

8. The roof window according to any one of the previous claims, wherein said locking means (12) comprises at least one of a threaded nut, a spring, a clip, a slider, and a pin.

9. The roof window according to any one of the previous claims, wherein said second pin end (8b) comprises an enlarged portion too large to pass through at least one of said first opening (9), said second opening (10), and said third opening (11), and wherein said first pin end (8a) comprises a throughgoing channel (14), extending perpendicular to a center axis (CA) of said releasable connection pin (8), for receiving a part of said locking means (12).

10. The roof window according to any one of the previous claims, wherein said actuator (4) further comprises a protective casing (15) adapted for enclosing said locking means (12) and said first pin end (8a).

11. The roof window according to claim 10, wherein said casing (15) comprises two casing halves, one casing half comprising an access opening (15a) allowing access to said locking means (12) such that said locking means (12) can be released from said releasable connection pin (8).

12. The roof window according to claim 10 or 11, wherein each suspension arm (3) has an upside-down U-shaped cross-section enclosing said locking means (12) and said casing (15), an open end of said U-shape being at least partially directed towards an adjacent frame side member (2a, 2b).

13. The roof window according to claim 12, wherein said locking means (12) is accessible through a wall opening (16) in a wall (3b) of said U-shaped cross-section, said wall (3b) extending adjacent said sash

side member (1a, 1b).

14. The roof window according to any one of the previous claims, wherein said actuator (4) is adapted for pivoting said sash (1) in relation to said frame (2) against a load (L) of said sash (1), said load (L) mainly being caused by the weight of said sash (1),

said push-pull chain (5) being adapted for bending freely in a first direction (D1), past a configuration in which said push-pull chain forms a straight line (5c), and only to a limited extent past said straight line (5c) configuration in a second opposite direction (D2),
said bracket (6) providing a support point (S) for supporting the load (L) of said sash (1), said support point (S) being laterally offset from the longitudinal extent of said push-pull chain (5) so that the load (L) of said sash (1) urges said push-pull chain (5) to bend in said second opposite direction (D2),
said first opening (9) being oblong and the longitudinal extent of said first opening (9) being aligned with the longitudinal extent of said push-pull chain (5),
said releasable connection pin (8) being allowed to move in said first opening (9) in the direction of the longitudinal extent of said first opening (9), the longitudinal extent of said first opening (9) being aligned with the longitudinal extent of said push-pull chain (5).

15. The roof window according to claim 14, wherein said bracket (6) comprises a fourth opening (17) adapted for receiving a pre-loading pin (18), said pre-loading pin (18) extending through said fourth opening (17) and connecting said bracket (6) to said sash (1),
the load (L) of said sash (1) urging said push-pull chain (5) to bend in said second opposite direction (D2) by said pre-loading pin (18) applying the load (L) of said sash (1) onto said bracket (6).

Patentansprüche

1. Dachfenster, das einen Fensterflügel (1) und einen Rahmen (2) umfasst, der zum Aufnehmen des Fensterflügels (1) ausgelegt ist, wobei der Fensterflügel (1) zwei Fensterflügelseitenelemente (1a, 1b) umfasst, die mit einem oberen Fensterflügelelement (1c) und einem unteren Fensterflügelelement (1d) verbunden sind, wobei der Fensterflügel (1) optional mit Hilfe von Aufhängungsarmen (3) am Rahmen aufgehängt wird, wobei der Fensterflügel (1) dazu konfiguriert ist, um eine Schwenkachse (A) zu schwenken, um den Fensterflügel in Richtung einer Außenseite des Fensters zu öffnen, wobei sich jeder optionale Aufhängungsarm (3) zumindest teilweise zwischen einem Fensterflügelseitenelement (1a, 1b) und einem Rahmenseitenelement (2a, 2b) erstreckt,
wobei das Dachfenster ferner Folgendes umfasst:

zumindest ein Stellglied (4), das zum Schwenken des Fensterflügels (1) zwischen einer geschlossenen Position und einer offenen Position ausgelegt ist, wobei das Stellglied (4) zum Sichern des Fensterflügels (1) in der geschlossenen Position ausgelegt ist,
wobei das Stellglied (4) eine Druck-Zug-Kette (5) und eine Halterung (6) umfasst, wobei die Halterung (6) starr mit einem ersten Ende (5a) der Druck-Zug-Kette verbunden ist, wobei ein zweites Ende (5b) der Druck-Zug-Kette in einem Stellgliedgehäuse (7) aufgenommen ist, das mit dem Rahmen (2) verbunden ist,
ein lösbarer Verbindungszapfen (8) mit einem ersten Zapfenende (8a) und einem zweiten Zapfenende (8b),
wobei die Halterung (6) eine erste Öffnung (9) umfasst, die zum Aufnehmen des lösbaren Verbindungszapfens (8) ausgelegt ist,
wobei der lösbare Verbindungszapfen (8) die Halterung (6) lösbar mit dem Fensterflügelseitenelement (1a, 1b) und/oder dem Aufhängungsarm (3) verbindet, wobei sich der lösbare Verbindungszapfen (8) in einer Richtung im Wesentlichen parallel zur Schwenkachse (A) durch die erste Öffnung (9) und durch eine zweite Öffnung (10) im Fensterflügelseitenelement (1a, 1b) und/oder eine dritte Öffnung (11) im Aufhängungsarm (3) erstreckt, und wobei das erste Zapfenende (8a) näher an einer Mitte (C) des Fensterflügels als das zweite Zapfenende (8b) angeordnet ist, und
ein Verriegelungsmittel (12), das mit dem ersten Zapfenende (8a) in Eingriff steht, wobei das Verriegelungsmittel (12) dazu konfiguriert ist, zu verhindern, dass der lösbare Verbindungszapfen (8) aus der zweiten Öffnung (10) und/oder der dritten Öffnung (11) entfernt wird.

2. Dachfenster nach Anspruch 1, wobei das erste Zapfenende (8a) dazu konfiguriert ist, das Verriegelungsmittel (12) in Eingriff zu nehmen.

3. Dachfenster nach Anspruch 1 oder 2, wobei die Druck-Zug-Kette (5) eine Mehrzahl von gekoppelten Glieder (13) umfasst, wobei ein letztes Glied (13a) am ersten Ende (5a) der Druck-Zug-Kette die Halterung (6) bildet.

4. Dachfenster nach einem der vorhergehenden Ansprüche, wobei sich der lösbare Verbindungszapfen (8) durch die zweite Öffnung (10) des Fensterflügelseitenelements (1a, 1b) erstreckt, wobei das erste

Zapfenende (8a) und das Verriegelungsmittel (12) in einer Vertiefung innerhalb des Fensterflügelseitenelements (1a, 1b) angeordnet sind, wobei das zweite Zapfenende (8b) zwischen dem Rahmenseitenelement (2a, 2b) und dem Fensterflügelseitenelement (1a, 1b) angeordnet ist.

5. Dachfenster nach Anspruch 4, wobei sich der lösbare Verbindungszapfen (8) außerdem durch die dritte Öffnung (11) des Aufhängungsarms (3) erstreckt, wobei das zweite Zapfenende (8b) zwischen dem Rahmenseitenelement (2a, 2b) und dem Aufhängungsarm (3) angeordnet ist.

6. Dachfenster nach einem der Ansprüche 1 bis 3, wobei sich der lösbare Verbindungszapfen (8) durch die dritte Öffnung (11) des Aufhängungsarms (3) erstreckt, wobei das erste Zapfenende (8a) und das Verriegelungsmittel (12) zwischen dem Aufhängungsarm (3) und dem Fensterflügelseitenelement (1a, 1b) angeordnet sind, wobei das zweite Zapfenende (8b) zwischen dem Rahmenseitenelement (2a, 2b) und dem Aufhängungsarm (3) angeordnet ist.

7. Dachfenster nach einem der vorhergehenden Ansprüche, wobei der Aufhängungsarm (3) einen Vorsprung (3a) umfasst, der sich parallel zur dritten Öffnung (11) erstreckt, wobei der Vorsprung (3a) zumindest teilweise einen Spalt zwischen dem Aufhängungsarm (3) und dem Fensterflügelseitenelement (1a, 1b) abdeckt.

8. Dachfenster nach einem der vorhergehenden Ansprüche, wobei das Verriegelungsmittel (12) eine Gewindemutter und/oder eine Feder und/oder einen Bügel und/oder einen Schieber und/oder einen Zapfen umfasst.

9. Dachfenster nach einem der vorhergehenden Ansprüche, wobei das zweite Zapfenende (8b) einen vergrößerten Abschnitt umfasst, der zu groß ist, um die erste Öffnung (9) und/oder die zweite Öffnung (10) und/oder die dritte Öffnung (11) zu durchdringen, und wobei das erste Zapfenende (8a) einen durchgehenden Kanal (14) umfasst, der sich senkrecht zu einer Mittelachse (CA) des lösbaren Verbindungszapfens (8) erstreckt, um einen Teil des Verriegelungsmittels (12) aufzunehmen.

10. Dachfenster nach einem der vorhergehenden Ansprüche, wobei das Stellglied (4) ferner ein Schutzgehäuse (15) umfasst, das zum Umschließen des Verriegelungsmittels (12) und des ersten Zapfenendes (8a) ausgelegt ist.

11. Dachfenster nach Anspruch 10, wobei das Gehäuse (15) zwei Gehäusehälften umfasst, wobei eine Gehäusehälfte eine Zugangsöffnung (15a) umfasst, die den Zugang zu dem Verriegelungsmittel (12) ermöglicht, so dass das Verriegelungsmittel (12) vom lösbaren Verbindungszapfen (8) gelöst werden kann.

12. Dachfenster nach Anspruch 10 oder 11, wobei jeder Aufhängungsarm (3) einen umgedrehten U-förmigen Querschnitt aufweist, der das Verriegelungsmittel (12) und das Gehäuse (15) umschließt, wobei ein offenes Ende der U-Form zumindest teilweise auf ein benachbarten Rahmenseitenelement (2a, 2b) gerichtet ist.

13. Dachfenster nach Anspruch 12, wobei das Verriegelungsmittel (12) durch eine Wandöffnung (16) in einer Wand (3b) des U-förmigen Querschnitts zugänglich ist, wobei sich die Wand (3b) neben dem Fensterflügelseitenelement (1a, 1b) erstreckt.

14. Dachfenster nach einem der vorhergehenden Ansprüche, wobei das Stellglied (4) zum Schwenken des Fensterflügels (1) in Bezug auf den Rahmen (2) gegen eine Belastung (L) des Fensterflügels (1) ausgelegt ist, wobei die Belastung (L) hauptsächlich durch das Gewicht des Fensterflügels (1) verursacht wird,

wobei die Druck-Zug-Kette (5) zum freien Biegen in einer ersten Richtung (D1) über eine Konfiguration hinaus, in der die Druck-Zug-Kette eine gerade Linie (5c) bildet, und nur in einem begrenzten Ausmaß in der Konfiguration über die gerade Linie (5c) hinaus in einer zweiten Gegenrichtung (D2) ausgelegt ist,
wobei die Halterung (6) einen Lagerpunkt (S) zum Tragen der Belastung (L) des Fensterflügels (1) bereitstellt, wobei der Lagerpunkt (S) seitlich von der Längserstreckung der Druck-Zug-Kette (5) versetzt ist, so dass die Belastung (L) des Fensterflügels (1) die Druck-Zug-Kette (5) zwingt, sich in die zweite entgegengesetzte Richtung (D2) zu biegen,
wobei die erste Öffnung (9) länglich ist und die Längserstreckung der ersten Öffnung (9) mit der Längserstreckung der Druck-Zug-Kette (5) ausgerichtet ist,
wobei es dem lösbare Verbindungszapfen (8) ermöglicht wird, sich in der ersten Öffnung (9) in Richtung der Längserstreckung der ersten Öffnung (9) zu bewegen, wobei die Längserstreckung der ersten Öffnung (9) mit der Längserstreckung der Druck-Zug-Kette (5) ausgerichtet ist.

15. Dachfenster nach Anspruch 14, wobei die Halterung (6) eine vierte Öffnung (17) umfasst, die zum Aufnehmen eines Vorspannzapfens (18) ausgelegt ist, wobei sich der Vorspannzapfen (18) durch die vierte

Öffnung (17) erstreckt und die Halterung (6) mit dem Fensterflügel (1) verbindet,
wobei die Belastung (L) des Fensterflügels (1) die Druck-Zug-Kette (5) dazu zwingt, sich in die zweite entgegengesetzte Richtung (D2) zu biegen, indem der Vorspannzapfen (18) die Belastung (L) des Flügels (1) auf die Halterung (6) ausübt.

Revendications

1. Fenêtre de toit comprenant un châssis (1) et un encadrement (2) apte à recevoir ledit châssis (1), ledit châssis (1) comprenant deux éléments latéraux de châssis (1a, 1b) connectés à un élément de châssis supérieur (1c) et un élément de châssis inférieur (1d), ledit châssis (1) étant en option suspendu audit encadrement au moyen de bras de suspension (3), ledit châssis (1) étant configuré pour pivoter autour d'un axe de pivotement (A) de manière à ouvrir ledit châssis vers une face extérieure de ladite fenêtre, chaque bras de suspension optionnel (3) s'étendant au moins partiellement entre un élément latéral de châssis (1a, 1b) et un élément latéral d'encadrement (2a, 2b),
ladite fenêtre de toit comprenant en outre :

au moins un actionneur (4) apte à faire pivoter ledit châssis (1) entre une position fermée et des positions ouvertes, ledit actionneur (4) étant apte à bloquer ledit châssis (1) dans ladite position fermée,
ledit actionneur (4) comprenant une chaîne de poussée-traction (5) et un support (6), ledit support (6) étant connecté de manière rigide à une première extrémité (5a) de ladite chaîne de poussée-traction, une seconde extrémité (5b) de ladite chaîne de poussée-traction étant reçue dans un boîtier d'actionneur (7) connecté audit encadrement (2),
une broche de connexion dissociable (8) avec une première extrémité de broche (8a) et une seconde extrémité de broche (8b),
ledit support (6) comprenant une première ouverture (9) apte à recevoir ladite broche de connexion dissociable (8),
ladite broche de connexion dissociable (8) connectant de manière dissociable ledit support (6) à au moins un parmi ledit élément de châssis latéral (1a, 1b) et ledit bras de suspension (3), ladite broche de connexion dissociable (8) s'étendant dans un sens sensiblement parallèle audit axe de pivotement (A) à travers ladite première ouverture (9) et à travers au moins une parmi une deuxième ouverture (10) dans ledit élément latéral de châssis (1a, 1b) et une troisième ouverture (11) dans ledit bras de suspension (3), et ladite première extrémité de broche (8a) étant disposée plus près d'un centre (C) dudit châssis ladite seconde extrémité de broche (8b), et
un moyen de verrouillage (12) s'engageant dans ladite première extrémité de broche (8a), ledit moyen de verrouillage (12) étant configuré pour empêcher ladite broche de connexion dissociable (8) d'être retirée d'au moins une parmi ladite deuxième ouverture (10) et ladite troisième ouverture (11).

2. Fenêtre de toit selon la revendication 1, dans laquelle ladite première extrémité de broche (8a) est configurée pour s'engager dans ledit moyen de verrouillage (12).

3. Fenêtre de toit selon la revendication 1 ou 2, dans laquelle ladite chaîne de poussée-traction (5) comprend une pluralité de liens couplés (13), un dernier lien (13a) à ladite première extrémité (5a) de ladite chaîne de poussée-traction formant ledit support (6).

4. Fenêtre de toit selon l'une quelconque des revendications précédentes, dans laquelle ladite broche de connexion dissociable (8) s'étend à travers ladite deuxième ouverture (10) dudit élément latéral de châssis (1a, 1b), ladite première extrémité de broche (8a) et ledit moyen de verrouillage (12) étant disposés dans un retrait dans ledit élément latéral de châssis (1a, 1b), ladite seconde extrémité de broche (8b) étant disposée entre ledit élément latéral d'encadrement (2a, 2b) et ledit élément latéral de châssis (1a, 1b).

5. Fenêtre de toit selon la revendication 4, dans laquelle ladite broche de connexion dissociable (8) s'étend en outre à travers ladite troisième ouverture (11) dudit bras de suspension (3), ladite seconde extrémité de broche (8b) étant disposée entre ledit élément latéral d'encadrement (2a, 2b) et ledit bras de suspension (3).

6. Fenêtre de toit selon l'une quelconque des revendications 1 à 3, dans laquelle ladite broche de connexion dissociable (8) s'étend en outre à travers ladite troisième ouverture (11) dudit bras de suspension (3), ladite première extrémité de broche (8a) et ledit moyen de verrouillage (12) étant disposés entre ledit bras de suspension (3) et ledit élément latéral de châssis (1a, 1b), ladite seconde extrémité de broche (8b) étant disposée entre ledit élément latéral d'encadrement (2a, 2b) et ledit bras de suspension (3).

7. Fenêtre de toit selon l'une quelconque des revendications précédentes, dans laquelle ledit bras de suspension (3) comprend un rebord (3a) s'étendant en parallèle à ladite troisième ouverture (11), ledit re-

bord (3a) couvrant au moins partiellement un intervalle entre ledit bras de suspension (3) et ledit élément latéral de châssis (1a, 1b).

8. Fenêtre de toit selon l'une quelconque des revendications précédentes, dans laquelle ledit moyen de verrouillage (12) comprend au moins un élément parmi un écrou fileté, un ressort, un clip, une glissière et une broche.

9. Fenêtre de toit selon l'une quelconque des revendications précédentes, dans laquelle ladite seconde extrémité de broche (8b) comprend une section élargie trop large pour passer à travers au moins une parmi ladite première ouverture (9), ladite deuxième ouverture (10) et ladite troisième ouverture (11), et ladite première extrémité de broche (8a) comprend un canal traversant (14) s'étendant à la perpendiculaire d'un axe central (CA) de ladite broche de connexion dissociable (8) pour recevoir une partie dudit moyen de verrouillage (12).

10. Fenêtre de toit selon l'une quelconque des revendications précédentes, dans laquelle ledit actionneur (4) comprend en outre un boîtier de protection (15) apte à fermer ledit moyen de verrouillage (12) et ladite première extrémité de broche (8a).

11. Fenêtre de toit selon la revendication 10, dans laquelle ledit boîtier (15) comprend deux moitiés de boîtier, une moitié de boîtier comprenant une ouverture d'accès (15a) permettant d'accéder audit moyen de verrouillage (12), de sorte que ledit moyen de verrouillage (12) peut être dissocié de ladite broche de connexion dissociable (8).

12. Fenêtre de toit selon la revendication 10 ou 11, dans laquelle chaque bras de suspension (3) a une section transversale en forme de U renversé renfermant ledit moyen de verrouillage (12) et ledit boîtier (15), une extrémité ouverte de ladite forme de U étant au moins partiellement dirigée vers un élément latéral d'encadrement adjacent (2a, 2b).

13. Fenêtre de toit selon la revendication 12, dans laquelle ledit moyen de verrouillage (12) est accessible par une ouverture de paroi (16) pratiquée dans une paroi (3b) de ladite section transversale en forme de U, ladite paroi (3b) s'étendant de manière à être adjacente audit élément latéral de châssis (1a, 1b) .

14. Fenêtre de toit selon l'une quelconque des revendications précédentes, dans laquelle ledit actionneur (4) est apte à faire pivoter ledit châssis (1) par rapport audit encadrement (2) à l'encontre d'une charge (L) dudit châssis (1), ladite charge (L) étant principalement due au poids dudit châssis (1), ladite chaîne de poussée-traction (5) étant apte à fléchir librement dans un premier sens (D1) après une configuration dans laquelle ladite chaîne de poussée-traction forme une ligne droite (5c), et seulement jusqu'à une extension limitée après ladite configuration en ligne droite (5c) dans un second sens opposé (D2),

ledit support (6) créant un point support (S) pour supporter la charge (L) dudit châssis (S), ledit point support (S) étant décalé latéralement de l'extension longitudinale de ladite chaîne de poussée-traction (5), de sorte que la charge (L) dudit châssis (1) force ladite chaîne de poussée-traction (5) à fléchir dans ledit second sens opposé (D2),
ladite première ouverture (9) étant oblongue et l'extension longitudinale de ladite première ouverture (9) étant alignée avec l'extension longitudinale de ladite chaîne de poussée-traction (5),
ladite broche de connexion dissociable (8) pouvant se déplacer dans ladite première ouverture (9) dans le sens d'extension longitudinale de ladite première ouverture (9), l'extension longitudinale de ladite première ouverture (9) étant alignée avec l'extension longitudinale de ladite chaîne de poussée-traction (5) .

15. Fenêtre de toit selon la revendication 14, dans laquelle ledit support (6) comprend une quatrième ouverture (17) apte à recevoir une broche de pré-chargement (18), ladite broche de pré-chargement (18) s'étendant à travers ladite quatrième ouverture (17) et connectant ledit support (6) audit châssis (1), la charge (L) dudit châssis (1) forçant ladite chaîne de poussée-traction (5) à fléchir dans le dit second sens opposé (D2) du fait que ladite broche de pré-chargement (18) applique la charge (L) dudit châssis (1) sur ledit support (6).

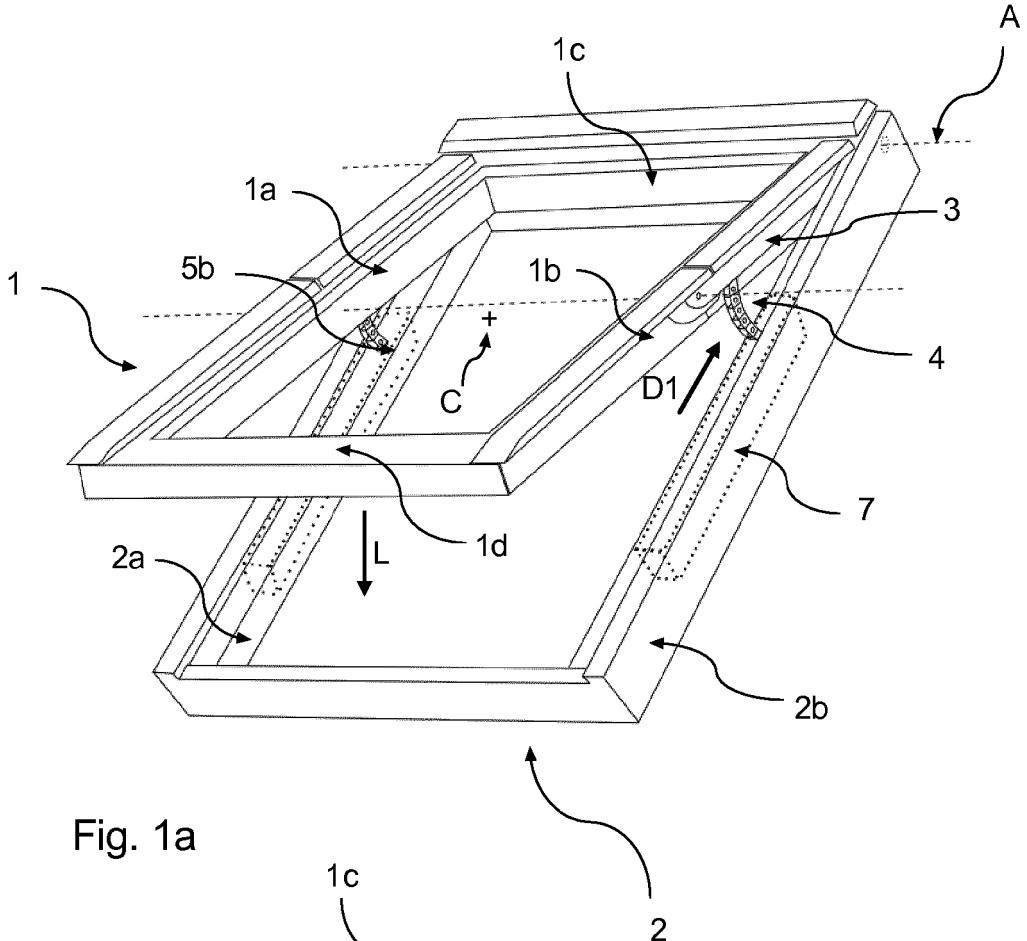

Fig. 1a

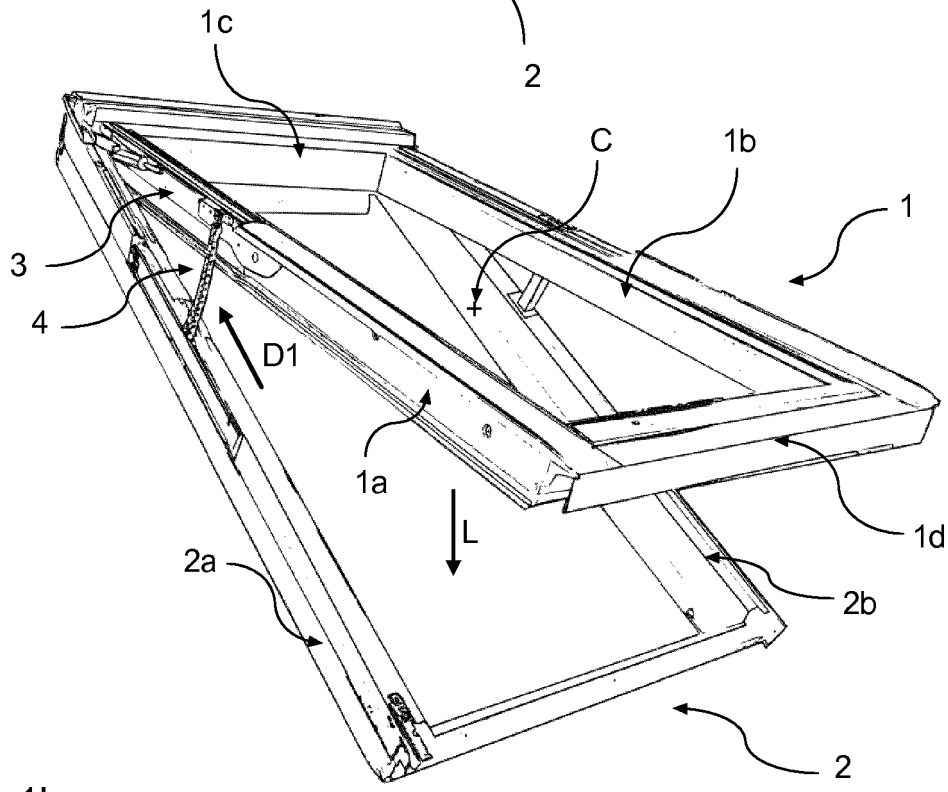

Fig. 1b

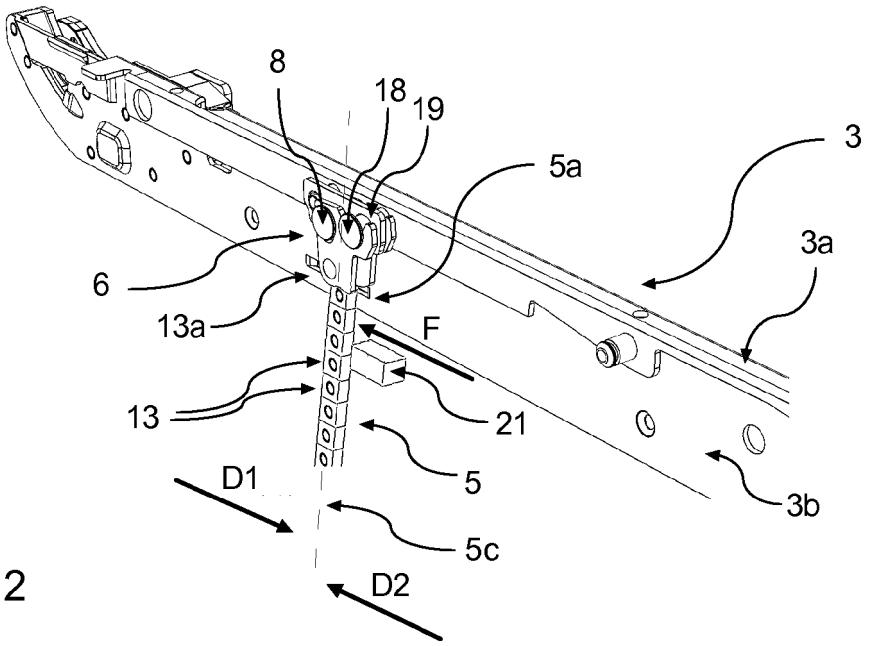

Fig. 2

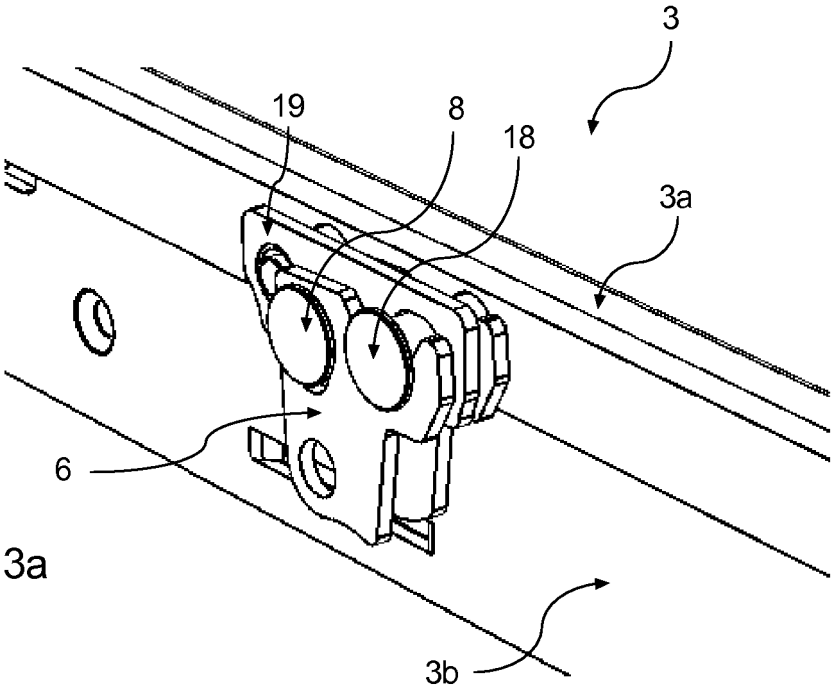

Fig. 3a

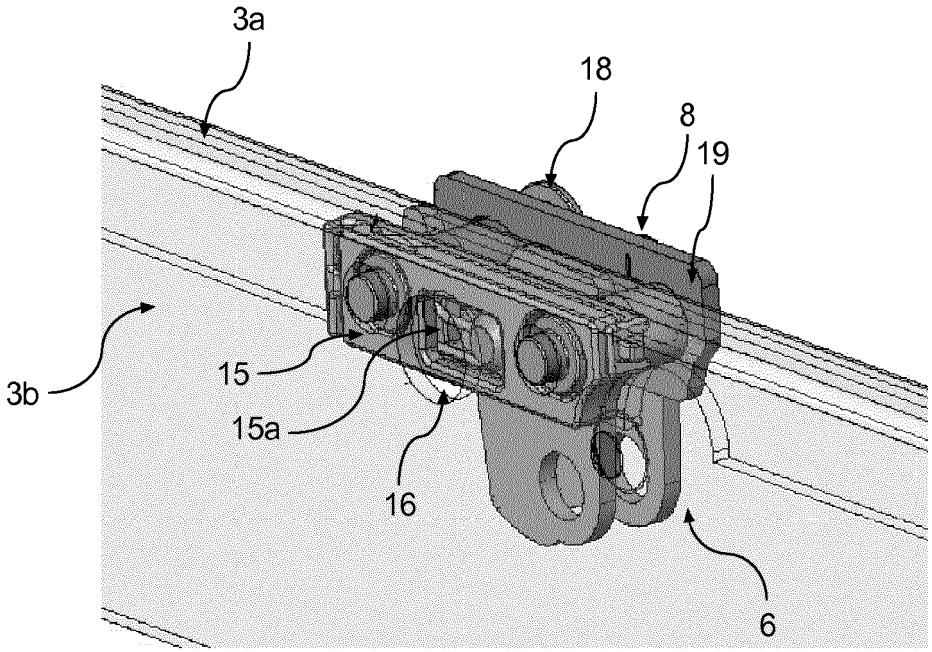

Fig. 3b

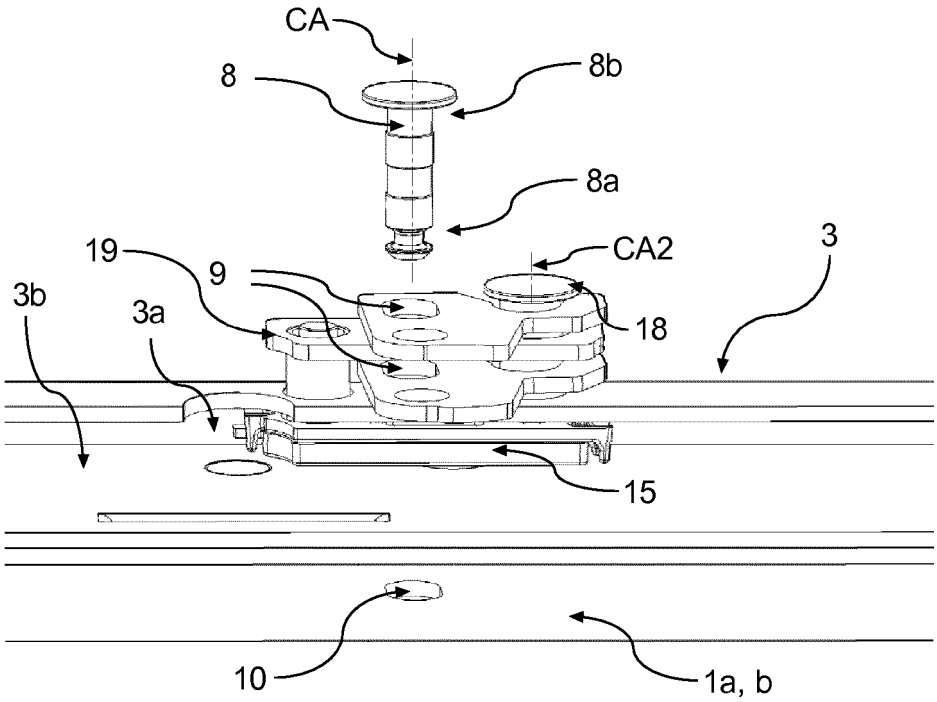

Fig. 3c

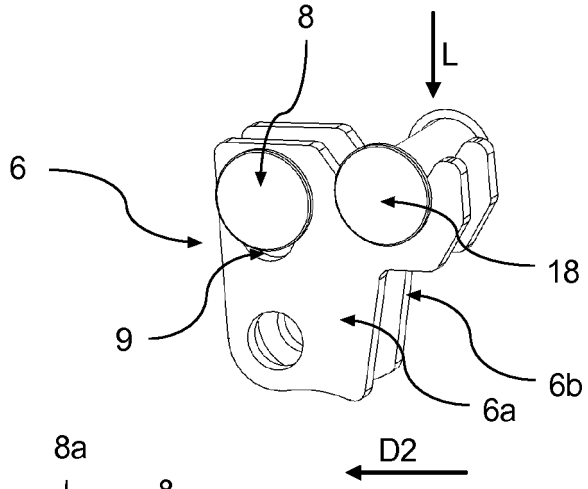

Fig. 4a

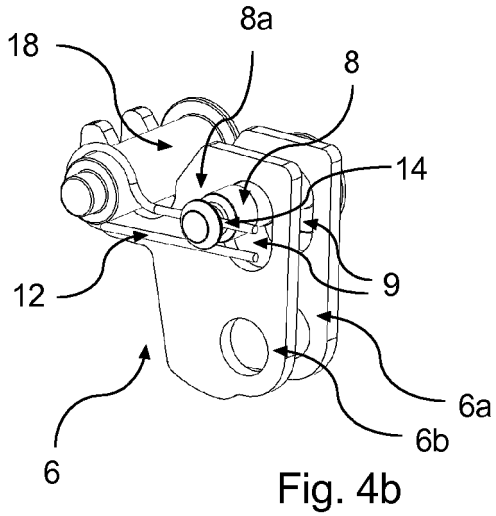

Fig. 4b

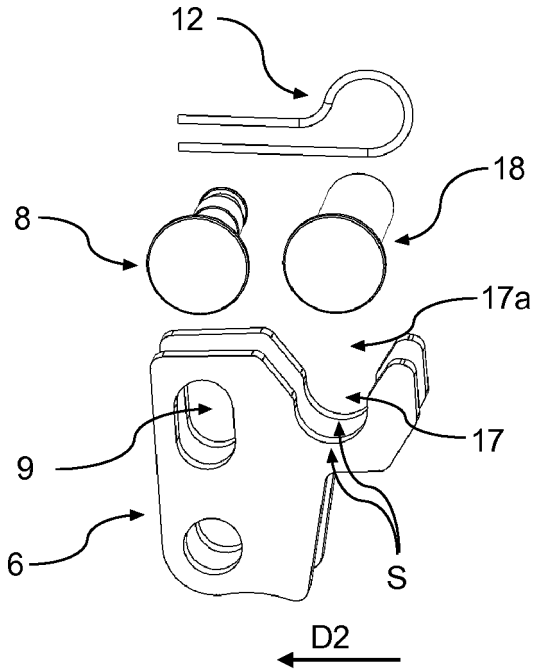

Fig. 4c

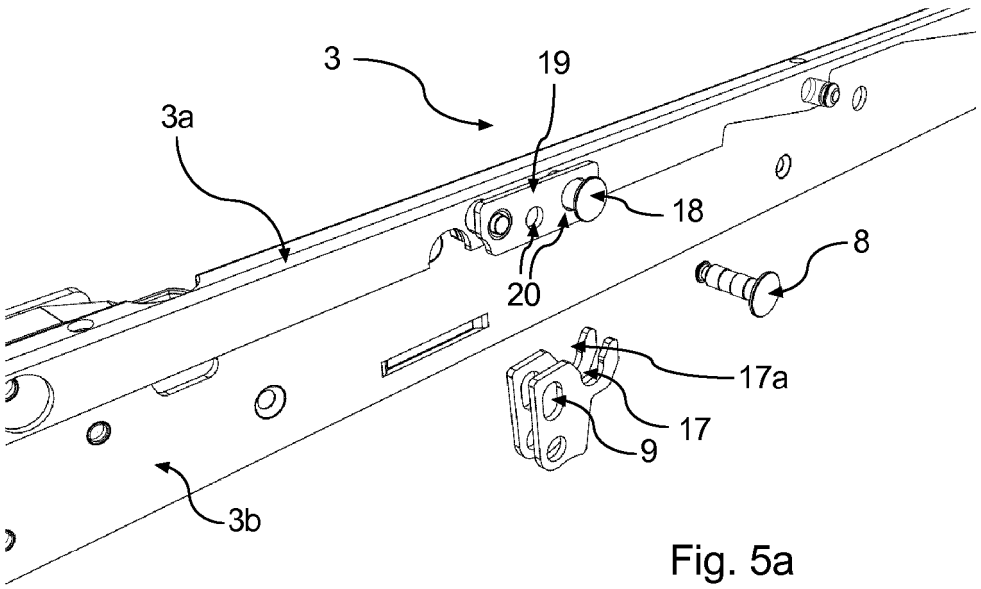

Fig. 5a

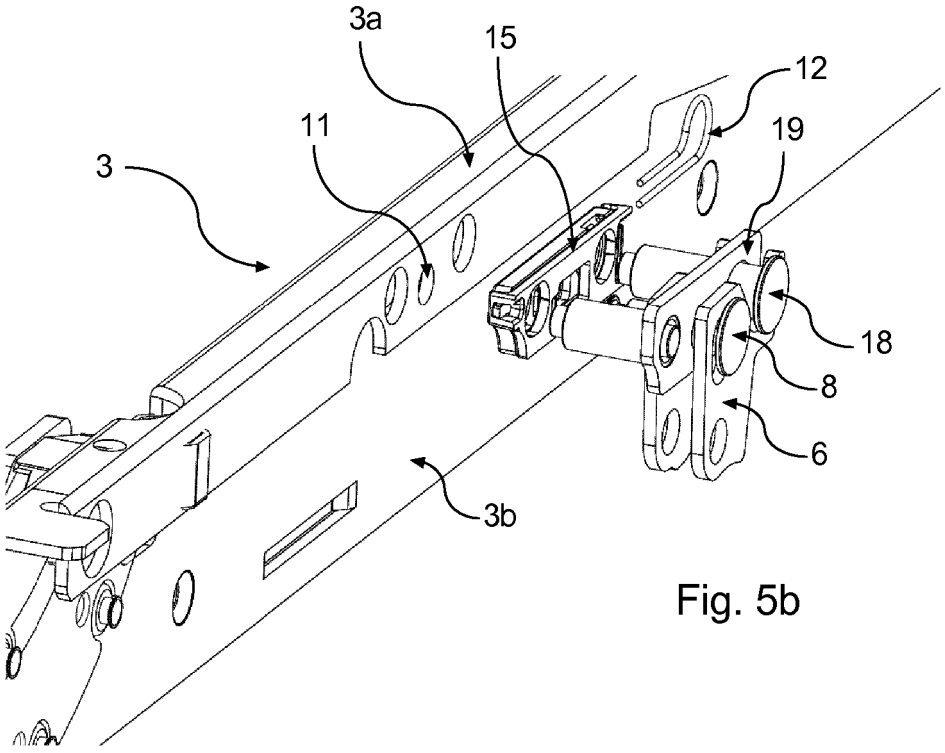

Fig. 5b

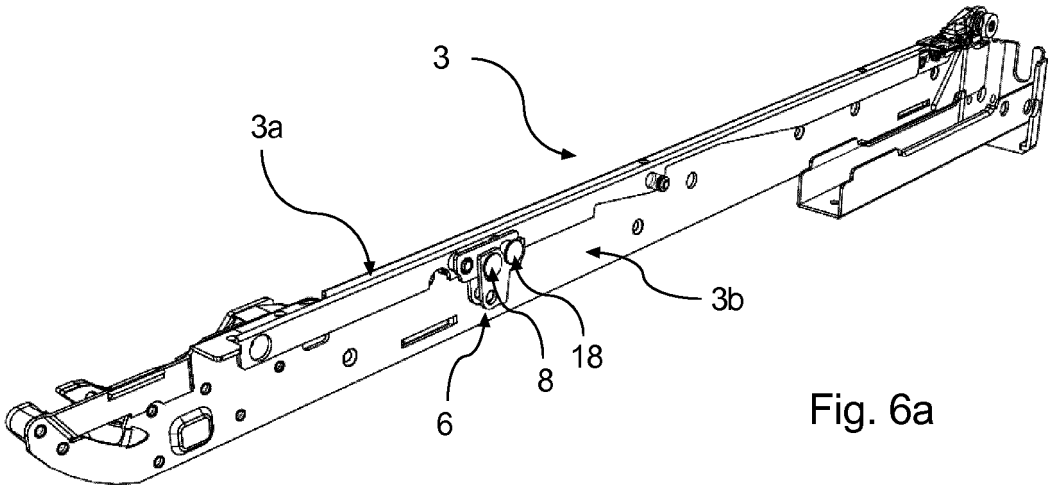

Fig. 6a

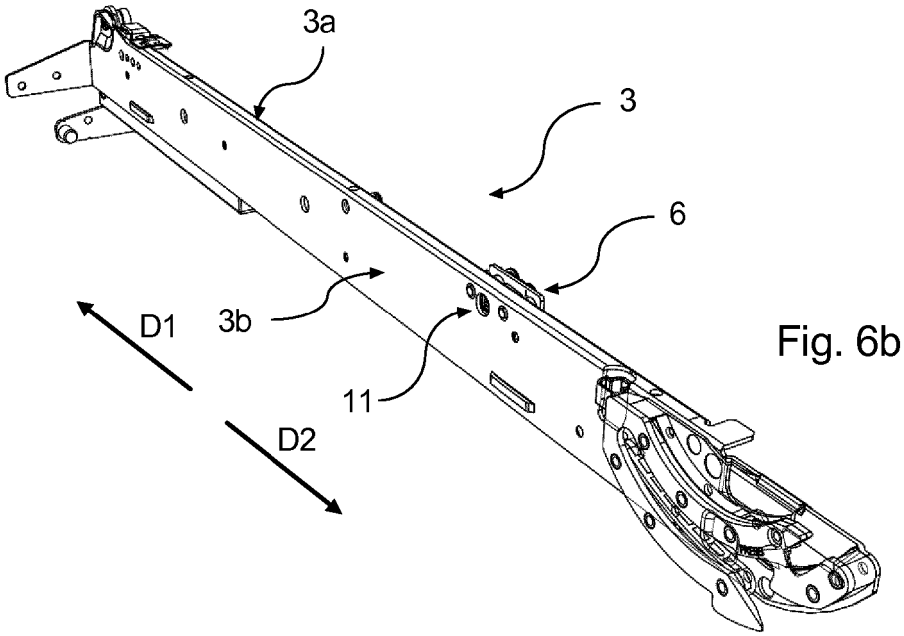

Fig. 6b

REFERENCES CITED IN THE DESCRIPTION

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