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(54) Three-bar hinge

(57) This invention relates to a three-bar hinge (4), and in particular to a three-bar hinge incorporating a restrictor, most suitably for use with a top swing window. The three-bar hinge (4) has a main bar (11). The main bar is indirectly connected to a base (10) by way of two link bars (12, 13), each link bar being pivotably connected to the base (10) and to the main bar (11). One of the link bars (12) and the base (10) has a respective restrictor peg (16) and a restrictor opening (17), the restrictor peg being locatable in the restrictor opening in order to limit the movement of the main bar relative to the base, and thereby restrict the opening movement of a window panel. The restrictor peg (16) is releasable from the restrictor opening (17) to permit full opening of the window panel when desired. The three-bar hinge has a locking mechanism (30) which is adapted to retain the restrictor peg within the restrictor opening.

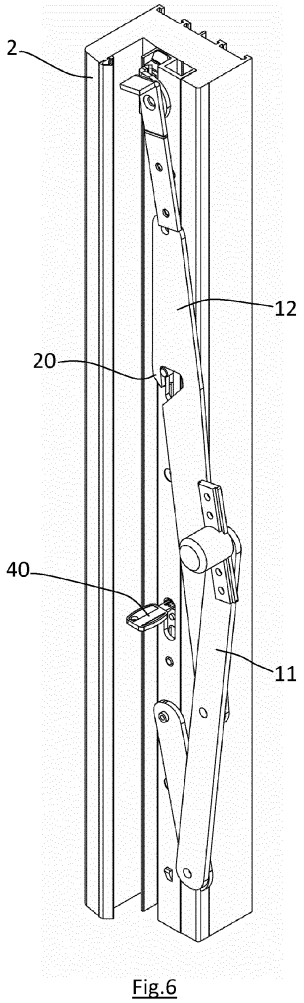

Fig.6

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Description

FIELD OF THE INVENTION

[0001] This invention relates to a three-bar hinge, and in particular to a three-bar hinge incorporating a restrictor.

[0002] The invention has been designed for use with a top swing window and the following description will therefore relate primarily to that application. The use of the invention in other window and non-window applications is not thereby excluded.

[0003] In this description, directional and orientational terms such as "top", "bottom", "vertical" etc., usually refer to a top swing window in its normal orientation of use, and with the three-bar hinge fitted in its expected position of use as shown in Fig.1, unless stated otherwise.

BACKGROUND OF THE INVENTION

[0004] There are many different types of opening window available on the market. The type of window to which this invention is directed is most often referred to as a "top swing" window. Such a window is designed to pivot about a substantially horizontal axis. The window may be able to pivot through around 90 degrees (or perhaps more). Such a window is not mounted upon fixed (butt) hinges, but instead is mounted upon two sets of pivoting stays, each set of pivoting stays being most often referred to as a "three-bar hinge". The action of the three-bar hinge is such that the pivot axis moves as the window is opened.

[0005] A top swing window is shown schematically in Fig.1. In this window a single pivotable window panel 1 is provided, but it will be understood that top swing windows may be used in conjunction with other (fixed or movable) window panels in a common window frame.

[0006] The window panel 1 is mounted within a fixed window frame 2, and has a handle 3 connected to locking means (not seen) by which the window panel 1 may be secured in its closed position relative to the frame 2, in known fashion. The window panel 1 is supported by a pair of three-bar hinges 4, which are located in the gap between the window frame 1 and window panel 2 along the vertical edges of the window, and are therefore shown in dotted outline as they are not visible when the window panel is closed.

[0007] When the handle 3 is turned to open the window panel 1, the bottom edge 5 of the window panel may be pushed outwardly, the window panel being caused to pivot about a substantially horizontal axis upon the aligned mounting pegs (not shown in Fig.1 but see the mounting peg 6 in Fig.3) of the respective three-bar hinges 4. During this pivoting movement, the top edge 7 of the window panel 1 also moves away from its corresponding frame part.

[0008] The mounting pegs of the three-bar hinges upon which the window panel 1 is mounted move out of alignment with the window frame 2 during the opening movement. The effect of this is that the window panel 1 undergoes a somewhat complex movement, with the top edge 7 moving downwardly relative to the window frame 2. The three-bar hinges 4 define a fully open position for the window panel 1. Some three-bar hinges provide around 90° of opening movement, i.e. the fully open position for the window is substantially horizontal, the window panel 1 projecting outwardly from the window frame 2. Other three-bar hinges provide almost 180° of opening movement, so that the peripheral lip surrounding the window panel engages the frame. The opened position permits the outside of the window panel 1 to be cleaned from inside the room or building, and can also permit persons to exit the room or building in case of an emergency.

[0009] In order to prevent a person such as a child from falling out of an opened window, the handle 3 is usually key-lockable. However, the user must unlock the handle when the window is to be opened for cleaning or ventilation and if the user fails to re-lock the handle after the window has been closed there is then no barrier to a child for example (deliberately or inadvertently) opening the window panel 1 sufficiently to fall through the window opening.

[0010] This is a disadvantage with all opening windows, and has been addressed in relation to top swing windows by the use of a safety catch or restrictor which permits only partial opening of the window, in particular to a position in which the window opening provides ventilation but is too small for a person to pass therethrough. British Standard BS 6375 in particular requires a window opening of no more than 100 mm in the restricted position.

[0011] A first known design of three-bar hinge includes a main bar which carries the mounting peg for the window, and a base which in use is connected to the fixed frame. The main bar is pivotably connected to the base, and is further connected to the base by way of a link bar which is mounted to pivot relative to the main bar and the base as the window is moved relative to the fixed frame. The pivot point of the main bar is provided upon a slider which is located in a channel of the base, the slider moving relative to the channel as the window is opened. By restricting the movement of the slider relative to the channel it is possible to restrict the opening movement of the window panel.

[0012] The security of this window restrictor can be increased by incorporating a locking mechanism which limits the movement of the slider within the channel. When the lock mechanism is in place the window may be opened only by the restricted amount (e.g. 100 mm). When it is desired to open the window further, the lock mechanism must be released by way of a key, and removed from the three-bar hinge in order to permit the slider to move within the channel.

[0013] It is a disadvantage of this known lock mechanism that it can easily be misplaced once removed. If the lock mechanism is removed so that the window may be fully opened for cleaning, for example, the user may sim-

ply forget to replace the lock mechanism when the window is subsequently closed, so that subsequent opening of the window is not restricted.

[0014] A second design of three-bar hinge differs from the first design in that the main bar is not connected directly to the base, but is indirectly connected thereto by two link bars, each link bar being pivotably connected to the main bar and the base. The present invention relates to a three-bar hinge of this design. In these three-bar hinges there is no slider so that another method of restricting the window opening movement must be used.

SUMMARY OF THE INVENTION

[0015] It is an object of this invention to provide a three-bar hinge of the second design incorporating a restrictor whereby the opening movement of a window panel may be restricted.

[0016] According to the invention therefore, there is provided a three-bar hinge having a main bar and a base, the main bar being indirectly connected to the base by way of two link bars, each link bar being pivotably connected to the base and to the main bar, one of the link bars and the base having a respective restrictor peg and a restrictor opening, the restrictor peg being locatable in the restrictor opening in order to limit the movement of the main bar relative to the base, the restrictor peg being releasable from the restrictor opening, the three-bar hinge having a locking mechanism which is adapted to lock the restrictor peg within the restrictor opening.

[0017] The main bar is designed to be mounted upon a movable panel and the base is designed to be mounted upon the fixed frame. In the particular application of a top swing window, the main bar will typically carry a mounting peg upon which the window panel is mounted.

[0018] Instead of restricting the movement of the slider in the direction of the longitudinal axis of the base as in the first design of three-bar-hinge, the present invention restricts the movement of a link bar in the direction perpendicular to the longitudinal axis of the base.

[0019] Preferably, the restrictor peg is connected to the locking mechanism, and both components are movably mounted upon the base. Preferably also, the restrictor opening is formed in a link bar.

[0020] Desirably, the restrictor peg is movable in the direction of the longitudinal axis of the base, the restrictor peg being movable between a restricting position and a non-restricting position. In the restricting position the restrictor peg can lie within the restrictor opening, and in the non-restricting position the restrictor peg can lie outside the restrictor opening.

[0021] Preferably, the restrictor opening is provided as a recess or cut-out of the link bar. Preferably also, the recess or cut-out also provides a guideway for the restrictor peg, the guideway being connected to the restrictor opening.

[0022] Desirably, the guideway has an angled surface, engagement of the restrictor peg upon the angled surface guiding the restrictor peg into the restrictor opening. Engagement of the restrictor peg upon the angled surface preferably causes movement of the restrictor peg from its unrestricted position to its restricted position. In this way, it can be arranged that closing movement of the (unrestricted) window panel causes the restrictor peg to enter the restrictor opening whereby subsequent opening movement of the window panel is restricted.

[0023] Preferably, the restrictor peg is located upon a slide member which is carried by the base, and which is slidable relative to the base in the direction of the longitudinal axis of the base. The slide member may be secured to the base by fastenings which are located in elongated openings in the slide member, the elongated openings permitting the desired amount of longitudinal movement whereby the restrictor peg can move between its restricting and non-restricting positions.

[0024] Desirably, the lock mechanism is also carried by the slide member. In this way, the lock mechanism is carried by the three-bar hinge and is not releasable therefrom. Only the key is removable, in common with most designs of lock mechanism. Since the lock mechanism is not separable from the three-bar hinge by the user, it cannot become lost, and the user cannot forget to replace it.

[0025] Preferably, the lock mechanism includes a lock member which is resiliently biased in a direction substantially perpendicular to the longitudinal axis of the base, i.e. substantially perpendicular to the direction of movement of the slide member. Desirably, the base includes a lock opening adjacent to the slide member into which the lock member can project, the lock member being biased to project into the lock opening. It is arranged that when the restrictor peg is in its restricting position the lock member lies alongside the lock opening and is biased thereinto. It is also arranged that a key must be inserted into the lock mechanism in order to release the lock member from the lock opening and permit the slide member to move relative to the base, and thereby to permit the restrictor peg to move to its non-restricting position.

[0026] The biasing of the lock member means that when the key is subsequently removed, and the window is closed, the restrictor peg will be driven to its restricting position by the angled surface of the guideway, the slide member will move correspondingly to the position in which the lock member lies alongside the lock opening, and the lock member will be driven into the lock opening by its resilient bias. In this way, the lock mechanism is automatically actuated, and the window movement becomes restricted, each time the window is closed. It is therefore not possible for the user to forget to actuate the restrictor.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0027] The invention will now be described in more de-

tail, by way of example, with reference to the accompanying drawings, in which:

Fig.1 shows a schematic view of a top swing window fitted with two three-bar hinges, at least one of which is according to the present invention;

Fig.2 shows a side view of one of the three-bar hinges of the window of Fig.1, in a partially-opened (unrestricted) position;

Fig.3 shows the three-bar hinge of the invention, in an unrestricted condition;

Fig.4 shows the three-bar hinge in a restricted condition;

Fig.5 shows the three-bar hinge in an unrestricted condition;

Fig.6 shows a perspective view similar to Fig.4;

Fig.7 shows a perspective view of the three-bar hinge in an alternative unrestricted position;

Fig.8 shows an exploded view of the three-bar hinge, from the front; and

Fig.9 shows an exploded view from the rear.

DETAILED DESCRIPTION

[0028] A description of the window panel 1 of Fig.1 is set out above and will not be repeated.

[0029] Fig.2 shows one of the two three-bar hinges 4 in its position between the fixed window frame 2 and the movable window panel 1. As also seen in Fig.3, and in common with three-bar hinges of the second design, the three-bar hinge 4 comprises a base 10, a main bar 11, a first link bar 12 and a second link bar 13.

[0030] The mounting peg 6 is carried by the main bar 11, and is connected to the window panel 1 by way of suitable fastenings. As shown in Figs. 4-7, in this embodiment the window panel 1 is also connected to a mounting bracket 14, but in other embodiments this additional mounting bracket is not provided.

[0031] The main bar 11 is not connected directly to the base 10, but instead is indirectly connected thereto by the first link bar 12 and the second link bar 13, each of which is pivotably mounted to both of the base 10 and the main bar 11. The pivot points 15 for the respective link bars 12 and 13 are both fixed relative to the base 10.

[0032] The three-bar hinge 4 restricts the opening movement of the window panel 1 by limiting the relative movement of a link bar in a direction substantially perpendicular to the longitudinal axis A-A of the base 10. The relative movement of the first link bar 12 is utilised in this embodiment, but it will be understood that the relative movement of the second link bar 13 could be used in alternative embodiments.

[0033] The three-bar hinge 4 has a restrictor peg 16 carried by the base 10 and a restrictor opening 17 located in the first link bar 12. The restrictor opening 17 is connected to a guideway 18, the restrictor opening 17 and the guideway 18 being formed together as a single cut-out in the first link bar 12.

[0034] Figs.4 and 6 show the three-bar hinge 4 in its restricted condition. It will be noted that the restrictor peg 16 is located within the restrictor opening 17, i.e. that portion of the cut-out which lies behind the projecting wall 20.

[0035] Figs.2-9 represent positions in which a fitted window is partially opened (by varying distances), and it will be understood that when the window is closed the main bar 11 and the link bars 12, 13 all overlie the base 10. Whilst in the position shown in Fig.4 the restrictor peg 16 is engaging the projecting wall 20, when the window is closed the restrictor peg 16 lies a small distance away from the projecting wall 20. It will be understood that it is the relationship between that small distance between the projecting wall 20 and the restrictor peg 16, and the distance between the restrictor peg 16 and the pivot peg 15 of the first link bar 12, which determines the angle through which the (restricted) window panel 1 may be opened.

[0036] In contrast to Figs.4 and 6, Figs.5 and 7 both show the three-bar hinge 4 in its non-restricted condition, i.e. with the restrictor peg 16 released from the restrictor opening 17. A comparison of Fig 4 with Fig.5, and a comparison of Fig.6 with Fig.7, shows that the restrictor peg 16 has been moved downwardly to its unrestricted position, out of alignment with the projecting wall 20 and therefore out of the restrictor opening 17. Once the restrictor peg 16 has been moved out of alignment with the projecting wall 20 the first link bar 12 may be pivoted further (as shown in Fig.7), corresponding to unrestricted opening of the window panel 1.

[0037] As seen in the exploded views of Figs. 8 and 9, the restrictor peg 16 is carried by a slide member 21, and is specifically fastened in a hole 22 in the slide member 21. The slide member 21 is located in a channel 23 of the base 10. The slide member 21 is secured within the channel 23 by two screws 24, which pass through respective elongated openings 25 in the slide member and into respective holes 26 in the base 10. The base 10 includes a similarly-elongated opening 27 for the restrictor peg 16.

[0038] The slide member 21 also carries a lock mechanism 30, which comprise two plates 31 and 32, which lie to opposed sides of the slide member 21 and are connected together by two pegs 33 which pass through holes 34 in the slide member 21. The plates 31, 32 together define a channel which contains a lock member 35 and two compression springs 36, whereby the lock member 35 is resiliently biased to project from the channel.

[0039] The base 10 has a lock opening 37 which can receive the lock member 35. It is arranged that the slide

member 21 can move relative to the base 10, in the direction of the longitudinal axis A-A, between a restricting position shown in Figs. 4 and 6 and a non-restricting position shown in Figs. 5 and 7. In the restricting position the lock member 35 is aligned with the lock opening 37. The resilient biasing of the lock member 35 means that the lock mechanism 30 is actuated each time the slide member 21 moves to its restricting position.

[0040] In order to release the three-bar hinge 4 and permit unrestricted window opening, a key 40 must be inserted through the elongated opening 41 in the base 10 and into the keyway of the lock mechanism 30. In this embodiment the key 40 does not need to be rotated and it is arranged that the insertion of the key 40 is sufficient to move the lock member 35 out of the lock opening 37. The form of the key 40 and its corresponding keyway is therefore very simple, but is shaped to avoid the lock mechanism being actuated by a screwdriver, paper clip or the like. Thus, it is not usually necessary for the lock mechanism 30 to be particularly secure, just sufficiently secure in order to prevent a child from inadvertently or deliberately releasing the lock mechanism.

[0041] In order to release the restrictor the window panel 1 must first be partially opened, to the position close to that of Figs 4 and 6, so that the elongated opening 41 and the underlying keyway is visible. The key 40 is inserted into the keyway, which moves the lock member 35 out of the lock opening 37. The key can then be pressed downwardly to move the slide member from the position of Figs. 4 and 6 to the position of Figs. 5 and 7. This releases the restrictor peg 16 from the restrictor opening 17, and permits full opening movement of the window panel 1.

[0042] When the window panel 1 is subsequently closed, the key 40 must be removed otherwise it will foul the first link bar 11. During closing movement of the window panel 1, the three-bar hinge 4 moves from the position of Fig. 7 into the position of Fig.5, i.e. the window is closed until the restrictor peg 16 enters the guideway 18. The guideway 18 has an angled surface 42 (see Fig. 5).

[0043] As the window is closed further, beyond the position of Fig.5, the angled surface 42 drives the restrictor peg 16 upwardly and into the restrictor opening 17. As the restrictor peg 16 is moved upwardly the slide member 21 is corresponding moved upwardly.

[0044] It is arranged that the angled surface 42 drives the restrictor peg 16, and thereby the slide member 21, sufficiently far so that the lock member 35 moves into alignment with the lock opening 37, whereupon the resilient bias of the compression springs 36 drive the lock member 35 into the lock opening 37. The three-bar hinge 4 therefore becomes automatically locked in its restricted condition when the window panel 1 is closed.

[0045] It is preferred that the closing movement of the window panel 1 drives the restrictor peg 16 to its restricted position, rather than spring biasing of the restrictor peg 16 for example. Thus, whilst it would be possible to spring bias the slide member 21 to its restricting position, it is mechanically simpler to utilise the closing movement of the window panel 1. Spring biasing the slide member would result in a "latching" arrangement each time the window panel 1 was closed from an unrestricted opened position, and would require an angled lead-in upon the projecting wall 20 of greater extent than that provided on the embodiment shown. The projecting wall 20 would likely have to be made wider in order to provide the required angled lead-in, whereas the guideway 18 is sufficiently wide (in the direction perpendicular to the longitudinal axis A-A) to accommodate a long angled surface and provide substantial longitudinal movement of the slide member 21.

[0046] In addition, spring biasing of the slide member 21 would mean that the user must hold the slide member in its unrestricted position until the restrictor peg 16 has passed the projecting wall 20, whereas in the present embodiment the key 40 may be removed as soon as the slide member 21 has been moved to its unrestricted position, and before the window panel 1 is opened further.

[0047] It will be seen from Fig.1 that the window 1 has two three-bar hinges 4. In this embodiment the security is increased by incorporating a lock mechanism 30 on both of the three-bar hinges, but it will be understood that the opening movement of the window 1 could alternatively be restricted by providing a locking restrictor on only one of the three-bar hinges, if desired. If both of the three-bar hinges include restrictors and lock mechanisms, they are preferably released by the same key 40.

[0048] As explained above, it is a feature of some three-bar hinges that they permit almost 180° of opening movement. With such three-bar hinges, the link bars 12, 13 pivot away from the base 10 during the first 90° or so of opening movement, and then pivot back towards the base 10 during the remaining opening movement. In such cases, the first link bar 12 may re-engage the restrictor boss 16 in the fully opened position, and the window panel 1 may become restricted in its fully opened position. That is advantageous in relation to large windows in particular, as it permits the outside of the window panel 1 to be cleaned without risk of the window panel moving more than a few centimetres. When it is desired to close the window panel 1, the key must be inserted and the slide member moved to its non-restricting position, as set out above.

[0049] It will be understood that an alternative embodiment could be provided in which the positions of the restrictor peg and the restrictor opening are reversed, i.e. the link bar 12 or 13 could carry a fixed restrictor peg and the slide member could have a cut-out or recess formed similarly to the guideway 118 and restrictor opening 117.

Claims

1. A three-bar hinge (4) having a main bar (11) and a base (10), the main bar being indirectly connected

to the base (10) by way of two link bars (12, 13), each link bar being pivotably connected to the base (10) and to the main bar (11), one of the link bars (12) and the base (10) having a respective restrictor peg (16) and a restrictor opening (17), the restrictor peg being locatable in the restrictor opening in order to limit the movement of the main bar relative to the base, the restrictor peg (16) being releasable from the restrictor opening (17), the three-bar hinge having a locking mechanism (30) which is adapted to retain the restrictor peg within the restrictor opening.

2. A three-bar hinge according to claim 1 in which the restrictor peg (16) is mounted upon the base (10).

3. A three-bar hinge according to claim 2 in which the restrictor peg (16) is connected to the locking mechanism (30).

4. A three-bar hinge according to claim 2 or claim 3 in which the restrictor peg (16) and the locking mechanism (30) are both movably mounted upon the base (10).

5. A three-bar hinge according to any one of claims 2-4 in which the restrictor peg (16) is movable relative to the base, the path of movement being substantially parallel to the longitudinal axis (A-A) of the base (10).

6. A three-bar hinge according to any one of claims 2-5 in which a slide member (21) is movably mounted upon the base, and in which the restrictor peg is mounted upon the slide member.

7. A three-bar hinge according to claim 6 in which the slide member (21) is secured to the base (10) by fastenings (24) which are located in elongated openings (25) in the slide member.

8. A three-bar hinge according to claim 6 or claim 7 in which the lock mechanism (30) is also mounted upon the slide member (21).

9. A three-bar hinge according to any one of claims 1-8 in which the lock mechanism includes a lock member (35) which is resiliently biased in a direction substantially perpendicular to the longitudinal axis (A-A) of the base (10).

10. A three-bar hinge according to claim 9 in which the base (10) includes a lock opening (37) into which the lock member (35) can project, the lock member being biased to project into the lock opening.

11. A three-bar hinge according to any one of claims 1-10 in which the restrictor opening (17) is provided as a cut-out of the link bar (12).

12. A three-bar hinge according to claim 11 in which the cut-out also provides a guideway (18) for the restrictor peg (16), the guideway being connected to the restrictor opening (17).

13. A three-bar hinge according to claim 12 in which the guideway (18) has an angled surface (42), movement of the restrictor peg (16) across the angled surface in use causing the restrictor peg to move relative to the base, the path of movement being substantially parallel to the longitudinal axis (A-A) of the base (10).

14. A three-bar hinge according to claim 13 in which the movement of the restrictor peg (16) relative to the base causes the restrictor peg (16) to move from its unrestricted position to its restricted position.

15. A three-bar hinge according to claim 13 or claim 14 in which the angled surface (42) is formed to guide the restrictor peg into the restrictor opening (17).

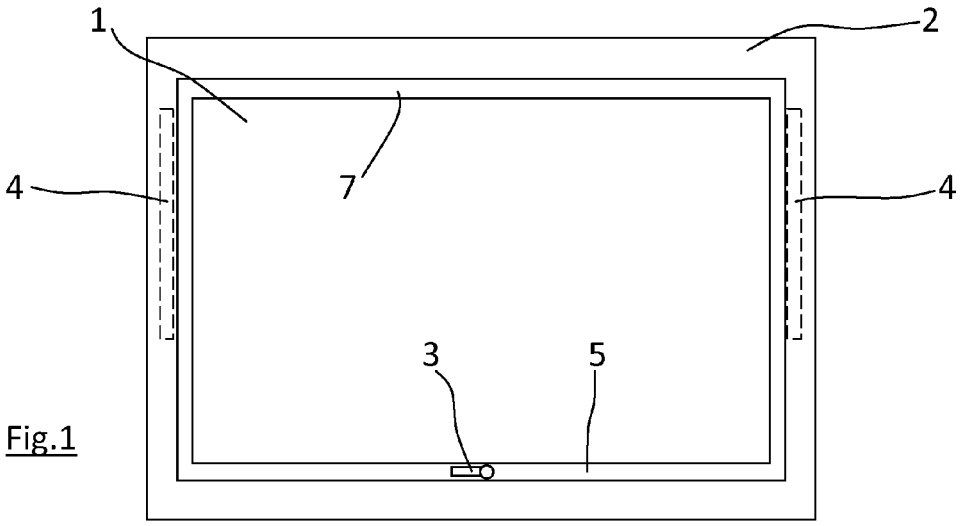

Fig.1

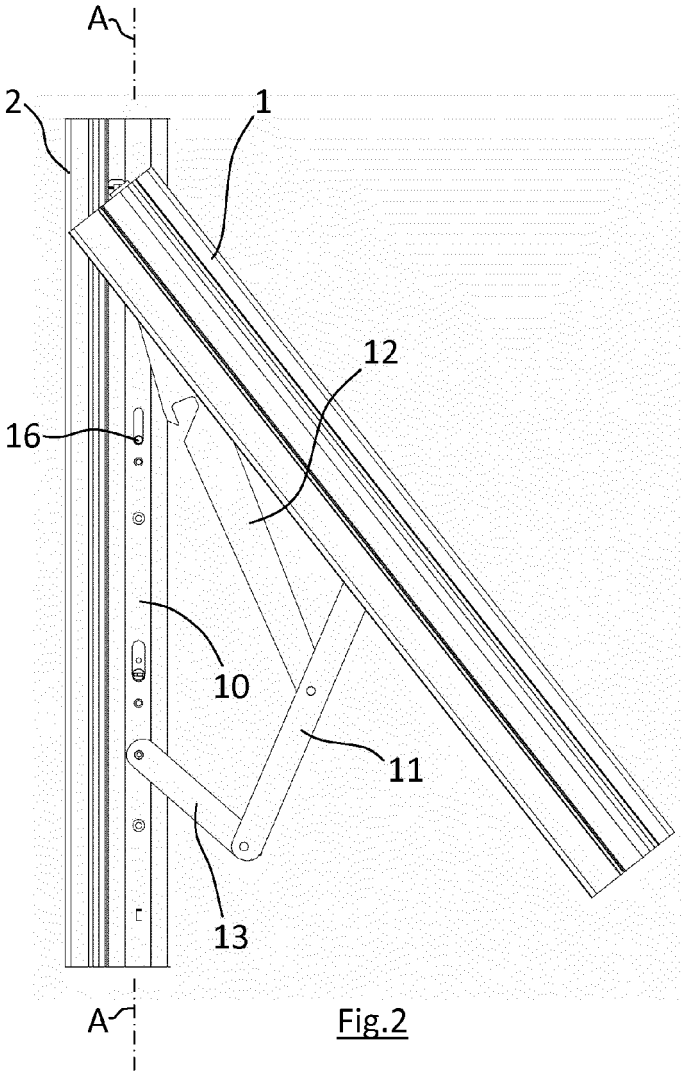

Fig.2

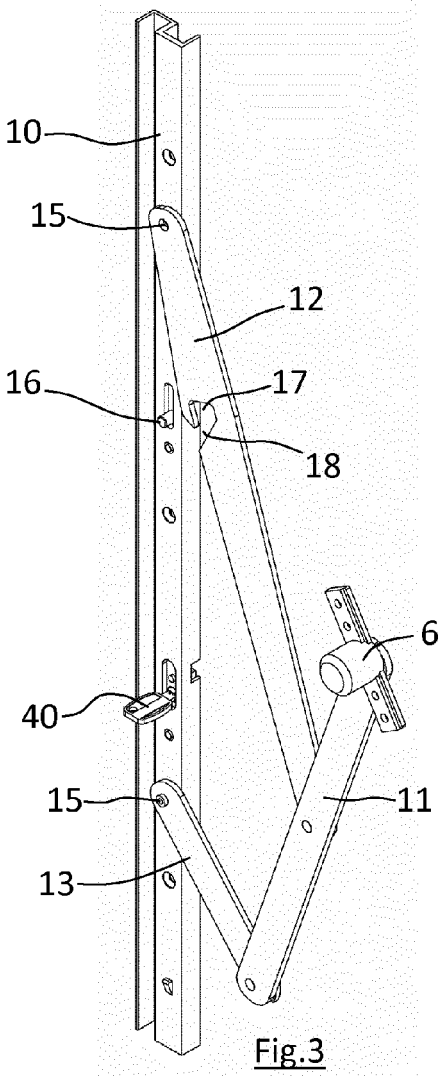

Fig.3

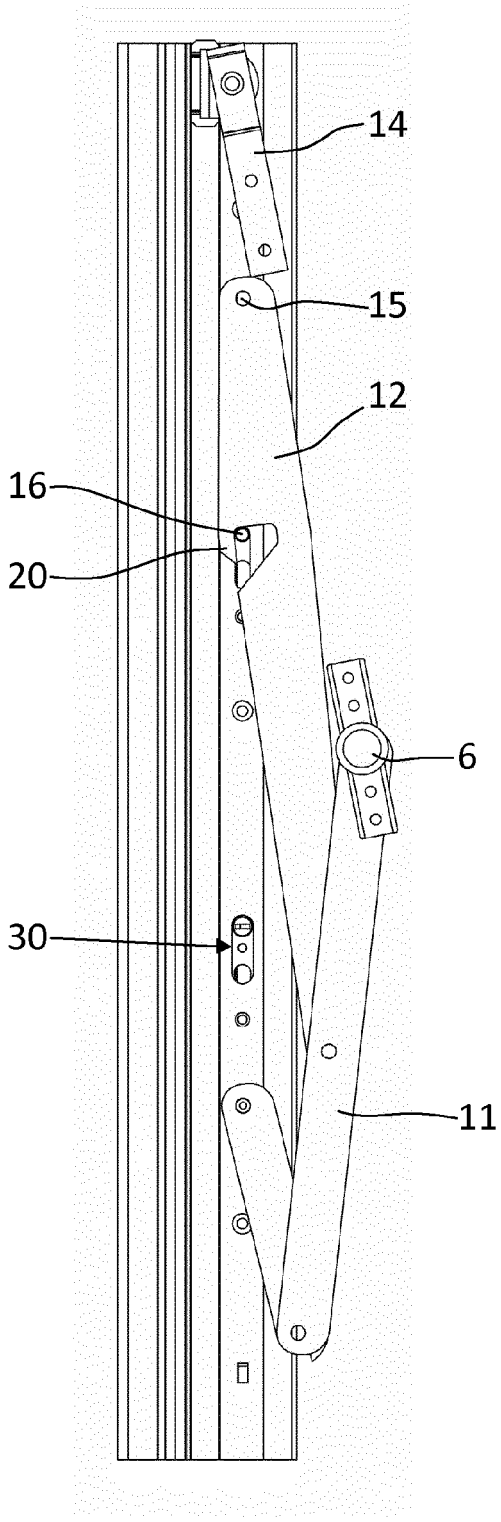

Fig.4

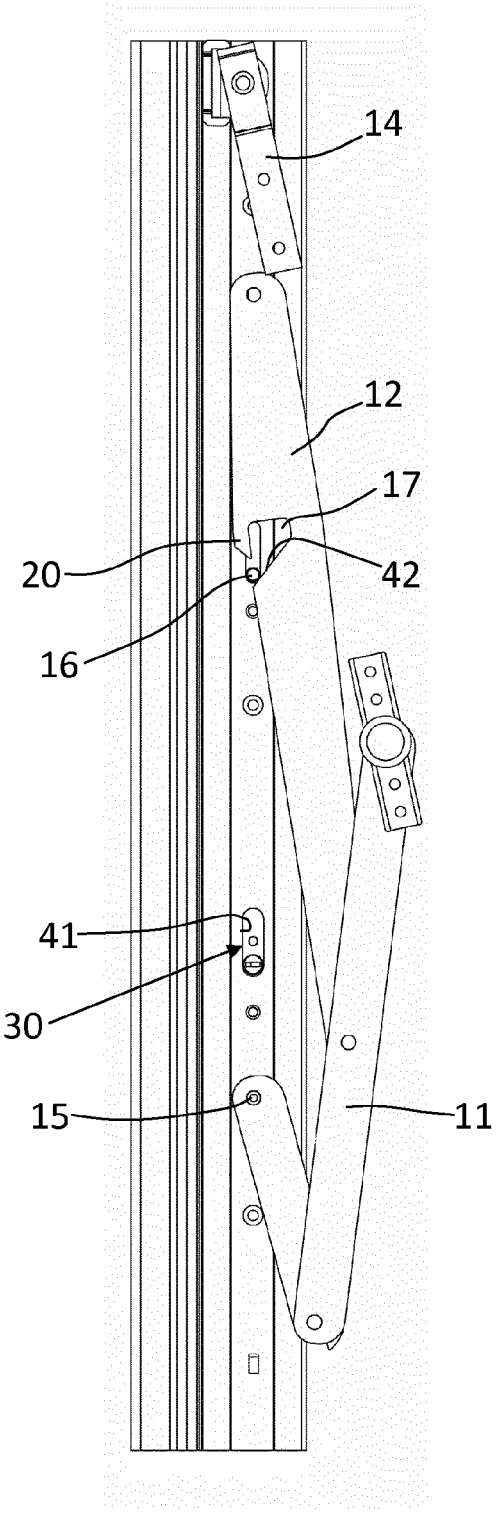

Fig.5

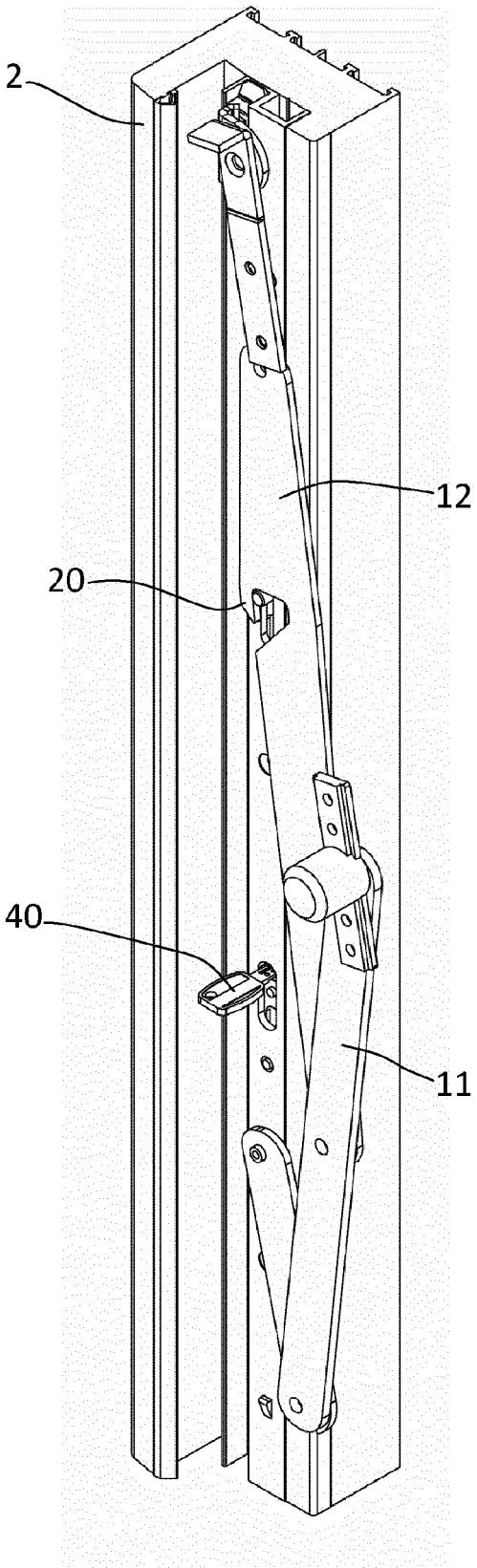

Fig.6

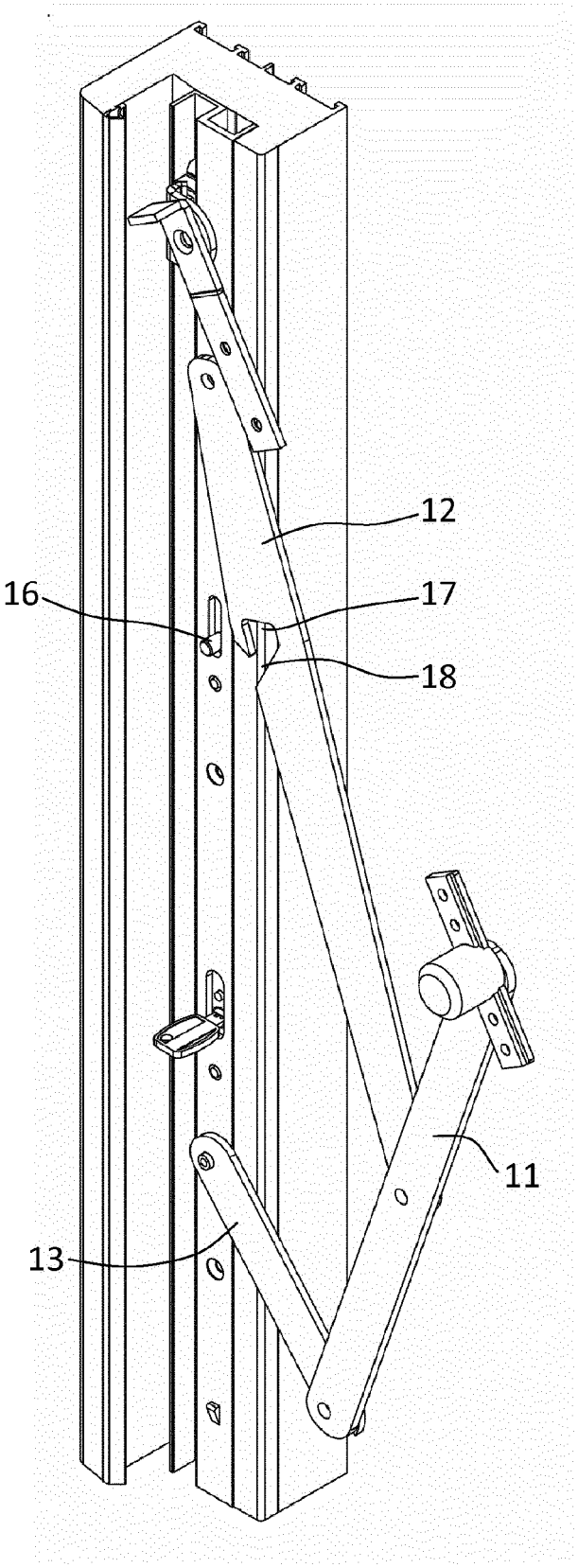

Fig.7

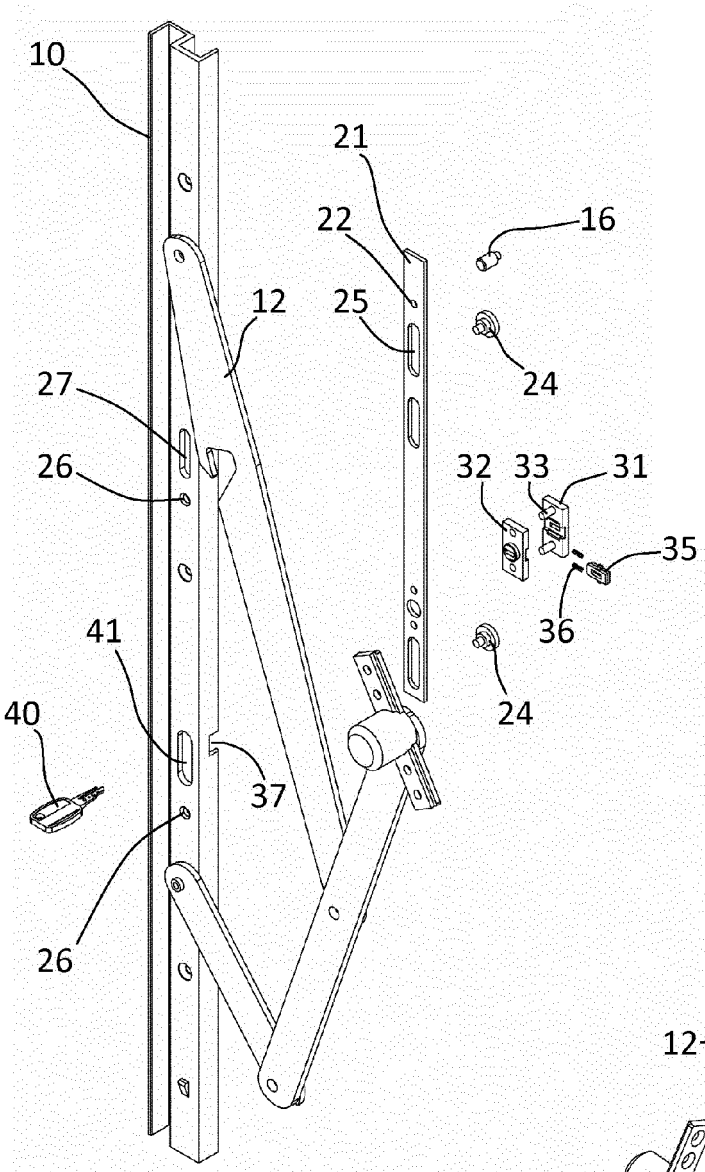
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Fig.8

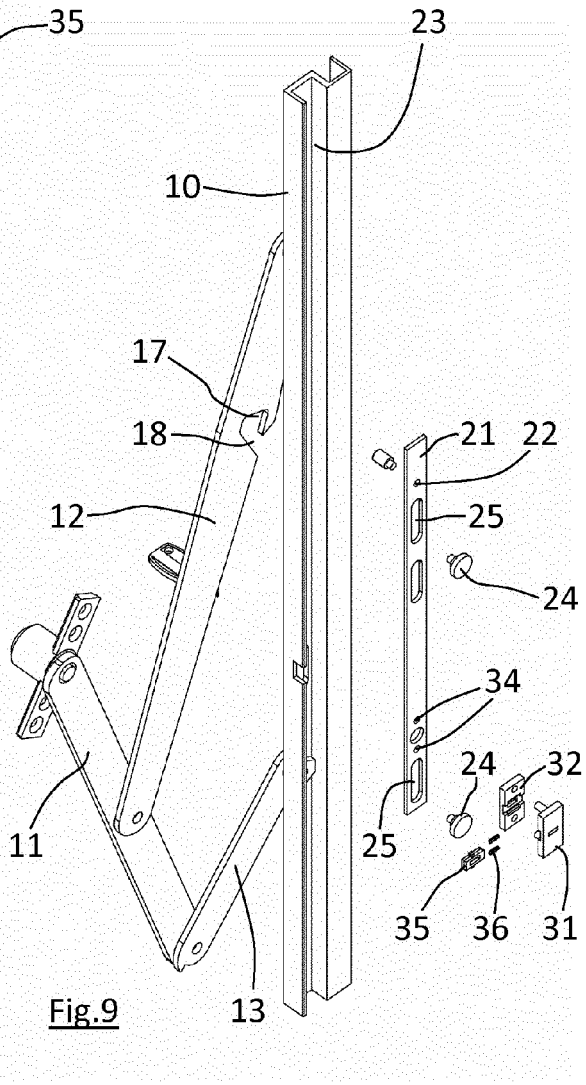
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Fig.9