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(54) ACTUATING MECHANISM FOR TILT&TURN DOOR OR WINDOW FRAMES, COMPRISING A LEVER AND A CONNECTING ROD DIVERGING FROM SAID LEVER

(57) An actuating mechanism (14) for opening and closing of turn-only and tilt&turn door or window frames (9) comprises a swivel aim (20), pivoting about a hinge (18) and hinged to a leaf (11) of the frame (9), a slidable rod (22), connected to movement transmission means (16), a grooved lever (24), hinged to the leaf (11) and connected to the swivel arm (20), and a connecting rod (28), further connecting the swivel arm (20) to the leaf (11), in such a way that, when the door and window frame is to be opened in a tilt-mode, the grooved lever (24) and the connecting rod (28) rotate in a convergent manner with respect to each other.

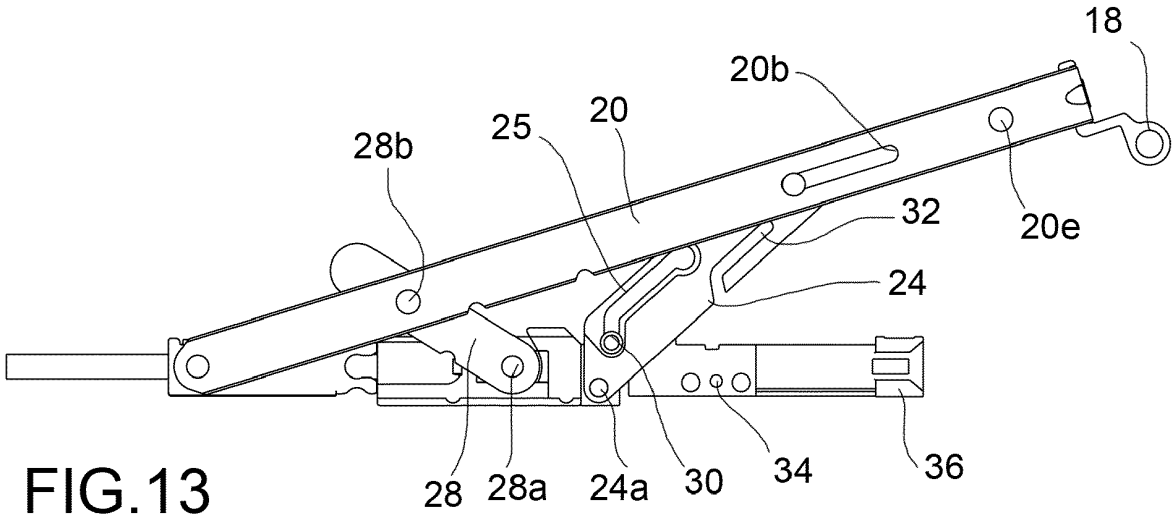

FIG.13

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Description

Technical field

[0001] The present invention relates, in general, to window and door frames and related components; in particular, the invention relates to an actuating mechanism for opening and closing of turn-only and tilt&turn door or window frames.

Background of the invention

[0002] Solutions are known of doors and windows for use in a duplicity of configurations: one configuration, so-called "turn", allows the leaf to move around a vertical axis, while the second configuration, so-called "tilt", allows an oscillating movement of the leaf about a horizontal axis. The choice of opening the leaf with a turn or a tilt mode can be carried out by manipulating a handle of an operating device, usually of the espagnolette or T-shape type. The handle is generally operable in three working positions: a position in which the door or window is closed and locked, a position in which the window is openable in "turn" mode, and a position in which the door or window is openable in "tilt" mode.

[0003] The control device actuates, depending from the working position of the handle, a linkage which acts on an actuating mechanism connected to both the mounting frame of the window or door and the leaf (more precisely, to the frame).

[0004] However, conventional systems generally force those wishing to open or close the door to exert a manual push on the leaf itself, in addition to the rotation of the handle. This operation could be complicated and uncomfortable, for example to those who suffer from a disability, for whom it would not be possible to reach the handle if placed too high (as is usually the case for traditional doors or windows, in which the handle is placed at about 1.30 m from the ground).

[0005] To assist people with disabilities, and allow them to open and close the leaf, the actuating mechanism and its handle are placed on the lower horizontal side of the leaf. With such a configuration, however, the lever arm of the force exercised on the leaf to open and close it in the so-called "tilt" position is substantially null. In fact, there is no mechanism to assist the person in the opening and closing operations of the leaf.

[0006] Such limitations, understandably, affect the usability of the door or window by persons who suffer, for example, of a disability.

[0007] To overcome this drawback, an actuating mechanism has been disclosed in the prior art, an example of which is represented in FIG. 4, which provides a swivel arm hinged at one end to the door or window frame, and at the opposite end to the leaf. The arm is connected to the leaf by means of a rod, slidably constrained to the arm at one end, and hinged to the leaf at its opposite end. A lever, pivotable about the door leaf, is hinged to the above-mentioned rod, which lever has a shaped groove within which a vertical pin is movable, carried by a sliding rod, the former being moved by the movement transmission means connected to the operating device.

[0008] The pin carried by the sliding rod, moving within the groove, determine the relative position of the swivel arm and the rod (positioned along an upper horizontal edge of the wing). In particular, when the pin is in a proximal position with respect to the end of the lever hinged to the leaf, the swivel arm and the rod are free to mutually rotate, while when the pin is in a distal position with respect to the hinge point of the lever to the leaf, the swivel arm and the sliding rod are constrained to remain in an aligned and superimposed position.

[0009] The main purposes of the lever and the groove are to allow the pin to move away from the hinge point of the lever (in such a way to create a longitudinal lever arm of a clamping force, which maintains the swivel arm and the rod mutually aligned and superimposed), and to allow the opening and closing of the window in a "tilt" position, without the need of a manual thrust applied to the door. This is possible because the groove has an inclined portion on which the pin, in its translation motion, applies a force which, being eccentric with respect to the hinge point of the lever to the leaf, generates a moment able to spread apart the swivel arm with respect to the leaf.

[0010] Thanks to an actuating mechanism so configured, the handle can be placed at the horizontal bottom edge of the frame, thus allowing those suffering from a disability to open and close the window even if it were in a tilt position, without having to push the door by hand.

[0011] However, in such a configuration, the whole weight of the leaf, during the opening and closing phase in tilt-mode, is supported only by the swivel arm and the grooved lever. In order to strengthen _the mechanism and to assist the movement, a connecting rod is added, which is hingeable to the leaf and connected to the swivel arm.

[0012] An example of an actuating mechanism comprising an additional connecting rod is known from DE 33 45 870 A1, showing a control mechanism having the grooved lever hinged on one end to the leaf, and at the opposite end directly to the swivel arm, and a connecting rod substantially parallel with respect to such a grooved lever and connected to both the leaf and the swivel arm.

[0013] However, this configuration does not allow an optimal distribution of weights and forces along the swivel arm, thereby stressing the junctions between the actuating mechanism and the mounting frame, and among the various components of the actuating mechanism.

[0014] This can adversely affect the operative efficiency and integrity of the mechanism.

Summary of the invention

[0015] One object of the present invention is to overcome the aforementioned problems.

[0016] To achieve this result, the grooved lever and the connecting rod can rotate in a convergent manner with respect to each other, when the actuating mechanism is in a condition of divergence between the swivel arm and the leaf (for example, when the leaf is to be opened in the tilt-mode).

[0017] Unlike the above-mentioned solution known in the prior art, where the grooved lever and the additional connecting rod are substantially parallel or even slightly convergent (in such a way to diverge, instead of converging, when the leaf is to be opened in a tilt-mode), a better balance of weights and forces can be achieved, and the overall robustness of the actuating mechanism can be improved.

[0018] The above and other objects and advantages are achieved, according to an aspect of the invention, by an actuating mechanism for the opening and closing of tilt&turn window frames, having the features defined in claim 1. Preferred embodiments of the invention are defined in dependent claims.

Brief description of the drawings

[0019] The functional and structural features of some preferred embodiments of an actuating mechanism for opening and closing of tilt and turn doors or windows according to the invention will now be described. Reference is made to the accompanying drawings, in which:

- Figures 1 and 2 are schematic perspective views of a turn-mode-open window and a tilt-mode-open window, respectively;
- Figures 3A and 3B are schematic perspective views of an operating system for an actuating mechanism, according to an embodiment of the present invention, in which the linkage and some possible positions of the handle are shown, respectively;
- Figure 4 is a schematic top view of an actuating mechanism, according to the prior art;
- Figure 5 is a schematic perspective view of an actuating mechanism, according to one embodiment of the present invention;
- Figures 6 and 7 are schematic side and top views, respectively, of the actuating mechanism, in a closed position of the window frame;
- Figure 8 is a schematic top view of a component of the actuating mechanism, in the operative condition shown in Figures 6 and 7;
- Figures 9 and 10 are schematic side and top views, respectively, of the actuating mechanism, in a turn-mode open condition;
- Figure 11 is a schematic top view of a component of the actuating mechanism, in the operative condition shown in Figures 9 and 10;
- Figures 12 and 13 are schematic side and top views, respectively, of the actuating mechanism, in a tilt-mode open condition;
- Figure 14 is a schematic top view of a component of the actuating mechanism, in the operative condition shown in Figures 12 and 13;
- Figures 15 and 16 are a schematic side and top views, respectively, of the actuating mechanism, in the closing phase; and
- Figure 17 is a schematic top view of a component of the actuating mechanism, in the operative condition shown in Figures 15 and 16.

Detailed description

[0020] Before explaining in detail a plurality of embodiments of the invention, it should be clear that the invention is not limited in the application thereof to the constructional details and to the configuration of the components disclosed in the following description or shown in the drawings. The invention can be embodied and implemented or realized practically in different ways. It should be understood that the phraseology and terminology have not descriptive purposes and are not meant to be limitative.

[0021] Referring first to Figures 1 and 2, a door and window frame 9 is shown (in this example, a window), in two operating conditions, a so-called "turn" operating condition, in which a leaf 11 of the frame is pivotable about a lateral vertical axis A, and a second operating condition, so-called "tilt" condition, in which the leaf 11 of the window frame 9 is pivotable about a horizontal lower axis B, respectively. Generally, the frame 9 comprises a frame 10 for fixing the window frame to a wall (not illustrated), and a casing 11a of the leaf on which an operating device 12 is mounted.

[0022] The operation of the window in tilt or turn configurations is carried out through an actuating mechanism 14, which connects the frame 10 to the casing 11a.

[0023] As shown in Figure 3A, a rotation imparted to the operating device 12 (in the illustrated example, an espagnolette handle) actuates movement transmission means or linkage 16, through which it is possible to act on the actuating mechanism 14, so to control the operation thereof in closing conditions, and tilt-mode and turn-mode opening conditions. As already mentioned, the handle 12 can be placed in different positions (as shown, for example, in Figure 3B, in which three possible positions of the handle on the leaf are illustrated).

[0024] As already mentioned, the rotation imparted to the control device 12 actuates the linkage 16, which is connectable to a slidable rod 22, so as to cause the latter to reciprocate along a top edge of the casing lla of the leaf 11. The leaf is also connectable to the mounting frame 10 via a swivel arm 20, hingeable by means of a first junction 20a to a hinge 18 (known per se, which can be in view, retractable etc.) fixed to the fixing frame 10, and through a second junction 20b to the leaf 11. Advantageously, the first and second junctions 20a, 20b of the swivel arm 20 are located on opposite ends of said arm.

[0025] The swivel arm 20 is also connectable to the leaf 11 by means of a grooved lever 24, hingeable to the

leaf 11 by means of a third junction 24a, and connected to the swivel arm 20 by means of a first pin 24b, which is conveniently slidable along a first groove or rectilinear slot 20d present on said swivel arm 20. Conveniently, the third junction 24a and the first pin 24b are at opposite ends of said grooved lever 24.

[0026] The grooved lever 24 has a first shaped groove 25, within which a second pin 30, carried by the slidable rod 22, is movable.

[0027] The first shaped groove 25 has at least one straight portion 25a, extended in the direction of the length of the grooved lever 24, and an inclined portion 25b, consecutive with respect to said straight portion 25a and preferably extended towards the leaf 11. According to a preferred embodiment of the invention, the inclined portion 25b ends with a terminal stop edge 25c, against which the second pin 30 abuts in the "tilt" operating condition of the door and window frame 9. Optionally, for example in the case of an ambidextrous handle (not shown), the first shaped groove 25 may comprise, further to a first portion configured as described above (i.e., with a straight portion and an inclined portion), also a second portion (having in turn a straight portion and an inclined portion) which is symmetrical to the first portion with respect to a longitudinal axis of the grooved lever 24.

[0028] Throughout the present description and in the claims, the terms and expressions indicating positions and orientations, such as "longitudinal" and "inclined", shall be referred to the largest dimension of the single components of the actuating mechanism (for example, the swivel arm 20 is extended longitudinally in the direction of the length thereof).

[0029] The swivel arm 20 is further connectable to the leaf 11 via a connecting rod 28, hinged to the leaf 11 by means of a fourth junction 28a and connected to the swivel arm 20 via a fourth pin 28b. The connecting rod 28 may be hinged to the swivel arm 20 through the fourth pin 28b or, optionally, can be slidable or pivotable along a second rectilinear groove or slot present in said swivel arm 20 (according to an embodiment not shown). Advantageously, the forth junction 28a and the fourth pin 28b are at opposite ends of said rod 28. The connecting rod 28 can assist, for example, the lever 24 in supporting the weight of the leaf 11.

[0030] The connecting rod 28 is oriented, with respect to the grooved lever 20, in such a way that, in a condition of divergence between the swivel arm 20 and the leaf 11, the grooved lever 24 and the connecting rod 28 rotate around the respective third and fourth junctions 24a, 28a in a convergent manner (e.g., the first pin 24b, integral to the grooved lever 24, and the fourth pin 28b, integral to the connecting rod 28, approach to each other in the direction of the length of the swivel arm 20).

[0031] According to an embodiment not shown, the third and fourth junctions 24a, 28a and the first and fourth pins 24b, 28b can be arranged differently with respect to the illustrated examples. For example, the grooved lever 24 may be fixed to the swivel arm and be slidable on the leaf, in which case the respective first junction 24a and third pin 24b would be placed at opposite positions with respect to the embodiment shown, e.g., in Figure 13. The same may apply to the fourth junction 28a and the fourth pin 28b associated to the connecting rod 28, whose positions may be inverted, provided that at least two points on the grooved lever 24 and the connecting rod 28, respectively, approach to each other when the swivel arm 20 diverges from the leaf 11.

[0032] Figure 13, for example, shows a preferred embodiment where the grooved lever 24 and the connecting rod 28 are mounted in such a way that, in a condition where the swivel arm 20 and the leaf 11 are aligned (closed leaf or turn-mode configuration), the distance between the respective third and fourth junctions 24a, 28a is lower than the distance between the respective first and fourth pins 24b, 28b. Accordingly, when the swivel arm 20 rotates with respect to the leaf 11, the grooved lever 24 and the connecting rod 28 move in a convergent manner with respect to each other (in this case, the first pin 24b and the fourth pin 28b approach to each other in the direction of the length of the swivel arm 20).

[0033] Optionally, the grooved lever 24 has a second shaped groove 32, in which a third pin 34 carried by the slidable rod 22 is slidable.

[0034] The second shaped groove 32 is longitudinally more spaced (along the grooved lever 24) from the third junction 24a (where the grooved lever 24 is hinged to the leaf 11), with respect to the first shaped groove 25. In this way, when the door and window frame 9 is in a closed condition, the third pin 34 exerts on the grooved lever 24 a larger locking moment compared to that exerted by the second pin 30, the lever arm of the locking force being longer (i.e., the longitudinal distance between pins 30, 34 and the third junction 24a).

[0035] The second shaped groove 32 has at least one straight portion 32a, extended in the direction of the length of the grooved lever 24, and an inclined portion 32b, consecutive with respect to said straight portion 32a and preferably extended towards the leaf 11.

[0036] Advantageously, the inclined portion 32b is open at one end, so as to allow the third pin 34 to insert and disengage with respect to the second shaped groove 32, during the rotation of the grooved lever 24. Furthermore, according to an optional embodiment not shown, the third pin 34 can be retractable, in such a way to move downwards when the solid edges of the grooved lever 24 slide over it (for example, being pressed downwards by such edges), and lifting within the second shaped groove 32 (for example, by means of a biasing elastic means), thus engaging such a second groove.

[0037] Figures 6, 7 and 8 show a condition where the leaf 11 is closed (i.e., the leaf is substantially coplanar with the frame 10). In such a condition the swivel arm 20, the grooved lever 24, the connecting rod 28 and the slidable rod 22 are aligned, integral and superimposed, the grooved lever 24 and the connecting rod 28 being in a vertically intermediate position between the swivel arm

20 and the slidable rod 22. The slidable rod 22 is in a retracted condition, thus the second and third pins 30, 34 are at an end-of-stroke position (distal with respect to the third junction 24a) along the respective first and second shaped grooves 25, 32. A fith pin 20e, integral to the swivel arm 20, preferably engages a cursor 36 carried by the slidable rod 22.

[0038] Figures 9, 10 and 11 show a condition where the leaf 11 is openable in a turn-mode (i.e., the leaf is pivotable about a lateral vertical axis A). In such a condition the swivel arm 20, the grooved lever 24, the connecting rod 28 and the slidable rod 22 remain integral and overlapped, pivoting around the vertical axis A. The slidable rod 22, by means of the linkage 16 operated by the rotation of the handle 12, translate along the edge of the leaf, moving away from the hinge 18. The second and third pins 30, 34, dragged by the slidable rod 22, travel all along the respective straight portions 25a, 32a of the first and second shaped grooves 25, 32, approaching to the third junction 24a where the grooved lever 24 is hinged to the leaf 11. The fifth pin 20e disengages the cursor 36.

[0039] Figures 12, 13 and 14 show a condition where the leaf 11 is openable in a tilt-mode (i.e., the leaf is pivotable about a lower horizontal axis B). In such a condition the swivel arm 20 and the slidable rod 22 spread relative to one another, the slidable rod 22 pivoting (with the leaf 11) around the second junction 20b with respect to the swivel arm 20. The slidable rod 22, by means of the linkage 16 operated by a further rotation of the operating device 12, translate along the edge of the leaf, moving further away from the hinge 18. The second and third pins 30, 34, dragged by the slidable rod 22, travel all along the respective inclined portions 25b, 32b of the first and second shaped grooves 25, 32, unlocking the rotation of the grooved lever 24 and the rod 28. Said grooved lever 24 and rod 28 pivot mutually converging, the first pin 24b being free of sliding along the respective first rectilinear groove 20d on the swivel arm 20.

[0040] In such an operating condition, in particular, the second pin 30 exerts a thrust against the edges of the respective inclined portion 25b of the first shaped groove 25: such a thrust, being eccentric with respect to the third junction 24a, imparts a moment around said third portion 24a, determining the opening of the leaf 11. At the end of the stroke of the slidable rod 22, the second pin 30 abuts against the terminal stop edge 25c of the first shaped groove 25. The third pin 34 goes out of the second shaped groove 32, through the respective inclined portion 32b, disengaging the grooved lever 24.

[0041] Eventually, Figures 15 to 17 show a closing phase of the door and window frame 9, wherein the leaf 11 approaches the frame 10. In such a condition, the swivel arm 20 and the slidable rod 22 tend to re-align again, the slidable rod 22 pivoting (integral to the leaf 11) around the second junction 20b with respect to the swivel arm 20. The slidable rod 22, by means of the linkage 16 operated by the rotation of the handle contrariwise with respect to the previous rotations, is push again along the edge of the leaf, approaching to the hinge 18. The second and third pins 30, 34, dragged by the slidable rod 22, travel back along the respective inclined portions 25b, 32b of the first and second shaped grooves 25, 32, until the rotation of the grooved lever 24 and the connecting rod 28 is locked in an aligned condition with respect to the swivel arm 20 and the slidable rod 22. Said grooved lever 24 and connecting rod 28 pivot in a mutually diverging way, the respective first and forth pins 24b, 28b moving away relative to one another along the swivel arm 20.

[0042] In such an operative condition, in particular, the second pin 30 exerts a thrust against the edges of the respective inclined portion 25b of the first shaped groove 25. In this circumstance, the thrust exerted by the second pin 30 will act in an opposite direction with respect to the thrust exerted during the tilt-mode opening phase of the leaf. Such a thrust, being eccentric with respect to the third junction 24a, imparts a moment around said third junction 24a, determining the closure of the leaf. At the end of the stroke of the slidable rod 22, the second and third pins 30, 34 come back in the position shown in Figure 8.

[0043] Thanks to the thrust exerted by the second pin 30 on the first shaped groove 25 (which thrust is generated by the translation of the slidable rod 22), it is possible to open and close the leaf, even during the tilt operative mode, by rotating even only the handle 12, i.e., without pushing manually the leaf. At the same time, the moment generated by the third pin 34 acting on the second shaped groove 32 may contribute to increase the opening/closing force, and guarantees an optimal locking action between the swivel arm and the slidable rod/leaf.

[0044] As will be apparent to the skilled in the art, what is disclosed above applies both to the case of a frame suitable to work in a tilt&turn mode (i.e., allowing the user to choose how to open the leaf), and the sole tilt configuration (in which case, steps shown in Figures 9 to 11 may be totally or partially bypassed).

[0045] The advantage achieved is to increase the balance of weights and forces acting on the actuating mechanism so as to strengthen and support the latter during the operation thereof, in particular as far as the tilt-mode opening and closure movements are concerned.

[0046] Various aspects and embodiments of the actuating mechanism according to the invention have been described. It is understood that each embodiment may be combined with any other embodiment. Moreover, the invention is not limited to the embodiments described, but may be varied within the scope defined by the appended claims.

Claims

1. An actuating mechanism (14) for opening and closing of turn-only and tilt&turn door or window frames (9), comprising:

- a swivel arm (20), pivotable about a hinge (18) by a first junction (20a), and hingeable to a leaf (11) of the frame (9) by a second junction (20b);
- a slidable rod (22), connectable to movement transmission means (16) actuated by an operating device (12), said sliding rod being mounted along an upper horizontal edge of the leaf (11);
- a grooved lever (24), hingeable to the leaf (11) by a third joint (24a) and connected to the swivel arm (20) by a first pin (24b), said grooved lever (24) having a first shaped groove (25) in which a second pin (30), carried by the slide (22), is slidable, said first shaped groove (25) having at least one straight portion (25a), extended in the direction of the length of the grooved lever (24), and an inclined portion (25b), consecutive with respect to said straight portion (25a); and
- a connecting rod (28), by which the swivel arm (20) is further connectable to the leaf (11), said connecting rod (28) being hingeable to the leaf (11) by means of a fourth junction (28a) and connected to the swivel arm (20) via a fourth pin (28b);

characterized in that the grooved lever (24) and the connecting rod (28), in a condition of divergence between the swivel arm (20) and the leaf (11), rotate around the respective third and fourth junctions (24a, 28a) in a convergent manner, the respective first and fourth pin (24b, 28b) approaching in the direction of the length of the swivel arm (20).

2. A mechanism according to claim 1, wherein the grooved lever (24) has a second shaped groove (32) in which is slidable a third pin (34) carried by the slide (22), said second shaped groove (32) having at least one straight portion (32a), extended in the direction of the length of the grooved lever (24), and an inclined portion (32b), consecutive with respect to said straight portion (25a).

3. A mechanism according to any one of the preceding claims, wherein said swivel arm (20) has at least a first rectilinear groove (20d) extending along the length of the swivel arm (20), and the first pin (24b), connecting the grooved lever (24) to the swivel arm (20), is slidable in said respective first rectilinear groove (20d) of the swivel arm (20).

4. A mechanism according to any one of the preceding claims, wherein said inclined portion (25b) of the first shaped groove (25) extends from the straight portion (25a) of said first shaped groove (25) towards the leaf (11).

5. A mechanism according to any one of the preceding claims, wherein said inclined portion (25b) has a terminal stop edge (25c), against which the second pin (30) abuts.

6. A turn-only or tilt&turn door or window frame (9), comprising:

- a rectangular shaped frame (11a) with a horizontal upper side, a horizontal lower side and two vertical sides that connect the upper and lower sides;
- an operating device (12), mounted on the horizontal lower side or on one of the two vertical sides in proximity of the horizontal lower side of the frame (11a);
- an actuating mechanism (14) according to one of the preceding claims; and
- movement transmission means (16) connected to the operating device (12) and to the actuating mechanism (14).

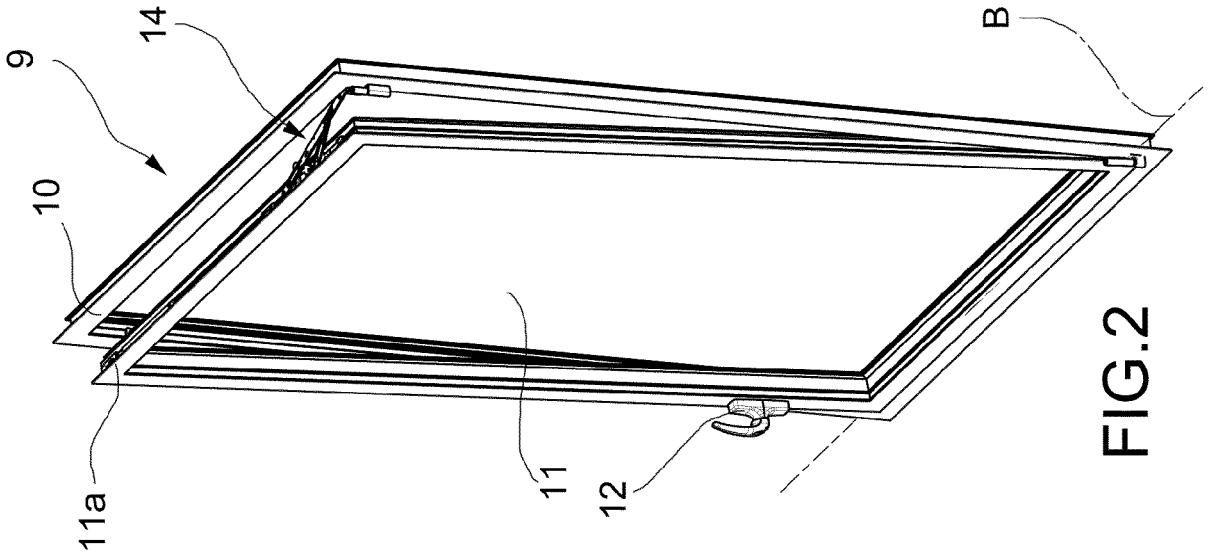


FIG.2

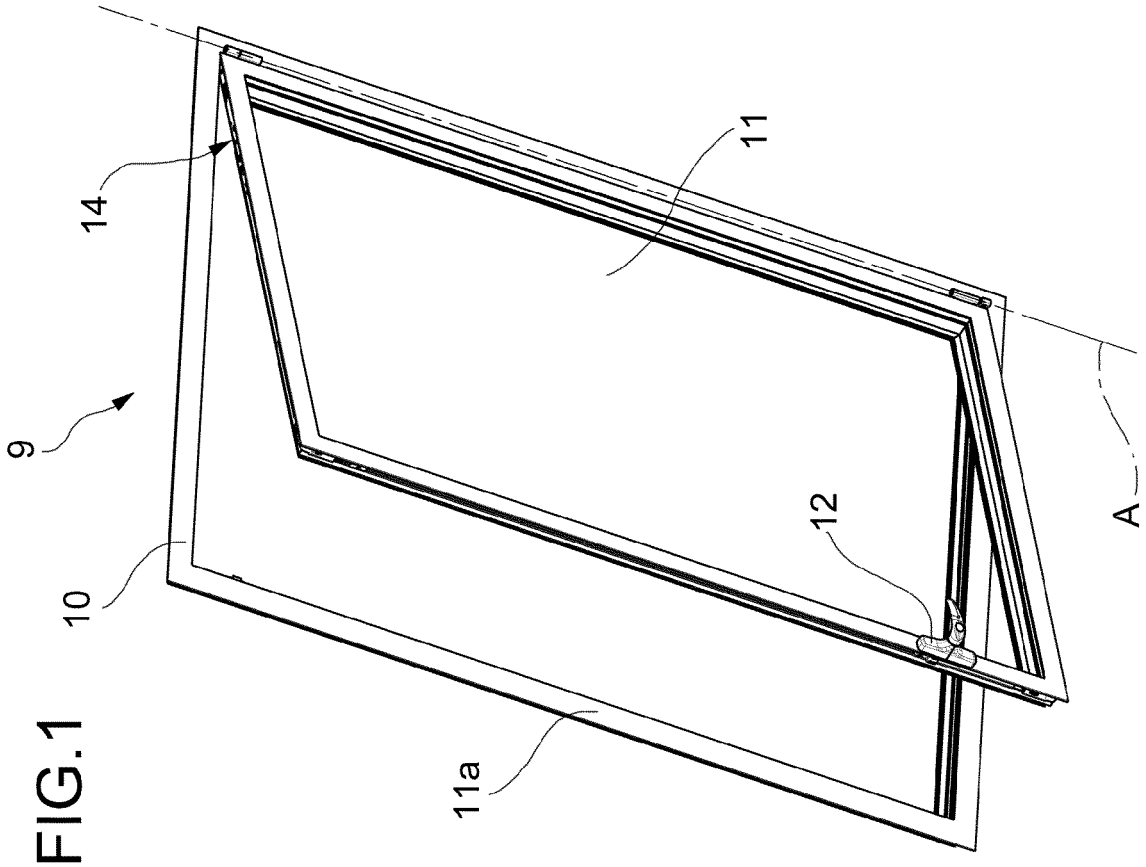
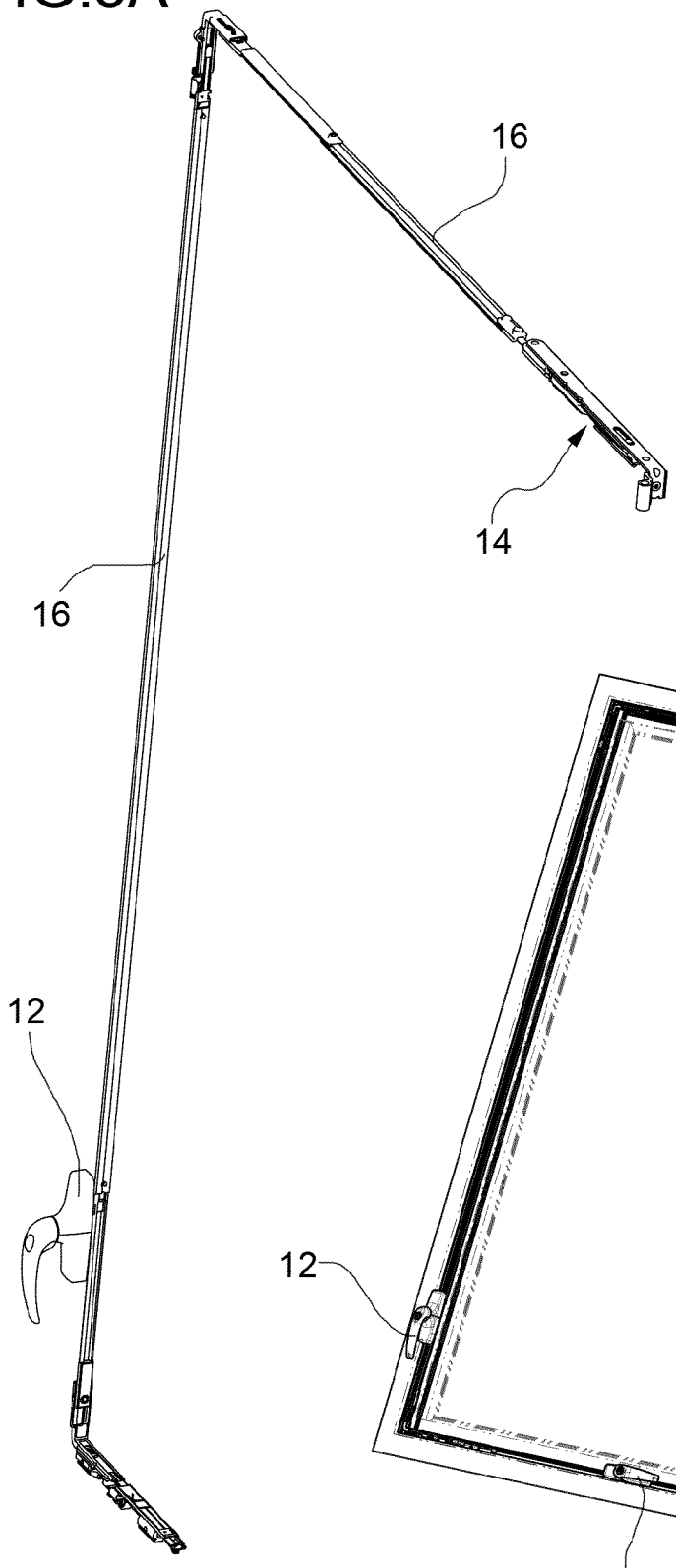


FIG.1

FIG.3A



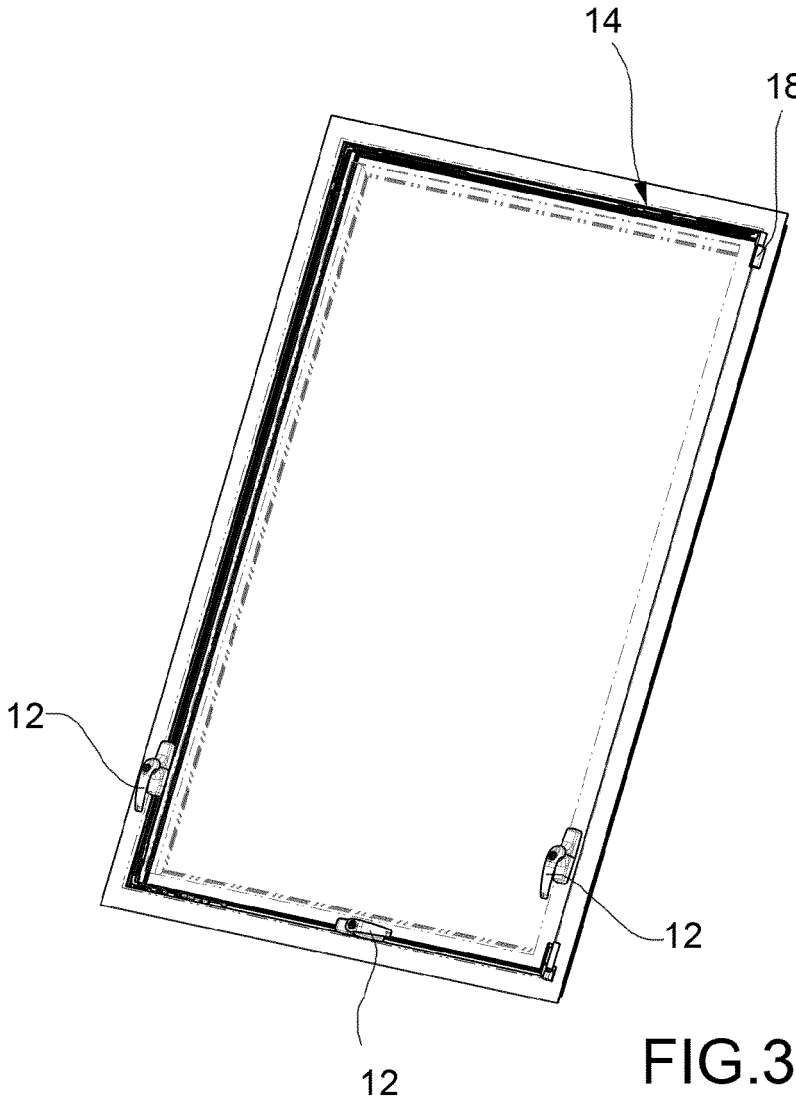
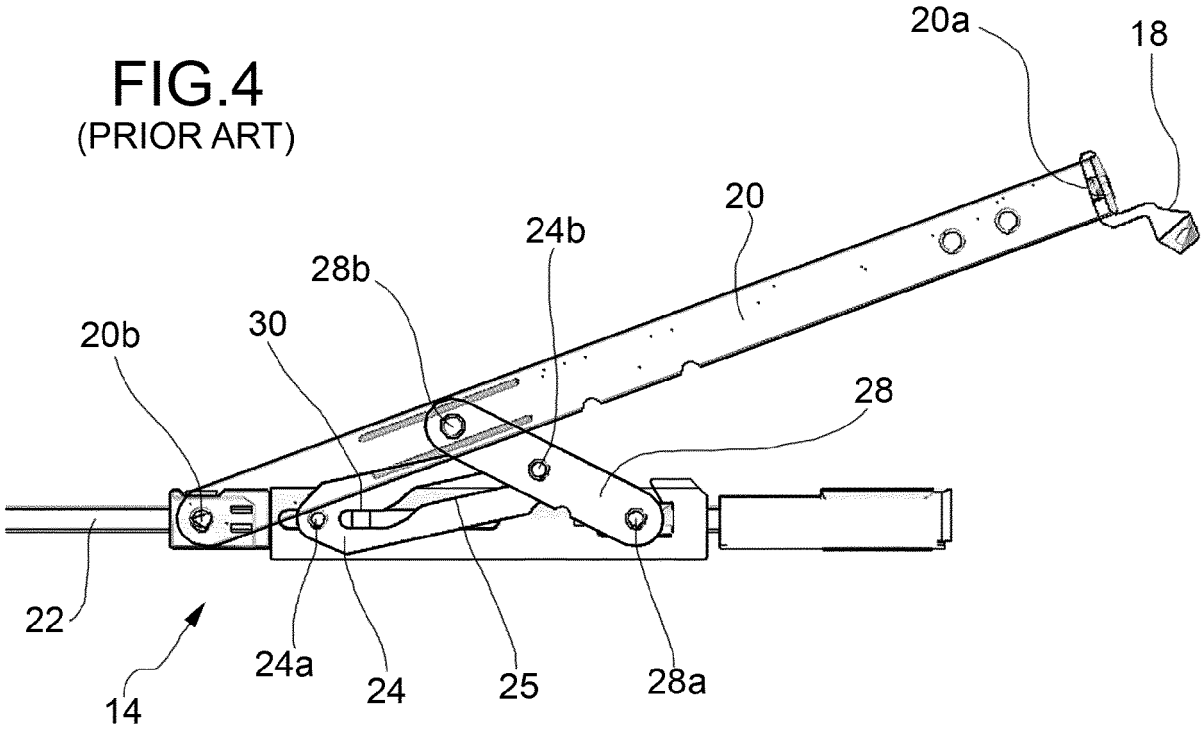


FIG.3B

FIG.4
(PRIOR ART)



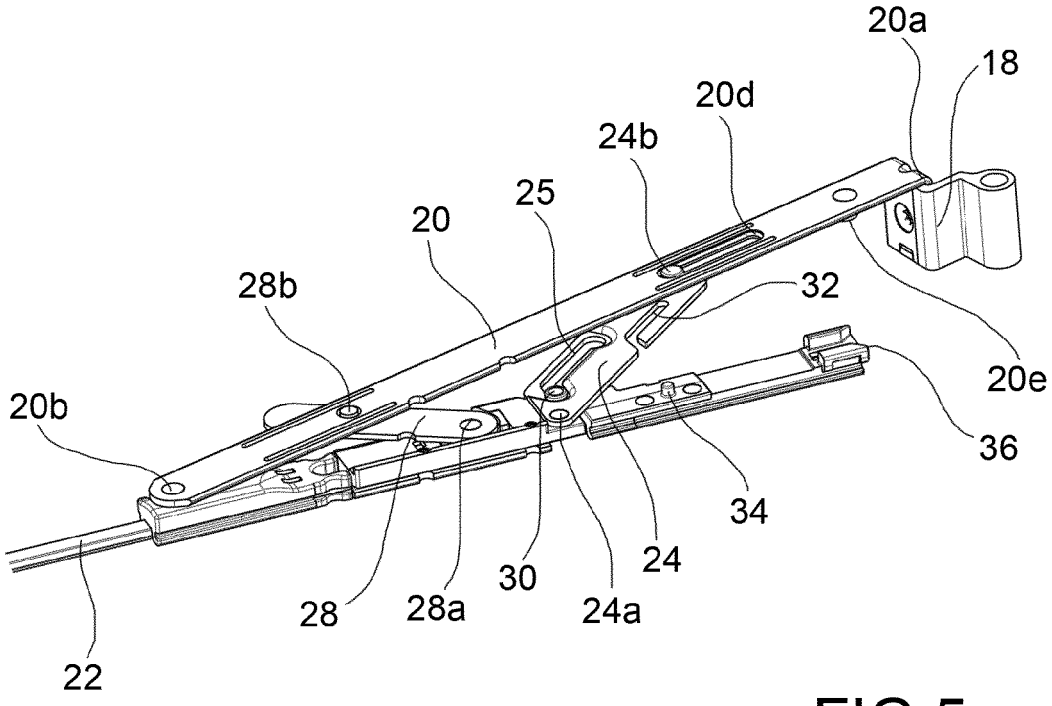


FIG.5

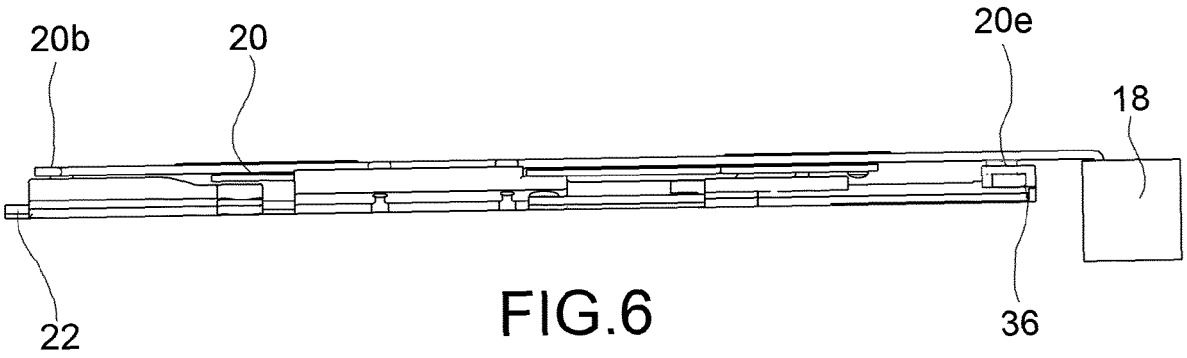


FIG.6

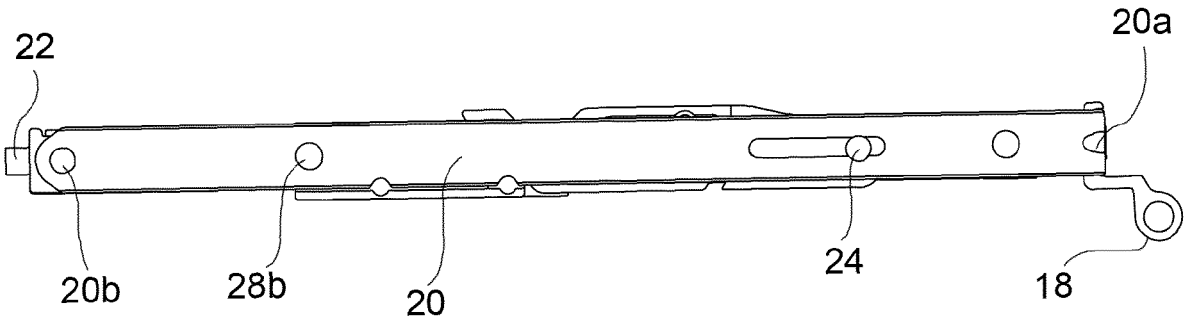


FIG.7

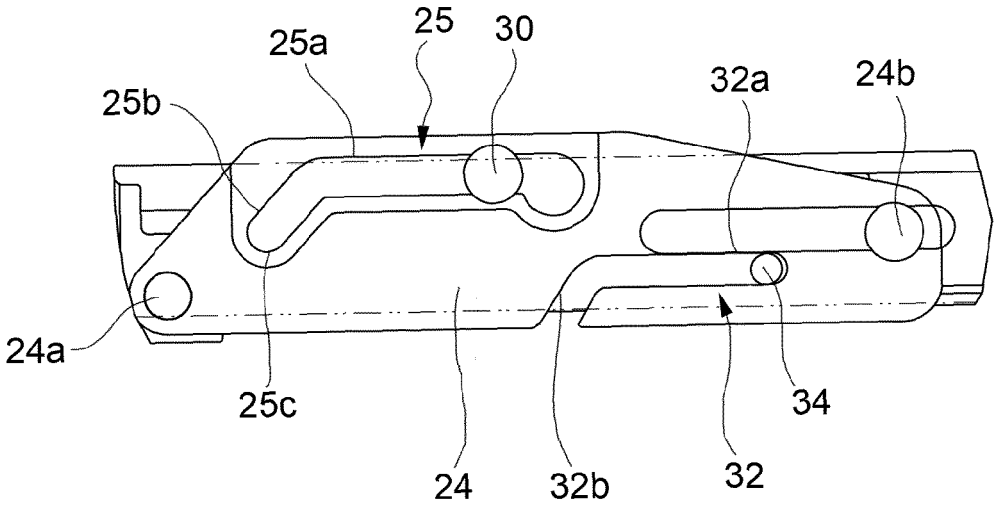


FIG.8

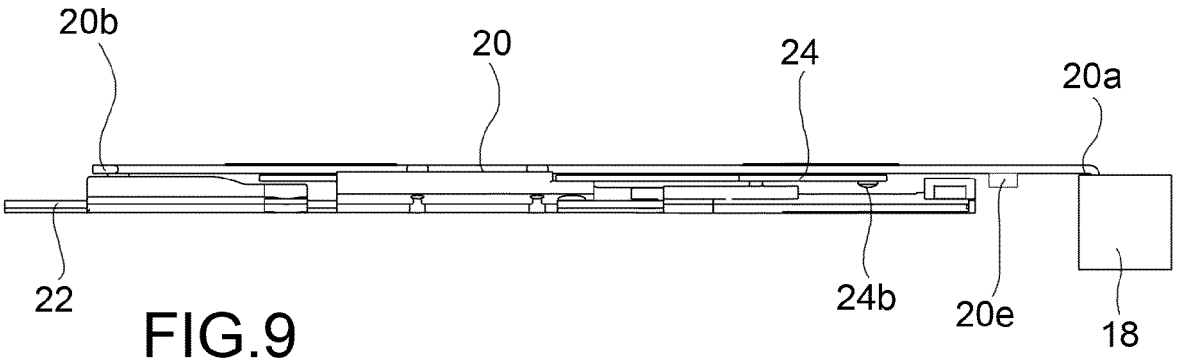


FIG.9

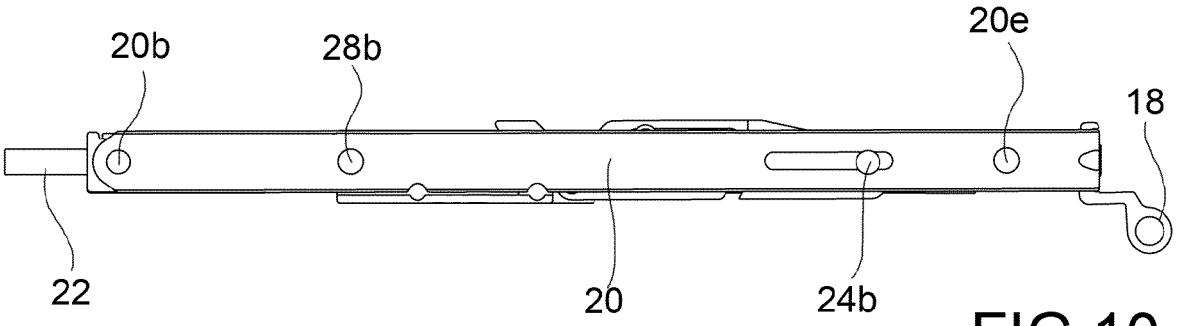


FIG.10

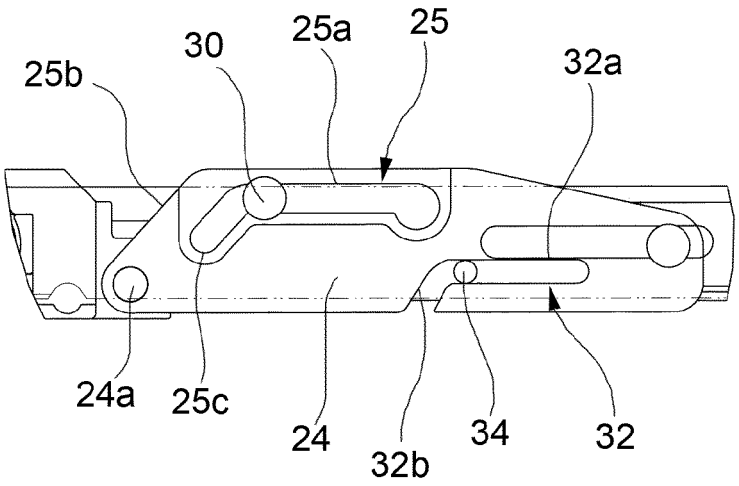


FIG.11

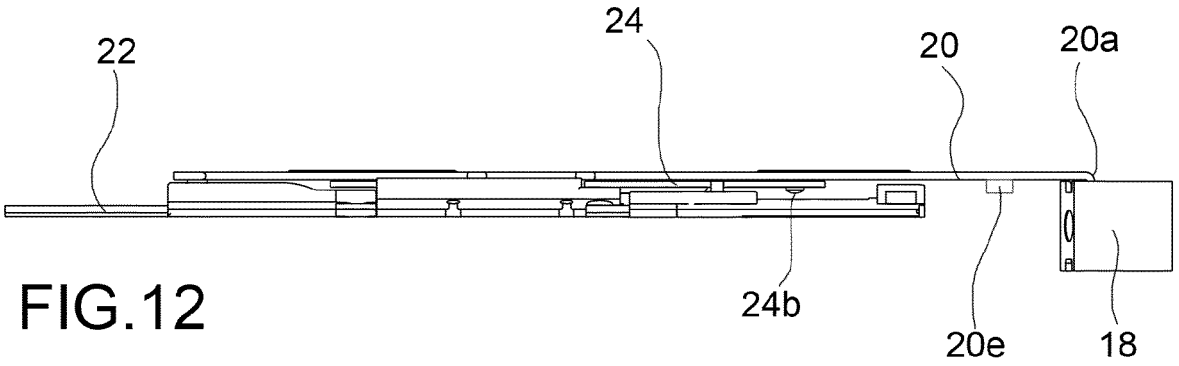


FIG.12

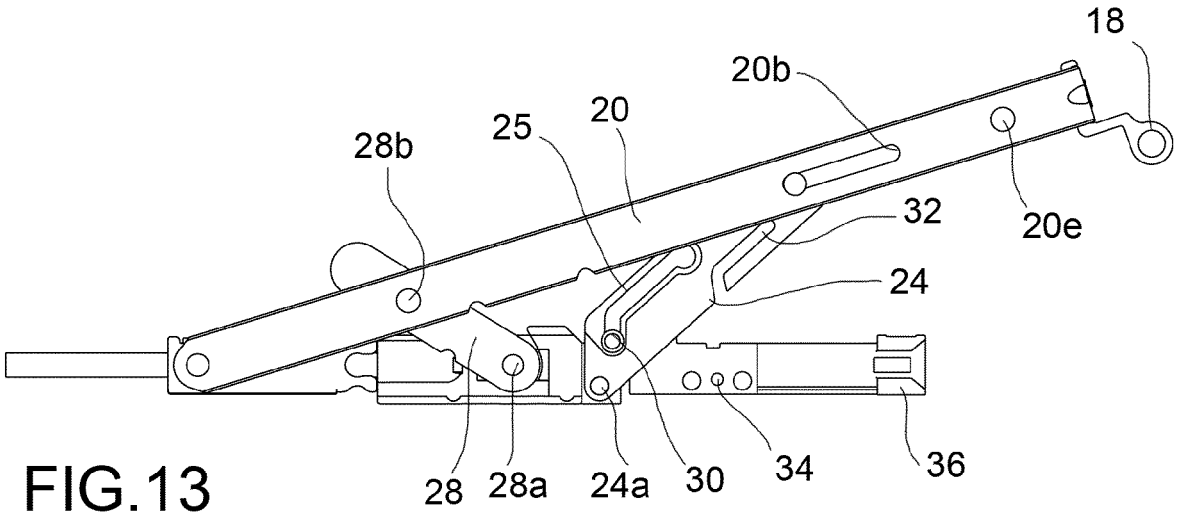


FIG.13

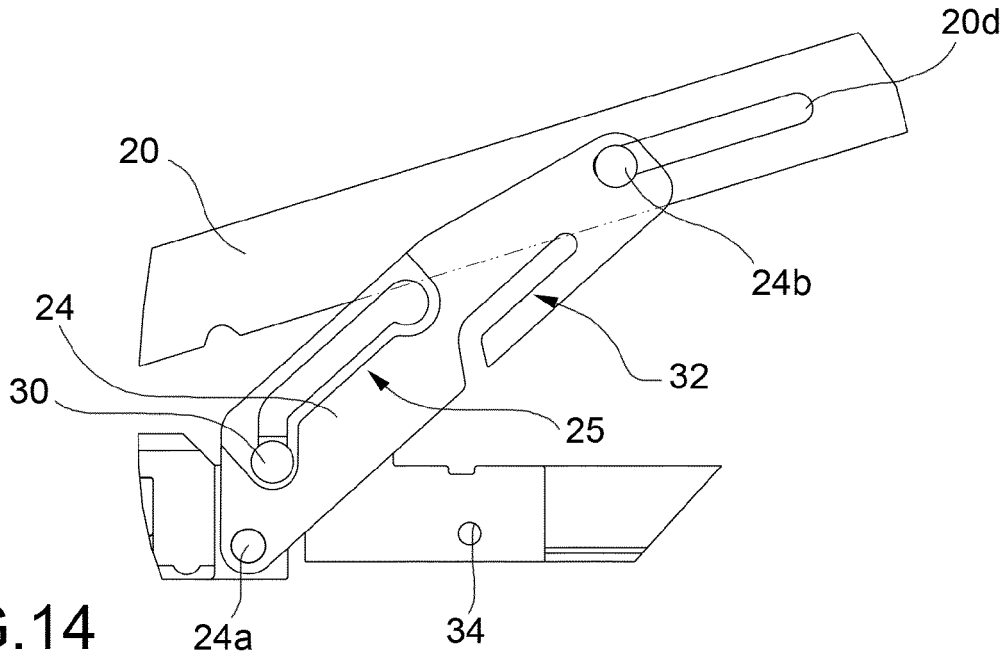


FIG.14

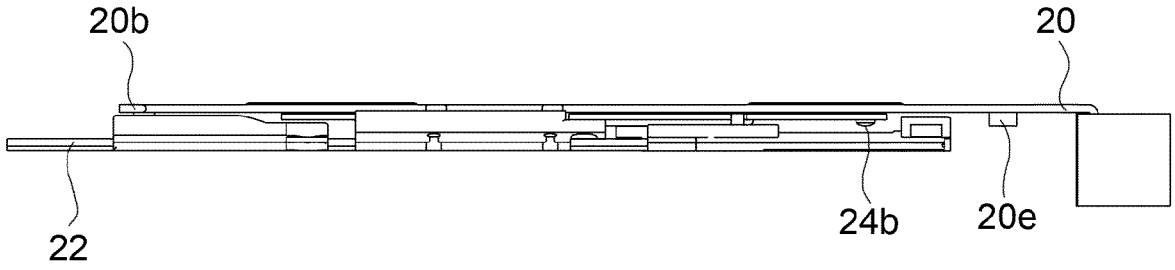


FIG.15

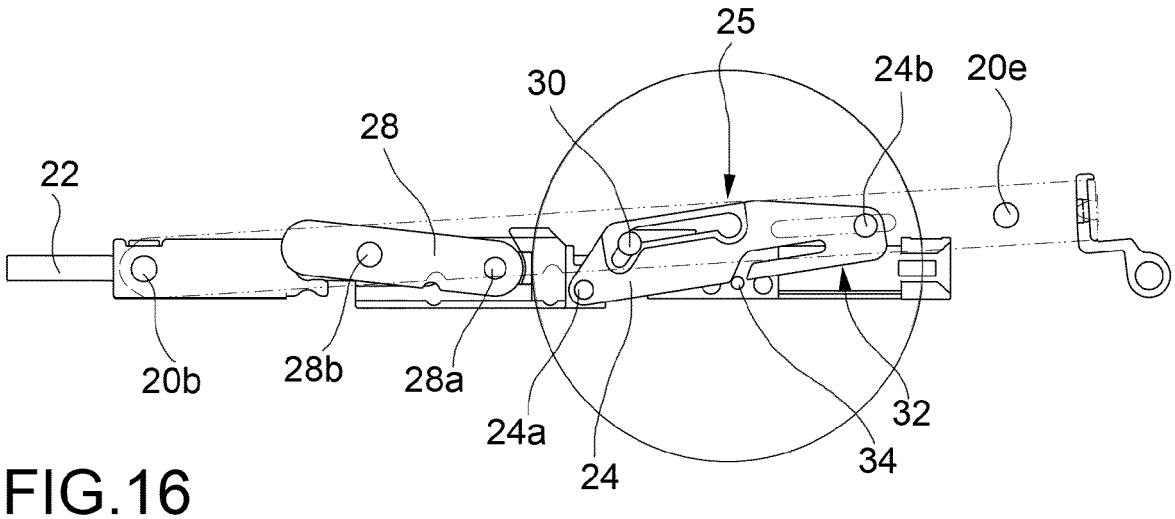


FIG.16

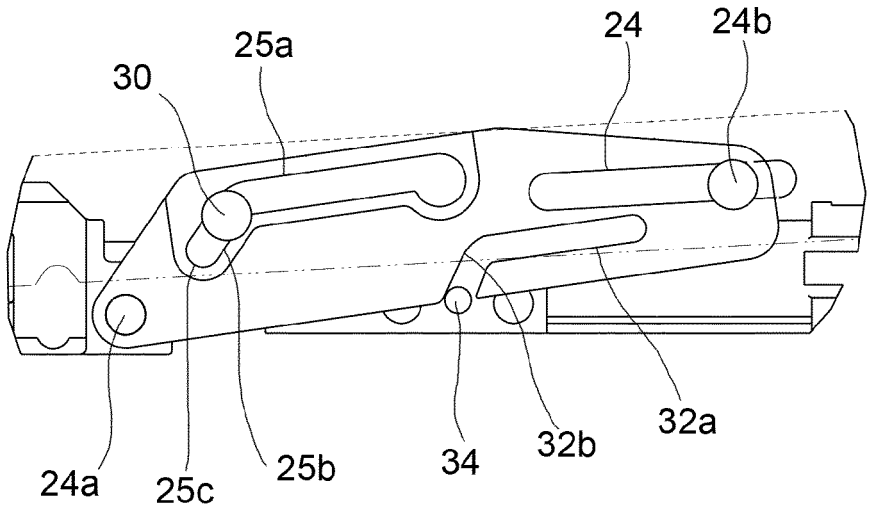


FIG.17

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EUROPEAN SEARCH REPORT

Application Number
EP 16 15 6634

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 33 45 870 A1 (GEZE GMBH [DE]) 27 June 1985 (1985-06-27) * page 9, paragraph 3 - page 10, paragraph 3; figure 1 * -----	1-6	INV. E05D15/52 E05F11/24

TECHNICAL FIELDS SEARCHED (IPC)

E05D
E05F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	15 June 2016	Klemke, Beate

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15-06-2016

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