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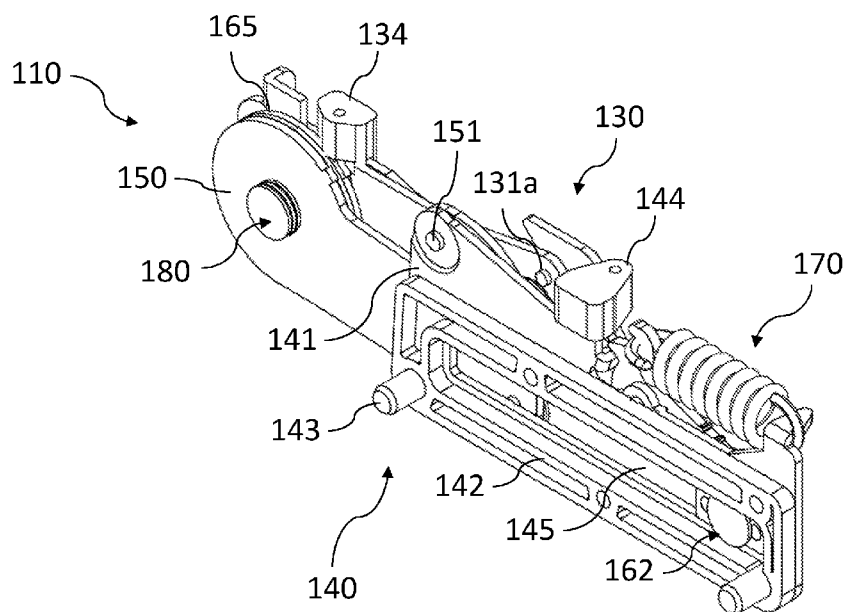


Fig. 4

(57) Abstract: Hinge for a roof window and roof window with a set of hinges. In the roof window, each hinge (110) of the set of hinges comprises a frame hinge part (130), a sash hinge part (140), and a movement supporting assembly comprising guiding means including a linkage mechanism with at least two links (150, 160) providing connection between the sash hinge part and the frame hinge part. Each link is connected to at least one of the frame hinge part and the sash hinge part at a joint and connected to each other. The hinge (110) furthermore comprises a braking device (180) acting on at least one element of the movement supporting assembly over at least a part of the opening and/or closing movement. The braking device (180) comprises one or more friction elements.



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Title of Invention

Hinge for a roof window and roof window with a set of hinges.

5 Technical Field

The present invention relates to a hinge for a roof window with a stationary primary frame having a plurality of frame members including at least two opposing side members, and at least one secondary frame including a sash having a plurality of sash members including at least two opposing
10 side members and optionally an intermediate frame, said hinge being configured to be connected to the primary frame or to the intermediate frame, and to the secondary frame sash to define a hinge axis of the roof window, said hinge comprising a frame hinge part, a sash hinge part, and a movement supporting assembly comprising guiding means configured to allow the sash
15 hinge part to assume an angle relative to the frame hinge part substantially around said hinge axis during an opening movement from a closed position to an open position and during a closing movement from the open position to the closed position, the guiding means comprising a linkage mechanism including at least two links providing connection between the sash hinge part and the
20 frame hinge part, each link being connected to at least one of the frame hinge part and the sash hinge part at a joint and connected to each other, the frame hinge part comprising a base plate defining a hinge plane substantially perpendicular to the hinge axis of the roof window and the sash hinge part comprising a base plate substantially parallel to the base plate of the frame
25 hinge part. The invention furthermore relates to a roof window including a set of hinges.

Background Art

Windows for installation in an inclined roof surface may be provided
30 in a number of varieties and include more or less complicated operational structures to allow opening of the sash and to fulfil other functions, such as ventilation. Such roof windows include the pivoting type hinged at or near the centre, the top-hinged type, and finally the roof windows that are top-hinged

during normal operation but which pivot for cleaning. Roof windows of the top-hinged type have a primary hinge axis provided by a top hinge and pivot for cleaning by means of an intermediate frame in which the sash is hinged to provide a secondary hinge axis.

5 Basically, the hinges in such a window need to fulfil a number of requirements, in particular with regard to the movement pattern required to allow an overlap between the cover members fastened to the frame and the counterpart cover members fastened to the sash to be established in the closed position of the roof window. To improve the user experience, lifting
10 assistance by force transmission to selected parts of the hinge may be provided to assist in particular the opening movement. Furthermore, braking means may be provided to modulate the movement of the sash during opening and closing and/or to render parking of the sash in arbitrary open positions easy and uncomplicated. Typically, one hinge will be located at
15 either side of the roof window to define a substantially horizontal hinge axis.

 One very well-proven type of hinge providing the required pattern of movements is the pivot hinge, which includes a guidance on the frame hinge part cooperating with a slide rail on the sash hinge part. Such pivot hinges are for instance disclosed in Applicant's EP 1 038 083 B1 and EP 1 781 883 B1
20 and are very versatile as regards operational areas and adaptation of components. Examples of roof windows incorporating such adapted hinges are shown in Applicant's published European patent applications EP 2 770 146 A1 and EP 2 770 149 A1.

 However, as an alternative to the traditional pivot hinges in certain
25 fields of application, so-called pantograph hinges are known, in which the desired pattern of movements is provided by a linkage mechanism. The use of hinges including linkage mechanisms is traditionally most often known from the furniture field, but such hinges are also well-known to use for roof windows. Prior art examples include Danish patent No. 114 321, US patent
30 No. 4,446,597, and Applicant's European patents EP 22 657 B1 and EP 89 813 B1. In a modern update of this so-called pantograph hinge, Applicant's international published application WO 2017/076416 A1 presents a hinge of

the kind mentioned in the introduction.

Although the hinges in the above examples are to some extent capable of providing the kinetic and kinematic performances aimed at, there is still room for improvement.

5

Summary of Invention

With this background it is an object of the present invention to improve a hinge of the kind mentioned in the introduction with respect to controlling the output forces of the linkage mechanism of the hinge and enabling its relative movement and ease of operability.

This is achieved with a hinge of the kind mentioned in the introduction, which is further characterised in that the at least two links of the linkage mechanism are connected to each other in a bearing axle, and the at least two links comprise a sash link providing connection between the bearing axle and the frame hinge part, and a frame link providing connection between the bearing axle and the sash hinge part, that the hinge comprises a braking device acting on at least one element of the movement supporting assembly over at least a part of the opening and/or closing movement, and that the braking device comprises at least one friction element.

While the linkage mechanism provides a smooth and well-defined movement pattern, the provision of the braking device may allow for a safer and easier window to open and close, thus modulating the opening movement and minimizing the risk of accidents.

By the term "link" it is to be understood an element in the form of a substantially rigid body retaining its shape throughout its motion.

The bearing axle enables a rotational relative movement between the links and is not fixed relative to any of the hinge parts and is thus able to move freely during the opening and closing movements. The links are therefore movable relative to the respective base plates of the hinge parts. In this way, a compact configuration of the hinge is achieved while maintaining suitable degrees of freedom.

In a presently preferred embodiment, the friction element is

configured to provide a frictional force on at least one link of the linkage mechanism and/or at a joint between the linkage mechanism and the sash hinge part or the frame hinge part. In this way, optimum flexibility in the provision of the friction element is obtained, while at the same time providing
5 a direct contact between the friction element and the moving parts.

In another presently preferred embodiment, at least one friction element is biased, preferably by comprising a spring. This enables a precise control of the force during movement of the window.

In another presently preferred embodiment, the frame link is
10 connected to the sash hinge part in a sliding joint and/or the sash link is connected to the frame hinge part in a sliding joint, each sliding joint preferably cooperating with a guide track. Thus, a stable movement in the guide track is achieved.

Other presently preferred embodiments and further advantages will
15 be apparent from the subsequent detailed description and drawings.

Brief Description of Drawings

In the following description, embodiments of the invention will be described with reference to the drawings, in which

20 Fig. 1 is a perspective view of a roof window according to the invention;

Fig. 2 is a partial perspective view of details of a roof window, including frame and sash side members, in an embodiment of the invention;

Fig. 3 is a partial perspective view of the frame side member of Fig. 2
25 and shows a hinge in a first embodiment of the invention;

Figs 4 and 5 are perspective views of the hinge in the first embodiment of the invention;

Fig. 6 is a view of the hinge of Figs 4 and 5 seen from the above;

Figs 7, 8 and 9 are exploded perspective views of the details of Figs
30 4 and 5;

Figs 10 to 12 are partial side views showing a roof window in an embodiment of the invention with the hinge of the first embodiment, in three

different positions of the sash relative to the frame;

Fig. 13 is a partial perspective view of details of a roof window, including frame and sash side members, in an open position of the sash relative to the frame and with a hinge in a second embodiment of the invention;

Fig. 14 is a partial perspective view of the frame side member of Fig. 13, including the hinge of the second embodiment of the invention;

Figs 15 and 16 are perspective views of the hinge in the second embodiment of the invention;

Figs 17 and 18 are perspective views of the hinge in a third embodiment of the invention;

Fig. 19 is a partial perspective view of details of a roof window, including frame and sash side members, in an entirely open cleaning position of the sash relative to the frame and with a hinge in a fourth embodiment of the invention;

Fig. 20 is a partial perspective view of the frame side member of Fig. 19, including the hinge of the fourth embodiment of the invention;

Figs 21 and 22 are perspective views of the hinge in the fourth embodiment of the invention;

Figs 23 and 24 are perspective views of the hinge in a fifth embodiment of the invention; and

Figs 25 and 26 are perspective views of the hinge in a sixth embodiment of the invention.

25 Description of Embodiments

In the following, embodiments of the inventive hinge and roof window will be described in further detail. When referring to the Figures, the terms up, down, upwards, downwards, top and bottom are taken relative to how the figures are displayed. A front view is taken from the hinge and viewing towards the frame. A view from behind is therefore taken as viewed from the frame towards the hinge. A longitudinal direction is, if nothing else is mentioned, longitudinal along the length of a member. It is to be understood

that the arrangement shown in a horizontal orientation is not the normal orientation as the window is installed in an inclined roof.

Throughout the description of embodiments, reference will be made to a hinge carrying reference numerals 10; 110; 210; 310; 410; 510; 610. The hinge 10 shown in its mounted condition in a roof window is representative for all embodiments, and any one of the hinges 110; 210; 310; 410; 510; 610 may thus be put in the place of the hinge 10 shown in Fig. 1. While there may be differences between the embodiments, elements having the same or analogous function are denoted by the same reference numerals to which 100, 200... has been added.

Fig. 1

Initially, reference is made to Fig. 1 in which a roof window according to the invention is shown, including a set of hinges of which one hinge 10 is indicated. The hinge 10 is representative of the hinges of the below embodiments.

In a manner known *per se*, the window comprises a sash 2 carrying a glazing in the form of a pane 3 and a stationary primary frame 1. The window is intended to be built into a surface, which is inclined with respect to the horizontal, typically a roof, and the window will in the following be referred to as roof window. At a position between the top and centre of the window, there is a hinge connection between the frame 1 and the sash 2. The frame 1 and sash 2 are each formed by four members of which one frame side member 1a and one sash side member 2a are indicated. The sash 2 is openable with respect to the frame 1, as the sash 2 may be moved from a closed position, in which e.g. the sash side member 2a is substantially parallel with the frame side member 1a, to an open position, in which the sash side member 2a forms an angle with the frame side member 1a. During this movement, the sash 2 rotates about a hinge axis α situated at the hinge connection. As indicated in Fig. 1, the hinge axis α is located substantially at a centre axis of the roof window, as seen in the height direction. Other positions of the hinge axis are of course conceivable, for instance further upwards towards the top

of the roof window. A corresponding operation of the window as described above and from here on is also true for the type of hinge described in the Applicant's international application published under WO 2017/076416 A1.

To protect the interior and the components of the window itself and to
5 ascertain weather-proof transition to the surrounding roofing, the roof window comprises a covering, including flashing members (not shown), cladding and covering elements of which a frame side covering element 1b and sash side covering element 2b are shown.

From a closed position, the user operates the operating device of the
10 window. The operating device typically comprises a handle (not shown) connected with the sash bottom member and/or, as shown here, an operating and locking assembly 4 including a ventilation flap at the sash top member with a lock mechanism to interact with a striking plate on the frame top member. The force, and hence moment, exerted by the user operating the
15 operating device, is transferred to the hinge 10 which in turn exerts a moment on the sash 2, and the moment resulting from the weight of the sash 2 and pane 3 is overcome, along with any frictional forces present. All in all, the opening operation entails that the sash 2 is moved from a closed position to an open position as represented by Fig. 1, in which the sash plane forms an
20 opening angle with the frame plane. Closing the window from the open position entails the opposite movement of the sash 2. It is possible to position the sash 2 in a number of arbitrary opening positions, in which the sash 2 is held stable relative to the frame 1. The sash 2 is also able to be rotated to allow cleaning of the outside of the pane 3 from the inside of the building in
25 which the roof window is installed. Depending on the position of the hinge axis in the window, the sash 2 may be rotated substantially through 180°.

Figs 2 to 12

Referring now first to Figs 2 to 9, a first embodiment of a hinge
30 according to the invention will be described in detail.

In Figs 2 and 3, the hinge 110 is shown in a position corresponding to a closed position of the sash 2 relative to the frame 1. The roof window is

represented by frame side member 1a and sash side member 2a in Fig. 2, and by only the frame side member 1a in Fig. 3, while other parts of the roof window have been omitted for ease of reading. The hinge 110 comprises a frame hinge part 130 and a sash hinge part 140 configured to assume an angle relative to the frame hinge part 130. The hinge 110 forms part of a set of hinges, of which the frame hinge part 130 of each hinge 110 is configured to be connected to the frame side member 1a of the frame 1 of the roof window in a mounted condition, at a location chosen to provide the desired position of the hinge axis α , and the sash hinge part 140 is correspondingly configured to be connected to the sash side member 2a.

Turning now to Figs 4 and 5, a base plate 131 of the frame hinge part 130 defines a hinge plane substantially perpendicular to the hinge axis α of the window in the mounted condition of the hinge, and a base plate 141 of the sash hinge part 140 is substantially parallel to the base plate 131 of the frame hinge part 130. The frame hinge part 130 has a receiver element 132 coupled to the base plate 131, the function of which will be described further below, and a distance piece 142 to keep the base plate 131 at an appropriate position relative to the frame side member 1a.

The frame hinge part 130 and the sash hinge part 140 comprise fastening means which can be for example pins or spigots 133, 143, or any type of threaded fastening means, for fastening to the frame side member 1a and sash side member 2a, respectively. The spigots 133, 143 are fixed on the receiver element 132 and the base plate 141 of the sash hinge part 140, respectively, such that sash-side spigots 143 protrude through the distance piece 142. The receiver element 132 is fastened to the frame side member 1a either in the supply condition or in a first step of installation, and the remaining components of the hinge 110 including the base plate 131 of the frame hinge part 130 are all connected to the sash 2.

Due to the configuration of the hinge 110, the sash link 150 and the frame link 160 are provided connected with each other by means of the bearing axle 155, and thus form a coherent structure constituting the "remaining components of the hinge 110".

Following correct positioning of the remaining components of the hinge 110 relative to the frame side member 1a with the receiver element 132, the base plate 131 of the frame hinge part 130 is brought into connection with the receiver element 132 in that a base plate rivet 131a is brought into
5 engagement with a receiver element slot 132a.

The frame hinge part 130 and the sash hinge part 140 are furthermore provided with holding clips 134, 144 for connecting the covering elements 1b, 2b of the frame and sash side members 1a, 2a.

It is noted that during the entire opening and closure movement, the
10 respective planes of the base plates 131, 141 of the frame hinge part 130 and the sash hinge part 140 are at all times kept substantially parallel, thus avoiding transverse movements perpendicular to the hinge plane as defined by the base plates 131, 141.

In order to render the necessary movement between the parts of the
15 hinge possible, each hinge comprises a movement supporting assembly. The movement supporting assembly comprises guiding means configured to allow the sash hinge part 140 to assume an angle relative to the frame hinge part 130 substantially around the hinge axis α during an opening movement from a closed position to an open position and during a closing movement from the
20 open position to the closed position. In the type of hinge according to the invention, the guiding means comprise a linkage mechanism including at least two links 150, 160 providing connection between the sash hinge part 140 and the frame hinge part 130, and each link is connected to at least one of the frame hinge part and the sash hinge part at a joint and connected to each
25 other as will be described in the following for the first embodiment.

According to the invention, the linkage mechanism comprises two links, namely a sash link 150 and a frame link 160 providing connection between the sash hinge part 140 and the frame hinge part 130.

The frame link 160 is connected to the sash hinge part 140 in a
30 sliding joint 162. The sliding joint 162 cooperates with a guide track 145. Here, the guide track 145 is provided in the sash hinge part 140, more specifically in the base plate 141 of the sash hinge part 140. The sliding joint

may in principle comprise a pin or an axle, but is here formed as a sliding block 163. The sliding block 163 is connected to an engagement part 164. Suitable materials of the components of the sliding joint, and of other components of the hinge, are given in Applicant's above-mentioned WO
5 2017/076416 A1. The sliding connection may also include a pin and/or an axle, either alone or in combination with the sliding block.

In the first embodiment, the sash link 150 is connected to the frame hinge part 130 by means of an additional link 165 via a hinged joint 153. In turn, the additional link 165 is connected to the frame hinge part 130 at a
10 hinged joint 166 located eccentrically relative to the hinged joint 153 forming the connection between the sash link 150 and the additional link 165. The additional link 165 adds a degree of freedom to the hinge 110 and this provides for an even more fine-tuned movement pattern.

Furthermore, the frame link 160 is connected to the frame hinge part
15 130 in a hinged joint 161, and the sash link 150 is connected to the sash hinge part 140 in a hinged joint 151.

A force transmission device 170 is provided for exerting lifting assistance to the movement of the sash 2 relative to the frame 1 during opening of the roof window in the mounted condition of the hinge 110. The
20 force transmission device 170 is provided with biasing means, which in general may be selected from the group comprising leaf springs, torsion springs and tension/compression springs. In the embodiment shown, the biasing means is a tension spring 172. The tension spring 172 is connected to the base plate 141 of the sash hinge part 140 and acts on a pick-up 171
25 connected to the sash hinge part 140 in a hinged joint 173 such that the pick-up 171 acts on the sliding joint 162, at the engagement part 164 thereof.

Finally, the hinge 110 comprises a braking device 180 acting on an element of the movement supporting assembly over a part of the opening and/or closing movement. In its most simple form, the braking device 180
30 comprises a friction element configured to provide a frictional force on a link of the linkage mechanism and/or at a joint between the linkage mechanism and the frame hinge part.

In the shown first embodiment, the braking device 180 comprises a friction element in the form of a friction disc 181, biased by a plate spring 182 acting on the sash link 150 via a washer 183. The friction disc 181 is provided between the sash link 150 and the additional link 165. The friction disc 181 is made of a suitable material which is able to apply a braking force on the sash link 150 and consequently on the entire linkage mechanism. The person skilled in the art is aware of materials which are able to withstand wear over long periods of time, for instance suitable plastic materials. Here, where the additional link 165 is substantially circular, this has an additional advantage in ensuring a large contact surface of the friction disc 181, which is at the same time to a large extent overlapped by the additional link 165 during the movement, as indicated in the Figs 10 to 12.

Turning now to Figs 10 to 12, a sequence of positions during the opening movement of the hinge 110 and thus of the sash 2 relative to the frame 1 of the entire roof window is shown.

From the closed position shown in Fig. 10, the sash 2 is rotated relative to the frame 1 when the user operates the operating device. The particular movement pattern of the linkage mechanism of the guiding means ensures that the sash side covering element 2b moves out of engagement with the frame side covering element 1b without conflict into an open position as represented by Fig. 11 or Fig. 12. The force transmission device 170 assists during the lifting operation, and the braking device 180 is configured such that it modulates the movement of the sash hinge part 140 relative to the frame hinge part 130, and thus of the entire sash 2 relative to the frame 1 in order to keep any exaggerated movement in check.

Figs 13 to 16

Turning now to the remaining Figures of the drawings, it is again noted that elements having the same or analogous function are denoted by the same reference numerals as in the first embodiment, to which 100, 200... has been added. Only differences will be described in detail.

In a second embodiment, the force transmission device 270 of the

hinge 210 comprises a pick-up 271 connected to the sash hinge part 240 in a hinged joint 273 and configured to act on the sliding joint 262 via a separate pick-up link 274. This provides for an alternative set-up of the force transmission device 270.

5

Figs 17 to 18

In a third embodiment, the pick-up 371 of the force transmission device 370 of the hinge 310 is biased by a leaf spring 372. The leaf spring 372 is fixated by a fastening protrusion 375a and a first abutment protrusion 375b and a second abutment protrusion 375c provide for the bias of the pick-up 371. Leaf springs have suitable biasing properties and are easy to handle and mount.

Figs 19 to 22

In a fourth embodiment, the friction element of the braking device 480 comprises a leaf spring 481, 482, 483, 484. The leaf springs 481, 482, 483, 484 are configured to interact with sliding joints 452, 462. The sliding joints 452, 462 are movable in respective tracks 435, 445 in the frame hinge part 430 and the sash hinge part 440, respectively. In this embodiment, two leaf springs 481, 482; 483, 484 are positioned oppositely to interact with a respective sliding joint 452; 462. This renders the design of the hinge 410 simple, yet reliable and well-functioning.

Figs 23 to 24

In a fifth embodiment, a guide track 552 is provided in the sash link 550, and the sliding joint 535 is provided on the frame hinge part 530 of the hinge 510.

The friction element of the braking device 580 comprises two squeeze blocks 581, 582. The squeeze blocks 581, 582 are provided in connection with the sliding joint 535 and interact with the sash link 550 at the guide track 552 therein. Alternatively, a single squeeze block may be provided. The provision of squeeze blocks has proven to function well as an

alternative braking solution.

Figs 25 to 26

In a sixth embodiment, the provision of the guide track 652 in the sash link 650 and of the sliding joint 635 on the frame hinge part 630 of the hinge 610 corresponds to the configuration of the fifth embodiment.

The friction element of the braking device 680 comprises two narrowed sections 681, 682. The lower narrowed section 681 and upper narrowed section 682 are configured to interact with the sliding block 663 of the sliding joint 662. Each of the two narrowed sections 681, 682 has a width which is uniformly smaller than the width at another portion of the braking device 680. Alternatively, a single narrowed section may be provided. A very simple structure of the hinge 610 is achieved.

15 Non-shown embodiments

The hinge of the embodiments described in the above is also applicable in roof windows which are top-hinged during normal operation and which pivots for cleaning. It is understood that in such a roof window, the stationary frame 1 constitutes a primary frame, and the sash 2 functions as a first secondary frame and an intermediate frame functions as a second secondary frame. The intermediate frame is fastened to the stationary frame at a top mounting fitting and the sash is hinged at the top of the roof window, via the intermediate frame to the stationary frame, to render the roof window top-hinged during normal operation. The sash is also pivotally connected to the intermediate frame in order to be able to rotate the sash to provide access to the exterior of the pane, for instance for cleaning purposes. To that end, the intermediate frame is provided with a frame hinge part of the hinge and the sash with the counterpart sash hinge part.

The invention is not limited to the embodiments shown and described in the above, but various modifications and combinations may be carried out.

List of reference numerals

- 1 frame
 - 1a frame side member
 - 1b frame side covering element
- 2 sash
 - 2a sash side member
 - 2b sash side covering element
- 3 pane
- 4 operating and locking assembly
- α hinge axis

- 10 hinge

- 110 hinge

- 130 frame hinge part
 - 131 base plate
 - 131a base plate rivet
 - 132 receiver element
 - 132a receiver element slot
 - 133 spigot
 - 134 holding clip

- 140 sash hinge part
 - 141 base plate
 - 142 distance piece
 - 143 spigot
 - 144 holding clip
 - 145 guide track

- 150 sash link
 - 151 hinged joint (to base plate 141)
 - 153 hinged joint (to additional link 165)

- 155 bearing axle

- 160 frame link
 - 161 hinged joint (to base plate 131)
 - 162 sliding joint (to guide track 145)
 - 163 sliding block
 - 164 engagement part

- 165 additional link
 - 166 hinged joint of friction link 165 (to base plate 131)

- 170 force transmission device

- 171 pick-up
- 172 spring
- 173 hinged joint
- 180 braking device
 - 181 friction disc
 - 182 plate spring
 - 183 washer
- 210 hinge
- 230 frame hinge part
- 240 sash hinge part
 - 245 guide track
- 250 sash link
 - 251 hinged joint
- 255 bearing axle
- 260 frame link
 - 261 hinged joint (to base plate 231)
 - 262 sliding joint (to guide track 245)
 - 263 sliding block
- 270 force transmission device
 - 271 pick-up
 - 272 spring
 - 273 hinged joint
 - 274 pick-up link
- 280 braking device
- 310 hinge
- 330 frame hinge part
- 340 sash hinge part
 - 345 guide track
- 350 sash link
 - 351 hinged joint
- 355 bearing axle
- 360 frame link

- 361 hinged joint
- 362 sliding joint (to guide track 345)
- 363 sliding block
- 364 engagement part
- 370 force transmission device
 - 371 pick-up
 - 372 spring
 - 375a fastening protrusion (for spring 372)
 - 375b first abutment protrusion
 - 375c second abutment protrusion
- 380 braking device
- 410 hinge
- 430 frame hinge part
 - 435 guide track
- 440 sash hinge part
 - 441 base plate
 - 445 guide track
- 450 sash link
 - 452 sliding joint (to track 435)
- 455 bearing axle
- 460 frame link
 - 462 sliding joint (to guide track 445)
- 480 braking device
 - 481 leaf spring
 - 482 leaf spring
 - 483 leaf spring
 - 484 leaf spring
 - 485 protrusion
- 510 hinge
- 530 frame hinge part
 - 535 sliding joint
- 540 sash hinge part

- 545 guide track
- 550 sash link
 - 551 hinged joint
 - 552 guide track (to sliding joint 535)
- 555 bearing axle
- 560 frame link
 - 561 hinged joint
 - 562 sliding joint (to guide track 545)
 - 563 sliding block
 - 564 engagement part
- 570 force transmission device
- 580 braking device
 - 581 first squeeze block
 - 582 second squeeze block
- 610 hinge
- 630 frame hinge part
 - 635 sliding joint
 - 636 sliding block
- 640 sash hinge part
 - 645 guide track
- 650 sash link
 - 651 hinged joint
 - 652 guide track (to sliding joint 635)
- 655 bearing axle
- 660 frame link
 - 661 hinged joint
 - 662 sliding joint (to guide track 645)
 - 663 sliding block
- 670 force transmission device
- 680 braking device
 - 681 lower narrowed section
 - 682 upper narrowed section

Claims

1. A hinge (110; 210; 310; 410; 510; 610) for a roof window with a stationary primary frame (1) having a plurality of frame members including at least two opposing side members (1a), and at least one secondary frame including a sash (2) having a plurality of sash members including at least two opposing side members (2a) and optionally an intermediate frame, said hinge being configured to be connected to the primary frame (1) or to the intermediate frame and to the secondary frame sash (2) to define a hinge axis
10 (α) of the roof window,

said hinge (110; 210; 310; 410; 510; 610) comprising a frame hinge part (130; 230; 330; 430; 530; 630), a sash hinge part (140; 240; 340; 440; 540; 640), and a movement supporting assembly comprising guiding means configured to allow the sash hinge part to assume an angle relative to the frame hinge part substantially around said hinge axis (α) during an opening movement from a closed position to an open position and during a closing movement from the open position to the closed position, the guiding means comprising a linkage mechanism including at least two links (150, 160; 250, 260; 350, 360; 450, 460; 550, 560; 650, 660) providing connection between
20 the sash hinge part and the frame hinge part, each link being connected to at least one of the frame hinge part and the sash hinge part at a joint and connected to each other, the frame hinge part (130; 230; 330; 430; 530; 630) comprising a base plate (131) defining a hinge plane substantially perpendicular to the hinge axis (α) of the roof window and the sash hinge part (140; 240; 340; 440; 540; 640) comprising a base plate (141) substantially
25 parallel to the base plate (131) of the frame hinge part,

characterised in that

the at least two links of the linkage mechanism are connected to each other in a bearing axle (155; 255; 355; 455; 555; 655), and the at least
30 two links comprise a sash link (150; 250; 350; 450; 550; 650) providing connection between the bearing axle (155; 255; 355; 455; 555; 655) and the frame hinge part (130; 230; 330; 430; 530; 630), and a frame link (160; 260;

360; 460; 560; 660) providing connection between the bearing axle and the sash hinge part (140; 240; 340; 440; 540; 640), that

the hinge comprises a braking device (180; 280; 380; 480; 580; 680) acting on at least one element of the movement supporting assembly over at least a part of the opening and/or closing movement, and

that the braking device (180; 280; 380; 480; 580; 680) comprises at least one friction element (181; 481, 482, 483, 484; 581, 582; 681, 682).

2. A hinge according to claim 1, wherein the friction element is configured to provide a frictional force on at least one link of the linkage mechanism and/or at a joint between the linkage mechanism and the sash hinge part or the frame hinge part.

3. A hinge according to claim 2, wherein the at least one friction element (181; 481, 482, 483, 484) is biased, preferably by comprising a spring (182; 481, 482, 483, 484).

4. A hinge according to any one of the preceding claims, wherein the frame link (160; 260; 360; 460; 560; 660) is connected to the sash hinge part (140; 240; 340; 440; 540; 640) in a sliding joint (162; 262; 362; 462; 562; 662) and/or the sash link (450; 550; 650) is connected to the frame hinge part (430; 530; 630) in a sliding joint (452; 535; 635), each sliding joint preferably cooperating with a guide track (145; 245; 345; 445, 435; 545, 552; 645, 652).

5. A hinge according to claim 4, wherein the guide track (145; 245; 345; 445, 435; 545; 645) is provided in the respective sash hinge part (140; 240; 340; 440; 540; 640) or frame hinge part (430).

6. A hinge according to claim 5, wherein the guide track (145; 245; 345; 445, 435; 545; 645) is provided in the base plate (141, 131) of the respective sash hinge part (140; 240; 340; 440; 540; 640) or frame hinge part (430).

7. A hinge according to claim 4, wherein the guide track (552; 652) is provided in a link of the linkage mechanism, preferably in the sash link (550; 650), and the sliding joint (535; 635) is provided on a hinge part, preferably on the frame hinge part (530; 630), more preferably on the base plate of the frame hinge part.

8. A hinge according to any one of claims 4 to 7, wherein the sliding joint comprises a pin, axle and/or a sliding block (163; 263; 363; 563; 663, 636), said sliding block being preferably connected to an engagement part (164; 364).

5 9. A hinge according to any one of the preceding claims, wherein the frame link (160; 260; 360; 560; 660) is connected to the frame hinge part (130; 230; 330; 530; 630) in a hinged joint (161; 261; 361; 561; 661) and/or the sash link (150; 250; 350; 550; 650) is connected to the sash hinge part (140; 240; 340; 540; 640) in a hinged joint (151; 251; 351; 551; 651).

10 10. A hinge according to any one of the preceding claims, wherein the sash link (150; 250; 350) is connected to the frame hinge part (130; 230; 330) by means of an additional link (165), the sash link being connected to the additional link via a hinged joint (153).

15 11. A hinge according to claim 10, wherein the additional link (165) is connected to the frame hinge part (130; 230; 330) at a hinged joint (166) located eccentrically relative to the hinged joint (153) forming the connection between the sash link (150; 250; 350) and the additional link (165).

20 12. A hinge according to any one of the preceding claims, wherein the friction element of the braking device (180; 280; 380) comprises a friction disc (181), preferably biased by a plate spring (182).

13. A hinge according to claims 11 and 12, wherein the friction disc (181) is provided between the sash link (150) and the additional link (165).

25 14. A hinge according to any one of claims 1 to 11, wherein the friction element of the braking device (480) comprises at least one leaf spring (481, 482, 483, 484).

15. A hinge according to any one of claims 4 to 11 and 14, wherein the at least one leaf spring (481, 482, 483, 484) is configured to interact with the sliding joint or sliding joints (452, 462).

30 16. A hinge according to claim 15, wherein two leaf springs (481, 482; 483, 484) are positioned oppositely to interact with a respective sliding joint (452; 462).

17. A hinge according to any one of claims 1 to 11, wherein the

friction element of the braking device (580) comprises at least one squeeze block (581, 582), preferably two squeeze blocks.

18. A hinge according to claims 7 and 17, wherein the at least one squeeze block (581, 582) is provided in connection with the sliding joint (535) and interacts with the sash link (550) at the guide track (552) therein.

19. A hinge according to any one of claims 1 to 11, wherein the friction element of the braking device (680) comprises at least one narrowed section (681, 682), preferably two narrowed sections.

20. A hinge according to claims 8 and 19, wherein the at least one narrowed section (681, 682) is configured to interact with the sliding block (663) of the sliding joint (662).

21. A hinge according to any one of the preceding claims, wherein a force transmission device (170; 270; 370; 570; 670) is provided for exerting lifting assistance to the movement of the sash (2) relative to the frame (1) during opening of the roof window in the mounted condition of the hinge (110; 210; 310; 510; 610), and wherein said force transmission device is provided with biasing means selected from the group comprising leaf springs, torsion springs and tension/compression springs.

22. A hinge according to claims 4 and 21, wherein the force transmission device (170; 270; 370; 570; 670) comprises at least one pick-up (171; 271; 371) connected to the frame hinge part and/or the sash hinge part (140) in a hinged joint (173) and configured to act on the sliding joint (162; 262; 362), either directly or via a separate pick-up link (274).

23. A hinge according to claim 22, wherein said pick-up (171; 271; 371) is biased by a spring (172; 272; 372), preferably in the form of a tension spring (172; 272), a leaf spring (372) or a torsion spring.

24. A roof window comprising
a stationary primary frame (1) having a plurality of frame members including at least two opposing side members (1a),
at least one secondary frame including a sash (2) having a plurality of sash members including at least two opposing side members (2a), and optionally an intermediate frame, and

a set of hinges (10) according to any one of claims 1 to 23 connected to the primary frame (1) or to the intermediate frame and to the sash (2) to define a hinge axis (α) of the roof window, the frame hinge part of each hinge being connected to one of said frame side members (1a) of the stationary
5 primary frame (1) or to side members of the intermediate frame, and the sash hinge part of each hinge being connected to one of said sash side members (2a).

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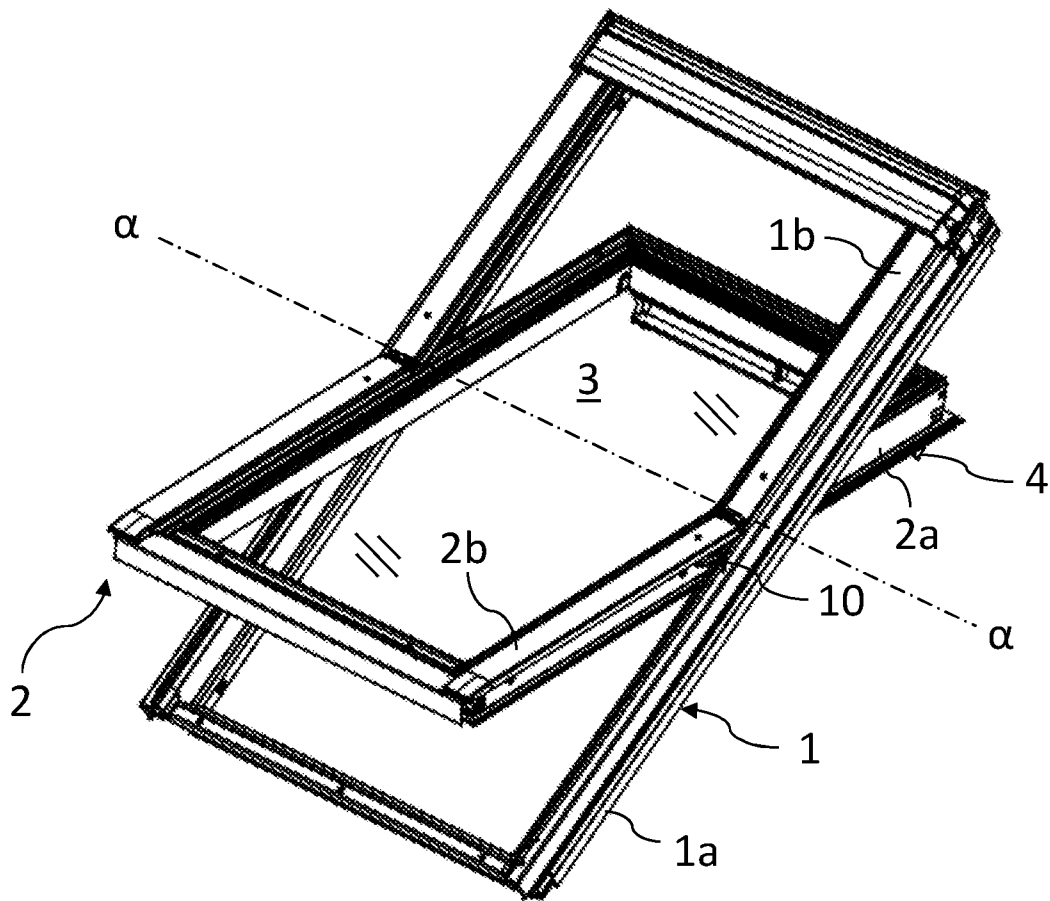


Fig. 1

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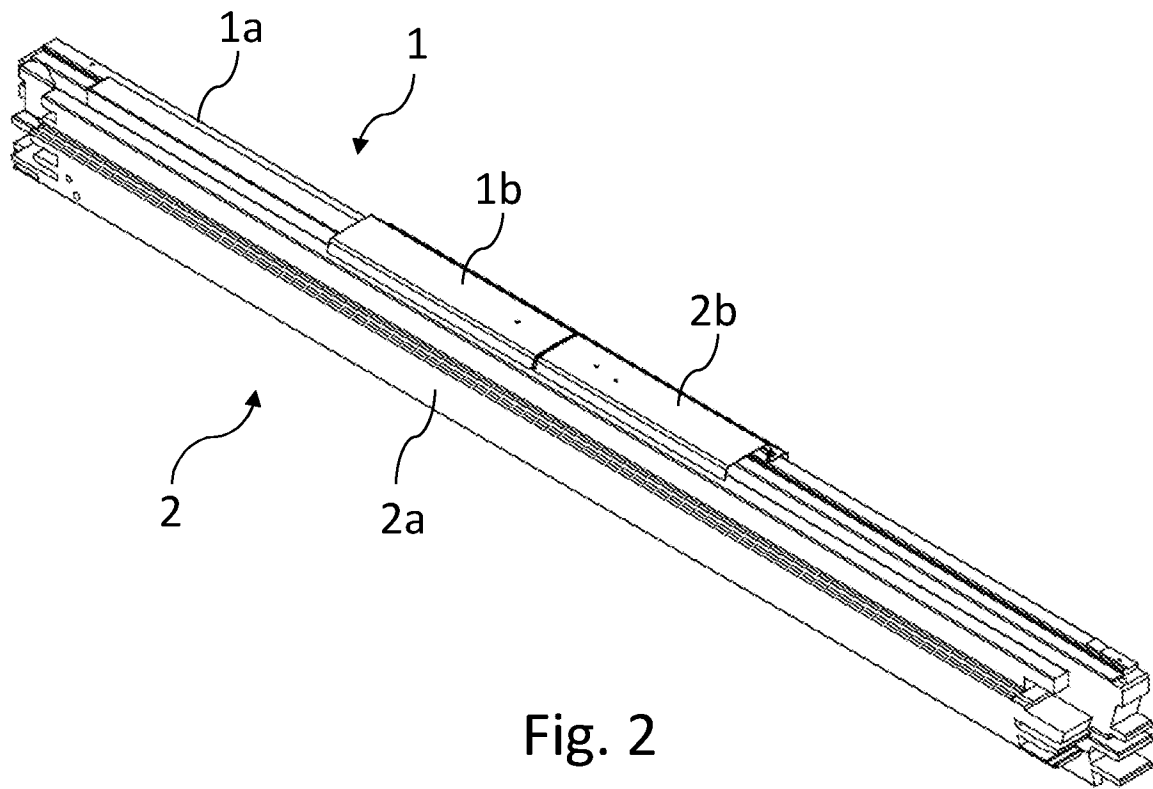


Fig. 2

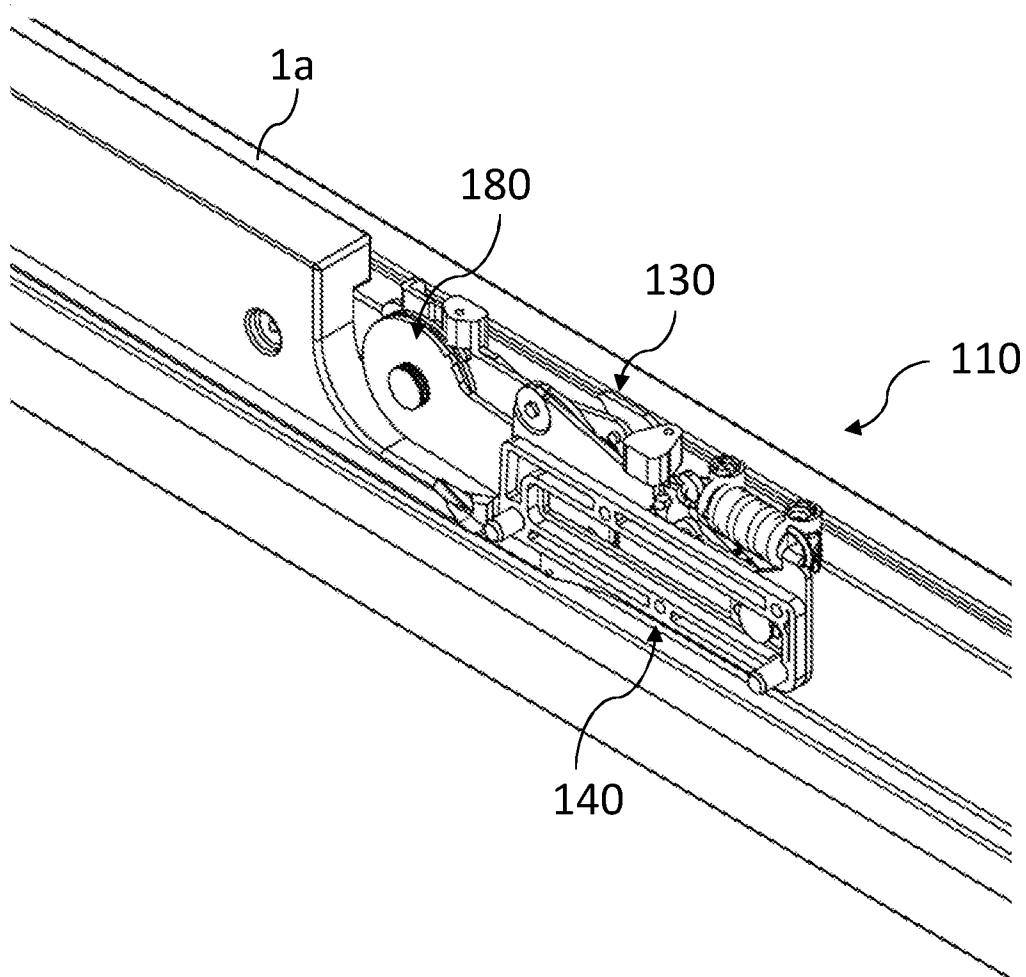


Fig. 3

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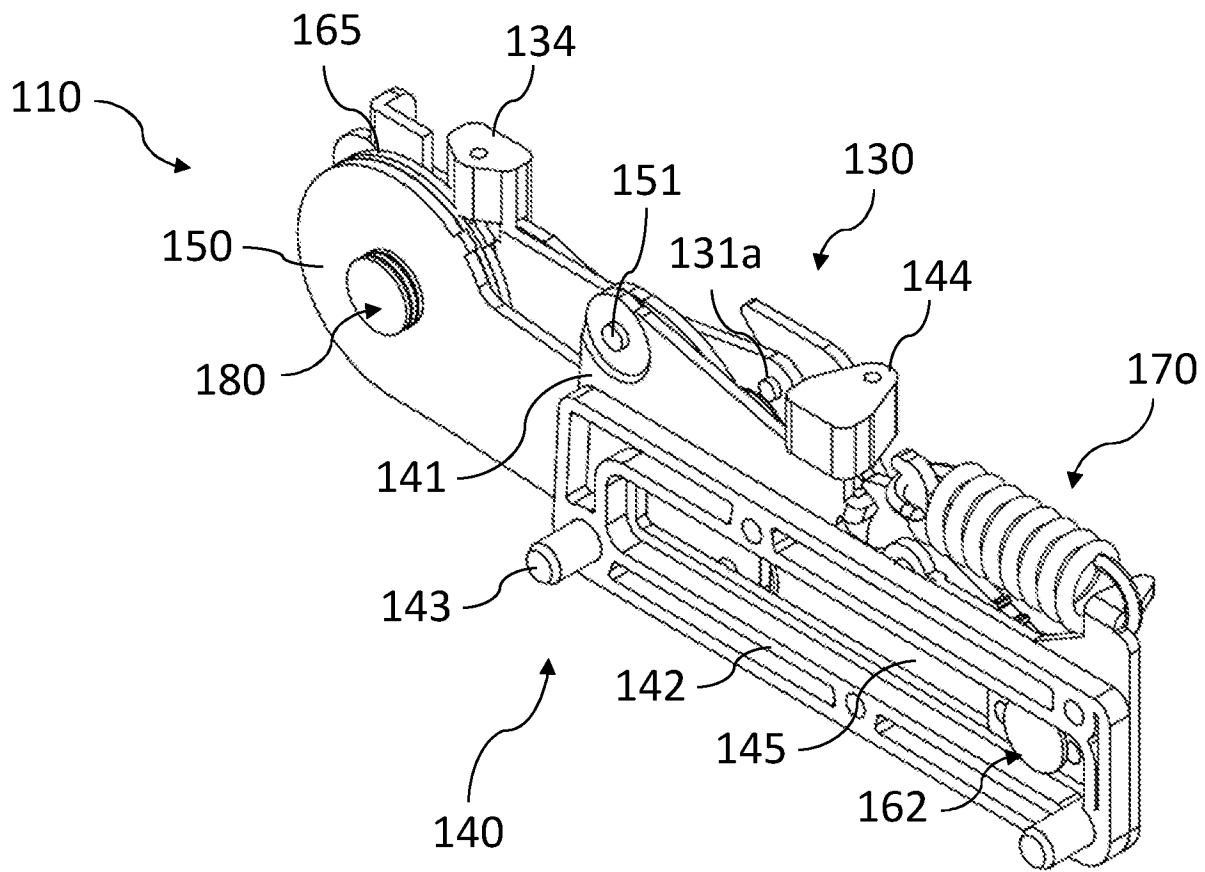


Fig. 4

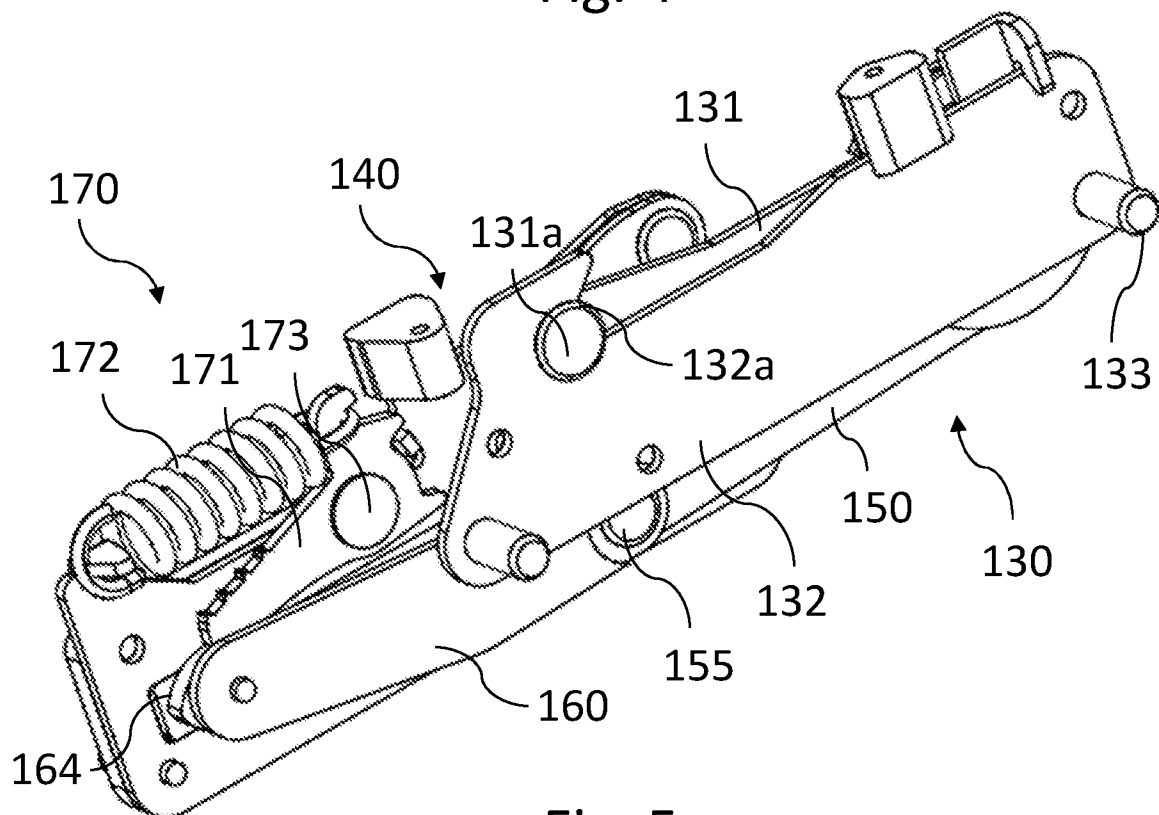
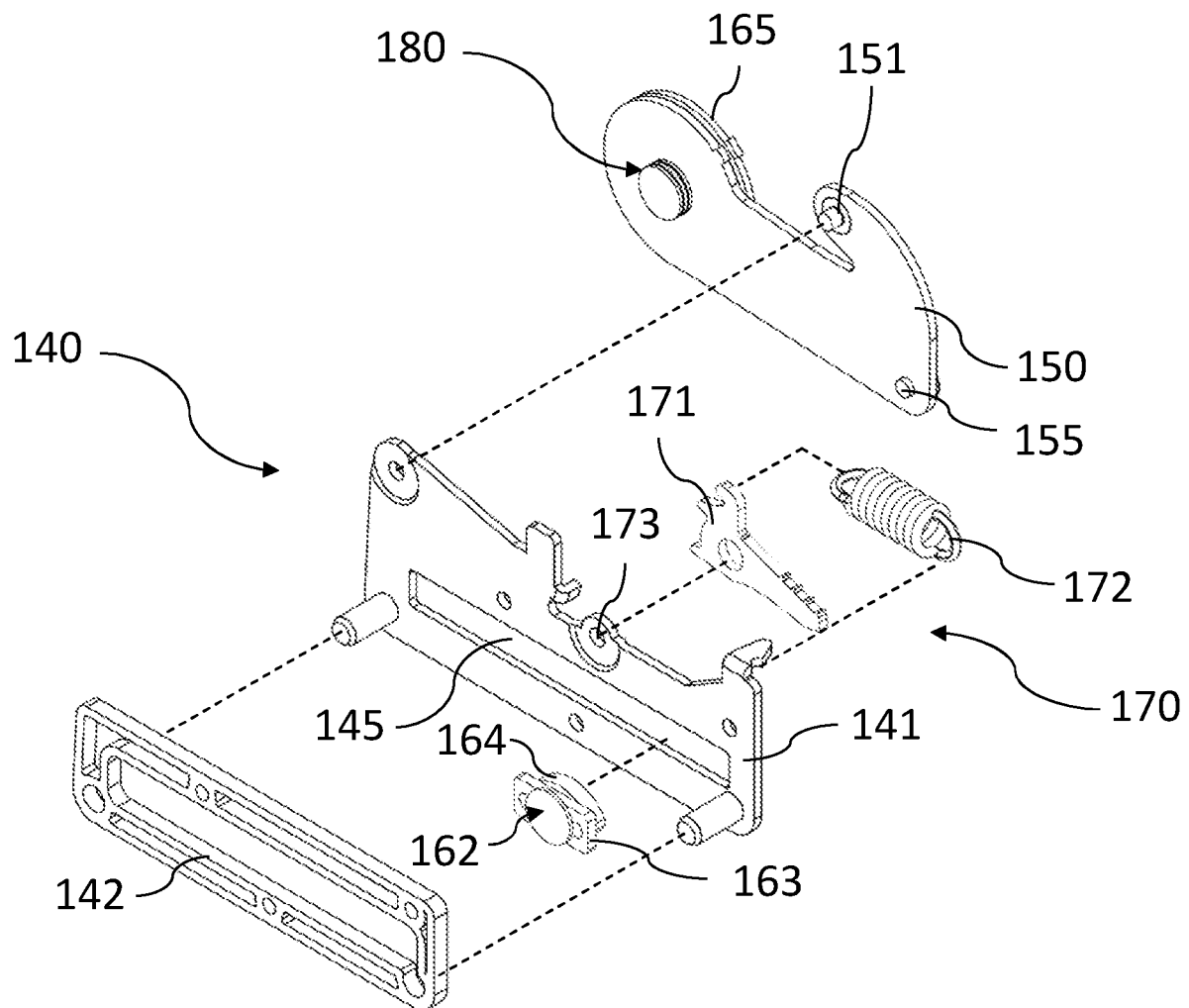
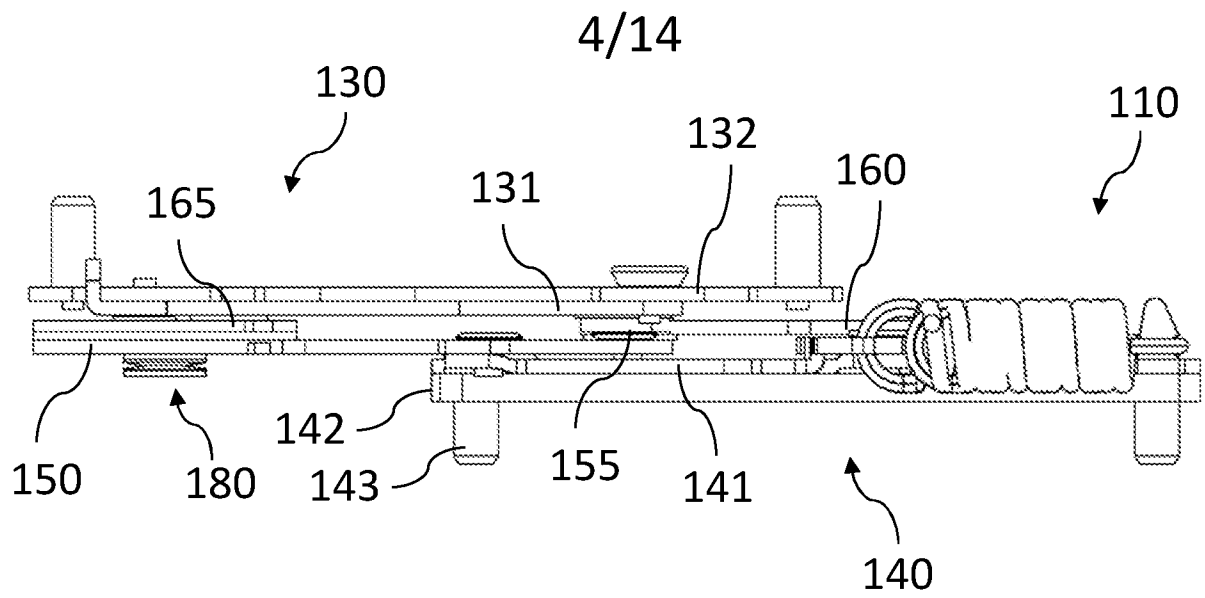


Fig. 5



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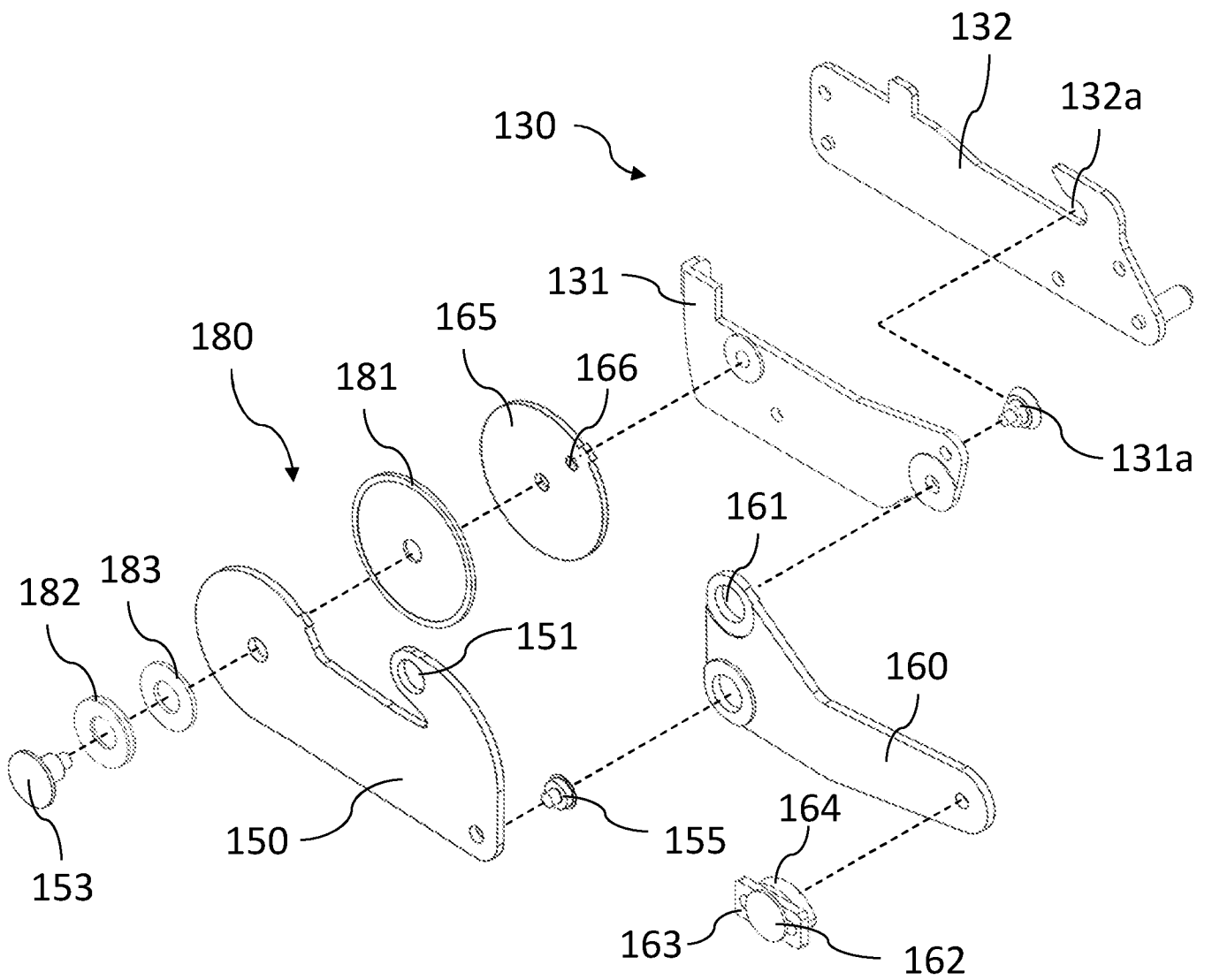
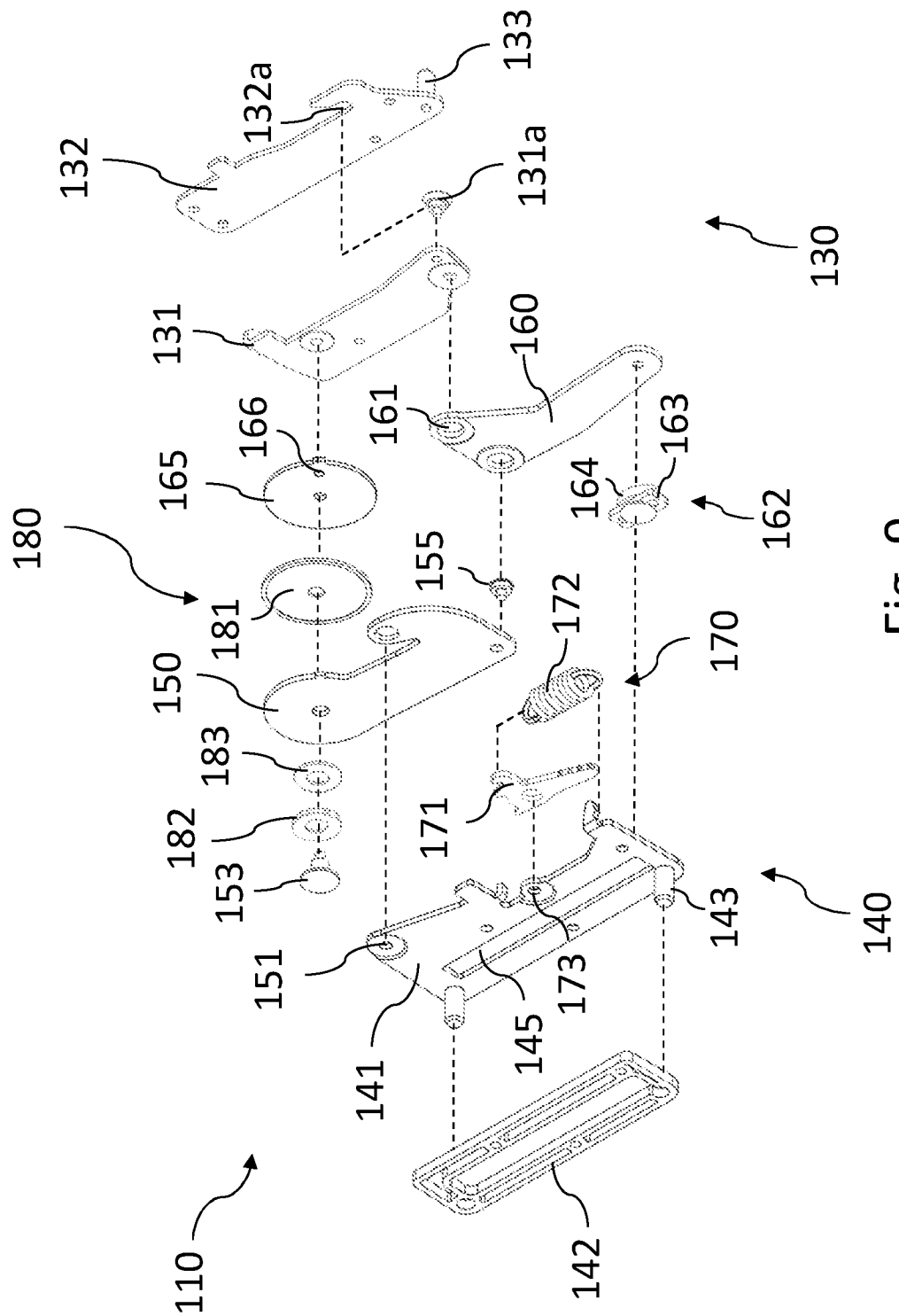


Fig. 8



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Fi. 6

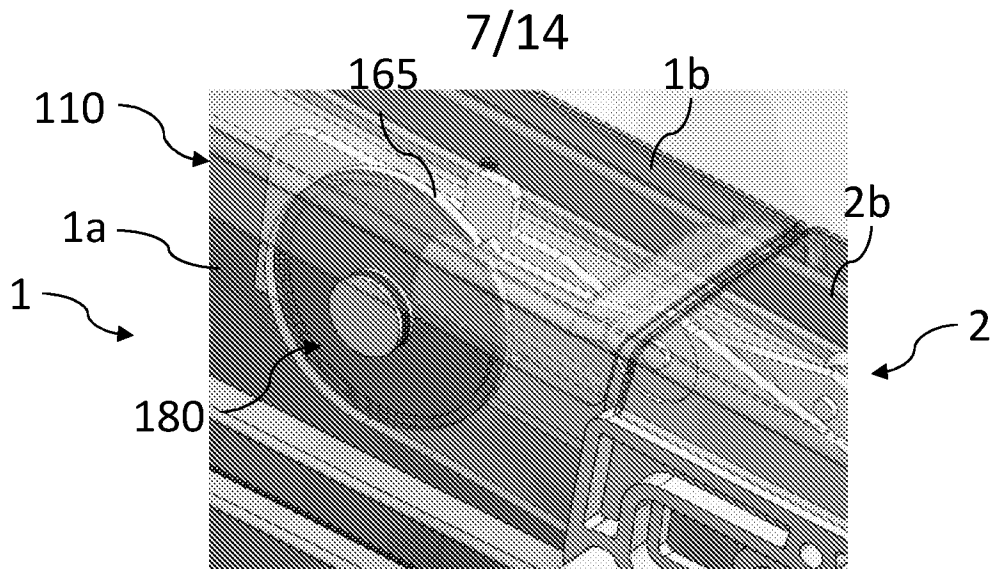


Fig. 10

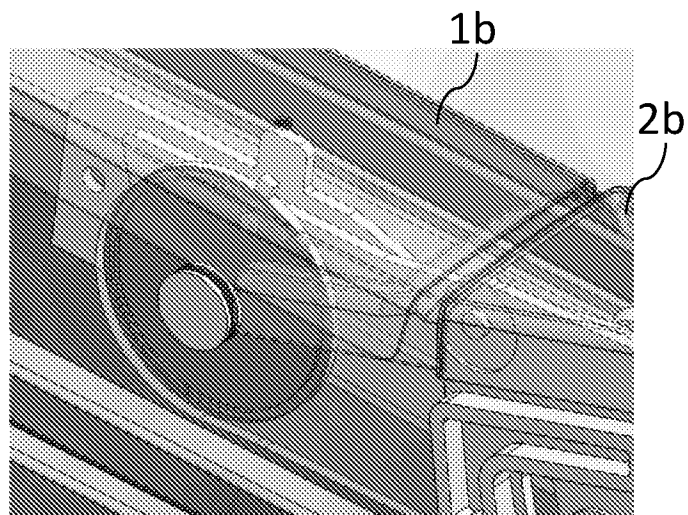


Fig. 11

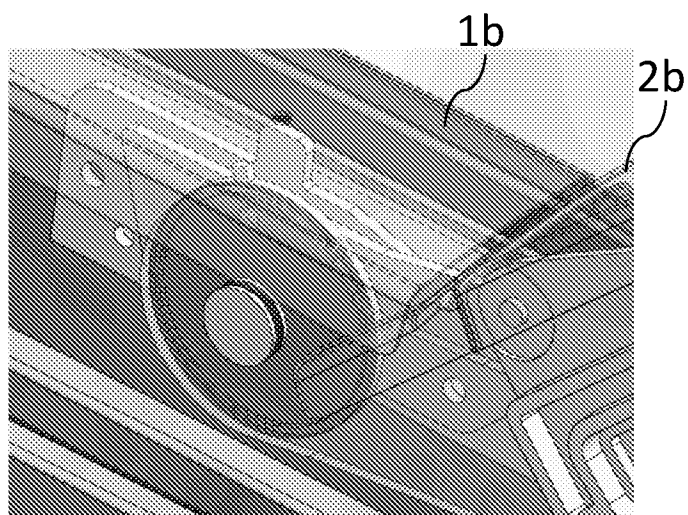


Fig. 12

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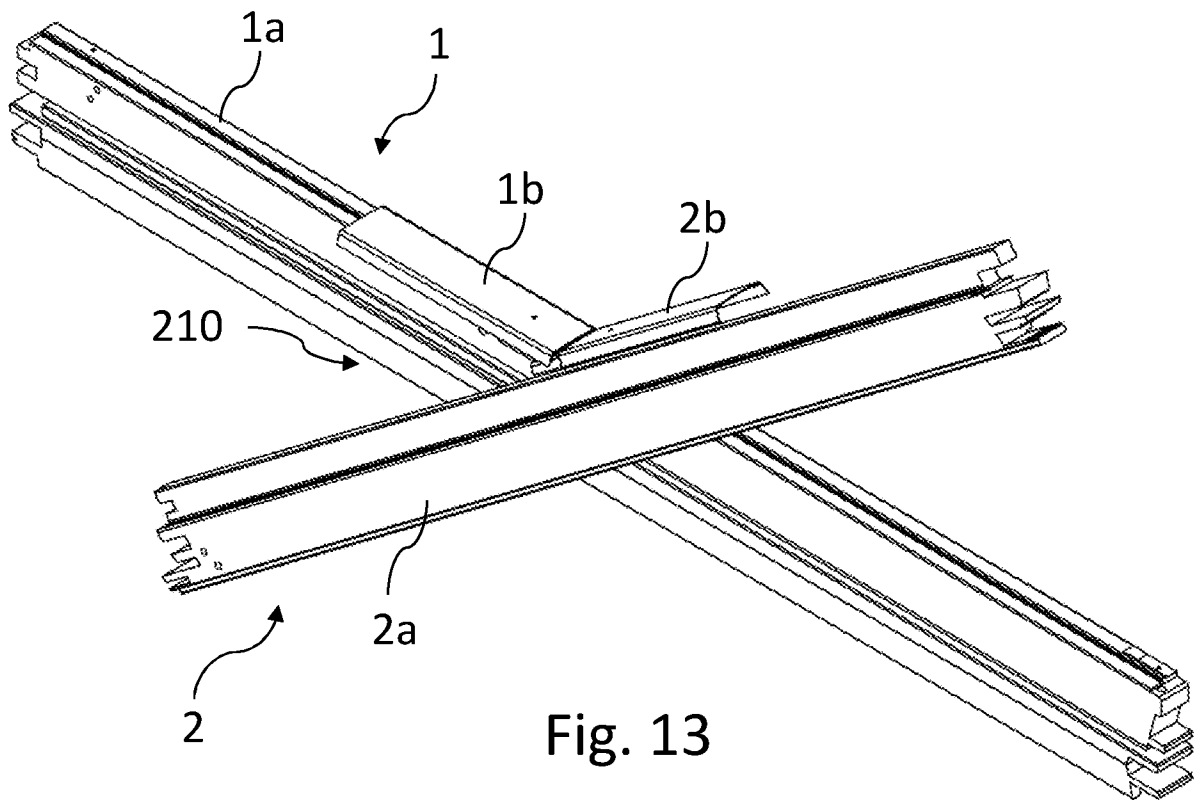


Fig. 13

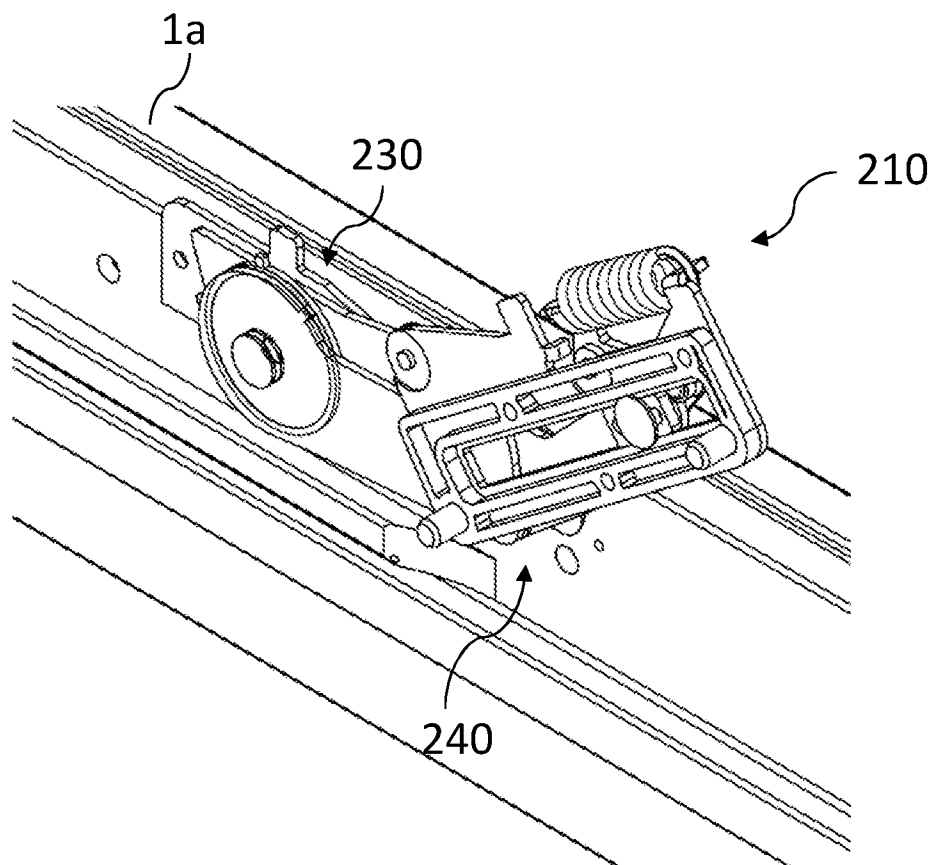


Fig. 14

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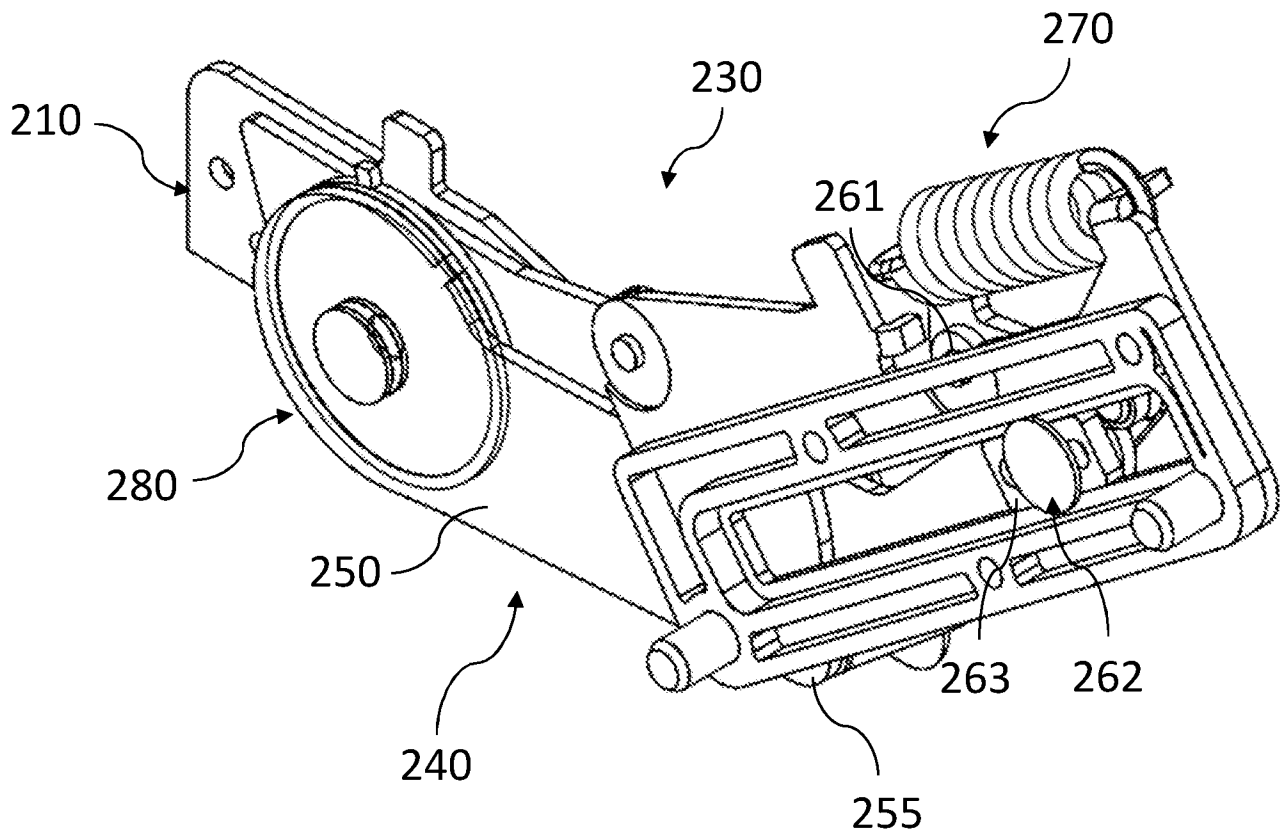


Fig. 15

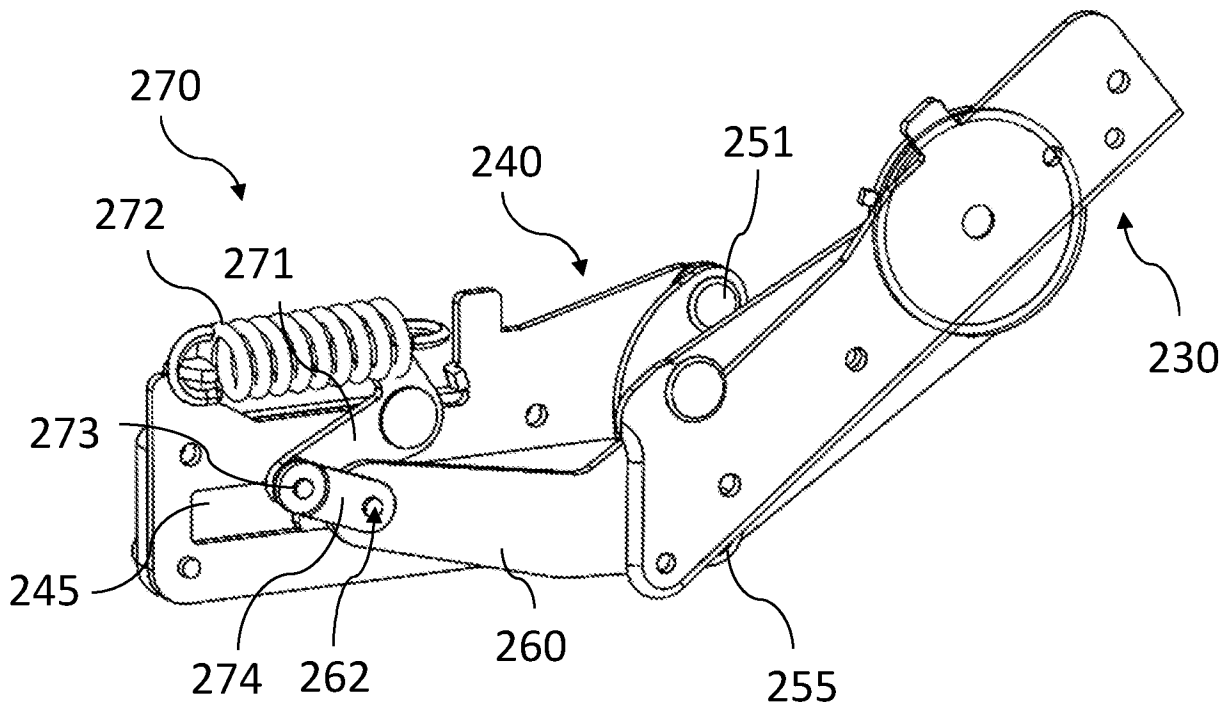


Fig. 16

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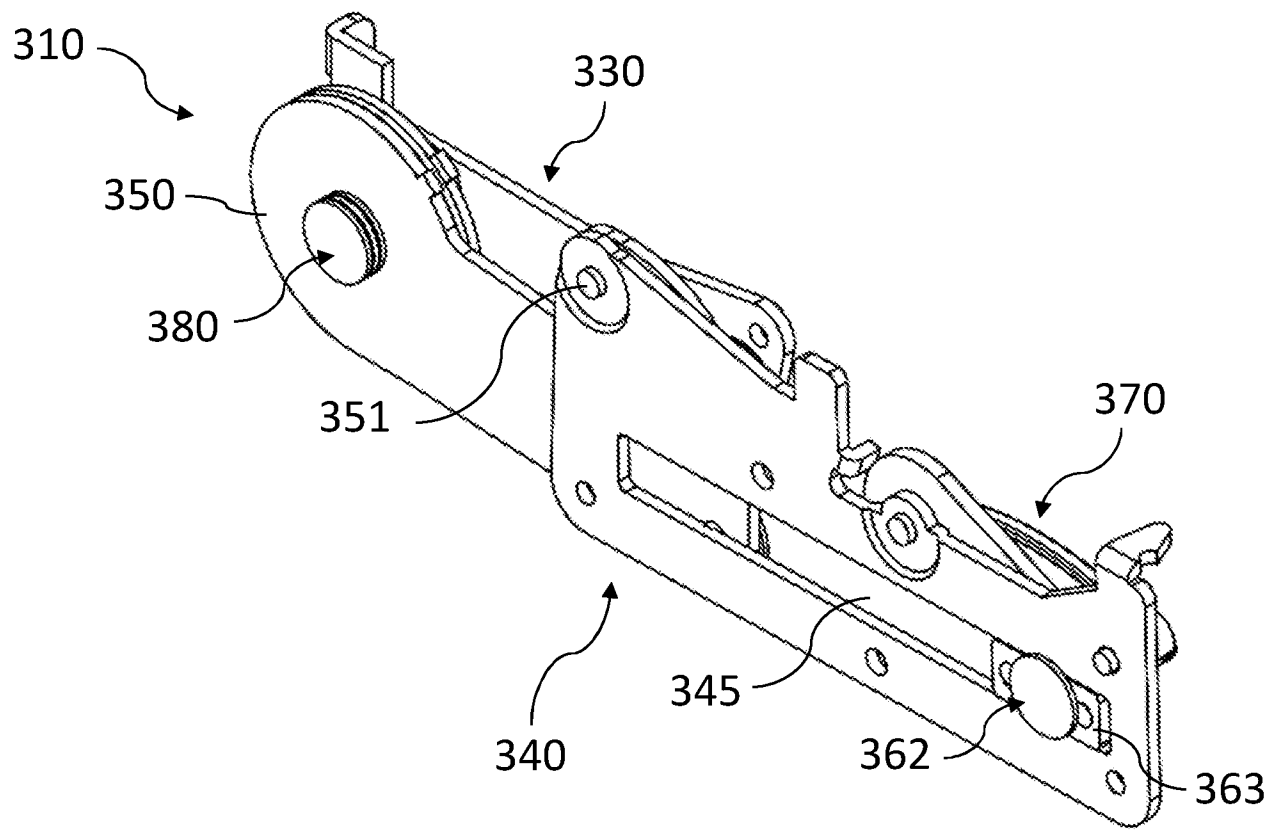


Fig. 17

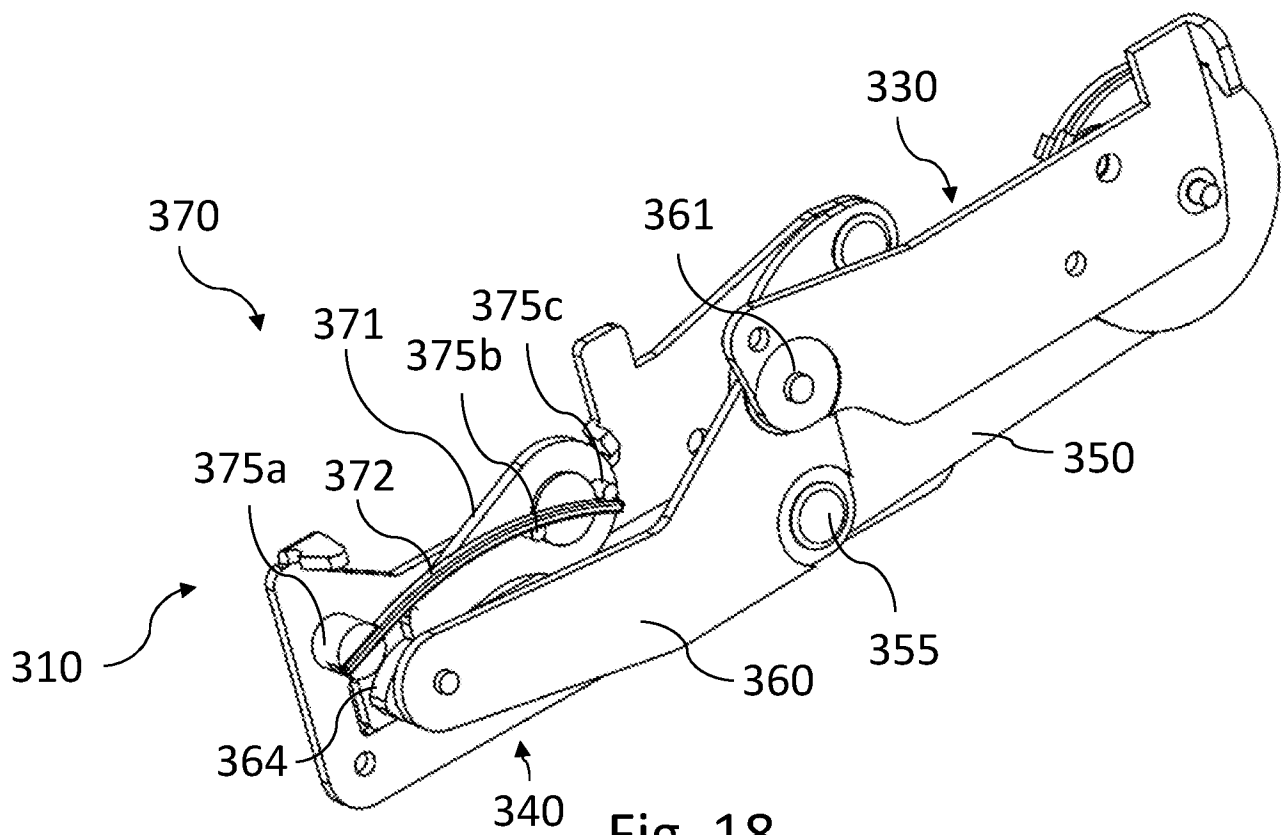


Fig. 18

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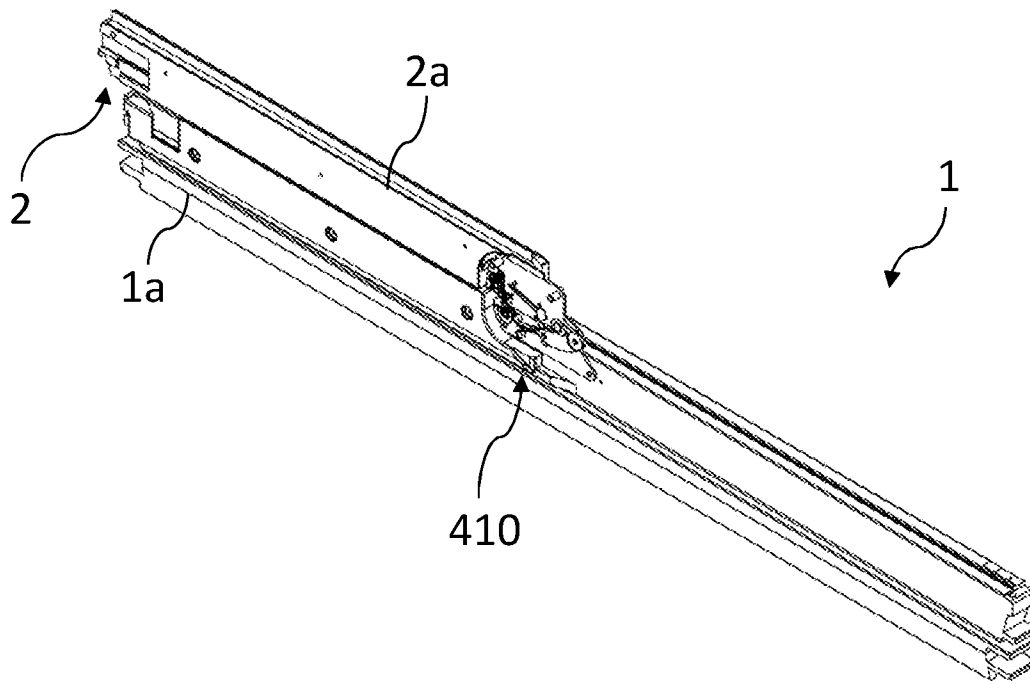


Fig. 19

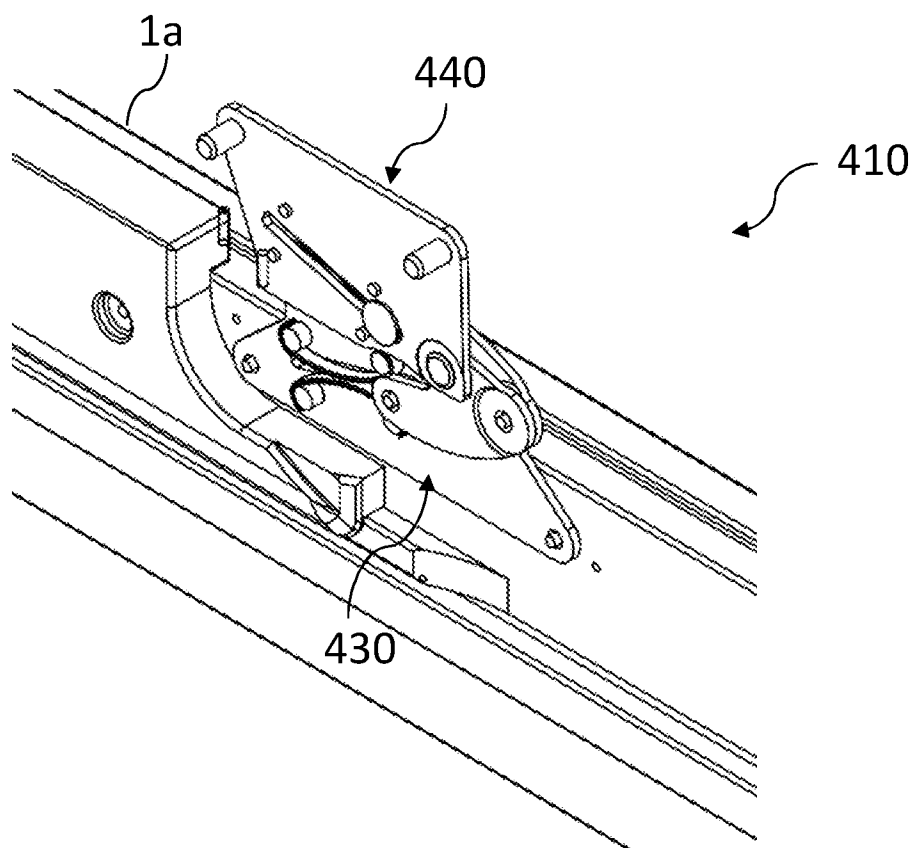


Fig. 20

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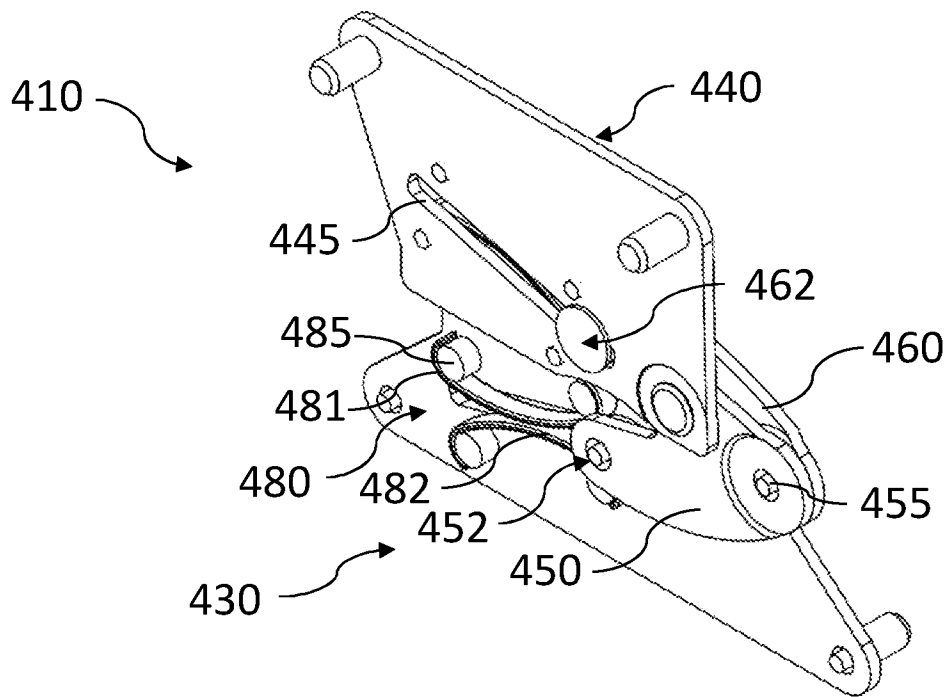


Fig. 21

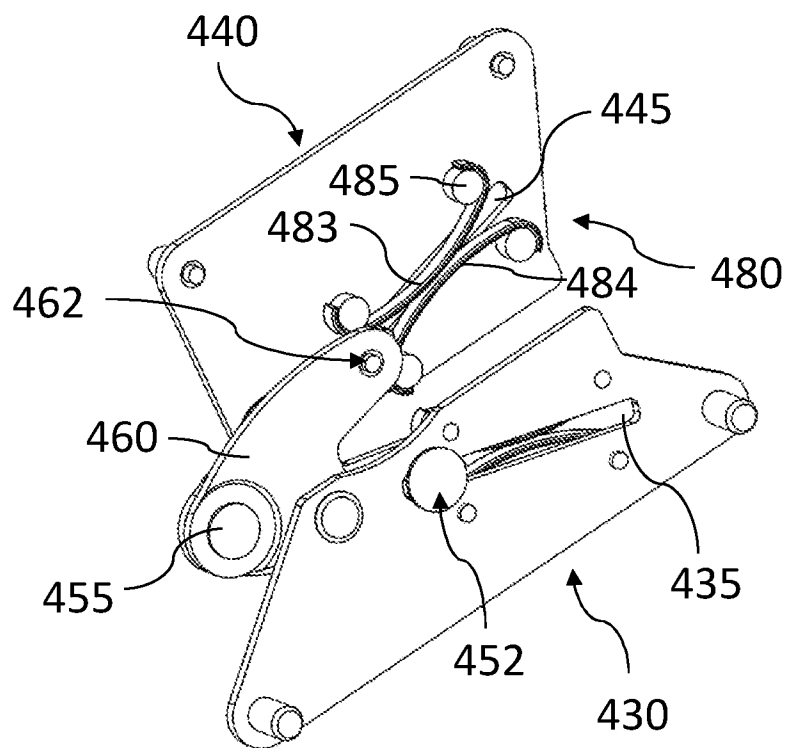


Fig. 22

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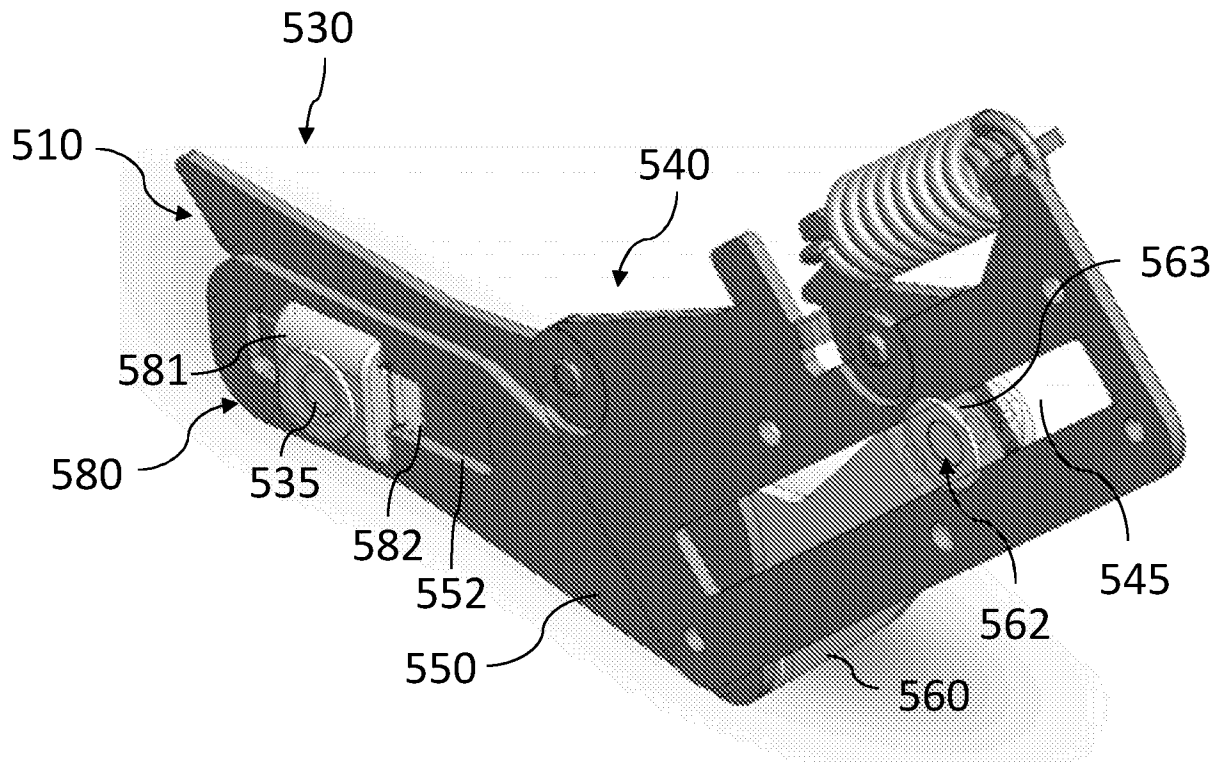


Fig. 23

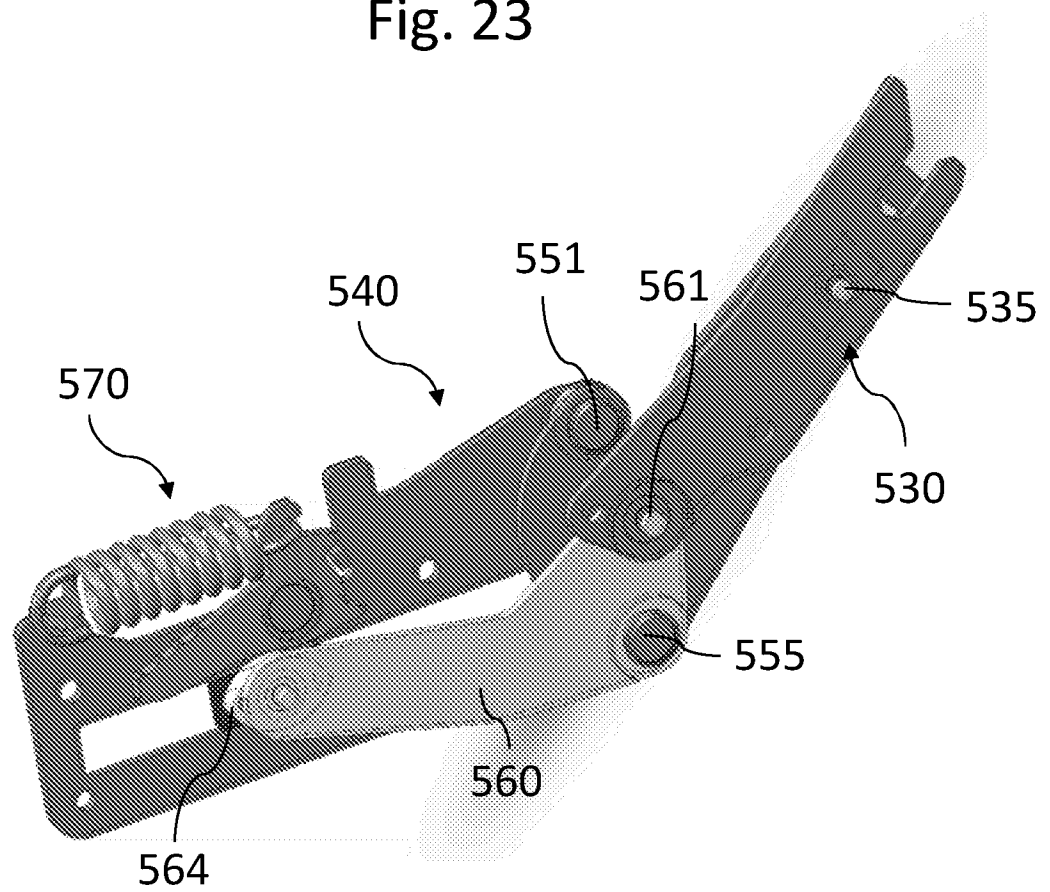


Fig. 24

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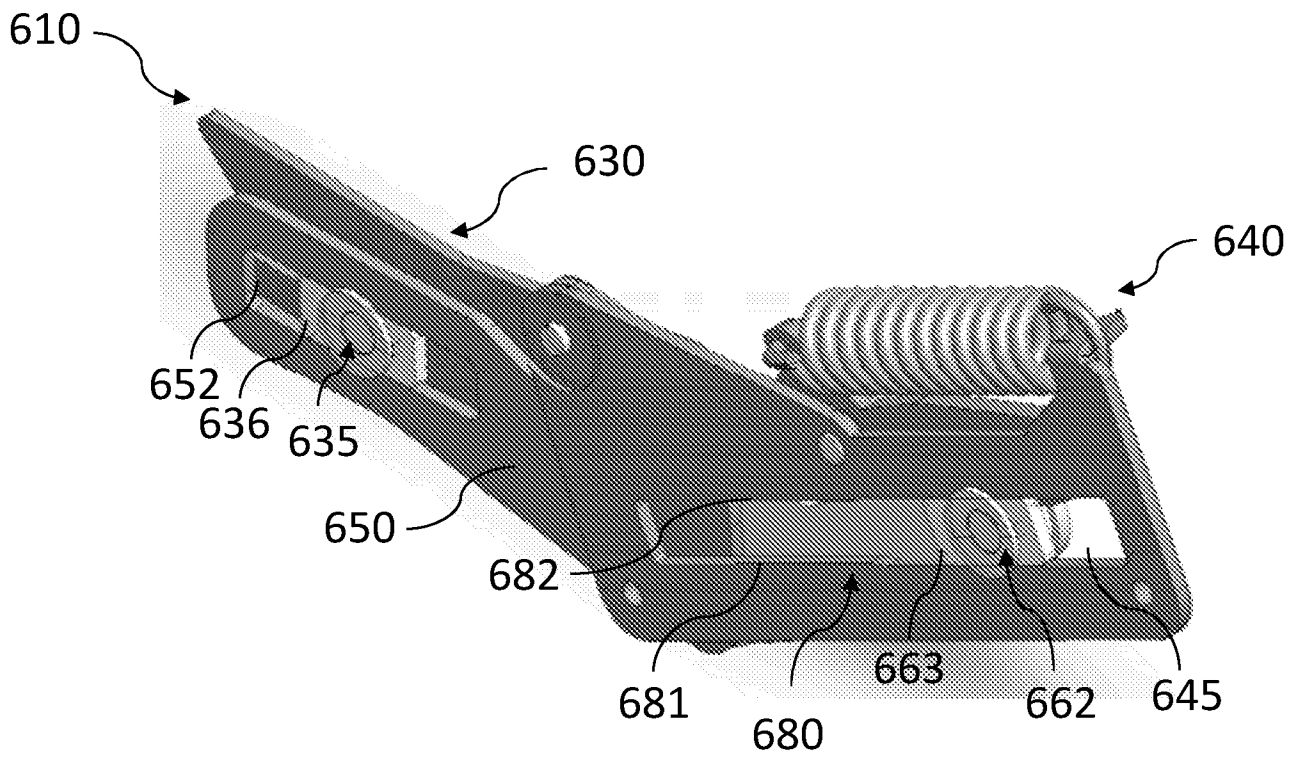


Fig. 25

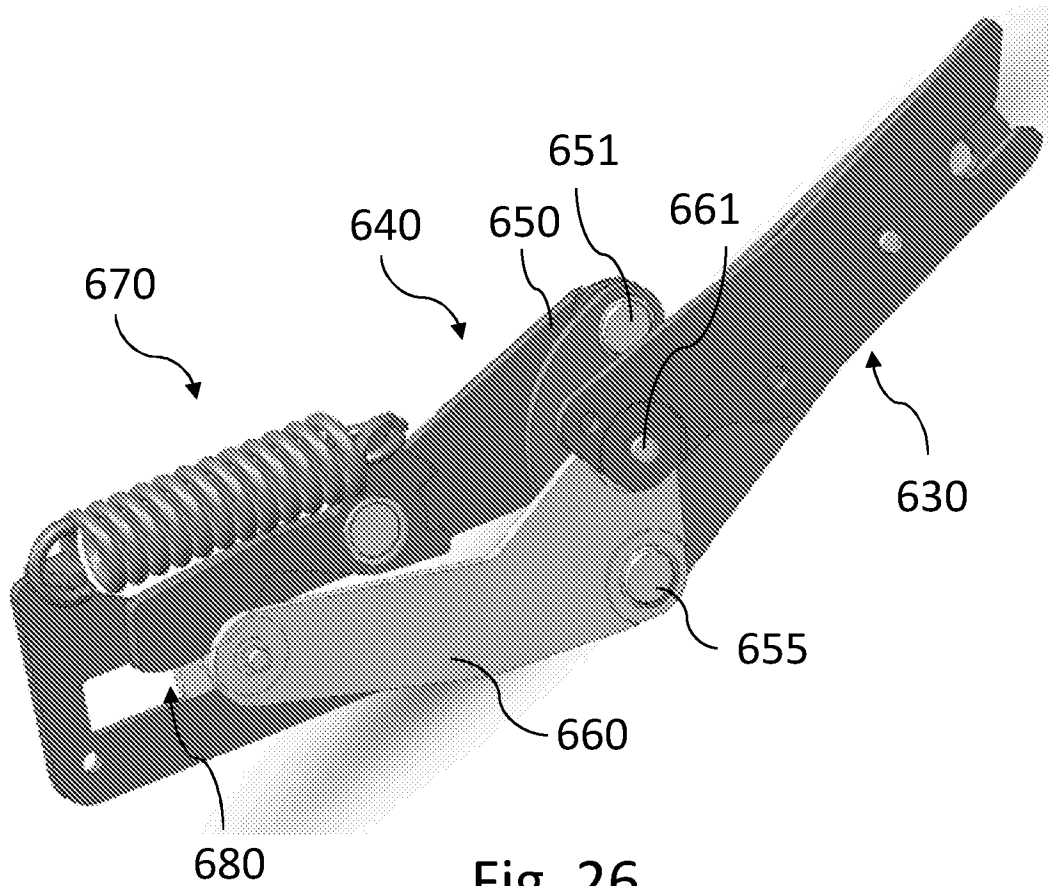


Fig. 26

INTERNATIONAL SEARCH REPORT

International application No
PCT/DK2022/050086

A. CLASSIFICATION OF SUBJECT MATTER INV. E05D7/082 E05D7/085 E05D7/086 E05F1/12 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) E05D E05F		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	page 5, paragraph 1-3; figures -----	7, 10, 11, 13
X	WO 2017/076416 A1 (VKR HOLDING AS [DK]) 11 May 2017 (2017-05-11) cited in the application	1, 2, 4-6, 8, 9, 19-24
Y	page 7, line 10 - page 8, line 31; figures -----	14-16
Y	DE 868 706 C (BACHERT WILLY) 26 February 1953 (1953-02-26) page 3, lines 4-51; figures -----	14-16
A	US 2 287 563 A (SIGFRID PERSSON ERIC) 23 June 1942 (1942-06-23) page 1, column 1, lines 11-22; figures -----	14-16, 19
-/--		
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search	Date of mailing of the international search report	
19 July 2022	27/07/2022	
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Witasse-Moreau, C	

INTERNATIONAL SEARCH REPORT

International application No

PCT/DK2022/050086

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 5 271 124 A (SANDELL ANTHONY C [ZA]) 21 December 1993 (1993-12-21) column 4, lines 15-32; figure 1B -----	1

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