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(54) **ROOF WINDOW WITH A PRIMARY FRAME AND AT LEAST ONE SECONDARY FRAME, METHOD FOR INSTALLING SUCH A ROOF WINDOW AND METHOD FOR DISMANTLING A SECONDARY FRAME OF THE ROOF WINDOW**

DACHFENSTER MIT EINEM PRIMÄRRAHMEN UND MINDESTENS EINEM HILFSRAHMEN, VERFAHREN ZUR MONTAGE EINES SOLCHEN DACHFENSTERS UND VERFAHREN ZUR DEMONTAGE EINES SEKUNDÄRRAHMENS DES DACHFENSTERS

FENÊTRE DE TOIT AVEC UN CADRE PRINCIPAL ET AU MOINS UN CADRE SECONDAIRE, PROCÉDÉ D'INSTALLATION D'UNE TELLE FENÊTRE DE TOIT ET PROCÉDÉ DE DÉMONTAGE D'UN CADRE SECONDAIRE DE LA FENÊTRE DE TOIT

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(73) Proprietor: **VKR Holding A/S**  
**2970 Hørsholm (DK)**

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(72) Inventors:  
 • **HEDE, Lasse Vinther**  
**2970 Hørsholm (DK)**  
 • **RYBERG, Jesper**  
**2970 Hørsholm (DK)**

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(74) Representative: **AWA Denmark A/S**  
**Strandgade 56**  
**1401 Copenhagen K (DK)**

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**EP-A1- 0 733 146 WO-A1-89/10460**

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## Description

### Technical Field

**[0001]** The present invention relates to a roof window, particularly for installation in an inclined roof surface, comprising a primary frame, at least one secondary frame, such as a sash and/or an intermediate frame, and a lifting device including a lifting arm inserted between the primary frame and the at least one secondary frame, a sledge system and a coupling mechanism, the lifting arm having a first end rotatably connected with said sledge system slidably connected with the primary frame in a sledge guidance and a second end rotatably connected with the at least one secondary frame, the lifting device furthermore including a spring assembly configured to be coupled to the sledge system and to the first end of the lifting arm by means of said coupling mechanism, such that the spring assembly is able to assume an uncoupled condition and a coupled condition relative to the sledge system the coupling mechanism comprising a first coupling member associated with the spring assembly and adapted to cooperate with a second coupling member associated with the sledge system, and the first coupling member including a hook element and the second coupling member includes receiving means formed in the sledge system and configured to cooperate with said hook element in the coupled condition, in that the hook element is configured to assume at least a non-engagement position and an engagement position. The invention furthermore relates to a method for installing such a roof window, and a method for dismantling a secondary frame of the roof window.

### Background Art

**[0002]** Windows for installation in an inclined roof surface 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. Examples of top-hung windows that pivot for cleaning are for instance disclosed in Applicant's WO-A-89/10460, EP 0 733 146 B1, EP 1 873 323 B1 and EP 2 762 665 A2. To make it possible to pivot the window sash approximately 180° to a convenient cleaning position, the sash structure is connected with an intermediate frame with frame arms, which in the closed position of the window are positioned between the upper parts of the frame and sash side members, and which during normal use of the window as a top-hung window follow the sash side members.

**[0003]** In roof windows in which the operation takes place either entirely or partially about a hinge axis at the top, it is known to balance at least part of the weight of the movable components by means of a lifting device inserted between a pair of associated side members of the stationary frame and the sash element, respectively, and having one end pivotally connected with one of the

side members while its other end is hinged to a sliding shoe displaceable along the other side member, said shoe being urged by a tension spring in a direction so as to exert an outwardly directed pressure through the lever on the sash element. The purpose of this arrangement is to facilitate opening the window, and the dimensions may be chosen so that the spring can retain the top-hinged frame in equilibrium in a desired opening position.

**[0004]** Coupling and uncoupling of the spring assembly of such a window is known from e.g. EP 0 081 333 B1, wherein one end of the sash lifting-lever presents at least two pivot points having different distances from the pivot point at the other end of the lever, and being located to successively becoming operative during the opening of the window and successively increasing the effective length of the lever. Another disclosure is found in WO 89/010460 A1, wherein a slide shoe and a pre-stressed spring provided with coupling means adapted to be brought into engagement with each other during the installation of the window is described. Said coupling means include a tie rod connected on one end to said spring and to a coupling element on its other end. The coupling element engages a receiving recess in the sliding shoe by means of a traverse pin. This window however requires the installer to lift the entire weight of the sash with one hand while the other hand is placed in a potentially dangerous position between sash and frame during installation and dismantlement. In addition, window sashes are progressively gaining in weight as modern sashes include additional elements offering a greater range of functionalities, and better insulation properties require greater amount of materials being included in the construction of frames, panes and sashes.

**[0005]** Considering this, it is presently a challenge to provide a spring assembly and sledge system coupling mechanism that can bear current load requirements while offering an intuitive and easily manageable roof window simplifies installation and dismantlement.

### Summary of Invention

**[0006]** It is therefore the object of the invention to provide a roof window, in which the secondary frame is easily installed and dismantled.

**[0007]** This is achieved with a roof window of the kind mentioned in the introduction, which is furthermore characterised in that the coupling mechanism furthermore comprises a coupling plate arranged to assume at least a first position corresponding to the coupled condition and a second position corresponding to the uncoupled condition, the coupling plate allowing the hook element to assume said non-engagement position, that the hook element of the first coupling member has at least one hook portion facing the sledge system, that the hook element has a U-shaped configuration including a base plate portion and two flange portions, one hook portion being provided at one of or each of the flange portions, that the spring assembly comprises a tension rod includ-

ing a rod portion extending substantially along the length of the spring assembly, and a head portion facing the hook element, the tension rod being provided with at least one inclined portion at the transition between the head portion and the rod portion, that the hook element is provided with an aperture in the base plate portion to allow passage of the tension rod such that the head portion of the tension rod is retained within the U-shape at the front side of the base plate portion and the rod portion at the back side, that the coupling plate of the coupling mechanism has a base portion located at the back side of the base plate portion of the hook element and is provided with an oblong aperture to allow passage of the rod portion of the tension rod, and wherein the coupling plate is slidable in the plane of the base portion substantially perpendicularly to the rod portion such that when in the first or bottom position, the hook portion is capable of assuming its engagement position, and in the second or top position, the hook portion is kept in its non-engagement position, that an angle element is provided near the head portion of the tension rod, having an aperture to allow passage of the rod portion of the tension rod, and that an end piece is provided, having an aperture to allow passage of the rod portion of the tension rod, the end piece furthermore having an upstanding wall, on which a protrusion is formed to surround the aperture of the end piece, and wherein two protruding flanges are provided at either side of the upstanding wall to define a track.

**[0008]** It is thereby possible to couple and uncouple the spring assembly from the sledge system by manually positioning the coupling plate in the selected position and opening and closing the sash to either release or engage the first coupling member. The coupling plate stays in the selected position until it is re-activated, this allowing for the installation or dismantling of the sash and/or intermediate frame in the stationary frame, as the first coupling member is free of its coupling with the sledge system and thus without interference of the bias of the spring assembly.

**[0009]** The hook element of the first coupling member has at least one hook portion facing the sledge system. This is advantageous from in particular an installation point of view.

**[0010]** In another presently preferred embodiment, the hook element of the first coupling member is arranged to slidably contact the sledge system in one direction and to engage said second coupling member in another direction. In addition to being simple in installation and dismantling, this also provides for a logical operation.

**[0011]** In a second aspect of the invention, a method for installing a roof window is provided.

**[0012]** In a third aspect of the invention, a method for dismantling a secondary frame of the roof window is provided.

**[0013]** Further preferred embodiments of the invention are set out in the dependent claims.

## Brief Description of Drawings

**[0014]** In the following description embodiments of the invention will be described with reference to the schematic drawings, in which

Fig. 1 is a perspective view of a roof window, seen from the interior side and in an open position;

Fig. 2 is a perspective view of details of a roof window with a lifting device, in a first embodiment of the invention and corresponding to the open position of the roof window of Fig. 1;

Fig. 3 is an isometric view of the details of the roof window of Fig. 2, in a closed position of the window;

Fig. 4 is a partially exploded view of the details of Fig. 3;

Fig. 5 is an isometric view of the spring assembly shown in Fig. 3;

Fig. 6 is a partial isometric view, on a larger scale, of the spring assembly shown in Fig. 5;

Fig. 7 is a partial exploded isometric view of some elements of Fig. 6;

Figs 8a to 8e are isometric views of the elements of Fig. 7;

Fig. 9a is a partial isometric view, on a larger scale, of details shown in Fig. 3;

Fig. 9b is an exploded, partial perspective view of details of the lifting device in another embodiment of the invention;

Figs 10 and 11 are partial isometric views of details of the lifting device of the roof window in a second embodiment of the invention;

Figs 12a to 12h are schematic partial side views of an embodiment of the roof window of the invention, during coupling and uncoupling of the lifting device;

Figs 13a-13b, 14a-14b and 15a-15b are perspective views of details of the roof window in the second embodiment;

Fig. 16 shows a schematic perspective view of details of a roof window in a further embodiment of the invention;

Fig. 17 shows a schematic side view of details of a roof window in a still further embodiment of the invention;

Figs 18a-18e are views corresponding to Figs 8a-8e, respectively, of details of the roof window in a third embodiment,

Figs 19a-19b are views corresponding to Figs 13a-13b, respectively, of details of the roof window in the third embodiment;

Fig. 20a is a view corresponding to Fig. 14a of details of the roof window in the third embodiment;

Fig. 20b is a partial perspective view of details of the roof window in the third embodiment; and

Figs 21 to 24 show partial or full, exploded, or sectional views of details of a roof window in yet another embodiment of the invention.

## Description of Embodiments

**[0015]** Referring initially to Fig. 1, the general configuration of a roof window which is top-hinged during normal operation and which pivots for cleaning is shown. Such a window is shown and described in further detail in Applicant's above-mentioned European patent No. 0 733 146 B1. In Fig. 1, a lifting device 10 is indicated which, referring now also to Fig. 2 to 9a, forms part of a first embodiment of the roof window according to the present invention.

**[0016]** The roof window comprises a primary frame in the form of a stationary frame 1 configured for installation in an inclined roof surface. At least one secondary frame is connected to the stationary frame 1, in the embodiment shown a first secondary frame in the form of a sash 2 carrying a pane 4, and a second secondary frame in the form of an intermediate frame 3. The intermediate frame 3 is fastened to the stationary frame at a top mounting fitting 5, and the sash 2 is hinged at the top of the roof window, via the intermediate frame 3 to the stationary frame 1, to render the roof window top-hung during normal operation. The sash 2 is also pivotally connected to the intermediate frame 3 in order to be able to rotate the sash 2 to provide access to the outside of the pane 4, for instance for cleaning purposes. To that end, the intermediate frame 3 is provided with a frame hinge part 6 of pivot hinge fitting. Although not shown in detail, it is clear to the skilled person that the sash 2 is provided with the counterpart sash hinge part of the pivot hinge fitting.

**[0017]** A lifting device 10 is composed of a spring arrangement 20 and a sledge system 30 which cooperate to assist in the opening of the window, that is, bringing the secondary frame or frames to an angled position relative to the primary frame. Here, from a closed position, the user operates the operating device of the window in the form of a handle 7 at the bottom member of the sash 2. The bias of the spring arrangement 20 of the lifting device 10 acts on a lifting arm 14 inserted between the stationary frame 1 and the intermediate frame 3. In turn, the lifting arm 14 exerts a moment on the intermediate frame 3 and hence to the sash relative to an axis through a top hinge pin 11. In combination with the force exerted by the user on the handle 7, transferred to a lifting moment, the moment resulting from the weight of the sash 2 with pane 4 is overcome. Closing the window from the open position entails the opposite movements of the sash 2 and relevant parts of the lifting device 10. A similar lifting device may be provided at each side of the roof window. Finally, the roof window is provided with a ventilation device 8 acting to allow passage of air also in the closed position of the window.

**[0018]** In further detail, the lifting arm 14 has a first end 12 rotatably connected with a sledge system 30, which in turn is slidably connected with the primary frame 1 in a sledge guidance 16, and a second end 13 rotatably connected with the at least one secondary frame 3, the lifting device 10 furthermore including a spring assembly

20 configured to be coupled to the sledge system 30. As the sledge system 30 is connected to the lifting arm 14, the spring assembly 20 is in turn configured to be connected to the first end 12 of the lifting arm 14 by means of a coupling mechanism to be described in further detail below, such that the spring assembly 20 is able to assume an uncoupled condition and a coupled condition relative to the sledge system 30.

**[0019]** Figs 5 and 6 show the general components of the spring assembly 20 of a roof window. Further details and advantages of the particular spring assembly 20 are the subject of Applicant's co-pending patent application filed on the same day as the present application, and is shown for information purposes only in Figs 21 to 24. The present invention is however applicable to any kind of spring assembly. Thus, the general components of the spring assembly are: a tension rod 22 accommodating a buffer spring system 28 and a main spring system 29. The buffer spring system 28 acts as an auxiliary system to the main spring system 29. In order to adapt one and the same spring assembly to varying roof inclinations, an adjustment means is provided in the form of a movable adjustment plate 26 which is placed in one of several recesses 27a in a spring casing 27 accommodating the buffer spring system 28.

**[0020]** As shown, the buffer spring system 28 comprises an outer spring 281 and an inner spring 282 of substantially identical pre-defined lengths. The pre-defined length of the springs 281, 282 is typically chosen according to the dimensions of other parts of the lifting device. In the mounted condition, the inner spring 282 is accommodated inside the outer spring 281 so as the axes of the respective springs extend substantially co-axially.

**[0021]** In the embodiment shown, the outer spring 281 and the inner spring 282 of the buffer spring system 28 have mutually different spring constants, and the outer spring 281 and the inner spring 282 of the buffer spring system 28 have mutually opposite thread directions.

**[0022]** The spring assembly 20 here further comprises at least one spring plug 283, 284 configured to be in contact with the respective end of the inner spring 282 of the buffer spring system 28 in the mounted condition. That is, here the two spring plugs 283 and 284 form the respective ends of the buffer spring system 283 and 284. At the manufacture stage, it is advantageous that the spring plugs 283, 284 is provided with friction-increasing means at the surface configured to be in contact with the respective end of the inner spring 282 of the buffer spring system 28. In this way, the two springs are kept together in a safe manner.

**[0023]** According to the present invention, and referring also the schematic views of Figs 12a-12e showing the stages of coupling and de-coupling, the coupling mechanism comprises a first coupling member 21 associated with the spring assembly 20 as is shown most clearly in Fig. 6.

**[0024]** The first coupling member 21 is adapted to cooperate with a second coupling member associated with

the sledge system 30. In the first, second and third embodiment shown in Figs. 10-11 and 13a-15b, and Figs 18a-20b, the second coupling member comprises a sledge 31 forming part of the sledge system 30, and the sledge 31 includes receiving means configured to cooperate with the first coupling member 21 in the coupled condition.

**[0025]** In all of the embodiments shown, the first coupling member includes a hook element 21 to cooperate with the second coupling member including its receiving means formed in the sledge system 30. The hook element 21 is configured to assume at least a non-engagement position and an engagement position, and the coupling mechanism furthermore comprises a coupling plate 25 arranged to assume at least a first position corresponding to the coupled condition and a second position corresponding to the uncoupled condition, the coupling plate 25 allowing the hook element 21 to assume said non-engagement position. Operation of the presently preferred embodiments will be described in further detail in connection with Figs 12a to 12h.

**[0026]** In the embodiment shown, the hook element 21 of the first coupling member has at least one hook portion 214 facing the sledge system 30. This provides for a particularly easy and safe coupling procedure.

**[0027]** Even though the coupling mechanism could function well with only a single hook and receiving means pair, it is preferred that the hook element 21 as shown in for instance Fig. 8d has a U-shaped configuration including a base plate portion 212 and two flange portions 213, one hook portion 214 being provided at each of the flange portions 213.

**[0028]** Turning now in particular to the exploded view of Fig. 7 and the detailed individual views of Figs 8a to 8e, the tension rod 22 of the spring assembly 20 comprises includes a rod portion 221 extending substantially along the length of the spring assembly 20, and a head portion 222 facing the hook element 21, the tension rod 22 being provided with at least one inclined portion 223, 224 at the transition between the head portion 222 and the rod portion 221.

**[0029]** In the first embodiment, the hook element 21 of the first coupling member is provided with an aperture 211 in the base plate portion 212 to allow passage of the tension rod 22 such that the head portion 222 of the tension rod 22 is retained within the U-shape at the front side of the base plate portion 212 and the rod portion 221 at the back side.

**[0030]** The coupling plate 25 of the coupling mechanism has a base portion 252 which in the assembled position is located at the back side of the base plate portion 212 of the hook element 21, i.e. opposite the sledge system 30, and is provided with an oblong aperture 251 to allow passage of the rod portion 221 of the tension rod 22, and wherein the coupling plate 25 is slidable in the plane of the base portion 252 substantially perpendicularly to the rod portion 221 such that when in a bottom position, the hook portion 21 is capable of assuming its

engagement position, and in a top position, the hook portion 21 is kept in its non-engagement position.

**[0031]** Furthermore, the coupling plate 25 is here provided with a bottom flange 253 formed on the base portion 252 to abut on the at least one inclined portion 223 in the non-engagement position via the base plate portion 212. This brings about the actual retention of the hook element 21 in its non-engagement position in the embodiment shown.

**[0032]** The coupling plate 25 is provided with a cut-out 254 at the top of the base portion 252 to form at least one, preferably two, upstanding lugs 255. This eases the application of tools and the re-entry into the coupling position. Furthermore, the cut-out 254 allows for accommodation of reinforcement or stiffening elements for the sash.

**[0033]** In principle the configuration of the connection between the first coupling member and the spring assembly 20 may be carried out in any suitable manner as long as it fulfils the requirements due to the relatively large forces involved. A robust structure as in the present embodiment includes an angle element 23 provided near the head portion 222 of the tension rod 22, having an aperture 231 to allow passage of the rod portion 221 of the tension rod 22.

**[0034]** Here, an end piece 24 is furthermore provided, having an aperture 241 to allow passage of the rod portion 221 of the tension rod 22, the end piece 24 furthermore having an upstanding wall 242, on which a protrusion 243 is formed to surround the aperture 241 of the end piece 24, and wherein two protruding flanges 244 are provided at either side of the upstanding wall 242 to define a track 245.

**[0035]** As shown, the angle element 23 is provided with an upstanding leg 232 and a bottom leg 233, the aperture 231 of the angle element 23 being provided in the upstanding leg 232, and wherein two protruding flanges 234 are provided substantially in parallel to the bottom leg 233 and each defining a gap 235 relative to the upstanding leg 232.

**[0036]** In the assembled state, the end piece 24 is positioned with the back side of its upstanding wall 242 abutting the front side of the upstanding leg 232 of the angle element 23, between the bottom leg 233 and the protruding flanges 234, and wherein the base portion 252 of the coupling plate 25 is received slidably in the track 245 of the end piece and the respective gaps 235 of the angle element 23.

**[0037]** In order to obtain a smooth movement during the coupling procedure, each flange portion 213 of the U-shaped the hook element 21 here includes an apex 210 at the front end, a rounded transition 215 between the apex 210 and the hook portion 214, a bottom edge portion 218 between the hook portion 214 and the base plate portion 212, an opposite top portion 217, and at least one inclined edge portion 216, 219 between the top portion 217 and the apex 210.

**[0038]** In the third embodiment, the components of the

coupling mechanism shown in Figs. 18a-18e have a substantially corresponding configuration as in Figs. 8a-8e. The following differences are present in the embodiment shown; they may be present individually or in combination: The hook element 21 is provided with two grooves 217a in the top portion 217 to provide for possible further guidance. The protruding flanges 244 of the end piece 24 are provided with a respective rib portion 244a and two bent flange portions 246 on the side facing the spring arrangement 20. The angle element 23 is provided with enlarged aperture sections 231a adjoining the aperture 231 in order to accommodate the bent flange portions 246. In this way, easy assembly and safe retention in use is achieved. Finally, the coupling plate 25 is provided with friction-increasing portions 256, for instance in the form of riffling or other surface treatment to increase the friction to enhance the retention of the coupling plate 25 in the desired position. Corresponding friction-increasing portions may be provided on the opposite side of the base portion 252. The friction-increasing portions may also be provided as separate elements for instance a film or the like applied to the base portion 252. The components of the coupling mechanism need to be dimensioned suitably relative to each other in order to avoid excess frictional forces but at the same time allow for proper operation.

**[0039]** Further details of the sledge system 30 are shown in the second and third embodiments in Figs 10 to 11 and 13a to 15b, and Figs. 18a-20b. Elements having the same or analogous function as in the first embodiment carry the same reference numerals. Only differences relative to the first embodiment will be described in detail.

**[0040]** Referring now in particular to Figs 10-11, 13a-13b and 15a, the sledge 31 of the sledge system 30 comprises a bottom portion 310, a first wall portion 311 and a second wall portion 312, one receiving recess 314 being preferably provided at each of the transitions between the first wall portion 311 and the bottom portion 310 and between the second wall portion 312 and the bottom wall portion 310, and wherein a hole 315 is provided in the first wall portion 311 and a hole 316 is provided in the second wall portion 312 for receiving an axle 40 connected to the first end 12 of the lifting arm 14. Finally, the sledge 31 is provided with a second opening 318 and an incision 319 to make room for other parts of the lifting device 10.

**[0041]** In the third embodiment of the roof window shown in Figs. 19a-19b, the sledge 31 has been made longer relative to the sledge of the first and second embodiments. This provides the sledge 31 with a larger strength. As a consequence, the incision 319 is made longer.

**[0042]** In the presently preferred embodiments shown and described herein, the receiving means of the second coupling member include at least one receiving recess 314 in the sledge 31 of the sledge system 30. The second coupling member could also take other shapes. One conceivable, alternative solution would be to utilise the axle 40 as receiving means. This alternative solution is shown

in Fig. 17.

**[0043]** Further details of the axle 40 shown in Figs 15a-15b, 16 and 20b are given for information purposes only and are the subject of Applicant's co-pending patent application filed on the same day as the present application.

**[0044]** In general, the components of the lifting device are subjected to high loads, in particular in large roof windows and in low roof pitches. In such fields of application, the required lifting capacity of the lifting device may amount to close to 500 Nm. Loads of these magnitudes not only pose severe demands on the components but also require high performance of the spring assembly.

**[0045]** In addition to the aspects covered by the present application, precautions have also been taken to mitigate adverse effects of the load in the top hinge pin 11 and the top bearing fitting 15. In order for the top hinge pin 11 to be safely lodged in the top bearing fitting 15 at all times, the top hinge pin 11 has been formed with a head and is furthermore secured against rotation. In order to transfer the load on the top hinge pin 11 exerted by the sash via the intermediate frame safely to the top bearing fitting 15, the top bearing fitting 15 is provided with protrusions (not shown in detail).

**[0046]** In order to control the frictional forces more precisely at the movement of the sledge system 30 in the sledge guidance 16, the sledge system 30 comprises a runner 32 in the embodiments described and shown in particular in Figs. 10-11, 14a-14b, and 20a-20b, configured to accommodate the sledge 31 and being provided with at least one recess 324 opposite the respective receiving recess 314 of the sledge 31 of the second coupling member. Further details of the runner 32 are shown for information purposes only; such details are the subject of Applicant's co-pending patent application filed on the same day as the present application. It is noted that the present invention is applicable also to sledge systems in which there is no runner, or a runner of a different configuration. In the embodiment shown, the runner 32 is formed of a plastic material such as POM which may also be provided with a coating of for instance Teflon® or other treatment having the function to act as a lubricant to reduce the friction.

**[0047]** The narrowing 313 on the runner 32 is made for reasons of space availability. By forming the runner slenderer in one side, it is possible to make 322a thicker, and tolerances are accommodated in the side where 322 is - in that way the axle 40 is guided such that the end 402 does not protrude to wear on the side of the guidance.

**[0048]** An edge portion 328 is provided as a cut-out in order to allow space for other parts of the assembly. A flange portion 329 scrapes the guidance to force for instance smudge gathered in the sledge guidance 16 to the sides of the guidance.

**[0049]** In principle, the coupling mechanism may be designed in any suitable manner and operated accordingly, as long as the fundamentals as outlined initially are fulfilled. As will be understood from the following description of the operational steps performed during coupling

and uncoupling of the spring assembly 20 from the sledge system 30 in the embodiments shown and described in the above with reference to the sequence of Figs 12a to 12h, the hook element 21 of the first coupling member is in the presently preferred embodiments arranged to slidably contact the sledge system 30 in one direction and to engage said second coupling member, in the embodiments shown the sledge 31, in another direction, namely by being forced in the opposite direction to ensure engagement with the first and second coupling members by the components of the lifting device itself. Not all elements are indicated by reference numerals in Figs 12a to 12h for ease of readability and it is referred to the above description of the remaining Figures for detailed explanations.

**[0050]** Turning first to Fig. 12a, the roof window is shown in its closed condition, that is the secondary frame or frames are lying substantially in parallel with the primary frame. Here, the intermediate frame 3 represents the secondary frames, and the position of the sledge guidance 16 and the spring assembly 20 indicate the corresponding position of the stationary frame 1 although not shown, i.e. here substantially horizontal for reasons of clarity, even though the stationary frame 1 will most often be installed in an inclined roof surface prior to coupling the spring assembly 20 to the sledge system 30. The coupling mechanism is not yet active, and the sledge system 30 is consequently located at a distance from the spring assembly 20. From the break-out enlarged view of Fig. 12a is apparent the position of the coupling plate 25 in its first position, i.e. bottom position, and corresponds to the engagement position of the hook element 21 in which coupling is possible.

**[0051]** When opening the window by rotating the intermediate frame 3 about the top hinge pin 11, the lifting arm 14 rotates as well, and the sledge system 30 moves in the direction of the spring assembly 20 and its associated first coupling member in the form of hook element 21. When approaching the position shown in Fig. 12b, the hook element 21 slides up on the sledge 31 and is able to rotate slightly on the tension rod 22, as the base plate portion 212 of the hook element 21 is able to move relative to the inclined portion 223 on the back side of the head portion 222. The coupling plate 25 is still in its first, or bottom position. During the continued movement in the opening direction of the intermediate frame 3 and the ensuing translational movement of the sledge system 30, the hook portions 214 of the hook element 21 will reach a position just above the receiving recesses 314. As the spring assembly 20 is biased and exerts a pull in the tension rod 22, to the left in Fig. 12b, the hook element 21 will be subjected to a clockwise moment which in turn forces the hook portions 214 to enter the receiving recesses 314 of the sledge 31.

**[0052]** Once the coupling has taken place, the hook element 21 withdraws further to the left due to the bias of the spring assembly, the hook portions 214 are drawn into stable engagement with the receiving recesses 314

in the sledge 31 as shown in Fig. 12c.

**[0053]** The window is now ready for normal operation, and during the subsequent closing of the intermediate frame 3, the movement of the lifting arm 14 pulls the sledge system 30 towards the top of the window, i.e. to the right as shown in Fig. 12d. The closing movement takes place during simultaneous further bias of the spring assembly 20 as is known *per se*.

**[0054]** Should the need for removal of the secondary frame or frames arise, the roof window is prepared for uncoupling by first rotating the intermediate frame 3 to an open position. Then, the coupling plate 25 is brought from its first or bottom position to its second or top position by an upwards movement, indicated by arrow A in Fig. 12f. In the embodiment shown, the window is not entirely open in the position of Fig. 12f, that is, the sledge system 30 is not in its left-most position but distanced from the spring assembly 20 by some millimetres. In practice, the sash is rotated to its fully open position and then moved slightly back in the closing direction such that the coupling plate 25 is free to be moved upwards. In this position the coupling plate is held in its upper most position by means of friction. The hook element 21 is still engaged with the sledge system 30 as the hook portions 214 are gripping the recesses 314 of the sledge 31 until the user grabs the sash and lifts it. During this movement, the hook element 21 is allowed to turn upwards in the counter-clockwise direction. This brings the hook element 21 to its non-engagement position in which coupling is not possible. This action is brought about in that the bottom flange 253 of the coupling plate 25 abuts on the back side of the base plate portion 212 of the hook element 21. The hook element 21 is thus affected by a counter-clockwise moment which keeps it in the non-engagement position. The secondary frame(s) may now be dismantled from the primary frame, here thus the intermediate frame 3 with sash 2 and pane 4 lifted off the connection with the stationary frame 1. The lifting of the coupling plate 25 may in principle take place in any suitable manner. However, in order to ensure that unwarranted release does not take place, use of a suitable tool is preferably prescribed.

**[0055]** Bringing the roof window back to a position prepared for coupling takes place by simply rotating the intermediate frame 3 in the closing direction. Towards the end of the closing movement, the lifting arm 14 pushes the coupling plate 25 downwards, in the direction of arrow B in Fig. 12h. Once the counter-clockwise moment previously acting on the hook element 21 is released, the hook element 21 is able to rotate in the clockwise direction to assume the position shown in Fig. 12a.

#### List of reference numerals

##### [0056]

- 1 primary frame (stationary frame)
- 2 first secondary frame (sash)
- 3 second secondary frame (intermediate frame)

4	pane		28	buffer spring system
5	top mounting fitting			281 outer spring
6	frame hinge part of pivot hinge fitting			282 inner spring
7	handle			283 spring plug
8	ventilation device	5		284 spring plug
			29	main spring system
10	lifting device			291 spring
11	hinge pin			292 spacer tube
12	first end of lifting arm		30	sledge system
13	second end of lifting arm	10	31	second coupling member / sledge
14	lifting arm			310 bottom portion
15	top bearing fitting			311 first wall portion
16	sledge guidance			312 second wall portion
				313 narrowing
20	spring assembly	15		314 receiving recess
21	first coupling member / hook element			315 hole
	210 apex			316 hole
	211 aperture			317 first opening
	212 base plate portion			318 second opening
	213 flange portion	20		319 incision
	214 hook portion		32	runner
	215 rounded transition edge portion			320 bottom portion
	216 inclined edge portion			321 first wall portion
	217 top portion			321a first journal section
	217a groove in top portion	25	322	second wall portion
	218 bottom edge portion			322a second journal section
	219 inclined edge portion		323	bowl portion
22	tension rod		324	recess
	221 rod portion		325	cut-out
	222 head portion	30	326	cut-out
	223 first inclined portion		327	resilient upstanding portion
	224 second inclined portion		328	edge portion
	225 adjustment ring		329	flange portion
23	angle element			
	231 aperture	35	40	axle
	231a enlarged aperture sections			401 rifled end
	232 upstanding leg			402 other end
	233 bottom leg			403 markings
	234 protruding flange			404 location mark
	235 gap	40	50	friction brake device
24	end piece			51 friction brake element
	241 aperture			52 first cone
	242 upstanding wall			53 second cone
	243 protrusion			54 spring plug
	244 protruding flange	45		
	244a rib portion			
	245 track			
	246 bent flange portions			
25	coupling plate			
	251 oblong aperture	50		
	252 base portion			
	253 bottom flange			
	254 cut-out			
	255 upstanding lug			
	256 friction-increasing portions	55		
26	adjustment plate			
27	spring casing			
	27a recess for adjustment plate			

### Claims

1. A roof window, particularly for installation in an inclined roof surface, comprising

a primary frame (1),  
at least one secondary frame (2, 3), such as a sash (2) and/or an intermediate frame (3), and a lifting device (10) including a lifting arm (14) inserted between the primary frame (1) and the at least one secondary frame (2, 3), a sledge system (30) and a coupling mechanism, the lift-

ing arm (14) having a first end (12) rotatably connected with said sledge system (30) slidably connected with the primary frame (1) in a sledge guidance (16) and a second end (13) rotatably connected with the at least one secondary frame (3), the lifting device (10) furthermore including a spring assembly (20) configured to be coupled to the sledge system (30) and to the first end (12) of the lifting arm (14) by means of said coupling mechanism, such that the spring assembly (20) is able to assume an uncoupled condition and a coupled condition relative to the sledge system (30), the coupling mechanism comprising a first coupling member (21) associated with the spring assembly (20) and adapted to cooperate with a second coupling member (31) associated with the sledge system (30), and the first coupling member including a hook element (21) and the second coupling member includes receiving means formed in the sledge system (30) and configured to cooperate with said hook element (21) in the coupled condition, and the hook element (21) being configured to assume at least a non-engagement position and an engagement position,

wherein

the coupling mechanism furthermore comprises a coupling plate (25) arranged to assume at least a first position corresponding to the coupled condition and a second position corresponding to the uncoupled condition, the coupling plate (25) allowing the hook element (21) to assume said non-engagement position,

wherein the hook element (21) of the first coupling member has at least one hook portion (214) facing the sledge system (30),

wherein the hook element (21) has a U-shaped configuration including a base plate portion (212) and two flange portions (213), one hook portion (214) being provided at one of or each of the flange portions (213),

wherein the spring assembly (20) comprises a tension rod (22) including a rod portion (221) extending substantially along the length of the spring assembly (20), and a head portion (222) facing the hook element (21), the tension rod (22) being provided with at least one inclined portion (223, 224) at the transition between the head portion (222) and the rod portion (221),

wherein the hook element (21) is provided with an aperture (211) in the base plate portion (212) to allow passage of the tension rod (22) such that the head portion (222) of the tension rod (22) is retained within the U-shape at the front side of the base plate portion (212) and the rod portion (221) at the back side,

wherein the coupling plate (25) of the coupling mechanism has a base portion (252) located at

the back side of the base plate portion (212) of the hook element (21) and is provided with an oblong aperture (251) to allow passage of the rod portion (221) of the tension rod (22), and wherein the coupling plate (25) is slidable in the plane of the base portion (252) substantially perpendicularly to the rod portion (221) such that when in the first or bottom position, the hook portion (21) is capable of assuming its engagement position, and in the second or top position, the hook portion (21) is kept in its non-engagement position,

wherein an angle element (23) is provided near the head portion (222) of the tension rod (22), having an aperture (231) to allow passage of the rod portion (221) of the tension rod (22), and wherein an end piece (24) is provided, having an aperture (241) to allow passage of the rod portion (221) of the tension rod (22), the end piece (24) furthermore having an upstanding wall (242), on which a protrusion (243) is formed to surround the aperture (241) of the end piece (24), and wherein two protruding flanges (244) are provided at either side of the upstanding wall (242) to define a track (245).

2. A roof window according to claim 1, wherein the coupling plate (25) is provided with a bottom flange (253) formed on the base portion (252) to abut on the at least one inclined portion (223) in the non-engagement position.
3. A roof window according to claim 1 or 2, wherein the coupling plate (25) is provided with a cut-out (254) at the top of the base portion (252) to form at least one, preferably two, upstanding lugs (255).
4. A roof window according to claim 1, wherein the angle element (23) is provided with an upstanding leg (232) and a bottom leg (233), the aperture (231) of the angle element (23) being provided in the upstanding leg (232), and wherein two protruding flanges (234) are provided substantially in parallel to the bottom leg (233) and each defining a gap (235) relative to the upstanding leg (232).
5. A roof window according to claim 4, wherein the end piece (24) is positioned with the back side of its upstanding wall (242) abutting the front side of the upstanding leg (232) of the angle element (23), between the bottom leg (233) and the protruding flanges (234), and wherein the base portion (252) of the coupling plate (25) is received slidably in the track (245) of the end piece and the respective gaps (235) of the angle element (23).
6. A roof window according to any one of claims 1 to 5, wherein each flange portion (213) of the U-shaped

- the hook element (21) includes an apex (210) at the front end, a rounded transition (215) between the apex (210) and the hook portion (214), a bottom edge portion (218) between the hook portion (214) and the base plate portion (212), an opposite top portion (217), and at least one inclined edge portion (216, 219) between the top portion (217) and the apex (210).
7. A roof window according to any one of the preceding claims, wherein the receiving means of the second coupling member include at least one receiving recess (314) in a sledge (31) of the sledge system (30).
8. A roof window according to claim 7, wherein the sledge (31) comprises a bottom portion (310), a first wall portion (311) and a second wall portion (312), one receiving recess (314) being preferably provided at each of the transitions between the first wall portion (311) and the bottom portion (310) and between the second wall portion (312) and the bottom wall portion (310), and wherein a hole (315) is provided in the first wall portion (311) and a hole (316) is provided in the second wall portion (312) for receiving an axle (40) connected to the first end (12) of the lifting arm (14).
9. A roof window according to claim 7 or 8, wherein the sledge system (30) comprises a runner (32) configured to accommodate the sledge (31) and being provided with at least one recess (324) opposite the respective receiving recess (314) of the sledge (31).
10. A roof window according to any one of claims 1 to 6, wherein the receiving means of the second coupling member include an axle (40) connected to the first end (12) of the lifting arm (14).
11. A roof window according to any one of the preceding claims, wherein the hook element (21) of the first coupling member is arranged to slidably contact the sledge system (30) in one direction and to engage said second coupling member (31) in another direction.
12. A roof window according to any one of the preceding claims, wherein the coupling plate (25) is provided with at least one friction-increasing portion (256).
13. A method for installing a roof window having a primary frame, at least one secondary frame, and a lifting device inserted between the primary frame and the secondary frame, comprising the steps of:
- i) providing a roof window according to any one of claims 1 to 12;
  - ii) installing the primary frame in a roof structure; and
- iii) coupling the secondary frame to the primary frame.
14. The method according to claim 13, wherein step iii) includes the step of
- a) sliding the sledge system in the sledge guidance by opening the secondary frame until the first coupling member contacts and engages with the second coupling member; and
  - b) closing the secondary frame.
15. A method for dismantling the secondary frame of a roof window according to any one of claims 1 to 12, including the steps of
- a) opening the secondary frame;
  - b) positioning the coupling plate in the second position;
  - c) biasing the first coupling member against the coupling plate by further opening the secondary frame, and
  - d) removing the secondary frame.
- ### Patentansprüche
1. Dachfenster, insbesondere für den Einbau in einer geneigten Dachfläche, umfassend
- einen Primärrahmen (1),
  - mindestens einen Sekundärrahmen (2, 3) wie einen Flügelrahmen (2) und/oder einen Zwischenrahmen (3)
  - und
  - eine Hebevorrichtung (10), die einen zwischen dem Primärrahmen (1) und dem mindestens einen Sekundärrahmen (2, 3) eingeführten Hebearm (14), ein Schlittensystem (30) und einen Koppelmechanismus aufweist, wobei der Hebearm (14) ein erstes Ende (12), das drehbar mit dem Schlittensystem (30) verbunden ist, das verschiebbar mit dem Primärrahmen (1) in einer Schlittenführung (16) verbunden ist, und ein zweites Ende (13) hat, das drehbar mit dem mindestens einen Sekundärrahmen (3) verbunden ist, wobei die Hebevorrichtung (10) ferner eine Federanordnung (20) aufweist, die dazu ausgestaltet ist, mittels des Koppelmechanismus an das Schlittensystem (30) und an das erste Ende (12) des Hebearms (14) gekoppelt zu werden, so dass die Federanordnung (20) einen entkoppelten Zustand und einen gekoppelten Zustand bezüglich des Schlittensystems (30) einnehmen kann, wobei der Koppelmechanismus ein erstes Koppelglied (21) umfasst, das der Federanordnung (20) zugeordnet und dazu ausgeführt ist, mit einem zweiten Koppelglied (31) zusammen-

zuwirken, das dem Schlittensystem (30) zugeordnet ist, und das erste Koppelglied ein Haken-  
element (21) aufweist und das zweite Koppel-  
glied Aufnahmemittel aufweist, die in dem  
Schlittensystem (30) ausgebildet und dazu aus-  
gestaltet sind, in dem gekoppelten Zustand mit  
dem Hakenelement (21) zusammenzuwirken,  
und wobei das Hakenelement (21) dazu aus-  
gestaltet ist, mindestens eine Nichteingriffsposi-  
tion und eine Eingriffsposition einzunehmen,  
wobei  
der Koppelmechanismus ferner eine Koppel-  
platte (25) umfasst, die dazu angeordnet ist,  
mindestens eine erste Position, die dem gekop-  
pelten Zustand entspricht, und eine zweite Po-  
sition, die dem entkoppelten Zustand entspricht,  
einzunehmen, wobei die Koppelplatte (25) ge-  
staltet, dass das Hakenelement (21) die Nicht-  
eingriffsposition einnimmt,  
wobei das Hakenelement (21) des ersten Kop-  
pelglieds mindestens einen Hakenabschnitt  
(214) hat, der dem Schlittensystem (30) zuge-  
wandt ist,  
wobei das Hakenelement (21) eine U-förmige  
Konfiguration hat, die einen Basisplattenab-  
schnitt (212) und zwei Flanschabschnitte (213)  
aufweist, wobei der mindestens eine Hakenab-  
schnitt (214) an einem oder jedem der Flan-  
schabschnitte (213) vorgesehen ist,  
wobei die Federanordnung (20) eine Spann-  
stange (22) umfasst, die einen Stangenab-  
schnitt (221), der sich im Wesentlichen entlang  
der Länge der Federanordnung (20) erstreckt,  
und einen Kopfabschnitt (222) aufweist, der  
dem Hakenelement (21) zugewandt ist, wobei  
die Spannstange (22) an dem Übergang zwi-  
schen dem Kopfabschnitt (222) und dem Stan-  
genabschnitt (221) mit mindestens einem ge-  
neigten Abschnitt (223, 224) versehen ist,  
wobei das Hakenelement (21) mit einer Öffnung  
(211) in dem Basisplattenabschnitt (212) ver-  
sehen ist, um den Durchgang der Spannstange  
(22) zu gestatten, so dass der Kopfabschnitt  
(222) der Spannstange (22) in der U-Form an  
der Vorderseite des Basisplattenabschnitts  
(212) gehalten wird und der Stangenabschnitt  
(221) an der Rückseite,  
wobei die Koppelplatte (25) des Koppelmecha-  
nismus einen an der Rückseite des Basisplat-  
tenabschnitts (212) des Hakenelements (21)  
angeordneten Basisabschnitt (252) hat und mit  
einer länglichen Öffnung (251) versehen ist, um  
den Durchgang des Stangenabschnitts (221)  
der Spannstange (22) zu gestatten, und wobei  
die Koppelplatte (25) in der Ebene des Basis-  
abschnitts (252) im Wesentlichen senkrecht zu  
dem Stangenabschnitt (221) verschiebbar ist,  
so dass der Hakenabschnitt (21) seine Eingriffs-

position einnehmen kann, wenn er in der ersten  
oder unteren Position ist, und der Hakenab-  
schnitt (21) in seiner Nichteingriffsposition ver-  
bleibt, wenn er in der zweiten oder oberen Po-  
sition ist,

wobei ein Winkelement (23) in der Nähe des  
Kopfabschnitts (222) der Spannstange (22) vor-  
gesehen ist und eine Öffnung (231) hat, um den  
Durchgang des Stangenabschnitts (221) der  
Spannstange (22) zu gestatten, und  
wobei ein Endstück (24) vorgesehen ist, das ei-  
ne Öffnung (241) hat, um den Durchgang des  
Stangenabschnitts (221) der Spannstange (22)  
zu gestatten, wobei das Endstück (24) ferner  
eine aufrechte Wand (242) hat, an der ein Vor-  
sprung (243) ausgebildet ist, um die Öffnung  
(241) des Endstücks (24) zu umgeben, und wo-  
bei zwei vorragende Flansche (244) an beiden  
Seiten der aufrechten Wand (242) vorgesehen  
sind, um eine Schiene (245) zu definieren.

2. Dachfenster nach Anspruch 1, wobei die Koppelplat-  
te (25) mit einem Bodenflansch (253) versehen ist,  
der an dem Basisabschnitt (252) ausgebildet ist, um  
in der Nichteingriffsposition an dem mindestens ei-  
nen geneigten Abschnitt (223) anzuliegen.
3. Dachfenster nach Anspruch 1 oder 2, wobei die Kop-  
pelplatte (25) mit einem Ausschnitt (254) an der o-  
beren Seite des Basisabschnitts (252) versehen ist, um  
mindestens eine, vorzugsweise zwei, aufrechte La-  
schen (255) zu bilden.
4. Dachfenster nach Anspruch 1, wobei das Winkele-  
lement (23) mit einem aufrechten Schenkel (232)  
und einem unteren Schenkel (233) versehen ist, wo-  
bei die Öffnung (231) des Winkelements (23) in  
dem aufrechten Schenkel (232) vorgesehen ist und  
wobei zwei vorragende Flansche (234) im Wesent-  
lichen parallel zu dem unteren Schenkel (233) vor-  
gesehen sind, die jeweils einen Spalt (235) bezüglich  
des aufrechten Schenkels (232) definieren.
5. Dachfenster nach Anspruch 4, wobei das Endstück  
(24) so positioniert ist, dass die Rückseite seiner auf-  
rechten Wand (242) an der Vorderseite des aufrech-  
ten Schenkels (232) des Winkelements (23) zwi-  
schen dem unteren Schenkel (233) und den vorra-  
genden Flanschen (234) anliegt und wobei der Ba-  
sisabschnitt (252) der Koppelplatte (25) verschieb-  
bar in der Schiene (245) des Endstücks und den je-  
weiligen Spalten (235) des Winkelements (23) auf-  
genommen ist.
6. Dachfenster nach einem der Ansprüche 1 bis 5, wo-  
bei jeder Flanschabschnitt (213) des U-förmigen Ha-  
kenelements (21) einen Scheitel (210) an dem vor-  
deren Ende, einen abgerundeten Übergang (215)

- zwischen dem Scheitel (210) und dem Hakenabschnitt (214), einen unteren Randabschnitt (218) zwischen dem Hakenabschnitt (214) und dem Basisplattenabschnitt (212), einen gegenüberliegenden oberen Abschnitt (217) und mindestens einen geneigten Randabschnitt (216, 219) zwischen dem oberen Abschnitt (217) und dem Scheitel (210) aufweist.
7. Dachfenster nach einem der vorhergehenden Ansprüche, wobei die Aufnahmemittel des zweiten Koppelglieds mindestens eine Aufnahmeaussparung (314) in einem Schlitten (31) des Schlittensystems (30) aufweisen.
8. Dachfenster nach Anspruch 7, wobei der Schlitten (31) einen unteren Abschnitt (310), einen ersten Wandabschnitt (311) und einen zweiten Wandabschnitt (312) umfasst, wobei eine Aufnahmeaussparung (314) vorzugsweise an jedem der Übergänge zwischen dem ersten Wandabschnitt (311) und dem unteren Abschnitt (310) und zwischen dem zweiten Wandabschnitt (312) und dem unteren Wandabschnitt (310) vorgesehen ist und wobei ein Loch (315) in dem ersten Wandabschnitt (311) vorgesehen ist und ein Loch (316) in dem zweiten Wandabschnitt (312) vorgesehen ist, um eine mit dem ersten Ende (12) des Hebearms (14) verbundene Achse (40) aufzunehmen.
9. Dachfenster nach Anspruch 7 oder 8, wobei das Schlittensystem (30) eine Kufe (32) umfasst, die zur Aufnahme des Schlittens (31) ausgestaltet und mit mindestens einer Aussparung (324) gegenüber der jeweiligen Aufnahmeaussparung (314) des Schlittens (31) versehen ist.
10. Dachfenster nach einem der Ansprüche 1 bis 6, wobei die Aufnahmemittel des zweiten Koppelglieds eine Achse (40) aufweisen, die mit dem ersten Ende (12) des Hebearms (14) verbunden ist.
11. Dachfenster nach einem der vorhergehenden Ansprüche, wobei das Hakenelement (21) des ersten Koppelglieds dazu angeordnet ist, dass es das Schlittensystem (30) in einer Richtung verschiebbar kontaktiert und das zweite Koppelglied (31) in einer anderen Richtung in Eingriff nimmt.
12. Dachfenster nach einem der vorhergehenden Ansprüche, wobei die Koppelplatte (25) mit mindestens einem reibungserhöhenden Abschnitt (256) versehen ist.
13. Verfahren zum Einbauen eines Dachfensters mit einem Primärrahmen, mindestens einem Sekundärrahmen und einer zwischen dem Primärrahmen und dem Sekundärrahmen eingeführten Hebevorrichtung, umfassend die folgenden Schritte:
- i) Bereitstellen eines Dachfensters nach einem der Ansprüche 1 bis 12,
  - ii) Einbauen des Primärrahmens in einer Dachstruktur und
  - iii) Koppeln des Sekundärrahmens an den Primärrahmen.
14. Verfahren nach Anspruch 13, wobei Schritt iii) den Schritt des
- a) Verschiebens des Schlittensystems in der Schlittenführung durch Öffnen des Sekundärrahmens bis das erste Koppelglied das zweite Koppelglied kontaktiert und in Eingriff nimmt, und
  - b) Schließens des Sekundärrahmens
- aufweist.
15. Verfahren zum Abmontieren des Sekundärrahmens eines Dachfensters nach einem der Ansprüche 1 bis 12, einschließlich der Schritte des
- a) Öffnens des Sekundärrahmens,
  - b) Positionierens der Koppelplatte in die zweite Position,
  - c) Vorspannens des ersten Koppelglieds gegen die Koppelplatte durch weiteres Öffnen des Sekundärrahmens und
  - d) Entfernen des Sekundärrahmens.
- Revendications**
1. Fenêtre de toit, en particulier destinée à être installée dans une surface de toit inclinée, comprenant
- un cadre primaire (1),  
au moins un cadre secondaire (2, 3), tel qu'un châssis (2) et/ou un cadre intermédiaire (3), et un dispositif de levage (10) comprenant un bras de levage (14) inséré entre le cadre primaire (1) et l'au moins un cadre secondaire (2, 3), un système de coulisse (30) et un mécanisme d'accouplement, le bras de levage (14) ayant une première extrémité (12) reliée de manière rotative au système de coulisse (30) relié de manière coulissante au cadre primaire (1) dans un guidage de coulisse (16) et une seconde extrémité (13) reliée de manière rotative à l'au moins un cadre secondaire (3), le dispositif de levage (10) comprenant en outre un ensemble ressort (20) conçu pour être accouplé au système de coulisse (30) et à la première extrémité (12) du bras de levage (14) au moyen du mécanisme d'accouplement, de sorte que l'ensemble ressort

(20) puisse assumer une condition non accouplée et une condition accouplée par rapport au système de coulisse (30), le mécanisme d'accouplement comprenant un premier élément d'accouplement (21) associé à l'ensemble ressort (20) et conçu pour coopérer avec un second élément d'accouplement (31) associé au système de coulisse (30), et le premier élément d'accouplement comprenant un élément crochet (21) et le second élément d'accouplement comprenant des moyens de réception formés dans le système de coulisse (30) et conçus pour coopérer avec ledit élément crochet (21) dans la condition accouplée, et l'élément crochet (21) étant conçu pour assumer au moins une position de non mise en prise et une position de mise en prise,

le mécanisme d'accouplement comprenant en outre une plaque d'accouplement (25) conçue pour prendre au moins une première position correspondant à la condition accouplée et une seconde position correspondant à la condition non accouplée, la plaque d'accouplement (25) permettant à l'élément crochet (21) d'assumer ladite position de non mise en prise,

l'élément crochet (21) du premier élément d'accouplement ayant au moins une partie de crochet (214) faisant face au système de coulisse (30), l'élément crochet (21) ayant une configuration en forme de U comprenant une partie de plaque de base (212) et deux parties de bride (213), l'au moins une partie de crochet (214) étant disposée au niveau de l'une ou de chacune des parties de bride (213),

l'ensemble ressort (20) comprenant une tige de tension (22) comprenant une partie de tige (221) s'étendant sensiblement le long de la longueur de l'ensemble ressort (20), et une partie de tête (222) faisant face à l'élément crochet (21), la tige de tension (22) étant pourvue d'au moins une partie inclinée (223, 224) au niveau de la transition entre la partie de tête (222) et la partie de tige (221),

l'élément crochet (21) étant pourvu d'une ouverture (211) dans une partie de plaque de base (212) pour permettre le passage de la tige de tension (22) de sorte que la partie de tête (222) de la tige de tension (22) soit retenue à l'intérieur de la forme en U au niveau du côté avant de la partie de plaque de base (212) et la partie de tige (221) au niveau du côté arrière,

la plaque d'accouplement (25) du mécanisme d'accouplement ayant une partie de base (252) située au niveau du côté arrière de la partie de plaque de base (212) de l'élément crochet (21) et étant pourvue d'une ouverture oblongue (251) pour permettre le passage de la partie de tige (221) de la tige de tension (22) et la plaque d'ac-

couplement (25) pouvant coulisser dans le plan de la partie de base (252) sensiblement perpendiculairement à la partie de tige (221) de sorte que, lorsqu'elle se trouve dans la première position ou position inférieure, l'élément crochet (21) puisse assumer sa position de mise en prise, et dans la seconde position ou position supérieure, l'élément crochet (21) soit maintenu dans sa position de non mise en prise,

un élément d'angle (23) étant disposé à proximité de la partie de tête (222) de la tige de tension (22), ayant une ouverture (231) pour permettre le passage de la partie de tige (221) de la tige de tension (22), et

une pièce d'extrémité (24) étant fournie, ayant une ouverture (241) pour permettre le passage de la partie de tige (221) de la tige de tension (22), la pièce d'extrémité (24) ayant en outre une paroi verticale (242), sur laquelle une saillie (243) est formée pour entourer l'ouverture (241) de la pièce d'extrémité (24), et deux brides en saillie (244) étant fournies de chaque côté de la paroi verticale (242) pour définir une piste (245).

2. Fenêtre de toit selon la revendication 1, la plaque d'accouplement (25) étant pourvue d'une bride inférieure (253) formée sur la partie de base (252) pour venir en butée sur l'au moins une partie inclinée (223) dans la position de non mise en prise.
3. Fenêtre de toit selon la revendication 1 ou 2, la plaque d'accouplement (25) étant pourvue d'une découpe (254) au sommet de la partie de base (252) pour former au moins une, de préférence deux, pattes verticales (255).
4. Fenêtre de toit selon la revendication 1, l'élément d'angle (23) étant pourvu d'une jambe verticale (232) et d'une jambe inférieure (233), l'ouverture (231) de l'élément d'angle (23) étant fournie dans la jambe verticale (232), et deux brides en saillie (234) étant fournies sensiblement parallèlement à la jambe inférieure (233) et définissant chacune un espace (235) par rapport à la jambe verticale (232).
5. Fenêtre de toit selon la revendication 4, la pièce d'extrémité (24) étant positionnée avec le côté arrière de sa paroi verticale (242) en butée contre le côté avant de la jambe verticale (232) de l'élément d'angle (23), entre la jambe inférieure (233) et les brides en saillie (234), et la partie de base (252) de la plaque d'accouplement (25) étant reçue de manière coulissante dans la piste (245) de la pièce d'extrémité et les espaces (235) respectifs de l'élément d'angle (23).
6. Fenêtre de toit selon l'une quelconque des revendications 1 à 6, chaque partie de bride (213) de l'élément crochet en forme de U (21) comprenant un

- sommet (210) au niveau de l'extrémité avant, une transition arrondie (215) entre le sommet (210) et la partie de crochet (214), une partie de bord inférieur (218) entre la partie de crochet (214) et la partie de plaque de base (212), une partie supérieure opposée (217), et au moins une partie de bord inclinée (216, 219) entre la partie supérieure (217) et le sommet (210).
7. Fenêtre de toit selon l'une quelconque des revendications précédentes, les moyens de réception du second élément d'accouplement comprenant au moins un évidement de réception (314) dans une coulisse (31) du système de coulisse (30).
8. Fenêtre de toit selon la revendication 7, la coulisse (31) comprenant une partie inférieure (310), une première partie de paroi (311) et une seconde partie de paroi (312), un évidement de réception (314) étant de préférence fourni au niveau de chacune des transitions entre la première partie de paroi (311) et la partie inférieure (310) et entre la seconde partie de paroi (312) et la partie de paroi inférieure (310), et un trou (315) étant fourni dans la première partie de paroi (311) et un trou (316) étant disposé dans la seconde partie de paroi (312) pour recevoir un axe (40) relié à la première extrémité (12) du bras de levage (14).
9. Fenêtre de toit selon la revendication 7 ou 8, le système de coulisse (30) comprenant un longeron (32) conçu pour recevoir la coulisse (31) et étant pourvu d'au moins un évidement (324) opposé à l'évidement de réception (314) respectif de la coulisse (31).
10. Fenêtre de toit selon l'une quelconque des revendications 1 à 6, les moyens de réception du second élément d'accouplement comprenant un axe (40) relié à la première extrémité (12) du bras de levage (14).
11. Fenêtre de toit selon l'une quelconque des revendications précédentes, l'élément crochet (21) du premier élément d'accouplement étant conçu pour entrer en contact de manière coulissante avec le système de coulisse (30) dans une direction et pour venir en prise avec ledit second élément d'accouplement (31) dans une autre direction.
12. Fenêtre de toit selon l'une quelconque des revendications précédentes, la plaque d'accouplement (25) étant pourvue d'au moins une partie augmentant la friction (256).
13. Procédé d'installation d'une fenêtre de toit ayant un cadre primaire, au moins un cadre secondaire, et un dispositif de levage inséré entre le cadre primaire et le cadre secondaire, comprenant les étapes consistant à :
- i) fournir un dispositif de fixation selon l'une quelconque des revendications 1 à 12 ;
  - ii) installer le cadre primaire dans une structure de toit ; et
  - iii) accoupler le cadre secondaire au cadre primaire.
14. Procédé selon la revendication 13, l'étape iii) comprenant les étapes consistant à
- a) faire glisser le système de coulisse dans le guidage de coulisse en ouvrant le cadre secondaire jusqu'à ce que le premier élément d'accouplement entre en contact et vienne en prise avec le second élément d'accouplement ; et
  - b) fermer le cadre secondaire.
15. Procédé pour démonter le cadre secondaire d'une fenêtre de toit selon l'une quelconque des revendications 1 à 12, comprenant les étapes consistant à
- a) ouvrir le cadre secondaire ;
  - b) positionner la plaque d'accouplement dans la seconde position ;
  - c) solliciter le premier élément d'accouplement contre la plaque d'accouplement en ouvrant davantage le cadre secondaire, et
  - d) retirer le cadre secondaire.

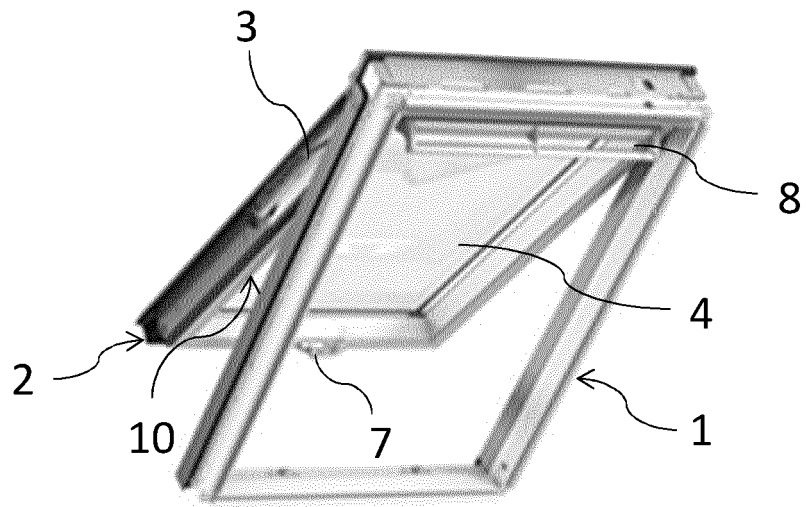


Fig. 1

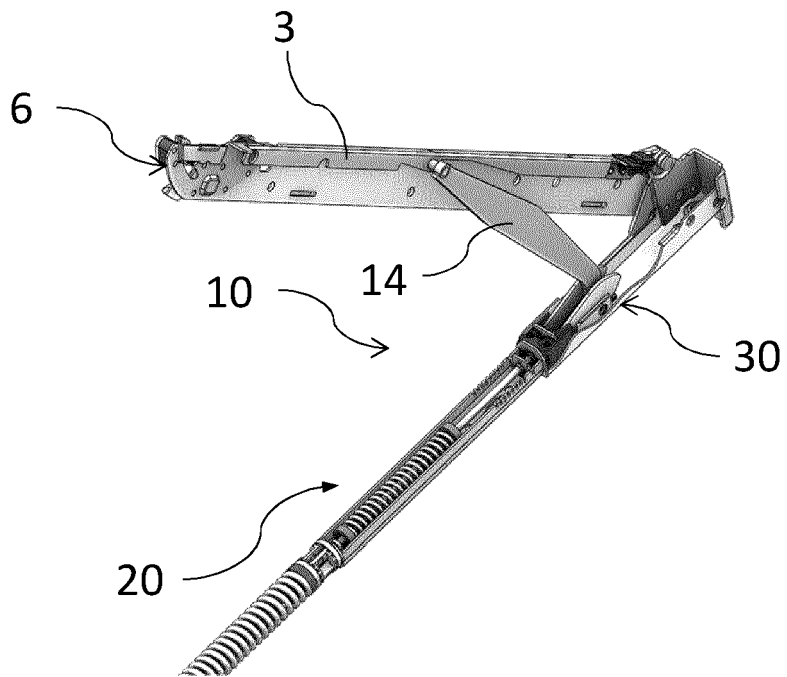
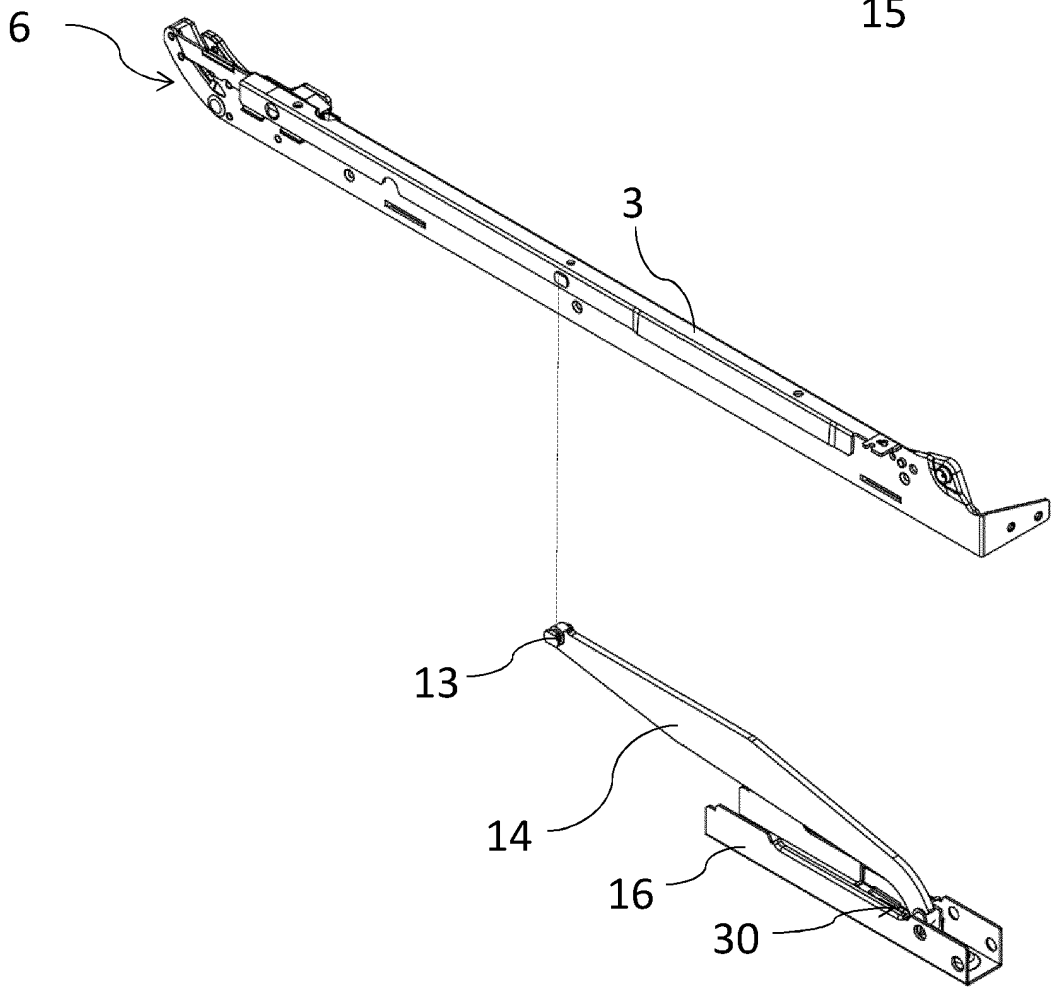
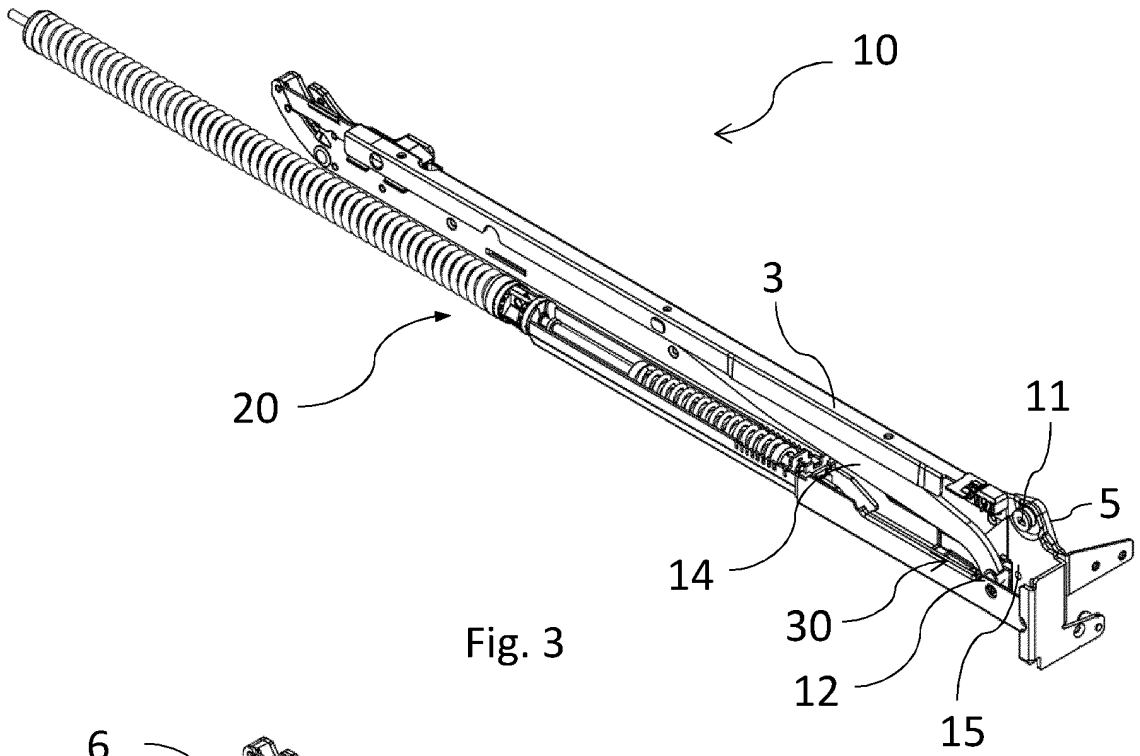


Fig. 2



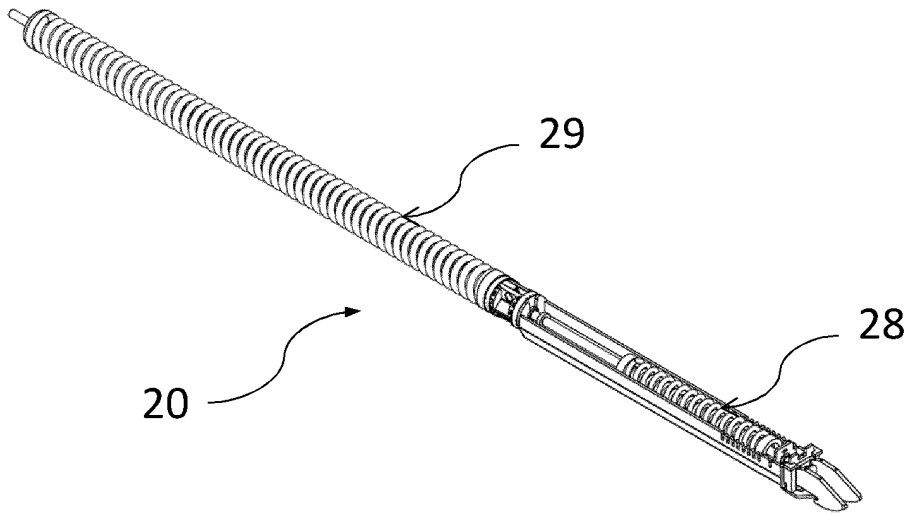


Fig. 5

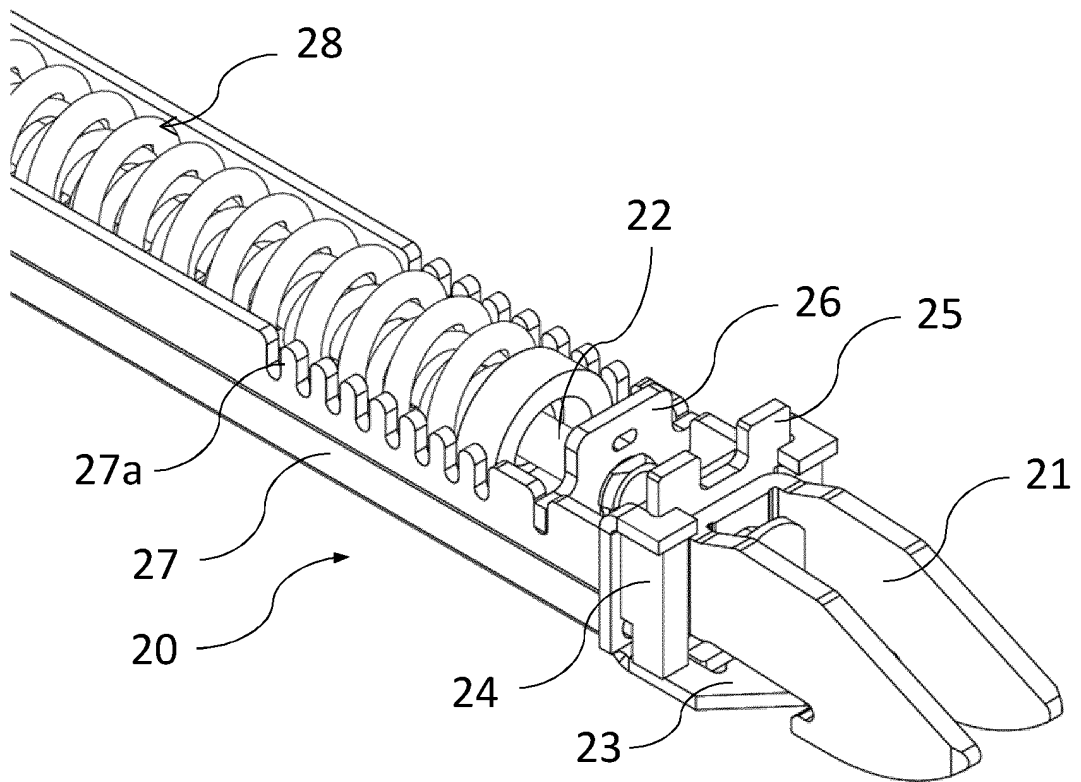


Fig. 6

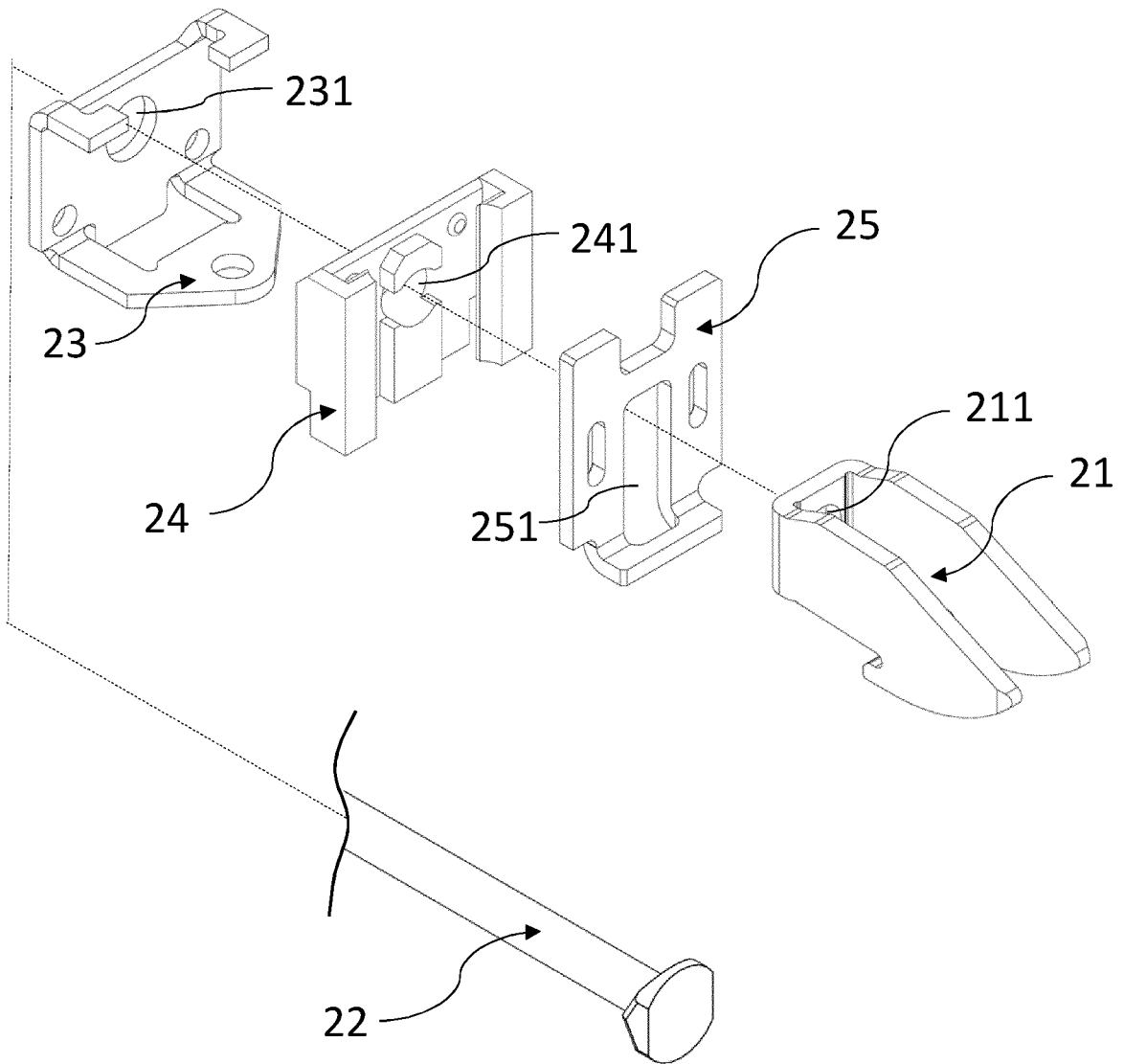
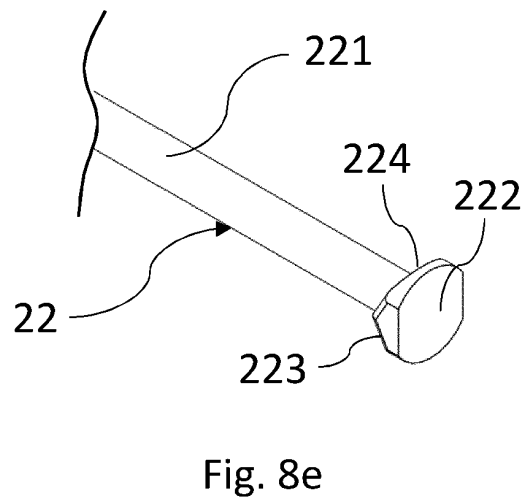
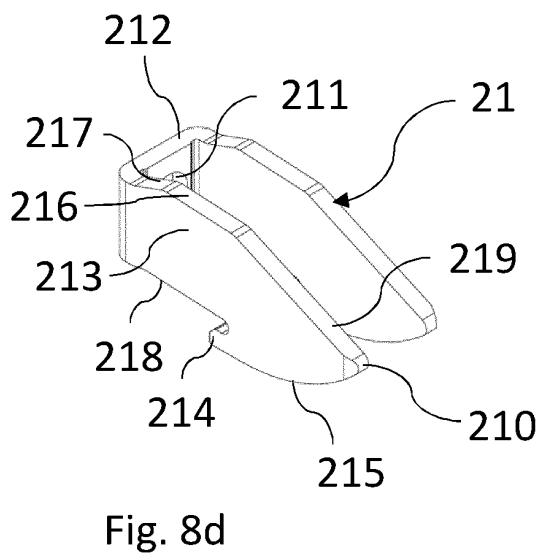
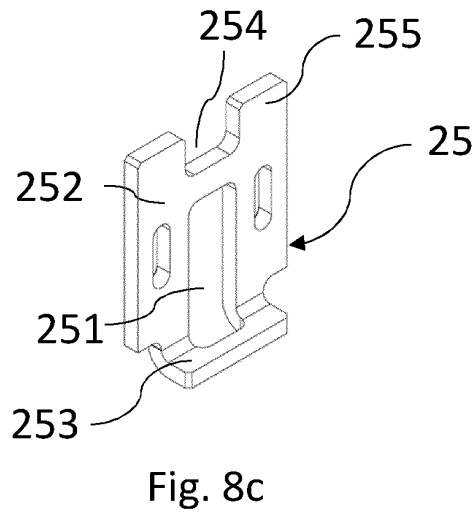
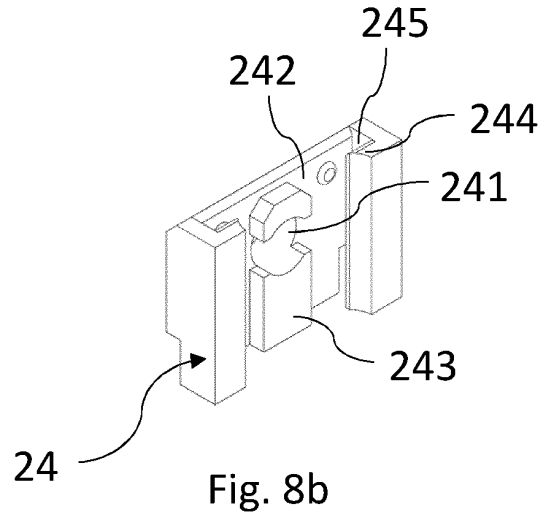
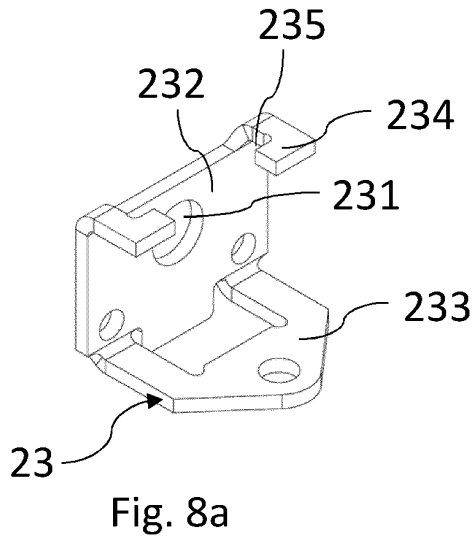


Fig. 7



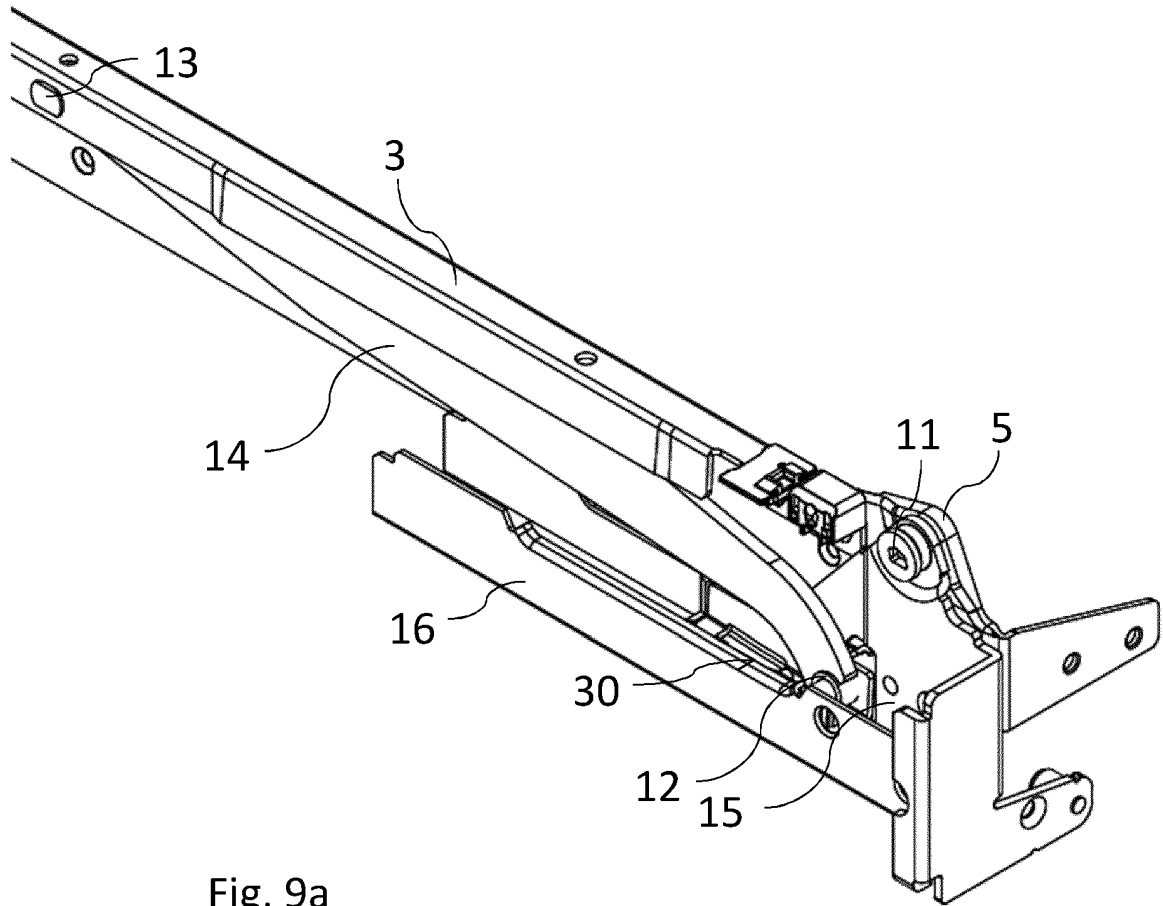


Fig. 9a

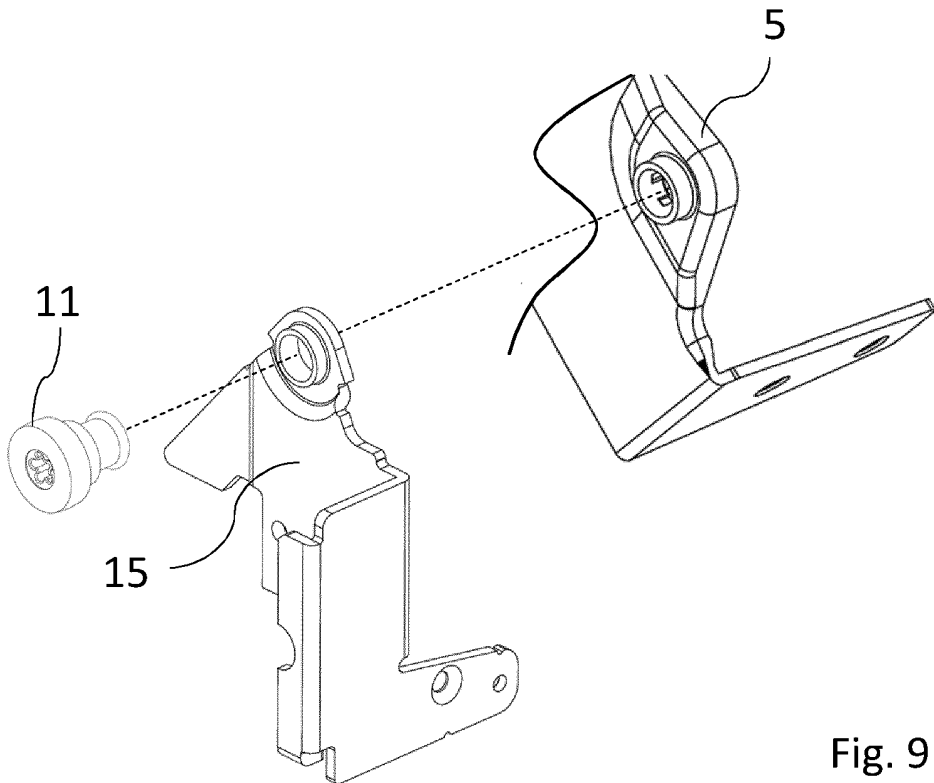


Fig. 9b

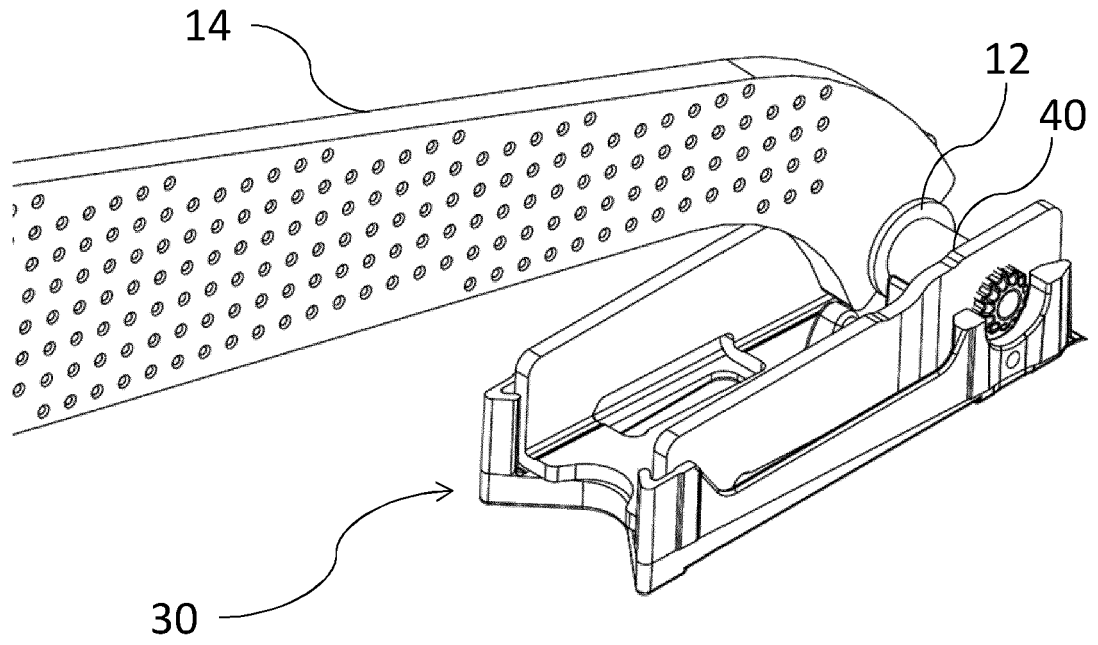


Fig. 10

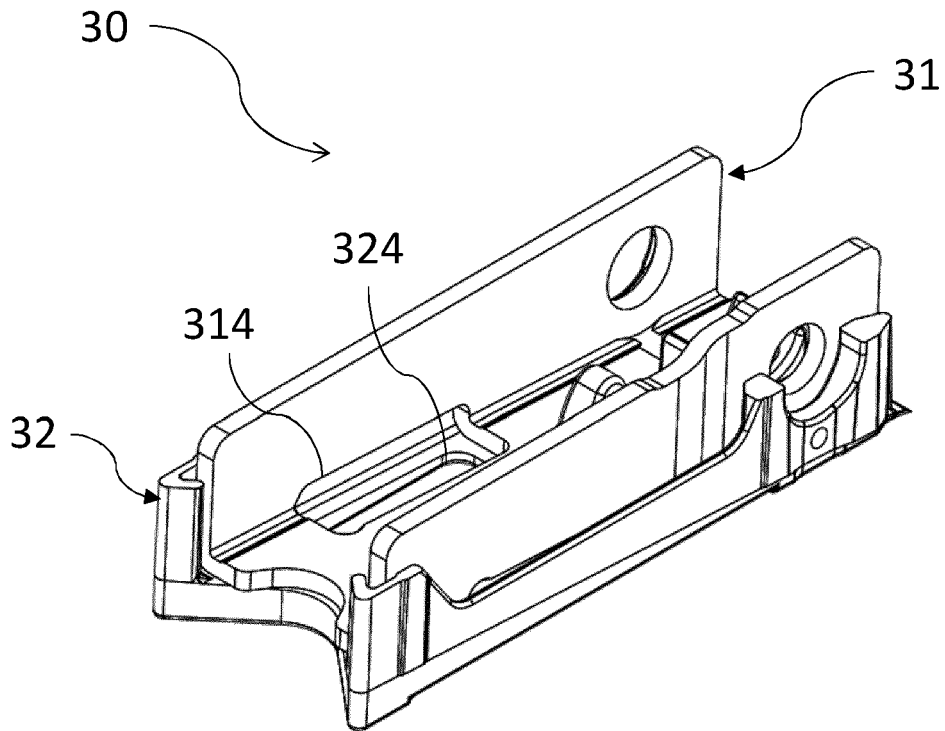


Fig. 11

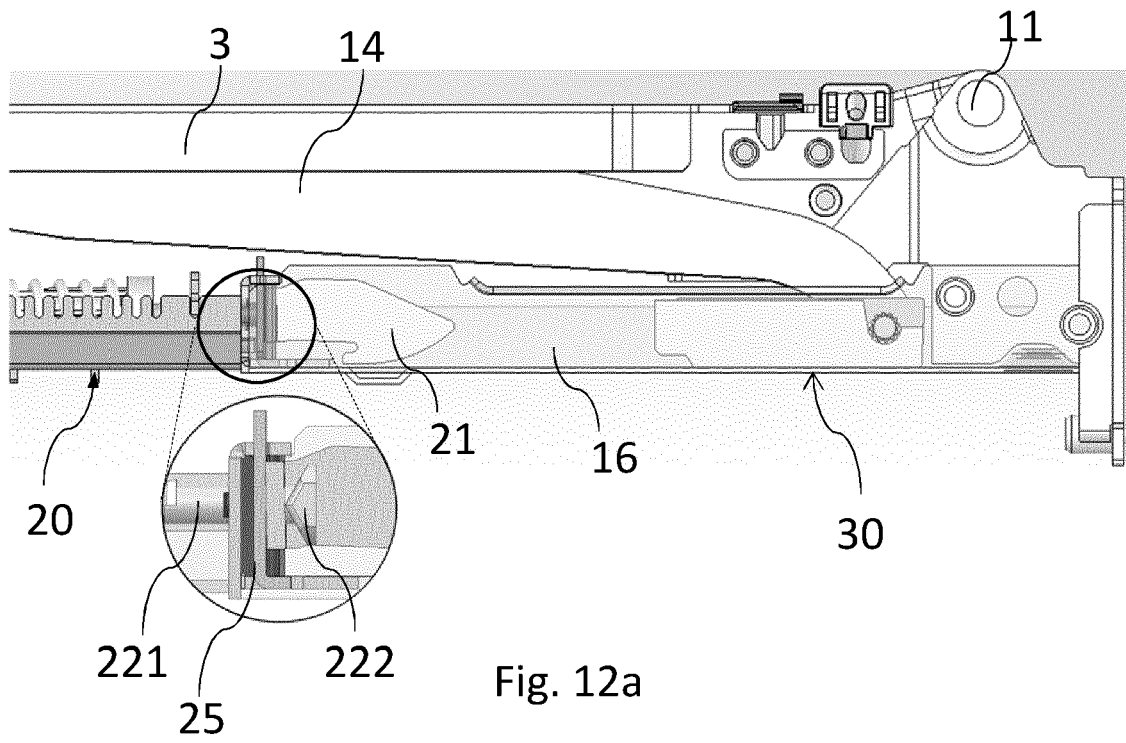


Fig. 12a

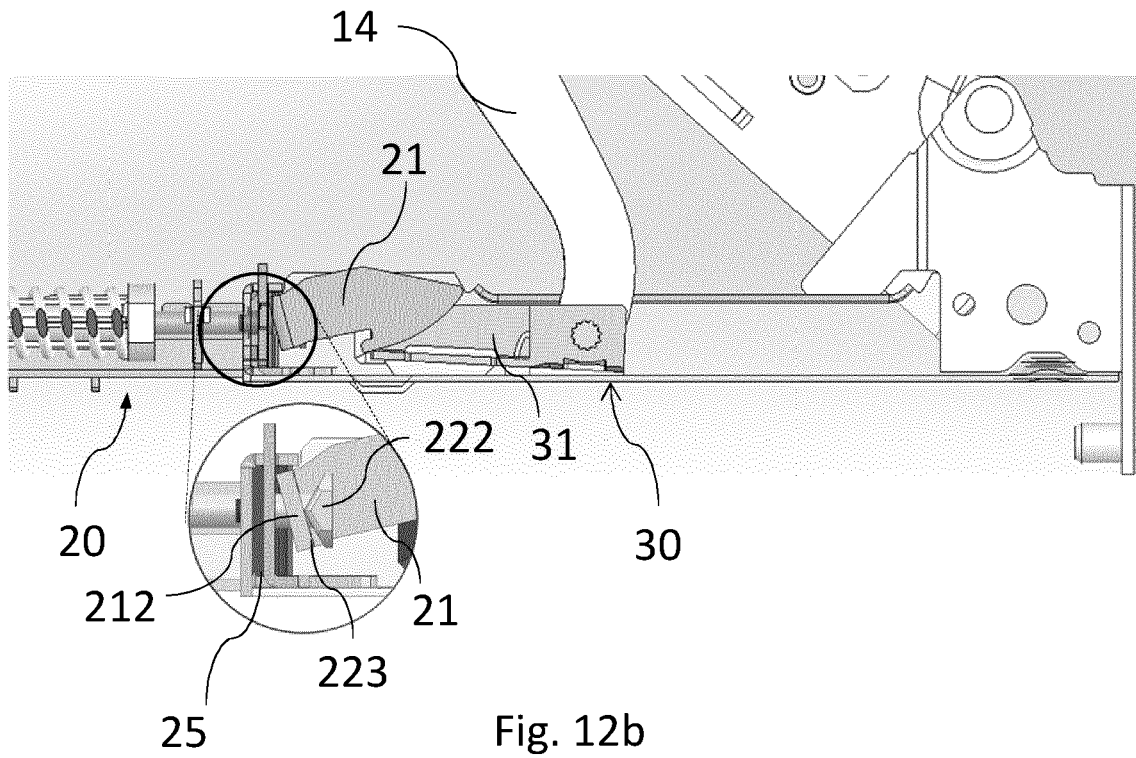


Fig. 12b

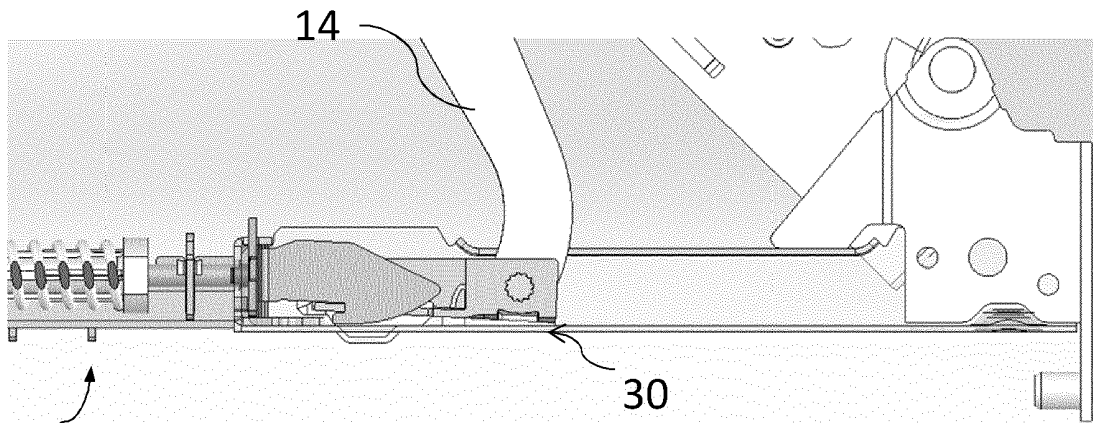


Fig. 12c

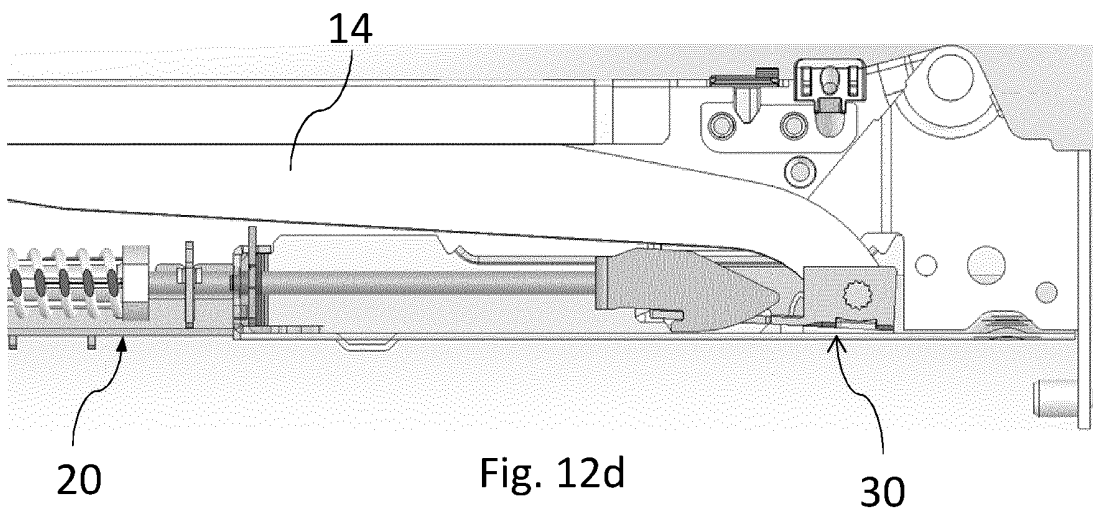


Fig. 12d

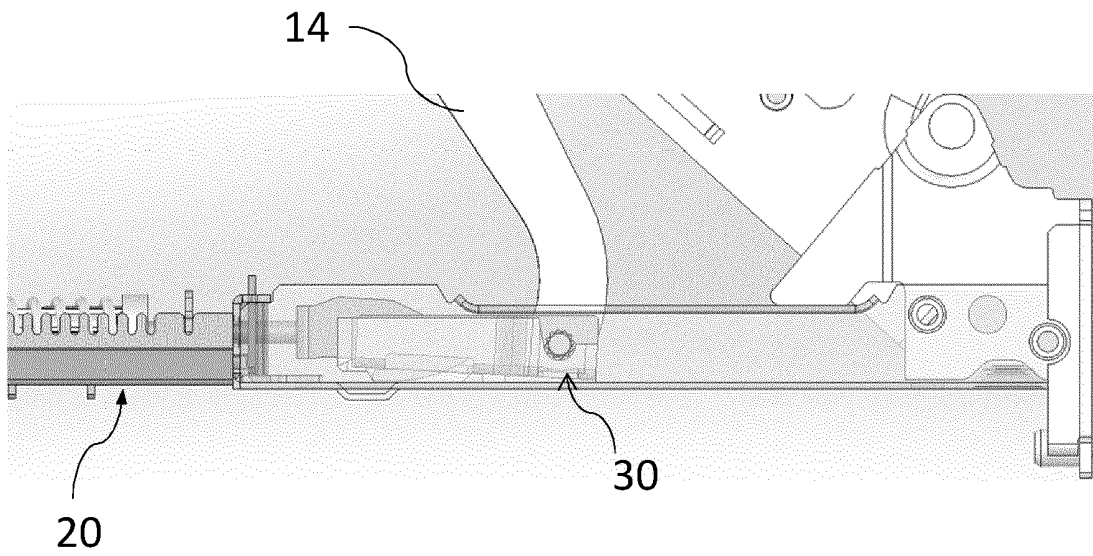


Fig. 12e

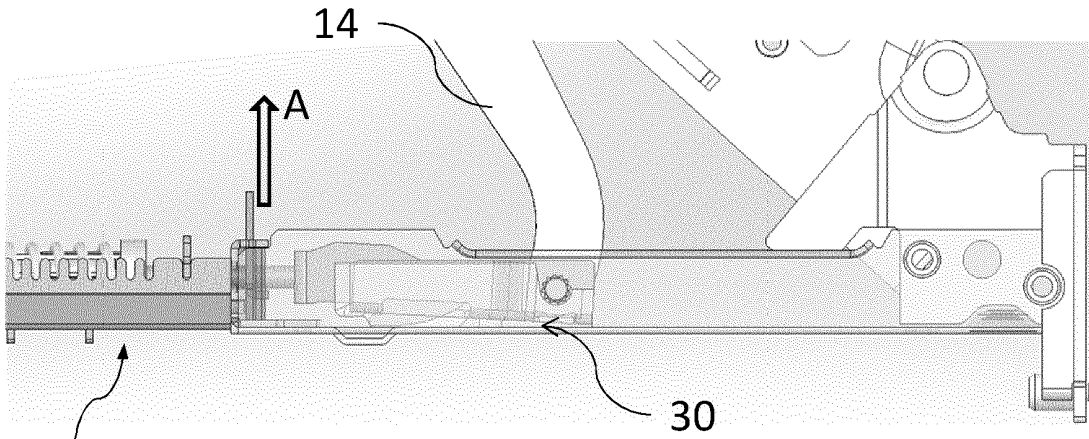


Fig. 12f

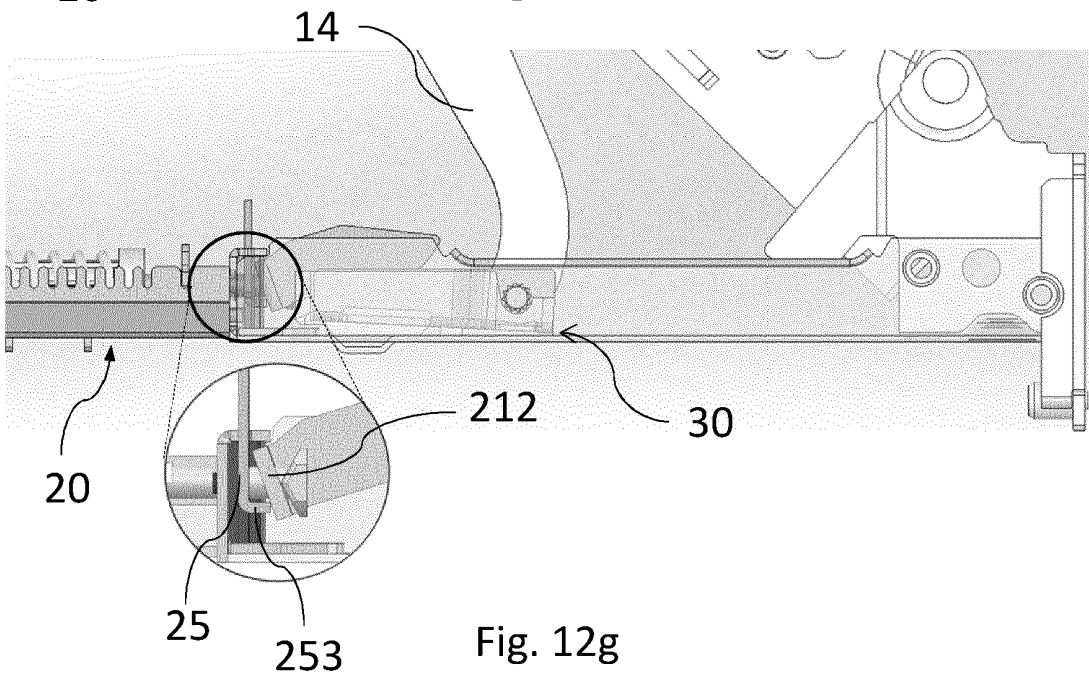


Fig. 12g

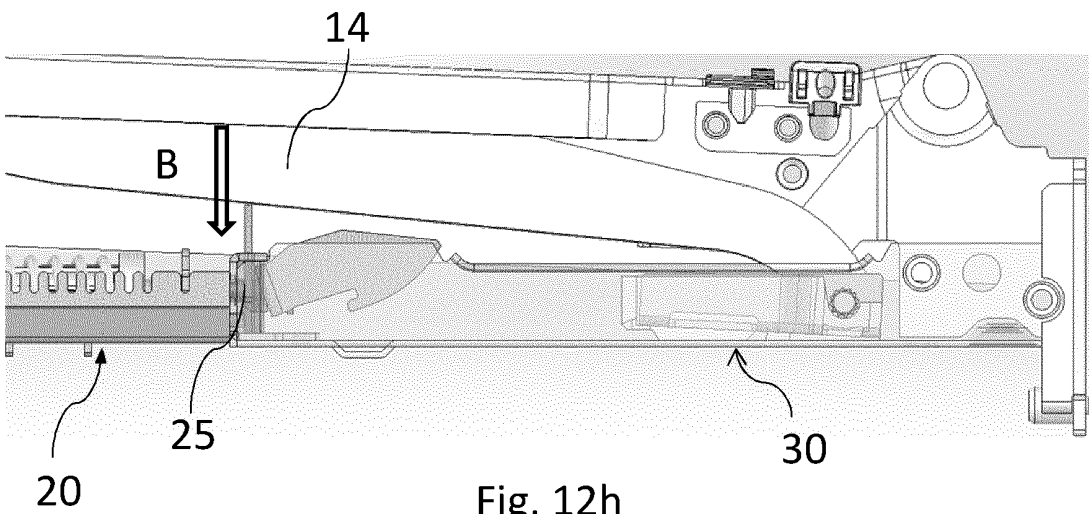


Fig. 12h

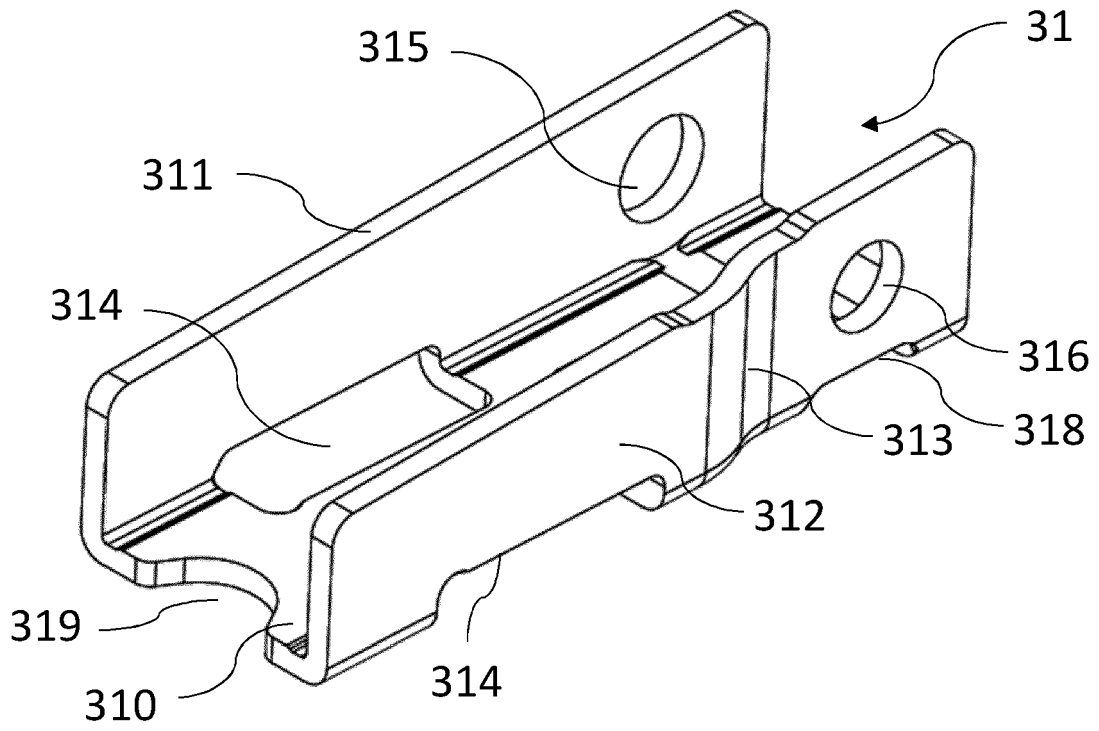


Fig. 13a

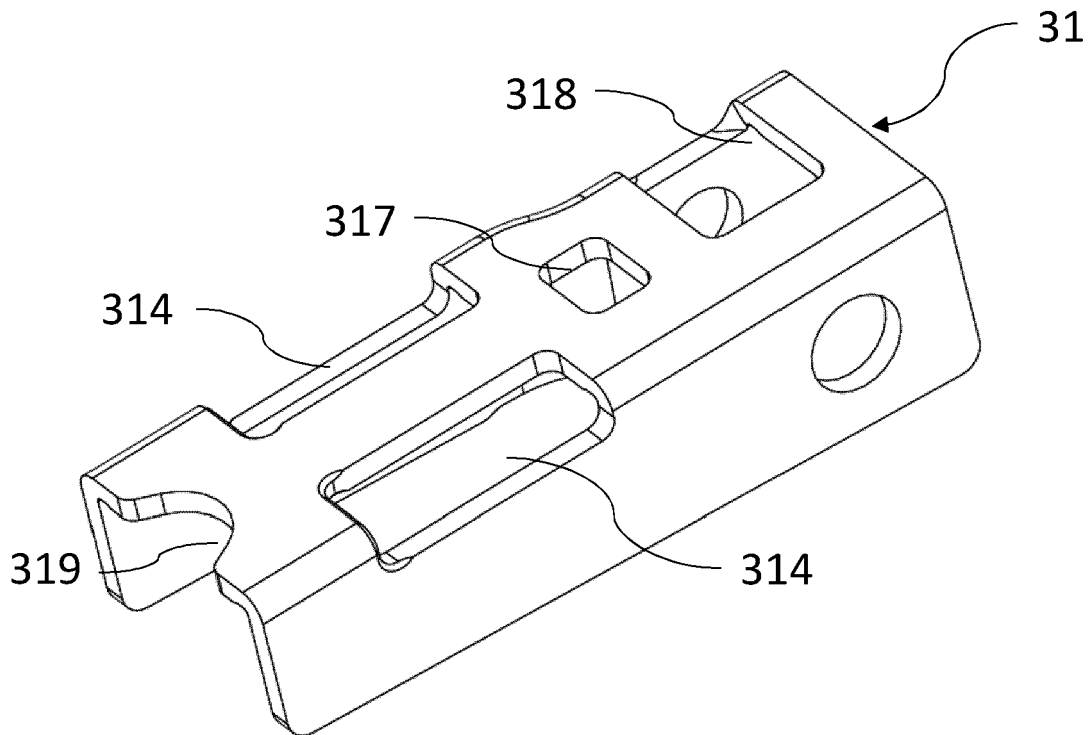


Fig. 13b

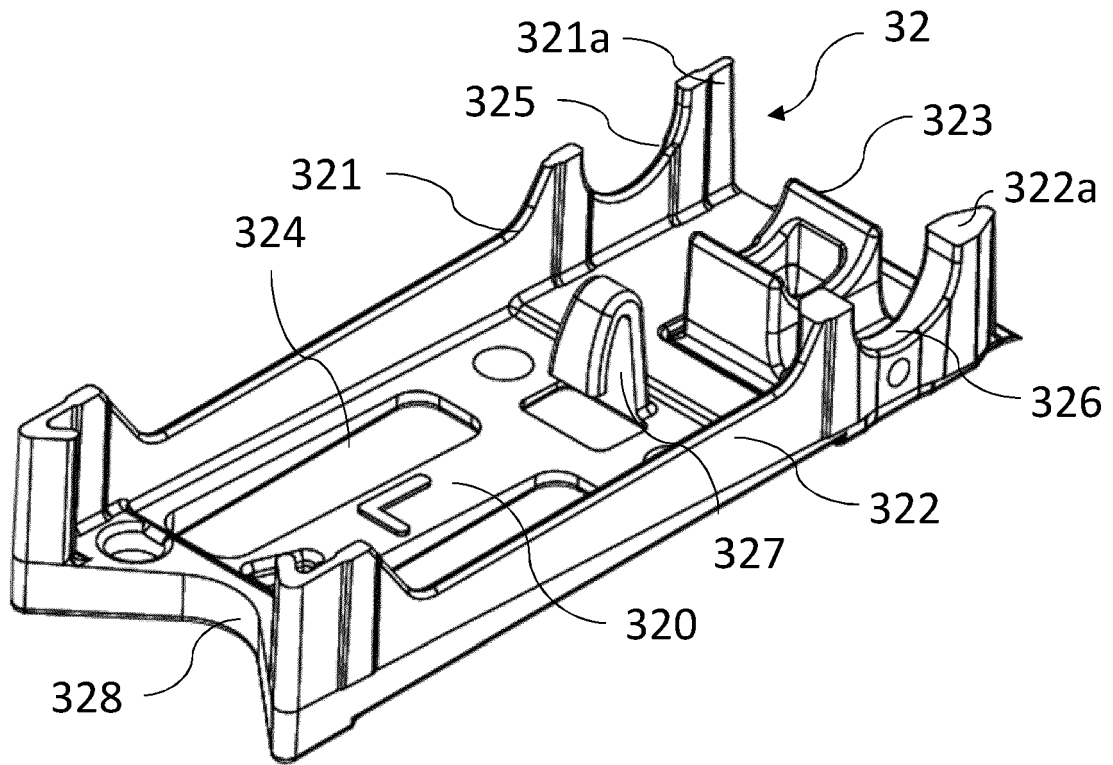


Fig. 14a

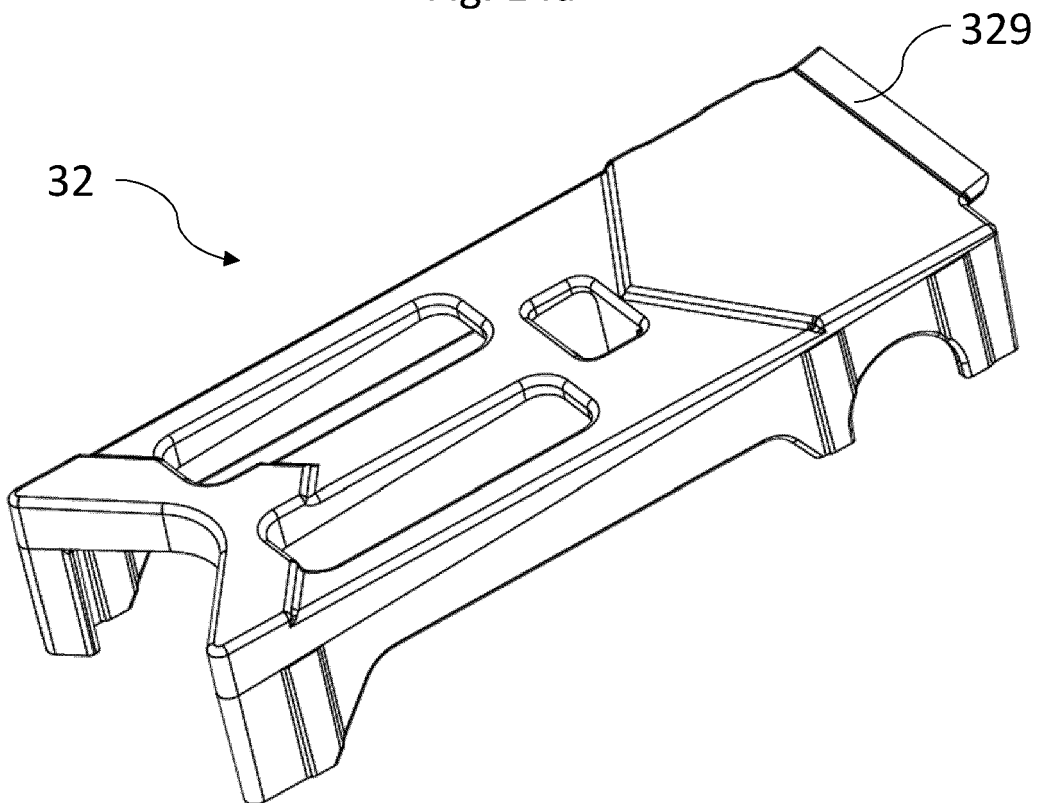


Fig. 14b

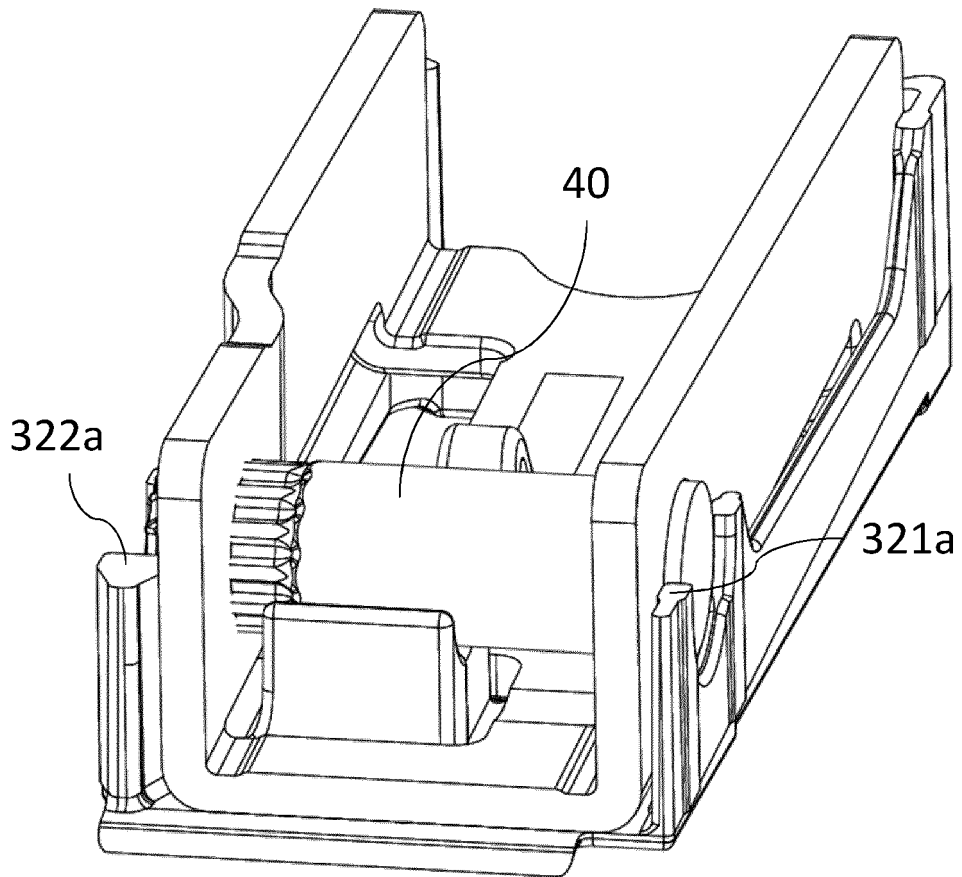


Fig. 15a

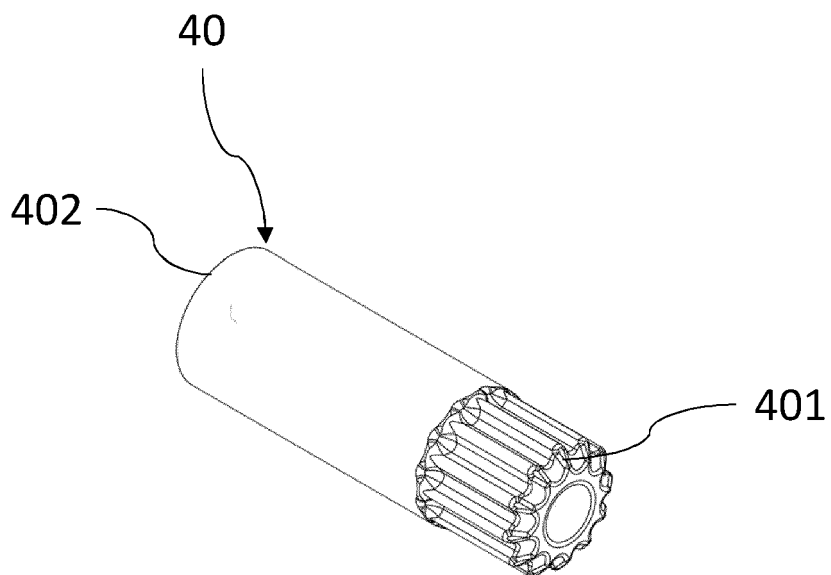


Fig. 15b

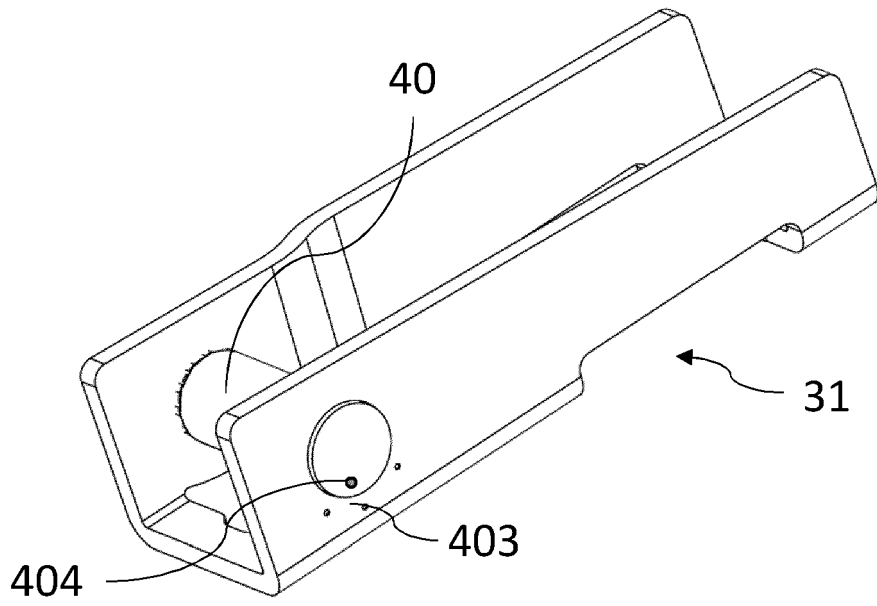


Fig. 16

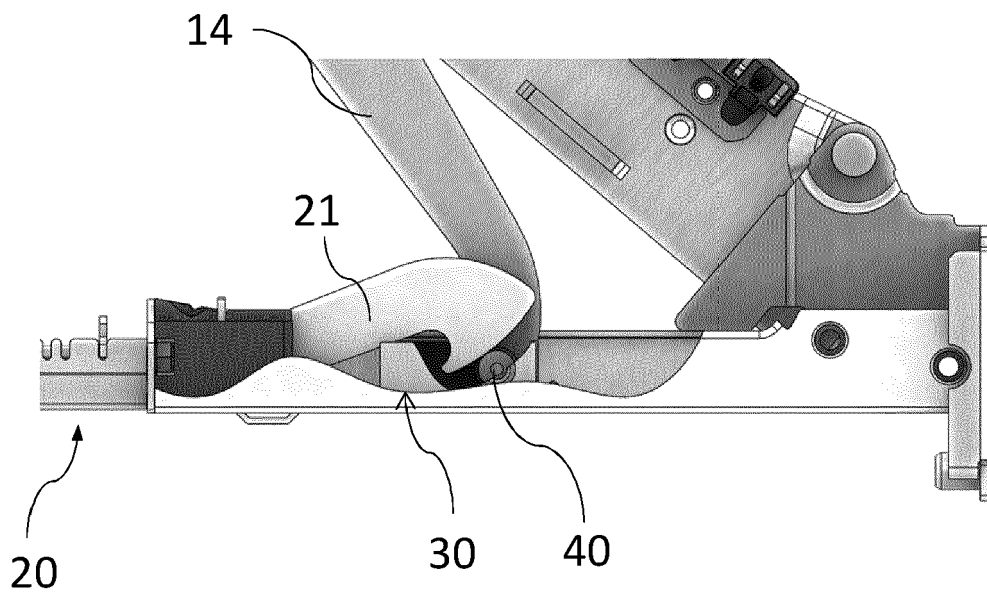


Fig. 17

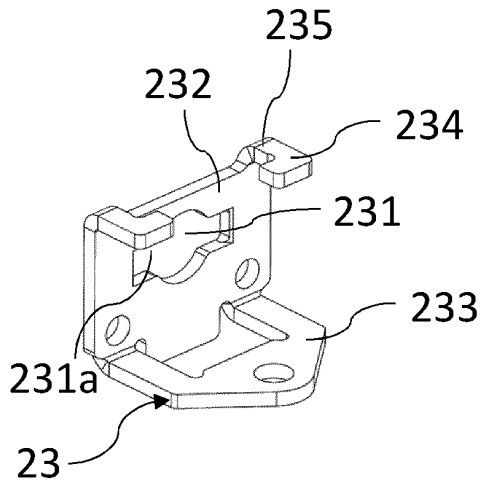


Fig. 18a

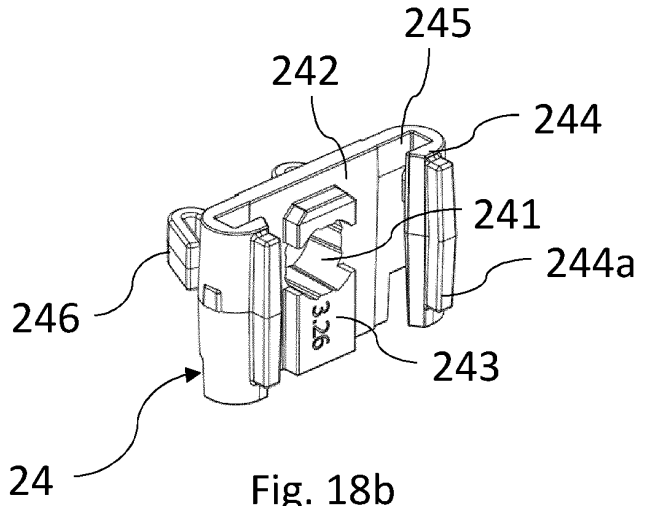


Fig. 18b

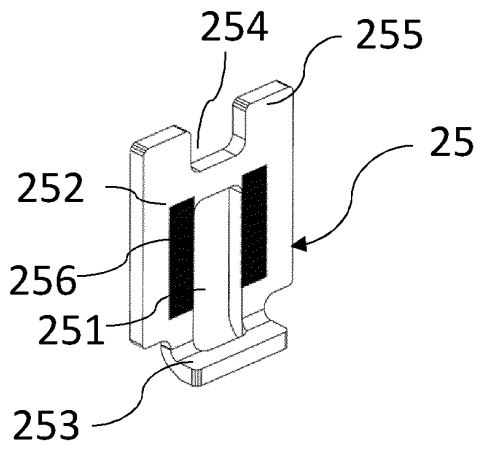


Fig. 18c

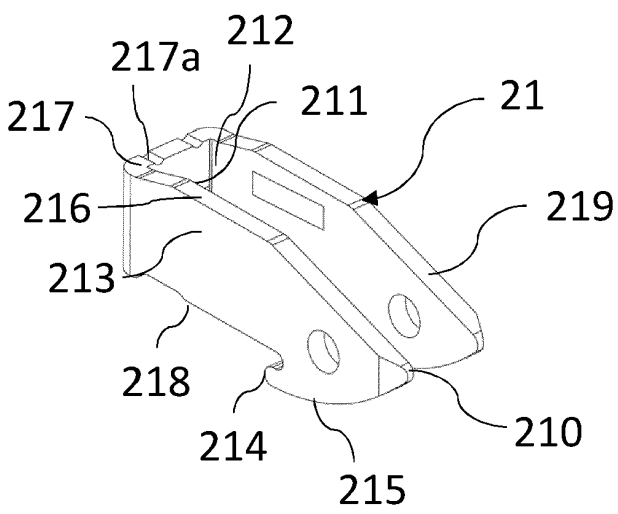


Fig. 18d

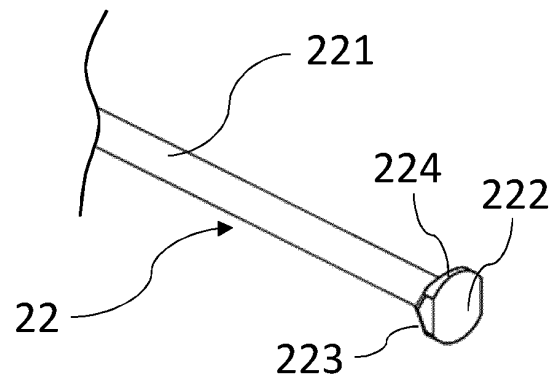


Fig. 18e

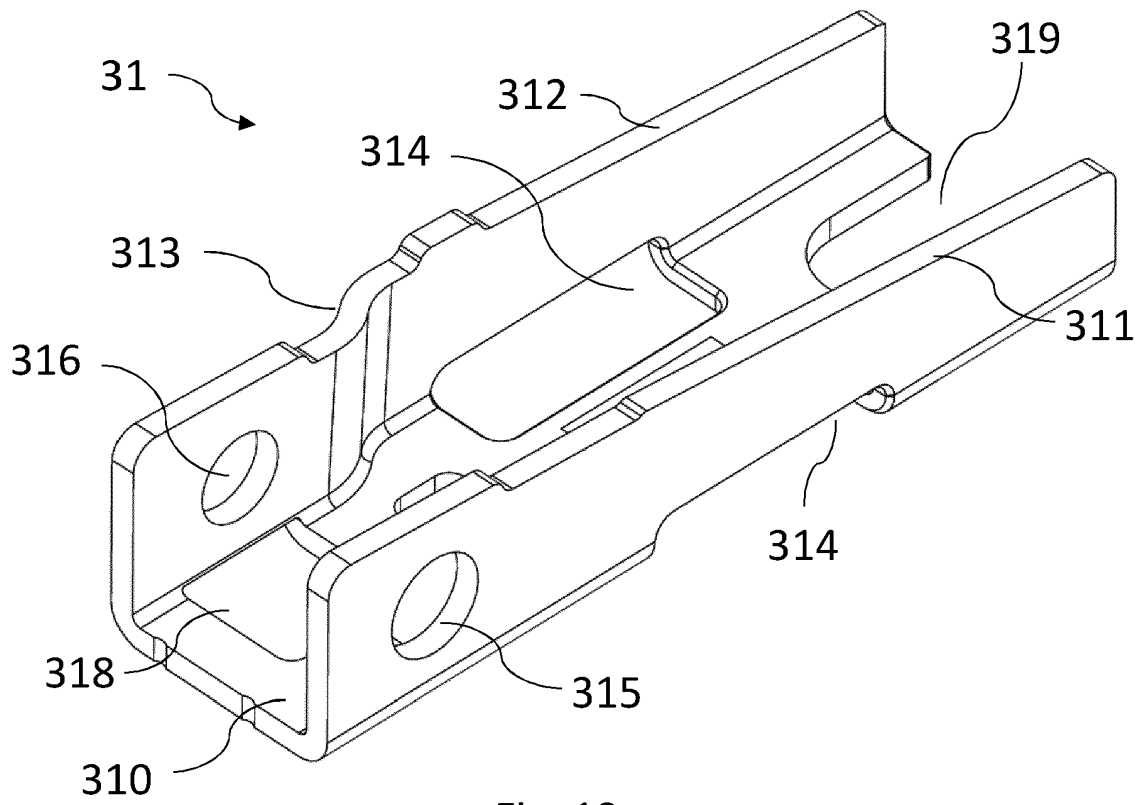


Fig. 19a

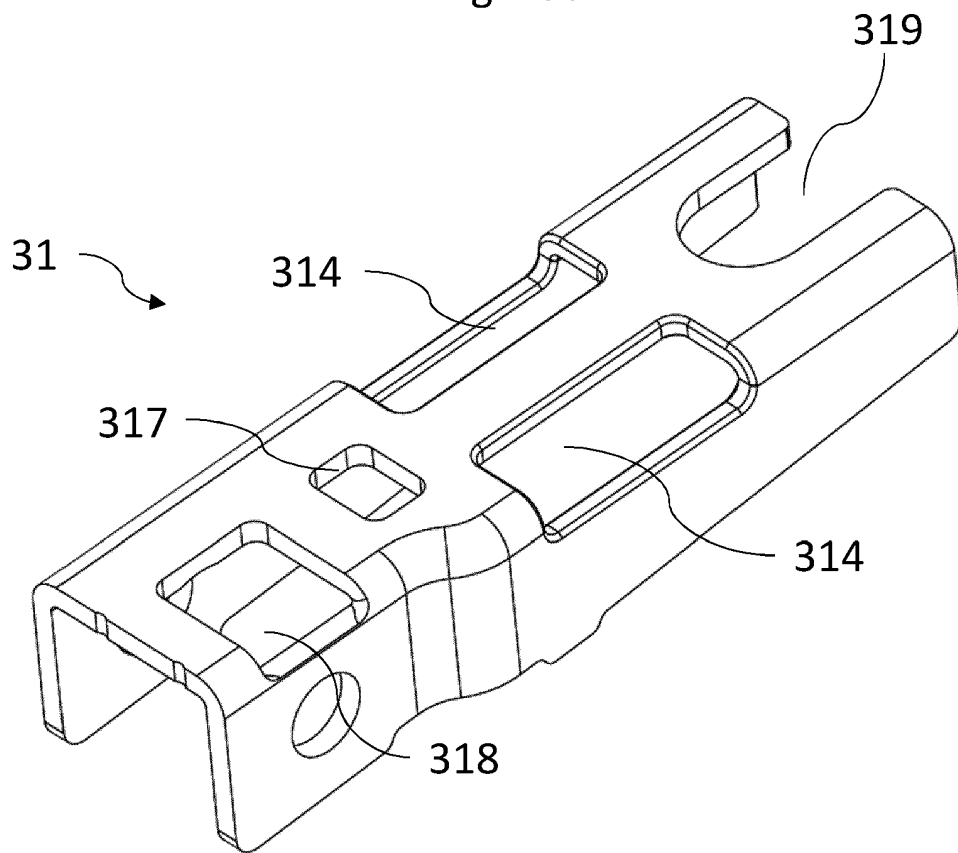


Fig. 19b

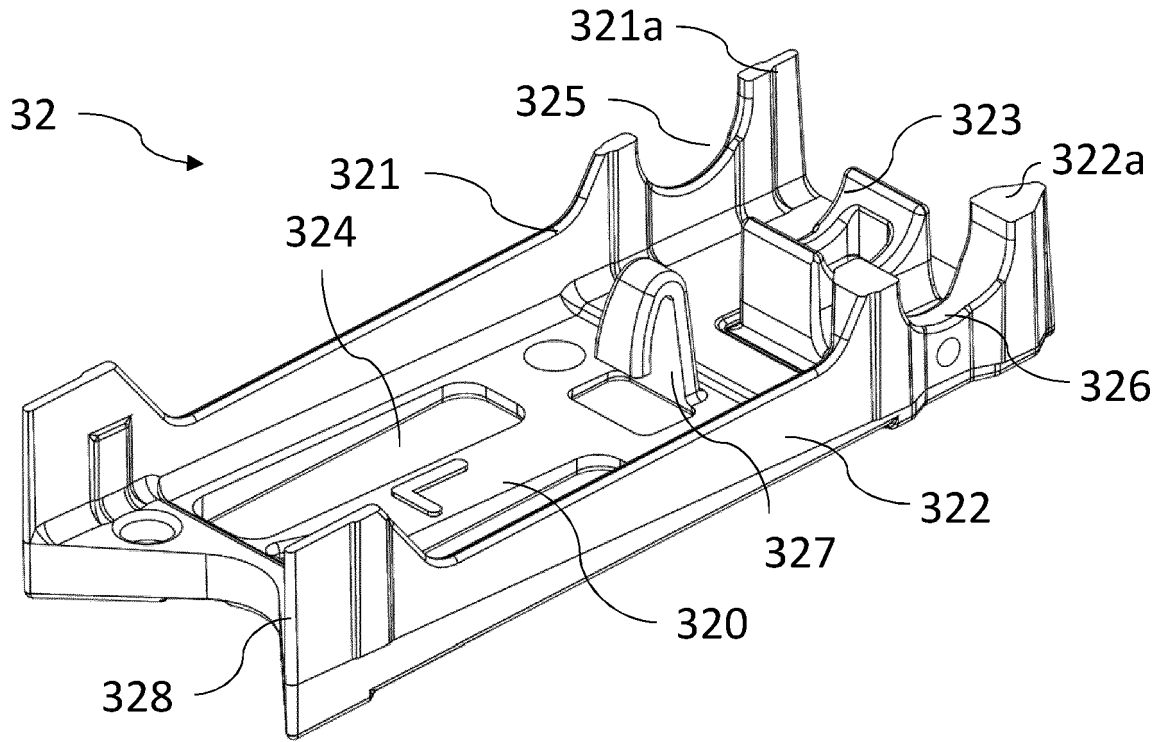


Fig. 20a

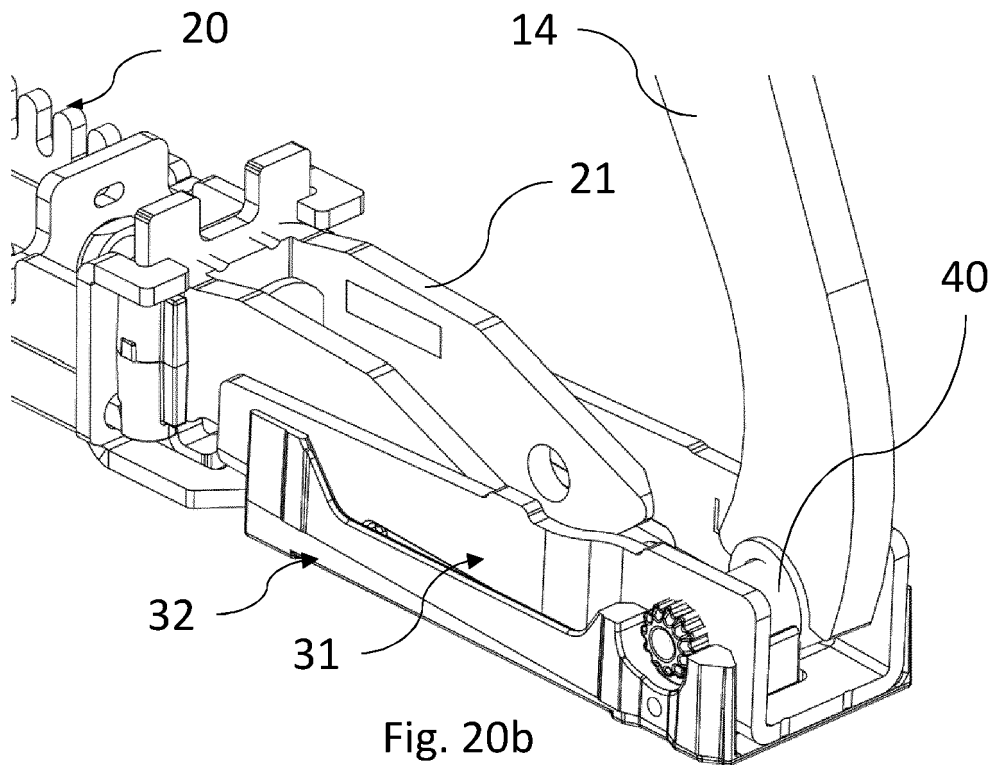


Fig. 20b

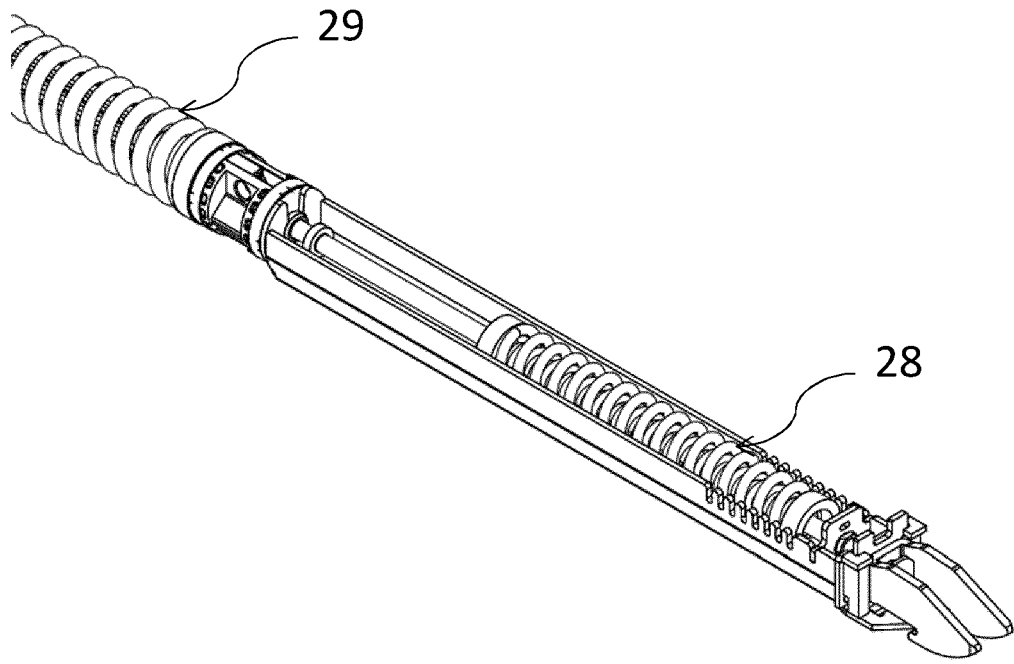


Fig. 21

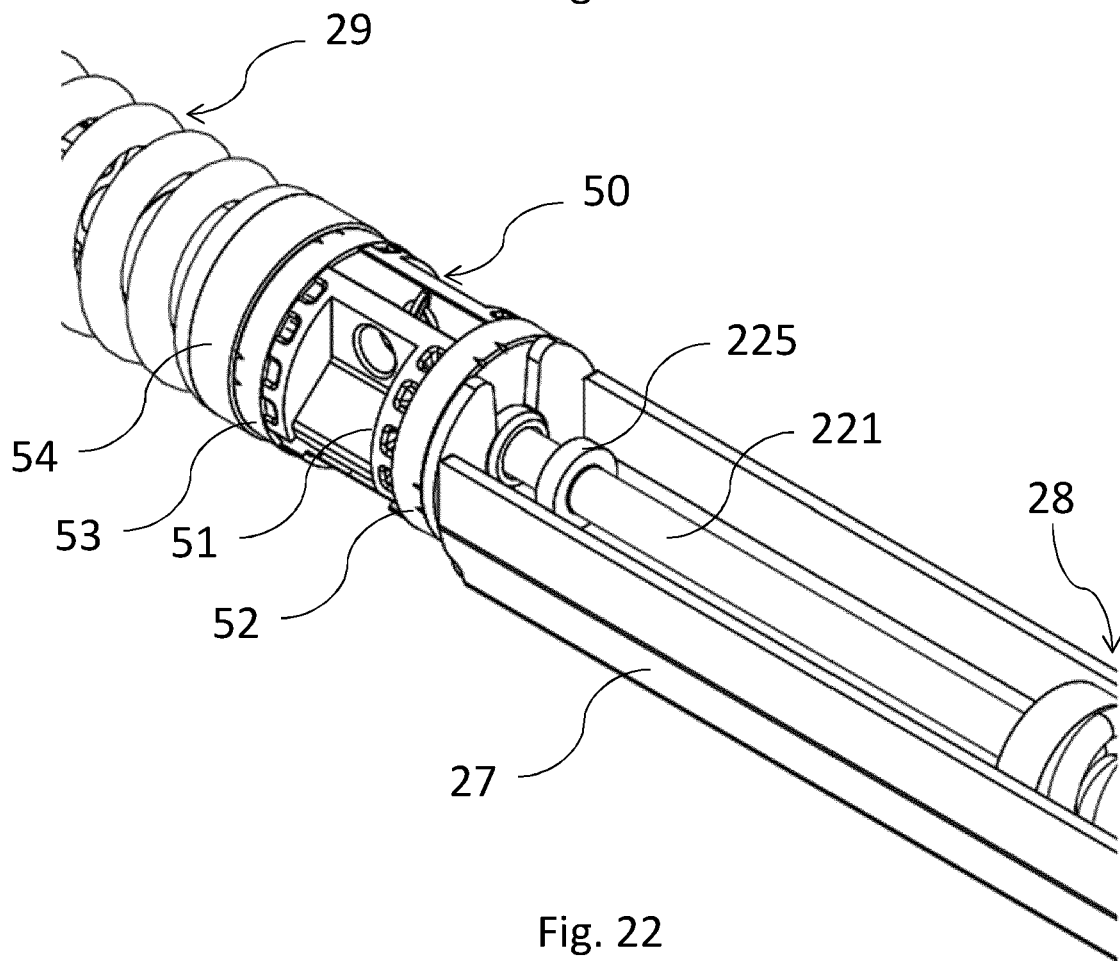


Fig. 22

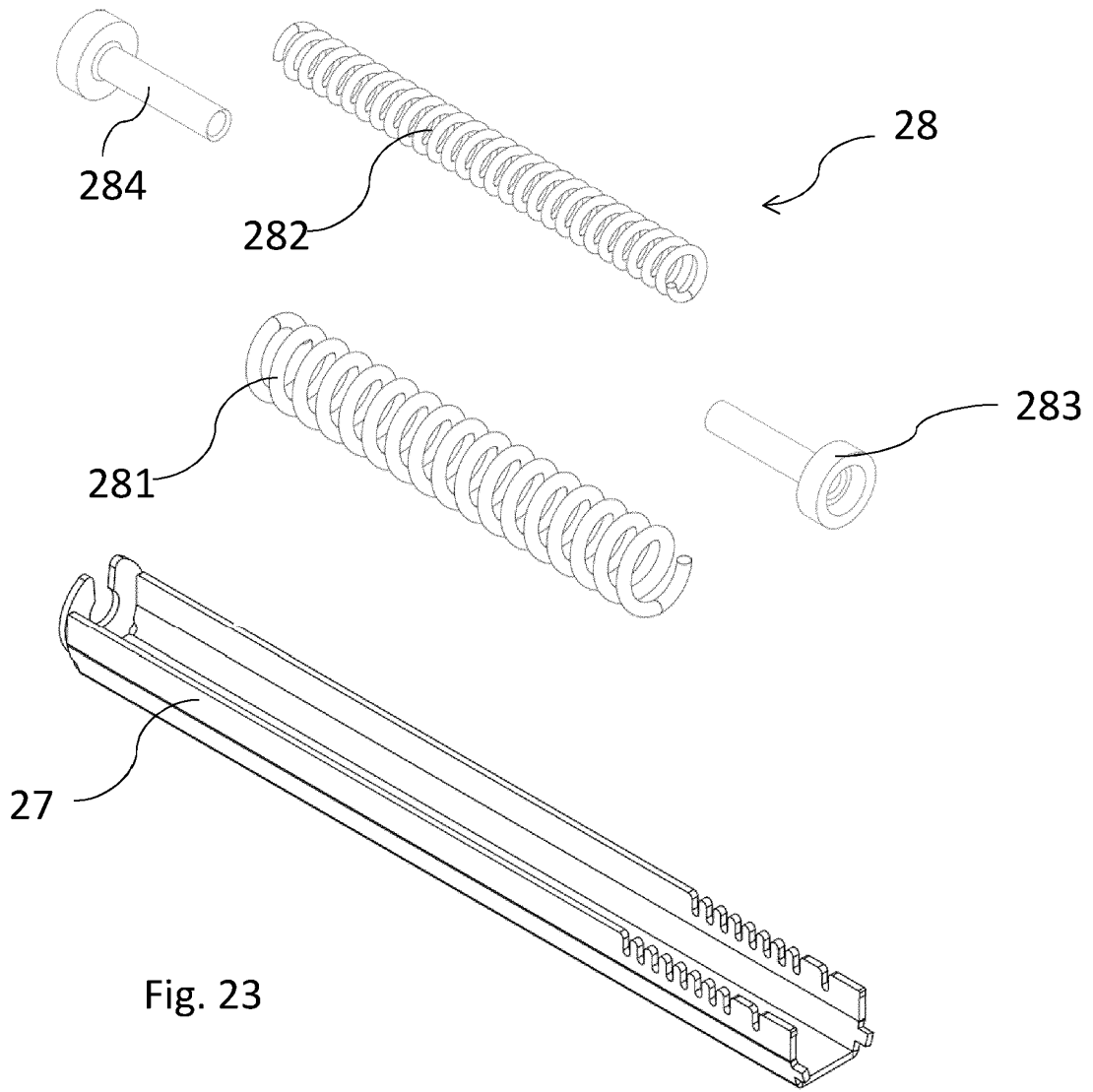


Fig. 23

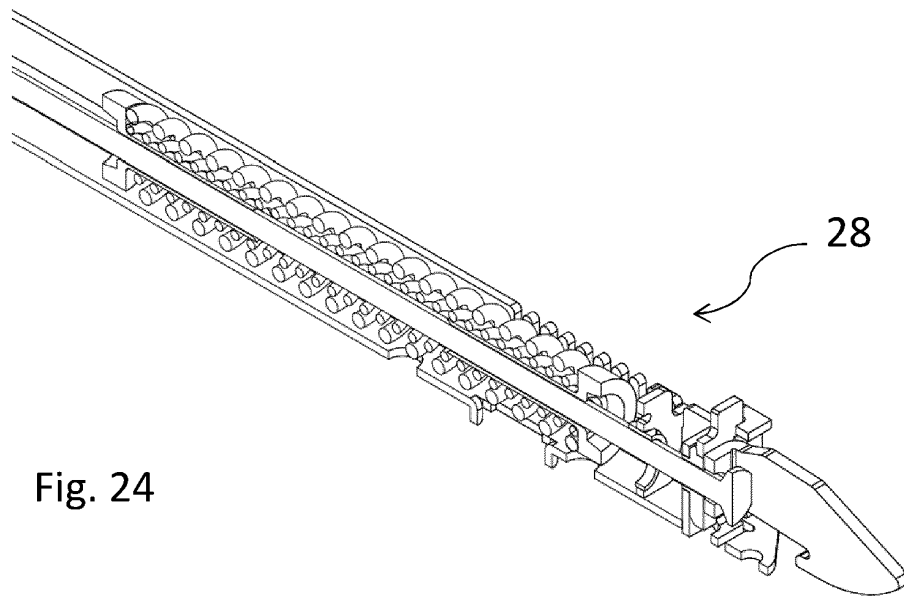


Fig. 24

**REFERENCES CITED IN THE DESCRIPTION**

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