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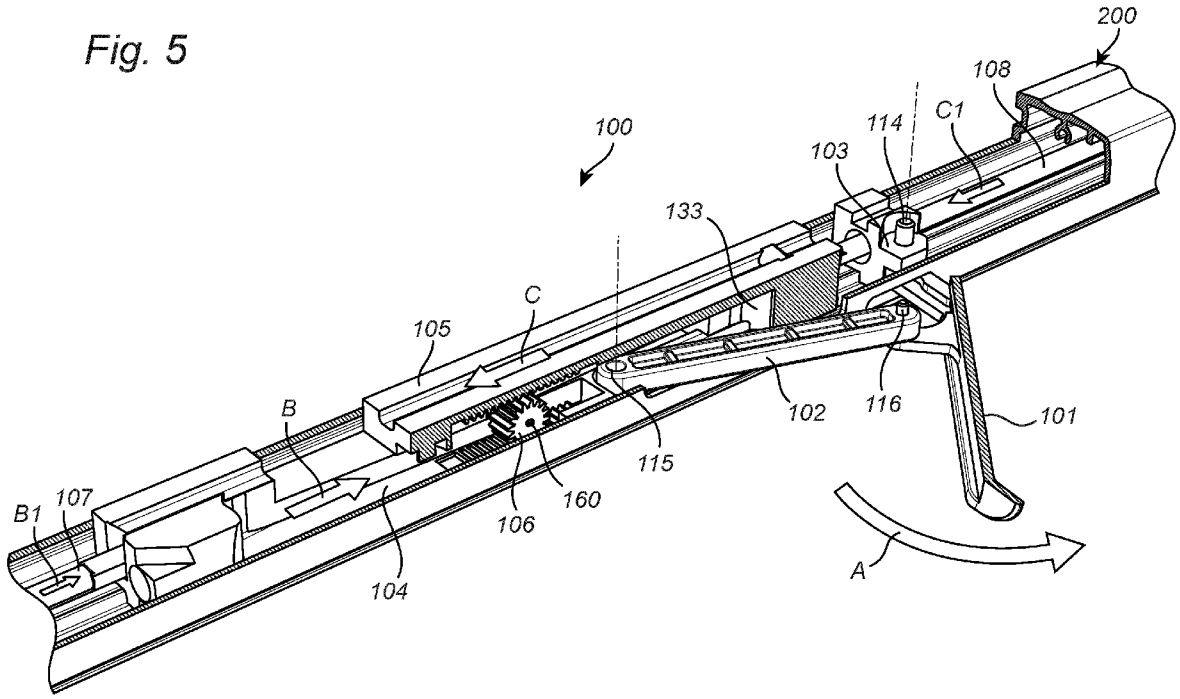
(54) Title: LOCKING ARRANGEMENT AND AN OPENABLE DOOR, WINDOW OR HATCH USING SUCH LOCKING ARRANGEMENT

Fig. 5



(57) Abstract: Locking arrangement for an openable door, window or hatch is provided. The locking arrangement comprises a first gear rack (104) having a longitudinal extension as seen in a first direction C and a second gear rack (105) having a longitudinal extension as seen in a second direction B opposite the first direction C. A gear wheel (106) is arranged between and in a driving engagement with the first and second gear racks. A handle (101) is configured to be set between a locking position and an opening position by rotation. The first gear rack (104) is configured to be displaced in the second direction B and the second gear rack (105) is configured to be displaced in the first direction C in response to the handle (101) being set from the locking position to the opening position. The locking arrangement may be used in a glazed balcony, a sliding window arrangement, a door, a window or a hatch.

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LOCKING ARRANGEMENT AND AN OPENABLE DOOR, WINDOW OR HATCH USING SUCH LOCKING ARRANGEMENT

Field of the Invention

The invention relates to a locking arrangement for an openable door, window or hatch and an openable door, window or hatch using such locking arrangement.

Background Art

It is well known in the art to provide balconies with a balcony glazing. One typical example is disclosed in SE 529 745 C2. The balcony glazing is arranged on a supporting stand which is mounted between a lower balcony slab and, arranged straight above the same, an upper balcony slab. The supporting stand has an upper horizontal frame part, a lower horizontal frame part and two vertical frame parts. The horizontal frame parts constitute guide rails and carry between them a plurality juxtaposed vertical glass doors which are laterally movable. Each glass door is movable back and forth along a rectilinear path between a first end position where they together cover the front side of the balcony along its entire width, and a second position in which they are arranged in a partly overlapping relationship whereby the front side of the balcony is maximally open. The glass doors are pivotally arranged in view of the guide rails to allow e.g. cleaning. The pivoting is provided by an arrangement which is integrated in a frame of the glass door, where a vertically extending pin is displaceable along the vertical direction in and out of engagement with the guide rail. One pin is arranged in an upper horizontal edge portion of the glass door and one pin is arranged in the lower horizontal edge portion of the glass door. The two pins are operable simultaneously by a so called espagnolette type locking arrangement. The locking arrangement disclosed in SE 529 745 C2 comprises a centrally arranged rotatable connector connected to two vertically extending shafts. The ends of the two shafts are pivotably mounted to the connector on diametrically opposing sides of the rotatable connector. Thereby, when rotating the connector in a first direction, the free ends of the two shafts will move apart into a locking engagement with a respective hole in upper and lower horizontal portions of the outer frame. Correspondingly, when rotating the connector in a second, opposite direction, the free ends of the two shafts will move in the opposite direction out of locking engagement with the respective holes. The connector may be operable by e.g. a handle or key that is arranged to engage the connector through a vertical side

portion of the inner frame of the respective door. The frame accommodating the locking arrangement must be wide enough to accommodate the connector. The width of the frame has a direct impact on the available free window area, which should be as large as possible. Accordingly, the prior art solution relies on a lever mechanism where the lever is determined by the radius of the connector. Thus, to safe guard that the force required to rotate the connector and hence operate the locking arrangement can be provided, the connector must not be made too small since its radius constitutes a lever.

There is hence a need for a new robust locking arrangement that requires a reduced space in the frame of an openable element such as a glass door. There is also an aesthetic driving force towards balconies and the like where the framing is made as visually insignificant as possible.

Summary of the Invention

The main object of the invention is to provide a locking arrangement which requires a reduced space in the frame.

Another object is to provide a robust locking arrangement.

These and other objects are met by a locking arrangement for an openable door, window or hatch, the locking arrangement comprising:

a first gear rack connected to a first end portion of first shaft having a longitudinal extension as seen in a first direction;

a second gear rack connected to a first end portion of a second shaft having a longitudinal extension as seen in a second direction opposite the first direction;

the first and second gear racks being received and guided along the interior of a longitudinally extending frame member;

a gear wheel arranged between and in a driving engagement with the first and second gear racks;

a handle being configured to be set between a locking position and an opening position by the handle being rotated about a pin which is arranged inside the interior of the frame member;

an arm being articulately connected to the handle via a first pivot arranged at a distance from the fixedly arranged pin and articulately connected to the first gear rack via a second pivot, whereby

the first gear rack is configured to be displaced in the second direction and the second gear rack is configured to be displaced in the first direction in response to the handle being set from the locking position to the opening position;

in which locking position the openable element is locked by second end portions of the first and second shafts engaging stop members being separate from the openable element, and

in which opening position the first and second shafts are moved towards each other to release engagement between the second end portions of the first and second shafts and the stop members.

Accordingly, a locking arrangement is provided in which all parts which are to be housed in the frame member of the openable element are substantially linearly operated. Thus, the locking arrangement is less bulky. The width of the frame member as seen in the main extension plane of the openable element may be reduced. In practice this means that in the event of the openable element being a framed window, the window area may be made larger than with prior art solutions. This is of special importance in a balcony glazing where the framing should be made as small and visually insignificant as possible.

By the locking arrangement comprising a handle which is integral with the locking arrangement, there is no risk of essential parts being lost, such as a removable key.

By the pin being arranged inside the interior of the frame member, the pivot that is formed by the pin will be concealed and protected from the ambience.

A free end of the arm associated with the second pivot may be configured to be received in a longitudinally extending cavity formed inside the frame member in a position when the handle is set in the locking position. Thereby, a very compact solution is provided for which in turn allows the profile of the frame member to have a small cross section. Also, all moving parts, except for part of the handle and part of the arm, are well encapsulated. In normal use when the locking arrangement is set to its locked position, only the handlebar as such is visible. Further in this condition it extends in parallel with the longitudinal extension of the frame member, whereby it does not form any bulky projection.

The cavity may be formed by the first and second gear racks being longitudinally displaced in response to the handle being set from the opening position to the locking position

The second pivot may be configured to be arranged inside the frame member when the handle is set in the locking position and configured to be arranged outside the frame member when the handle is set in the opening position. Thereby a compact solution is provided which still allows a sufficient lever.

A free end of the second gear rack may be configured to abut a stop portion of the first gear rack in a position when the handle is set in the opening position.

Thereby a physical stop is provided for which prevents further mutual displacement of the gear racks and hence also further displacement of the shafts in view the guide rails.

The first and second gear racks may comprise complementary guiding surfaces configured to form interacting sliding surfaces during longitudinal displacement of the first and second gear racks in the first and second directions.

The first and second gear racks may be slidingly supported by inner wall portions of the frame member during longitudinal displacement of the first and second gear racks in the first and second directions.

The first gear rack may be indirectly connected to the first end portion of the first shaft via a first distance member; and the second gear rack may be indirectly connected to the first end portion of the second shaft via a second distance member. It is to be understood that the gear racks with remained function may be directly connected to the shafts. The distance member together with its respective gear rack and shaft may be slidably received in the through-going channel of the frame member. At least one of the shafts may be configured to extend through a portion of the corresponding gear rack. This may be provided for by the shaft extending through a channel or groove in the gear rack.

According to yet another aspect, the invention refers to an openable door, window or hatch comprising a longitudinally extending frame member having an interior extending along the longitudinal extension of said frame member, and wherein the frame member in a wall portion thereof comprises a through-going opening having an extension transverse the longitudinal extension of the frame member, and wherein the interior of the frame member is arranged in communication with the ambience via said through-going opening; wherein

the frame member is configured to support a locking arrangement according to any of claims 1-7, with the first and second shafts of the locking arrangement being received in the interior of the frame member;

and

wherein the second end portions of the first and second shafts are allowed to project past a respective end portion of said longitudinally extending frame member, thereby allowing the second end portions of said first and second shafts to selectively engage a respective stop member separate from the openable door, window or hatch when operating said handle. The openable element may by way of example be of the type configured to support a panel shaped building element, such as a window. The features and advantages of the locking arrangement have been thoroughly discussed above and these are equally applicable to an openable

element using such locking arrangement. Hence, to avoid undue repetition, reference is made to the section above.

The through-going opening in the frame member may have a longitudinally extending shape having a long axis aligned with the longitudinal extension of the frame member.

The handlebar of the handle may be arranged on an exterior wall portion of the frame member; and wherein a free end of the arm associated with the handle via the second pivot is configured to be received in a longitudinally extending cavity formed inside the frame member in a position when the handle is set in the locking position, and wherein said free end of the arm is configured to be moved out from the interior of the frame member via the through-going opening as the locking arrangement is set from the locking position to the opening position by operating the handle.

According to yet another aspect, the invention refers to the use of a locking arrangement with the features described above, in a glazed balcony, a sliding window arrangement, a door, a window or a hatch.

Brief Description of the Drawings

The invention will now be described in more detail with reference to the accompanying drawings.

Fig. 1 schematically discloses one embodiment of a typical balcony glazing with one embodiment of an openable element in the form of a framed window.

Fig. 2 is an exploded view with the components forming part of the locking arrangement.

Fig. 3 is a partially exploded view of the locking arrangement when set to the locking position.

Fig. 4 discloses the locking arrangement when set to the locking position.

Fig. 5 discloses the locking arrangement in an intermediary position during setting from the locking position to the opening position.

Fig. 6 discloses the locking arrangement when set to the opening position.

Fig. 7 schematically discloses the locking arrangement and the operation thereof from a first, locked position into a second, released position.

Description of a Preferred Embodiment

Turning to Fig. 1 one example of a balcony glazing arrangement 1 is disclosed together with one openable element 2 in the form of a framed window 3. The framed window 3 may be seen as a slidable door.

The balcony glazing arrangement 1 is arranged on a supporting stand 4 which is mounted between a lower balcony slab 5 and, arranged straight above the same, an upper balcony slab 6. The supporting stand 4 has an upper horizontal frame part 7, a lower horizontal frame part 8 and two vertical frame parts 9. The horizontal frame parts 7, 8 constitute guide rails 300A, 300B and carry between them a plurality of juxtaposed framed windows 3 which are laterally movable.

In the disclosed embodiment, each framed window 3 consists of a rectangular glass pane 10, a rectangular inner frame 11 in which the glass pane 10 is mounted, and an outer frame 12. The outer frame 12 may be provided as an upper guide rail 300A and a lower guide rail 300B in which the inner frame 11 is configured to be pivotally mounted about a vertical pivot axis (not disclosed in Fig. 1) positioned at one vertical lateral edge of the framed window 3. The outer frames 12 and, thus, the framed windows 3 as a whole are movable back and forth, each along a rectilinear path. The moving paths of the outer frames 12 extend parallel to and adjacent to each other along the entire length of the horizontal frame parts 7, 8. Hence, the outer frames 12 are mounted and guided in the horizontal frame parts 7, 8. The framed windows 3 are movable between a first end position where they together cover the front side of the balcony along its entire width, and a second position (not disclosed) in which they are arranged in an overlapping relationship.

In order to allow the framed window 3 to be arranged in a locked position in view of the outer frame 12, the framed window 3 is provided with a locking arrangement 100. The locking arrangement 100 is arranged in a vertical portion of the inner frame 11, which portion in the following will be referred to as a frame member 200. In Fig. 1, only the handle 101 configured to operate the locking arrangement 100 is disclosed.

Now turning to Figs. 2 and 3, exploded views of the locking arrangement 100 are disclosed together with a portion of the frame member 200. To facilitate understanding of the locking arrangement 100 in a condition when mounted in the frame member 200, Fig. 3 discloses a partial cross section of the frame member 200 and the handle 101 respectively.

The locking arrangement 100 comprises a handle 101, an arm 102, a support member 103, a first gear rack 104, a second gear rack 105, an intermediate gear wheel 106, a first shaft 107 and a second shaft 108. The first gear rack 104 is

configured to be connected to a first end portion 110 of the first shaft 107 via a first distance member 111. The second gear rack 105 is configured to be connected to a first end portion 112 of the second shaft 108 via a second distance member 113. Only a portion of the first and second shafts 107, 108 are disclosed. The support member 103 is configured to be fixedly arranged inside the frame member 200. The handle 101, mainly intended to extend outside the frame member 200, is configured to be articulately connected at one of its ends to the fixed support member 103 via a pin 114. The arm 102 is articulately connected to the handle 101 via the first pivot 115 which is arranged at a distance from the pin 114 and articulately connected to the first gear rack 104 via the second pivot 116. The pin 114 may be fixed or be rotatable around its own axis. Before going into the details of the operation, the design of the individual components will be described.

The frame member 200 is in the disclosed embodiment provided as an extruded profile 201 having a longitudinal extension L. The frame member 200 has a hollow interior. In the event of the locking arrangement 100 being configured to be an openable window panel or a door panel, the longitudinal extension L will typically coincide with the vertical direction thereof. It is to be understood that other orientations are possible.

As non-limiting examples, the frame member 200 may be formed by aluminium or a plastic material. The frame member 200 has a generally quadrangular cross section with two sets of opposing side walls 202A, 202B; 203A, 203B. One of the side walls 202A which is configured to extend substantially perpendicular to the surface extension of the openable element 2, is in the disclosed embodiment configured to receive or support a portion of a window frame or a door blade, depending on the type of openable element. The other side wall 202B is configured to receive the handle 101. The other set of opposing side walls 203A, 203B are, in the disclosed embodiment, configured to form exterior surfaces facing the inside and outside of e.g. a balcony or a room.

The inner wall portions 204 of the frame member 200 are configured to act as sliding and guiding surfaces when interacting with the first and second gear racks 104, 105 in a manner to be described below.

As is best seen in Fig. 2, one of the wall portions 202B which in operation is configured to extend substantially perpendicular to the surface extension of the openable element 2 comprises an oblong through-going opening 205 configured to allow a portion of the arm 102 to be moved in and out of the opening 205 during setting of the locking arrangement 100. Further, the same wall portion 202B comprises two through-going openings 206 allowing connection of the handle 101 to

the parts of the locking arrangement 100 that are received inside the frame member 200. It is to be understood that the three through-going openings 205, 206 may be replaced by one opening only, two opening or more than three openings.

Now turning to the support member 103. The support member 103 is configured to be fixedly arranged inside the frame member 200 by the pin 114 which extends transverse the longitudinal extension L of the frame member 200. The support member 103 is thereby prevented from being displaced in view of the frame member 200.

The pin 114 is arranged to extend inside the interior of the frame member 200. The pin 114 is configured to allow an articulated connection of one end of the handle 101. The pin 114 may be integrally formed with the support member 103 or as is disclosed in Fig. 2 be formed as an insert.

The support member 103 further comprises a through-going channel 118 or groove having an extension coinciding to the longitudinal extension L of the frame member 200. This channel 118 or groove is used to allow insertion of the first end portion 112 of the second shaft 108, which first end portion 112 in turn is configured to engage the second gear rack 105 in a manner to be discussed below.

Turning to the handle 101, this is best seen in Fig. 3. The handle 101 comprises a handlebar 119 with a first and a second set of connecting arms 120, 121. The first set of connecting arms 120 are configured to extend through the oblong opening 205 in the side wall portion 202B of the frame member 200 to allow connection to the second pivot 116. The second set of connecting arms 121 are configured to extend through the two through-going openings 206 in the side wall portion 202B of the frame member 200 to allow connection to the pin 114. Thereby, during use, only the handlebar 101 as such is visible to the user while all other components are received inside the interior of the frame member 200.

It is to be understood that the number of connecting arms 120, 121 on the handle 101 and their design may be altered within the scope of the invention. This also applies to the design of the openings 205, 206 in the frame member 200.

As given above, the locking arrangement 100 comprises a first gear rack 104 and a second gear rack 105 which are configured to be in driving arrangement with each other by an intermediary gear wheel 106 which is supported by a shaft 160. In the disclosed embodiment, the two gear racks 104, 105 have an identical design and are configured to be mounted in the frame member 200 by being mutually turned in view of each other, see e.g. Fig. 2. To facilitate description, the overall design of the gear rack will be described based on the partially exploded view in Fig. 3 and the

second gear rack 105 disclosed therein. The description to follow, unless nothing else is given, is equally applicable to the first gear rack 104.

The gear rack 105 comprises an elongated longitudinally extending body configured to be slidingly received and guided inside the frame member 200. Hence, the first and second gear racks 104, 105 comprise complementary guiding surfaces 140 configured to form interacting sliding surfaces during longitudinal displacement of the first and second gear racks 104, 105 in the first and second directions.

The gear rack 105 may be formed as a unitary body by e.g. injection moulding or machining.

One of the two opposing ends of the gear rack 105 comprises an engagement portion 119. The engagement portion 119 is provided with an exterior cross section, as seen in a direction transverse to the longitudinal extension L, which forms sliding surfaces 141 configured to be in guiding engagement with the inner walls 204 of the frame member 200.

As is seen in Fig. 4, the engagement portion 119 additionally comprises a longitudinally extending groove 117 with two opposing projections 122A, 122B. The opposing projections 122A, 122B are configured to allow a direct or indirect locking engagement with the first end portion 112 of the second shaft 108. This will be further discussed below.

Now turning anew to Fig. 3 and specifically to the opposite end of the gear rack 105, this end comprises a toothed portion 123. The toothed portion 123 has a longitudinal extension. The teeth are arranged with an extension transverse to the longitudinal extension L of the frame member 200. In use, the two identical gear racks 104, 105 are arranged one on top of the other and mutually turned 180 degrees to thereby extend in opposite directions, with the gear wheel 106 engaging the two toothed portions 123.

The outer end of the gear rack 105 comprises a partition wall 161 which extends transverse to the longitudinal extension L.

The outer end of the gear rack 105, opposite the engagement portion 119 comprises a guiding wall portion 125 having an extension along the longitudinal extension L. In use, the guiding wall portion 125 is configured to slidingly abut an inner wall portion 204 of the frame member 200.

The outer end of the gear rack 105 further comprises a pivot 115. The pivot 115 is configured to engage one end of the arm 102. This pivot 115 has previously been and will be referred to as the first pivot 115. The first pivot 115 is arranged in a recessed corner portion of the gear rack 105.

As is best seen in Figs. 3 and 4, the arm 102 of the locking arrangement 100 has an elongated form with two opposing ends. One of the ends is configured to be articulately hinged to the first pivot 115 which is formed in the first gear rack 104. The opposite end of the arm 102 is configured to be articulately connected to the second pivot 116 to which the handle 101 is articulately connected. This second pivot 116 is in the disclosed embodiment provided as an insert pin 126 which extends from the arm 102 and through holes in the first set of connecting arms 120 of the handle 101. The arm 102 is thereby articulately hinged in both its ends. It is to be understood that the arm 102 may be articulately hinged in other ways with remained function.

Now turning to Fig. 4, the engagement between the engagement portion 119 of the second gear rack 105 and the first end portion 112 of the second shaft 108 is illustrated. As given above, the engagement portion 119 in the end of the gear rack 105 comprises a longitudinally extending groove 117 with two opposing projections 122A, 122B. The two projections 122A, 122B are mutually displaced as seen along the longitudinal extension L. The opposing projections 122A, 122B are substantially V-shaped.

A rear end 123 of the longitudinally extending groove 117 comprises, in a position behind the innermost projection 122A a cavity 124 which has an extension forming an angle to the longitudinal extension L. The cavity 124 communicates with the groove 117.

The free end portion 112 of the shaft 108 comprises two V-shaped cuts 125A, 125B being substantially complementary to the opposing projections 122A, 122B of the groove 117. The V-shaped cuts 125A, 125B may be integrally formed in the shaft 108 or be arranged as a distance member 113 to be connected to the end portion 112 of the shaft 108. In the event a distance member 113 is used, the shaft 108 is indirectly connected to the gear rack 105.

In order of allowing a locking engagement between the free end portion 112 of the shaft 108 and the engagement portion 119 of the gear rack 105, the free end portion 112 of the shaft 108 is inserted into the longitudinally extending groove 117 and into the cavity 124, and in this inserted position, the shaft 108 is angled back into a position in parallel with the longitudinal extension L of the frame member 200. In this parallel position, the opposing projections 122A, 122B will be received in the respective V-shaped cuts 125A, 125B. Thereby, a linear driving engagement results where a displacement of the gear rack 105 pulls the shaft 108 along.

This engagement described above in view of the second gear rack 105 and the second shaft 108 is equally applicable to the engagement between the first gear

rack 104 and the first shaft 107. Hence, to avoid undue repetition, only the engagement of the second gear rack 105 is described.

As is best seen in Fig. 7, the opposite free ends 131, 132 of the respective shafts 107, 108 are configured to be displaced in and out of engagement with stop members 150A, 150B which are arranged in guide rails 300A, 300B in which the openable element 2 is supported. The guide rails 300A, 300B may by way of example be constituted by a part of a glazed balcony. Accordingly, one stop member 150A is arranged in the upper guide rail 300A and one stop member 150B is arranged in the lower guide rail 300B. In the disclosed embodiment, the respective stop member 150A, 150B is formed as a plug received in the respective guide rail 300A, 300B. The stop member 150A, 150B comprises a channel 151A, 151B coaxially arranged with the longitudinal extension of the first and second shafts 107, 108.

In a condition when the locking arrangement 100 is set to its locking position, the shafts 107, 108 have been displaced in view of one another so that the free ends 131, 132 of the shafts 107, 108 are received in the stop members 150A, 150B (dashed lines). Correspondingly, in a condition when the locking arrangement 100 is set to its opening position, the shafts 107, 108 have been displaced in view of other so that the free ends 130, 131 of the shafts 107, 108 are out of engagement with the stop members 150A, 150B. In other words, when the locking arrangement 100 is set to its locking position, the first and second shafts 107, 108 are maximally displaced in view of each other into a position where the free ends 131, 132 of the first and second shafts 107, 108 respectively engages the stop members 150A, 150B. Correspondingly, when the locking arrangement 100 is set to its opening position, the shafts 107, 108 are maximally linearly displaced towards each other to thereby release engagement with the stop members 150A, 150B. No matter direction, the displacement of the shafts 107, 108 is a result of the direct or indirect driving engagement between the two shafts and the respective gear racks 104, 105. This will be described in detail below when discussing the operation.

The stop members 150A, 150B are preferably made by plastics. By making the stop members 150A, 150B of a non-corrosive material, formation of oxides along the shaft receiving channels in the stop members 150A, 150B is prevented. It is to be understood that in an alternative, non-disclosed embodiment, the stop members 150A, 150B may be replaced by a hole or a channel arranged in the respective guide rail 300A, 300B.

Now turning to Fig. 4, the locking arrangement 100 is disclosed as being mounted in the frame member 200 of the type discussed above. To facilitate

understanding, only a portion of the frame member 200 is illustrated. The locking arrangement 100 is disclosed as being set to its locking position i.e. the first and second shafts 107, 108 are maximally displaced in view of each other into a position where the free ends 131, 132 of the first and second shafts 107, 108 respectively engages a stop member 150A, 150B as has been described in view of Fig. 7.

As can be seen in this view, although the first and second rear racks 104, 105 as such are identical, they are mounted one on top of the other with the engagement portions 119 facing away from each other. Thereby, a first longitudinally extending cavity 133 is defined by the inner wall portions 204 of the frame member 200, the bodies of the first and second gear racks 104, 105, the partition wall 161 of the first gear rack 104 and the engagement portion 119 of the second gear rack 105. This first longitudinally extending cavity 133 articulately receives the arm 102. One end of the arm 102 is articulately connected to the second pivot 116 connected to the handle 101, and the second end of the arm 102 is articulately connected to the first pivot 115 formed by the first gear rack 104.

A second longitudinally extending cavity 134 is defined by the opposing toothed portions 123 of the first and second gear racks 104, 105, an inner wall portion 204 of the frame member 200 and also the partition walls 161 of the two gear racks 104, 105. The second longitudinally extending cavity 134 receives the gear wheel 106 which thereby engages the two gear racks 104, 105 in a driving manner. The longitudinal extension of the first and second cavities 133, 134 is variable by the first and second gear racks 104, 105 being longitudinally displaced in response to the handle 101 being set from the opening position to the locking position. During such longitudinal displacement, the gear wheel 106 is rotated around its supportive shaft 160. The longitudinal displacement in this position is restricted by the free end of the second gear rack 105 being configured to abut a stop portion 144 of the support member 103.

As is illustrated in Fig. 4, in the condition when the handle 101 is set to the locking position, a virtual line VL is formed to extend between the first and second pivots 115, 116 where the virtual line VL forms an angle α in view of the longitudinal centre line CL of the frame member 200. To provide a “self-locking effect” of the handle 101 which maintains the handle in this locking position, the engagement portion 119 in the second gear rack 105 may be provided as a shoulder 142 facing the arm 102. When setting the handle 101 from the locking position to the opening position, the end of the arm 102 must be forced to pass the shoulder 142. This may be provided for by overcoming an inherent elasticity in the engaging parts. Accordingly, the operator must actively force the arm 102 by operating the handle

101 to pass the shoulder 142 in order to set the locking arrangement to its open position.

Now turning to Fig. 5, the locking arrangement 100 is illustrated in an intermediate position between the locking position and the opening position. Thus, the handle 101 has been pivoted in a direction away from the frame member 200, see arrow A. The handle 101 is pivoted around the pin 114. Since the handle 101 is also indirectly connected to the arm 102 via the second pivot 116, the handle 101 pulls the associated end of the arm 102 out from the first longitudinally extending cavity 133. This is allowed as a result of the opposite end of the arm 102 being articulately connected to the first pivot 115 which is integral with first gear rack 104.

As a result of this setting of the handle 101, the arm 102 displaces, by a pulling action, the first, lower, gear rack 104 in a second direction, see arrow B, towards the support member 103. This is allowed by the first gear rack 104 being slidingly received in the frame member 200. Since the first gear rack 104 is arranged in a driving engagement with the second gear rack 105 via the intermediary gear wheel 106, the second gear rack 105 is displaced in the opposite direction, see arrow C, by being slidingly received in the frame member 200. Since the first and second gear racks 104, 105 are in direct driving engagement with each other via the intermediate gear wheel 106, the first and second gear racks 104, 105 are displaced the same distance and with the same speed. Thus, a ratio 1:1 applies in terms of displacement and speed for the two gear racks 104, 105.

Also, as a result of the first and second gear racks 104, 105 being directly or indirectly connected to the shafts 107, 108, the shafts 107, 108 will move along in the same directions, see arrows B1 and C1.

The mutual displacement of the first and second gear racks 104, 105 continues until the handle 101 has been set to its fully opened position, see Fig. 6. In this position, the first and second gear racks 104, 105 have been mutually displaced to such extent that the free end of the second gear rack 105 opposite the engagement portion 119 abuts a mating stop portion 143 of the engagement portion 119 of the first gear rack 104.

Depending on the extension of the toothed portions 123 in the first and second gear racks 104, 105, the gear wheel 106 may have reached an end of the toothed portions 123 in which it is prevented from further rotation around its shaft 160.

In this fully opened position of the handle 101, and as a result of the full displacement of the first and second gear racks 104, 105 towards each other, the

shafts 107, 108 have been maximally linearly displaced towards each other to thereby release engagement with the stop members 150A, 150B, see Fig 7.

As is illustrated in Fig. 6, in the condition when the handle 101 is set to the fully opened position, the virtual line VL which extends between the first and second pivots 115, 116, now forms an angle β in view of the longitudinal centre line CL of the frame member 200. The handle 101 will maintain this fully opened position and hence also the two shafts 107, 108 out of engagement with the guide rails 300A, 300B as was discussed in view of Fig. 7. This position will be maintained even though the operator should loosen his/her grip of the handle 101.

It is to be noted that when setting the handle 101 from the fully closed position, see Fig. 4 to its fully opened position, see Fig. 6, the virtual line VL of the arm 102 has shifted from an angle α to an angle β as the second pivot 116 passes the centreline CL. In this context, angle α may be seen as a negative angle in view of the centre line CL whereas angle β may be seen as a positive angle in view of the centre line CL. Thus, in the position when the virtual line VL is aligned with the centre line CL, a fully balanced position of the handle is achieved. However, the fully balanced position is only a temporary “transition position” when setting the handle 101 from the fully opened to the fully closed position and vice versa. Thereby, the locking arrangement will either be in the locking position or in the opening position where the operator as previously discussed must actively force the arm 102 by operating the handle 101 to pass the shoulder 142 to set the locking arrangement to its open position and vice versa.

The locking arrangement has been described and illustrated based on a frame member where the handle is arranged on one of the two side walls that extend substantially perpendicular to the surface extension of the openable element, and where the inner side walls of the other set of opposing side walls act as sliding and guiding surfaces for the first and second gear racks. It is to be understood that the frame member may be redesigned within the scope of the invention so that the gear racks are configured to be guided and slid along the other set of opposing side walls of the frame member. Hence, the handle may be supported by another side wall of the frame member than exemplified above.

The locking arrangement has been described as arranged with the handles projecting from a side wall portion extending transverse the major plane of the openable element with the shafts extending along the vertical extension of the frame member. It is to be understood that the locking arrangement may be arranged in other orientations and in other surfaces of an openable element. The locking

arrangement may by way of example be equally applicable in the event the shafts have a horizontal extension.

The locking arrangement has been described as applied to an openable element of a balcony. It is to be understood that the locking arrangement is also applicable in other applications such as a sliding window arrangement, a door, a window or a hatch.

CLAIMS

1. Locking arrangement for an openable door, window or hatch (2), the locking arrangement comprising:

a first gear rack (104) connected to a first end portion (110) of a first shaft (107) having a longitudinal extension as seen in a first direction C;

a second gear rack (105) connected to a first end portion (112) of a second shaft (108) having a longitudinal extension as seen in a second direction B opposite the first direction C;

the first and second gear racks (104, 105) being received and guided along the interior of a longitudinally extending frame member (200);

a gear wheel (106) arranged between and in a driving engagement with the first and second gear racks (104, 105);

a handle (101) being configured to be set between a locking position and an opening position by the handle (101) being rotated about a pin (114) which is arranged inside the interior of the frame member (200);

an arm (102) being articulately connected to the handle (101) via a first pivot (115) arranged at a distance from the pin (114) and articulately connected to the first gear rack (104) via a second pivot (116), whereby

the first gear rack (104) is configured to be displaced in the second direction B and the second gear rack (105) is configured to be displaced in the first direction C in response to the handle (101) being set from the locking position to the opening position;

in which locking position the openable element (2) is locked by second end portions (131, 132) of the first and second shafts (107, 108) engaging stop members (150A, 150B) being separate from the openable element (2), and

in which opening position the first and second shafts (107, 108) are moved towards each other to release engagement between the second end portions (131, 132) of the first and second shafts (107, 108) and the stop members (150A, 150B).

2. Locking arrangement according to claim 1, wherein a free end of the arm (102) associated with the second pivot (116) is configured to be received in a longitudinally extending cavity (133) formed inside the frame member (200) in a position when the handle (101) is set in the locking position.

3. Locking arrangement according to claim 2, wherein said cavity (133) is

formed by the first and second gear racks (104, 105) being longitudinally displaced in response to the handle (101) being set from the opening position to the locking position.

4. Locking arrangement according to any of claims 1-3, wherein the second pivot (116) is configured to be arranged inside the frame member (200) when the handle (101) is set in the locking position and configured to be arranged outside the frame member (200) when the handle (101) is set in the opening position.

5. Locking arrangement according to any of the preceding claims, wherein a free end of the second gear rack (105) is configured to abut a stop portion (143) of the first gear rack (104) in a position when the handle (101) is set in the opening position.

6. Locking arrangement according to any of the preceding claims, wherein the first and second gear racks (104, 105) comprise complementary guiding surfaces (140) configured to form interacting sliding surfaces during longitudinal displacement of the first and second gear racks (104, 105) in the first and second directions B, C; and/or

wherein the first and second gear racks (104, 105) are slidingly supported by inner wall portions (204) of the frame member (200) during longitudinal displacement of the first and second gear racks (104, 105) in the first and second directions B, C.

7. Locking arrangement according to any of the preceding claims, wherein the first gear rack (104) is indirectly connected to the first end portion (110) of the first shaft (107) via a first distance member (111); and the second gear rack (105) is indirectly connected to the first end portion (112) of the second shaft (108) via a second distance member (113).

8. An openable door, window or hatch, comprising a longitudinally extending frame member (200) having an interior extending along the longitudinal extension of said frame member (200), and wherein the frame member (200) in a wall portion thereof comprises a through-going opening (205) having an extension transverse the longitudinal extension of the frame member (200), and wherein the interior of the frame member (200) is arranged in communication with the ambience via said through-going opening (205); wherein

the frame member (200) is configured to support a locking arrangement (100) according to any of claims 1-7, with the first and second shafts (107, 108) of the locking arrangement (100) being received in the interior of the frame member (200); and

wherein the second end portions (131, 132) of the first and second shafts (107, 108) are allowed to project past a respective end portion of said longitudinally extending frame member (200), thereby allowing the second end portions (131, 132) of said first and second shafts (107, 108) to selectively engage a respective stop member (150A, 150B) separate from the openable door, window or hatch (2) when operating said handle (101).

9. The openable door, window or hatch according to claim 8, wherein

a handlebar (119) of the handle (101) is arranged on an exterior wall portion of the frame member (200); and wherein

a free end of the arm (102) associated with the handle (101) via the second pivot (116) is configured to be received in a longitudinally extending cavity (133) formed inside the frame member (200) in a position when the handle (101) is set in the locking position, and wherein said free end of the arm (102) is configured to be moved out from the longitudinally extending cavity (133) of the frame member (200) via the through-going opening (205) as the locking arrangement (100) is set from the locking position to the opening position by operating the handle (101).

10. Use of a locking arrangement according to any of claims 1-7 in a glazed balcony, a sliding window arrangement, a door, a window or a hatch.

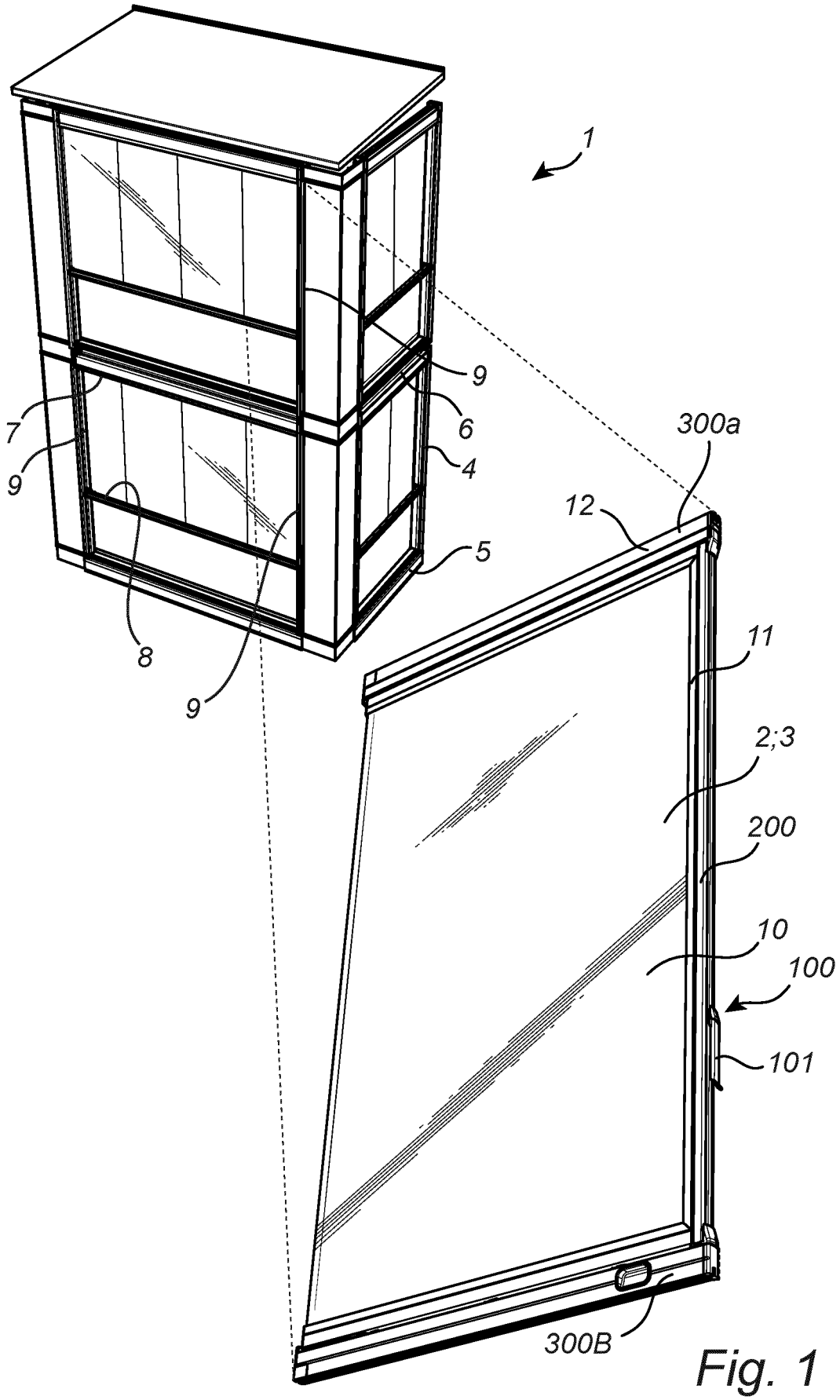
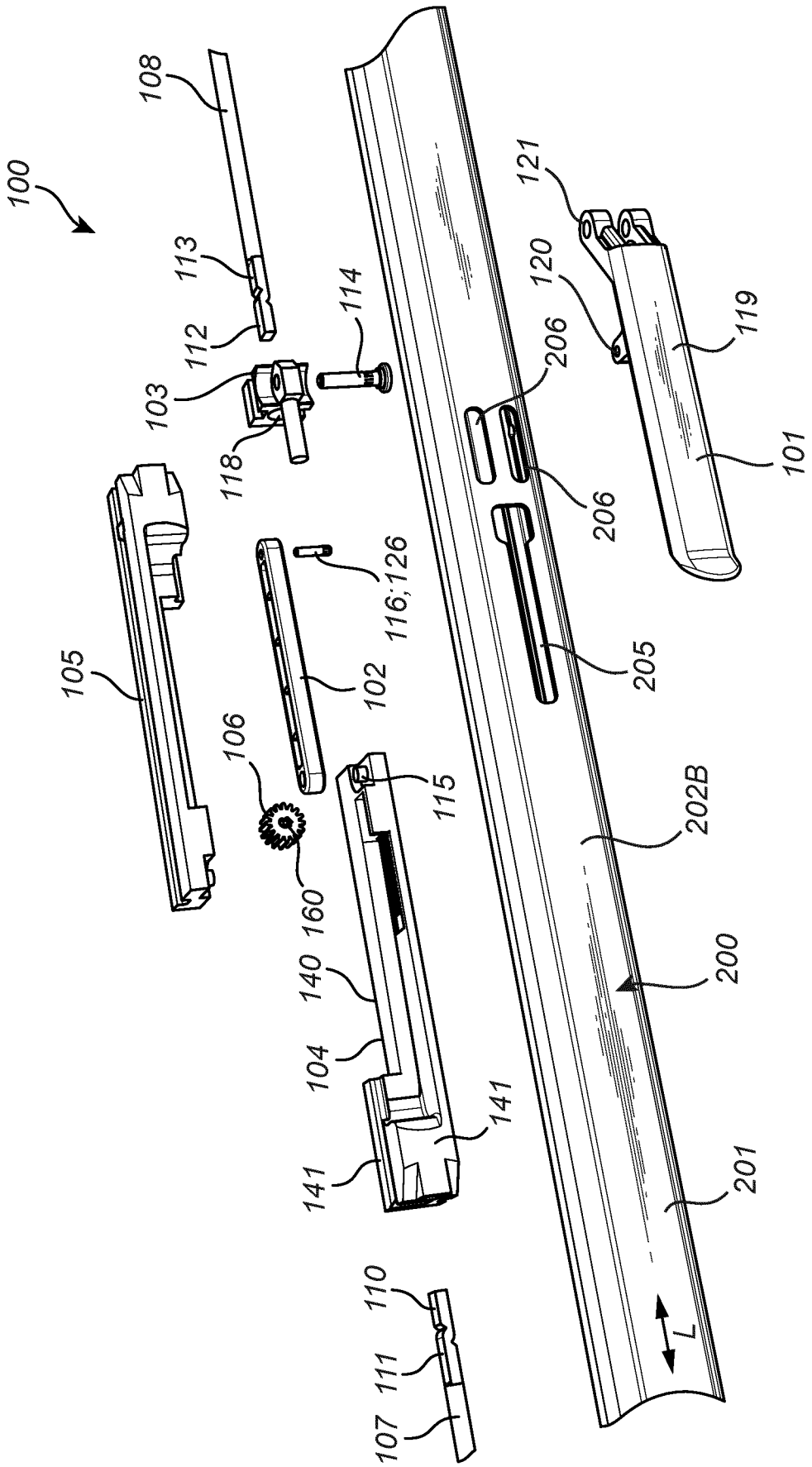


Fig. 1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112
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206
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101
206
205
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102
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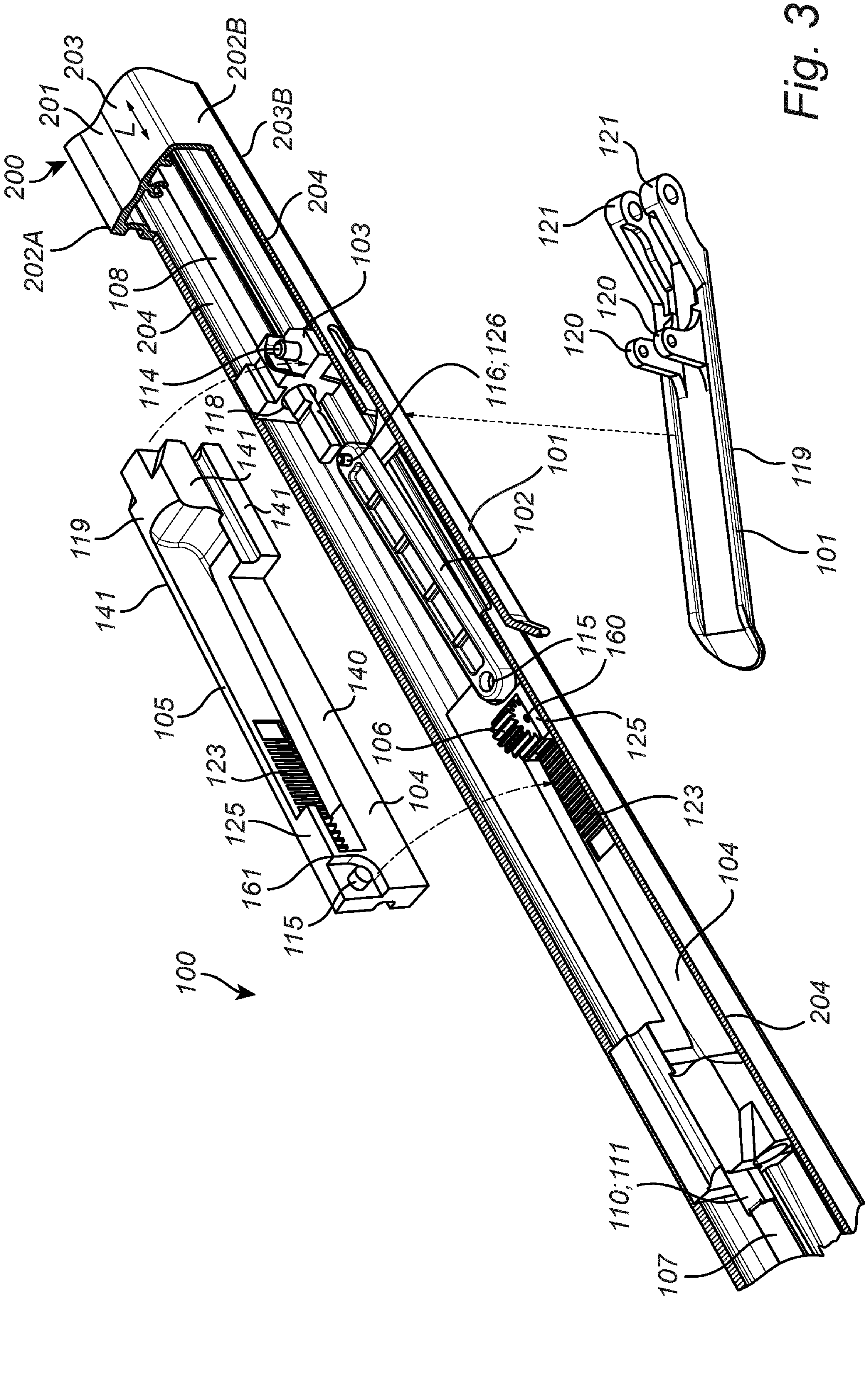
160
115
202B
200
140
104
141
141
201
110
111
107
L

Fig. 2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202B
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202A
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119
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120
120
141
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104
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161
115
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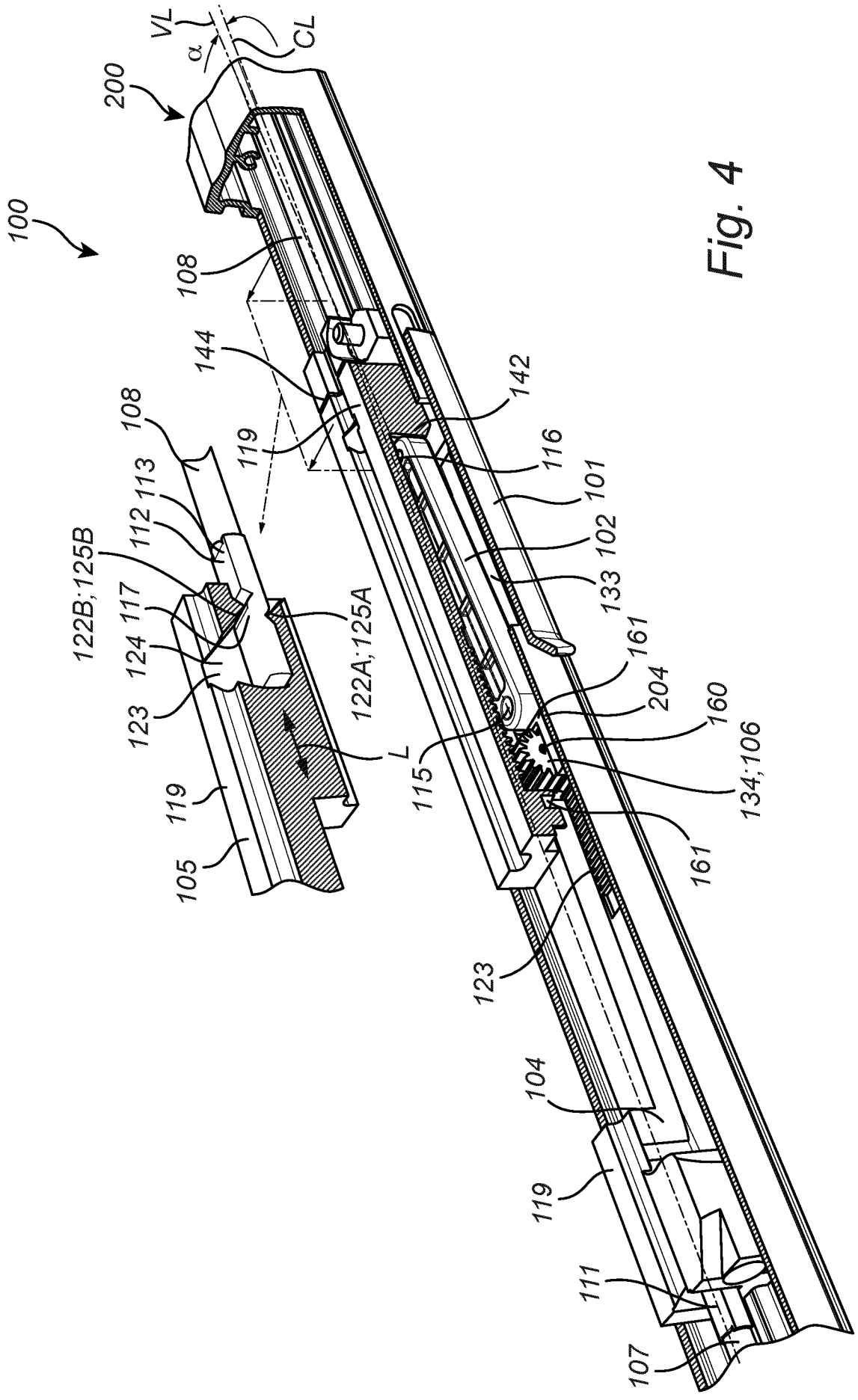
100
104
204
110;111
107

Fig. 3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122B;125B
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123
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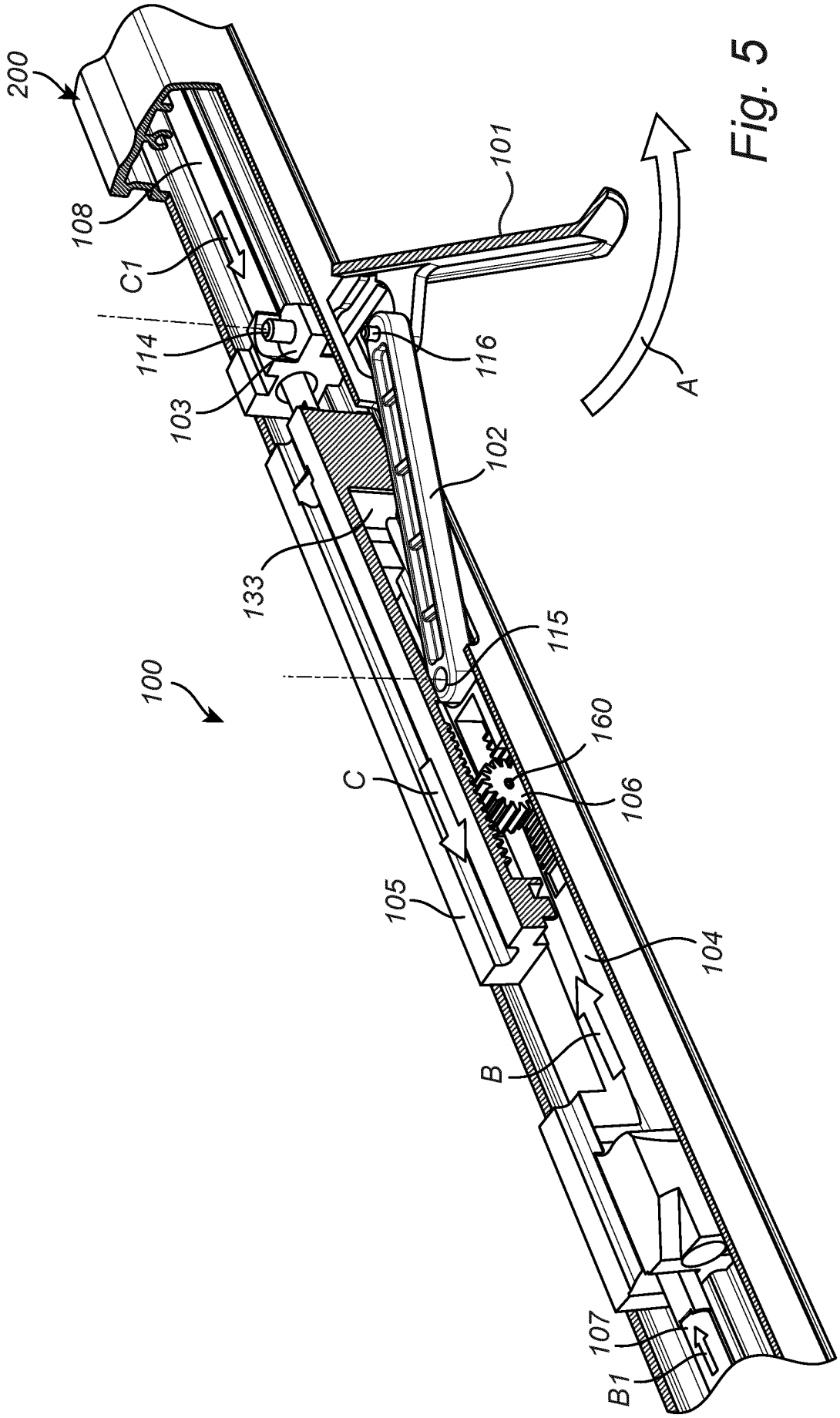
111
107

Fig. 4


200
108
C1
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133
115
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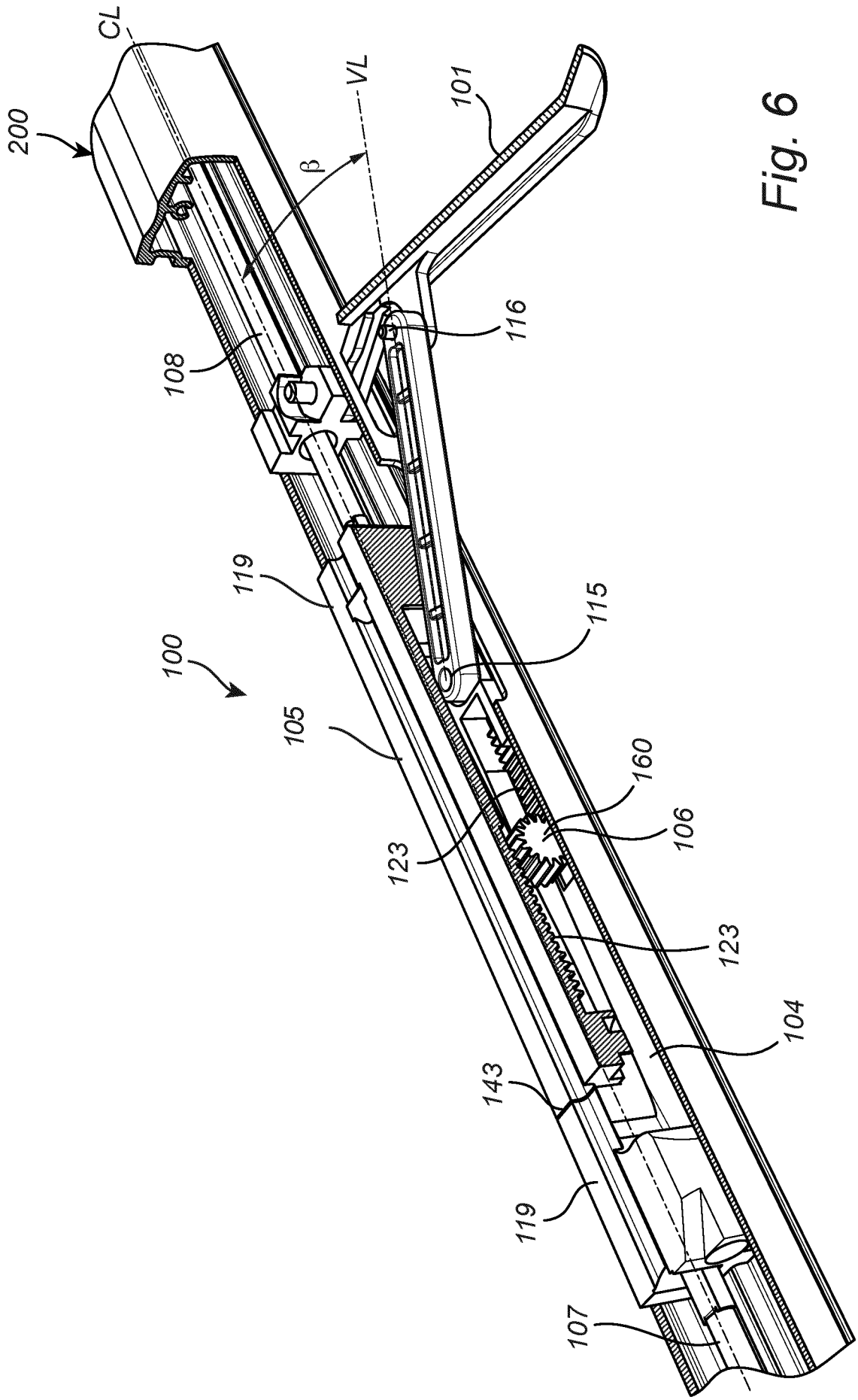
104
B
107
B1

Fig. 5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107

Fig. 6

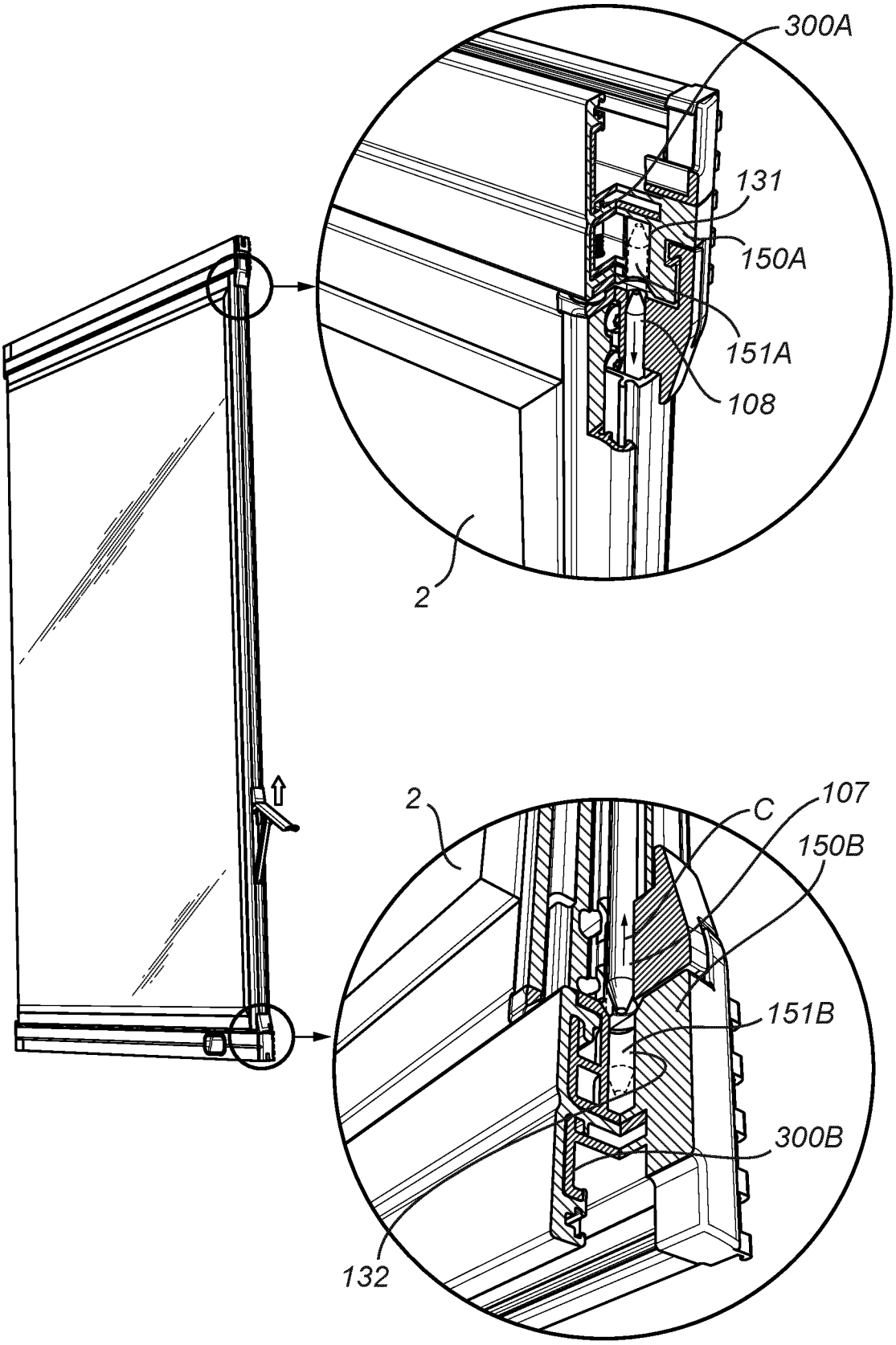

Fig. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2021/065921

A. CLASSIFICATION OF SUBJECT MATTER
INV. E05C9/04
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)
E05C E05B

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2020/048934 A1 (MINTER PETER J [US] ET AL) 13 February 2020 (2020-02-13)	1,2,4-10
A	paragraph [0110] - paragraph [0126]; figures 30-33	3
A	US 2 743 126 A (CARSLEY HAROLD G ET AL) 24 April 1956 (1956-04-24) figures 1-3	1,7,8,10
A	SE 529 745 C2 (NORDISKA BALCO AB [SE]) 13 November 2007 (2007-11-13) cited in the application the whole document	1-10

☐ 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

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"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
22 September 2021	30/09/2021

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Robelin, Fabrice

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2021/065921

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2020048934 A1	13-02-2020	NONE	
US 2743126 A	24-04-1956	NONE	
SE 529745 C2	13-11-2007	EP 2118422 A1	18-11-2009
		SE 529745 C2	13-11-2007
		WO 2008108703 A1	12-09-2008