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(71) Applicant: **BT Products AB**
595 81 Mjölby (SE)

(72) Inventors:
- **Gromark, Mårten**
  582 23 Linköping (SE)
- **Österskog, Johan**
  582 37 Linköping (SE)
- **Larsson, Henrik**
  591 61 Motala (SE)
- **Ekvall, Clas**
  590 74 Ljungsbro (SE)

(74) Representative: **Gustafsson, Tomas**
Zacco Sweden AB
P.O. Box 5581
114 85 Stockholm (SE)

(54) Industrial truck comprising a pivotal protection gate

(57) An industrial truck comprising a platform (8) for the driver and a pivotal protection gate (100) and a releasable locking arrangement (200, 200', 300) for locking the protection gate (100) in a protective position (105) in which it protects a driver that is present on the platform (8) wherein the locking arrangement (200, 200', 300) is arranged such that it is unlocked when the protection gate (100) is pivoted upwards from the protective position (105) so that the protection gate (100) may be lowered to an essentially vertical rest position (106).

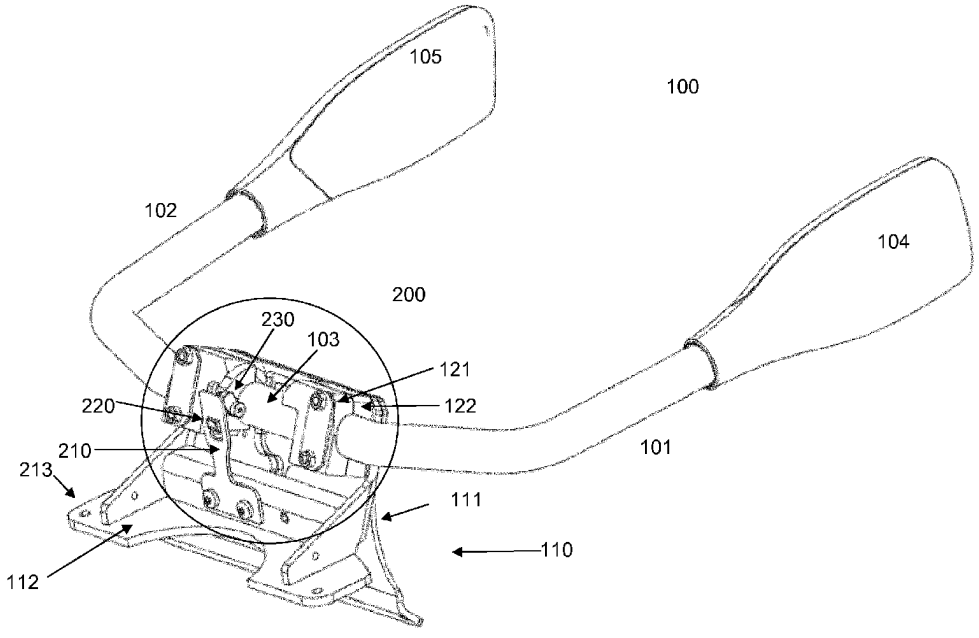

Fig 2

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Description

[0001] The present invention relates to an industrial truck comprising a pivotal protection gate according to the preamble of claim 1.

BACKGROUND

[0002] Industrial trucks may be provided with a platform so that the driver can ride on the truck. In order to protect the driver from falling off the platform during operation of the truck, side bars are arranged over the sides of the platform. The side bars, also called protection gate or driver's stand guard are typically pivotal so that they can be swung away from the platform to allow the driver to enter or leave the platform. Another function of the gates is that they on a tiller arm truck having a pivotable platform can be swung away in order to allow the driver/operator to walk with the tiller arm truck. When the protection gates are swung away a lower velocity for the tiller arm truck is permitted. Consequently when the protection gates are applied in the protective position.

[0003] JP9151090 shows an industrial truck having a platform for the driver and a pivotal protection gate to protect the driver. The protection gate comprises a locking mechanism that locks the protection gate in a position over the platform so that it protects the driver. The locking mechanism comprises a spring biased locking pin that enters a corresponding opening in the protection gate. When the driver wants to leave the platform he must release the locking mechanism by pulling out the locking pin and then swing the protection gate upwards away from the platform.

[0004] EP0466065 A discloses a tiller arm truck having a gate wherein the gate can be swung away in order to allow an operator to walk while operating the tiller arm truck. The gate is arranged to cooperate with a platform of the tiller arm truck, such that the gate can be used to operate the pivotal action of the platform.

[0005] One problem associated with the known protection gate of JP9151090 is that it comprises several separate parts and therefore is expensive and complicated to manufacture. A further problem is that the driver needs both hands to operate the known protection gate. The driver must use one hand to pull out the spring biased locking spring to release the locking mechanism and the other hand to swing away the protection gate. For a driver who raises and lowers the protection gate very often during a working day this is cumbersome and inefficient use of time.

[0006] Another problem associate with EP0466065 is that the gate at its resting position is rotated 180 degrees from its protective position. This means that the gate when being stowed away or when being moved from the resting position must rotate a long distance, making the transition time consuming. And further the operator must reach out far in order to be able to rotate the gate 180 degrees. And further in the resting position the upper part of the tiller arm truck of is occupied by the gate. This is disadvantageous as the tiller arm can interfere with the gate, and also it prevents the upper part of the tiller arm truck from having for example storing compartments.

[0007] Hence, it is an object of the present invention to provide an industrial truck comprising an inexpensive protection gate of simple construction that can be operated with a minimum of work performed by the driver.

SUMMARY OF THE INVENTION

[0008] This object is achieved by an industrial truck comprising a platform for a driver, a pivotal protection gate and a releasable locking arrangement for locking the protection gate in a protective position in which it protects a driver present on the platform characterized in that the locking arrangement is arranged such that it is automatically unlocked when the protection gate is pivoted upwards from the protective position to a release position so that the protection gate may be lowered to an essentially vertical rest position.

[0009] The locking arrangement is unlocked automatically by a simple lifting motion of one of the side bars of the protection gate, i.e. without direct manipulation by the driver of the parts of the locking arrangement. This allows the protection gate to be easily operated by the driver with a minimum of work. Since the driver only needs one hand for operating the protection gate his other hand can be used to operate the truck. For example, the driver can lower the protection gate and actuate the forks of the truck at the same time to lower a load. For a driver who enters and leaves the truck very often during a working day this is a considerable saving of time. The inventive protection gate is further simple in construction and there is no need for any extra levers or actuators for unlocking the locking arrangement. This allows the protection gate to be manufactured and installed at low cost. The entire locking arrangement of the protective gate can further be encapsulated in a housing. This prevents dirt or moisture from entering the locking arrangement and provides for little maintenance.

[0010] Preferably the locking arrangement comprises: a spring element that is attached to the truck for releasable locking the protection gate in the predetermined protective position; a release element that is arranged such that it releases the spring element from the protection gate when the protection gate is pivoted upwards from the protective position and wherein the release element further is arranged such that the spring element remains released from the protection gate as the protection gate is lowered to the rest position.

[0011] Preferably, the locking arrangement comprises a locking element that protrudes from the protection gate and wherein the spring element comprises an opening for receiving the protruding locking element when the protection gate is in the protective position.

[0012] Preferably, the release element is arranged such that it releases the spring element from the protrud-

ing locking element when the protection gate is pivoted upwards to the release position.

[0013] Preferably, the release element is arranged such that it pushes the spring element away from the protruding locking element when the protection gate is pivoted downwards from the release position to the rest position.

[0014] Preferably, the release element pushes the spring element away from the protruding locking element when the protection gate is pivoted upwards to the release position.

[0015] Preferably, the release element pushes the spring element away from the protruding locking element so that the locking element passes the opening in the spring element during lowering of the protection gate.

[0016] Preferably, the release element is movable arranged on the protection gate between a first end position A and a second end position B;
wherein the locking arrangement is arranged such that when the protection gate is pivoted upwards from the protective position to the release position the release element is in the end first position (A) and pushes the spring element away from the locking element and when the protection gate is pivoted downwards from the release position to the rest position, the release element moves from end position A to position B and pushes the spring element away from the locking element as the locking element passes the opening of the spring element.

[0017] Preferably, the release element is pivotally attached to the protection gate by a pivotal pin, whereby the locking arrangement is arranged such that the angle between the pivot and the spring element is 90° or more. This ensures that maximal friction exist in the contact between spring element and release element so that the release element is prevented from sliding on the spring element during downwards pivoting of the protection gate. Instead, during pivoting of the protection gate, the release element remains immovable with regard to the spring element and pushes the spring element away from the locking element.

[0018] Another embodiment describes a locking arrangement according to claims 2 - 9. The advantages of this embodiment is a reliable functioning of the locking arrangement. The common elements of the above embodiments having essentially the same effects as discussed above. In particular the embodiment provides for easy maintenance where single parts as the spring, hook element etc. are changeable and adaptable for different protection gates. Further it is advantageous that the spring acting on the hook element can be a conventional spring that can be replaced easily.

[0019] According to a further embodiment, the industrial truck comprises two or more locking arrangements wherein the two or more locking arrangements locks the protection gate in different raised positions.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

Figure 1:	A schematic drawing of an industrial truck according to all embodiments of the invention.
Figure 2:	A schematic drawing of a pivotal protection gate of the truck according to the first embodiment of the invention.
Figure 3:	A partly exploded view of the encircled portion of the protection gate in figure 2.
Figure 4a-c:	Different views of an enlarged portion of the protection gate according to the invention.
Figure 5:	A schematic drawing showing the function of the locking mechanism of the protection gate in the truck according to the first embodiment.
Figure 6:	An enlargement of the inventive protection gate according to an alternative.
Figure 7:	An enlargement of the inventive protection gate according to an alternative.
Figure 8:	Discloses a preferred third embodiment of the inventive protection gate.
Figure 9	Discloses the function of the third embodiment
Figure 10	Discloses a magnification of the third embodiment.

DESCRIPTION OF EMBODIMENTS

[0021] Figure 1 illustrates schematically an industrial truck 1 according to a first preferred embodiment of the invention. The truck illustrated in figure 1 is a so called tiller arm truck. This truck type, also known as stacker or order pick truck, or more generally a tiller arm truck, is generally known in the art and its features will therefore only be briefly described. The truck comprises a housing 2 in which the motor, the hydraulic system and the control system of the truck are located (these parts are not shown in figure 1). The truck comprises a drive wheel 3 which is propelled by the motor, forward support wheels 4 that are arranged on support arms 5 and a load engaging means 6 that can be raised and lowered by a hydraulic cylinder 7. The truck 1 further comprises a platform 8 on which the driver can stand when driving the truck. The platform is pivotal between an upright position and a lowered, horizontal position. A steering means 9 e.g. a tiller arm is arranged such that the driver can steer the truck while walking behind the truck or while standing on the platform when the platform is pivoted into a lowered position. Although a tiller arm truck having a pivotal platform is described in figure 1, it is obvious that the invention also is applicable to other truck types. For example, the protection gate may be used in a truck having a fixed platform, or a driver's booth. The truck may also be an order pick truck in which the driver is present on a platform

that is raised on the mast of the truck.

[0022] The truck further comprises a protection gate 100 for protecting a driver present on the platform. The protection gate comprises two elongated bars 101, 102 that extend from a protection gate attachment 110 (not shown in the figure) that is attached to the top of the motor housing of the truck close to the rear end of the truck. In figure 1 only one bar 101 is shown since the truck 1 is shown in a side view. The protection gate 100 comprises a locking arrangement for locking the protection gate in a position 105 where the bars 101, 102 of the protection gate extend essentially horizontally over the platform 8 of the truck so that the protection gate protects the driver from falling of the platform. The locking arrangement is located in the protection gate attachment 110 and is therefore not visible in figure 1, however it will be described in detail further below. A protection gate housing 107 encapsulates the locking arrangement and protects it from dust.

[0023] Above and in the following is by "horizontal direction" or "horizontally" meant a direction that is essentially parallel to the ground that truck is standing on. By "vertical direction" or "vertically" is meant a direction that is essentially perpendicular to the ground that the truck is standing on.

[0024] According to the invention the locking arrangement is arranged such that it locks the protection gate in a protective position so that the protection gate cannot be lowered. The locking arrangement is further arranged such that it is unlocked when the protection gate is pivoted upwards from the protective position 105. This is achieved in that the driver lifts one of the bars 101, 102 of the protection gate to a release position 104. The bars 101 and 102 are interconnected, so when one bar is lifted the entire protective gate pivots and therefore also the other bar is lifted. Thereafter the protection gate can be pivoted downwards i.e. lowered, to a rest position 106 in which the bars of the protection gate does not block the sides of the platform. In the rest position 106, as can be seen in figure 1, the bars 101, 102 of the protection gate hang vertically from the attachment 110 along the sides of the motor housing so that the sides of the platform 8 are free.

[0025] Figure 2 is a detailed view of the truck in figure 1 showing the protection gate 100, the protection gate attachment 110 and the locking arrangement 200. The protection gate has a U-shaped form, comprising a middle section 103 that interconnect a first bar 101 and a second bar 102. Typically, the protection gate is made from a bent metal pipe, such as an aluminium tube. At the end of the bars 101, 102 are protective pads 104, 105 arranged to protect the driver from shocks and provide side support.

[0026] The middle section 103 of the protection gate is pivotally attached to the protection gate attachment 110. The protection gate attachment 110 is an essentially L-shaped metal plate having a vertical portion 111 and a lower horizontal portion 112 for attachment to the truck motor housing, e.g. by screws or rivets. The middle section 103 of the protection gate is pivotally attached in the top of the vertical portion 111 so that the protection gate can pivot upwards and downwards. There are many ways of pivotally attaching the middle section of the protection gate to the protection gate attachment 110. In this embodiment, the middle section 103 of the tube shaped protection gate is clamped between two blocks 121, 122 which each has a recess that corresponds to the diameter of the middle section 103. The recess formed by the blocks 121, 122 is slightly larger than the outer diameter of the middle section to allow the middle section to rotate between the two blocks.

[0027] The locking arrangement 200 comprises a spring element 210, a locking element 220 and a release element 230. The locking arrangement 200, which is encircled in figure 2 will in the following be described with reference to figures 3 which shows a partly exploded view of the encircled area in figure 2.

[0028] Figure 3 shows a pin shaped locking element 220 which protrudes radially from a cam 221 that is firmly attached to the middle section 103. The cam 221 has an upper surface 222 that faces away from middle section, a lower surface, (not shown) that is in contact with the middle section and two side surfaces 223, 224 that are perpendicular to the periphery of the middle section, only side surface 223 is visible in figure 3. The cam 221 is firmly attached, e.g. welded to the middle section 103 so that is follows the pivoting motion of the protection gate. A portion of the upper surface 222 of the cam 221 has been milled away so that a recess 225 is formed in the periphery of the cam. The recess 225 extends between two radially extending end surfaces A and B which will be explained further below. An opening 226 for a pin is provided between end surfaces A and B.

[0029] According to an alternative the locking element is a pin that is directly attached to the surface of the middle section 103, e.g. riveted or welded. It is also possible to form the locking element integrally together with the protection gate, e.g. by moulding.

[0030] The locking arrangement further comprises a release element 230. The release element has an elongated oval shape and has a circumferential radial surface 231 and side surfaces 232 and 233. Only side surface 233 is visible in figure 3. A stop member 234, i.e. small stud projects from the side surface 232 in a first end of the release element. The second end of the release element comprises a through hole 235. The release element is pivotally attached to the side surface 223 of the cam 221 by a pin 236 which extends through openings 226 and 235 in the cam and the release element. The release element is attached in a position between end surfaces A and B of the recess 225 in the cam and so that the stop member 234 protrudes into the recess 225. The release element is further positioned on the cam 221 and dimensioned so that the first end of the release element extends past the upper surface 222 of the cam. In particular, the release element is arranged such that first

end of the release element protrudes past the locking element 220. In operation the release element is movable, i.e. can be pivoted, between a first end position A and a second end position B, which correspond to end surfaces A and B of the recess in the cam 221. The pivotal motion of the release element is blocked when stop member 234 comes into contact with either end surface A or end surface B.

[0031] It is not necessary that the locking arrangement comprises a cam to which the release element is pivotally attached. It is also possible to arrange the release element movable directly on the periphery on the middle section of the protection gate. This may for example be achieved by forming a groove in the surface of the middle section. In this case the groove should extend over a portion of the circumference of the middle section and the two ends of the groove define end position A and end position B. A release element in the form of a steel ball may be arranged slidable in the groove between end position A and end position B.

[0032] The locking element further comprises a spring element 210. The spring element 210 is typically a leaf spring, i.e. a rectangular elongated strip of resilient metal such as steel. The lower end portion 211 of the leaf spring is attached to the vertical portion 111 of the protection gate attachment 110, in a position below the middle section 103 of the protection gate. The spring element extends upwards so that its upper end 212 extends over the release element 230. The spring element comprises an opening 213 which is dimensioned to receive the locking element 220. The opening 213 is located such that it receives the locking element 230 when the protection gate is in the horizontal protective position. As can be seen in figure 3 the spring element comprises a contact surface 214 which is located above the opening 213 in the spring element. The contact surface 214 allows the release element to act on the spring element and press the spring element away from the locking element. It is obvious the extension of the contact surface has to be selected with regard to the position of the release element and the locking element. For example, the contact surface has a length of at least 8 mm and extends beyond the opening the opening in the spring element.

[0033] Figure 4a to 4c shows different views of the assembled locking arrangement. Figure 4a shows the release element 230 which is pivotally attached to the side 223 of the cam 221. The locking arrangement 200 is in a locked position in which the locking element 220 extends through the opening 213 in the spring element. Figure 4b shows a side view of the locking arrangement in figure 4a. In figure 4b, the release element is in the end position A, in which the stop member 234 is in contact with the end surface A of the recess 225 in the cam. Figure 4c shows the locking arrangement in unlocked position, in which the release element 230 is in the end position B and presses the spring element 210 away from the locking element.

[0034] The principle of the function of the inventive protection gate will be described in the following with reference to figure 5 which schematically shows a view cut longitudinally along the protection gate in figure 2.

[0035] In figure 5a the protection gate 100 is locked in the protective horizontal position 105. Hence, the bar 102 is oriented essentially horizontally. The locking element 220 that protrudes from the middle section 103 of the protection gate extends through the opening 213 of the spring element 210. The release element 230 is in the end position A and in contact with the spring element.

[0036] To unlock the locking arrangement 200 so that the protection gate can be lowered, the bar 102 is lifted upwards to a release position, see figure 5b. This causes the middle section 103 of the protection gate to pivot in the protection gate attachment (not shown). As the protection gate is pivoted upwards, the release element 230 slides over the spring element and pushes the spring element away from the locking element 220 so that the locking element no longer extends through the opening 213 in the spring element, i.e. the looking element is free from the spring element. The release position 104 is a position in which the release element 230 is in the first end position A and pushes the spring element away from the locking element, so that the spring element is released from locking element. In this position the angle between the pivotal attachment point of the release element and the spring element is preferably 90° or more. In figure 5b this is illustrated by the angle between the spring element and a straight line from the pivotal attachment point of the release element to the spring element. The reason therefore is that in this angular position, maximal friction exists between the spring element and release element. Preferably, the locking arrangement is arranged such that the spring element is released from the locking element when the side bars are lifted by an angle of 1-10°, more preferred 3-7°, most preferred 5° in relation to the essentially horizontal position.

[0037] Thereafter, as shown in figure 5c the protection gate 100 is pivoted downwards, i.e. the bar 102 is lowered. During lowering of the protection gate, the resiliency of the spring element 210 forces the spring element to press on the release element. The high friction between the spring element and the release element prevents the release element from sliding on the spring element during downwards pivoting of the protection gate. Instead, release element 230 remains immovable, with regard to the spring element and pivots instead over the periphery of the middle section of the protection gate from end position A to end position B. Hence, the release element and the spring element remains a position where they form an angle of 90° or more whereby maximum friction exist between the release element and the spring element. This has the effect that the release element keeps the spring element pushed away from the locking element 220 so that the locking element can pass the opening 213 in the spring element during lowering of the protection gate to the rest position.

[0038] Figure 5d shows the protection gate in the ver-

tical rest position.

[0039] When the protection gate is raised from the rest position, the locking element slides over the surface of the spring element until the locking element reaches and enters the opening 213 in the spring element then the protection gate is locked in the protective position.

[0040] Figure 6 shows a second embodiment of the inventive truck in which the protection gate comprises a first and a second locking arrangement 200, 200'. The locking arrangements are identical but the cams 221, 221' of the first and second locking arrangements are displaced in relation to each other on the periphery of the middle section of the protection gate. As can be seen in figure 6, this causes the locking element 220, 220' and the release element 230, 230' of the first and second locking arrangement to be displaced in relation to each other. In figure 6, the first locking arrangement 200 is displaced by 14° in relation to the second locking arrangement 200'. The advantage therewith is that the protection gate can be locked in two different positions so that the position of the protection gate can be optimized with regard to the length of the driver. For example the first locking arrangement 200 locks the protection gate in a first protective position that suits a short driver and the second locking arrangement 200' locks the protection gate in a second protective position that suits a tall driver. In order to increase the stability of the protection gate when it is in the locked protective position the two locking elements could be parallel, i.e. not displaced. It is of course possible to provide more than two locking arrangements.

[0041] The locking arrangements shown in figure 7 are identical to the locking arrangements shown in figure 6. However in figure 7 are also the spring elements 210, 210' shown, the spring elements were excluded in figure 6 in order to not obscure underlying components for the viewer.

[0042] In operation, the protection of the second embodiment works similar to the first embodiment.

[0043] Following is the function described when the protection gate is released and lowered from the second protective position in which the gate is locked by the second locking arrangement 200'. When the gate is lifted to the release position the release element 230', which is in end position A', pushes the spring element 210' away from the locking element 220'. When the gate is lowered from the release position, the release element 230' moves from end position A' to end position B' and holds the spring element away from the locking element 220' until the locking element 220' has passed the opening 213' in the spring element 210'. Thereafter the release element 230 of the first locking arrangement 100, which is in its end position A, comes into contact with spring element 210 and pushes it away as the release element 230 moves from end position A to end position B. Thereby, the protection gate may be lowered from the uppermost protecting position to the rest position without locking in the lower protecting position.

[0044] When the gate is raised from the rest position, the locking element 220 of the first locking arrangement 100 slides over the surface of the spring element 210 until the locking element reaches and enters the opening 213 in the spring element 213. Then the protection gate is locked in the lower protective position. If the gate is lifted from this position, the release element 230 pushes the spring element 210 away until the locking element 220' of the second locking arrangement 100' comes into contact with spring element 210'. If the gate is raised further, the locking element 220' slides over the surface of the second spring element 210' until the locking element 220' enters the opening 213' in the second spring element 210' and locks the gate in the upper protective position.

[0045] In the above embodiment, the first and second locking arrangements 200 and 200' are displaced by 14°. However, if they are displaced with a very large angle other parts of the locking arrangements must be modified accordingly. For example by extending the spring element.

[0046] In a further preferred embodiment a locking arrangement 300 is disclosed in figure 8. Schematic figure 1 and the corresponding text passages of the detailed description, is also applicable to this embodiment and the reference numbers of this figure 1 have been applied here below. This embodiment differs from the embodiment comprising a spring element 210 in that the spring element 210 has been replaced by a hook element 310, as seen in figure 10. The hook element 310 is pivotally arranged around a pivoting axis 327. A spring 340 enables the hook element to rotate in a clock wise direction of figure 8. The hook element is for this purpose provided with a recess 328 that can engage with the spring 340. However, of course the recess 328 can be replaced, for example by a non disclosed through hole, a screw attachment or a weld, in order to securely fix the spring 340 to the hook element 310. The disclosed spring 340, as seen in figure 8, is a helical spring, but could be replaced by any suitable spring as a plate spring, a spiral spring or a resilient material such as rubber. The spring 340 enables the hook element 310 to rotate into a locking position with the recess 313, of the hook element 310, engaging a protruding locking element 320 of the cam 321, on a surface B'. The advantage of the locking arrangement 300 is that it provides for a very robust and reliable function. It also has the advantage of being smooth in its function.

[0047] The different features of this locking arrangement 300 will now be described in detail.

[0048] The gate of the further embodiment corresponds to the gate of the previous embodiment. The gate further comprises the same type of suitable arrangement for attaching the gate pivotally to a tiller arm truck or a corresponding type of truck.

[0049] Further a cam 321 is comprised in the locking arrangement 300, see figure 8. The cam 321 has an upper surface 322 that faces away from the middle section. This upper surface 322 is constituted of a section of the

peripheral surface of the cam 321. The cam 321 further comprises a lower surface 329 that is in contact with the middle section 103. The lower surface 329 is the peripheral surface of the through hole in the cam 321. The cam 321 further has two side surfaces 323 and 324 that are perpendicular to the periphery to the middle section 103. Only side surface 323 is visible in figure 8. The cam 321 is firmly attached to the middle section 103 so that it follows the pivoting motion of the protection gate 100. A portion of the upper surface 322 of the cam 321 has been milled away so that a recess 325 is formed in the periphery of the cam. The recess 325 extends between two radially extending end surfaces A' and B' which will be explained further below. An opening 326 to allow for a rotation axis 336 of a release element 330 is provided between end surfaces A' and B'.

[0050] The provided hook element 310 as seen in figure 8 or figure 10, is preferably made of steel, but could be made of for example plastic. The hook element 310 is basically a plate with a thickness allowing it to not be resilient. The hook element 310 has a through hole allowing a pivot arrangement to be arranged comprising a pivot. Thus the hook element can pivot around the axis 327 as seen in figure 8. The hook element 310 has a recess 328 that is arranged in an elongated manner in order to be able to engage with the spring 340. The recess 328 can be adapted to the chosen spring configuration and could also be a through hole for directly engaging a spring or for allowing a screw to in turn engage a spring.

[0051] On to the hook element 310 is a slide surface element 360 attached. The slide surface element 360 is preferably attached to the hook element 310 by means of two screws, for this purpose arranged screw holes 363 and 364. It is also possible to make the slide surface element 360 unitary with the hook element 310. The slide surface element 360 has two sliding surfaces 361 and 362. The slide surface 361 is arranged at an angle to the adjacent slide surface 362. These slide surfaces are arranged to interact with the release element 330 to be described further below. The slide surface element 360 is preferably made of a sintered material, to have a sufficient resistance to wear.

[0052] The release element 330 is pivotable and is essentially the same as in the previous embodiments. It pivots around a pivoting axis in the centre of a through-hole 335 of the release element 330 concentric with the through hole 326 of the cam 321. The release element 330 is pivotable between two end positions A' and B'. The two end positions correspond to surface A' and surface B' for the previous embodiment of the locking arrangement 200, the surfaces in figure 8 have been awarded the reference numbers A' and B'. The release element 330 has a stop member 334, in the form of a protruding object from the side surface 332 of the release element 330. The stop member 334 is arranged to be able to engage with surface A' and B' of the cam 321. The stop member can be constituted of a stud, a pin, a screw or any general protrusion that allows the stop member 334 to engage with both surface A' and B'. The release element 330 has a circumference that has a first surface 338 ending in a nose 339 pointing in the right direction of figure 10. From the nose 339 in the anti-clockwise direction further runs a surface 337 that is angled when viewing in the plane of figure 10, to surface 338. These surfaces cooperate when the release element 330 acts. The motion and function of the release element 330 is the same as that for the previously described release member 230. The release element 330 is attached in a position between the end surfaces A' and B' of the recess 325, in the cam 321 so that the stop member 334 protrudes into the recess 325. The release element 330 is further positioned on the cam 321 and dimensioned so that the first end of the release element extends past the upper surface 322 of the cam. In particular, the release element is arranged such that first end of the release element 330 protrudes past the locking element 320. In operation the release element is movable, i.e. can be pivoted, between a first end position A' and a second end position B', which correspond to end surfaces A' and B' of the recess 325 in the cam 321. The pivotal motion of the release element 330 is blocked when stop member 334 comes into contact with either end surface A' or end surface B'.

[0053] As with the previous embodiment there is no need for a cam to which the release element is attached as described in connection with embodiment described above. Design of the release element can thus also be adapted as in line with the previous embodiment, where a release element is arranged on the middle section 103, for example in a groove in the surface of the middle section 103.

[0054] The function of the locking arrangement 300 is the following, as described from an essentially horizontally orientated position as seen in figure 5a for the previous embodiment. In this position the locking element 320 is engaged with surface B' of the cam's 321 recess 325. The release element 330 is in the end position in contact with surface A'. To unlock the arrangement 300 for lowering the protection gate the bar 102 is lifted upwards to a release position, see figure 9 moments I - III. The rotation of the middle section 103 of the protection gate 100 allows the release element to slide on the upper sliding surface 361 of the sliding surface element 360.

[0055] The spring force F of the spring is at all times seeking to rotate the hook element 310 in the anti-clockwise direction of figure 9. or figure 10, clockwise direction if viewing on figure 8. The release element 330 pushes the hook element 310 away from the locking element 320, moment I - II of figure 9. After passing the nose 365 of the sliding surface element 360 of the hook element 310, the release element 330 alters position to the lower end position where it is in contact with the end surface B', moment III of figure 9. The operator can now rotate the protection gate in the opposite direction wherein the release element 330 pushes the hook element 310 away by acting on the lower surface 362 of the sliding surface

element 360, moment IV and V of figure 9. The action of the release element 330 on the surface 362 in turn pushes the locking element 320 of the cam 321 away from the hook element 310 such that the protection gate 100 can be rotated downwards to the vertical rest position 106, moment V and VI of figure 9. Spring force is referred to as F in figure 9.

[0056] All angles as discussed with the previous locking arrangement 200 are relevant for the current locking arrangement 300. A corresponding raising of the gate 100 is performed with the described functions in reverse. By adding several locking arrangements 300 it is possible to achieve several locking positions for the protective gate.

[0057] It is also possible in line with the embodiment of the industrial truck where two or more locking arrangements are added, to use one locking arrangement 200 according to the first embodiment of the industrial truck, together with a locking arrangement according to the described third embodiment 300 of the industrial truck. And of course it is possible to combine the embodiment of the industrial truck having several locking arrangements 200, 200' with the third embodiment 300, and the other way around.

Claims

1. An industrial truck comprising a platform (8) for a driver and a pivotal protection gate (100) and a releasable locking arrangement (200, 300) for locking the protection gate (100) in a protective position (105) in which it protects the driver that is present on the platform (8) **characterized in that** the locking arrangement (200, 300) is arranged such that it is automatically unlocked when the protection gate (100) is pivoted upwards from the protective position (105) to a release position (104) so that the protection gate (100) may be lowered to an essentially vertical rest position (106).

2. The industrial truck according to claim 1, wherein the locking arrangement comprises a hook element (310) that is pivotably attached to the industrial truck for releasable locking the protection gate (100) in the predetermined protective position (105); a release element (330) that is arranged such that it releases the hook element (310) from the protection gate (100) when the protection gate is pivoted upwards from the protective position (105) and wherein the release element (330) further is arranged such that the hook element (310) remains released from the protection gate (100) as the protection gate (100) is lowered to the rest position (106).

3. The industrial truck according to claim 2, wherein the locking arrangement comprises a locking element (320) that protrudes from the protection gate (100) and wherein the hook element (310) comprises a recess (313) for receiving the protruding locking element (320) when the protection gate (100) is in the protective position (105).

4. The industrial truck according to claim 3, wherein the release element (330) is arranged such that it releases the hook element (310) from the protruding locking element (320) when the protection gate (100) is pivoted upwards to the release position.

5. The industrial truck according to claim 4, wherein the release element (330) pushes the hook element (310) away from the protruding locking element (320) when the protection gate (100) is pivoted upwards to the release position (104).

6. The industrial truck according to claim 5, wherein the release element (330) is arranged such that it pushes the hook element (310) away from the protruding locking element (320) when the protection gate (100) is pivoted downwards from the release position (104), to the rest position (106).

7. The industrial truck according to claim 6, wherein the release element (330) pushes the hook element (310) away from the protruding locking element (320) so that the locking element (320) passes the recess (313) in the hook element (310) during the lowering of the protection gate (100).

8. The industrial truck according to any of claims 2 - 7 wherein the release element (330) is movable arranged on the protection gate (100) between a first end position A' and a second end position B';
wherein the locking arrangement (300) is arranged such that when the protection gate (100) is pivoted upwards from the protective position (105) to the release position (104) the release element (330) is in the end first position A' and pushes the hook element (310) away from the locking element (320) and when the protection gate (100) is pivoted downwards from the release position (104) to the rest position (106), the release element (330) moves from end position A' to position B' and pushes the hook element (310) away from the locking element (320) as the locking element passes the recess (313) of the hook element (310).

9. The industrial truck according to any of the claims 2 - 8 wherein the hook element (310) comprises two sliding surfaces (361, 362), preferably provided by a sliding surface element (360), wherein said surfaces (361, 362) are provided at an angle to each other.

10. The industrial truck according to claim 1, wherein the locking arrangement (200) comprises:

a spring element (210) that is attached to the truck for releasable locking the protection gate (100) in the predetermined protective position (105);

a release element (230) that is arranged such that it releases the spring element (210) from the protection gate (100) when the protection gate is pivoted upwards from the protective position (105) and wherein the release element (230) further is arranged such that the spring element (210) remains released from the protection gate (100) as the protection gate (100) is lowered to the rest position (106).

11. The industrial truck according to claim 10 wherein the locking arrangement (200) comprises a locking element (220) that protrudes from the protection gate (100) and wherein the spring element (210) comprises an opening (213) for receiving the protruding locking element (220) when the protection gate (100) is in the protective position (105).

12. The industrial truck according to claim 11, wherein the release element (230) is arranged such that it releases the spring element (210) from the protruding locking element (220) when the protection gate (100) is pivoted upwards to the release position (104).

13. The industrial truck according to claim 12, wherein the release element (230) is arranged such that it pushes the spring element (210) away from the protruding locking element (220) when the protection gate (100) is pivoted downwards from the release position (104) to the rest position (106).

14. The industrial truck according to claim 13, wherein the release element (230) pushes the spring element (210) away from the protruding locking element (220) when the protection gate (100) is pivoted upwards to the release position (104).

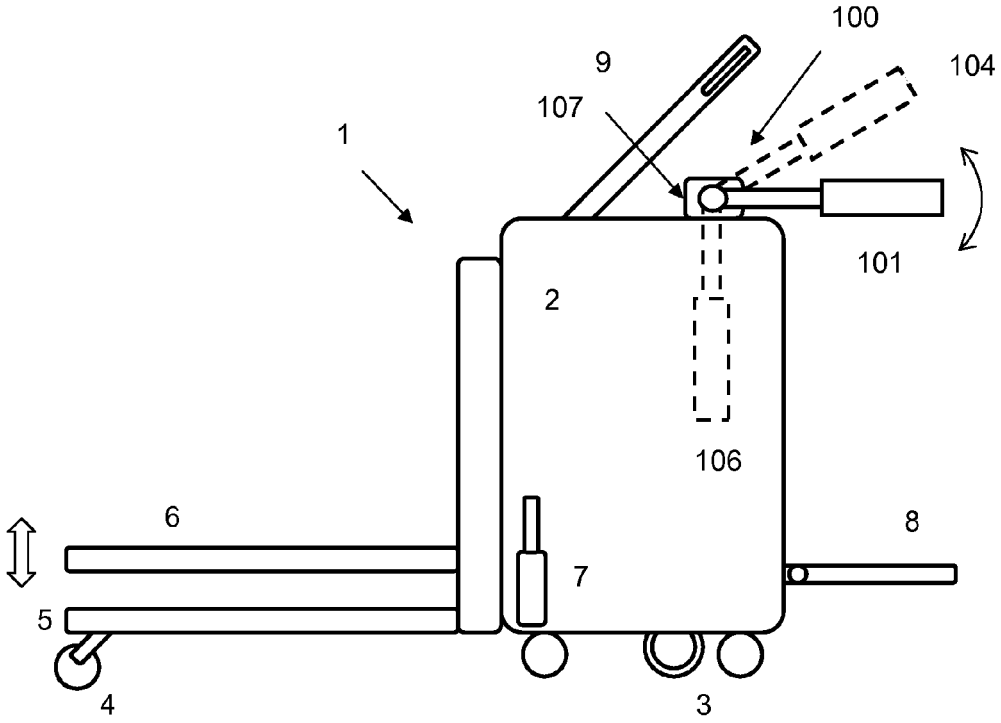
15. The industrial truck according to claim 14, wherein the release element (230) pushes the spring element (210) away from the protruding locking element (220) so that the locking element (220) passes the opening (213) in the spring element (210) during lowering of the protection gate (100).

16. The industrial truck according to any of claims 11 - 15 wherein the release element (230) is movable arranged on the protection gate (100) between a first end position A and a second end position B;

wherein the locking arrangement (200) is arranged such that when the protection gate (100) is pivoted upwards from the protective position (105) to the release position (104) the release element (230) is in the end first position (A) and pushes the spring element (210) away from the locking element (220) and when the protection gate (100) is pivoted downwards from the release position (104) to the rest position (106), the release element (230) moves from end position A to position B and pushes the spring element away from the locking element (220) as the locking element passes the opening (213) of the spring element (210).

17. The industrial truck according to claim 16, wherein the release element (230) is pivotally attached to the protection gate by a pivot (236) whereby the locking arrangement (200) is arranged such that the angle between the pivot (236) and the spring element (210) is 90° or more.

18. The industrial truck according to any of claims 1 -17, comprising two or more locking arrangements (200, 200', 300) wherein the two or more locking arrangements (200, 200', 300) lock the protection gate in different raised positions.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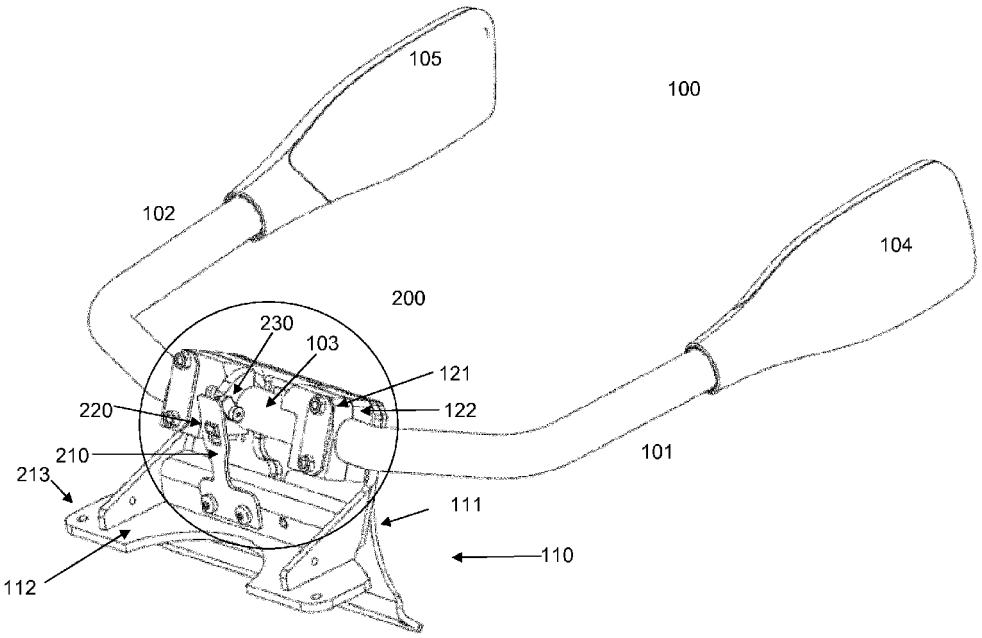

Fig 2

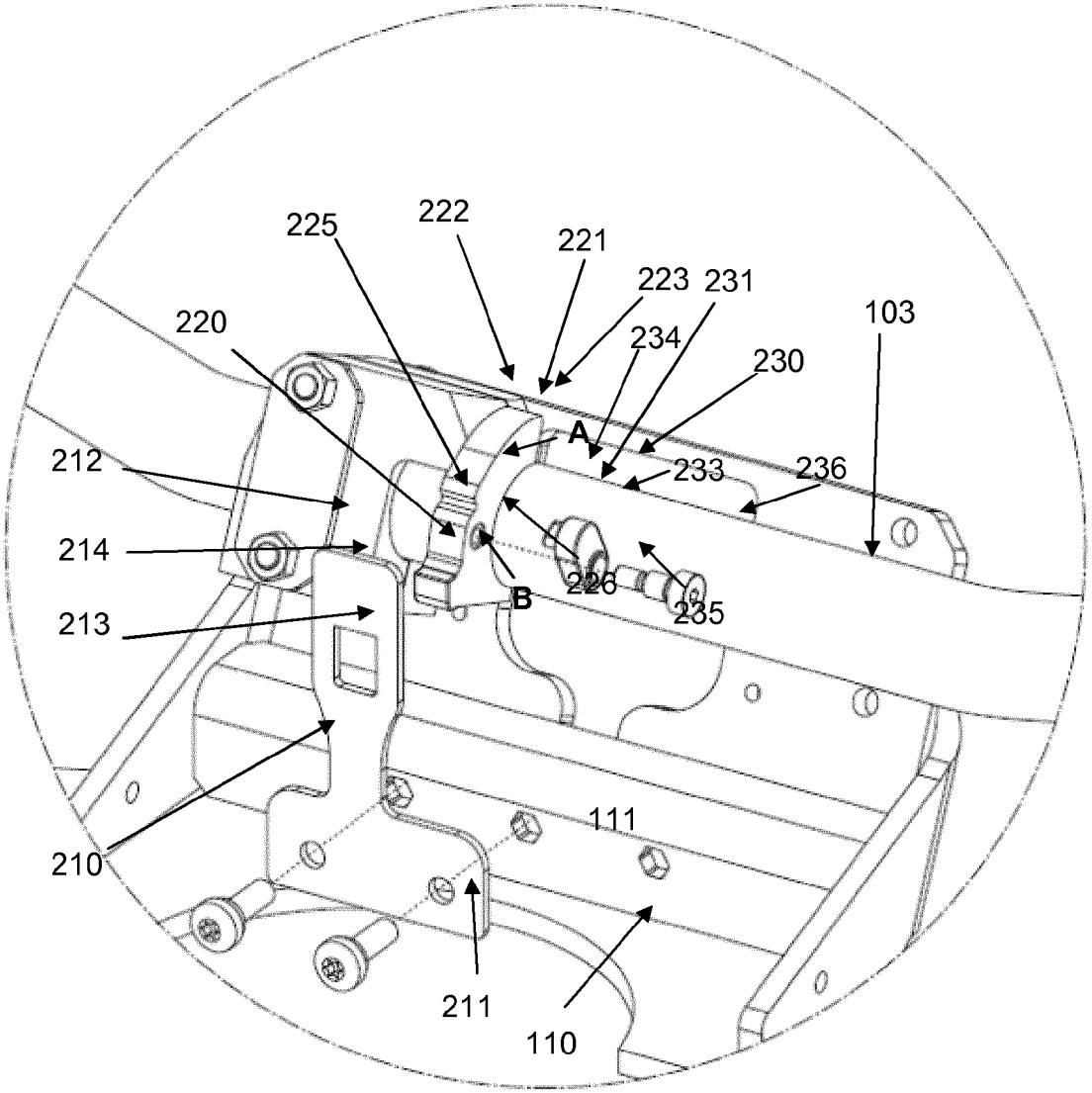
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Fig 3

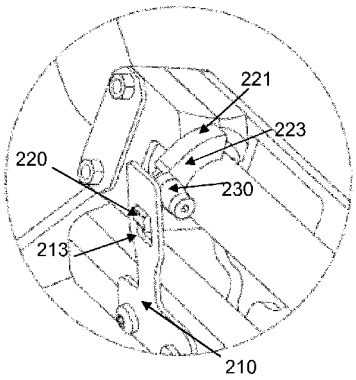

Fig 4a

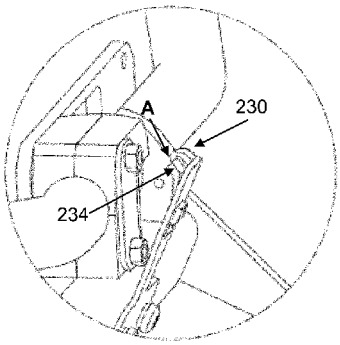

Fig 4b

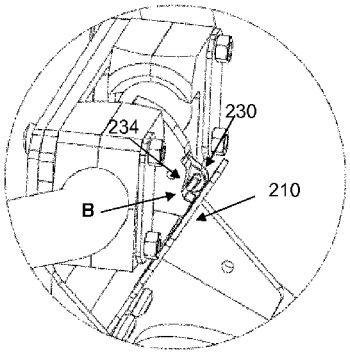

Fig 4c

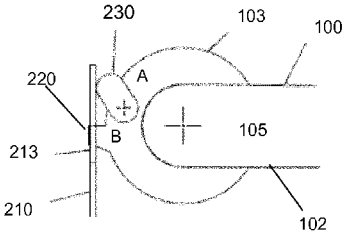

Fig 5a

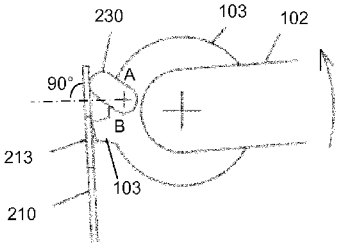

Fig 5b

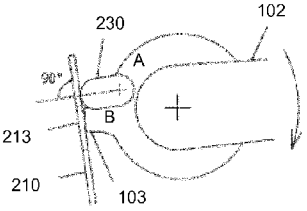

Fig 5c

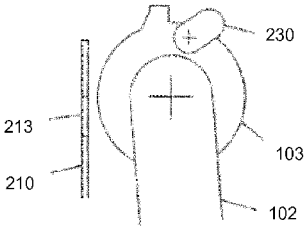

Fig 5d

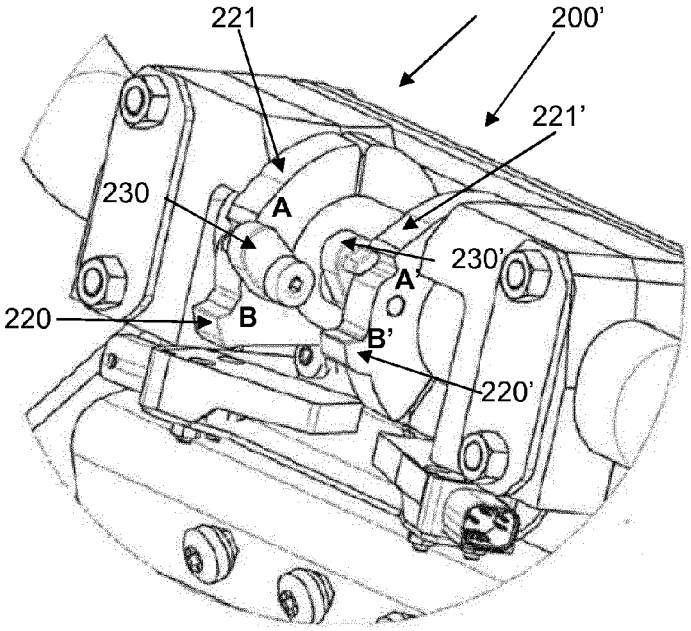

Fig 6

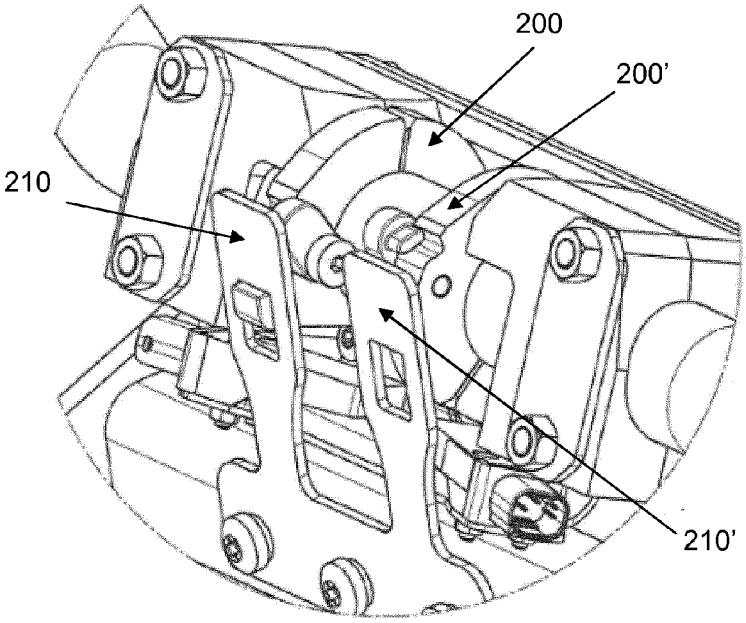

Fig 7

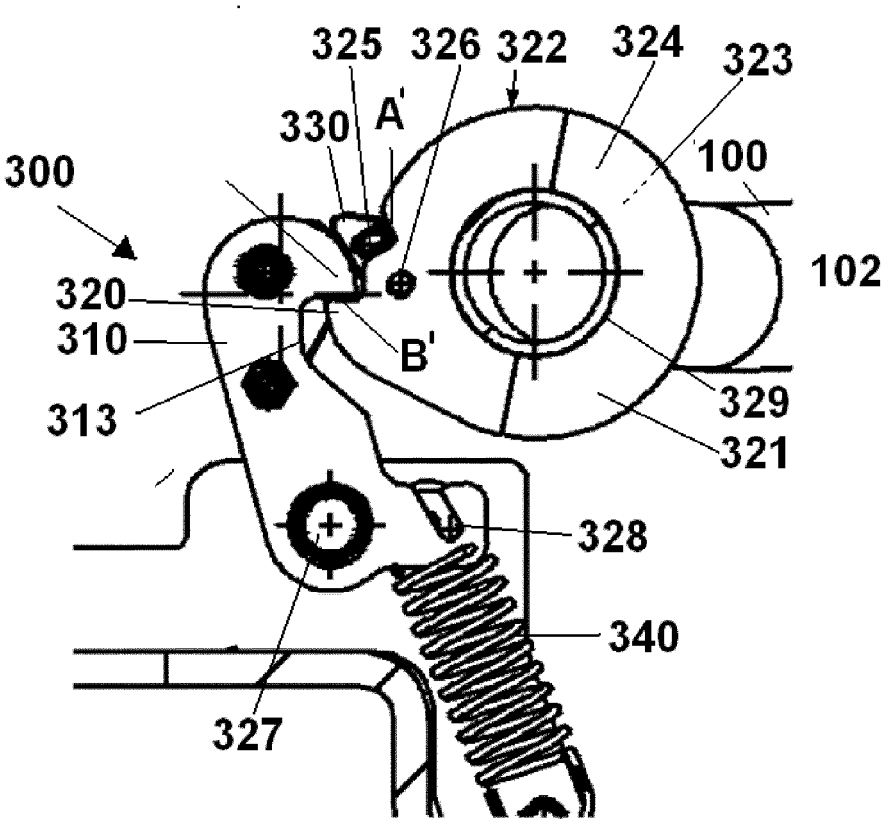
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Fig 8

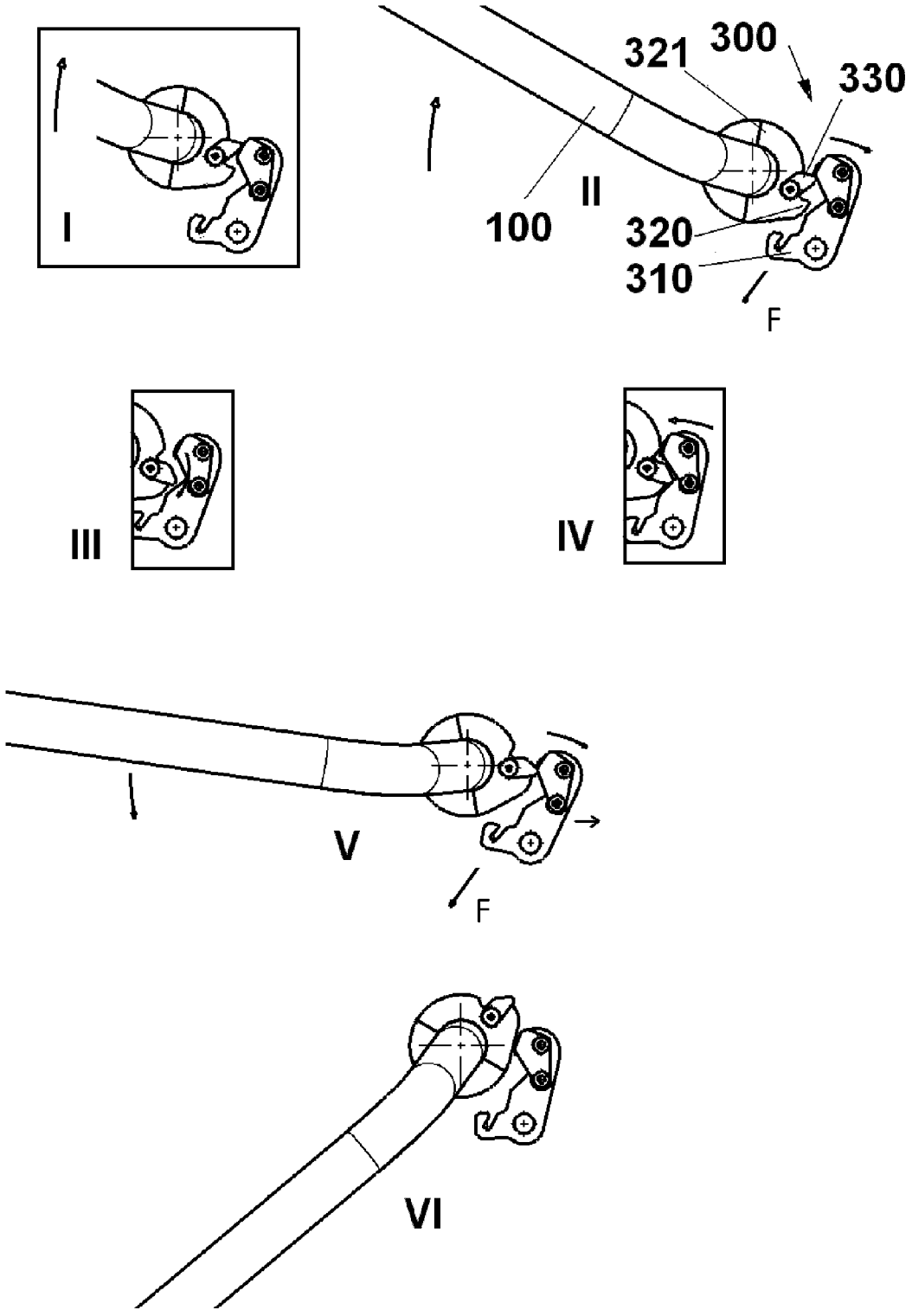

Fig 9

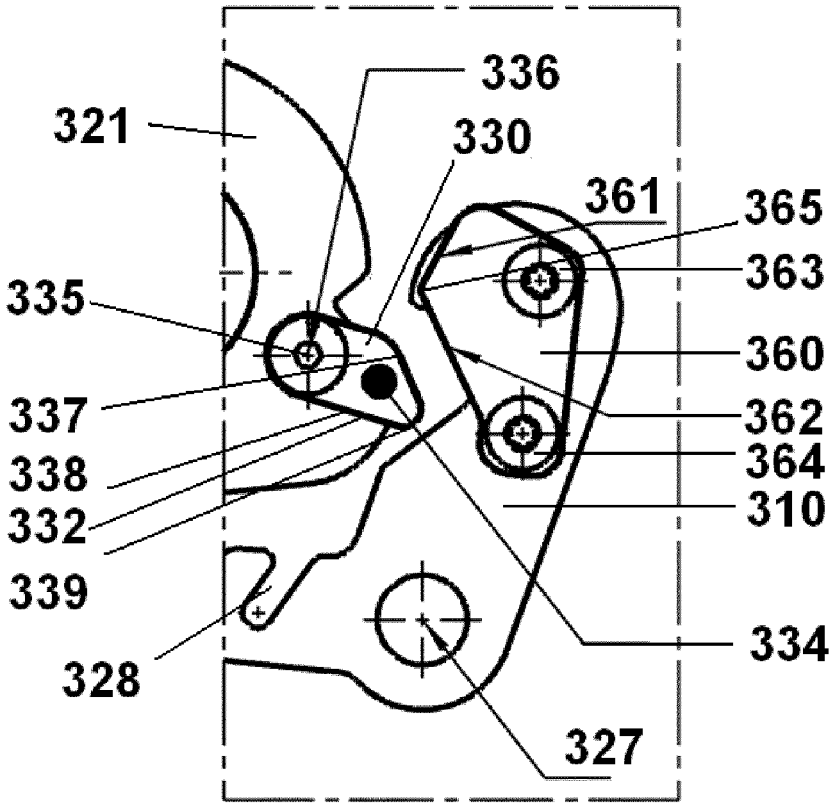
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Fig 10

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EUROPEAN SEARCH REPORT

Application Number
EP 13 16 1630

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2010/089703 A1 (GALLAGHER MICHAEL P [US] ET AL) 15 April 2010 (2010-04-15) * abstract; figures * * paragraphs [0006], [0012], [0042], [0048], [0053], [0056], [0058] * -----	1	INV. B66F9/065 B66F9/075 B66F17/00
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A	FR 2 822 124 A1 (LOC MANUTENTION [FR]) 20 September 2002 (2002-09-20) * the whole document * -----	1	

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B66F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	3 May 2013	Verheul, Omiros

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1

EPO FORM 1503 03.82 (P04C01)

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03-05-2013

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- EP 0466065 A **[0004] [0006]**