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(54) **Closure opening mechanism**

(57) An panic or emergency exit mechanism (134) in which a push bar (108) can be rotated in a first direction (U) to unlatch a primary latch bolt, and a secondary latch

bolt, and can be rotated in a second direction (L) to selectively engage a secondary latch bolt to supplement primary latching.

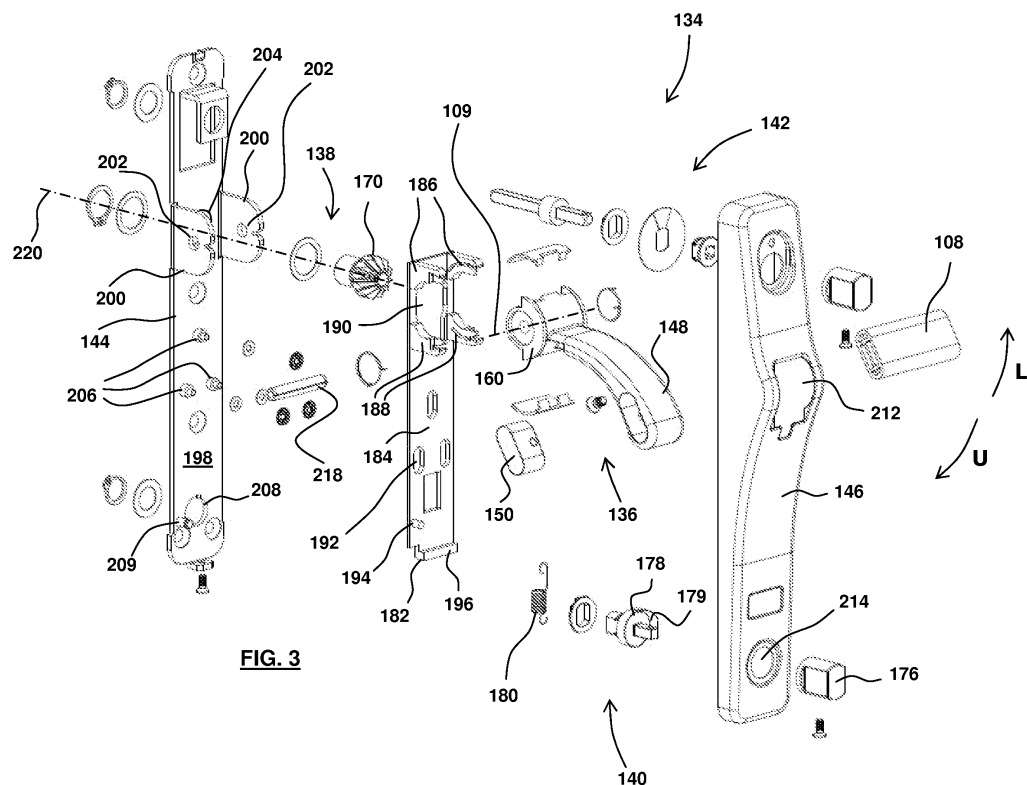


FIG. 3

Description

[0001] The present invention relates to a closure opening mechanism. Specifically, the present invention relates to a door panic or emergency exit device which is arranged to latch and unlatch a door via a primary and, selectively, a secondary latching mechanism.

[0002] Exits such as emergency exits to industrial buildings comprise doors which can be opened in an emergency by the use of a panic exit device or an emergency exit device. Such doors have an open state (when the door can be freely opened), a latched state (when the door is secured relative to the door frame but readily openable with an exit control) and a locked state in which the door cannot be readily opened without the aid of e.g. a key.

[0003] A typical panic or emergency exit will always only be latched from the inside- that is to say exit is always possible from the inside. Typically, the panic or emergency exit mechanism will comprise a retractable bolt in the door which engages with a keep on the frame to latch the door. A panic exit device control such as a push bar or touch bar (typically spanning the width of the door), or an emergency exit device control such as a touch pad positioned on the inside surface of the door will allow the user to retract the bolt to unlatch and open the door. Such devices commonly comprise large surfaces to aid visibility and usability. Such devices are often configured to automatically relatch once the door is pushed into the closed position. This is often achieved with the use of an angled bolt which is forced to retract as it passes the door frame and resiles to an extended position once it is opposite the keep.

[0004] Typical exits featuring emergency exit or panic exit devices will open outwards from the building such that opening can be achieved simply by pushing on the exit control to both unlatch and open the door. Often, these exits will only be openable from the inside- i.e. there is no method of bolt control on the exterior surface of the door. This is a security measure to prevent unauthorised access.

[0005] Some exits featuring emergency exit or panic exit devices however have outside access devices, through the use of which the latch can be retracted to open the door. Often, these outside access devices require locking arrangements to prevent unauthorised access. Such locking arrangements act on the mechanism of the outside access device to prevent it moving the bolt- e.g. by disconnecting a mechanism between the handle and bolt or simply preventing movement of the handle (movement of the bolt will not be restrained as the door still needs to be openable from a latched state from the inside). It should be noted that unlike traditional locks, the door must remain only in the latched state from the inside- i.e. the door must remain openable by activation of the emergency exit control and must not be locked from the inside.

[0006] Exits featuring emergency exit or panic exit de-

vices have traditionally been constructed from timber or metal framed doors, which provide a sufficiently stiff and secure barrier to unauthorised entry with a single, primary, latch bolt. PVC (polyvinyl chloride) and uPVC (unplasticised polyvinyl chloride) - which will be collectively referred to hereinafter as "PVC" - are increasingly being used as an alternative to timber and metal frames. PVC closures are generally lighter, cheaper to manufacture and less easily susceptible to corrosion and damp effects than their metal and timber counterparts. They are also more common in the more domestic industrial setting such as hospices, care homes and student or holiday accommodation.

[0007] One problem with PVC doors is that they are less stiff than timber or metal doors. This makes it easier to force PVC doors open, as they can be deformed sufficiently to insert a lever between the door and frame and prize the door open.

[0008] It is known to provide standard (non-emergency) PVC doors and closures with multi-point locking mechanisms, which comprise a secondary locking system having a number of separately actuatable lock bolts spaced apart from the primary lock mechanism. Such multi-point mechanisms provide better security than the single lock bolt systems by anchoring the door to the frame at several positions.

[0009] One problem with such mechanisms is that they require actuation to secure the secondary locking mechanism. To provide the required level of security these secondary locking mechanisms do not automatically relatch when the door is closed. Instead, the actuation is brought about by the turning of a key (usually through several rotations) which advances the bolts of the secondary locking mechanism into their keeps. Other types of secondary locking mechanisms are also known, for example sliding esplagnottes and rotating hooks which provide an increased level of security over simple bolts.

[0010] If multi-point mechanisms are used in emergency exits to latch PVC doors, the secondary latching mechanism must be actuatable by the emergency exit control to unlatch and open the door in an emergency. It is also a requirement that the secondary latching mechanism securely holds the door in place to prevent unauthorised access. As such it is desirable to retain the form of the secondary locking mechanism of the non-emergency exit version (e.g. sliding esplagnotte, hook formations). Unlike the primary latch bolt, such secondary latch formations cannot be simply be automatically relatched upon closure of the door and require manual actuation to set them to the latched position.

[0011] This has been achieved with the use of a multi-turn key or knob of which several rotations are required to actuate the secondary latching mechanism.

[0012] As such the door has three conditions- open, latched (in which only the primary latch bolt is engaged it its keep) and superlatched (in which the primary and secondary latch bolts are engaged). The superlatched condition can only be achieved by turning the key or knob

several times to engage the secondary latch mechanism.

[0013] A problem with this system is that several turns of a key or knob are required to superlatch the door, which takes time and which is prone to insufficient latching as the user may think that the secondary locking mechanism has engaged before it actually has. Also, relatively little torque can be transferred to the secondary locking mechanism via a key or knob due to their small radii. As such, if the alignment between the secondary locking mechanism and the frame is slightly off, it may be very difficult to superlatch the door.

[0014] A problem with panic or emergency exit devices is that the moving parts of the device (often between the control and the housing) can create a gap in which user's fingers can be trapped. As such the range of movement of the control is limited to prevent gaps appearing in which fingers can be trapped.

[0015] It is an aim of the present invention to overcome or at least mitigate at least one of the above problems.

[0016] According to a first aspect of the invention there is provided a panic or emergency exit device for opening a closure,

the closure having a primary latch movable between an open condition and a latched condition and a secondary latch movable between an open condition and a latched condition,

the emergency exit device having a first control manually actuable to move the primary latch and the secondary latch from the latched condition to the open condition, wherein;

the first control is manually actuable to move the secondary latch from the open condition to the latched condition to supplement the primary latch.

[0017] By integrating control of the secondary locking mechanism into the control (e.g. a push bar), actuation of the secondary locking mechanism is made easier. The control is generally of significant size, and as such the secondary locking mechanism can be latched with a single motion. The provision of a separate control (e.g. a key or knob) is not required and as such operation of the door latching mechanisms is simpler.

[0018] An example panic or emergency exit device in accordance with the present invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a perspective view of the inside of a door comprising a panic exit device in accordance with the present invention,

Figure 2 is an exploded side view of a part of the panic exit device of figure 1,

Figure 3 is an exploded perspective view of a part of the panic exit device of figure 1,

Figure 3a is a perspective view of a part of the panic exit device of figure 1,

Figure 4 is a detailed exploded perspective view of a part of the panic exit device of figure 1,

Figure 5 is a perspective view of a cover plate of the

panic exit device of figure 1,

Figure 6 is a schematic exploded view of a part of the panic exit device of figure 1 in a latched condition, Figure 7 is a schematic exploded view of a part of the panic exit device of figure 1 in an open condition, Figure 8 is a schematic exploded view of a part of the panic exit device of figure 1 between a latched and a superlatched condition,

Figure 9 is a schematic exploded view of a part of the panic exit device of figure 1 in a superlatched condition,

Figure 10 is a schematic exploded view of a part of the panic exit device of figure 1 between a superlatched and an open condition,

Figure 11 is a schematic side section view of a part of the panic exit device of figure 1 in an anti-lock condition, and

Figure 12 is a schematic side section view of a part of the panic exit device of figure 1 in a free lock condition.

[0019] Figure 1 shows a door 100 comprising a frame 102 and glass panes 104. The frame 102 is primarily constructed from PVC. The door 100 is mounted to a frame (not shown) via hinges 106. An panic exit control in the form of a push bar 108 is mounted on the door frame 102. The push bar 108 is connected to a latching mechanism (134) to retract a primary bolt 110. The push bar is rotatable about a push bar axis 109. The primary bolt 110 is engageable in a primary keep 112 (shown schematically) on the door frame to latch the door 100.

[0020] The door comprises a first and second secondary bolt 114, 116 which engage respective first and second secondary keeps 118, 120 to supplement the latching effect of the primary bolt 110. When the primary bolt 110 alone is engaged in the primary keep 112, the door is latched. When the primary bolt 110 and the secondary bolts 114, 116 are engaged in their respective keeps, the door is superlatched. When the door 100 is superlatched, it is more difficult to force it open as the door 100 is secured to the frame in multiple positions.

[0021] The primary bolt 100 is biased into the extended position, and comprises an angled face (not shown) to engage the door frame and automatically retract and extend into the primary keep 112 when the door is pushed closed. In order to retract the primary bolt 110 and release the door 100 from a latched condition, the push bar 108 is rotated from a nominal position (as shown) downwards in direction U about the push bar axis 109. As will be described in detail below, the rotation of the push bar simultaneously retracts the primary bolt 110 and rotates the door about the hinges 106 to open it.

[0022] The secondary bolts 114, 116 provide supplementary latching. They are engageable with their respective keeps 118, 120 by rotating the push bar from the datum position in a direction L, opposite to the direction U whilst the door is closed. Such action extends the secondary bolts 118, 120 as will be described below to su-

perlatch the door 100.

[0023] The door 100 can be opened from a superlatched condition by rotating the push bar in the direction U to disengage the primary and secondary bolts 110, 114, 116 and open the door. Upon closing the primary latch 110 will automatically resile into the keep 112 however the secondary bolts 114, 116 require a further actuation of the push bar 108 in direction L to extend them and achieve the superlatched state.

[0024] As such, the user can leave the door in a latched or superlatched state depending on preference. For example, the door 100 may be latched at times when the premises are occupied and superlatched when the premises are unoccupied. It should be noted that a basic level of latching is always automatically provided by the primary bolt 110, although increased security can be provided by superlatching the door 110 without impairing the ability to open the door 100 in an emergency.

[0025] Referring to figure 2, an exploded view of the frame 102 with a latching assembly 122 is shown. The latching assembly 122 comprises a primary mechanism 124 which engages with the push bar 108 and the primary bolt 110. Two secondary mechanisms 126, 128 are also provided which retract and extend the secondary bolts 114, 116. The primary mechanism 124 is connected to the secondary mechanisms 126, 128 via a first slide bar 130 and a second slide bar 132 to extend the secondary bolts 114, 116 when the push bar 108 is rotated in direction L and retract them when the push bar is rotated in direction U (if they are extended).

[0026] Figures 3 and 3a show a more detailed view of the push bar mechanism 134. The push bar mechanism comprises a push bar subassembly 136, a gear subassembly 138, an anti-lock subassembly 140 and an indicator subassembly 142. The subassemblies 136, 138, 140 and 142 are mounted to a back plate 144 and concealed by a cover plate 146.

[0027] The push bar subassembly 136 comprises an operating arm 148, the push bar 108 and an end cap 150. The operating arm 148 is shown in more detail in figure 4, and comprises a lever arm portion 152 terminating in a push bar receiving portion 154 at a first end and a drum portion 156 at a second end.

[0028] The push bar receiving portion comprises a bore 158 to receive both the end cap 150 and the push bar 108.

[0029] The operating arm 148 comprises an operating arm gear 160 and an operating arm locator 162. The operating arm gear 160 has a disc shaped body 164 with a bevel gear 166 defined thereon and a bore 161 defined therethrough. The bevel gear 166 defines the push bar axis 109 at its centre coincident with the bore 161. The operating arm locator 162 defines a bore 163 therethrough. The operating arm gear 160 and the operating arm locator 162 fit at each end of the drum portion 156 of the operating arm 148.

[0030] The lever arm portion 152 of the operating arm 148 further comprises a rib 168 proximate the drum por-

tion 156 whose function will be discussed below.

[0031] The gear subassembly 138 comprises a spindle drive 170, also shown in more detail in figure 4. The spindle drive 170 comprises a shaft 172 terminating in a bevel gear 174. The shaft 172 defines a square cross section bore (not shown) open at the end opposite the bevel gear 174 for receiving a latch shaft 222 (see figure 3a).

[0032] The anti-lock subassembly 140 comprises a dogging knob 176, a release actuator 178, a return spring 180 and an anti-lock plate 182. The anti-lock plate 182 comprises a slide plate 184, a pair of upper guides 186 and a pair of lower guides 188. The guides 186, 184 project from the slide plate 184. The slide plate 184 defines a main orifice 190 situated between the guides 186, 188 and three guide slots 192 below the lower guides 188.

[0033] The release actuator 178 comprises a cammed surface 179.

[0034] The slide plate 184 comprises a spring abutment 194 and a bottom flange 196 projecting from the slide plate 184 at its lower edge.

[0035] The indicator subassembly 142 will not be described in detail.

[0036] The back plate 144 comprises a base plate 198 and a pair of parallel bearing arms 200 projecting therefrom and each defining a bearing hole 202. A drive orifice 204 is defined between the bearing arms 200. Three slide pins 206 and a spring pin 209 project from the base plate 198. The base plate 198 also defines a release actuator bearing orifice 208 therethrough.

[0037] The cover plate 146 (as shown in figure 5) defines an indicator orifice 210, a lever orifice 212 and an anti-lock orifice 214. The lever orifice 212 is generally rectangular with a slot 216 extending from a bottom edge thereof.

[0038] The push bar mechanism 134 is assembled as follows.

[0039] The anti-lock plate 182 is mounted with the slide pins 206 of the back plate 144 passing through the guide slots 192 such that the anti-lock plate 182 can slide on the backplate 144. The return spring 180 is attached to the spring abutment 194 and the spring pin 209 to resile the anti-lock plate 182 to a lower position. The release actuator 178 is engaged in the actuator bearing orifice 208 of the back plate 144 such that upon rotation of the release actuator 178 the cammed surface 179 contacts the flange 196 of the anti-lock plate 182 to urge the anti-lock plate 182 upwards against the bias of the return spring 180.

[0040] The spindle drive 170 is then rotatably mounted into the drive orifice 204 such that the shaft 172 projects from the rear of the back plate 144. The operating arm 148 is then rotatably mounted to the bearing arms 200 with a pin 218 which passes through the bearing holes 202 and the bores 161, 163 of the operating arm 148. The pin 218 lies on the push bar axis 109.

[0041] As the operating arm 148 is mounted to the bearing arms 200, the bevel gears of the spindle drive

170 and the operating arm gear 160 engage such that rotation of the operating arm 148 about the push bar axis 109 brings about rotation of the spindle drive 170 about a spindle axis 220.

[0042] The cover plate 146 is then placed over the entire assembly with the lever arm portion 152 and part of the release actuator 176 protruding from the lever orifice 212 and the anti-lock orifice 214 respectively. The dogging knob 176 is then attached to the release actuator 176 to provide user control of the anti-lock subassembly 140.

[0043] It should be noted that the lever orifice 212 permits motion of the operating arm 148 both upwardly and downwardly from a nominal position as will be described below. It should also be noted that when the operating arm 148 is actuated into a lower position, the rib 168 of the operating arm 148 engages the slot 216. The rib 168 and the slot 216 are specifically dimensioned to be less than 10mm (i.e. below the size of a human finger) to prevent finger trapping.

[0044] Referring now to figures 6 to 10, the operating sequence of the push bar mechanism 134 is shown schematically. As shown, the spindle drive is connected to a latch shaft 222. A primary pinion gear 224 and a secondary pinion gear 226 are mounted to the latch shaft 222. The primary pinion gear 224 engages with a primary rack 228 which is attached to the primary bolt 110. The secondary pinion gear 226 engages with a secondary rack 230. The secondary rack 230 defines a slot 232. Adjacent the secondary rack 230 is a slide plate 234 comprising a slide pin 236 projecting therefrom and through the slot 232. The slide plate 234 is functionally linked to the first and second slide bars 130, 132 configured to actuate the secondary bolts 114, 116.

[0045] Figure 6 shows the push bar mechanism 134 in a latched state with the primary bolt 110 engaging the primary keep 112. It will be noted that the secondary bolts 114, 116 are not engaging their respective keeps 118, 120.

[0046] To open the door 100, the push bar 108 (and hence the operating arm 148) is rotated in direction U and about the push bar axis 109. As shown in figure 7, the meshed bevel gears 174, 166 cause corresponding rotation of the spindle drive 170 and the pinion gears 224, 226. The primary rack 228 pulls the primary bolt 110 free of the primary keep 112 to enable opening of the door 100. The secondary rack 230 also moves but merely slides over the slide pin 236 via the slot 232.

[0047] Referring to figure 8, the push bar mechanism 134 is moved from the latched condition of figure 6 to a superlatched condition. The push bar 108 (and hence the operating arm 148) is rotated about the push bar axis 109 in latching direction L. The meshed bevel gears 174, 166 cause corresponding rotation of the spindle drive 170 and the pinion gears 224, 226. The secondary rack 230 moves and pushes the slide pin 236 and the slide plate 234 upwardly to actuate the first and second slide bars 130, 132 and engage the secondary bolts 114, 116

in their respective keeps 118, 120.

[0048] The primary bolt 110 is unaffected, which may be achieved by a lost motion connection between the primary gear 224 and the primary rack 228. In this embodiment the primary gear 224 comprises a section of its perimeter 225 on which no gear teeth are defined and as such may move freely with respect to the primary rack 228 whilst the secondary bolts 114, 116 are actuated.

[0049] Following this step, the push bar 108 (and hence the operating arm 148) is rotated back to its nominal position as shown in figure 9 to leave the mechanism 134 superlatched. As can be seen the only difference between the latched condition of figure 6 and the superlatched condition of figure 9 is the position of the slide plate 234, the first and second slide bars 130, 132 and the secondary latch bolts 114, 116.

[0050] Referring to figure 10, the mechanism 134 can be moved to the open position from the superlatched position by rotation of the push bar 108 (and hence operating arm 148) in the direction U. In this instance, the secondary pinion gear 226 urges the secondary rack 230 downwards, and due to the position of the slide pin 236 also actuates the first and second slide bars 130, 132 to retract the secondary bolts 114, 116 at the same time as the primary bolt is retracted (as described above with reference to figure 7).

Turning to figures 11 and 12, the mechanism 134 is shown in anti-lock and free lock conditions respectively. To engage the anti-lock condition, the dogging knob 176 is oriented such that the cammed surface 176 of the release actuator 178 does not contact the bottom flange 196 of the anti-lock plate 182. As such the return spring 180 urges the anti-lock plate 182 into the lower position as shown in figure 11. It will be noted that in this position, the operating arm cannot be lifted above the nominal position (as shown) due to the interaction between the operating arm gear 160 and the upper guides 186. As such, the superlatched condition cannot be entered.

[0051] To enter the free lock condition, the dogging knob 176 is rotated to engage the cammed surface 179 with the flange 196 and lift the anti-lock plate 182 against the bias of the return spring 180. This repositions the upper guides 186 to permit movement of the operating arm in direction L to enter the superlatched condition.

[0052] It should be noted that the failsafe condition of the anti-locking subassembly is in the anti-lock condition. That is to say that the return spring 180 naturally biases the anti-lock plate 182 into the lower position and the anti-lock plate 182 naturally falls under gravity to the lower position.

[0053] The anti lock feature therefore prevents unintentional superlatching of the door. The push bar may be able to swing up in the direction L when the door is closed vigorously which may cause problems with the secondary bolts fouling on the frame. This can be avoided with the use of the anti-lock feature in which the push bar is prevented from movement in direction L.

[0054] Variations of the above embodiment fall within

the scope of the present invention.

[0055] For example, the anti-lock feature may be positioned on the push bar or the operating arm to allow the user to simultaneously operate the anti-lock function and the push bar. It may take the form of a dead-man's handle in which it is necessary to depress a button on the push bar in order to lift it to superlatch the mechanism.

[0056] The system may be used in conjunction with an outside access device (OAD).

[0057] The secondary locking mechanism need not be on the same edge of the door as the primary locking mechanism. The secondary locking mechanism may be a shoot bolt that emerges from the top or bottom of the door.

[0058] The invention may be applied to any type of closure and may be used on e.g. windows.

5 in which the further control is configured to selectively prevent actuation of the first control to move the secondary latch from the open condition to the latched condition.

7. A panic or emergency exit device according to claim 5 or 6 in which the further control has a failsafe position in which it prevents movement of the secondary latch from the open condition to the latched condition.
8. A panic or emergency exit device according to claim 7 in which the further control is a dead man's handle on the first control.

Claims

1. An panic or emergency exit device for opening a closure,
the closure having a primary latch movable between an open condition and a latched condition and a secondary latch movable between an open condition and a latched condition,
the emergency exit device having a first control manually actuatable to move the primary latch and the secondary latch from the latched condition to the open condition, wherein;
the first control is manually actuatable to move the secondary latch from the open condition to the latched condition to supplement the primary latch.
2. A panic or emergency exit device according to claim 1, in which the first control is arranged to be moved;
in a first direction to move the primary latch and the secondary latch from the latched condition to the open condition and,
in a second direction, substantially opposite the first direction, to move the secondary latch from the open condition to the latched condition.
3. A panic or emergency exit device according to claim 2 in which the first control is rotatably mounted.
4. A panic exit device according to claim 3 in which the first control is a push bar mounted to be pushed in the first direction and lifted and / or pulled in the second direction.
5. A panic or emergency exit device according to any preceding claim further comprising a further control configured to selectively prevent movement of the secondary latch from the open condition to the latched condition.
6. A panic or emergency exit device according to claim

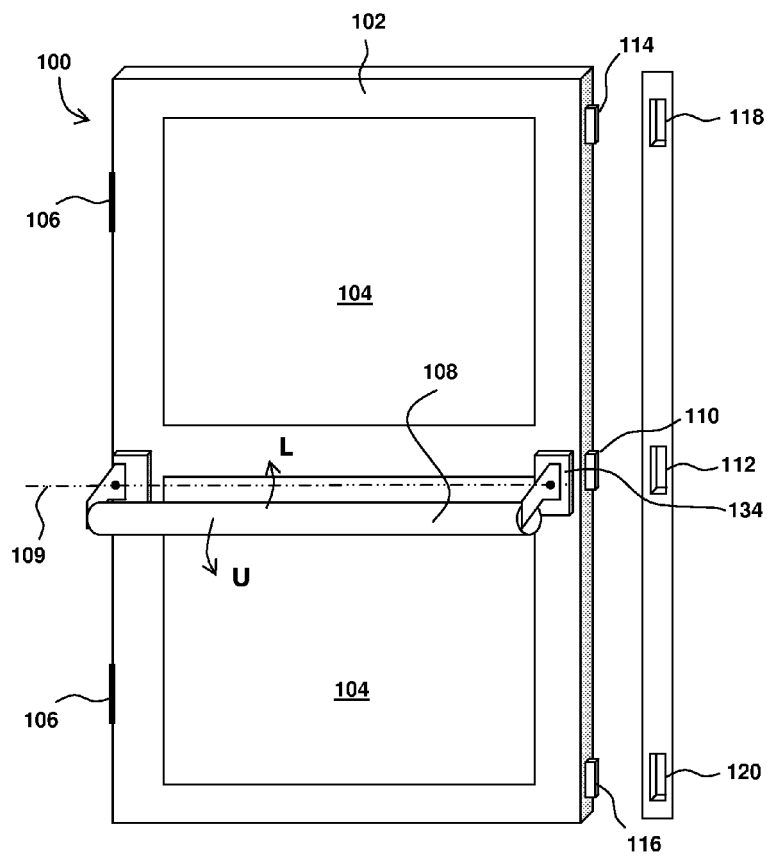


FIG. 1

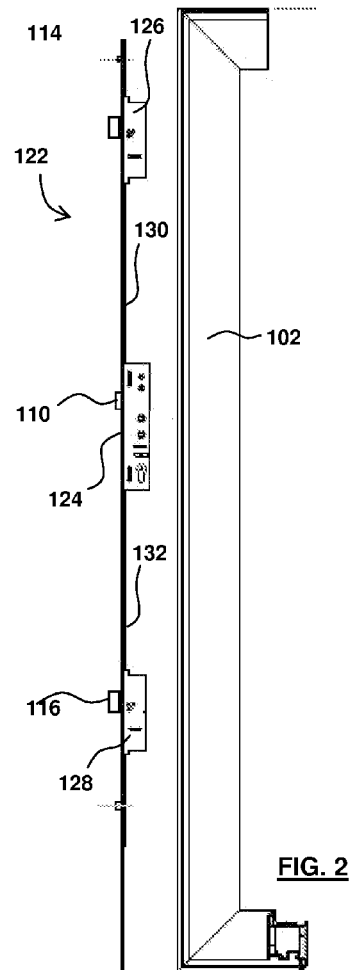
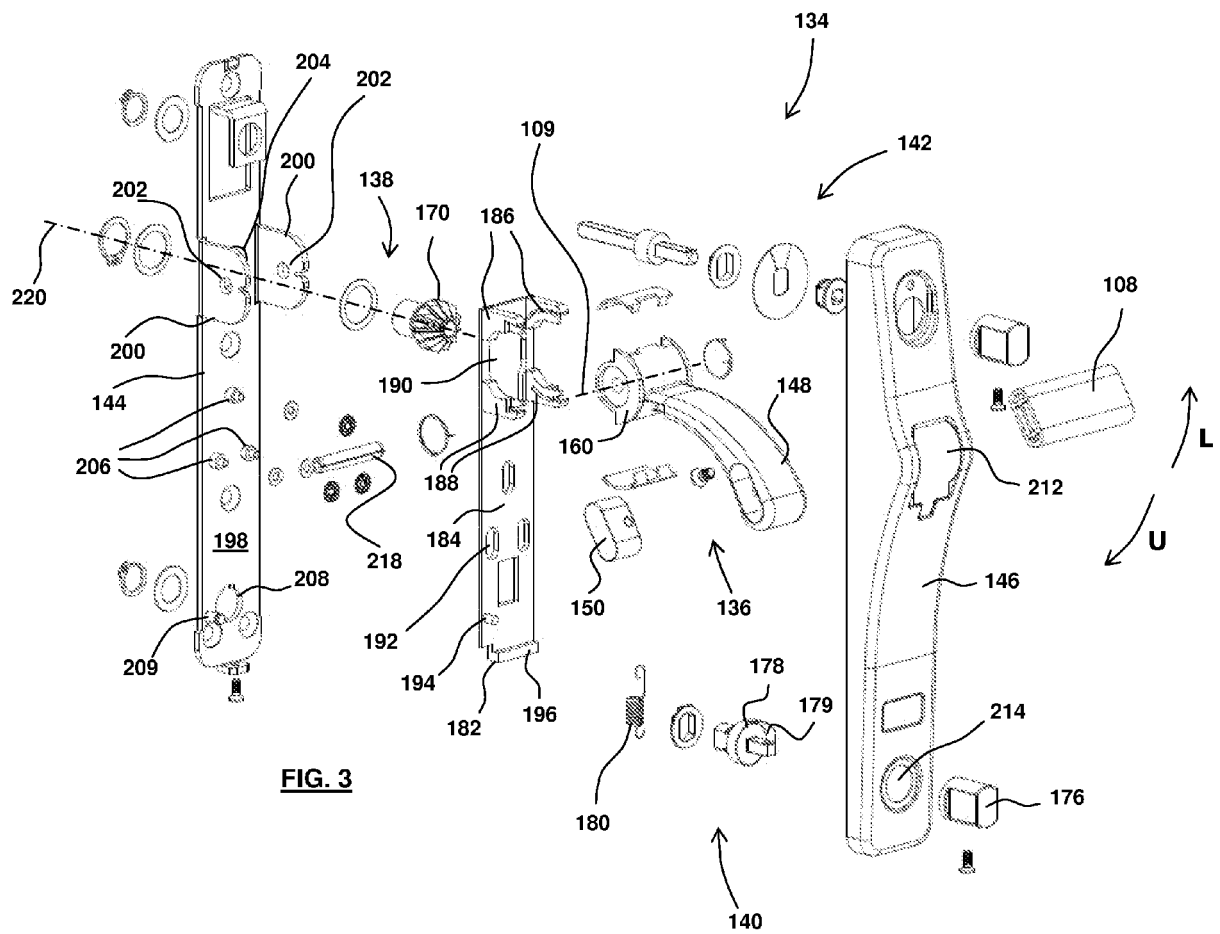
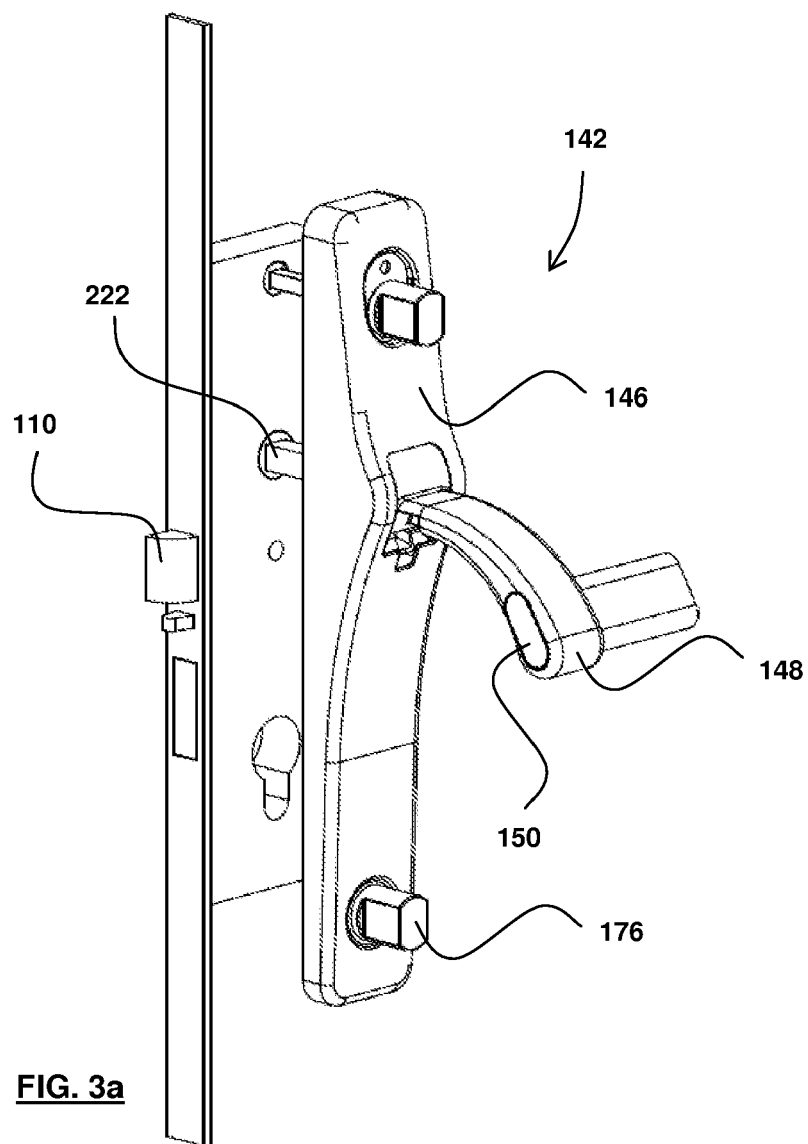


FIG. 2





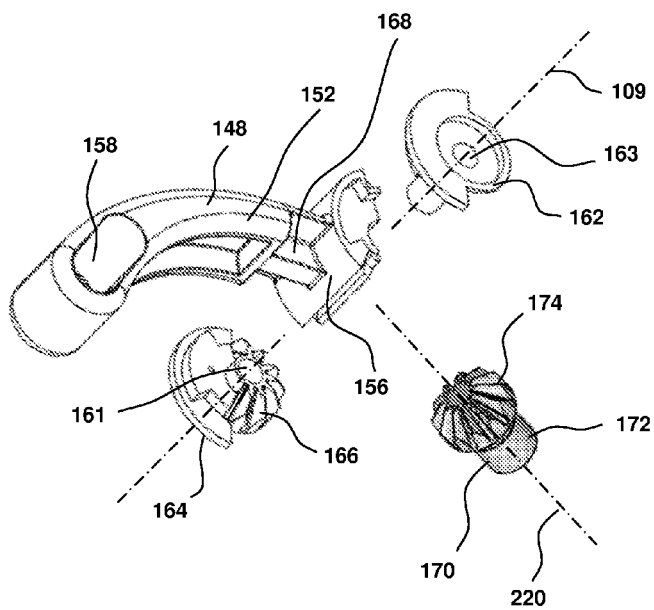


FIG. 4

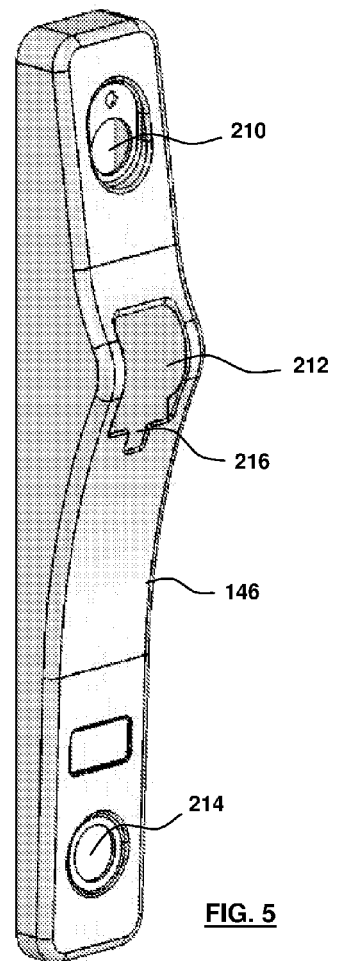
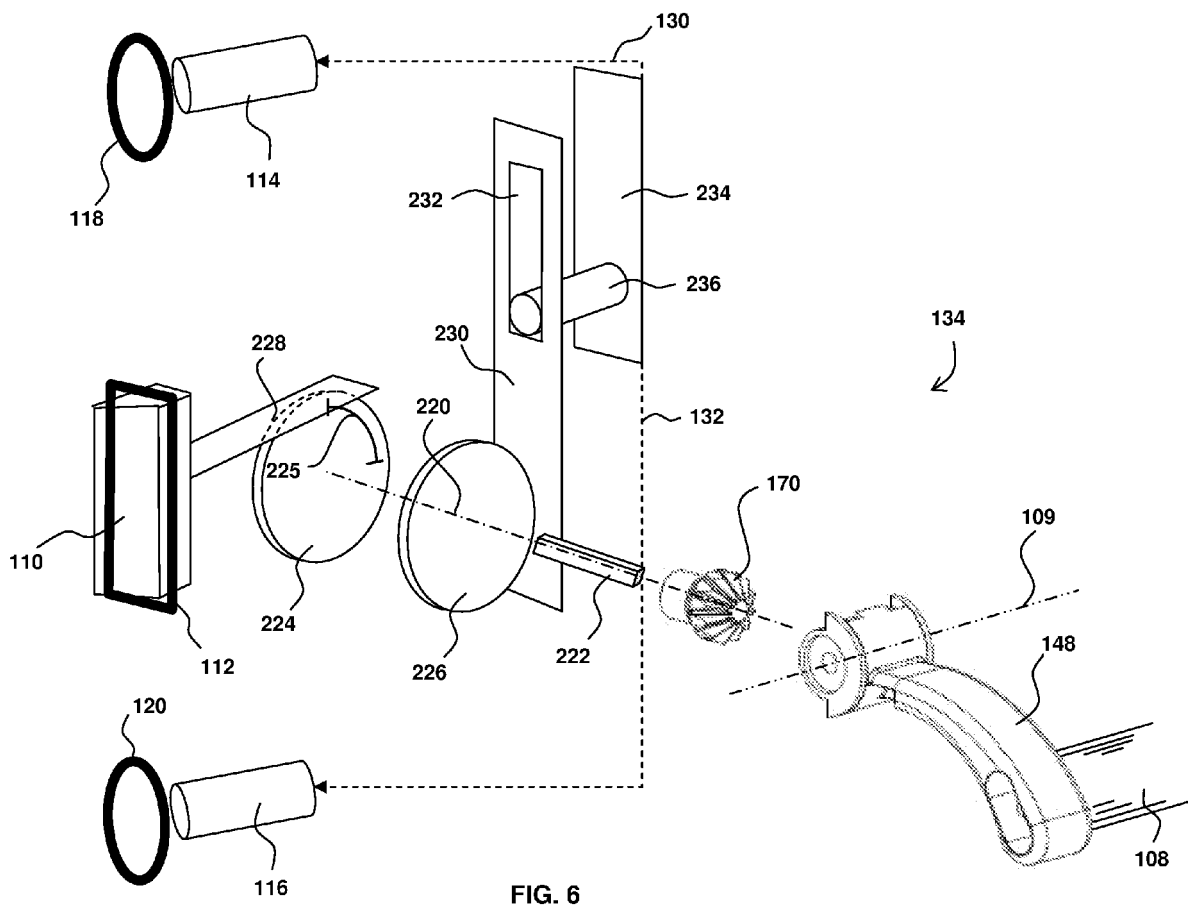
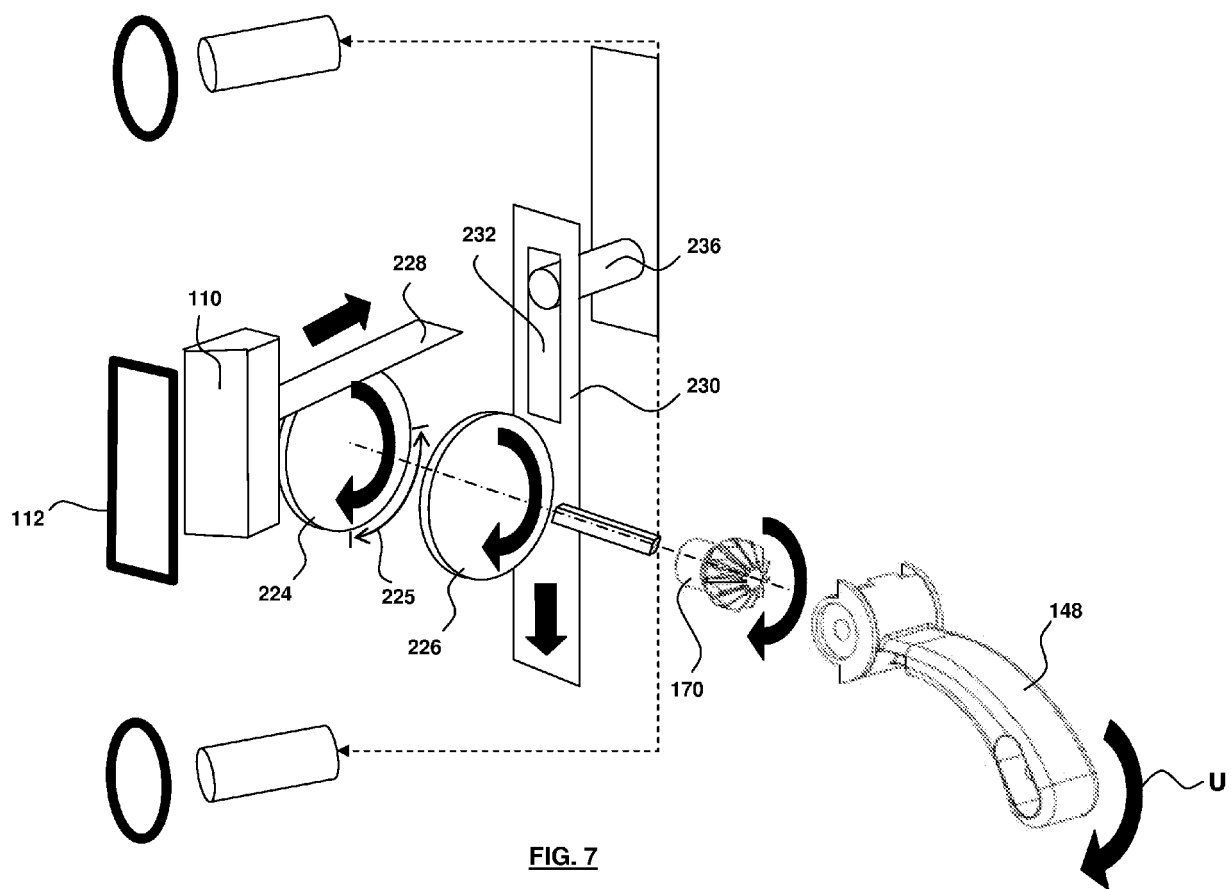


FIG. 5





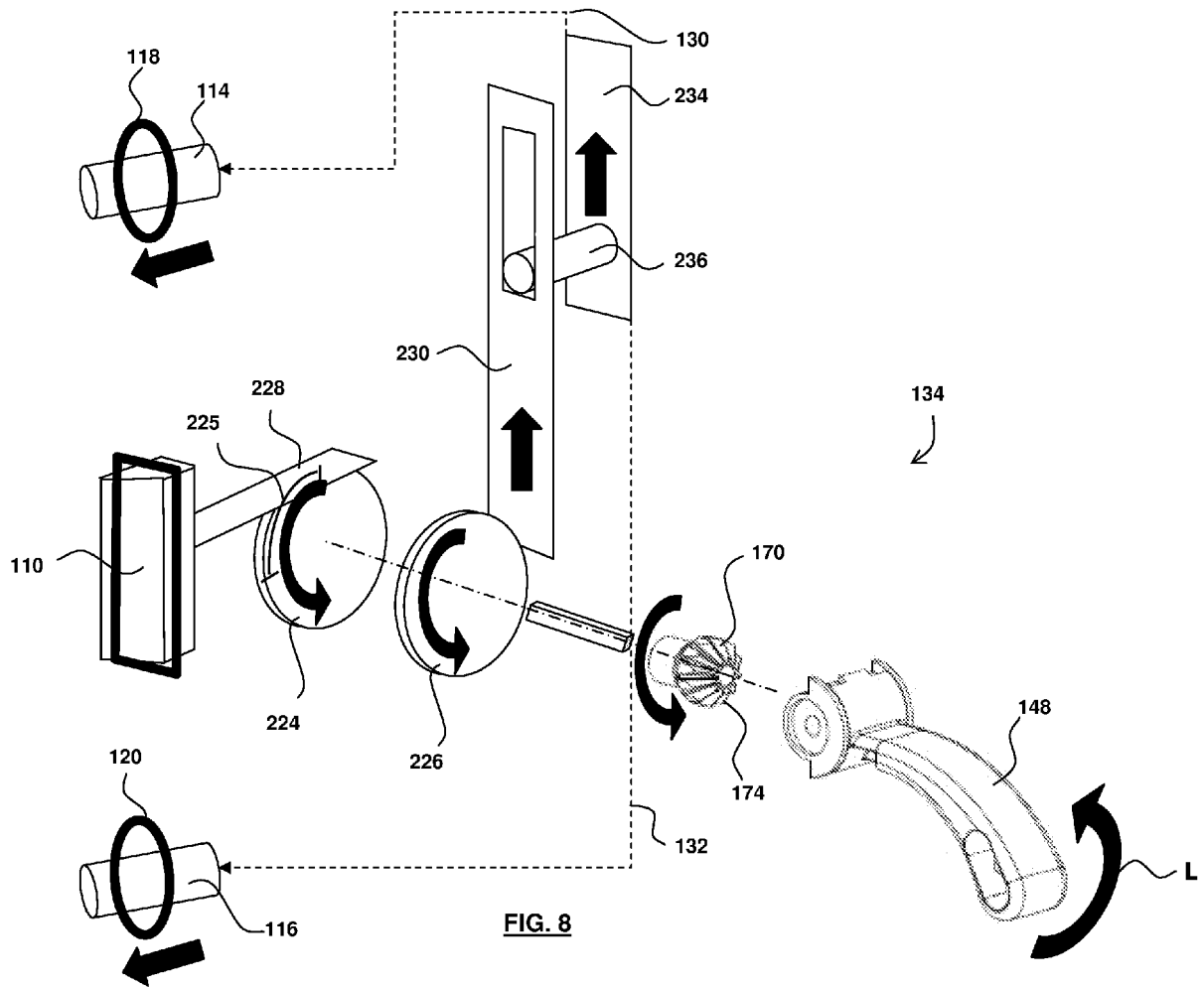
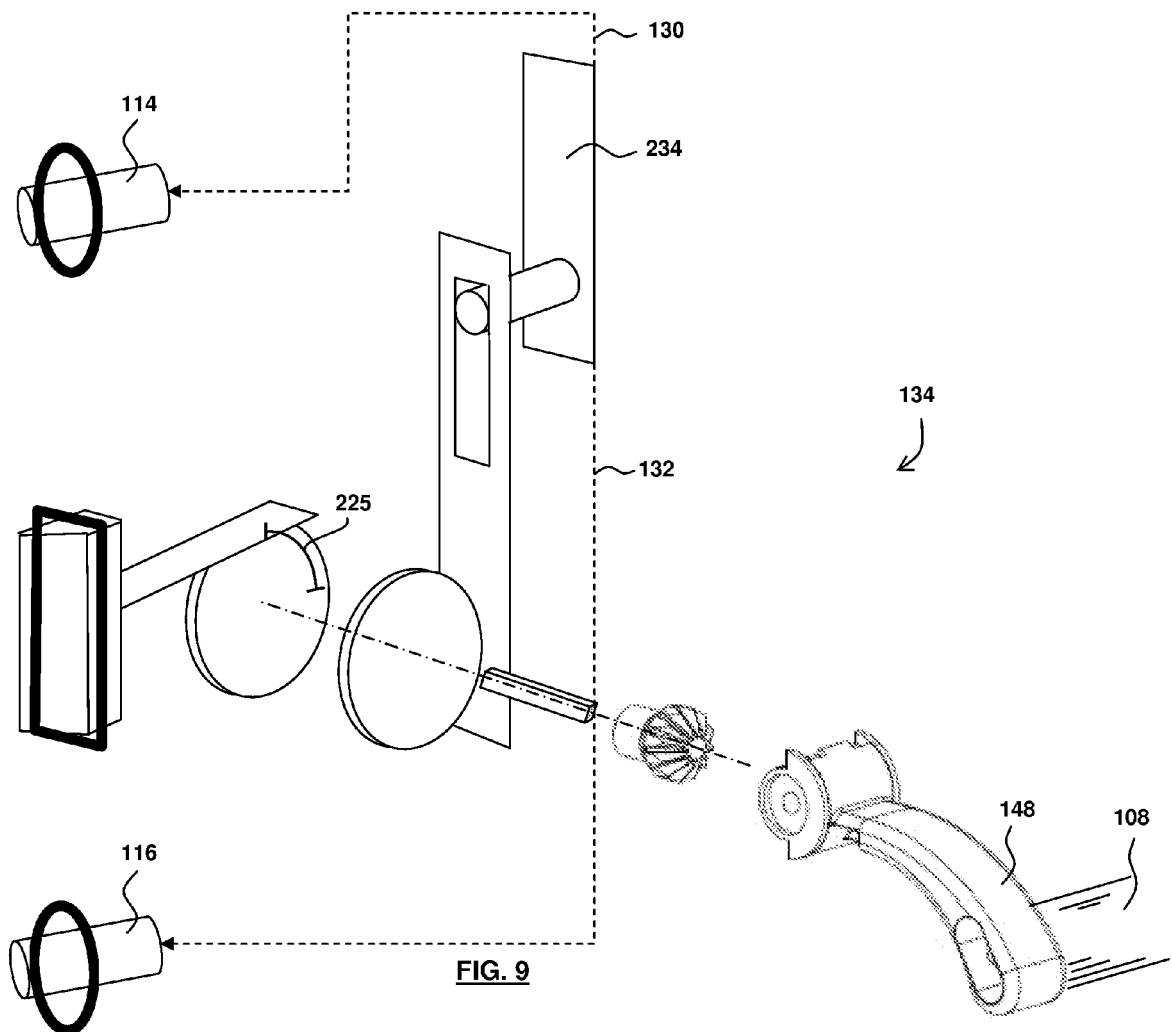


FIG. 8



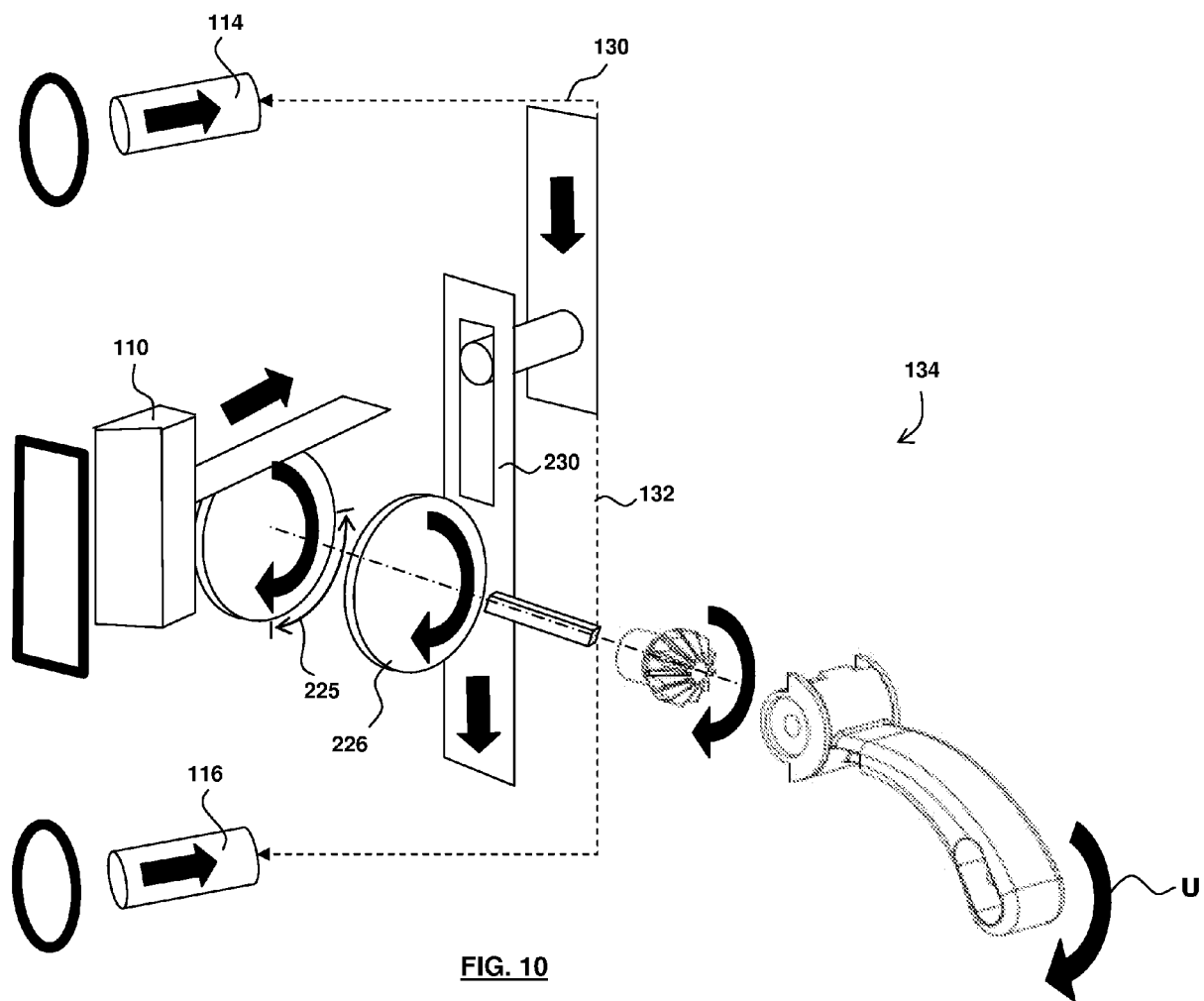


FIG. 10

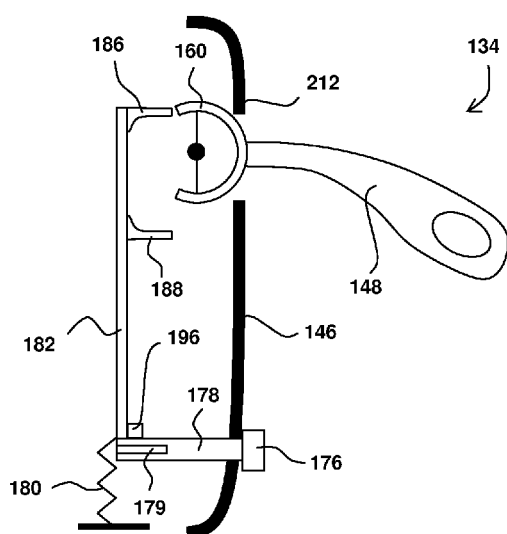


FIG. 11

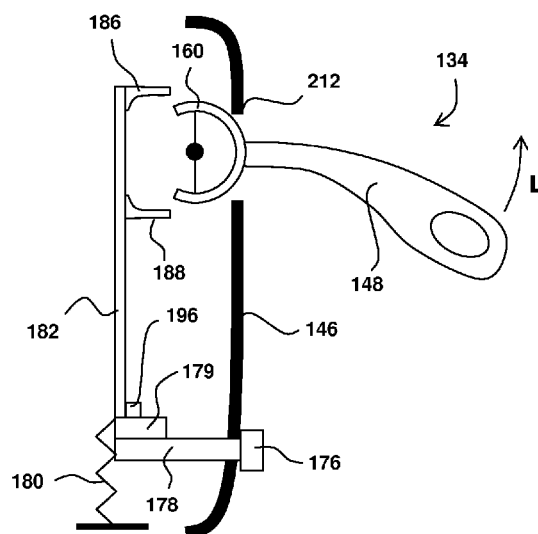


FIG. 12



EUROPEAN SEARCH REPORT

Application Number
EP 09 15 5542

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 626 143 A (FULLEX LOCKS LTD) 15 February 2006 (2006-02-15)	1-4	INV. E05B65/10
Y	* the whole document *	5-8	
Y	GB 524 602 A (EDWIN SHOWELL & SONS LTD; ALFRED JAMES BAKER) 9 August 1940 (1940-08-09) * the whole document *	5-8	
			TECHNICAL FIELDS SEARCHED (IPC)
			E05B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		24 August 2009	Cruyplant, Lieve
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

3
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 15 5542

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24-08-2009

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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