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(71) Applicant: **CENTRIX AERO, LLC** [US/US]; 1022 West Valley Hwy., Kent, WA 98032 (US).

(72) Inventor: **HERNANDEZ, Andres**; 5531 Via Dianza, Yorba Linda, CA 92887 (US).

(74) Agent: **HEYNSSENS, Paul B.**; Karr Tuttle Campbell, 701 Fifth Avenue, Suite 3300, Seattle, WA 98104 (US).

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(54) Title: DUAL PURPOSE LATCH

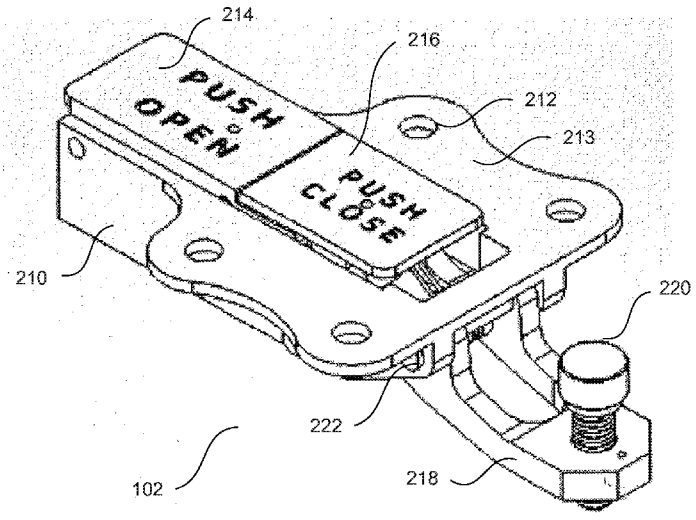

FIG. 2

(57) Abstract: A dual purpose latch is disclosed. The latch may be operated as a pressure release latch or an access panel latch. The dual purpose latch has a housing mounted to an access panel. A spring mechanism disposed within the housing is loaded against a bolt component that transmits the spring mechanism load to the bolt strike area. This strike area is normally part of the sub structure around the access panel. The access panel is hinged on the opposite side of the panel. The bolt rotates open once a predetermined load is achieved against the spring mechanism. As the load working between the spring mechanism and the bolt is high, directly manual opening of the bolt is not practical. A manual clutch release mechanism is attached to the spring mechanism that allows the bolt to rotate open by pushing a clutch trigger.

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DUAL PURPOSE LATCH

TECHNICAL FIELD

[0001] This description relates generally to latches and more specifically to latches for aircraft panels.

BACKGROUND ART

[0002] Pressure relief latches, and panel latches are often used in aircraft to vent pressure from an enclosure and to provide panel access respectively. In addition, pressure relief latches are often of a friction type that does not perform well over wide ranges of pressure.

[0003] Accordingly it may be desirable to combine pressure relief and panel release latches in a single simply constructed product that functions over a range of pressures.

DISCLOSURE OF INVENTION

[0004] The following presents a simplified summary of the disclosure in order to provide a basic understanding to the reader. This summary is not an extensive overview of the disclosure and it does not identify key/critical elements of the invention or delineate the scope of the invention. Its sole purpose is to present some concepts disclosed herein in a simplified form as a prelude to the more detailed description that is presented later.

[0005] A dual purpose latch operating as a pressure release latch, and access panel latch, is described below. The latch is primarily used in aircraft, and is of a simplified design, tending to make it economical and more reliable.

[0006] A housing mounted to an access panel that includes a spring mechanism loaded against a bolt component that transmits the spring mechanism load to the bolt

strike area/plate. This strike area is normally part of the sub structure around the access panel. The access panel is hinged on the opposite side of the panel.

[0007] The bolt rotates open once a predetermined load is achieved against the spring mechanism.

[0008] As the load working between the spring mechanism and the bolt is high, manual opening/release of the bolt is not possible. Consequently, a manual clutch release mechanism is attached to the spring mechanism that allows the bolt to rotate open by pushing a clutch trigger.

[0009] Many of the attendant features will be more readily appreciated as the same becomes better understood by reference to the following detailed description considered in connection with the accompanying drawings.

BRIEF DESCRIPTION OF DRAWINGS

[0010] The present description will be better understood from the following detailed description read in light of the accompanying drawings, wherein:

[0011] FIG. 1 shows a view of a latch attached on a pressure relief panel.

[0012] FIG. 2 shows a perspective view of a dual purpose latch in the closed position.

[0013] FIG. 3 shows a side view of a dual purpose latch with regards to the pressure relief panel in the closed position.

[0014] FIG. 4 shows a top view of a dual purpose latch in the closed position.

[0015] FIG. 5 shows a front view of a dual purpose latch in the closed position.

[0016] FIG. 6 shows a cross-sectional view of a dual purpose latch in the closed position.

[0017] FIG. 7 shows a cross-sectional view of a dual purpose latch with a clutch trigger pressed.

[0018] FIG. 8 shows a perspective view of a dual purpose latch with a clutch trigger pressed.

[0019] FIG. 9 shows a cross-sectional view of a dual purpose latch with a clutch trigger pressed and latch fully opened.

[0020] FIG. 10 shows a perspective view of a dual purpose latch with a clutch trigger pressed and latch fully opened.

[0021] FIG. 11 shows a cross-sectional view of a dual purpose latch with latch partially opened during a pressure relief event.

[0022] FIG. 12 shows a perspective view of a dual purpose latch with latch partially opened during a pressure relief event.

[0023] FIG. 13 shows a cross-sectional view of a dual purpose latch with latch fully opened during a pressure relief event.

[0024] FIG. 14 shows a perspective view of a dual purpose latch with latch fully opened during a pressure relief event.

[0025] FIG. 15 shows a perspective view of an alternative dual purpose latch in the closed position.

[0026] FIG. 16 shows a side view of the alternative dual purpose latch with regards to the pressure relief panel in the closed position.

[0027] FIG. 17 shows a cross-sectional view of the alternative dual purpose latch in the closed position.

[0028] FIG. 18 shows a side view of the alternative dual purpose latch with a clutch trigger pressed.

[0029] FIG. 19 shows a cross-sectional view of the alternative dual purpose latch with a clutch trigger pressed.

[0030] FIG. 20 shows a perspective view of the alternative dual purpose latch with a clutch trigger pressed.

[0031] FIGs. 21-23 show side, cross-sectional, and perspective views of the alternative dual purpose latch with a clutch trigger pressed and in open position.

[0032] FIGs. 24-26 show side, cross-sectional, and perspective views of the alternative dual purpose latch in full open position with a clutch trigger pressed and blade locked.

[0033] FIGs. 27-29 show side, cross-sectional, and perspective views of the alternative dual purpose latch with pressure relief load applied to swivel head.

[0034] FIGs. 30-32 show side, cross-sectional, and perspective views of the alternative dual purpose latch fully opened with a clutch trigger in closed position.

[0035] Like reference numerals are used to designate like parts in the accompanying drawing.

BEST MODE FOR CARYING OUT THE INVENTION

[0036] The detailed description provided below in connection with the appended drawings is intended as a description of the present examples and is not intended to represent the only forms in which the present example may be constructed or utilized. The description sets forth the functions of the example and the sequence of steps for constructing and operating the example. However, the same or equivalent functions and sequences may be accomplished by different examples.

[0037] The examples below describe a dual purpose latch. Although the present examples are described and illustrated herein as being implemented in an aircraft system, the system described is provided as an example and not a limitation. As those skilled in the art will appreciate, the present examples are suitable for application in a variety of different types of panel systems having latches.

[0038] Furthermore, it shall also be noted that the terms “coupled” or “coupling” shall be understood to include direct mechanical connections, indirect mechanical connections through one or more intermediary components, such that a mechanical force, a toque or a movement can be transmitted or transferred from one component to other component(s), no matter whether there are intermediary components.

[0039] The present example provides a dual purpose pressure relief and panel access latch that is of a simple cost effective and when used as a pressure relief latch functions over a wide range of pressures.

[0040] Separate pressure relief latches have been in play for some time on aircraft to prevent unexpected pressure increases in the main fuselage or engine nacelles to destroy sections of the aircraft. This is accomplished by installing these pressure relief latches in pressure relief panels that are mounted in critical areas of the aircraft. These pressure relief panels include a hinge area, and a securing area in the opposite edge section of the pressure relief panel where Pressure relief latches are mounted.

[0041] Additionally, aircraft's fuselages and/or engine nacelles utilize access panels for maintenance, avionics access, etc. These access panels are mounted in a similar fashion as the pressure relief panels, with the securing function being provided by simple button or other kinds of simple latches.

[0042] As the above described mechanism serve very different functions, they are normally installed in different panels. The exemplary design is a combination of these two functions into one mechanism.

[0043] A housing mounted to an access panel includes a spring mechanism loaded against a bolt component that transmits the spring mechanism load to the bolt strike area/plate. This strike area is normally part of the sub structure around the access panel. The access panel is hinged on the opposite side of the panel.

[0044] The bolt rotates open once a predetermined load is achieved against the spring mechanism. As the load working between the spring mechanism and the bolt is high, manual opening/release of the bolt is not desirable. Consequently, a manual release mechanism is attached to the spring mechanism that allows the bolt to rotate open by pushing a trigger.

[0045] Different approaches may have been taken to this dual purpose device. Most are evolutions of existing Pressure Relief latch technology, where a de-clutching

mechanism has been added to the back of the existing unit, making the unit significantly heavy and sensitive to vibration damage. Additionally, most of the existing pressure relief technology is based on strong friction between springs and rollers. This has the undesirable consequence of large release load tolerances, which, in consequence, forces the surrounding substructure to accommodate the maximum release load. This adds undesirable weight to the substructure.

[0046] Other approaches have reduced the release load tolerances by utilizing over center as well to achieve release load, but it is complex in the way the mechanism transmits this release load. Also, these mechanism are quite complex in their declutching functionality to allow access to the panel latch function. This unit achieves all functionalities of both latch types with a reduced number of components, and a simplified de-clutching mechanism.

[0047] FIG. 1 shows a typical application of a pressure relief, or panel access latch 102. A pressure relief panel or access panel 101 may be included in an airframe (not shown). The panel 101 may include a latch 102 mounted therein. The Panel 101 also includes a hinge or its equivalent 103 coupling the panel 101 to the airframe (not shown). In the securing area 105 the latch 102 typically engages the aircraft fuselage in a strike area 104. The latch comprises a spring mechanism loaded against a bolt component that transmits the spring mechanism load to the bolt strike area/plate. The access panel 101 is hinged on the opposite side of the panel. The latch 102 may be opened either manually or when a predetermined load is achieved against the spring mechanism. The details of the latch structure and operation mechanism are described below in Figs. 2-14.

[0048] Figures 2-6 show various views of the dual purpose latch in a closed position. Specifically, FIG. 2 shows a perspective view of the dual purpose latch; FIG. 3 shows a side view of the dual purpose latch with regards to the pressure relief panel in the closed position; FIG. 4 shows a top view of the dual purpose latch; FIG. 5 shows a

front view of the dual purpose latch; and FIG. 6 shows a cross-sectional view of a dual purpose latch.

[0049] As shown in Figures 2-6, the latch 102 comprises a housing 210 and a bolt 218 pivotably mounted to the housing 210 around a bolt pivot 222. The housing 210 has a flange 213 with mounting holes 212 so that the housing 210 may be mounted to an access panel 101.

[0050] In some embodiments, a panel contact 220 is attached to a distal end of the bolt 218 via an adjustable screw 219. The panel contact 220 touches the secure area 105 when the latch 102 is in the close position. Furthermore, the panel contact 220 is pushed against the area 105 by a spring mechanism to prevent the access panel/pressure release panel 101 being accidently open under normal pressure in cowls for aircraft engines. The height of the panel contact 220 is adjustable by rotating the adjustable screw 219 to accommodate gap distance variation between the bolt and the secure area 105. In some embodiments, the panel contact 220 is a swivel head, which enables a rotatable motion freedom (swivel motion) of the panel contact to ensure proper contact against the secure area 105 during the opening process of the latch.

[0051] In some embodiments, a clutch trigger 214 and a manual release panel 216 are mounted to the housing 210 of the latch 102. The manual release panel 216 is rigidly attached to the bolt 218 such that when the clutch may be opened by pivotably moving or pulling the manual release panel 216 around the bolt pivot 222. In some embodiments, the clutch trigger 214 and the manual release panel 216 are close to each other. Such layout makes it difficult to manually pull manual release panel 216 without pressing the clutch trigger 214 first, thus providing an additional protection to prevent the latch being opened accidently.

[0052] In some embodiments, the clutch trigger 214 is pivotably connected to one end of a clutch link 254. A clutch roller 256 is attached to the opposite end of the clutch link 254. In some embodiments, the latch 102 also comprise a load link 244 with its proximal end pivotably attached to the bolt 218 around a first load link pivot 240. A

second load link pivot 246 is attached to a distal end of the load link 244. When the clutch is in closed position, the second load link pivot 246 contacts the clutch roller 256 firmly by a spring mechanism. The second load link pivot 246 enables a rotary movement when the clutch link 254 is pushed or pulled by the clutch trigger 214. The pivot-roller contact layout has an advantage of movement of the clutch link 254 with minimum effort. Besides rotary movement, the second load link pivot 246 is also slidable in a load groove 248 in response to rotational movement of the bolt 218 around the bolt pivot 222 between a deployed position and a retracted position. The deployed and retracted positions of the bolt 218 are corresponding to the closed and open positions of the latch 102 respectively.

[0053] In some embodiments, the housing 210 of the latch 102 has an opening 238 to fit in a load spring 232 and a load spring screw 236. The load spring 232 is disposed between the load spring screw 236 and an interface cap 234, which is slidably confined with the opening 238. The load spring screw 236 is threadably attached to the housing 210 such that the load spring 232 may be pre-tensioned at a predetermined force by threadably adjusting the load spring screw 236 to a desired position. The predetermined force may be chosen according to the maximum allowed pressure of the pressure release panel 101.

[0054] Although a coil spring is shown in Fig. 6, one of ordinary skill in the art may understand that various other configurations, such as a gas cylinder, may also be used as a load spring. Furthermore, although the coil spring is compressed when the latch is in the close position, one with ordinary skill in the art may understand the spring may be configured in a stretched by reversely configuring the load spring screw and the interface cap. Such modifications may be implemented within the scope of this invention.

[0055] When the latch 102 is in the closed position, the load spring 232 pushes the interface cap 234, which passes the force to the clutch roller 256 and the second load link pivot 246. In some embodiments, when the latch 102 is in the closed position,

the load link 244 is directionally positioned such that the push force (or spring load) transferred to the load link 244 is applied along an axis 270 below the bolt pivot 222. As a result, the panel contact 220 is pushed to contact the secure area 105 firmly and the latch 102 stays in the closed position.

[0056] In some embodiments, a bolt spring 242 is attached to the first load link pivot 240. The bolt spring 242 may be a torsion spring engaged between the manual release panel 216 and the load link 244. When the latch 102 is in a close position (or the manual release panel 216 is closed), the bolt spring 242 is compressed. Such configuration enables fast clutch opening movement, either manually or due to over pressure within the pressure release panel. Typically, the bolt spring 242 has a much smaller spring constant than the load spring, such that the compressed bolt spring won't affect the clutch operation as a pressure release latch.

[0057] Typically, when the clutch is in the closed position, the spring load of the load spring is high, direct manual opening/release of the bolt using the manual release panel 216 is not desirable or easily accessible (due to narrow gap between the manual release panel 216 and the clutch trigger 214 in the close position). The manual clutch release mechanism is functioned to open the bolt manually and easily after the clutch trigger 214 being pressed, such that the latch 102 may also be used as a regular access latch. The details of the manual clutch release mechanism are described with respect to Fig. 7-10.

[0058] Figures 7-10 show various views of the dual purpose latch operating as an access latch. Specifically, FIG. 7 shows a cross-sectional view of the dual purpose latch when the clutch trigger 214 is pressed; FIG. 8 shows a perspective view of the dual purpose latch when the clutch trigger 214 is pressed; FIG. 9 shows a cross-sectional view of the dual purpose latch being fully opened with the clutch trigger 214 pressed; and FIG. 10 shows a perspective view of the dual purpose latch being fully opened with the clutch trigger 214 pressed.

[0059] When the clutch trigger 214 is pressed downward manually, the attached clutch link 254 also moves downward to push the clutch roller 256 away from contact with the second load link pivot 246. As mentioned above, the configuration of roller-pivot contact makes it easy to allow downward movement of the clutch roller 256, even though the clutch roller 256 and the second load link pivot 246 are compressed against each other by the load spring 232. In some embodiments, the second load link pivot 246 is larger than the clutch link 254 in geometry. Therefore, when the clutch roller 256 is pushed away, the second load link pivot 246 mechanical disengages or decouples from the load spring 232 and is therefore free from the load spring compression. Furthermore, when the clutch trigger 214 is pressed downward, the gap between the clutch trigger 214 and the manual release panel 216 is enlarged to allow manual access of the manual release panel 216. Since the bolt spring 242 is compressed in the closed position, the bolt spring 242 also exert a general upward force to the manual release panel 216 to facilitate the opening movement of the manual release panel 216. With the enlarged gap and help of the bolt spring 242, the manual release panel 216 may be easily opened with minimum effort to a fully open position, as shown in Fig. 9 and Fig. 10.

[0060] In some embodiments, the clutch trigger 214 has a marker on the surface to label a preferred position to press. In some embodiments, the clutch trigger 214 is attached to the clutch housing 210 around a clutch trigger pivot 252. The clutch trigger pivot 252 may also be biased to a close position by a torsion spring such that the latch 102 will be not opened accidently. In some embodiments, the clutch trigger 214 incorporates a clutch groove 258, which is used together with a bulge 259 disposed on the housing 210 to define allowable movement range of the clutch trigger 214. Although the trigger clutch is pressed as shown in Figures 7-10, one of ordinary skill in the art may understand that the trigger clutch may also be activated by pulling instead of pressing to disengage the bolt from the load spring with proper mechanical configurations.

[0061] Preferably, the latch 102 may be closed from an opening state in a certain order. When closing the latch 102, the clutch trigger 214 needs to be released back to the close position (the biased or default position) first, the manual release panel 216 is then pressed to compress the load spring and pivotably move the bolt into the closed position. If the manual release panel 216 is pressed to be in the close position, it would be very difficult, if not possible, to release the clutch trigger 214 back to the close position.

[0062] Figures 11-14 show various views of the dual purpose latch operating as a pressure release latch. Specifically, FIG. 11 shows a cross-sectional view of the dual purpose latch when the load spring is compressed under excessive pressure; FIG. 12 shows a perspective view of the dual purpose latch when the when the load spring is compressed under excessive pressure; FIG. 13 shows a cross-sectional view of the dual purpose latch being fully opened during a pressure relief event; and FIG. 14 shows a perspective view of the dual purpose latch being fully opened during a pressure relief event.

[0063] When excessive pressure is built up within the aircraft's fuselages and/or engine nacelles, the panel contact 220 is pushed against to the secure area 105 with excessive force. Reciprocally, the secure area 105 pushes the panel contact 220 back with the counterforce (see Fig. 3 for reference). The counterforce is transferred to the bolt 218 and through the bolt 218 to the load link 244 as well as the clutch roller 256. The clutch roller 256 pushes the interface cap 234 to further compress the load spring 232.

[0064] As the load spring 232 is compressed further due to excessive pressure buildup, the second load link pivot slidably moves in the load groove 248 further toward the load spring 232, the load link 244 gradually changes it direction until the axis 270 is beyond the bolt pivot 222, at which the counter force from the load spring (due to the compression of the spring) to the load link 244 is applied to open the bolt (instead of close the bolt). The bolt 218 is therefore opened quickly to release the excessive

pressure. The compression pressure toward the load spring when the axis 270 of the load link 244 reaches the load pivot 222 is corresponding to the maximum tolerable pressure of the latch 102. When the inner pressure within the aircraft's fuselages and/or engine nacelles is less than the maximum pressure, the latch may still function to remain a close position. Once the inner pressure within the aircraft's fuselages and/or engine nacelles is above the maximum pressure, the latch may be opened quickly, thanks for the configuration of the variable axis direction of the load link 244.

[0065] Different approaches have been taken to these Dual Purpose devices. Most are evolutions of existing Pressure Relief latch technology, where a de-clutching mechanism has been added to the back of the existing unit, making the unit significantly heavy and sensitive to vibration damage. Additionally, most of the existing pressure relief technology is based on strong friction between springs and rollers. This has the undesirable consequence of large release load tolerances, which, in consequence, forces the surrounding substructure to accommodate the maximum release load. This adds undesirable weight to the substructure.

[0066] The dual purpose latch described in Figs. 2-14 has achieved reduced release load tolerances: it utilizes over center as well to achieve release load, but it is complex in the way the mechanism transmits this release load. Also, the mechanism is quite complex in its de-clutching functionality to allow access panel function.

[0067] In general, all the exemplary embodiments disclosed above include a mechanism that works with the pressure relief load in a ratio that is close to 1:1. This means, load applied at the strike point of the pivoting bolt is very similar to the load that needs to be de-composed within the latch mechanism to create the load control mechanism. The consequence of this is that for higher pressure relief loads, higher loads needs to be dealt with internally with the additional consequences that this has: larger spring, then change in mechanism load plane, then increase size of all components. This means larger and heavier mechanisms, with potentially larger release load windows.

[0068] FIG. 15 shows a perspective view of an alternative dual purpose latch 302 for high release load. The dual purpose latch 302 may be installed in an access panel 101 (similar to the dual purpose latch 102 shown in Fig. 1 and Fig. 3). The alternative dual purpose latch 302 is in a close position as shown in Fig. 15. FIG. 16 shows a side view of the alternative dual purpose latch with regards to the pressure relief panel in the closed position. FIG. 17 shows a cross-sectional view of the alternative dual purpose latch in the closed position.

[0069] As shown in Figures 15-17, the latch 302 comprises a latch housing 310 and a bolt 318 pivotably mounted to the housing 310 around a bolt pivot 322. The housing 310 has a flange 313 with mounting holes 312 so that the housing 310 may be mounted to an access panel 101 (not shown in Figs. 15-17).

[0070] A panel contact 320 (such as a swivel head) is attached to a distal end of the bolt 318 via an adjustable screw 319. The panel contact 320 touches the secure area 105 (not shown in Figs. 15-17) when the latch 302 is in the close position. Furthermore, the panel contact 320 is pushed against the area 105 by a spring mechanism to prevent the access panel/pressure release panel 101 being accidently open under normal pressure in cowls for aircraft engines. The height of the panel contact 320 is adjustable by rotating the adjustable screw 319 to accommodate gap distance variation between the bolt and the secure area 305. In some embodiments, the panel contact 320 is a swivel head, which enables a rotatable motion freedom (swivel motion) of the panel contact to ensure proper contact against the secure area 105 during the opening process of the latch.

[0071] A clutch trigger 314 and a manual release panel 316 are mounted to the housing 310 of the latch 302. The manual release panel 316 is rigidly attached to the bolt 318 such that when the clutch may be opened by pivotably moving or pulling the manual release panel 316 around the bolt pivot 322. In some embodiments, the clutch trigger 314 is positioned within the manual release panel 316, as shown in Figs. 15-17.

Such configuration may be advantageous to prevent the clutch trigger 314 to be pressed accidently.

[0072] In some embodiments, the housing 310 of the latch 302 has an opening 338 to fit in a load spring 332 and a load spring screw 336. The load spring 332 is disposed between the load spring screw 336 and an interface cap 334, which is slidably confined with the opening 338. A cap roller 356 is attached to the interface cap 334. The load spring screw 336 is threadably attached to the housing 310 such that the load spring 332 may be pre-tensioned at a predetermined force by threadably adjusting the load spring screw 336 to a desired position. The predetermined force may be chosen according to the maximum allowed pressure of the pressure release panel 101. Different from the latch 102 shown in Figs. 2-14, the latch 302 is configured to position the load spring screw 336 facing the bolt 318 and position the slidable interface cap 334 away from the bolt 318.

[0073] Although a coil spring is shown in Fig. 17, one of ordinary skill in the art may understand that various other configurations, such as a gas cylinder, may also be used as a load spring. Furthermore, although the coil spring is compressed when the latch is in the close position, one with ordinary skill in the art may understand the spring may be configured in a stretched by reversely configuring the load spring screw and the interface cap. Such modifications may be implemented within the scope of this invention.

[0074] In some embodiments, the clutch trigger 314 is pivotably mounted to a trigger housing 315 at a trigger pin 352 and a trigger spring 353 may attached to the trigger pin 352 to bias the clutch trigger 314 toward a closed position. A blade (or a trigger arm) 344 is pivotably mounted to the clutch trigger 314 at a blade pin 342 and a blade spring 343 may attached to the blade pin 342 to bias the blade 344 toward an extended position, which will be discussed later. In some embodiments, the trigger housing 315 may be integrated with the manual release panel 316.

[0075] The blade 344 has a barbed end 345, which may extend out of the trigger housing 315 when the clutch trigger 314 is pressed. Once the barbed end 345 extends out, the recompressed blade spring 343 and the trigger spring 353, in combination, cause the barbed end 345 engaged firmly to a trigger housing surface 317 to keep the blade locked. The blade spring 343 biases the barbed end 345 toward the trigger housing surface 317 and the trigger spring 353 exerts a bias force to squeeze the barbed end 345 and the trigger housing surface 317 together.

[0076] A contact roller 346 is slidably confined within a groove 347 disposed on the trigger housing 315. When the clutch trigger 314 is in the closed position, the load spring 332 pushes the interface cap 334, which passes the force to the cap roller 356. When the latch 302 is in the closed position, the contact roller 346 is in firm contact with the cap roller 356 such that the push force (or spring load) from transferred to the contact roller 346 via the cap roller 356. The contact roller 346 then pushes the barbed end 345 firmly against the trigger housing 315. Furthermore, when the clutch 302 is closed, the cap roller 356 is positioned to prevent the cap roller 356 from pivotable opening movement around the bolt pivot 322. As a result, the latch 302 stays in the closed position.

[0077] In some embodiments, a bolt spring 323 is attached to the bolt pivot 322. The bolt spring 323 may be a torsion spring engaged between the flange 313 of the latch housing 310 and a bolt spring pin 324 place on the bolt 318. When the latch 302 is in a close position (or the manual release panel 316 is closed), the bolt spring 323 is compressed. Such configuration enables fast clutch opening movement, either manually or due to over pressure within the pressure release panel. Typically, the bolt spring 323 has a much smaller spring constant than the load spring 332, such that the compressed bolt spring won't affect the clutch operation as a pressure release latch.

[0078] Typically, when the clutch is in the closed position, the spring load of the load spring 332 is high; direct manual opening/release of the bolt 318 using the manual release panel 316 is not desirable or easily achievable. The manual clutch release

mechanism is functioned to open the bolt manually and easily after the clutch trigger 314 being pressed, such that the latch 302 may also be used as a regular access latch. The details of the manual clutch release mechanism are described with respect to Fig. 18-20.

[0079] FIGs. 18-20 show a side view, a cross-sectional view, and a perspective view of the alternative dual purpose latch with a clutch trigger pressed respectively. As shown the figures, when the clutch trigger 314 is pressed, the blade 344 moves downward and cause the barbed end 345 extended out of the trigger housing 315. Since the barbed end 345 is largest area in size of the blade 344, once the barbed end 345 extends out, the contact roller 346 may slide within the groove 347 away from contact with the cap roller 356 such that the cap roller 365 no longer prevents pivotable open movement of the contact roller 346.

[0080] In some embodiments, the latch housing 310 has a trigger groove 311 disposed in a position to receive the barbed end 345 when the clutch trigger 314 is pressed. Such a configuration may be advantageous to make the whole dual purpose latch 302 tight in packaging and in assembly.

[0081] FIGs. 21-23 show side, cross-sectional, and perspective views of the alternative dual purpose latch with a clutch trigger pressed and in open position. FIGs. 24-26 show side, cross-sectional, and perspective views of the alternative dual purpose latch in full open position with a clutch trigger pressed and blade locked.

[0082] Once the groove 347 slides away from contact with the cap roller 356, the recompressed bolt spring 323 helps to pop-up the manual release panel 316 and the trigger housing 315. Furthermore, once the barbed end 345 extends out, the recompressed blade spring 343 and the trigger spring 353, in combination, cause the barbed end 345 engaged firmly to a trigger housing surface 317 to keep the blade locked.

[0083] FIGs. 27-29 show side, cross-sectional, and perspective views of the alternative dual purpose latch with pressure relief load applied to swivel head. FIGs. 30-

32 shows side, cross-sectional, and perspective views of the alternative dual purpose latch fully opened with a clutch trigger in closed position.

[0084] When excessive pressure is built up within the aircraft's fuselages and/or engine nacelles, the panel contact 220 is pushed against to the secure area 105 with excessive force. Reciprocally, the secure area 105 pushes the panel contact 320 back with the counterforce (see Fig. 3 for reference). The counterforce is transferred to the bolt 318 and through the bolt 318 to the contact roller 346 as well as the cap roller 356. The cap roller 356 pushes the interface cap 334 to further compress the load spring 332.

[0085] As the interface cap 334 (and the cap roller 356) moves toward the load spring screw 336, the manual release panel 316 and the trigger housing 315 are pivotably opened gradually to a position wherein the contact roller 346 and the cap roller are aligned to an axis 360 of the load spring 332, at which the load spring 332 is compressed the most and a maximum pressure load of the latch 302is reached. When the inner pressure within the aircraft's fuselages and/or engine nacelles is less than the maximum pressure, the latch 302 may still function to close after the pressure is gone. Once the inner pressure within the aircraft's fuselages and/or engine nacelles is above the maximum pressure, the latch may be opened quickly. The roller-roller contact configuration also ensures that the latch 302 may be quickly opened once a pressure above the maximum pressure load is reached.

[0086] Although the dual purpose latch is described in the exemplary embodiments as shown in Figs. 2-32, one of the ordinary skill in the art may understand that the dual purpose latch may be used as a pressure relief latch only without the some components, such as clutch trigger, the clutch link and the clutch roller, etc. The configuration of the variable axis direction of the load link would still provide an advantage to quick release excessive pressure within the aircraft's fuselages and/or engine nacelles, or any other space subject to high pressure buildup.

[0087] Those skilled in the art will realize that the dual purpose latch can be constructed with various configurations. For example a dual purpose latch may comprise different combination of components other than disclosed in the aforementioned embodiments. Those skilled in the art will also realize that a dual purpose latch may further incorporate different components. The foregoing description of the invention has been described for purposes of clarity and understanding. Various modifications may be implemented within the scope and equivalence of the appended claims.

CLAIMS

1. A latch comprising:

a housing;

a bolt pivotably attached to the housing, the bolt pivotable moving around a bolt pivot between a closed position and an open position;

a load spring disposed within the housing, the spring transmitting a spring load to the bolt when the bolt is in a closed position; and

a clutch trigger attached to the housing, when the clutch trigger is activated, the clutch trigger is configured to allow manual rotation of the bolt from the closed position to the open position by mechanically disengaging the bolt from the spring load.

2. The latch of claim 1 further comprising:

a load link having a proximal end pivotably attached to the bolt around a first load link pivot, the spring load from the load spring is transmitted to the bolt through the load link.

3. The latch of claim 2 wherein the load link is directionally positioned such that the spring load transferred to the load link is applied to the bolt along an axis direction, when the bolt is in the closed position, the axis direction is such orientated such that the spring load applied to the bolt keeps the bolt closed.

4. The latch of claim 3 wherein when external force from pressure buildup is applied to bolt, the bolt starts pivotable movement against the spring load from the load spring through the load link and changes the axis direction of the load link.

6. The latch of claim 1 wherein when the axis direction of the load link is beyond the bolt pivot, the bolt is opened.

6. The latch of claim 1 further comprising a bolt spring attached to the first load link pivot to facilitate opening movement of the bolt, the bolt spring has a spring constant less than the load spring.

7. The latch of claim 5 wherein the bolt spring is compressed when the bolt is in the closed position.

8. The latch of claim 2 further comprising:

a clutch roller mechanically coupled to the clutch trigger via a clutch link; and

a second load link pivot attached to a distal end of the load link, the clutch roller and the second load link pivot are compressed against each other by the spring load when the bolt is in the closed position.

9. The latch of claim 8 wherein when the clutch trigger is activated, the clutch roller moves out of contact from the second load link pivot, thus mechanically disengages the bolt from the spring load.

10. The latch of claim 1 further comprising a load spring screw attached to the housing to confine the load spring, the load spring screw is threadably adjustable to apply a predetermined spring load of the load spring.

11. A pressure relief latch comprising:

a housing attached to an access panel;

a bolt pivotably attached to the housing for pivotable movement around a bolt pivot between a closed position and an open position, wherein the bolt engages a secure area in the closed position;

a load link pivotably attached to the bolt around a first load link pivot; and

a spring mechanism disposed within the housing and confined between a screw and an interface cap sildably disposed within the housing, the interface cap mechanically coupled to the load link, the spring mechanism having a predetermined spring load when the bolt is in a closed position, the spring load from the spring mechanism transmitted to the bolt through the interface cap and load link;

wherein when a force is applied to the bolt due to internal pressure buildup, the bolt pivotably moves and forces the load link to push the spring mechanism and causes interface cap sliding further away from the load link, the load link pivotably also moves around the first load link pivot as the bolt pivotably moves, the latch is opened when the load link pivotably moves to a position with an axis direction beyond the bolt pivot.

12. The pressure relief latch of claim 11 wherein the screw is threadably attached to the housing for adjustment of the predetermined spring load.

13. The pressure relief latch of claim 12 further comprising a bolt spring attached to the first load link pivot to facilitate opening movement of the bolt, the bolt spring has a spring constant less than the load spring.

14. The pressure relief latch of claim 13 wherein the bolt spring is compressed when the bolt is in the closed position.

15. The pressure relief latch of claim 11 further comprising a panel contact attached to a distal end of the bolt via an adjustable screw, the panel contact engages the secure area when the bolt is in the close position.

16. The pressure relief latch of claim 15 wherein the panel contact is a swivel head to enable a swivel motion for maintaining engagement with the secure area.

17. A method to manually open or close a pressure relief latch, the method comprising:

attaching a clutch trigger to the pressure relief latch, the pressure relief latch having a housing attached to a pressure relief panel, a spring disposed within the housing, and a bolt pivotably attached to the housing for movement between a closed position and an open position, the bolt engages a secure area by a spring load transmitted from the spring in the closed position;

disposing a clutch roller between the spring and the bolt, the clutch roller attached to the clutch trigger via a clutch link;

manually activating the clutch trigger to move the clutch roller to mechanical decouple the bolt from the spring; and

manually pivotably moving the bolt from the closed position to the open position.

18. The method of claim 17 further comprising:

releasing the clutch trigger;

manually pivotably moving the bolt, after the clutch trigger released, from the open position to the closed position, the spring load from the spring keeping the bolt in the closed position.

19. The method of claim 17 wherein the clutch trigger is pivotably attached to housing at a clutch trigger pivot.

20. The method of claim 17 wherein the clutch trigger pivot is biased by a torsion spring such that the clutch trigger stays in a position with the clutch roller coupled between the spring and the bolt when the clutch trigger is not activated.

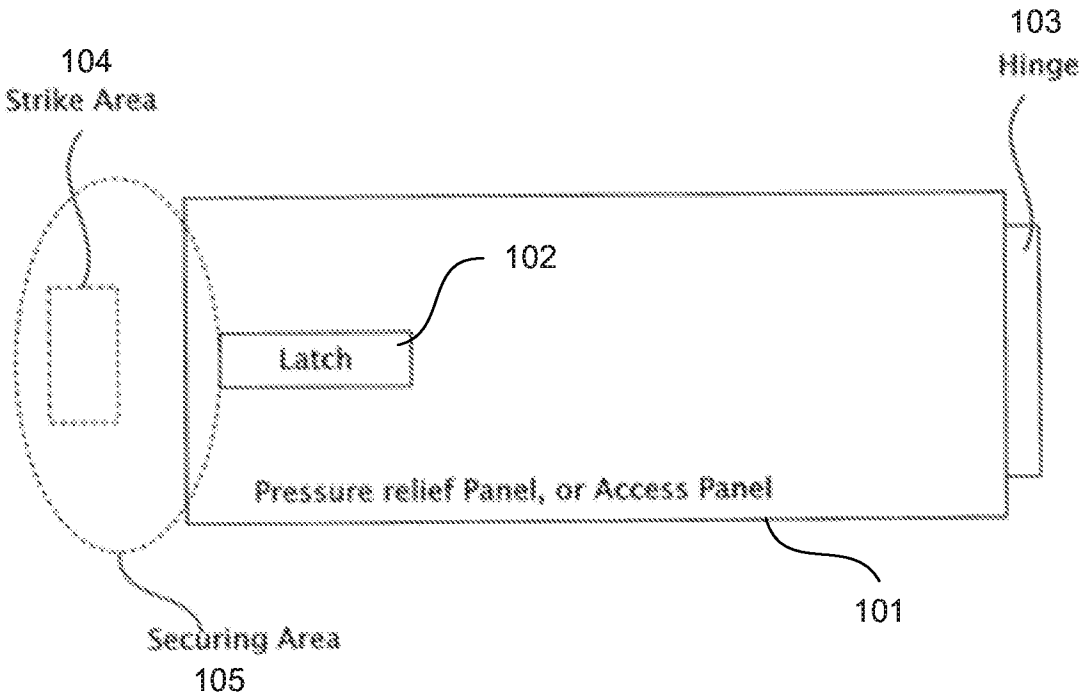
104
Strike Area
103
Hinge
102
Latch
Pressure relief Panel, or Access Panel
101
Securing Area
105

FIG. 1

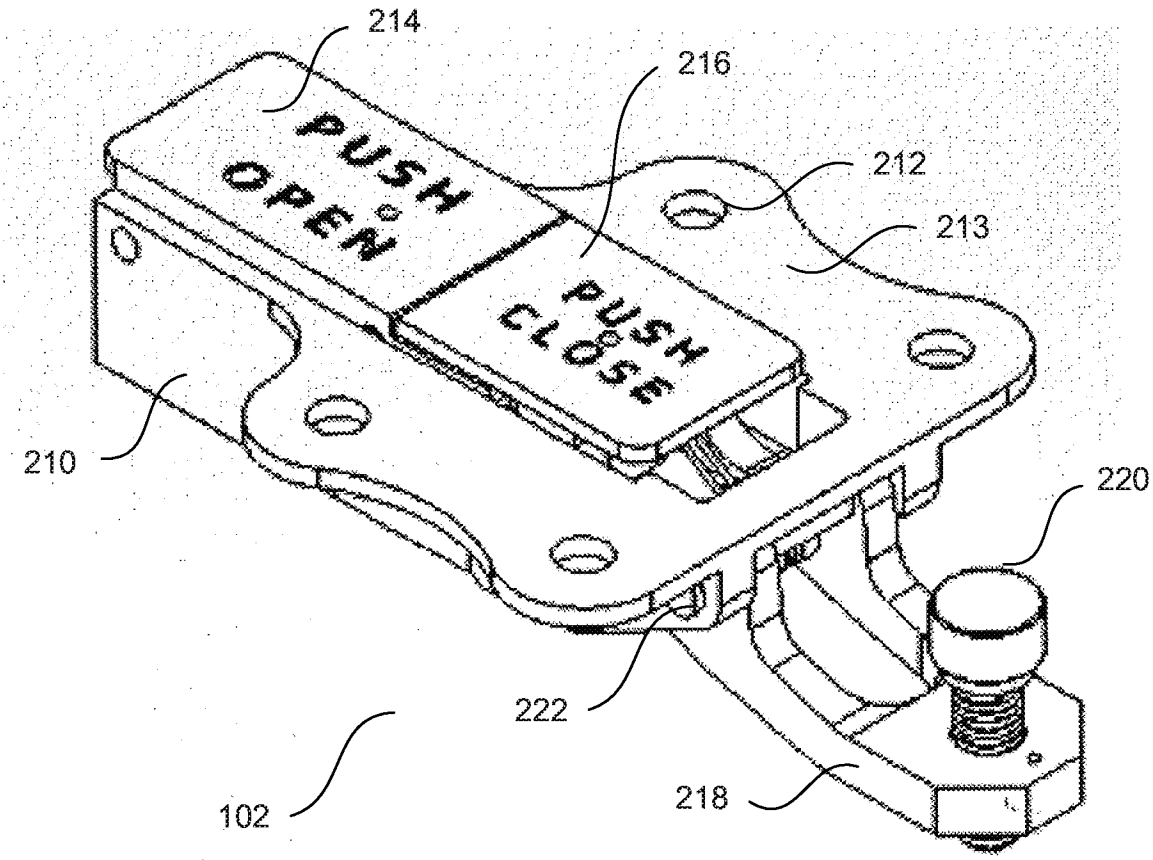

FIG. 2

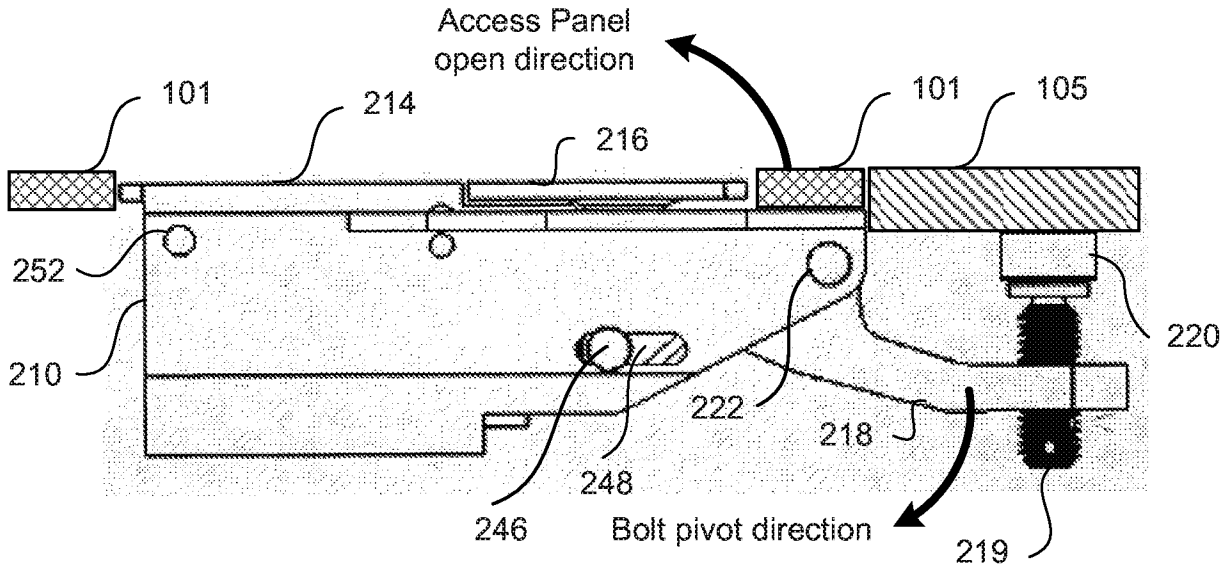
Access Panel
open direction
101
214
216
101
105
252
210
220
222
218
248
246
Bolt pivot direction
219

FIG. 3

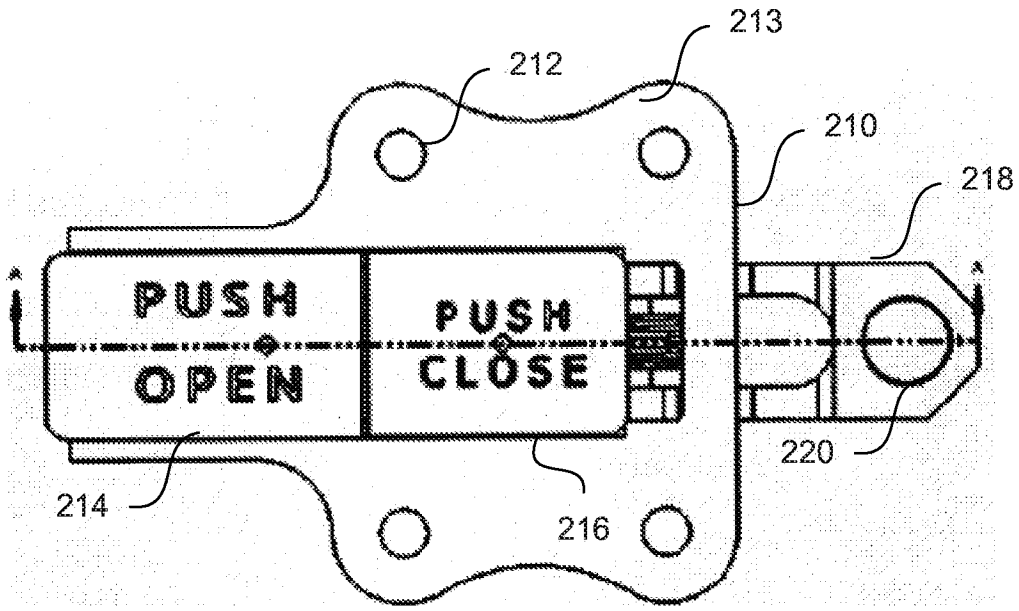

FIG. 4

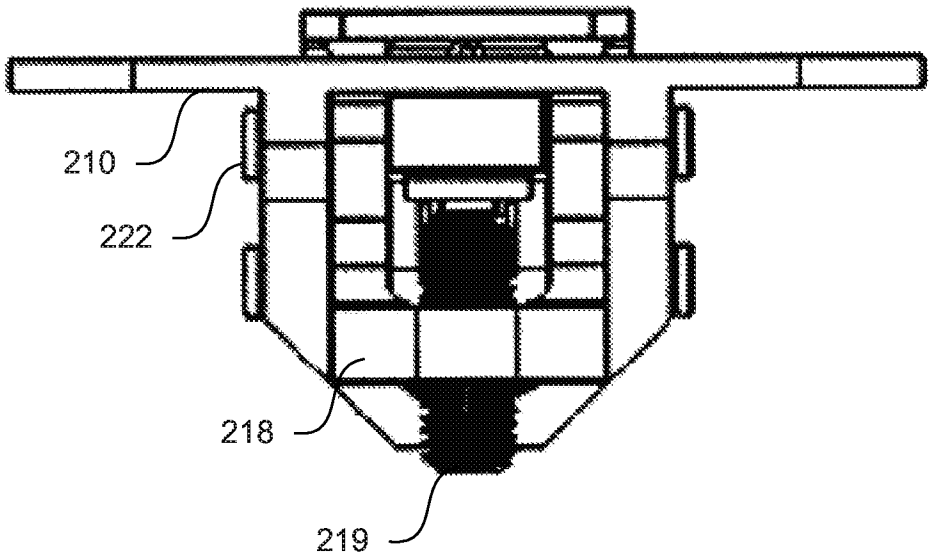

FIG. 5

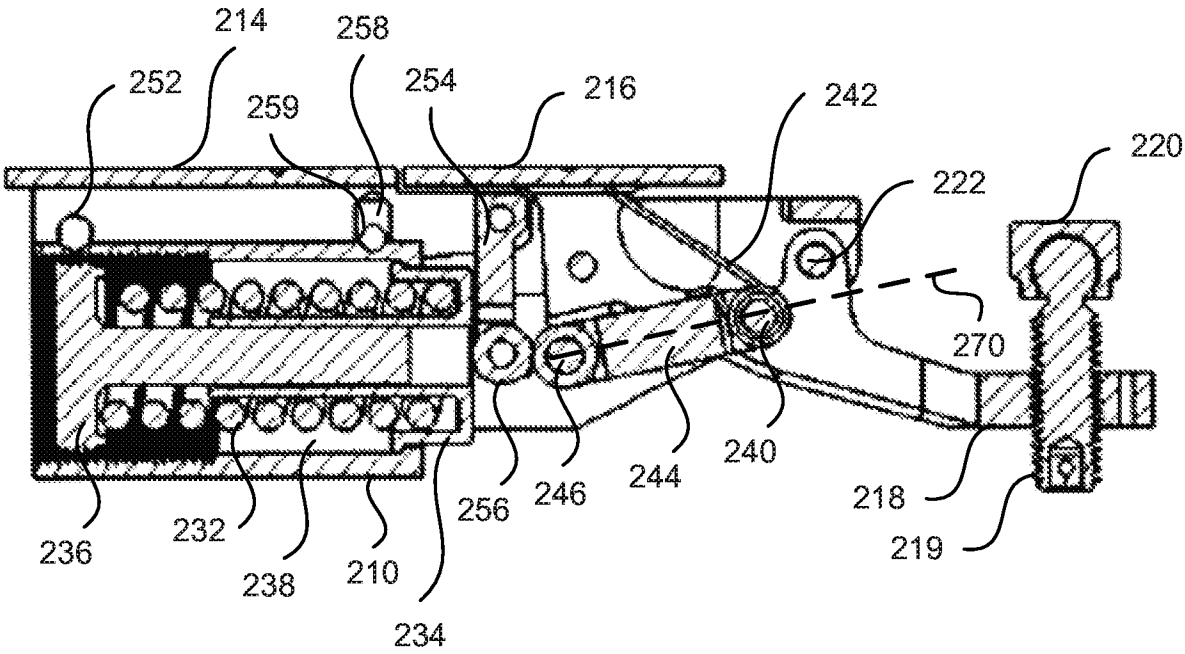
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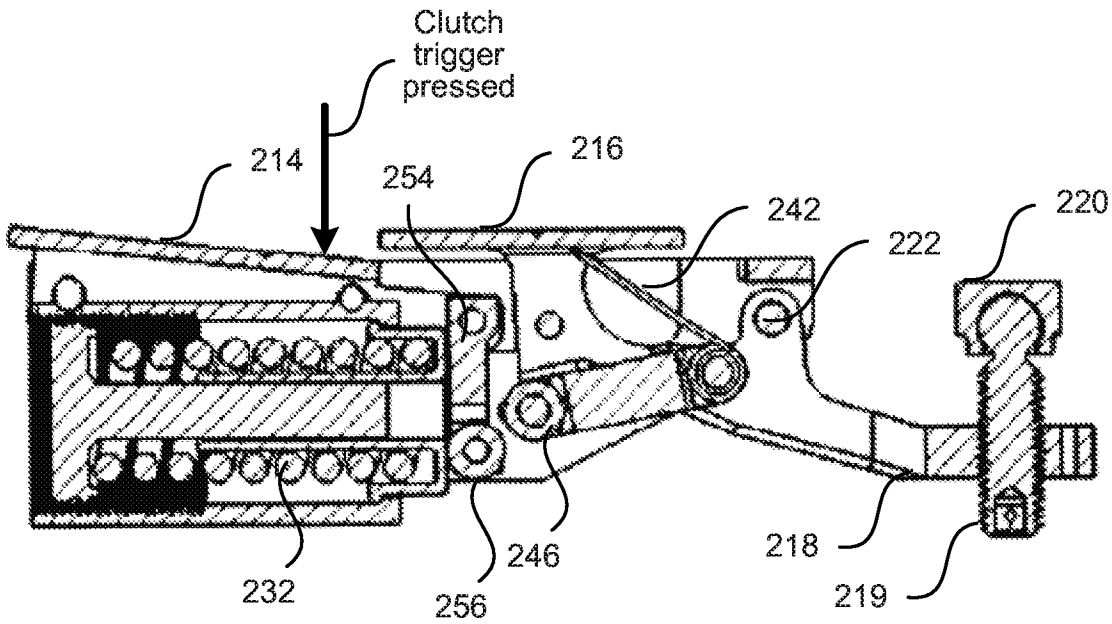
FIG. 6


Clutch
trigger
pressed
214
254
216
242
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220
232
256
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219

FIG. 7

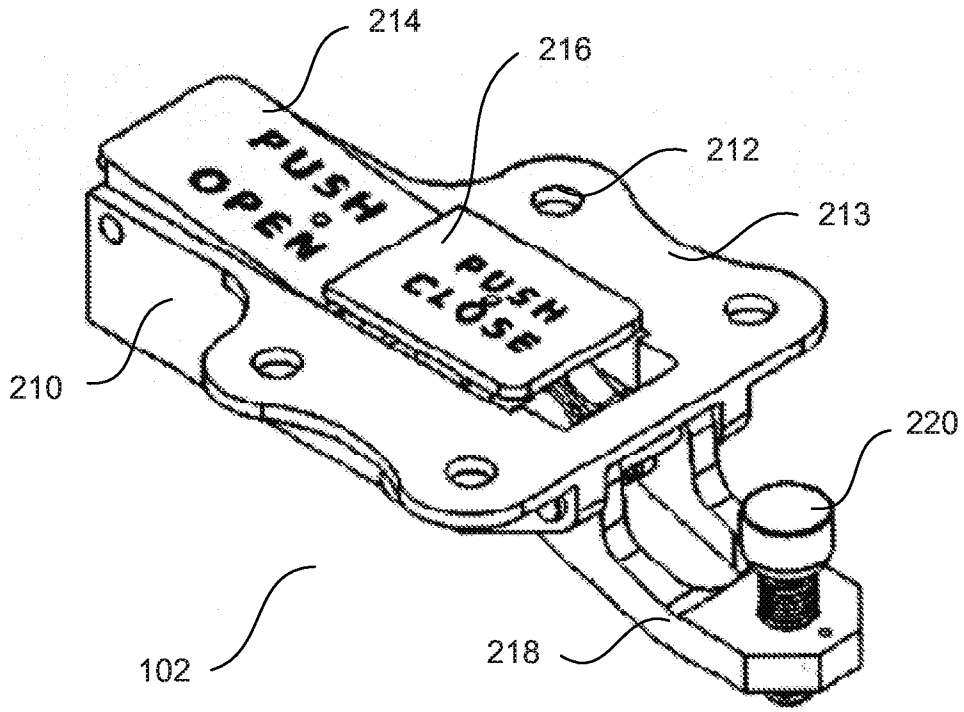

FIG. 8

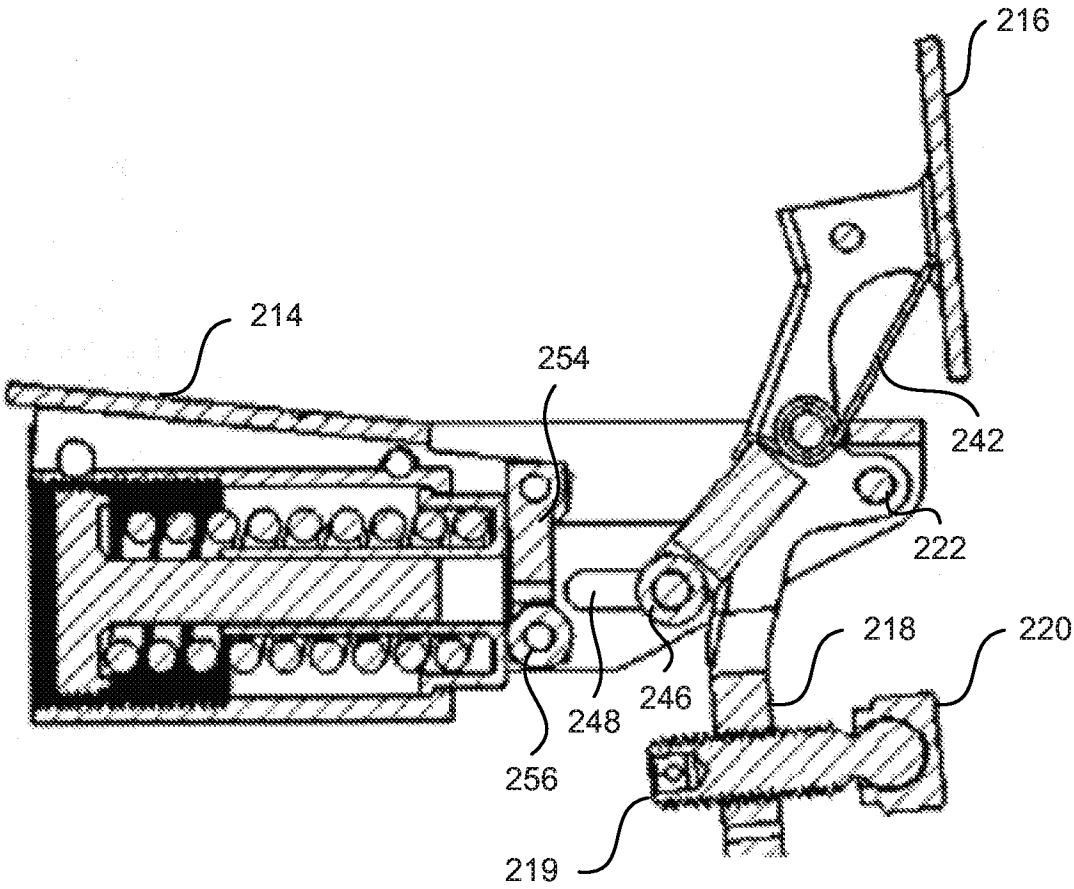

FIG. 9

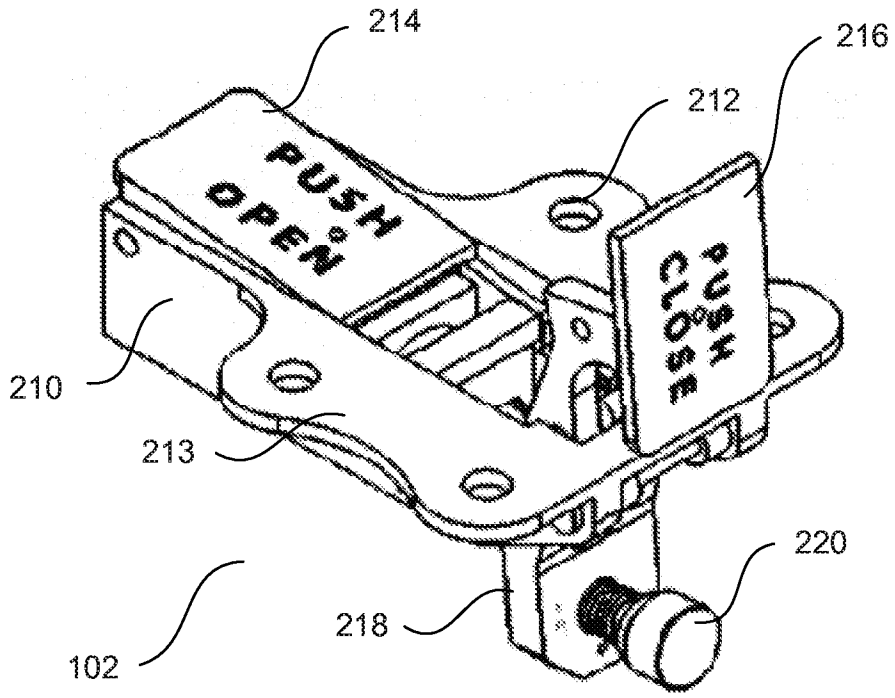

FIG. 10

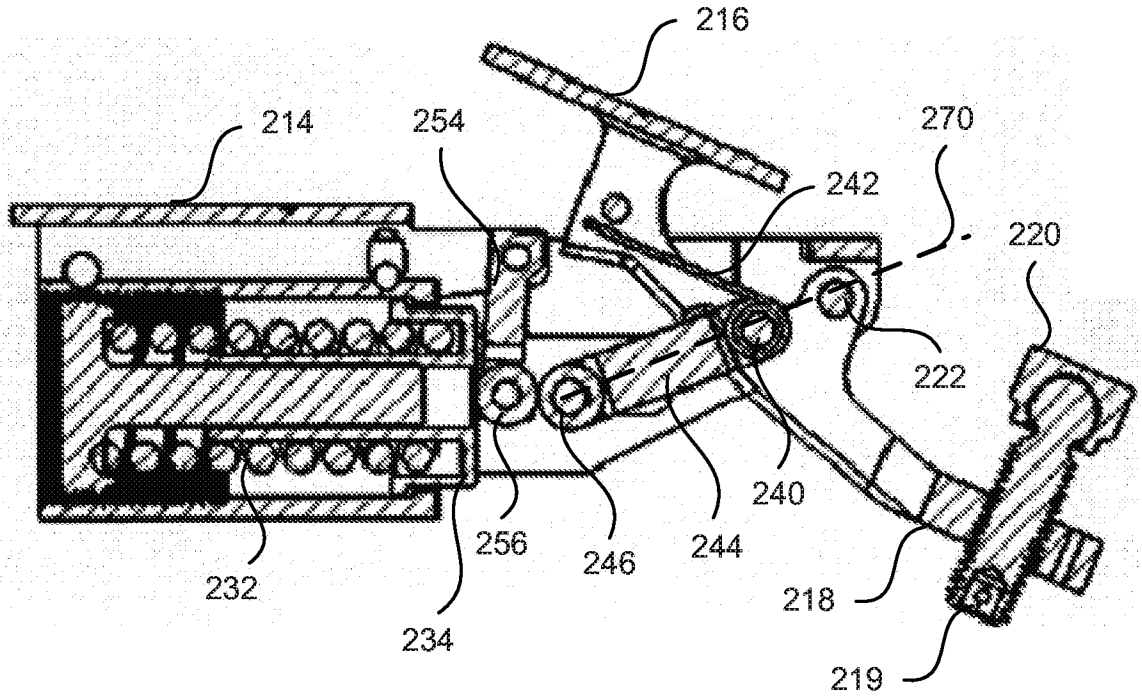

FIG. 11

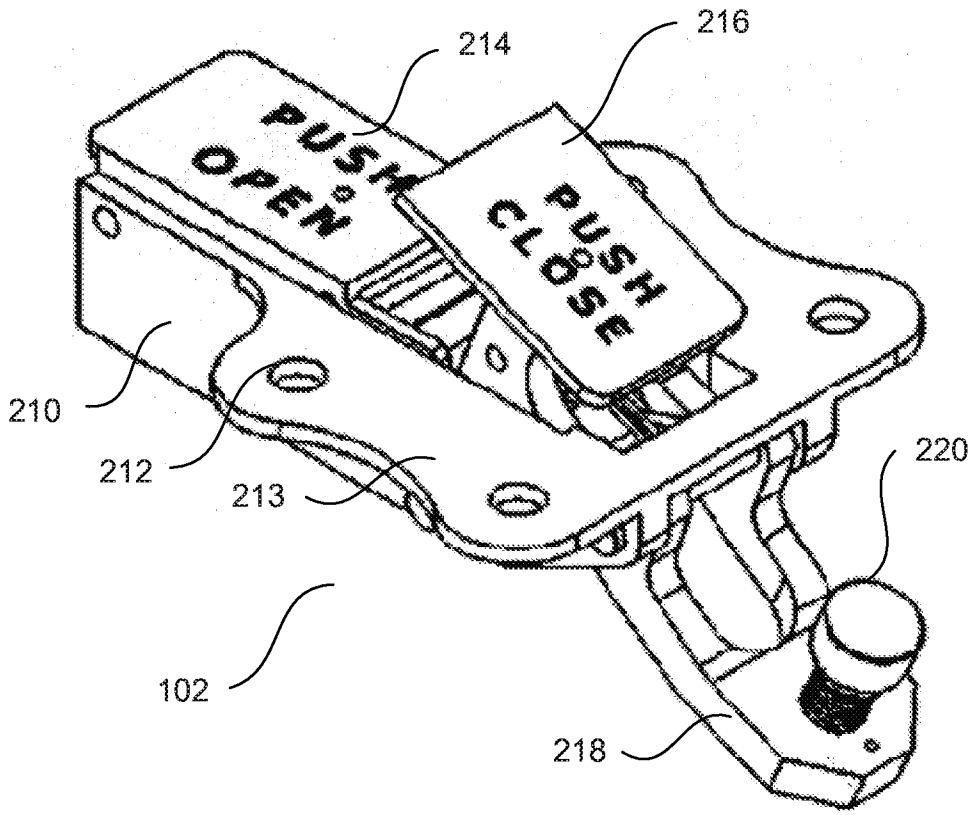

FIG. 12

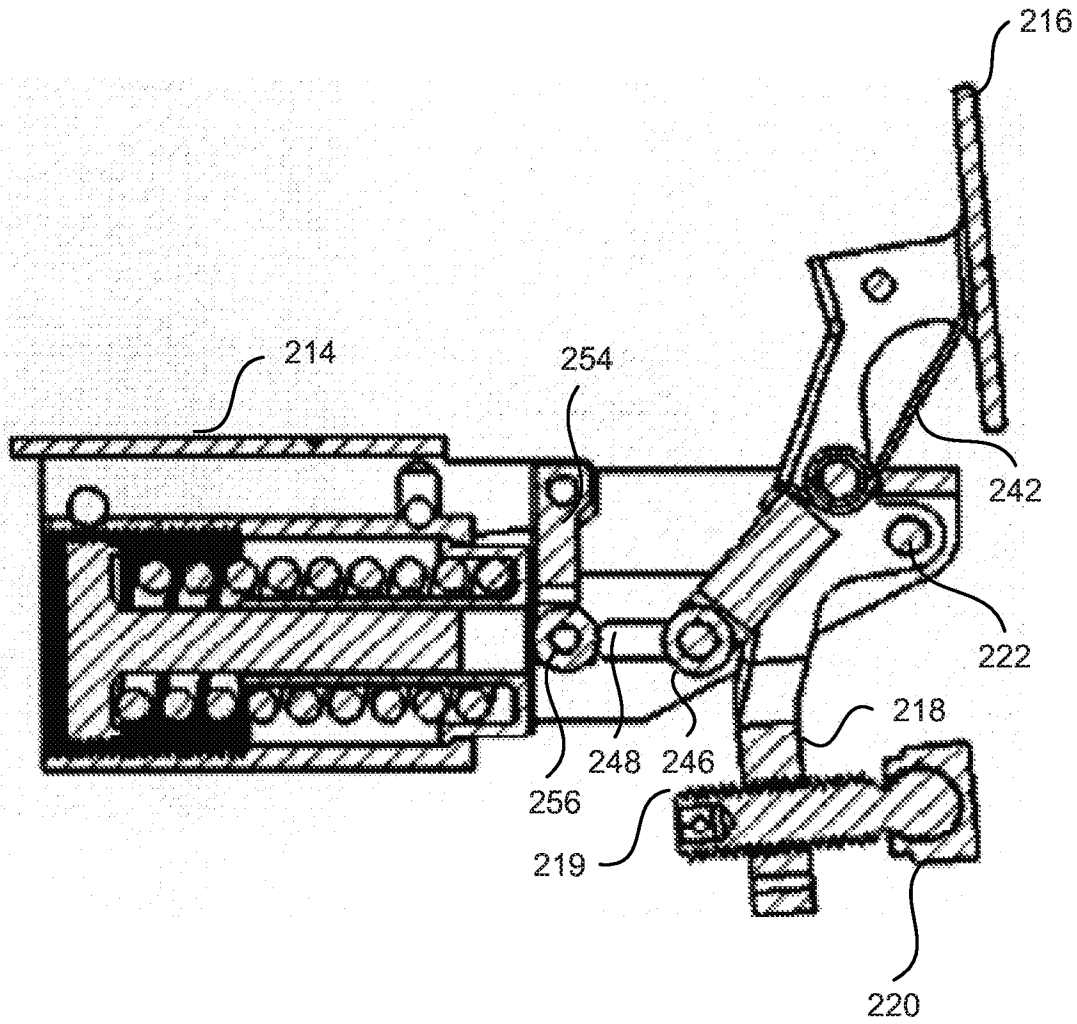

FIG. 13

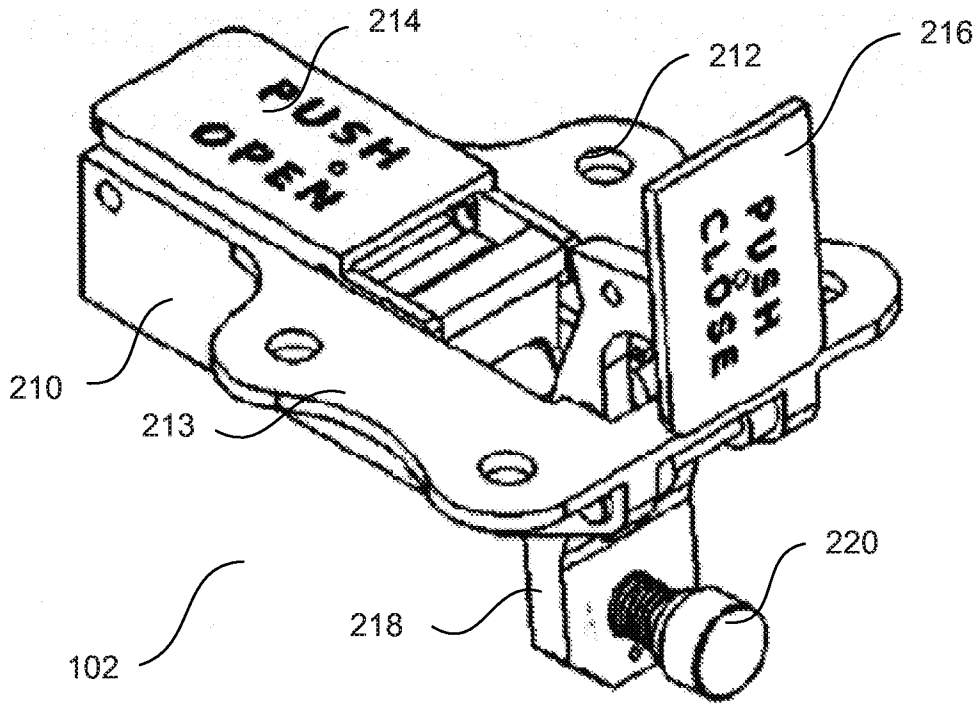

FIG. 14

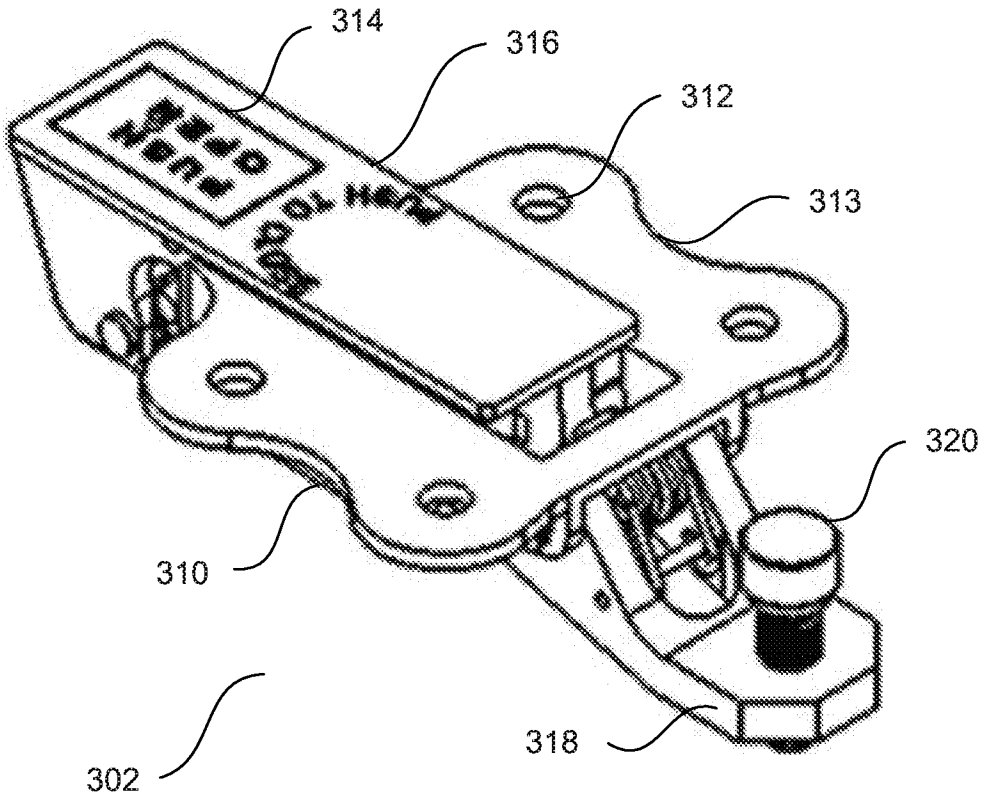

FIG. 15

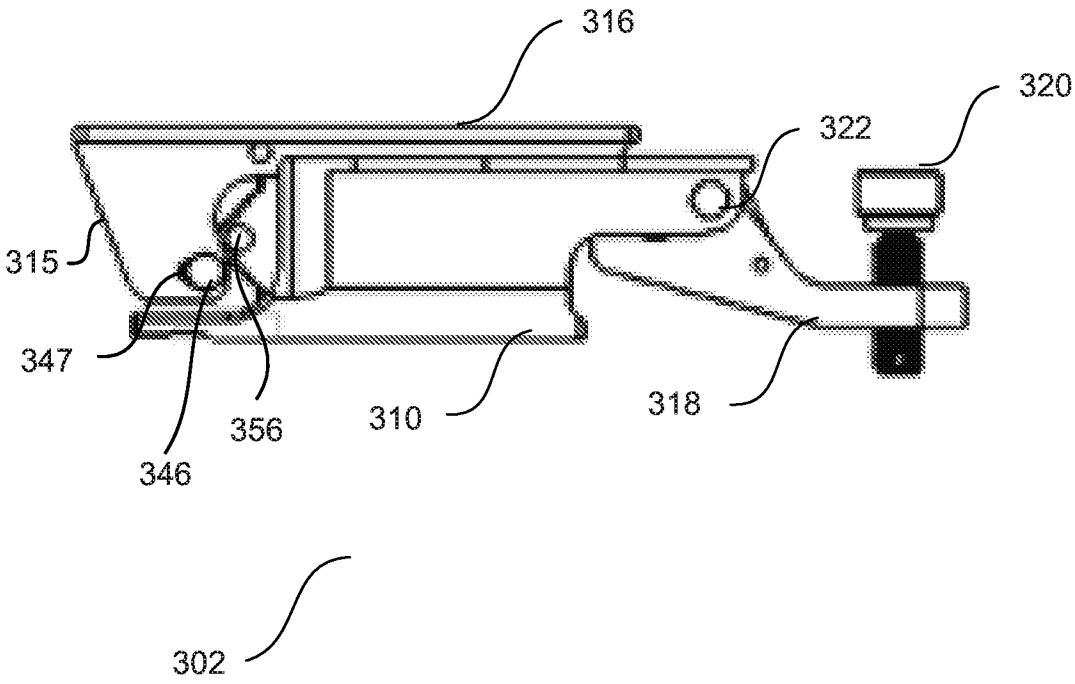

FIG. 16

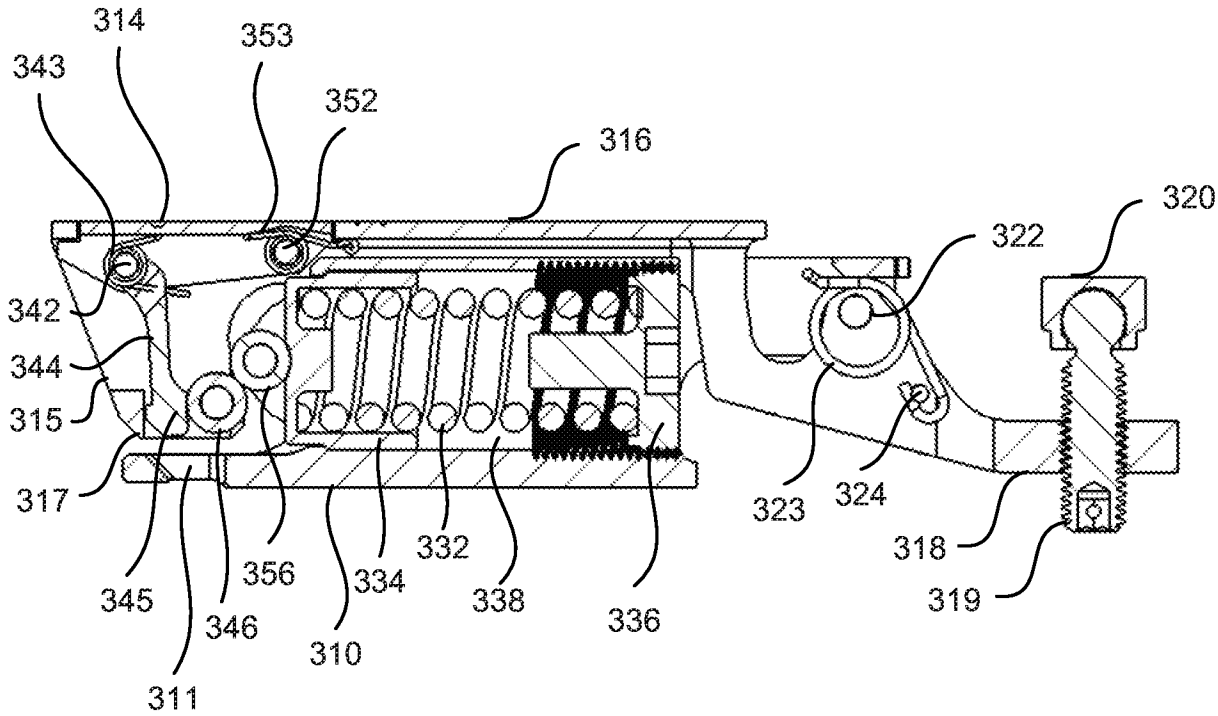
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FIG. 17

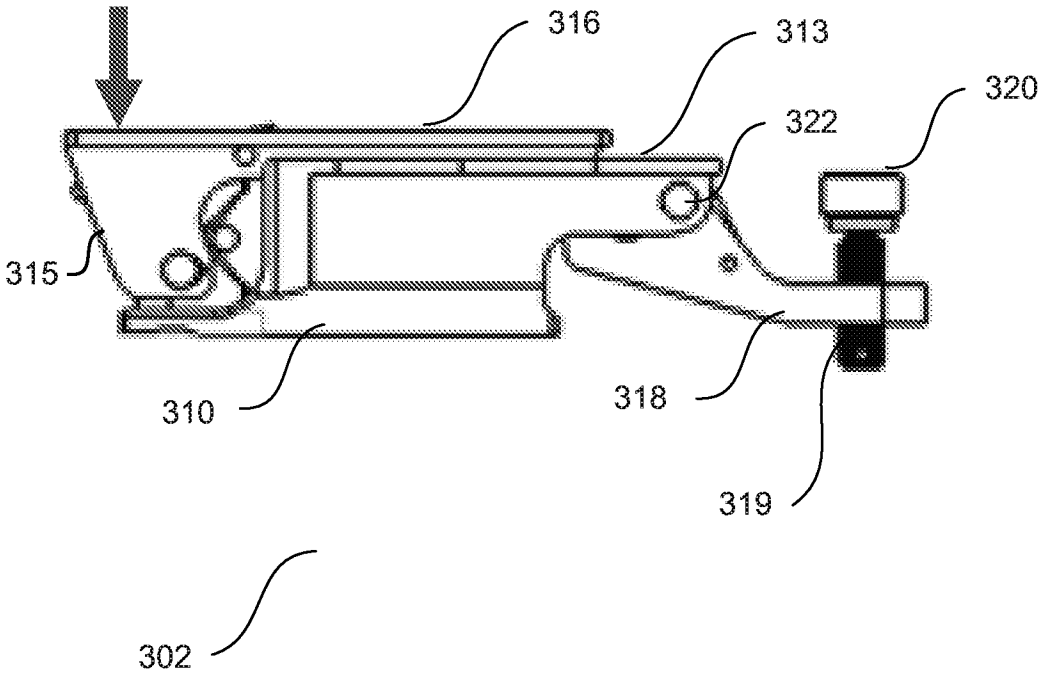

FIG. 18

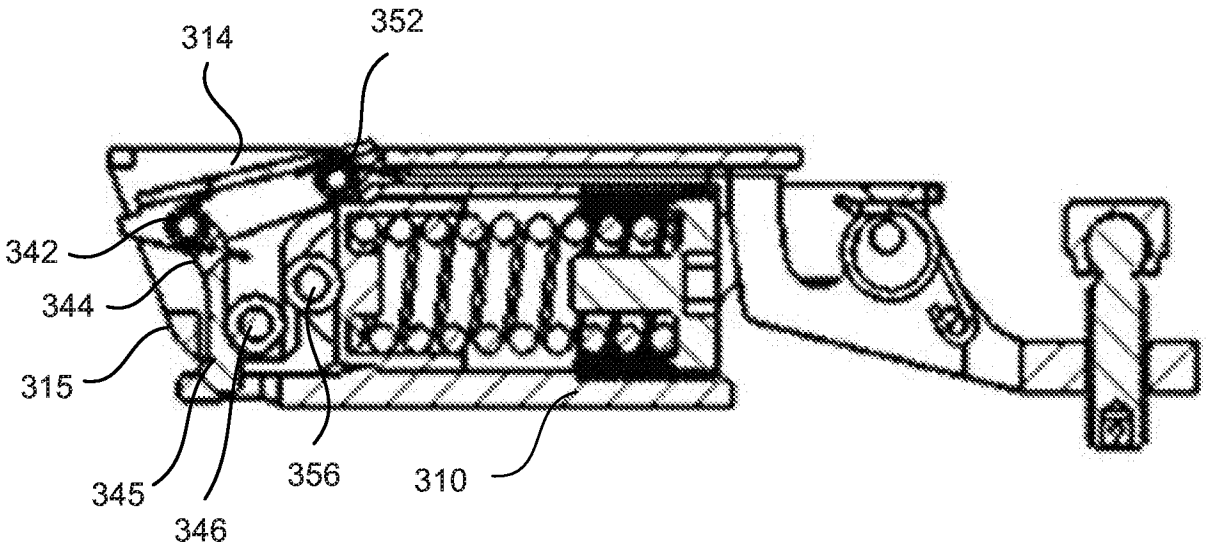

FIG. 19

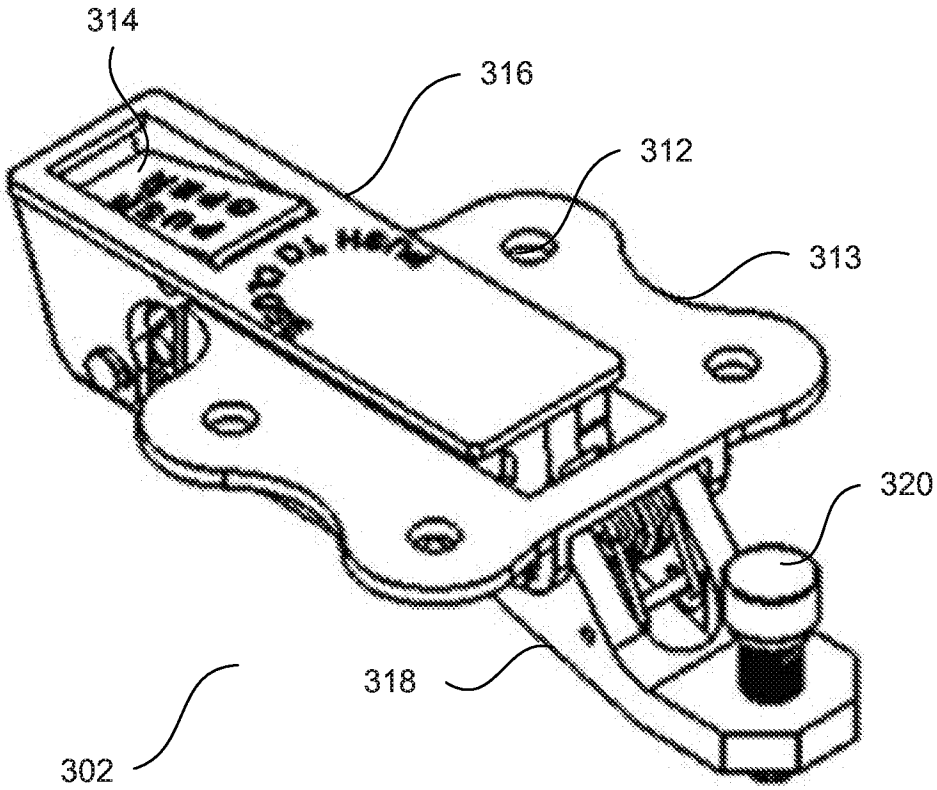

FIG. 20

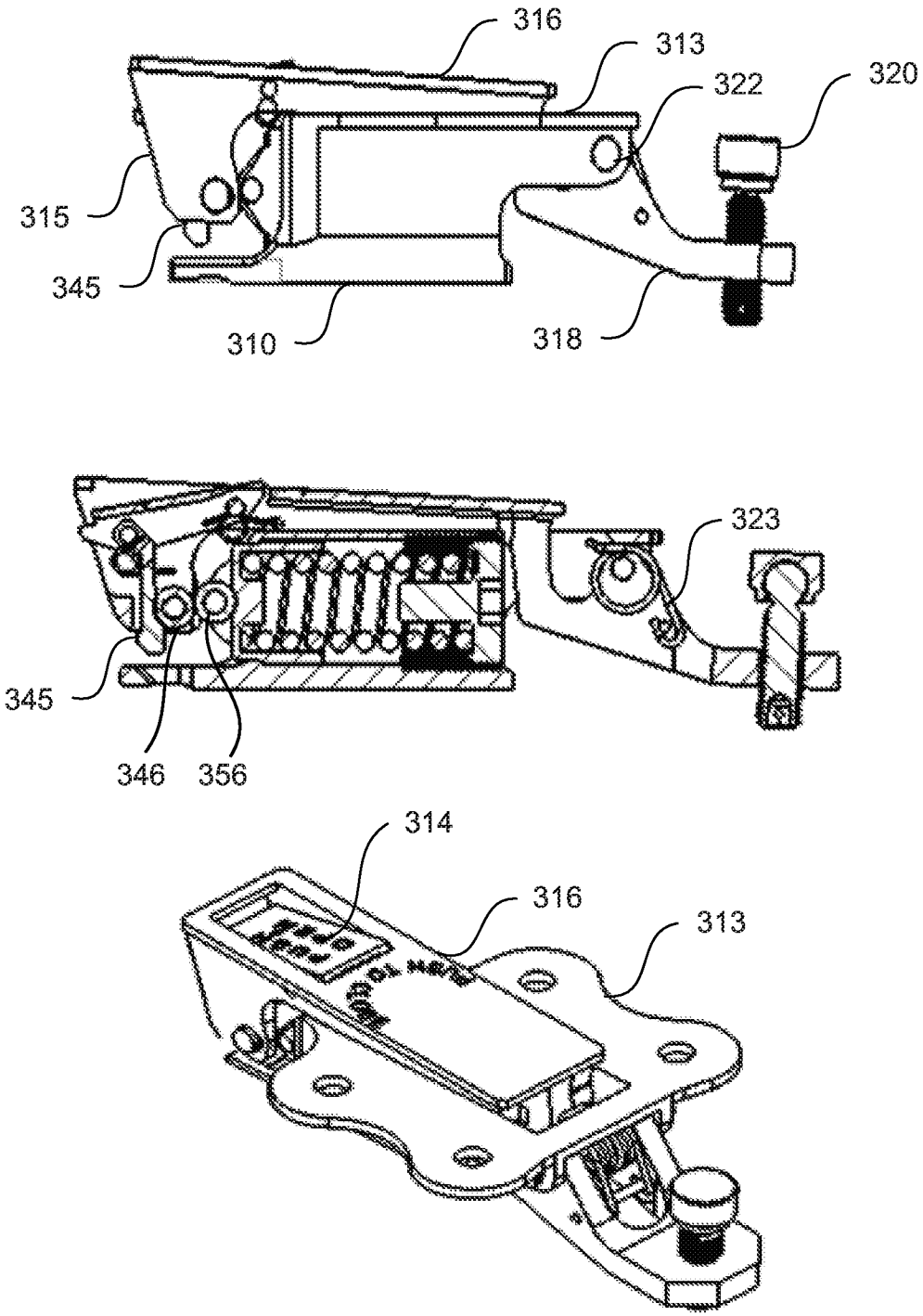

FIG. 21

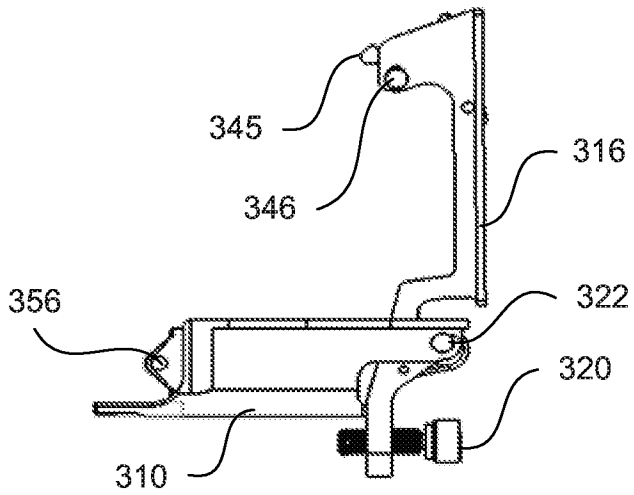

FIG. 22

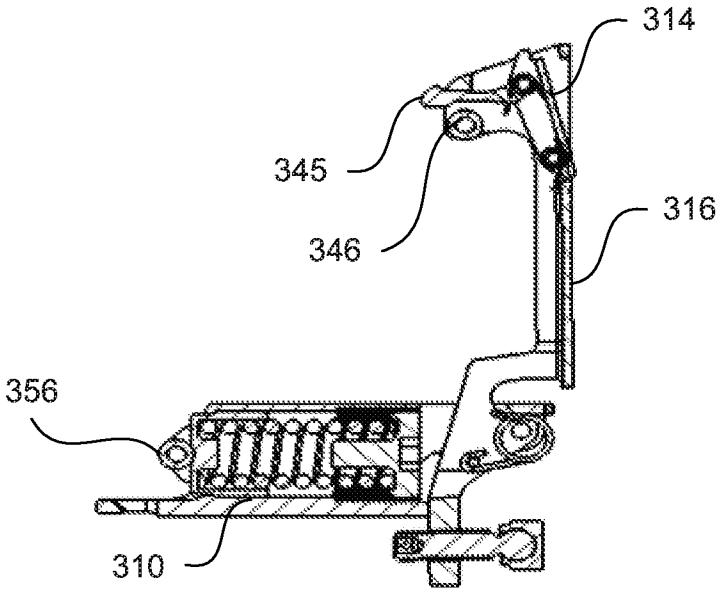

FIG. 23

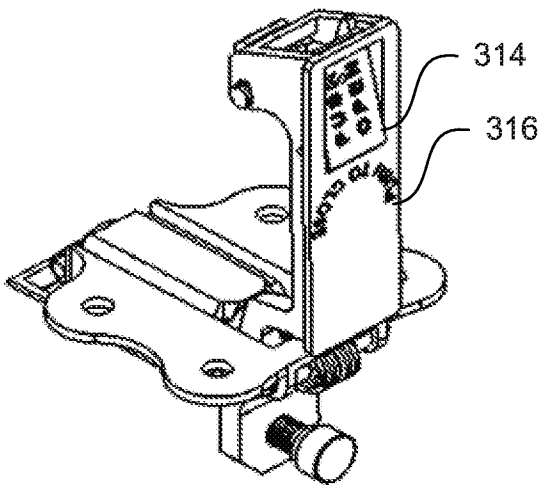

FIG. 24

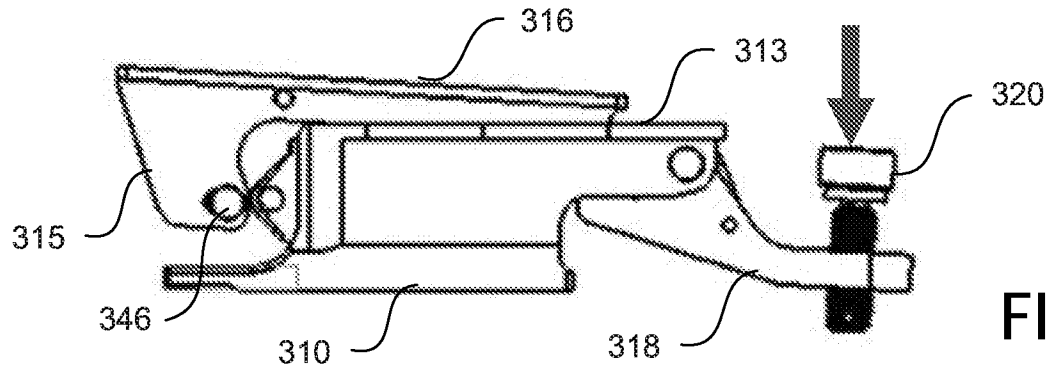

FIG. 24

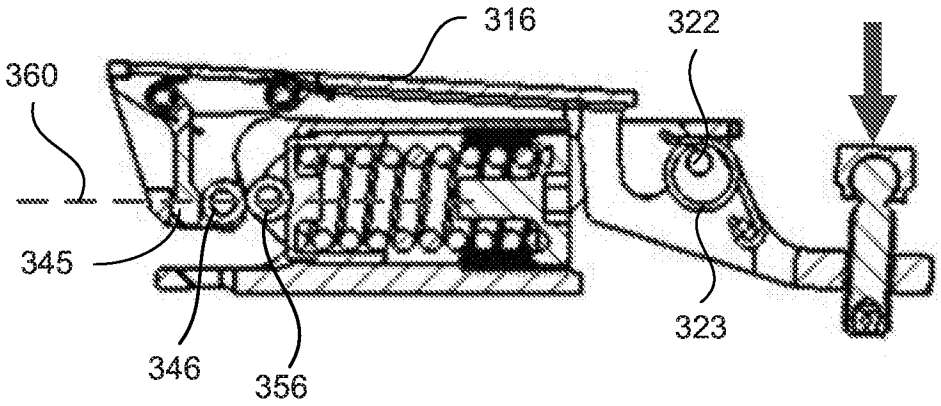

FIG. 25

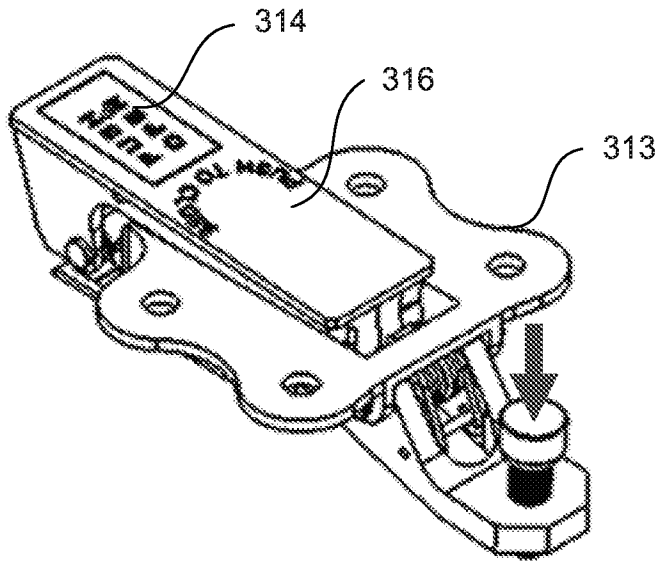

FIG. 26

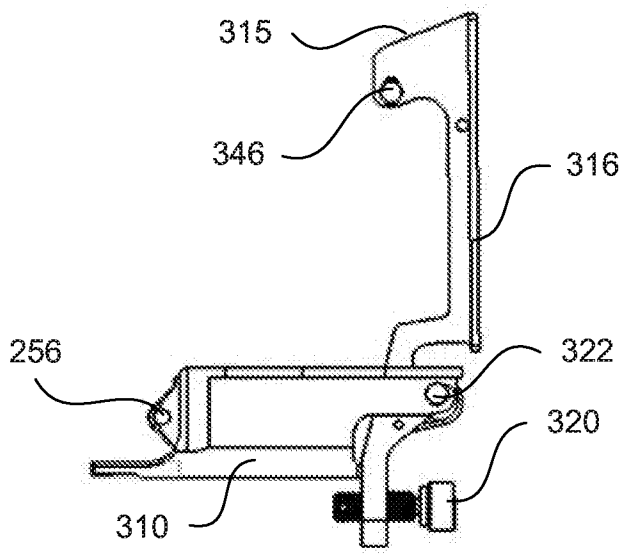

FIG. 27

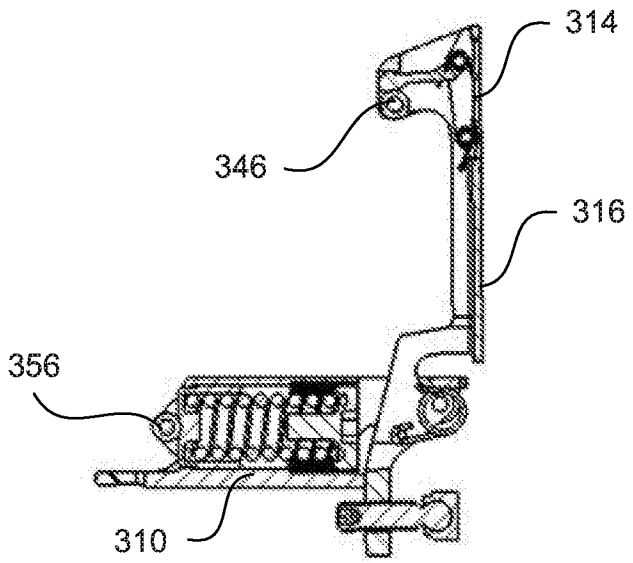

FIG. 28

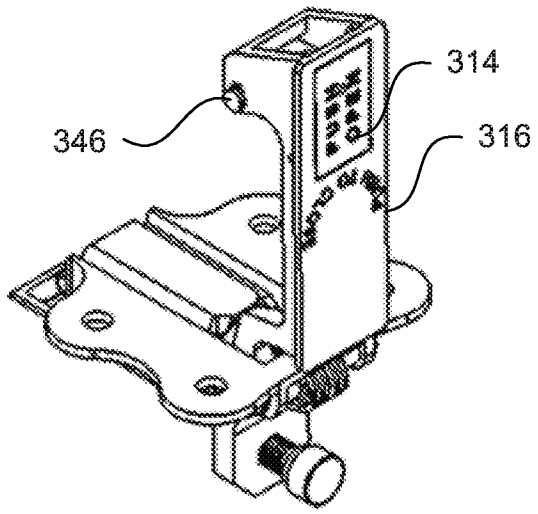

FIG. 29