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This application was filed on 10.05.2023 as a divisional application to the application mentioned under INID code 62.

(54) **BOLT LOCK BACK SYSTEM FOR A MAGAZINE**

(57) A magazine and methods of manufacturing the magazine are described. The magazine may comprise an elongated casing or feed tower having at least a distal end and a proximal end, and two sides longer than the distal and proximal ends, a follower having a tab extending toward one of the two sides (or proximal or distal end), and a bolt catch mechanism arranged at least partially inside and near a top of the elongated casing or feed tower, where the tab is arranged to contact and bias upward the bolt catch mechanism into a position configured to engage a bolt catch or slide stop of a firearm that the magazine is engaged with. In some embodiments, the magazine assembly may comprise a drum magazine assembly.

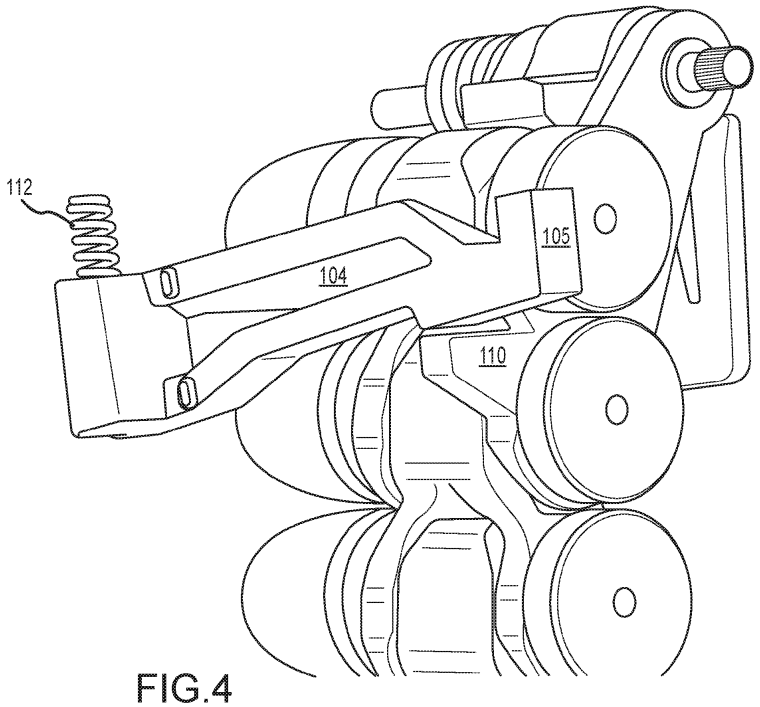

FIG.4

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Description

CLAIM OF PRIORITY UNDER 35 U.S.C. §119

[0001] The present Application for Patent claims priority to U.S. Provisional Application No. 62/818,555 entitled "Bolt Lock Back System for a Magazine" filed March 14, 2019, and assigned to the assignee hereof and hereby expressly incorporated by reference herein.

FIELD OF THE DISCLOSURE

[0002] The present disclosure relates generally to firearm magazines. In particular, but not by way of limitation, the present disclosure relates to systems, methods and apparatuses for a magazine with a unique bolt catch mechanism.

DESCRIPTION OF RELATED ART

[0003] At least one known drum magazine has a bolt catch engagement feature in its feed tower configured to engage a bolt catch in the weapon to lock the bolt in a rearward position after the last cartridge is fired. While functional and reliable in some firearm platforms, such as AR style platforms, this drum magazine is not compatible with others, such as the CZ Scorpion.

[0004] Lasichak (US8733224) discloses a drum magazine having a bolt stop actuator arranged in a vertical channel in a rear of the feed tower that is biased upward when a stop actuator follower contacts a bottom of the bolt stop actuator. However, the stop actuator follower requires a biased plunger that extends into the vertical channel when the stop actuator follower enters the feed tower, and this plunger is liable to jam. The stop actuator follower may also have a tendency to rotate while interfacing with a bottom of the bolt stop actuator, which leads to unnecessary friction between these two components.

[0005] SureFire provides high-capacity magazines utilizing nesting polymer (i.e., multi-piece) followers. Again, however, these magazines are not suited for engaging a bolt catch of a CZ Scorpion-style receiver.

[0006] Thus, an alternative bolt catch mechanism is needed for a magazine (e. g., a drum magazine, a single stack magazine, or a dual-stack magazine) that is operative with certain firearm platforms, such as the CZ Scorpion.

SUMMARY OF THE DISCLOSURE

[0007] The following presents a simplified summary relating to one or more aspects and/or embodiments disclosed herein. As such, the following summary should not be considered an extensive overview relating to all contemplated aspects and/or embodiments, nor should the following summary be regarded to identify key or critical elements relating to all contemplated aspects and/or embodiments or to delineate the scope associated with any particular aspect and/or embodiment. Accordingly, the following summary has the sole purpose to present certain concepts relating to one or more aspects and/or embodiments relating to the mechanisms disclosed herein in a simplified form to precede the detailed description presented below.

[0008] Some embodiments of the disclosure may be characterized as a magazine comprising a feed tower or an elongated casing having at least a distal end and a proximal end, and two sides longer than the distal and proximal ends. The magazine may further comprise a follower having a tab extending toward one of the two sides (or toward the distal end or toward the proximal end) and a bolt catch mechanism arranged at least partially inside and near a top of the elongated casing or feed tower, wherein the tab is arranged to contact and bias upward the bolt catch mechanism into a position configured to engage a bolt catch of a firearm that the magazine is engaged with. Although not shown, where the tab extends toward the distal or proximal end of the feed tower or elongated casing, the tab may interface with a bolt lock mechanism also arranged on the same distal or proximal end of the follower. Alternatively, the bolt lock mechanism could still comprise an arm running along one side of the follower, but further including a flange that wraps around from the side to the distal or proximal end of the follower so as to interface with the proximally or distally extending tab. This variation on the bolt lock mechanism can also pivot or slide vertically.

[0009] In some embodiments, the bolt catch mechanism is pivotable around a pivot axis toward the distal end of the elongated casing or feed tower. In some embodiments, the pivot axis is arranged in an opening in the distal end of the elongated casing or feed tower. In some embodiments, a bolt-engagement portion of the bolt catch mechanism protrudes through an opening in the proximal end of the elongated casing or feed tower.

[0010] In some other embodiments, a bolt-engagement portion of the bolt catch mechanism protrudes through an opening in the proximal end of the elongated casing or feed tower.

[0011] In some embodiments, the bolt catch mechanism is slidable along a path parallel with the follower once the tab contacts a lower surface of the bolt catch mechanism. In some embodiments, the tab is arranged toward the proximal end of the elongated casing or feed tower.

[0012] In some embodiments, the follower comprises a plurality of dummy cartridges coupled via movable links, and wherein the tab extends from one of the movable links or one of the plurality of dummy cartridges. In some embodiments, the bolt catch mechanism is an arm extending from the proximal end to the distal end of the elongated casing or feed tower.

[0013] In some embodiments, the tab contacts the bolt catch mechanism toward the proximal end of the elongated casing or feed tower. In some embodiments, the magazine is a single stack, double stack, or drum mag-

azine. In additional embodiments, the magazine is a drum magazine and the drum magazine includes a drum coupled to a bottom of the feed tower, and wherein the drum has a constant internal curve that causes axes of cartridges in the drum to intersect in front of the drum. In some embodiments, the drum and feed tower share a constant internal curve.

[0014] In some embodiments, the casing or feed tower is shaped to hold a single stack of cartridges from a bottom of the casing or feed tower toward a top of the casing or feed tower, and to transition to a double stack at the magazine's interface to the firearm.

[0015] Other embodiments of the disclosure may also be characterized as method of manufacturing a magazine, wherein the method comprises providing an elongated casing or feed tower having at least a distal end and a proximal end, and two sides longer than the distal and proximal ends, providing a follower having a tab, arranging the follower in the magazine such that when the follower moves within the elongated casing or feed tower, the tab extends toward one of the two sides, arranging a bolt catch mechanism within an upper portion of the elongated casing or feed tower such that the tab is arranged to contact the bolt catch mechanism and push it upward when the follower approaches or reaches a top of the magazine. In some embodiments, the bolt catch mechanism is configured to engage a bolt catch of a firearm that the magazine is engaged with when the follower approaches or reaches the top of the magazine.

[0016] In some embodiments, the method further comprises pivotally coupling the bolt catch mechanism to the elongated casing or feed tower at a pivot axis. In some additional embodiments, the method comprises forming a distal opening in the casing or feed tower and pivotally coupling the bolt catch mechanism to the elongated casing or feed tower within the distal opening. In some additional embodiments, the method comprises coupling the bolt catch mechanism to the elongated casing or feed tower via a sliding engagement.

[0017] In some embodiments, the method further comprises forming a bolt catch mechanism recess in one of the two sides and arranging the bolt catch mechanism within this recess. In some additional embodiments, the method further comprises forming a proximal opening in the proximal end of the elongated casing or feed tower, and arranging a bolt-engagement portion of the bolt catch mechanism within the proximal opening.

[0018] Other embodiments of the disclosure can be characterized as a magazine with a bolt catch mechanism. The magazine can have at least a distal end and a proximal end and two sides. The magazine can include an elongated casing or feed tower, a follower, and the bolt catch mechanism. The follower can have a tab extending toward one of the two sides (or toward the distal end or toward the proximal end), a side on which the bolt catch mechanism is arranged. The bolt catch mechanism can be pivotable or slidably, or have some other form of movement, as long as it is able to contact and push upward on the firearm's bolt catch when a final round of the magazine exits the magazine. The bolt catch mechanism can be at least partially inside and near a top of the elongated casing or feed tower. The bolt catch mechanism, if pivotable, can have a pivot axis toward the distal end of the elongated casing or feed tower. The tab can be arranged on the follower to contact the bolt catch mechanism, for instance, toward the proximal end of the elongated casing or feed tower where the bolt catch mechanism is pivotable. In fact, the tab can be arranged on the follower to contact the bolt catch mechanism anywhere along its length proximal to the pivot axis, if applicable. This arrangement allows the tab to push upward on the bolt catch mechanism when the follower approaches an uppermost position in the elongated casing or feed tower (e.g., the magazine approaches or reaches an empty state) and into a position to engage the bolt catch of the firearm. This may involve a pivoting or sliding motion.

[0019] An alternate embodiment of the disclosure may be characterized as a drum magazine comprising a drum, a feed tower having a front corner aperture near a top of the feed tower and a rear corner aperture near the top of the feed tower, and a follower assembly configured to follow a spiral path through the drum and a roughly linear path through the feed tower. The follower assembly may comprise a pivotable bolt catch mechanism having a pivot coupling coupled to the feed tower within the front corner aperture and having an engaged and disengaged position, wherein in the engaged position an end of the mechanism opposite from the pivot coupling extends through the rear corner aperture and wherein in disengaged position the end of the mechanism does not extend through the rear corner aperture. The follower assembly may further comprise two or more dummy cartridges and two or more links, one surrounding at least a portion of each dummy cartridge. In other words, at least a portion of each dummy cartridge is surrounded by at least one link. In some embodiments, a tab extends roughly sideways from at least one of the links or dummy cartridges such that when the two or more dummy cartridges move to a top of the feed tower, the tab biases the pivotable bolt catch mechanism upward into the engaged position.

[0020] Another embodiment of the disclosure may be characterized as a method of engaging a bolt catch in a firearm, wherein the method comprises presenting a final cartridge from a magazine into a chamber of the firearm via upward movement of a follower in an elongated casing or feed tower of a magazine, contacting a lower surface of a bolt catch mechanism of the magazine with a tab extending sideways from the follower (or toward the distal end or toward the proximal end), forcing the bolt catch mechanism upwards into an engaged position, and securing the bolt catch in a locked position with a bolt-engagement portion of the bolt catch mechanism as a result of upward movement of the bolt catch mechanism. In some embodiments, the bolt catch mechanism pivots upward to secure the bolt catch in the locked-back position.

[0021] These and other features, and characteristics of the present technology, as well as the methods of operation and functions of the related elements of structure and the combination of parts and economies of manufacture, will become more apparent upon consideration of the following description and the appended claims with reference to the accompanying drawings, all of which form a part of this specification, wherein like reference numerals designate corresponding parts in the various figures. It is to be expressly understood, however, that the drawings are for the purpose of illustration and description only and are not intended as a definition of the limits of the invention. As used in the specification and in the claims, the singular form of 'a', 'an', and 'the' include plural referents unless the context clearly dictates otherwise.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] Various objects and advantages and a more complete understanding of the present disclosure are apparent and more readily appreciated by referring to the following detailed description and to the appended claims when taken in conjunction with the accompanying drawings:

FIG. 1A illustrates a left side elevation view of an embodiment of a feed tower of a drum magazine having a unique bolt catch mechanism in an engaged position;
FIG. 1B shows the bolt catch mechanism of FIG. 1A in a disengaged position;
FIG. 2A illustrates a cross section of FIG. 1A;
FIG. 2B illustrates a cross section of FIG. 1B;
FIG. 3 illustrates a perspective view of the cross section of FIG. 2 A;
FIG. 4 illustrates a perspective view of an embodiment of a bolt catch mechanism and follower with tab in isolation;
FIG. 5 illustrates a perspective view of the follower with tab of FIG. 4 in isolation;
FIG. 6 illustrates an exploded view of the follower with tab of FIG. 5;
FIG. 7A illustrates a perspective view of an embodiment of a feed tower of a drum magazine having a bolt catch mechanism in a disengaged position;
FIG. 7B illustrates the feed tower of FIG. 7A in an engaged position;
FIG. 8A illustrates an embodiment of the bolt catch mechanism;
FIG. 8B illustrates another view of the embodiment of FIG. 8A;
FIG. 9 illustrates a cross section of two states of an embodiment of a firearm system including a magazine, bolt catch mechanism, bolt catch, and bolt;
FIG. 10 illustrates a cross section of two states of a second embodiment of a firearm system including a magazine, bolt catch mechanism, bolt catch, and bolt;
FIG. 11 illustrates a cross section of two states of a third embodiment of a firearm system including a magazine, bolt catch mechanism, bolt catch, and bolt;
FIG. 12 illustrates a cross section of two states of a fourth embodiment of a firearm system including a magazine, bolt catch mechanism, bolt catch, and bolt;
FIG. 13 illustrates a perspective view of an embodiment of a feed tower having a bolt catch mechanism that pivots at a proximal end of the feed tower;
FIG. 14 illustrates another perspective view of the embodiment shown in FIG. 13;
FIG. 15 illustrates a cutaway view of an inside of the embodiment shown in FIG. 13;
FIG. 16 illustrates a head on view of the bolt catch mechanism and a tab of the follower corresponding to the embodiment shown in FIG. 13;
FIG. 17 illustrates a profile view of the bolt catch mechanism and follower with tab shown in FIG. 16;
FIG. 18 illustrates a perspective view of the bolt catch mechanism and follower with tab shown in FIG. 16;
FIG. 19 illustrates an exploded view of the drum magazine assembly of FIG. 1 or a similar drum magazine;
FIG. 20 illustrates a perspective view of the drum magazine assembly in FIG. 19;
FIG. 21 illustrates an exploded view of a front cover assembly of the drum magazine assembly in FIG. 19-20;
FIGS. 22-23 are views of a follower assembly assembled and exploded, according to an embodiment;
FIG. 24 is an exploded view of an interface between the feed tower and the drum body according to some embodiments;
FIG. 25 is a front perspective view showing further details of the interface illustrated in FIG. 24;
FIG. 26 illustrates a flow diagram of a method according to an embodiment; and
FIG. 27 illustrates a flow diagram of another method according to an embodiment.

DETAILED DESCRIPTION

[0023] The word "exemplary" is used herein to mean "serving as an example, instance, or illustration." Any embodiment described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other embodiments. Furthermore, for the purpose of this disclosure, the terms "front" and "distal" shall refer to a side or direction associated with a direction of intended fire; for example, in FIG. 1, the front or distal side is towards the left. When referencing pivoting or rotating components, the term "distal" shall refer to a section of the component that is distant from the pivot point, while the term "proximal" shall refer to a section of the component approaching the pivot point. Similarly, the terms

"back", "rear", or "proximal" shall be associated with the intended bracing of a weapon, or the intended pivot point of a pivoting or rotating component. Moreover, for the purpose of this document, the term "cartridge" should be understood to include generally ammunition that can be magazine-fed, such as, for example, shotgun cartridges, grenade cartridges, and any other ammunition packaging a bullet or shot, a propellant substance and a primer within a case that is made to fit within a firing chamber of a firearm. Furthermore, for the purpose of this disclosure, the terms "spiral" and "generally spiraled" are meant to include any feature generally winding about a fixed point at a continuously and/or discontinuously increasing distance.

[0024] The present disclosure relates generally to a novel bolt catch mechanism for a magazine that is operative with a CZ scorpion-type receiver (e.g., a drum magazine, a single stack box magazine, or a dual-stack box magazine). More specifically, this disclosure describes a magazine having a feed tower (also spelled as feed tower) or elongated casing with a pivoting bolt lock back arm (also referred to as arm) that can be biased upward around a pivot axis by a tab on a follower as the follower nears or reaches a top of the magazine. In some cases, the pivoting bolt lock back arm may not pivot, but instead slide in a direction roughly parallel to a path of the follower.

[0025] In some other embodiments, the follower may not include a tab, and instead the pivoting bolt lock back arm may comprise a tab or a jog that is aimed back (i.e., sideways) toward the follower. In such cases, this tab or jog may be pushed upward by the follower, rather than a tab on the follower pushing the arm up. In either arrangement, the pivoting bolt lock back arm may engage the bolt catch of the firearm when the follower approaches an uppermost position in the elongated casing or feed tower (e.g., the magazine approaches or reaches an empty state).

[0026] FIG. 1 illustrates a left side elevation view of an embodiment of a feed tower 100 of a magazine having a unique bolt catch mechanism. In some examples, the magazine may be a single stack or double stack box magazine. In other cases, the magazine may be a drum magazine assembly, as further described in relation to FIGS. 19-21. In all three of these variations, the magazine may include a constant internal curve that causes cartridges or rounds in the drum to intersect in front of the drum, as described in FIG. 20. In some circumstances, the drum and feed tower may share a constant internal curve. That is, the focal points of cartridges throughout the drum and feed tower may have focal points that intersect at a substantially single point in front of the magazine. However, in another embodiment, the feed tower and drum may have different focal points, for instance, where a focal point of cartridges in the feed tower is lower than a focal point of cartridges in the drum. In this case, both the feed tower and the drum may have constant internal curves, and those curves may be the same or different radii.

[0027] Irrespective of the exact type of magazine, the magazine may comprise an elongated casing or feed tower having at least a distal end and a proximal end, and two sides longer than the distal and proximal ends. Furthermore, the magazine may comprise a follower having a tab extending towards one of the two sides, and a bolt catch mechanism arranged at least partially inside and near a top of the elongated casing or feed tower. The tab may be arranged to contact and bias upward the bolt catch mechanism into a position configured to engage a bolt catch of a firearm that the magazine is engaged with, as further discussed below. In the example of FIG. 1, the tab contacts the bolt catch mechanism towards the proximal end (rear) of the elongated casing or feed tower. Variations where the tab contacts the bolt catch mechanism towards the distal end of the feed tower are also discussed later in the disclosure.

[0028] FIGS. 1A and 1B show the bolt catch mechanism in the engaged and disengaged positions, respectively. As shown, FIGS. 1A and 1B depict a bolt catch mechanism 104, a pivot coupling 102, an aperture 103, an aperture 106, and a topmost (or last) cartridge 112. In some examples, the bolt catch mechanism 104 can pivot around a pivot axis (i.e., passing through the pivot coupling 102). In the example of FIG. 1, the pivot axis is arranged in an opening or aperture in the distal end (front end) of the elongated casing or feed tower. Further, to make room for the bolt catch mechanism 104 while not extending outside the boundaries of the feed tower 100, an opening (i.e., aperture 103) in the front corner of the feed tower 100 may be formed to make room for the pivot coupling 102. Additionally or alternatively, another opening (i.e., aperture 106) in a rear corner/proximal end of the feed tower 100 may be formed to allow a rear end of the bolt catch mechanism 104 to extend outside the feed tower 100 and interface with a bolt, or intermediate bolt catch, of a firearm when the bolt catch mechanism 104 is in the engaged position. In some cases, these apertures are not needed, and the bolt catch mechanism 104 can reside entirely within the feed tower 100.

[0029] FIG. 2 illustrates cross section views of FIG. 1. Specifically, FIG. 2A illustrates a cross section of FIG. 1A (i.e., engaged position) and FIG. 2B illustrates a cross section of FIG. 1B (i.e., disengaged position). As shown in FIG. 2A, the feed tower may comprise a bolt catch mechanism 104, a pivot coupling 102, apertures 103 and 106, one or more ridges 108, a dummy round 114 (one of a plurality that make up the follower), and a tab 110. In some examples, the bolt catch mechanism 104 may comprise a pivoting bolt lock back arm and a bolt-engagement portion 105. In this example, the pivoting lock back arm may extend from the proximal end to the distal end of the elongated casing or feed tower. As discussed above, the tab 110 may be located on the follower within the feed tower of the magazine. Alternatively, the tab 110 may be part of or affixed to one of the links in a chain of dummy rounds (e.g., dummy round 114), as further described in relation to FIG. 3. In some cases, the dummy

rounds may also be referred to as follower dummies.

[0030] FIG. 2B depicts the bolt catch mechanism 104 biased towards the disengaged position via a spring or other biasing mechanism, as further described in relation to FIGS. 4 and 7. For instance, FIG. 4 illustrates a perspective view of an embodiment of bolt catch mechanism 104 and follower with tab 110 in isolation, where the bolt catch mechanism 104 may be biased towards the disengaged position via a spring 112.

[0031] As long as final round 112 has not left the feed tower 100, there is no force to oppose the bias of the spring and the bolt catch mechanism 104 remains in the disengaged position. Specifically, when the tab 110 is not biasing the bolt catch mechanism 104 upward, the spring bias pushes the bolt catch mechanism 104 downward, but rotation downward is halted by contact with top edges of two ridges 108 extending inward from the inside of the feed tower 100 on the same side of the feed tower 100 as the bolt catch mechanism 104 (or extending toward the distal end or extending toward the proximal end).

[0032] In some cases, the casing or feed tower may be shaped to hold a single stack of cartridges from a bottom of the casing or feed tower towards a top of the casing or feed tower, and to transition to a double stack at the magazine's interface to the firearm (e.g., at a top of the magazine). In some embodiments, the ridges 108 (also referred to as ribs) under the bolt catch mechanism may also serve to guide single stack rounds or cartridges until they approach or clear the pivoting lock back arm. Once cartridges approach or clear the arm they may be pushed into the double stacked portion of the feed tower. That is, while the cartridges are generally stacked in a singular fashion within the feed tower, they may be in a double stack configuration at the action/receiver of the firearm.

[0033] Turning now to FIG. 2A, when the final round 112 leaves the feed tower 100, the pivoting bolt lock back arm of the bolt catch mechanism 104 may be biased upward around the pivot coupling 102 by the tab 110 on the follower as the follower nears or reaches a top of the magazine. In some examples, the tab 110 impinges on a bottom of the bolt catch mechanism 104. The force of this impingement is greater than the bias from the spring and so the bolt catch mechanism 104 is rotated (or pushed) upward such that an end (e.g., bolt engagement portion 105) of the bolt catch mechanism 104 extends out of the aperture 106 in the back corner of the feed tower 100.

[0034] FIG. 3 shows a perspective view of the cross section of FIG. 2A. As shown, FIG. 3 illustrates a tab 110 that is part of or affixed to one of the links in a chain of dummy rounds, such as dummy round 114. In some examples, when a final round leaves the feed tower and is replaced by the first dummy round 114, the pivoting bolt lock back arm of the bolt catch mechanism 104 may be biased upward around the pivot coupling 102 by the tab 110 on the follower (i.e., as the follower nears or reaches a top of the magazine). Specifically, the follower may comprise a plurality of dummy cartridges coupled via movable links, and the tab 110 may extend from one of the movable links or one of the plurality of dummy cartridges of the follower. As the tab 110 moves upward, it impinges on a bottom of the bolt catch mechanism 104. The force of this impingement may cause the bolt catch mechanism 104 to rotate (or slide) upward such that the bolt-engagement portion 105 of the bolt catch mechanism protrudes through the aperture 106 in the back corner of the feed tower 100.

[0035] It should be noted that, while a drum magazine and its feed tower are discussed and shown herein, in other embodiments, the bolt catch mechanism 104 can be applied to single or double stack box-type magazines rather than a drum magazine. In those cases, the tab 110 can extend from a traditional follower. Also, since a typical magazine uses a double stack, embodiments of this disclosure can use a single stack box-type magazine, or single-stack feed tower for a drum, but use a casing or feed tower width closer to that of a double stack, thereby making more room for the bolt catch mechanism 104 within the magazine or feed tower and next to a single stack portion of the casing or feed tower. In some cases, box-type magazines (e.g., single stack or double stack) may comprise a follower and a follower spring, where at least a portion of the follower spring is fixed to or coupled to the follower. In such cases, the tab 110 may be situated on the follower spring in the box magazine.

[0036] FIG. 5 illustrates a perspective view of the follower with tab 110 of FIG. 4 in isolation. Further, FIG. 6 illustrates an embodiment of an exploded view of a portion of a follower for a drum magazine including two dummy rounds 114 and 602, two links 608 and 610, two follower dummy rollers 604 and 606, and the tab 110. Although the tab 110 is shown as part of the first link 608 throughout this disclosure, the tab 110 could also be part of or attached to the second 610 or third link (or any subsequent dummy round or link) in the chain of dummy rounds of the follower assembly, or a dummy cartridge. In some embodiments, the dummy cartridge that has the tab 110 may not be rotatable. For ease of reference, the term dummy cartridge (e.g., dummy cartridges 502 and 504 in FIG. 5) may be used in this disclosure to reference a combination of a follower dummy roller (e.g., follower dummy roller 604) and a follower dummy or dummy round (e.g., dummy round 114). The terms first dummy cartridge 502 or leading dummy cartridge 502 may be used to reference the combination of the leading follower dummy roller 604 and the leading follower dummy 114.

[0037] In some embodiments, the follower assembly may have an inner spindle slider (e.g., see inner spindle slider 401 in FIG. 23), an outer spindle slider (e.g., see outer spindle slider 402 in FIG. 23), a spindle (e.g., see spindle 403 in FIG. 23), a plurality of follower dummy rollers 604 and 606 (see FIG. 6), a plurality of follower dummies 114 and 602, where follower dummy roller 604 is the leading follower dummy roller 604, and dummy 114

is the leading follower dummy. The follower assembly may also comprise a plurality of follower links 608 and 610, also referred to as links 608 and 610 for short.

[0038] In some embodiments, one or more of the follower dummy rollers 606 may rotate relative to the respective follower dummies 602, which may also rotate relative to the spiral track (not shown). That is, a front portion of a dummy cartridge 504 may rotate relative to a rear portion of a dummy cartridge 504. Similarly, a front portion of a leading dummy cartridge 502 may rotate relative to a rear portion of a leading dummy cartridge 502. Allowing the front and rear portions of dummy cartridges 502, 504 to rotate relative to each other as they pass through the spiral track may serve to minimize the frictional forces between the follower assembly and the drum body assembly.

[0039] In the present disclosure, the plurality of dummy cartridges 502, 504 are linked by a plurality of links 608, 610, such that each dummy cartridge 502, 504 is allowed to rotate within each link 608, 610 independently of the other dummy cartridges 502, 504 and the first dummy cartridge 502. This independent rolling may serve to substantially reduce the amount of sliding friction as the dummy cartridges of the follower assembly wind through the spiral track.

[0040] In order to achieve this independent rotation and minimize sliding friction, all or a majority of the spring force may be carried by the stacked follower links 608, 610 in a kinetic chain, thus allowing for independent rotation of the dummy cartridges 502, 504. It should be noted, however, that it is not a requirement that the entire first dummy cartridge 502 not rotate.

[0041] FIG. 7 also provides two views of the feed tower 100 with the bolt catch mechanism 104 in the engaged (bottom right) and disengaged (top right) positions. As shown, in the disengaged position, the aperture 106 in the feed tower 100 may be clearly seen without the bolt-engagement portion 105 of the bolt catch mechanism. However, in the engaged position, the tab 110 (not shown) may cause the bolt catch mechanism 104 to rotate upward such that the bolt-engagement portion 105 of the bolt catch mechanism protrudes through the aperture 106 in the back corner of the feed tower 100.

[0042] FIGS. 8A and 8B illustrate two isolated perspective views of one embodiment of the bolt catch mechanism 104.

[0043] FIG. 9 illustrates a cross section of two states (i.e., disengaged position on left, engaged position on right) of an embodiment of a firearm system including a magazine 900 with a feed tower, a bolt catch mechanism 902 comprising a pivoting bolt lock back arm and bolt engagement portion, a bolt catch 904, and a bolt 906. In some examples, the system depicted in FIG. 9 may implement one or more aspects of FIGS. 1-8. For instance, the bolt catch mechanism portion 902 may be similar or substantially similar to the bolt catch mechanism 104 shown in the figures above. In some examples, the magazine's feed tower may also comprise a pivot coupling 910 (similar to the pivot coupling 102 above), one or more apertures (e.g., front and rear of feed tower), one or more ridges, and a tab 908 (similar to the tab 110 above). As previously described, the bolt catch mechanism may pivot around the pivot coupling 910 in the feed tower. In some circumstances, apertures in the front and rear corners of the feed tower may be formed to make room for the pivot coupling 910 and the bolt engagement portion of the bolt catch mechanism, respectively.

[0044] Moving to the engaged position, the tab 908 on the follower may bias the pivoting bolt lock back arm of the bolt catch mechanism 902 upward pivoting around the pivot coupling 910 by the tab 908 on the follower (i.e., as the follower nears or reaches a top of the magazine 900). As the tab 908 moves upward, it impinges on a bottom of the bolt catch mechanism 902. The force of this impingement may cause the bolt catch mechanism 902 to rotate upward such that the bolt-engagement portion of the bolt catch mechanism 902 protrudes through the aperture in the back corner of the feed tower 900. The upward movement of the bolt catch mechanism 902 may cause the bolt catch 904 of the firearm to be secured in a locked position. In some cases, when pushed upward by the follower of an empty magazine, the bolt catch 904 may function to stop bolt 906 from traveling forward (i.e., to the left in FIG. 9). In such cases, the bolt 906 may be locked to the rear after the magazine 900 has been expended. After inserting a new magazine in the firearm, the bolt catch mechanism may return to the disengaged position (i.e., default unlocked position), either automatically or by the user.

[0045] FIG. 10 illustrates a cross section of two states (i.e., disengaged position on left, engaged position on right) of a second embodiment of a firearm system including a magazine 1000 with a feed tower, a bolt catch mechanism 1002 with a bolt engagement portion, a bolt catch 1004, and a bolt 1006. Unlike the firearm system shown in FIG. 9, the system of FIG. 10 may not comprise a pivot coupling point. However, the magazine's feed tower may comprise one or more apertures (e.g., front and rear of feed tower), one or more ridges, and a tab 1008 (similar to the tab 110 above). In some cases, after the last round in the magazine 1000 has been expended, the tab 1008 on the follower may move upward and collide with (or engage with) the bolt catch mechanism 1002. In such cases, the upward movement of the tab 1008 may cause the bolt catch mechanism 1002 to also move upward and engage with the bolt catch 1004 of the firearm, which may cause the bolt catch 1004 to be engaged in a locked position. In the engaged position, the bolt catch 1004 may prevent the bolt 1006 from traveling forward by locking the bolt 1006 to the rear.

[0046] FIG. 11 illustrates a cross section of two states (i.e., disengaged position on left, engaged position on right) of a third embodiment of a firearm system including a magazine 1100 with a feed tower, a bolt catch mechanism 1102 with a pivoting bolt lock back arm and a bolt engagement portion, a bolt catch 1104, and a bolt 1106.

In some firearm systems (e.g., Glocks, pistols, etc.), the bolt catch 1104 may be situated towards the distal end (i.e., front or barrel end of the firearm). In such cases, pivot coupling point 1110 may be located towards the proximal end (i.e., rear end) of the firearm. In some embodiments, the bolt catch mechanism 1102 may be similar or substantially similar to the bolt catch mechanism 1002 or bolt catch mechanism 902 described above, where the bolt catch mechanism 1102 pivots around the pivot coupling 1110 in the feed tower. In some examples, the magazine 1100's feed tower may also comprise one or more apertures (i.e., front and/or rear of feed tower), one or more ridges, and a tab 1108 (similar to the tab 110 or tab 908 above).

[0047] As shown, in the engaged position (i.e., after a last round or cartridge has been fired), the tab 1108 moves upward and causes the bolt catch mechanism 1102 to pivot around the pivot coupling point 1110 in the feed tower. In such cases, the upward movement of the bolt catch mechanism 1102 may secure the bolt catch 1104 of the firearm in a locked position. In this position, the bolt catch 1104 may lock the bolt 106 and stop it from traveling forward (i.e., to the left in FIG. 11) in the firearm.

[0048] While FIG. 11 shows a bolt (1106), in other embodiments, the bolt 1106 could be replaced by a slide having a slide lock (e.g., in a GLOCK). In that case, the bolt catch 1104 may move up and into the way of forward movement of the slide lock. Further, while the bolt catch 1104 has been shown as a single component, in other embodiments, the bolt catch 1104 can be formed from multiple components or multiple interlinked components, such as the interlinking between the GLOCK slide release and the slide. Further, while the illustrations show a bolt catch 1104 having a tab projecting rearward (to the right of the page), in other embodiments, the bolt catch 1104 could have a tab extending inward (e.g., into the page) and the bolt catch 1104 may overlap a portion of the bolt catch mechanism 1102 (when viewed from the side as in FIG. 11). What is more, the bolt catch 1104 has been shown as moving linearly up and down, but in other embodiments, could also include a rotating or pivoting motion, such as that seen in the GLOCK platform. Further, while the bolt 1106 is a simplified representation of a typical bolt, bolts come in a variety of shapes and sizes, and thus the shape shown as 1104 should not be limiting. For instance, in a GLOCK-style platform, a slide rather than a bolt may be implemented.

[0049] FIG. 12 illustrates a cross section of two states (i.e., disengaged position on left, engaged position on right) of a fourth embodiment of a firearm system including a magazine 1200 with a feed tower, a bolt catch mechanism 1202 with a bolt engagement portion, a bolt catch 1204, and a bolt 1206. In some aspects, the firearm system of FIG. 12 may be similar to the firearm system shown in FIG. 10, with the primary difference being the location of tab 1208. In some examples, the firearm system of FIG. 12 may also comprise one or more apertures (e.g., front and rear of feed tower) and/or one or more ridges (not shown). In some cases, after the last round in the magazine 1200 has been expended, the tab 1208 on the follower may move upward and collide with (or engage with) the bolt catch mechanism 1202. In such cases, the upward movement of the tab 1208 may cause the bolt catch mechanism 1202 to also move upward and engage with the bolt catch 1204 of the firearm, thus engaging the bolt catch 1204 in a locked position. In the engaged position, the bolt catch 1204 may prevent the bolt 1206 from traveling forward (i.e., to the left in FIG. 12) in the firearm, which may allow for faster reloading.

[0050] While FIG. 12 shows a bolt (1206), in other embodiments, the bolt 1206 could be replaced by a slide having a slide lock (e.g., in a GLOCK). In that case, the bolt catch 1204 may move up and into the way of forward movement of the slide lock. Further, while the bolt catch 1204 has been shown as a single component, in other embodiments, the bolt catch 1204 can be formed from multiple components or multiple interlinked components, such as the interlinking between the GLOCK slide release and the slide. Further, while the illustrations show a bolt catch 1204 having a tab projecting rearward (to the right of the page), in other embodiments, the bolt catch 1204 could have a tab extending inward (e.g., into the page) and the bolt catch 1204 may overlap a portion of the bolt catch mechanism 1202 (when viewed from the side as in FIG. 12). Further, while the bolt 1206 is a simplified representation of a typical bolt, bolts come in a variety of shapes and sizes, and thus the shape shown as 1204 should not be limiting. For instance, in a GLOCK-style platform, a slide rather than a bolt may be implemented.

[0051] The illustrated bolts, 906, 1006, 1106, and 1206 are shown with a wider diameter flange or teeth at a front of the bolt, much like one would see in an AR-style bolt. However, those of skill in the art will appreciate, that this is just one implementation of a bolt, and this disclosure can easily be applied to other shapes and variations of a bolt, such as that seen in a CZ Scorpion platform (where the bolt is more of a rectangular block rather than including a flange or teeth at a front end). In other embodiments, and as described above, the bolt can be replaced by a slide (e.g., in a Glock-style platform). These and other changes to the shape of the bolt or slide do not influence the magazine construction or operation of the magazine beyond the descriptions and figures provided herein.

[0052] Additionally, while the illustrated bolt catches 904, 1004, 1104, and 1204 are shown moving in a linear fashion between a disengaged and engaged position, in other embodiments, the bolt catch 904, 1004, 1104, and 1204 may pivot when moving between these two positions.

[0053] FIGS. 13-18 illustrate views of an alternate embodiment of a feed tower where the follower tab is located at a proximal end of the feed tower, and where the bolt catch mechanism of the magazine also pivots at the proximal end of the feed tower, as further described below. In some cases, the unique geometry of the pivoting bolt

lock back arm of the bolt catch mechanism may allow it to be engaged in spite of a shorter distance (i.e., as compared to FIGS.. 1-4 above) between the pivot coupling point and the point at which the engagement force is applied. For instance, unlike the bolt catch mechanism depicted in FIGS. 1, 2, 3, 4, or 8, where the pivoting bolt lock back arm is relatively straight or horizontal, the bolt catch mechanism illustrated in FIGS. 13-18 has a substantially irregular or curved lower portion. Because of this, the tab can impinge on a proximal end of the bolt catch mechanism while still causing the bolt catch mechanism to pivot around a proximal end of the bolt catch mechanism.

[0054] For instance, once the tab contacts a lower surface of the bolt catch mechanism or slides under the bolt catch mechanism, the bolt catch mechanism may be pivoted upward. In other words, an upward motion of the tab under the curved lower portion of the bolt catch mechanism may lead to a sliding motion of the bolt catch mechanism, where the sliding motion is parallel with the follower. Further, the unique geometry of the bolt catch mechanism in conjunction with the sliding motion may swing its opposite narrower end (e.g., see FIGS. 15, 17, and 18) upward into an engaged position. In some cases, this mechanism may also be referred to as a pivoting slide stop or pivoting slide catch mechanism.

[0055] FIG. 13 illustrates a perspective view of an alternate embodiment of a feed tower 1300 having a bolt catch mechanism 1302 that pivots at a proximal end of the feed tower 1300 via pivot 1310. FIG. 14 illustrates another perspective view of the embodiment shown in FIG. 13 with the pivot 1310, the bolt catch mechanism 1302, and a bias spring 1412. The spring 1412 can be arranged at a radius from the pivot 1310, and the spring 1412 can push up against a flange above the spring 1412 as shown in FIGS. 14 and 15. In some examples, the bolt lock back arm of the bolt catch mechanism 1302 may be biased towards the disengaged position via the bias spring 1412. The illustrated bias spring 1412 extends from a wall, but in practice could end flush with that wall. FIG. 15 illustrates a cutaway view of an inside of the embodiment shown in FIG. 13 with the spring 1412 and the pivot 1310.

[0056] FIG. 16 illustrates a head on view of the bolt catch mechanism 1302 and a tab 1608 of the follower corresponding to the embodiment shown in FIG. 13. Further, FIG. 17 illustrates a profile view of the bolt catch mechanism 1302 and follower with tab 1608 shown in FIG. 16. Lastly, FIG. 18 illustrates a perspective view of the bolt catch mechanism 1302 and follower with tab 1608 shown in FIG. 16.

[0057] In some circumstances, the design of the firearm may require a pivot mechanism (i.e., pivot 1310 in FIGS. 14-18) at a proximal end of the feed tower, for instance, due to the arrangement and/or location of the bolt (not shown). In such cases, one or more dummy cartridges 1614 may be deployed in the follower assembly of the magazine, where each of the dummy cartridges may comprise at least a dummy round, a link 1710, and optionally a tab 1608. In some examples, link 1710 may surround at least a portion of dummy cartridge 1614 (shown in FIG. 16, but not in FIG. 17).

[0058] In some cases, at least one of the dummy cartridges may be a first or leading dummy cartridge, as previously discussed in relation to FIG. 5. Further, the tab 1608 may be a part of or attached to any of the dummy cartridges 1614, such as the first or leading dummy cartridge, a second to last dummy cartridge, or another dummy cartridge. Additionally or alternatively, the tab 1608 may be attached to any dummy round or link in the chain of dummy rounds or links of the follower assembly. In the example shown in FIGS. 16-18, tab 1608 is attached to link 1710.

[0059] In some cases, when the dummy cartridge 1614 moves to a top of the feed tower, the tab 1608 may bias the pivotable bolt catch mechanism 1302 upward into the engaged position, securing the bolt catch (not shown) of the firearm in a locked position with a bolt-engagement portion of the bolt catch mechanism 1302.

[0060] FIGS. 19 and 20 illustrate an exploded view and a perspective view, respectively, of a drum magazine assembly 1. In some cases, the drum magazine assembly 1 may comprise a front cover assembly 10, a wheel 20, a drum body and spring assembly 30, a follower assembly 40, a rear cover 50, and retainer clips 60. In some examples, a feed tower assembly 70 may be coupled to a drum body 302 and retained by the front cover 10. The feed tower assembly may implement aspects of the feed tower described in reference to FIGS. 1 and 2 above. In some cases, wheel 20 may comprise one or more teeth 201 at a distal region of the wheel, and more specifically, at the distal face.

[0061] A rear cover 50 may be connected to the drum body assembly 30 and retained thereon by retaining clips 60. In some embodiments, the drum magazine assembly 1 may be configured to hold 50 to 100 or more cartridges, such as in a single-stack design having a generally spiraled stack configuration inside the drum body 302. It should also be understood that the maximum loading capacity of the drum magazine assembly 1 is dependent on the caliber of ammunition used. For larger sized cartridges, for example, and without limitation, the drum magazine assembly 1 may be configured to hold as little as 35 cartridges at maximum loading capacity. In still other embodiments, the drum magazine assembly 1 may be configured to hold as little as 10 cartridges at maximum loading capacity. These capacities should be considered exemplary only. In some examples, the drum magazine 1 may have a viewing window on the rear cover 50, with the viewing window extending substantially from a central portion of the rear cover 50 to a distal portion of the rear cover 50. In some embodiments, the viewing window need not necessarily include a transparent cover; instead, the viewing window may comprise an elongated opening in the rear cover 50, or a series of openings which may or may not be covered with a transparent ma-

terial and/or semi-transparent material. As another example, the rear cover 50 may be manufactured of a transparent or semi-transparent material.

[0062] The various components of the drum magazine assembly 1 may be manufactured of suitable polymeric materials, high-strength synthetic materials, composites, ceramics, various metals including aluminum, stainless steel or alloys, or any other material suitable for the intended use with a firearm, and the components may have one or more surface finishes suitable to minimizing friction between certain moving parts.

[0063] Turning now to FIG. 20, it can be seen that the drum magazine assembly 1 includes a drum coupled to a bottom of the feed tower. Further, the drum has a constant internal curve that causes axes of cartridges in the drum to intersect in front of the drum. In other words, the drum magazine assembly 1 may be designed such that a focal point of each cartridge substantially converges at a single point P at a distance D from the drum magazine assembly 1. Furthermore, and as illustrated in FIG. 20, the drum and feed tower may also share a constant internal curve. In some cases, the focal point of the feed tower may be lower than the focal point of the drum. In other words, the focal point of cartridges in the feed tower could be below single point P in FIG. 20. In other embodiments the feed tower and the drum can have constant internal curves therein, but constant curves having two different radii, or two different focal points but the same radii.

[0064] A continuous curvature between the drum body and the feed tower may be ideal, and many magazine designs according to this disclosure may start with such a constant internal curve. However, if there are cartridge feeding issues, then the cartridge behavior in the feed tower can be altered by angling the feed tower relative to the drum. For instance, angling the feed tower down relative to the drum increasing nose pressure on the cartridges, while angling the feed tower up relieves pressure on the cartridge noses and increases it on rears.

[0065] Non-optimal magazines allow cartridges at the Feed Lips to pitch up or down affecting how reliably the weapon can strip the rounds from the magazine and feed it into the chamber. If the bullet pitches up due to lack of pressure on the rear of the round stack, the weapon bolt may not effectively contact the cartridge case head and cause a "bolt over base" malfunction. If the bullet pitches down (nose dives) due to lack of pressure on the front of the round stack, rounds may hit too low on the weapon feed ramp or even impact the front of the magazine affecting smooth cartridge feeding.

[0066] Increasing spring pressure can help with the above issues but often magazines will exhibit pitch problems that cannot be fixed through spring pressure alone. To address this issue, pressure on the front or rear of the round stack can be adjusted by increasing or decreasing the pitch of the Drum body itself in relation to the Feed Tower. For instance, pitching the drum section up effectively raises the focal point of the cartridges in the drum and applies additional pressure on the front of the round stack. Pitching the drum section down has the opposite effect and increases the pressure on the rear of the stack.

[0067] Another possibility to adjust front or rear stack pressure is to increase or decrease the focal point radius. Shortening the radius compels the cartridges to apply more force on the front of the stack while elongating the radius applies more force to the rear of the stack.

[0068] For the purpose of this disclosure, substantial convergence should be understood to mean bringing the convergence within reasonable manufacturing tolerances. This substantial convergence allows for more optimal stacking of the cartridges, thus distributing forces across each cartridge case, and improving stack consistency and feeding. Moreover, the substantial convergence allows the cartridges to pass more smoothly through the drum magazine assembly 1 to the loading chamber as compared to a drum assembly not having the substantially converging focal point. It should be noted that the point P is defined by the conical apex of the multiple cartridges, or the length of taper of each cartridge case; that is, the distance D would be greater for cartridges designed with a slight taper than for cartridges designed with a more extreme taper. Also shown in FIGS. 19 and 20 is a first pivot axis A of an embodiment, as will be more apparent with brief reference to FIG. 23 and FIG. 19, axis A is approximately defined by the spindle 403 of the follower assembly 40 in FIG. 23. The wheel 20 and arm 2160 in FIG. 21 may also be configured to pivot about axis A.

[0069] Turning now to FIG. 21, the front cover assembly 10 is now discussed. The front cover assembly 10 may have a front cover 2120, a lever 2140, an arm 2160, and a pawl 2180. In some circumstances, a return spring 2101 may also be included in the front cover assembly 10. The front cover assembly 10 may provide several functions. First, the front cover 2120 may provide the wheel 20 and the interface between the wheel and other moving components some protection from excessive impacts or other rough handling while in use. The front cover assembly 10 including an advancing mechanism or arm 2160 and lever 2140 assembly may also provide for an increased moment arm for the user, as compared to turning the wheel 20 without the front cover assembly 10. However, it should be understood that the drum magazine assembly 1 is a fully functional assembly even when the front cover assembly 10 is not present; that is, a user could turn the wheel 20 by hand to insert cartridges.

[0070] Nonetheless, the front cover assembly 10 may be included to provide an advancing mechanism, which may include a lever 2140, an arm 2160, and a pawl 2180 assembly configured to enable a user to retract a spring 301 while loading cartridges. More specifically, an advancing mechanism or process may include the components and steps required to extend or rotate a lever 2140 to increase a moment arm, turn a wheel 20, load cartridges, and release a lever 2140 while returning. Rotating the lever 2140 also adds the advantage that one can hold

the lever 2140, and thus reduce spring pressure, while loading cartridges.

[0071] The arm return spring 2101 may be provided to ensure the arm 2160 is returned to and/or remains biased towards a starting position after each advancing motion. In some other cases, the arm return spring 2101 may be provided to ensure that the height of the arm 2160 does not exceed a threshold. The advancing mechanism may be configured to advance the wheel 20 such that one or more cartridges may be loaded after advancing the wheel 20. With the advancing mechanism, the magazine can be more easily loaded without having to release spring tension due to the loading process. Therefore, the spring 301 does not have to be wound after loading, thus improving cartridge feed consistency, weapon reliability, and safety. The spring 301 is also configured such that an outermost end is fixed relative to the drum body 302, while the innermost end rotates. It should also be understood that for the purpose of this document, the term "advance" may include both linear and rotational movement. For example, advancing a wheel includes rotating the wheel, while advancing a follower assembly may include causing a follower assembly to travel in a generally spiraled path such as through a spiral track or in a generally straight path, such as through a feed tower.

[0072] In some embodiments, the lever 2140 is generally positioned near the outer diameter of the front cover 2120 and is configured to cause a pawl 2180 to selectively engage the wheel 20. In turn, the wheel 20 may engage the spindle 403 of the follower assembly 40, seen in FIG. 23, to retract the spring and follower assembly 40 for loading cartridges. The advancing mechanism including a pawl 2180 and lever 2140 generally increases the moment arm applied to the spindle 403 when the lever 2140 is used, thus improving the ease of use of the drum magazine assembly 1. The lever 2140 itself may have a grip 2141 attached to a pivot body 2144; the lever 2140 may also have an advancement lock feature having a clearance groove 2142 in the pivot body 2144, a locking ridge 2121, and/or a lever lock 2143. In some examples, the advancement lock feature, including the groove 2142 and locking ridge 2121, may be provided to increase reliability in the use of the magazine. Specifically, when the lever 2140 is in the biased closed position, the groove 2142 may be rotated away from the locking ridge 2121 in the front cover 2120, causing the pivot body 2144 to abut the locking ridge 2121 should one attempt to operate the lever 2140 when the lever is closed. The pivot body 2144 is configured to rotate about axis D, shown in FIG. 21, such as within a passage 2161 of the arm 2160, and to cause the pawl 2180 to engage the wheel 20 for retracting the spring.

[0073] For instance, the pawl 2180 may be engaged by the lever 2140 at a notch in a shaft (not shown). Specifically, a pawl pin assembly 2111 have a pin and a biasing spring and positioned within the lever 2140 may bottom out on a first side of the notch, thus causing the pawl to rotate away from the wheel 20 when the lever 2140 is in the closed position. When the lever 2140 is opened, the pawl pin assembly 2111 is configured to push against the other side of the notch, thus allowing the pawl 2180 to advance over the teeth of the wheel 20 or engage the teeth 201 in a ratcheting configuration. Due to a spring assembly, the pawl pin assembly 2111 may cause the pawl 2180 to be biased against the wheel 20 when the lever 2140 is in the open position, thus ensuring the pawl 2180 engages the teeth 201 of the wheel 20 when the lever 2140 is being operated

[0074] The grip 2141 is configured to allow a user to grasp and rotate the lever 2140 relative to the arm 2160. With this motion, the lever 2140 may be moved from a biased closed position to an open position. Moving the lever 2140 to the open position may serve to increase the length of the moment arm, and hence the torque to be applied, to the spindle 403. It should be understood that, although movement is discussed as being achieved using a rotating mechanism, movement can be achieved in some embodiments using a telescoping motion.

[0075] The lever lock 2143 may be configured to prevent the lever 2140 from being opened when the drum magazine assembly 1 is installed in a weapon. This lever lock 2143 may prevent accidental activation of the lever 2140, especially when the magazine 1 is being used as a weapon-stabilizing support, or is being used in an environment in which branches, debris, load bearing equipment, or the operator could inadvertently entangle or push on the lever 2140. In some examples, the lever lock 2143 of the lever 2140 may be configured to operate with a variety of weapons. Further, although the lever lock 2143 is depicted as having a particular profile or shape, it is contemplated that the lever lock 2143 include any shape suitable for the purpose of preventing the lever 2140 from being opened when the magazine assembly 1 is installed in a weapon. As another example, the lever lock 2143 could comprise a latch safety, catch, or any other feature, as an alternative to, or in addition to, a blocking mechanism, to prevent the lever 2140 from being activated when the magazine 1 is used.

[0076] As previously mentioned, the drum body 302 and the drum magazine assembly 1 may be configured such that a focal point of each cartridge, regardless of where the cartridges are located in the drum magazine assembly 1, substantially converges at a single point P at a distance D from the drum magazine assembly 1. This is achieved in part by including a curvature to the rear cover 50, as well as a curvature to the spiral track of the drum magazine assembly.

[0077] Turning now to FIGS. 22 and 23, the follower assembly 40 is discussed in detail. In some examples, the follower assembly 40 may implement aspects of the follower discussed above in relation to FIGS. 4-6. The follower assembly 40 may have an inner spindle slider 401, an outer spindle slider 402, a spindle 403, a plurality of follower dummy rollers 404, a plurality of follower dummies 405, a leading follower dummy roller 406, a leading follower dummy 407, and a plurality of follower links 408,

or links 408 for short. For ease of reference, the term dummy cartridge 410 may be used to reference a combination of a follower dummy roller 404 and a follower dummy 405. The terms first dummy cartridge 412 or leading dummy cartridge 412 may be used to reference the combination of the leading follower dummy roller 406 and the leading follower dummy 407.

[0078] In some embodiments, one or more of the follower dummy rollers 404 may rotate relative to the respective follower dummies 405, which may also rotate relative to the spiral track of the drum. That is, a front portion of a dummy cartridge 410 may rotate relative to a rear portion of a dummy cartridge 410. Similarly, a front portion of a leading dummy cartridge 412 may rotate relative to a rear portion of a leading dummy cartridge 412. Allowing the front and rear portions of dummy cartridges 410, 412 to rotate relative to each other as they pass through the spiral track further minimizes the frictional forces between the follower assembly 40 and the drum body assembly 30.

[0079] The follower assembly 40 may include a sufficient number of dummy cartridges 410 so as to ensure that, when fully extended, the feed tower assembly 70 is approximately filled with the dummy cartridges 410 including the first dummy cartridge 412. Filling the feed tower assembly 70 with the dummy cartridges 410 allows the torsional spring 301 to apply a linear force on the cartridge stack through the feed tower, eliminating the need for a mechanical pusher arm. As will be understood by those skilled in the art, the overall purpose of the follower assembly 40 is to maintain loaded cartridges or the first dummy cartridge 412 biased towards a feed lip of the feed tower assembly 70. Each crank action of the lever 2140 causes the follower assembly 40 to retract enough to allow at least one cartridge to be loaded. However, the follower assembly 40 may retract enough to allow two or more cartridges to be loaded. Particularly when the follower assembly 40 is near a fully extended position, more cartridges may be loaded after a single advancing motion. When the follower assembly 40 is or moves closer to a fully retracted position, fewer cartridges may be inserted. Upon release of the lever 2140, the follower assembly 40 resumes the bias towards the feed lip.

[0080] In the present disclosure, and as seen in FIGS. 22 and 23, the plurality of dummy cartridges 410, 412 are linked by a plurality of links 408, such that each dummy cartridge 410 is allowed to rotate within each link 408 independently of the other dummy cartridges 410 and the first dummy cartridge 412. This independent rolling reduces sliding friction substantially as the dummy cartridges of the follower assembly 40 wind through the spiral track 303.

[0081] To achieve this independent rotation, all spring force is carried by the stacked follower links 408 in a kinetic chain, to allow independent rotation of the dummy cartridges 410, thereby minimizing sliding friction. It should be noted that the first dummy cartridge 412 may be keyed to not rotate, so as to enable a bolt catch function to be provided. Naturally, if a bolt catch function is not desired, the first dummy cartridge 412 may be configured to rotate just like the remaining dummy cartridges. It is also noted that it is not a requirement that the entire first dummy cartridge 412 not rotate. That is, the leading follower dummy 407 may be configured to rotate relative to the leading follower dummy roller 406, so as to minimize friction while still retaining a bolt catch function. The last dummy cartridge 410, that is, the dummy cartridge 410 closest to the spindle 403 when the follower assembly is installed in the magazine assembly 1, is configured to allow the inner spindle slider 401 to move along an axis of the dummy cartridge 410, or the follower dummy roller 404, so as to compensate for changes in the position of the dummy cartridges 410 relative to the plane define by axes B-C or a rear portion of the drum magazine assembly 1, illustrated in FIG. 20.

[0082] FIG. 24 illustrates a feed tower retention mechanism. As seen, the feed tower 701 includes a pair of mounting ribs 7012 (or engagement ribs) configured to interface with a pair of mounting slots 3022 in the drum body 302. The drum body 302 also has a pair of protrusions 3021 that are retained by the rear cover 50. Retaining clips 60 are further provided to maintain the front cover 10, the drum body 302, and the rear cover 50 in an assembled state. With a brief review of FIG. 25, it can be seen that the mounting ribs 7012 stop short of the rear cover 50 when the feed tower 701 is assembled to the drum body 302. In some cases, the protrusions 3021 of the drum body 302 may nest under the rear cover 50. By locking the feed tower in this manner, the present design exhibits much less potential for movement, as compared to currently-available designs. This also provides for reduced tolerance stacking problems, as well as improved strength and alignment as compared to currently-available designs.

[0083] In some cases, the spiral track in the drum may serve to guide single stack rounds in the drum body 302 until they get above the arm 2160 of the front cover assembly 10 and pushed into a single or double stack portion of the feed tower 701. It should be noted that, while the cartridges are generally stacked in a singular fashion within the drum body, they may appear as double stacked to the action/receiver of the firearm.

[0084] FIG. 26 illustrates a method 2600 of manufacturing a magazine according to one or more embodiments of the disclosure. In some cases, method 2600 may implement one or more aspects of FIGS. 1-25 discussed above.

[0085] At 2602, a magazine comprising an elongated casing or feed tower having at least a distal end and a proximal end, and two sides longer than the distal and proximal ends, may be provided. In some examples, providing the magazine may further comprise forming one or more openings in the distal and/or proximal ends of the elongated casing or feed tower.

[0086] At 2604, a bolt catch mechanism may be pro-

vided in the magazine, where the bolt catch may be arranged at least partially inside and within an upper portion of the elongated casing or the feed tower.

[0087] In some examples, the bolt catch mechanism be coupled to the elongated casing or feed tower via one of 2606-a or 2606-b.

[0088] In some embodiments, at 2606-a, the bolt catch mechanism may be pivotally coupled to the elongated casing or feed tower at a pivot axis. In some cases, the pivot axis may be arranged in an opening in the distal end of the elongated casing or feed tower, and the bolt catch mechanism may be pivotable around the pivot axis towards the distal end (i.e., pivotally coupled within the distal opening). In such cases, a bolt-engagement portion of the bolt catch mechanism may be arranged within a proximal opening and may be configured to pivotally move up and down within the proximal opening, as described in relation to FIG. 9. In some other cases, the pivot axis may be arranged in an opening in the proximal end of the elongated casing or the feed tower, and the bolt catch mechanism may be arranged within a distal opening and may be configured to pivotally move up and down with the distal opening, as described in relation to FIG. 11.

[0089] Optionally, in some embodiments, the bolt catch mechanism may be coupled to the elongated casing or feed tower via a sliding engagement, at 2606-b, also described in relation to FIGS. 13-18. In some cases, the bolt catch mechanism may be slidable along a path parallel with a follower once a tab contacts a lower surface of the bolt catch mechanism, as further described below.

[0090] At 2608, a follower may be provided in the magazine, where the follower comprises two or more dummy cartridges and two or more links, one surrounding at least a portion of each dummy cartridge.

[0091] At 2610, a tab may be provided on the follower, where the tab may extend sideways from the follower. Optionally, the tab may extend sideways from one of the links or one of the dummy cartridges on the follower. In some cases, the tab may extend towards one of the two sides of the magazine (or toward the distal end or toward the proximal end), for instance, a side on which the bolt catch mechanism is arranged. Although not shown, where the tab extends toward the distal or proximal end of the feed tower or elongated casing, the tab may interface with a bolt lock mechanism also arranged on the same distal or proximal end of the follower. Alternatively, the bolt lock mechanism could still comprise an arm running along one side of the follower, but further including a flange that wraps around from the side to the distal or proximal end of the follower so as to interface with the proximally or distally extending tab. This variation on the bolt lock mechanism can also pivot or slide vertically.

[0092] In some embodiments, at 2612, the tab may be arranged such that the tab contacts and biases upward the bolt catch mechanism into a position configured to engage a bolt catch of a firearm that the magazine is engaged with when the follower approaches a top of the magazine. In some embodiments, if the bolt catch mechanism is pivotable at a distal end, the tab may be arranged on the follower to contact the bolt catch mechanism, for instance, towards the proximal end of the elongated casing or feed tower. In some other cases, if the tab extends roughly sideways from at least one of the links or dummy cartridges (or toward the distal end or toward the proximal end), the tab may be arranged such that when the two or more dummy cartridges move to a top of the feed tower, the tab biases the pivotable bolt catch mechanism upward into an engaged position.

[0093] In yet other cases, if the bolt catch mechanism is slidable along a path parallel with the follower (i.e., bolt catch mechanism is coupled to the elongated casing or feed tower via a sliding engagement), the tab may be arranged to at least contact a lower surface of the bolt catch mechanism. It should be noted that, irrespective of the location of the tab (e.g., extending sideways from follower, dummy cartridges, links, etc., as well as towards either of the proximal or distal end), the tab may be arranged such that an upward motion of the tab under a curved lower portion of the bolt catch mechanism may lead to a sliding or swinging motion of the bolt catch mechanism, where the sliding motion is parallel with the follower.

[0094] FIG. 27 illustrates a method 2700 of using a magazine assembly comprising a bolt catch mechanism, according to one or more embodiments of the disclosure. In some cases, method 2700 may implement one or more aspects of FIGS. 1-26 discussed above. In some examples, the magazine may be manufactured using the method 2600, as described above in relation to FIG. 26.

[0095] In some embodiments, at 2702, the method may include loading and installing a magazine having a feed mechanism into a weapon, such as a firearm, where the magazine comprises at least an elongated casing or feed tower, a bolt catch mechanism, a follower, and a tab extending sideways from the follower, or from one of the links or one of the dummy cartridges (or toward the distal end or toward the proximal end). In some examples, the follower comprises a plurality of dummy cartridges coupled via movable links, where the tab extends from one of the movable links or one of the plurality of dummy cartridges. The tab may be arranged towards one of the proximal or distal ends of the elongated casing or feed tower.

[0096] Further, the magazine may be a single stack, double stack, or drum magazine. In some cases, such as when the magazine is a drum magazine, the drum magazine may include a drum coupled to a bottom of the feed tower, where the drum has a constant internal curve that causes axes of the cartridges in the drum to intersect in front of the drum. In some embodiments, the drum and feed tower may share a constant internal curve.

[0097] In some cases, loading a magazine at 2702 may include installing the magazine into a weapon having a closed bolt. Loading a magazine at 2702 may include

causing a closed bolt to push a first cartridge from a start position to a displaced position, and against a second cartridge or a leading follower dummy. Loading a magazine at 2702 may further include preventing a third cartridge or a second dummy cartridge from retracting into the magazine assembly while the first cartridge is in the displaced position.

[0098] In some embodiments, the method 2700 may further include blocking a lever at 2704, where blocking a lever includes causing the weapon to block the lever at a lever lock on the lever, thereby preventing the lever from being opened. Blocking a lever at 2704 may be achieved using, for example, a lever 2140 as described with reference to FIG. 21.

[0099] In some cases, the method 2700 may comprise firing the weapon at 2706 until a final cartridge from the magazine is presented into a chamber of the firearm via upward movement of the follower in the elongated casing or feed tower of the magazine. In some embodiments, firing the weapon at 2706 may include allowing loaded cartridges to advance through the magazine and/or a feed mechanism as described with reference to any one of the preceding figures.

[0100] In some cases, the method 2700 may also include engaging a bolt catch at 2708. Engaging a bolt catch at 2708 may be achieved using components similar to those discussed with reference to at least FIGS. 1-18 above. For instance, the bolt catch may be engaged at 2708 by contacting a lower surface of the bolt catch mechanism of the magazine with the tab extending sideways from the follower (or toward the distal end or toward the proximal end), or from one of the links or one of the dummy cartridges. In some cases, engaging a bolt catch at 2708 includes causing a bolt catch engagement feature, such as a sideways extending tab (or toward the distal end or toward the proximal end), to contact and force the bolt catch mechanism of the magazine upward into an engaged position, and secure the bolt catch of the firearm that the magazine is engaged with in a locked position with a bolt engagement portion of the bolt catch mechanism as a result of upward movement of the bolt catch mechanism.

[0101] In some cases, the bolt catch mechanism is pivotable around a pivot axis in one of a distal or proximal end of a feed tower of the magazine. The pivot axis may be situated at an opposite end to the tab in the feed tower. In some other cases, the bolt catch mechanism may be slidable along a path parallel with the follower once the tab contacts a lower surface of the bolt catch mechanism. In some cases, engaging the bolt catch on a weapon after a final cartridge is fired may serve to simplifying loading of a subsequent loaded magazine.

[0102] The method 2700 may further include disengaging the magazine at 2710 from a weapon, which may be achieved using any means, components, or actions known to those skilled in the art.

[0103] As used herein, the recitation of "at least one of A, B and C" is intended to mean "either A, B, C or any combination of A, B and C." The previous description of the disclosed embodiments is provided to enable any person skilled in the art to make or use the present disclosure. Various modifications to these embodiments will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other embodiments without departing from the spirit or scope of the disclosure. Thus, the present disclosure is not intended to be limited to the embodiments shown herein but is to be accorded the widest scope consistent with the principles and novel features disclosed herein.

Claims

1. A magazine comprising:

an elongated casing or feed tower having at least a distal end and a proximal end, and two sides longer than the distal and proximal ends;
a follower having a tab extending sideways toward one of the two sides; and
a bolt catch mechanism arranged at least partially inside and near a top of the elongated casing or feed tower, wherein the tab is arranged to contact and bias upward the bolt catch mechanism into a position configured to engage a bolt catch or slide stop of a firearm that the magazine is engaged with.

2. The magazine of Claim 1, wherein the bolt catch mechanism is pivotable around a pivot axis toward the distal end of the elongated casing or feed tower.

3. The magazine of Claim 2, wherein the pivot axis is arranged in an opening in the distal end of the elongated casing or feed tower.

4. The magazine of Claim 1 or Claim 2, wherein a bolt-engagement portion of the bolt catch mechanism protrudes through an opening in the proximal end of the elongated casing or feed tower.

5. The magazine of Claim 1, wherein the bolt catch mechanism is slidable along a path parallel with the follower once the tab contacts a lower surface of the bolt catch mechanism.

6. The magazine of Claim 1, wherein the tab is arranged toward the proximal end of the elongated casing or feed tower.

7. The magazine of Claim 1, wherein the follower comprises a plurality of dummy cartridges coupled via movable links, and wherein the tab extends sideways from one of the movable links or one of the plurality of dummy cartridges.

8. The magazine of Claim 1, wherein the bolt catch mechanism is an arm extending from the proximal end to the distal end of the elongated casing or feed tower.

9. The magazine of Claim 1, wherein the tab contacts the bolt catch mechanism toward the proximal end of the elongated casing or feed tower.

10. The magazine of Claim 1, wherein the pivot axis is distal of the follower.

11. The magazine of Claim 10, wherein the magazine is a drum magazine and the drum magazine includes a drum coupled to a bottom of the feed tower.

12. A method of manufacturing a magazine comprising:

providing an elongated casing or feed tower having at least a distal end and a proximal end, and two sides longer than the distal and proximal ends;
providing a follower having a tab extending sideways from the follower;
arranging the follower in the magazine such that when the follower moves within the elongated casing or feed tower, the tab extends toward one of the two sides;
arranging a bolt catch mechanism within an upper portion of the elongated casing or feed tower such that the tab is arranged to contact the bolt catch mechanism and push it upward when the follower approaches or reaches a top of the magazine; and
wherein the bolt catch mechanism is configured to engage a bolt catch or slide stop of a firearm that the magazine is engaged with when the follower approaches or reaches the top of the magazine.

13. The method of Claim 12, further comprising, pivotally coupling the bolt catch mechanism to the elongated casing or feed tower at a pivot axis.

14. The method of Claim 12, further comprising, coupling the bolt catch mechanism to the elongated casing or feed tower via a sliding engagement.

15. The method of Claim 12, further comprising:
forming a bolt catch mechanism recess in one of the two sides and arranging the bolt catch mechanism within this recess.

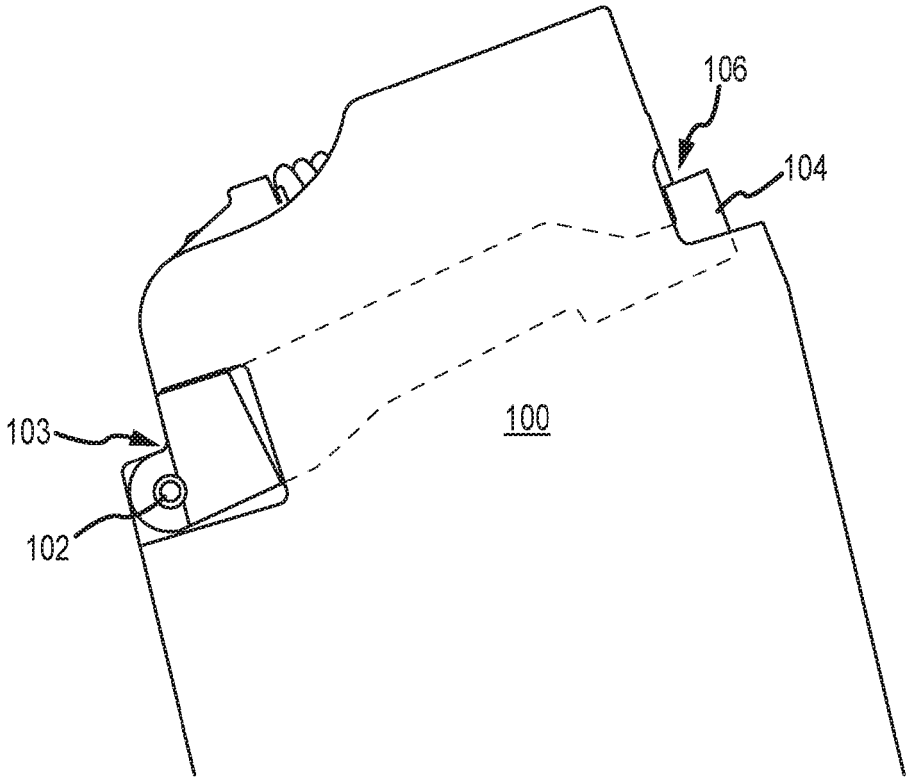

FIG.1A

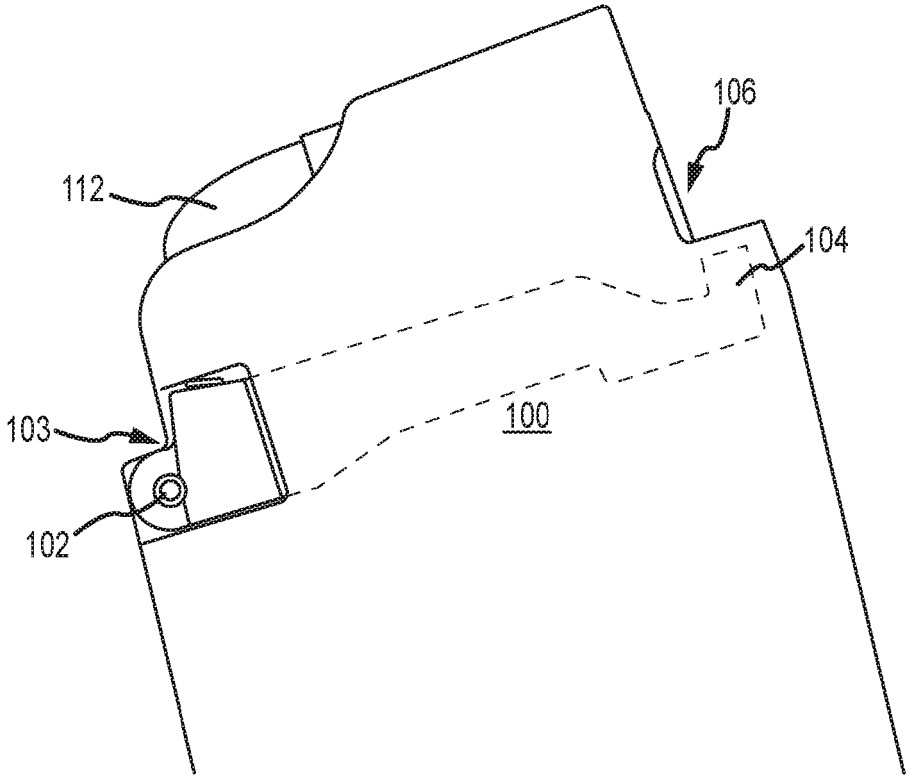

FIG.1B

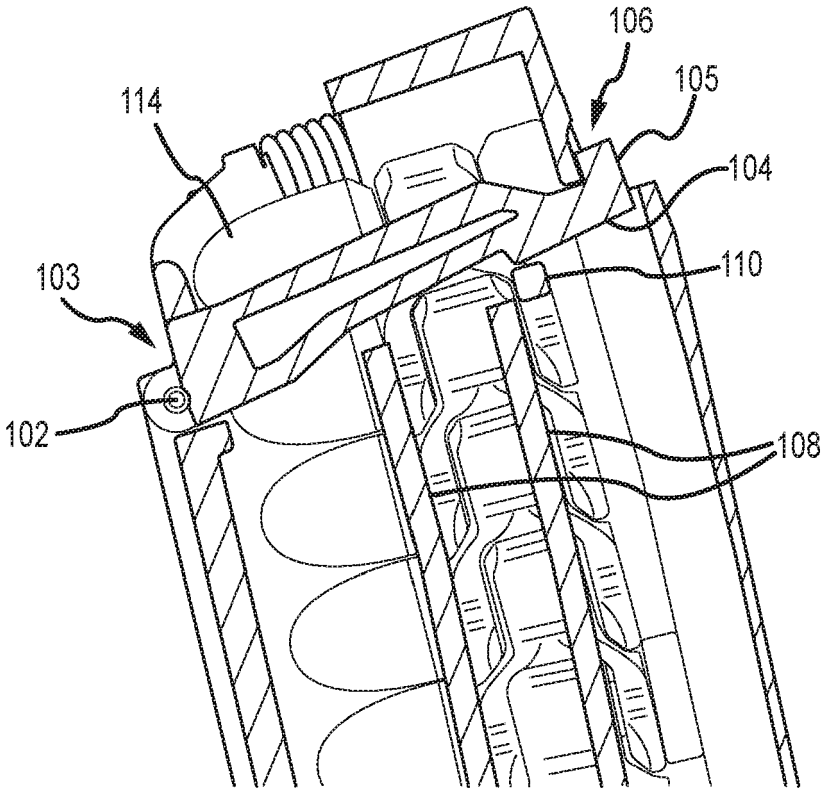

FIG.2A

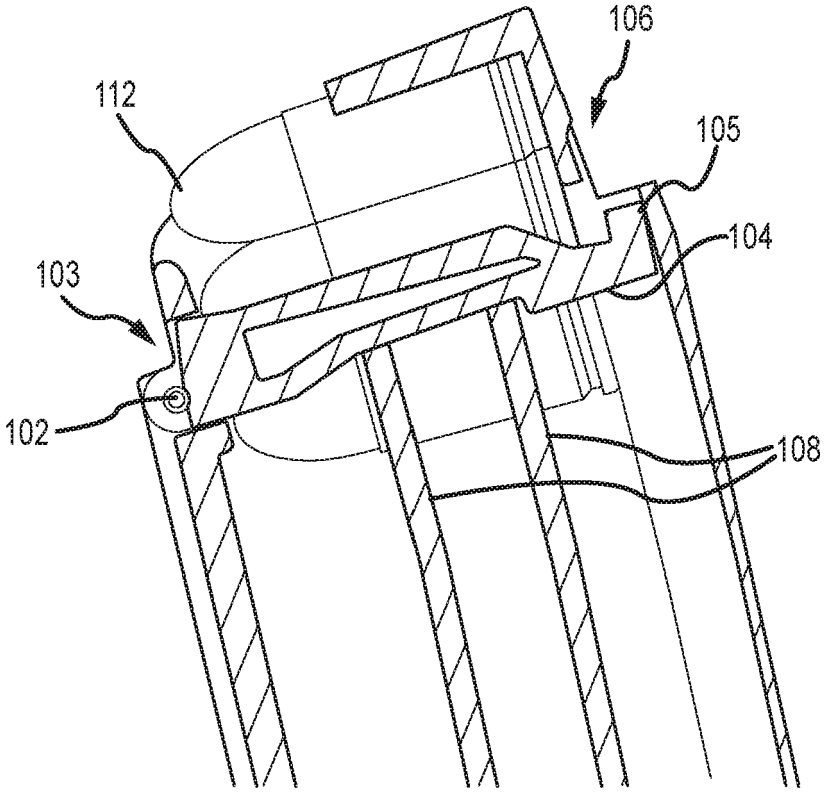

FIG.2B

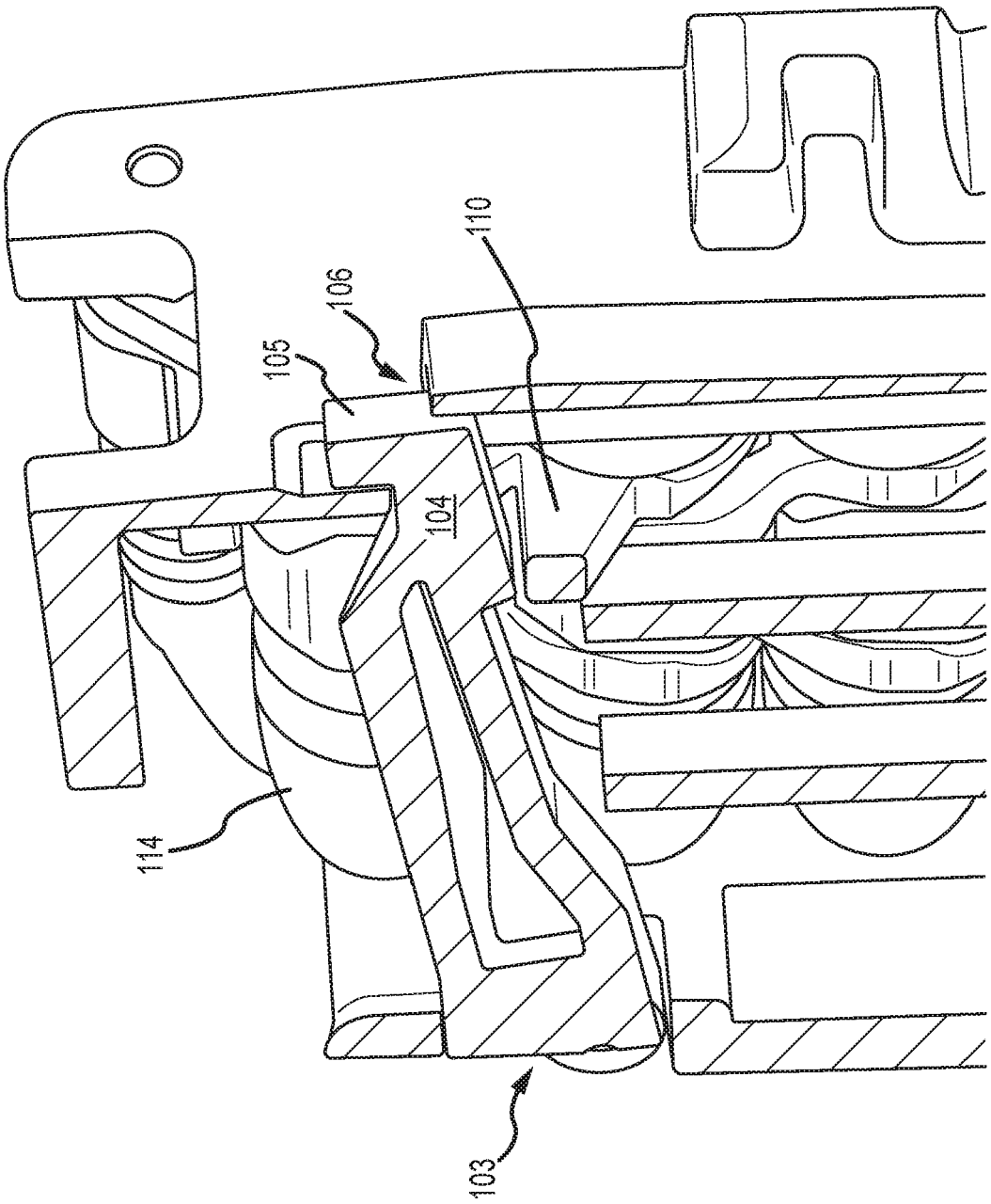

FIG.3

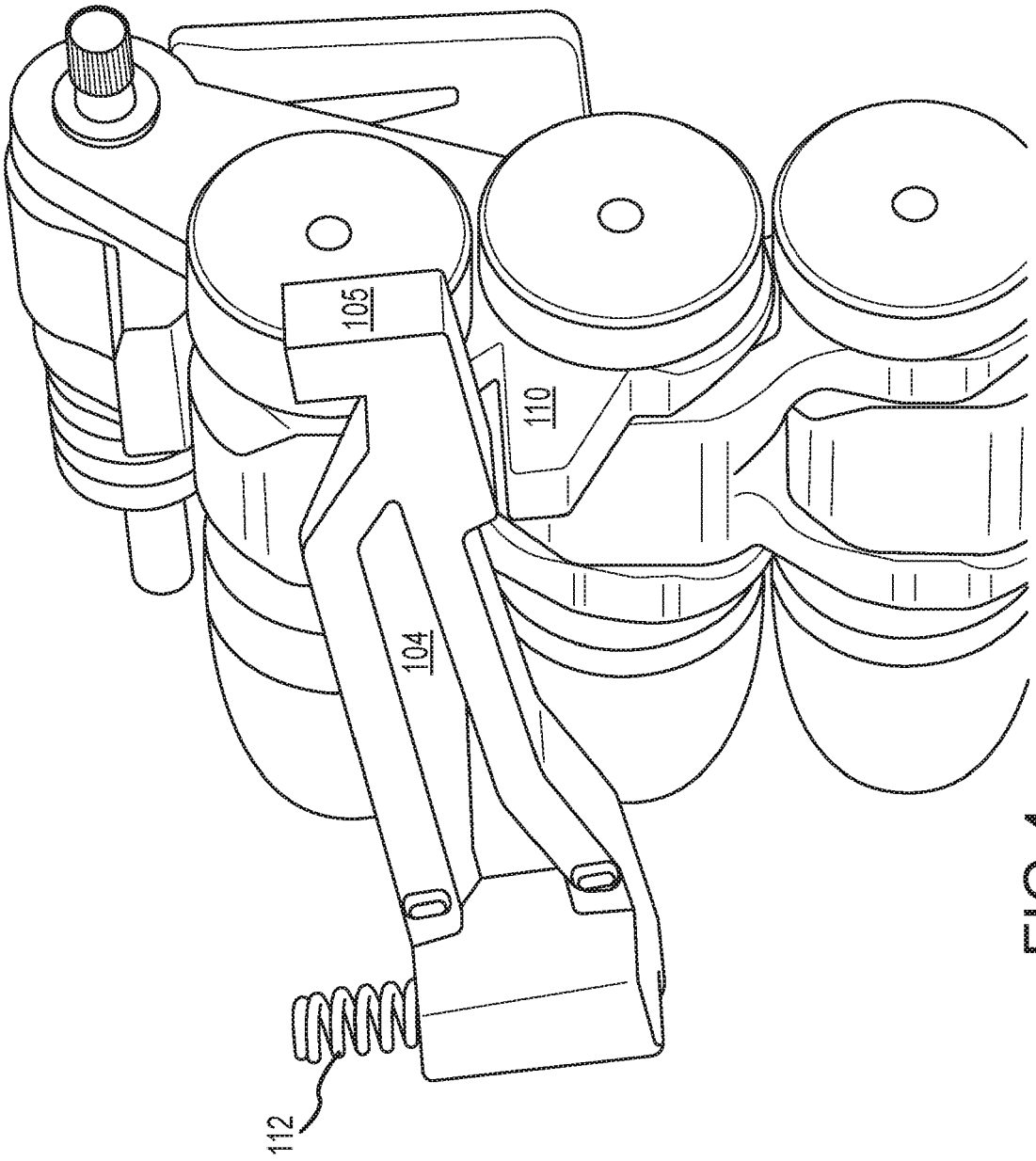

FIG.4

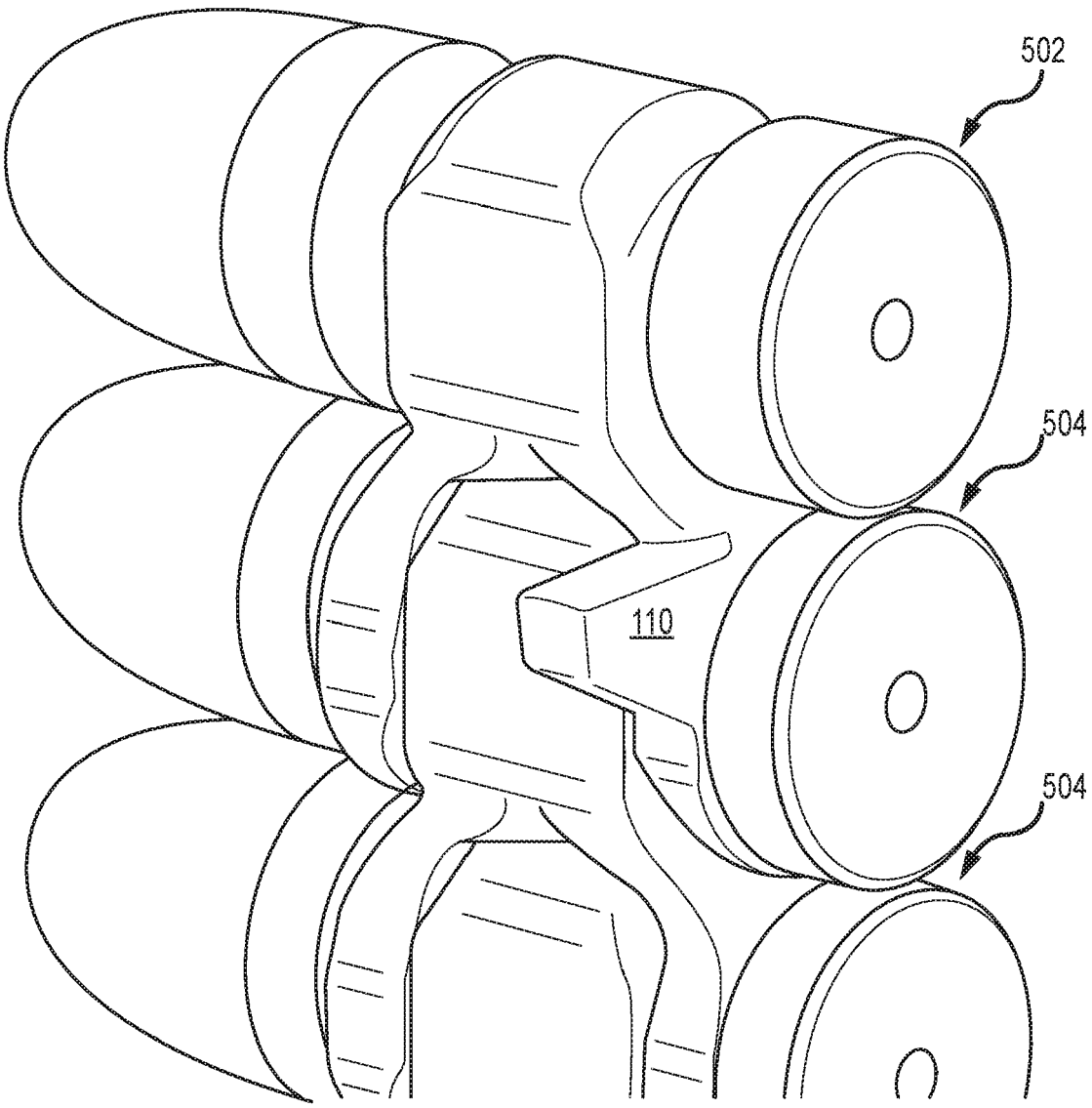

FIG.5

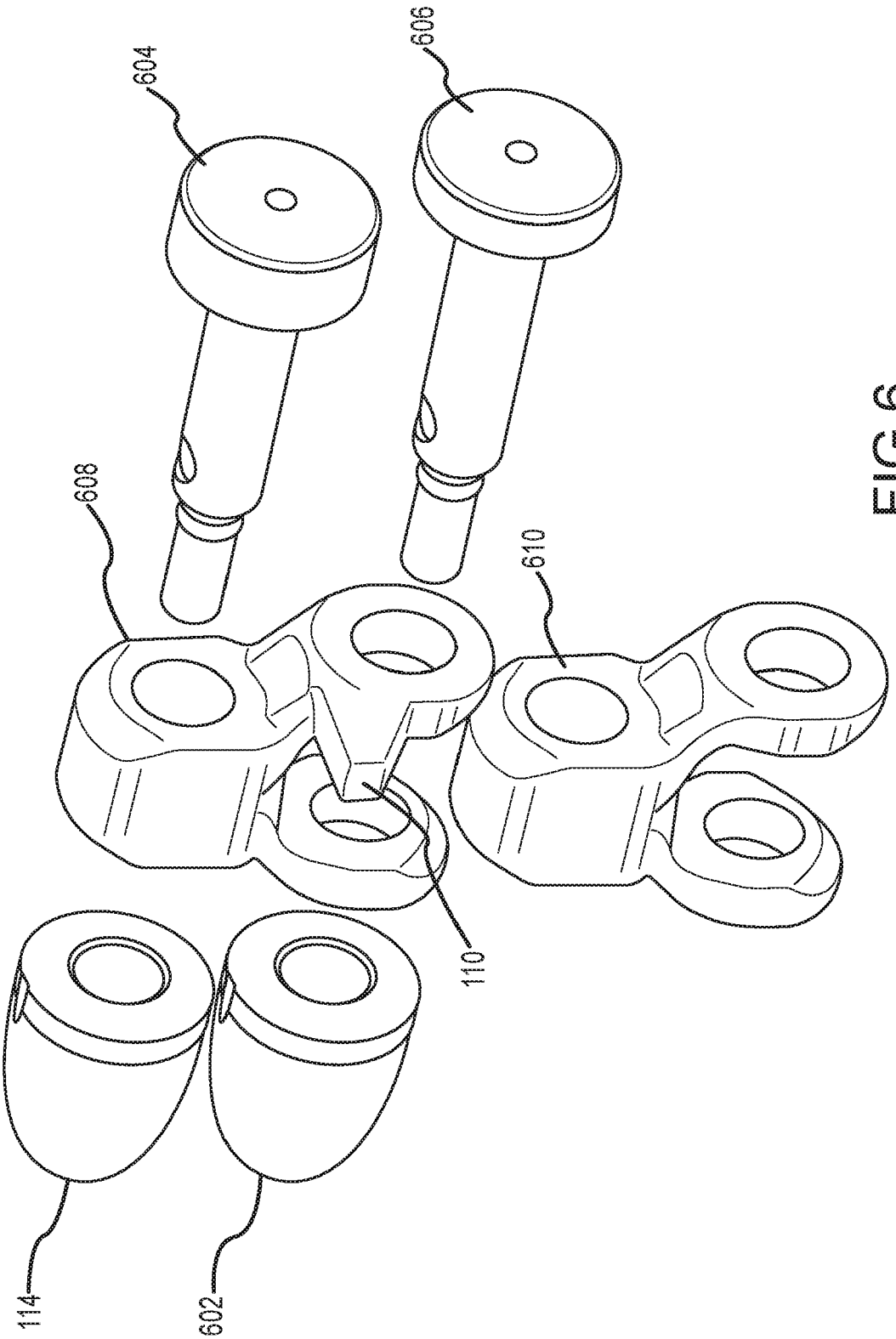

FIG.6

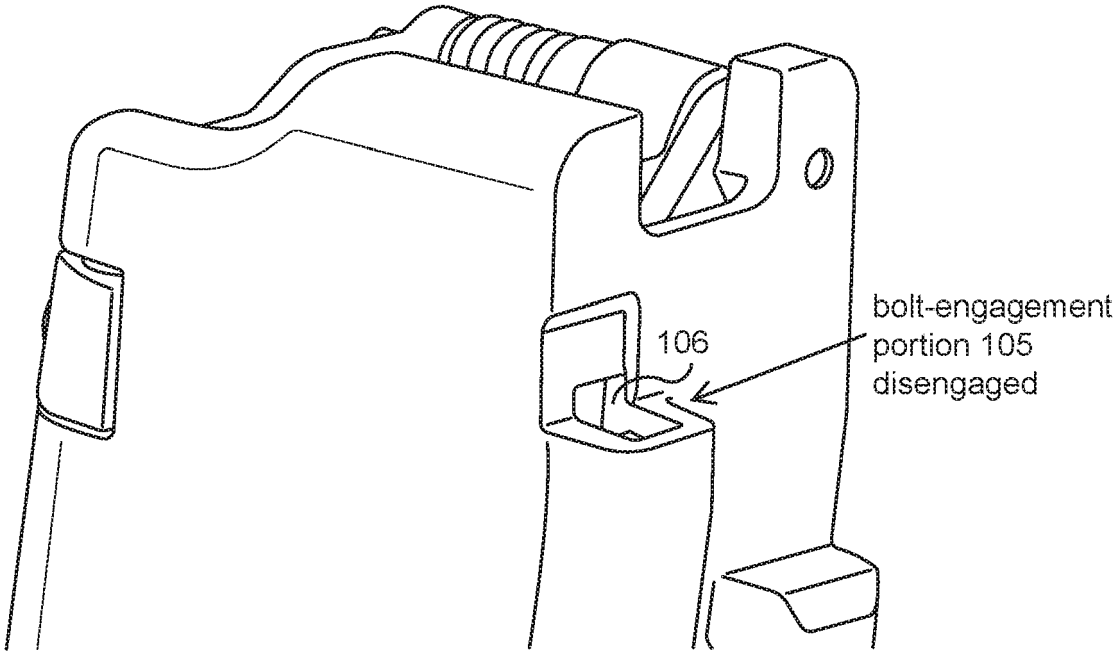
106
bolt-engagement
portion 105
disengaged

FIG.7A

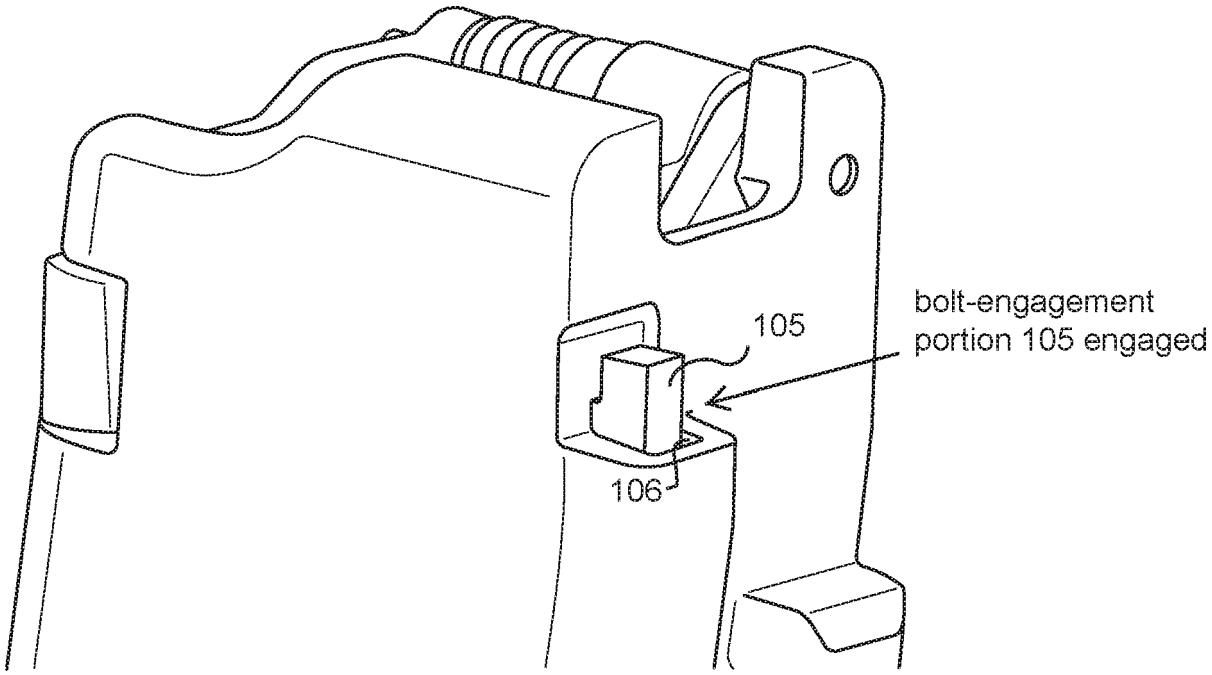
105
bolt-engagement
portion 105 engaged
106

FIG.7B

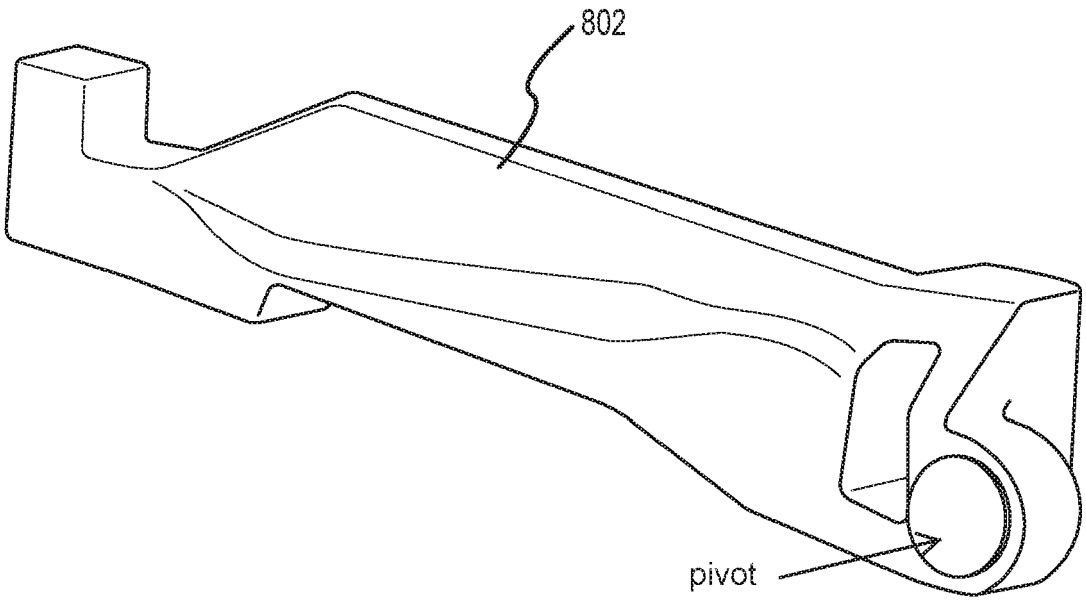

FIG.8A

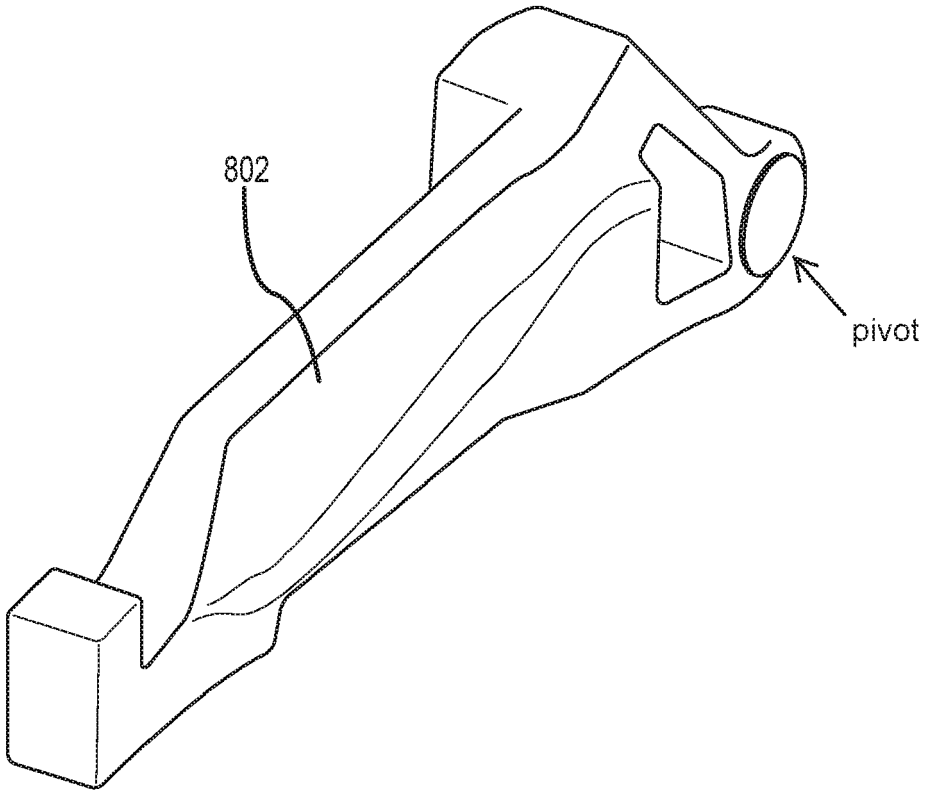

FIG.8B

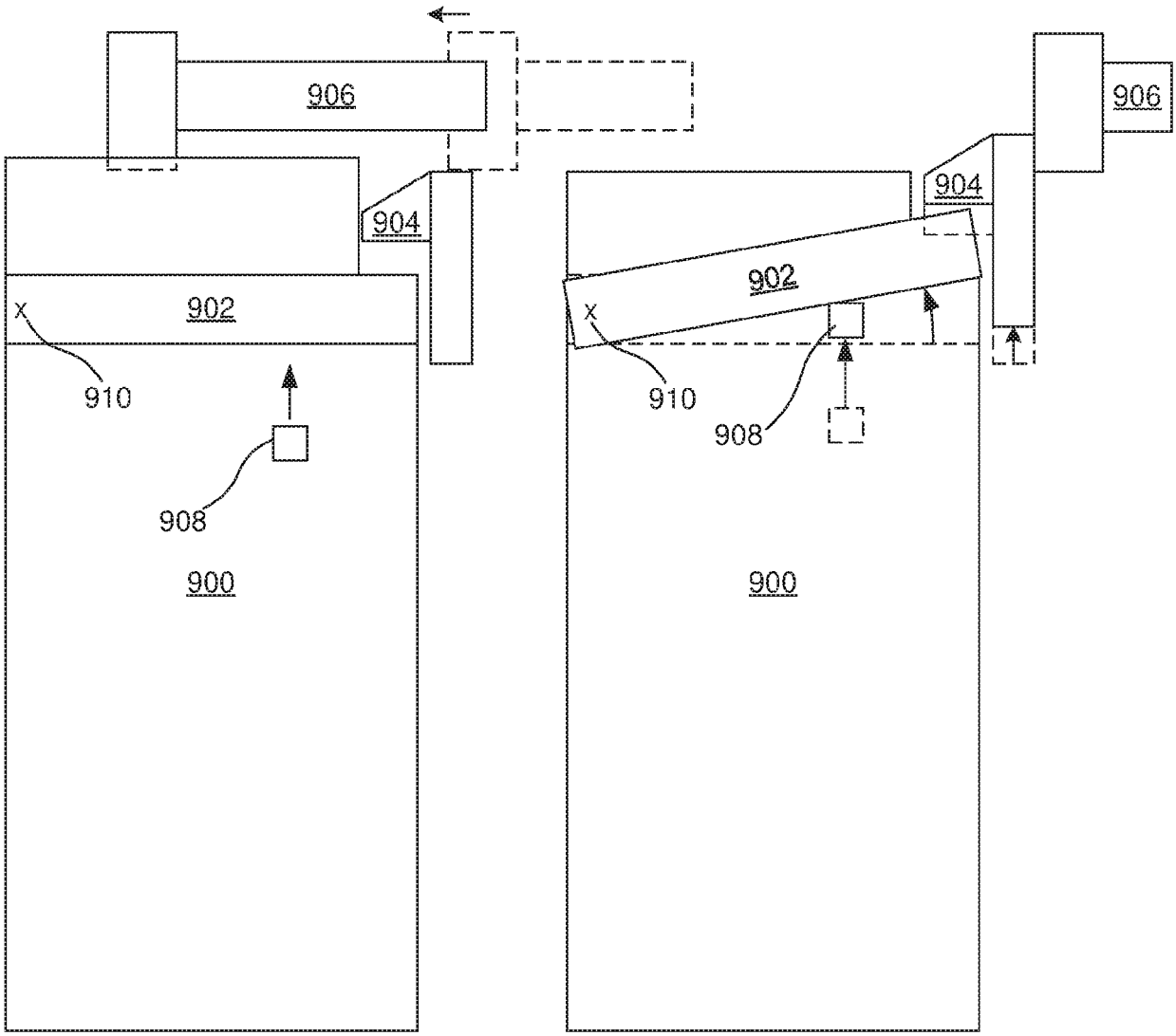

FIG. 9

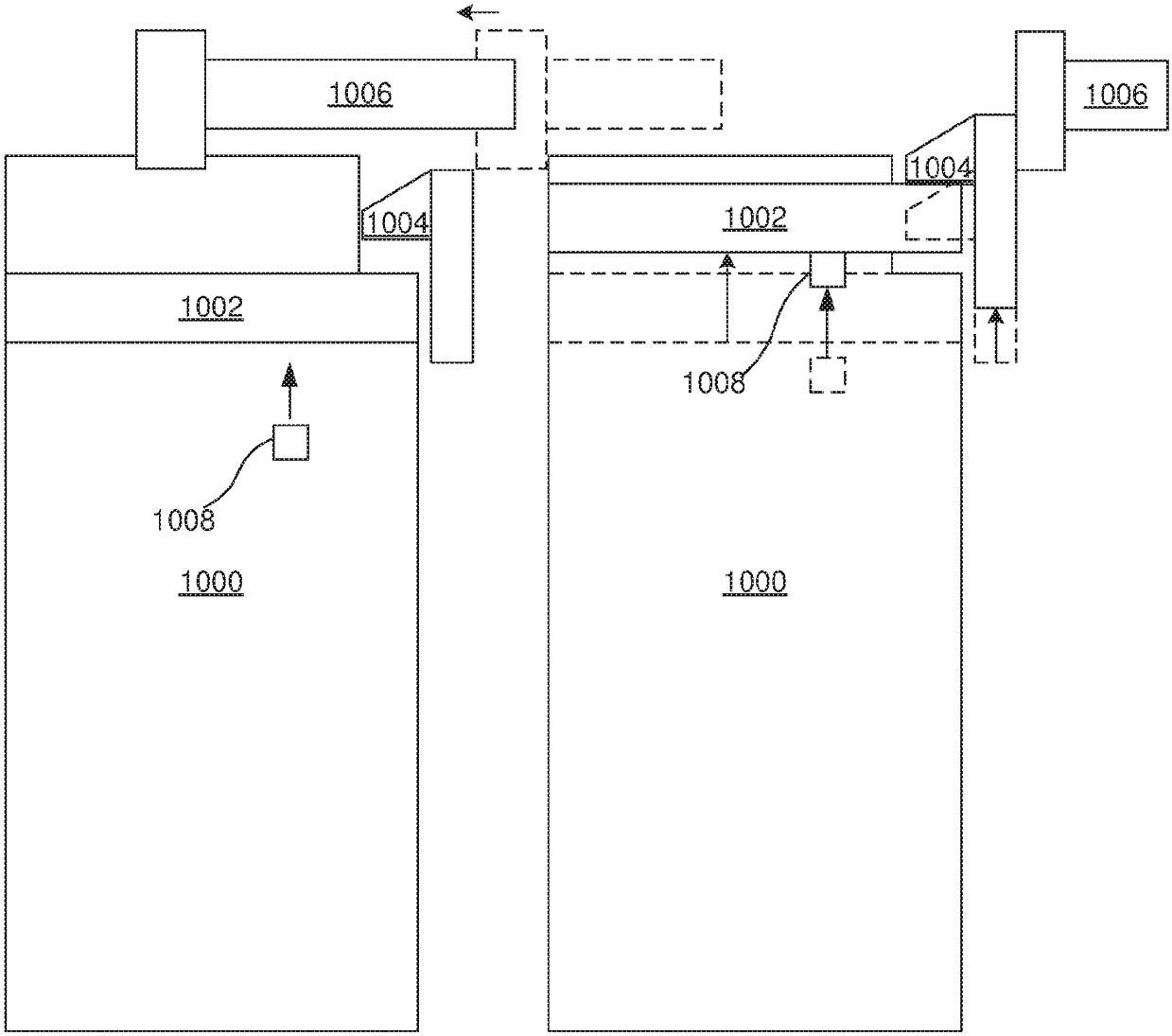

FIG. 10

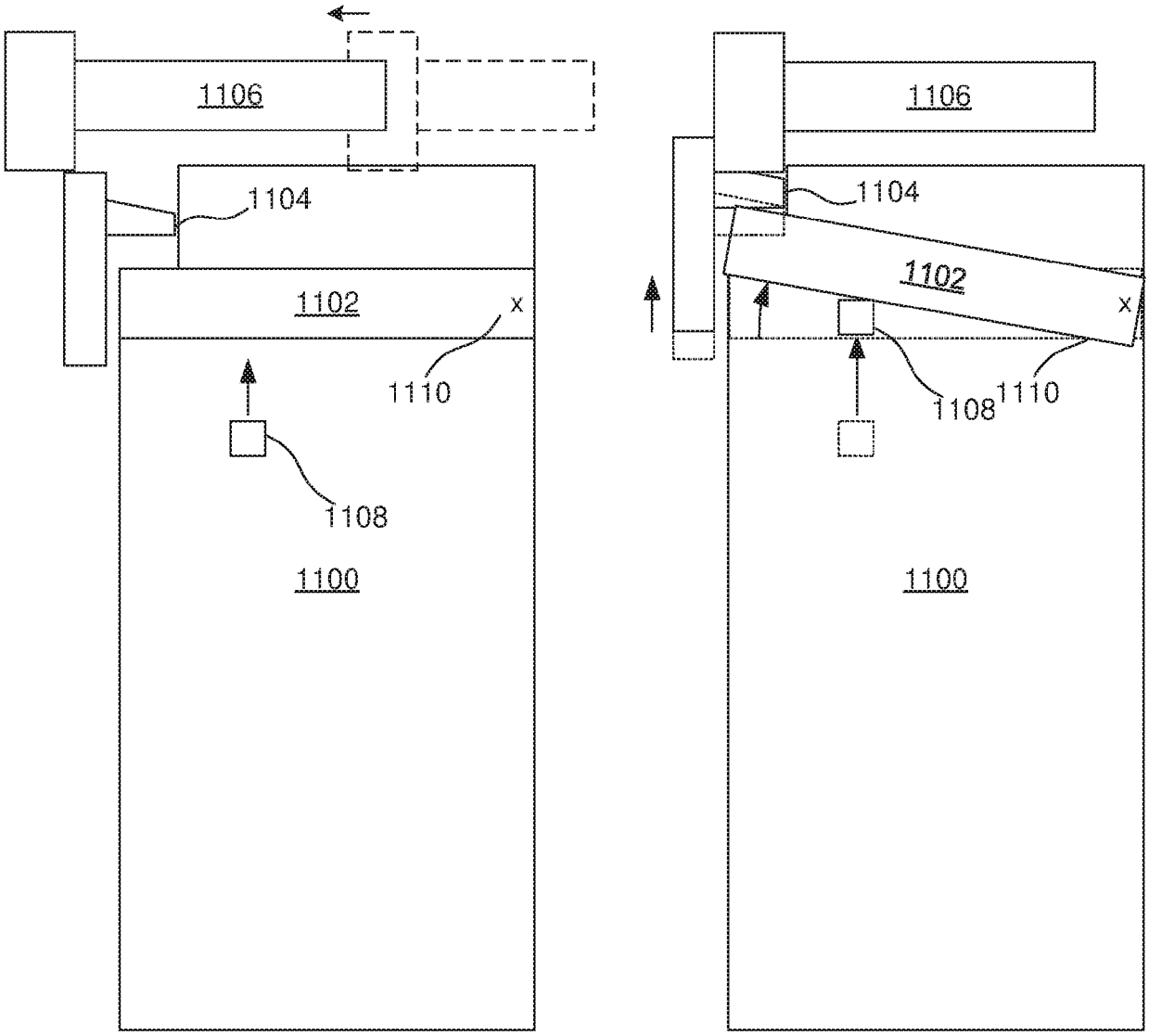
1106
1104
1102
x
1110
1108
1100
1106
1104
1102
x
1108
1110
1100

FIG. 11

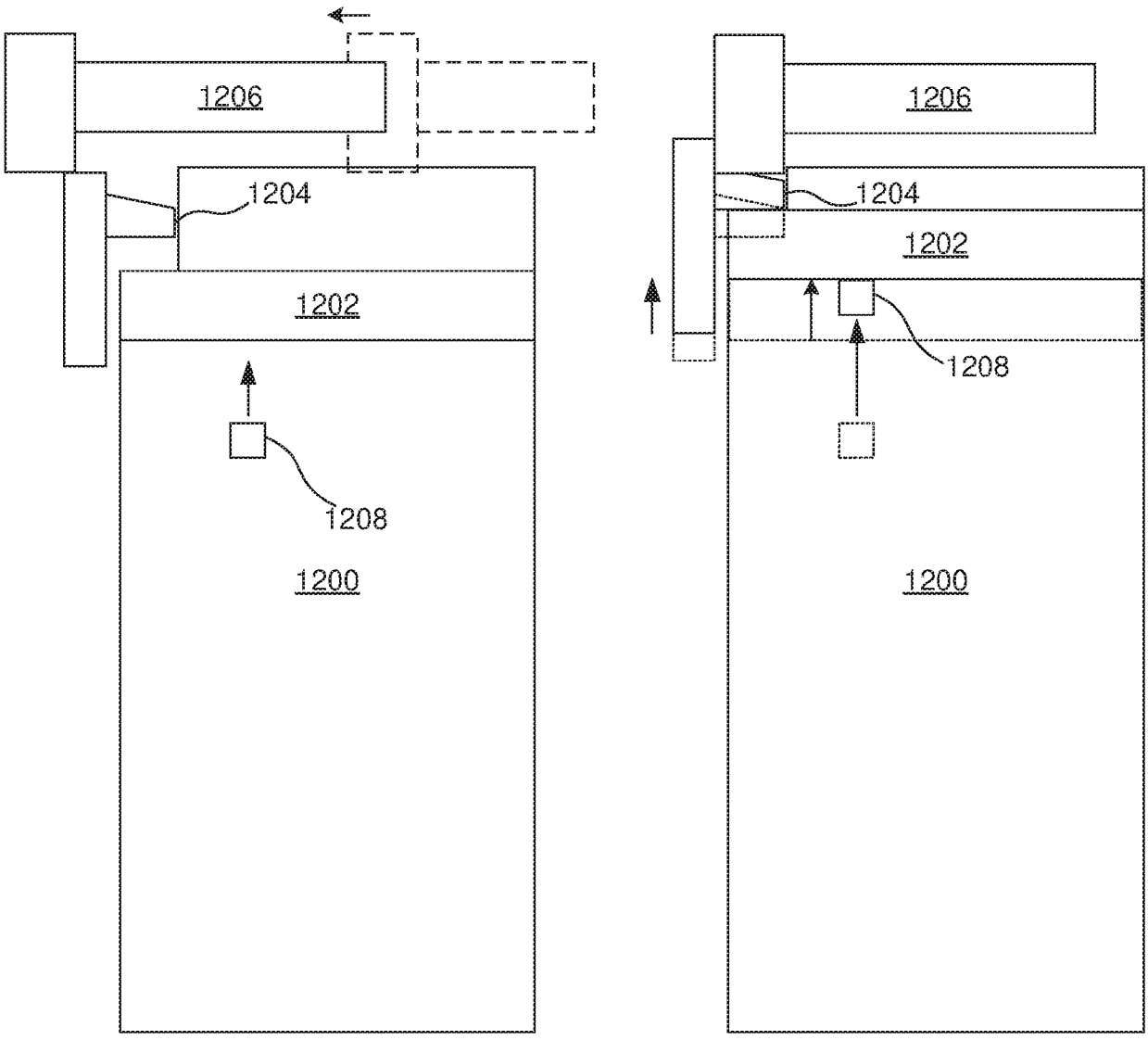

FIG. 12

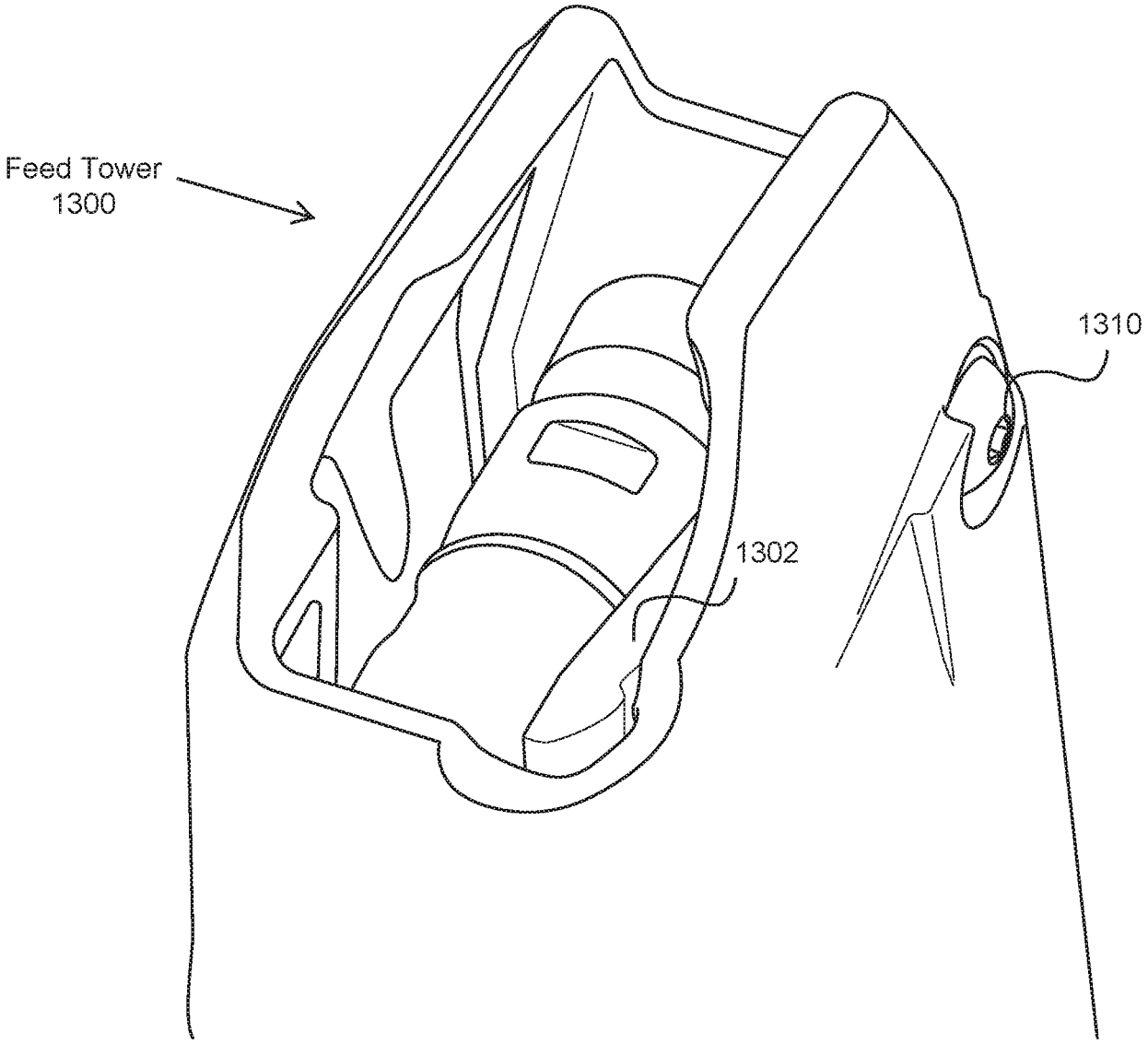

FIG.13

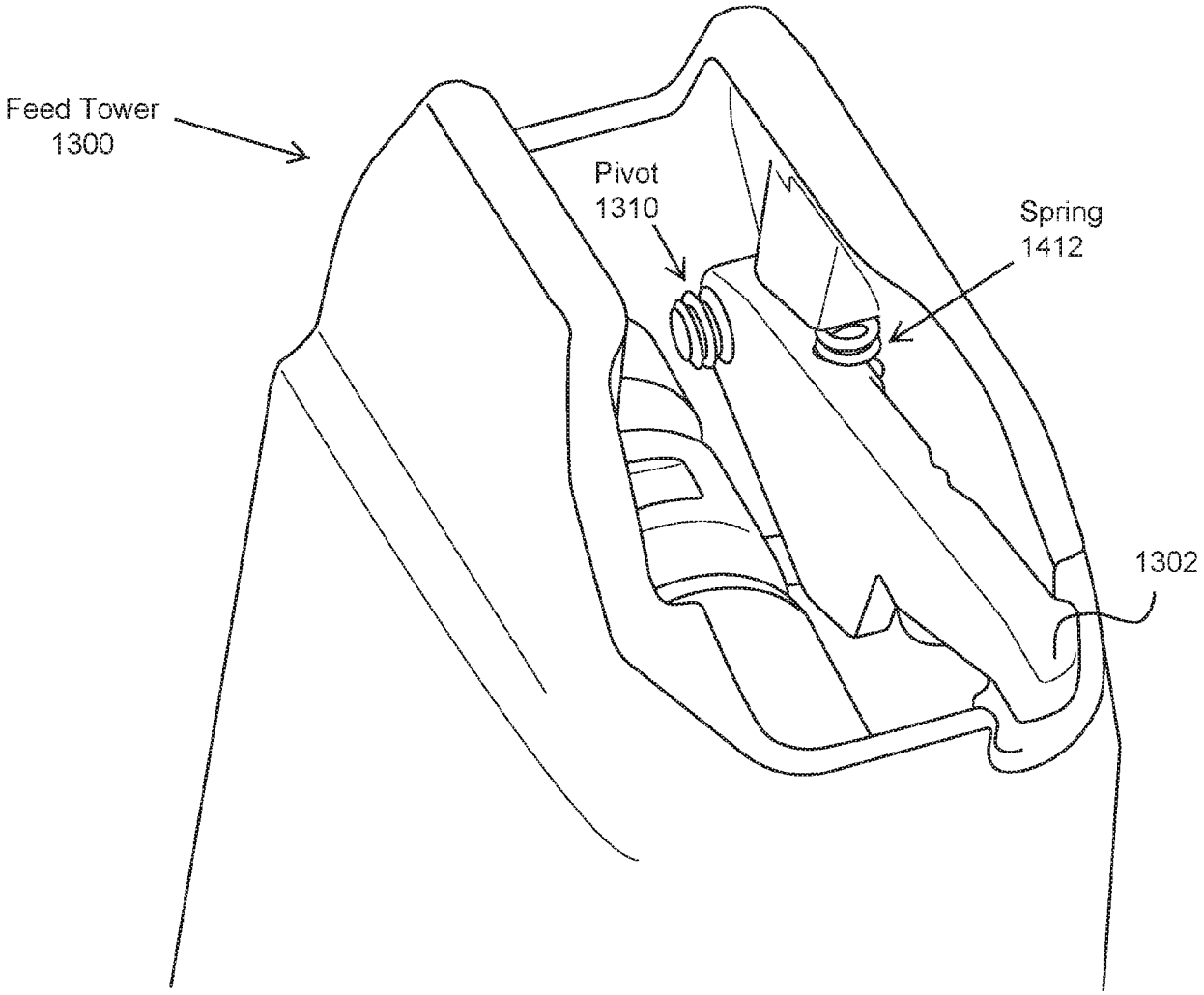

FIG.14

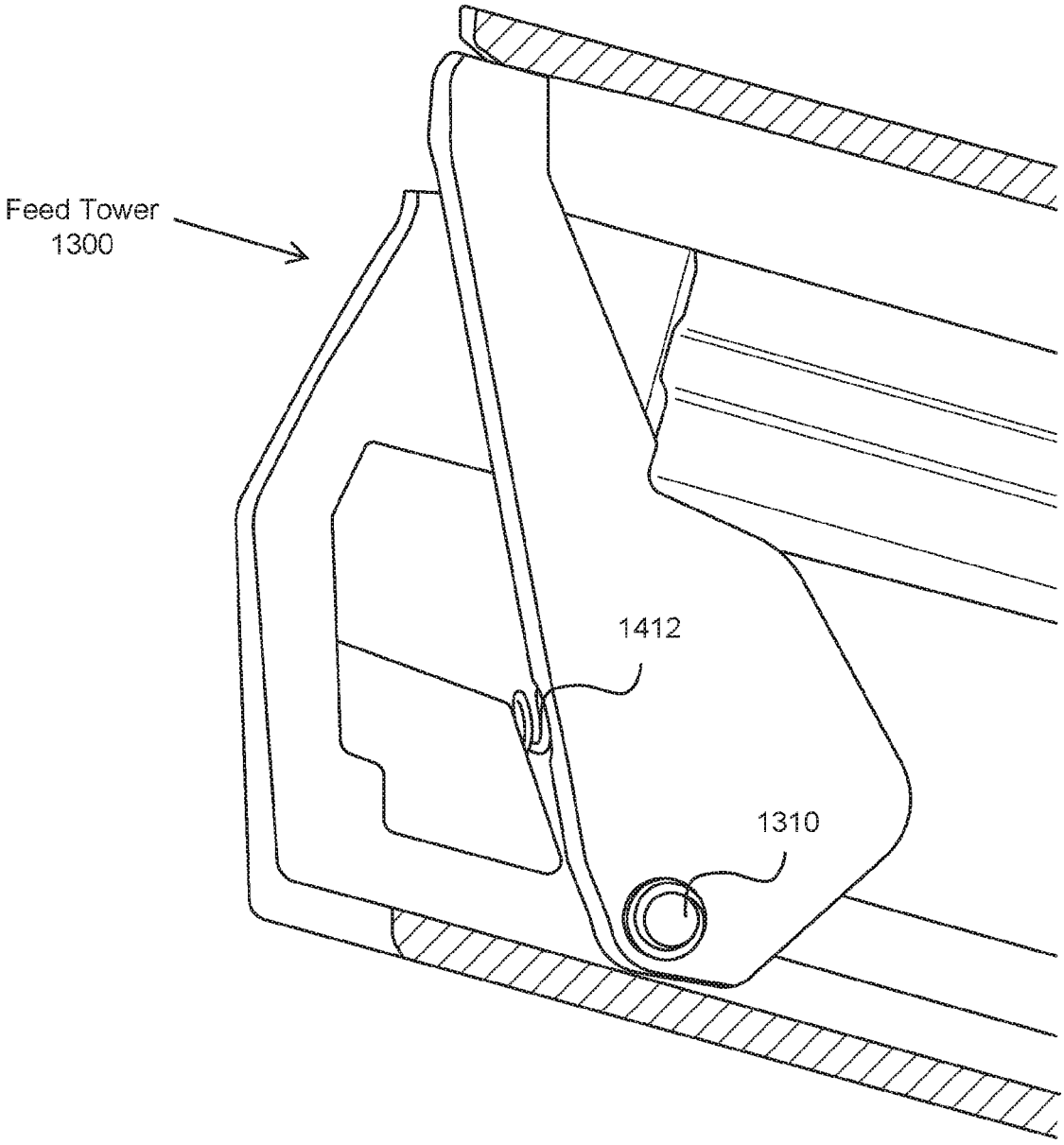

FIG.15

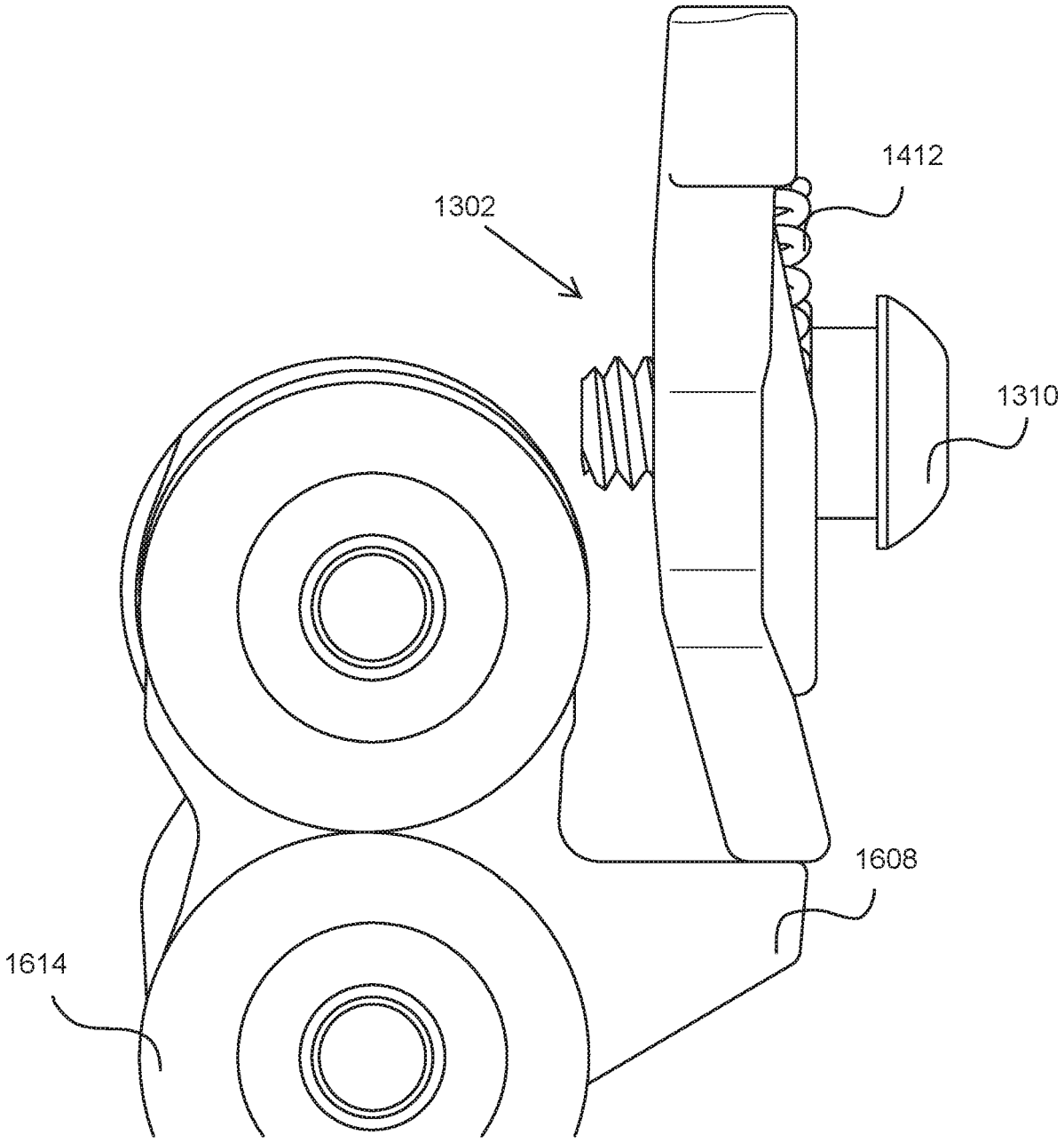

FIG.16

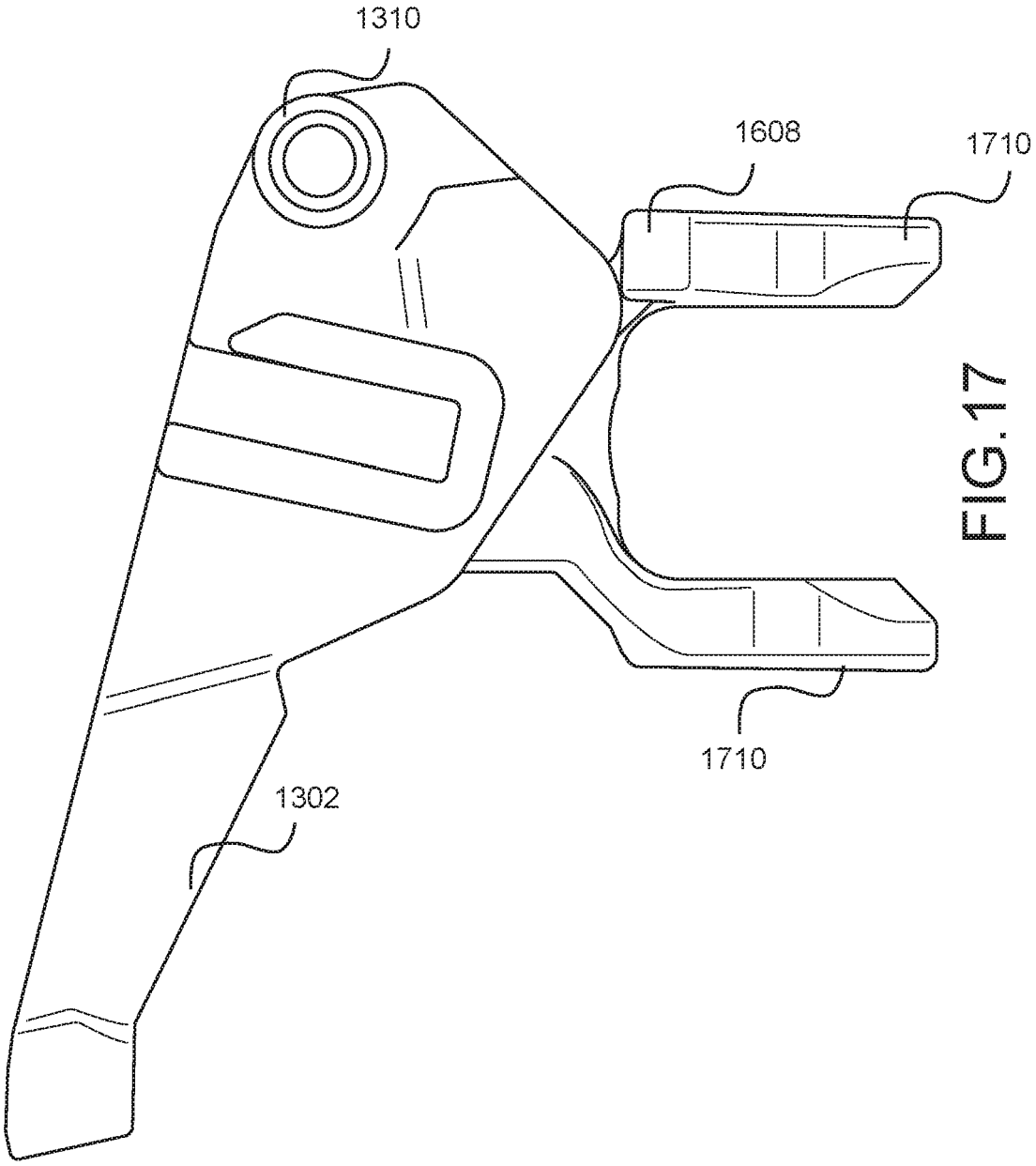

FIG.17

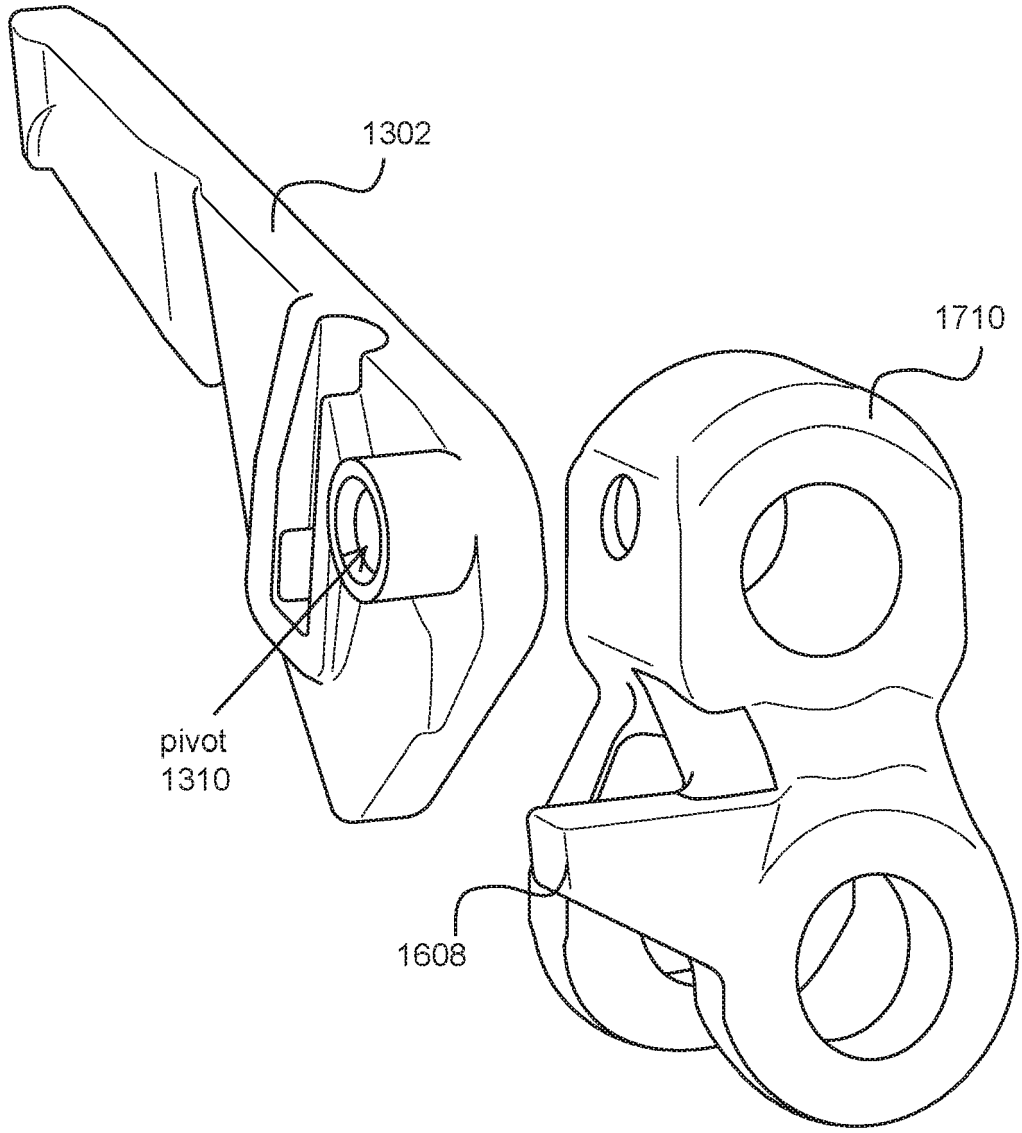

FIG.18

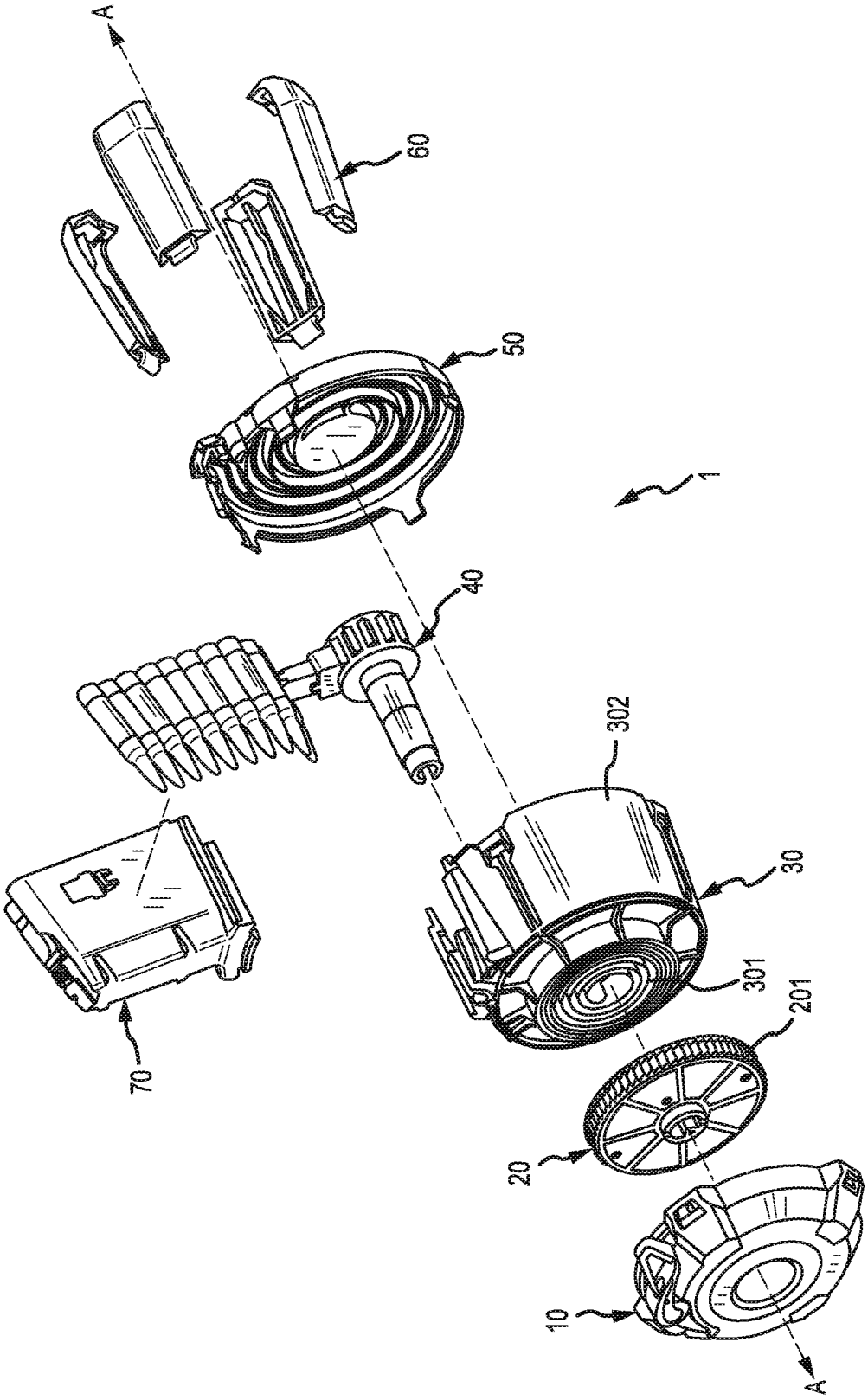

FIG.19

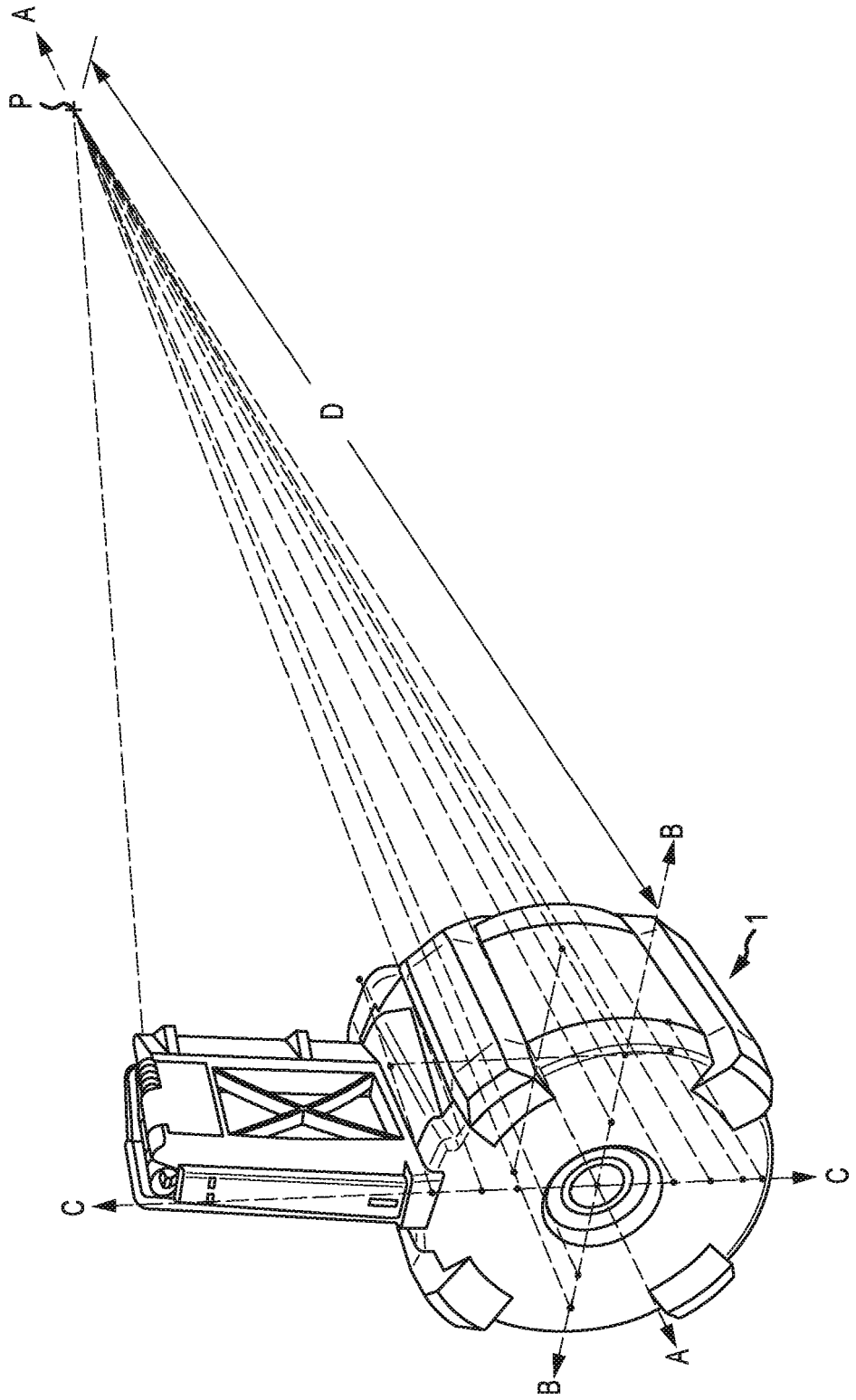

FIG. 20

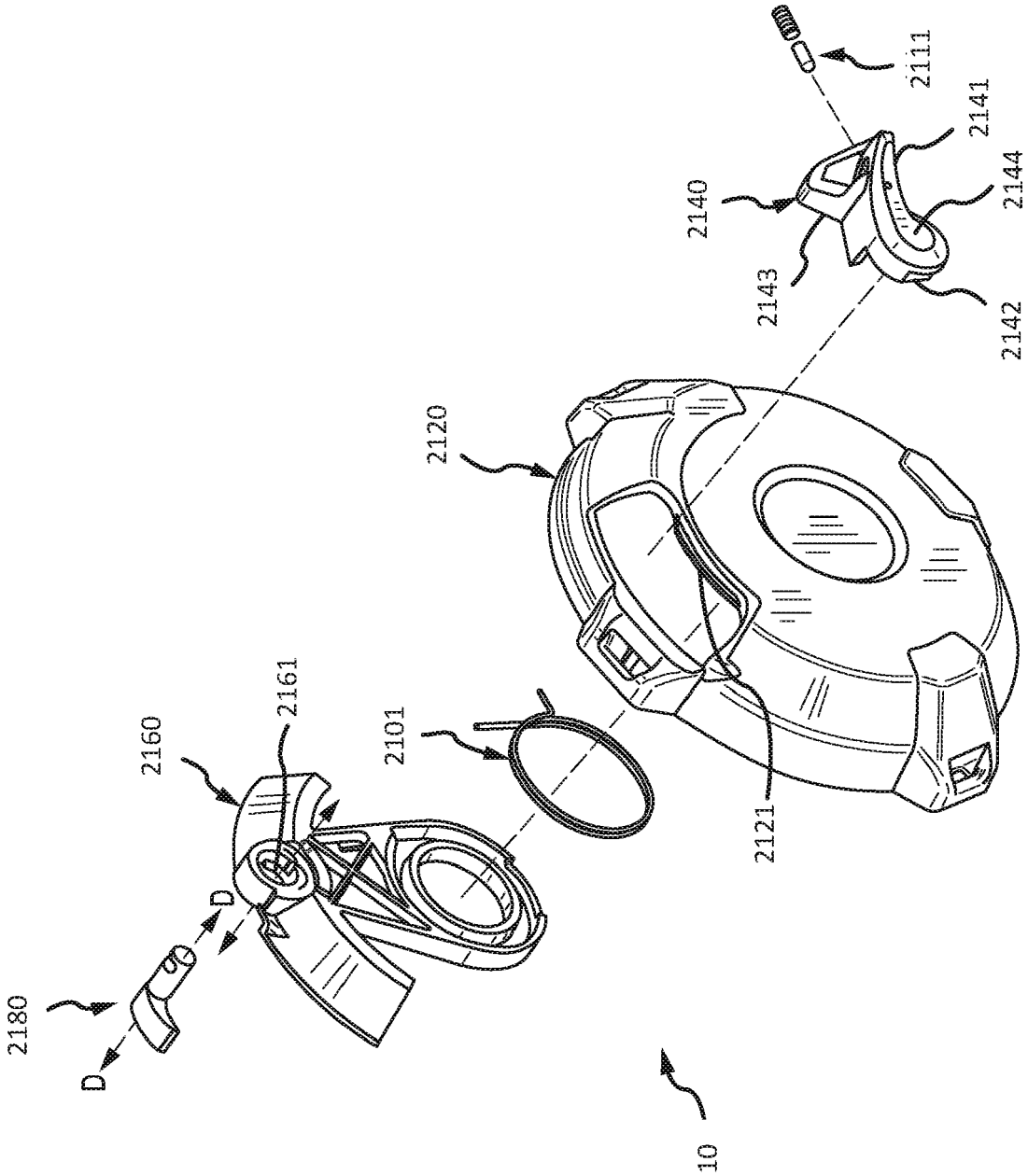
2111
2141
2144
2140
2143
2142
2120
2160
2161
2101
2121
2180
D
D
10

FIG. 21

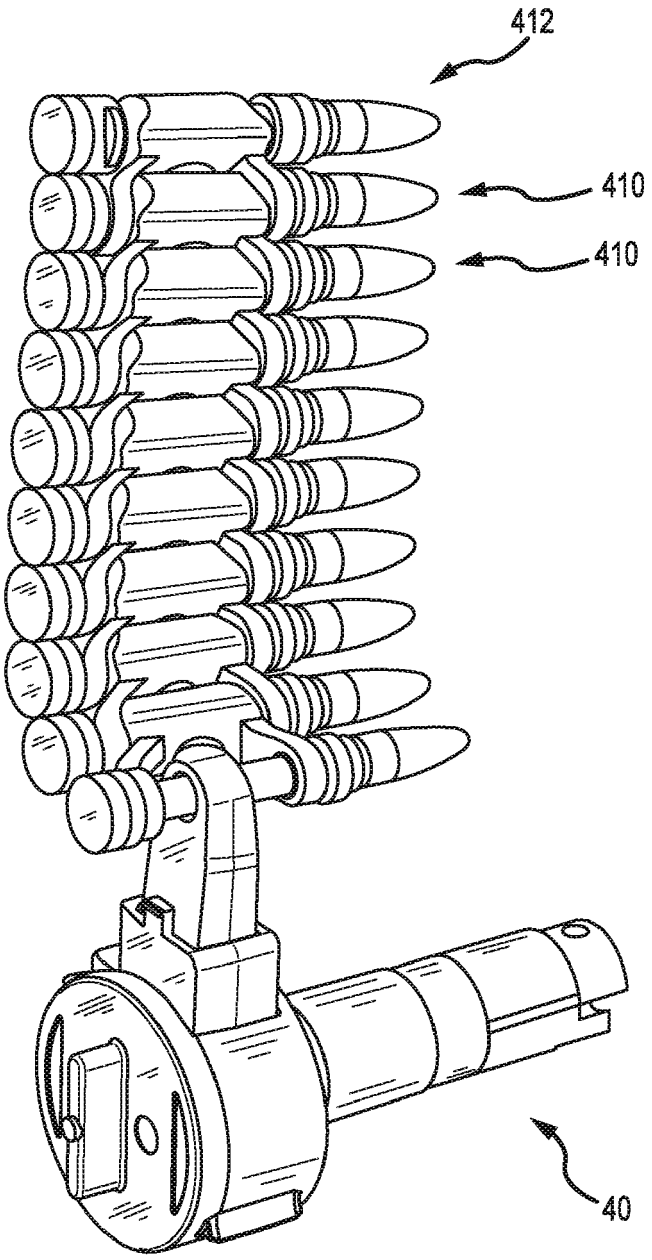

FIG. 22

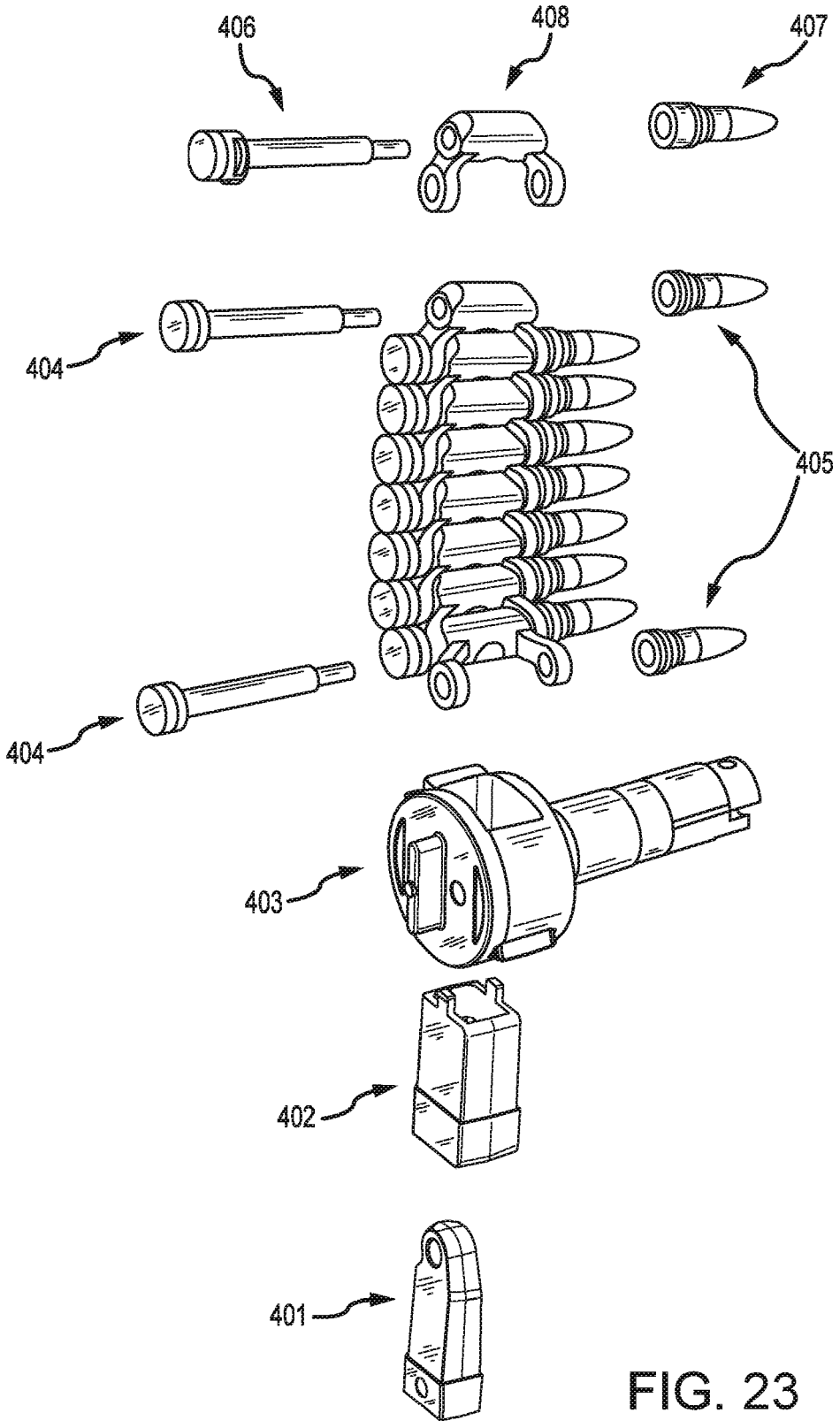

FIG. 23

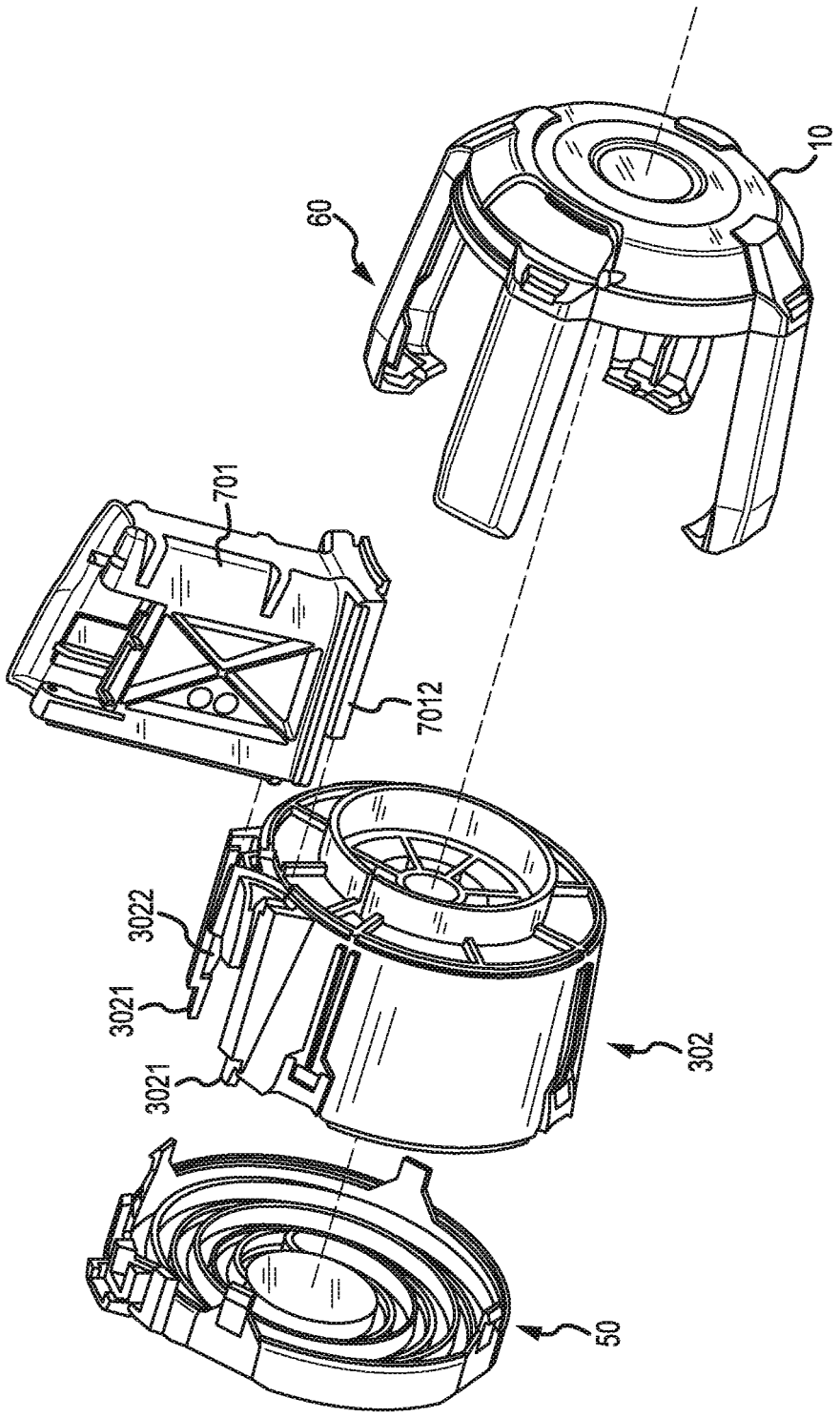

FIG. 24

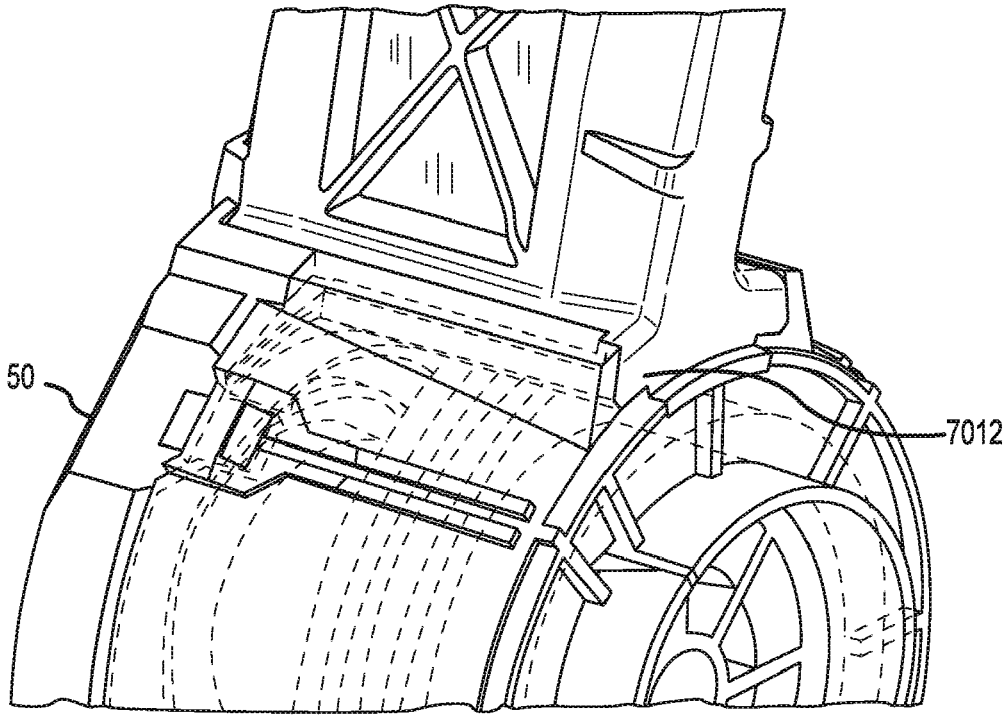

FIG. 25

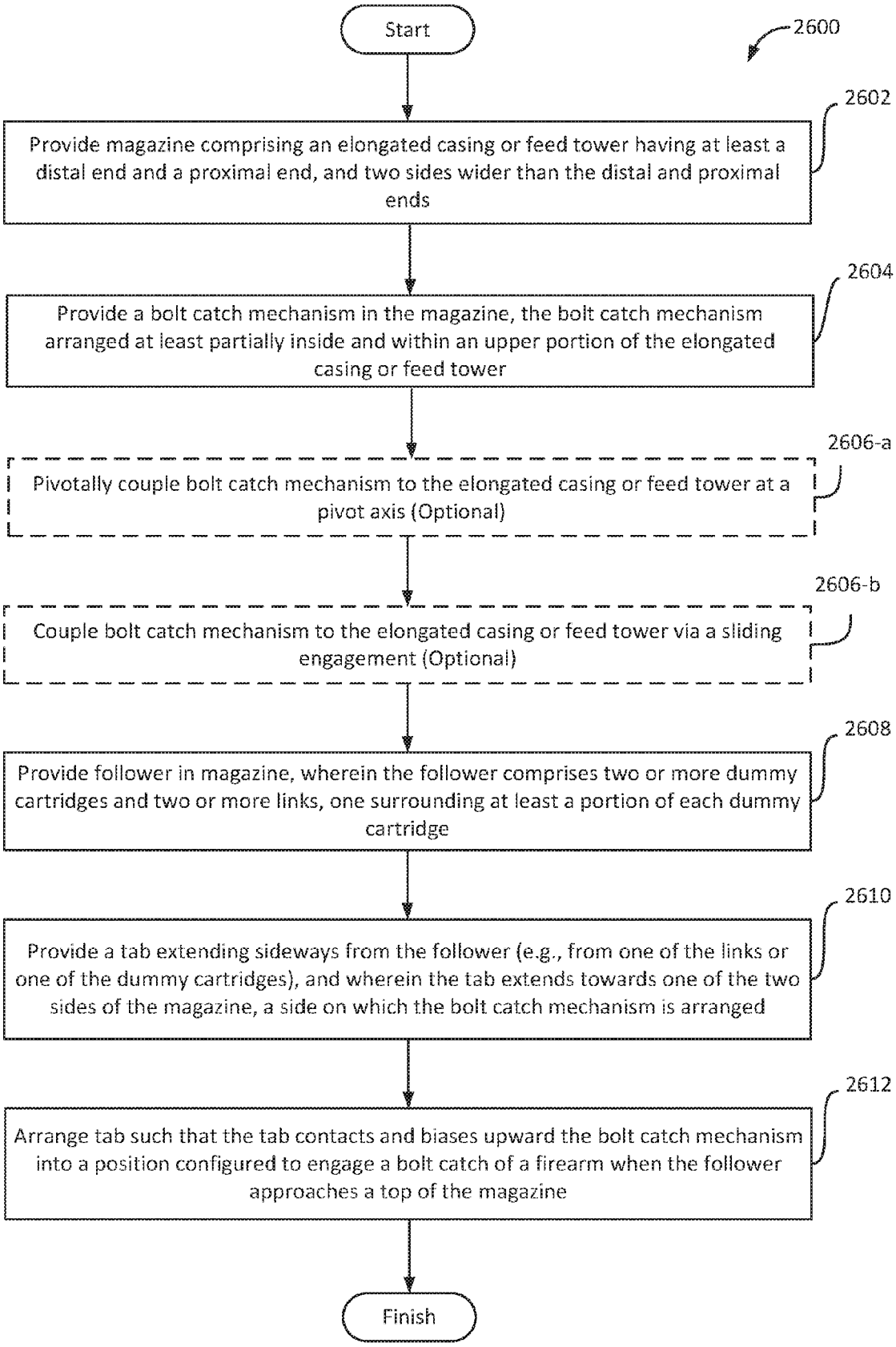
Start
2600
2602
Provide magazine comprising an elongated casing or feed tower having at least a distal end and a proximal end, and two sides wider than the distal and proximal ends
2604
Provide a bolt catch mechanism in the magazine, the bolt catch mechanism arranged at least partially inside and within an upper portion of the elongated casing or feed tower
2606-a
Pivotally couple bolt catch mechanism to the elongated casing or feed tower at a pivot axis (Optional)
2606-b
Couple bolt catch mechanism to the elongated casing or feed tower via a sliding engagement (Optional)
2608
Provide follower in magazine, wherein the follower comprises two or more dummy cartridges and two or more links, one surrounding at least a portion of each dummy cartridge
2610
Provide a tab extending sideways from the follower (e.g., from one of the links or one of the dummy cartridges), and wherein the tab extends towards one of the two sides of the magazine, a side on which the bolt catch mechanism is arranged
2612
Arrange tab such that the tab contacts and biases upward the bolt catch mechanism into a position configured to engage a bolt catch of a firearm when the follower approaches a top of the magazine
Finish

FIG. 26

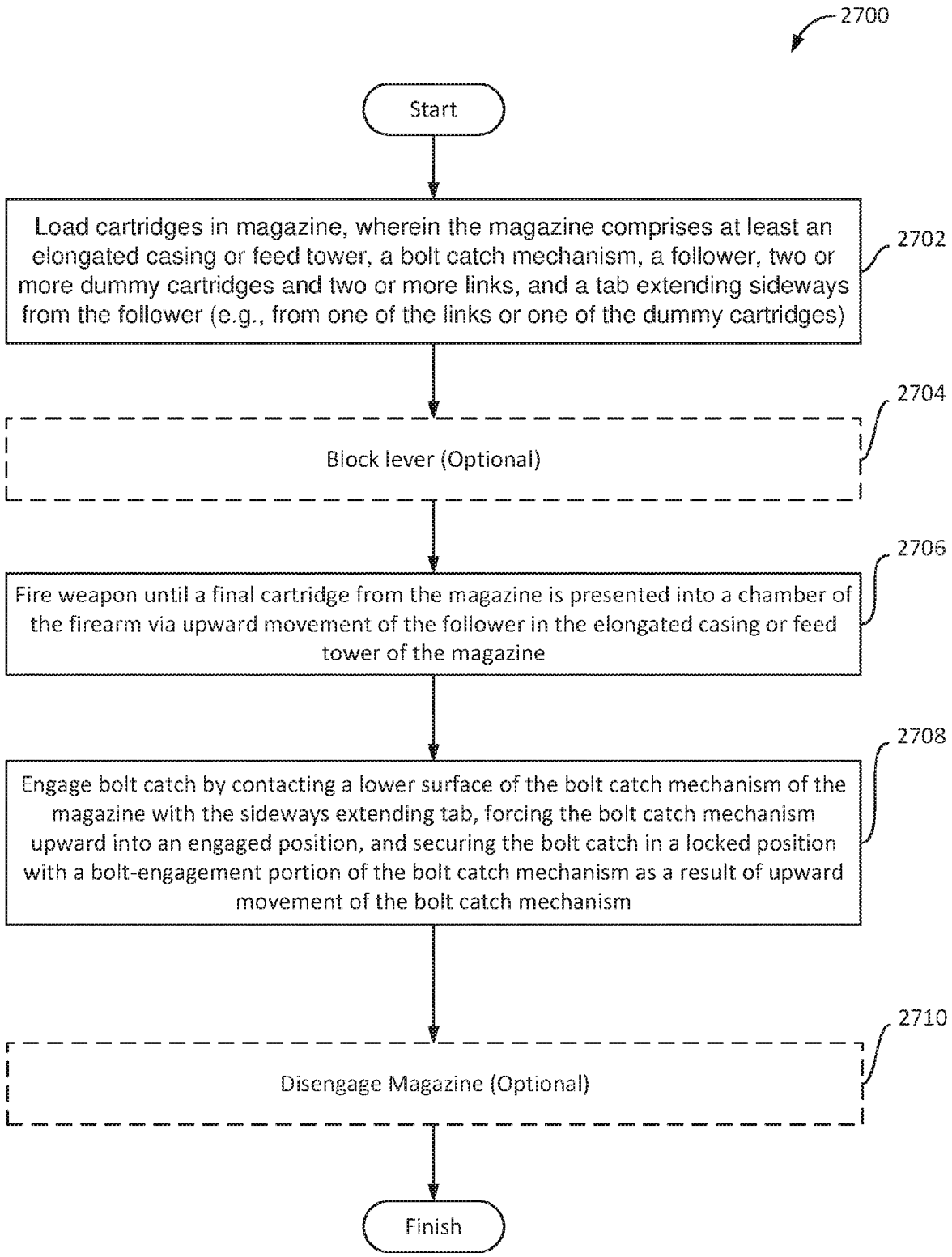
2700
Start
Load cartridges in magazine, wherein the magazine comprises at least an elongated casing or feed tower, a bolt catch mechanism, a follower, two or more dummy cartridges and two or more links, and a tab extending sideways from the follower (e.g., from one of the links or one of the dummy cartridges)
2702
Block lever (Optional)
2704
Fire weapon until a final cartridge from the magazine is presented into a chamber of the firearm via upward movement of the follower in the elongated casing or feed tower of the magazine
2706
Engage bolt catch by contacting a lower surface of the bolt catch mechanism of the magazine with the sideways extending tab, forcing the bolt catch mechanism upward into an engaged position, and securing the bolt catch in a locked position with a bolt-engagement portion of the bolt catch mechanism as a result of upward movement of the bolt catch mechanism
2708
Disengage Magazine (Optional)
2710
Finish

FIG. 27

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 62818555 **[0001]**
- US 8733224 B **[0004]**