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Baker et al.

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(54) **MODIFICATIONS FOR AR-10 STYLE FIREARM**

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F41A 19/30 (2006.01)
F41A 21/00 (2006.01)

(52) **U.S. Cl.**
CPC ***F41A 3/66*** (2013.01); ***F41A 19/30*** (2013.01); ***F41A 21/00*** (2013.01)

(58) **Field of Classification Search**
CPC F41A 11/02
See application file for complete search history.

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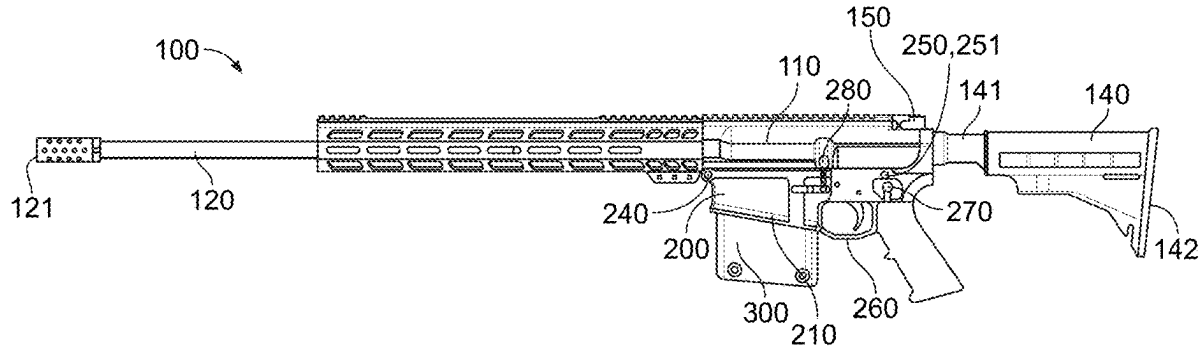
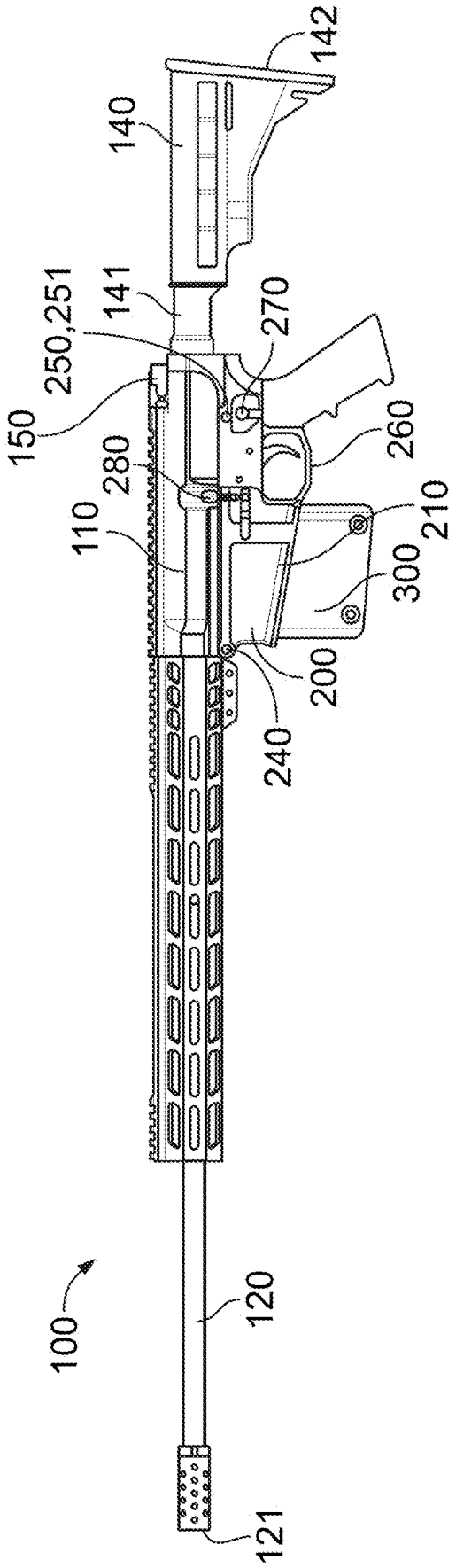
(57) **ABSTRACT**

The present disclosure provides example embodiments related to modifications for an AR-10 style firearm. In one embodiment, the AR-10 style firearm comprises modifications that enable the AR-10 style firearm to fire cartridges having a length between 73.66 mm and 91.44 mm, without increasing the overall length and/or weight, as compared to a standard AR-10 style firearm. The modified AR-10 style firearm may comprise, for example, modifications to the upper receiver, lower receiver, bolt carrier, magazine well, charging handle, firing pin, buffer tube weight, and/or the magazine.

18 Claims, 10 Drawing Sheets

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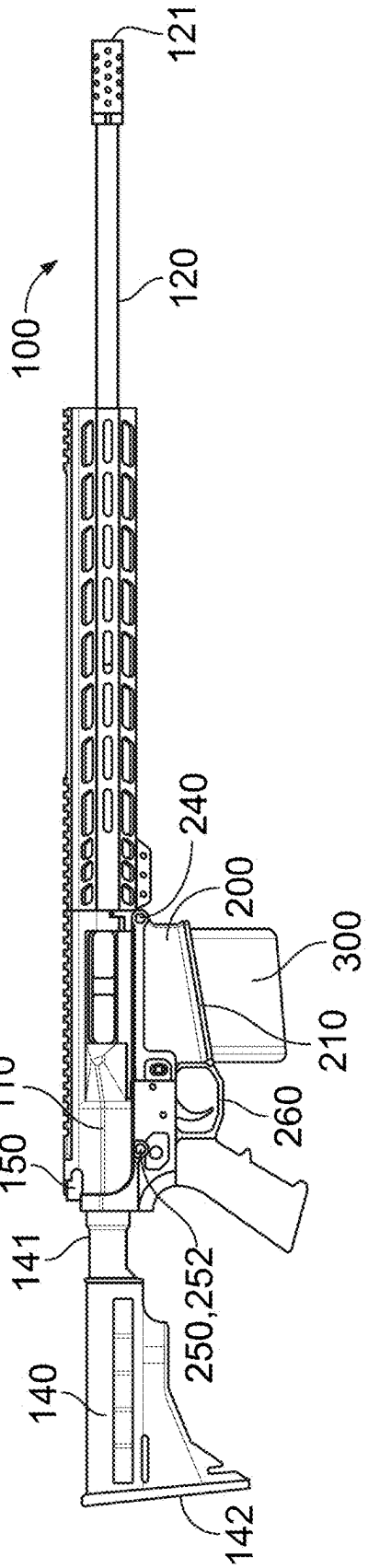
140
141
250,251
270
150
280
260
110
210
300
200
240
100
120
121

FIG. 1A


121
120
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240
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300
210
110
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150
141
250,252
140
142

FIG. 1B

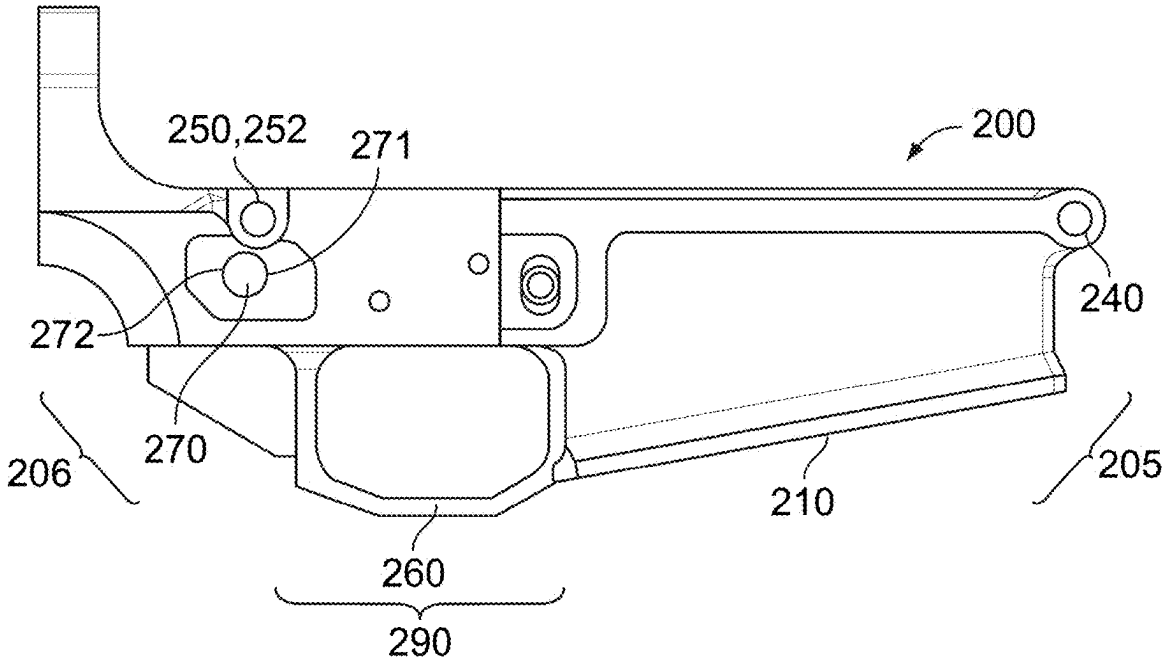
250,252
271
200
240
272
270
206
205
210
260
290

FIG. 2A

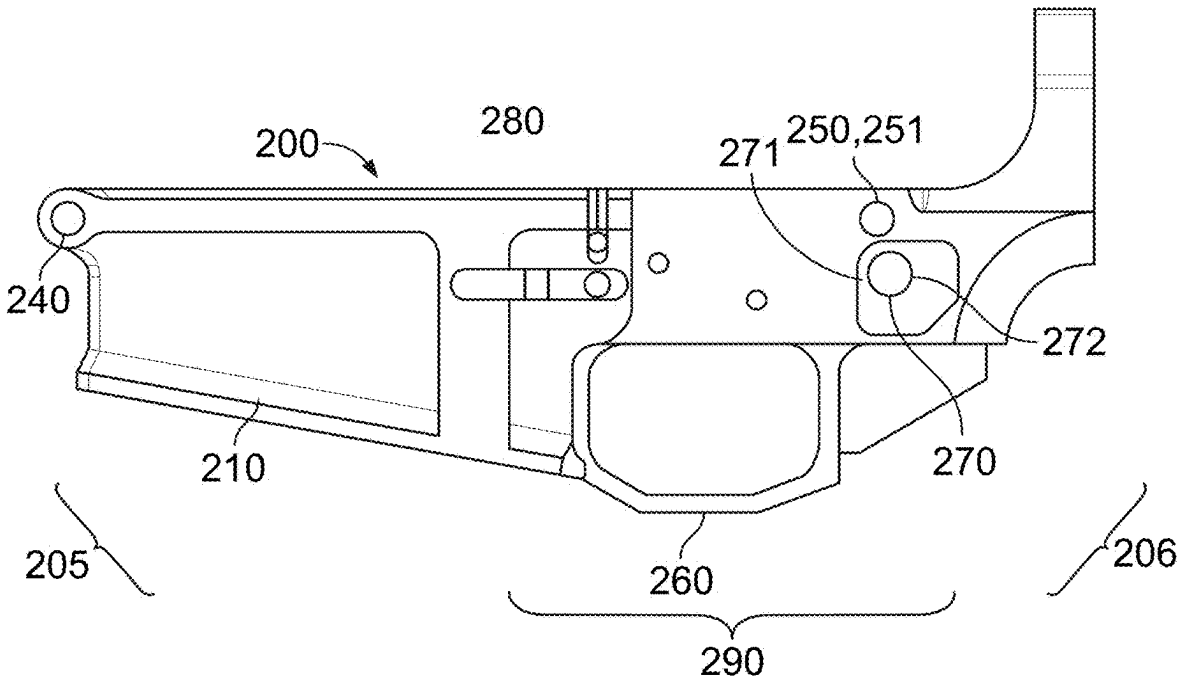
200
280
271
250,251
240
272
210
270
205
206
260
290

FIG. 2B

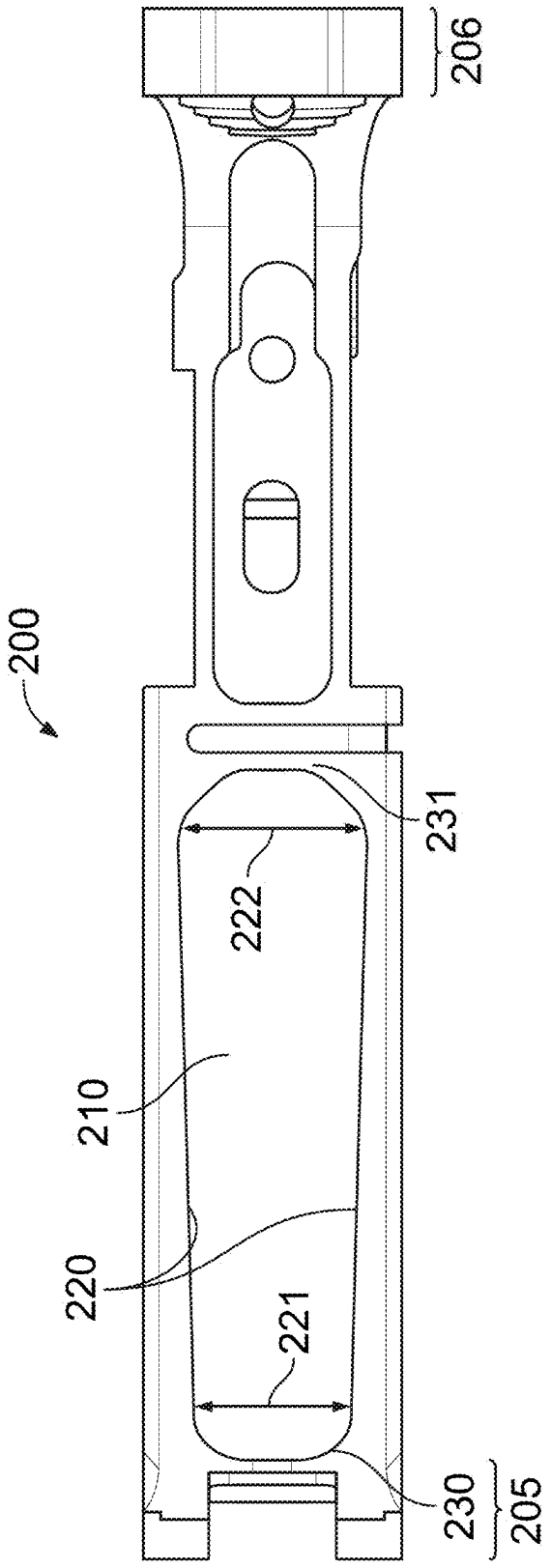

FIG. 2C

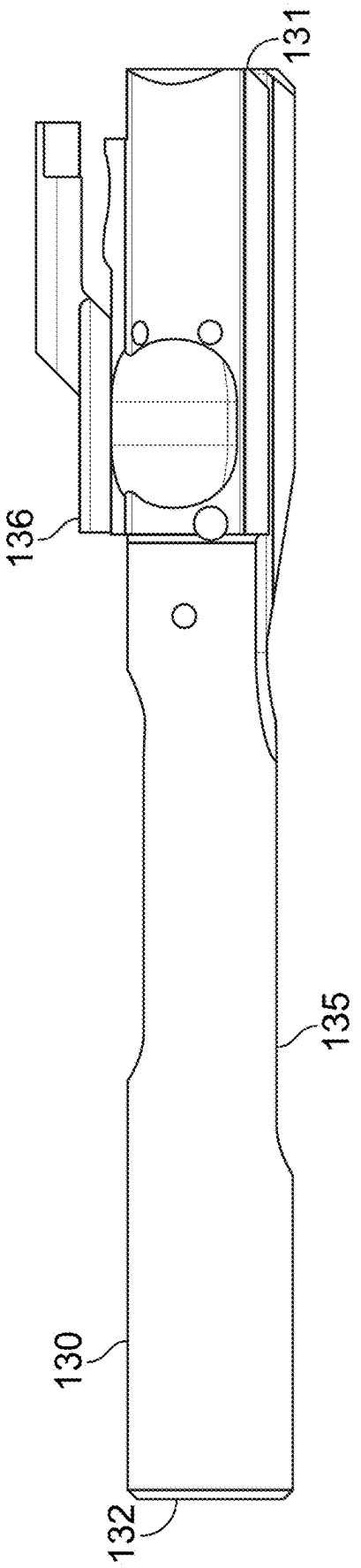

FIG. 3A

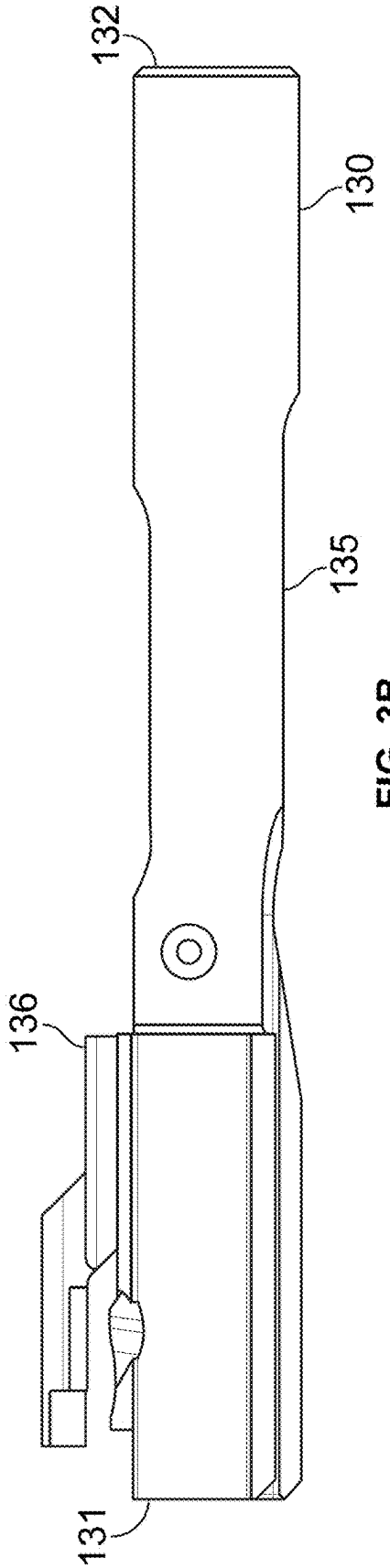

FIG. 3B

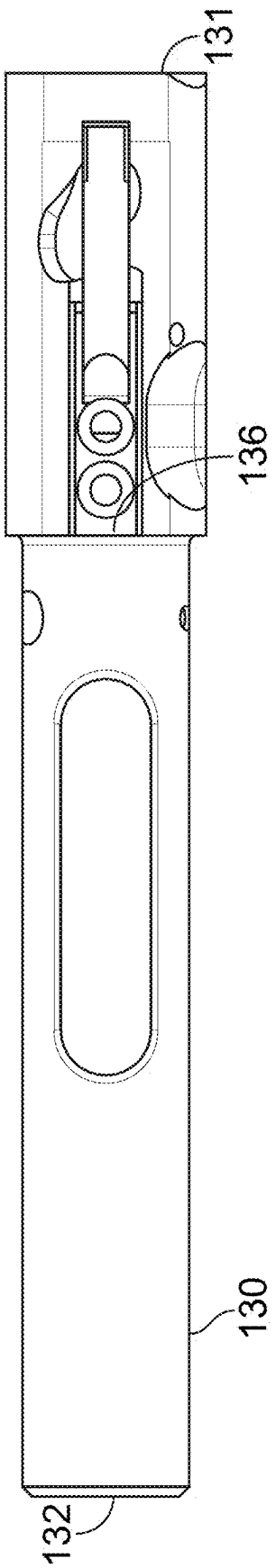

FIG. 3C

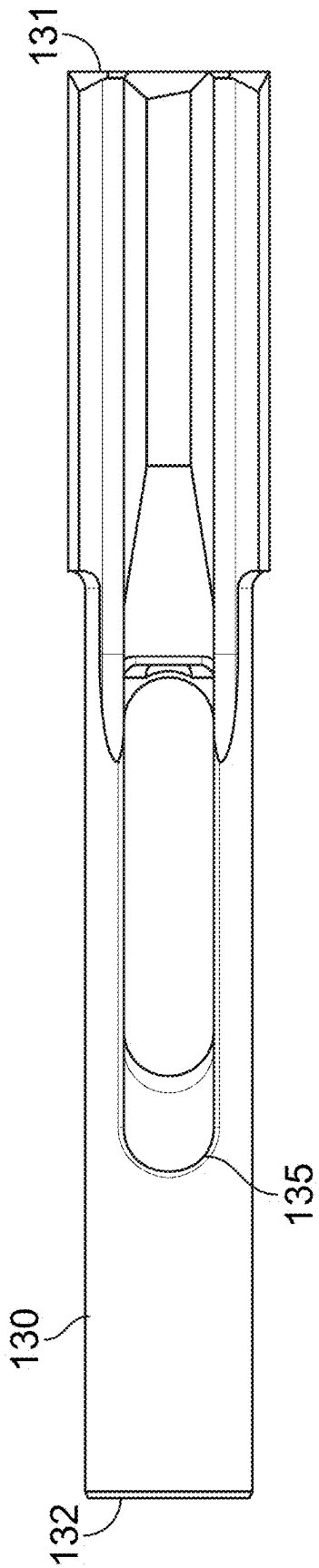

FIG. 3D

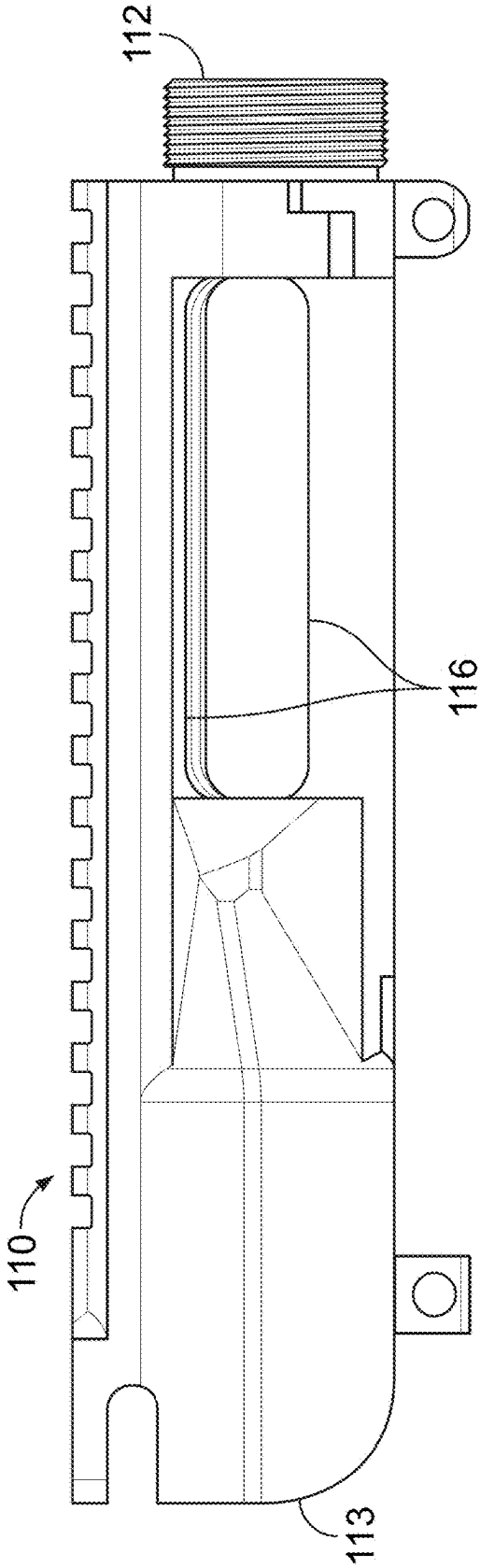

FIG. 4A

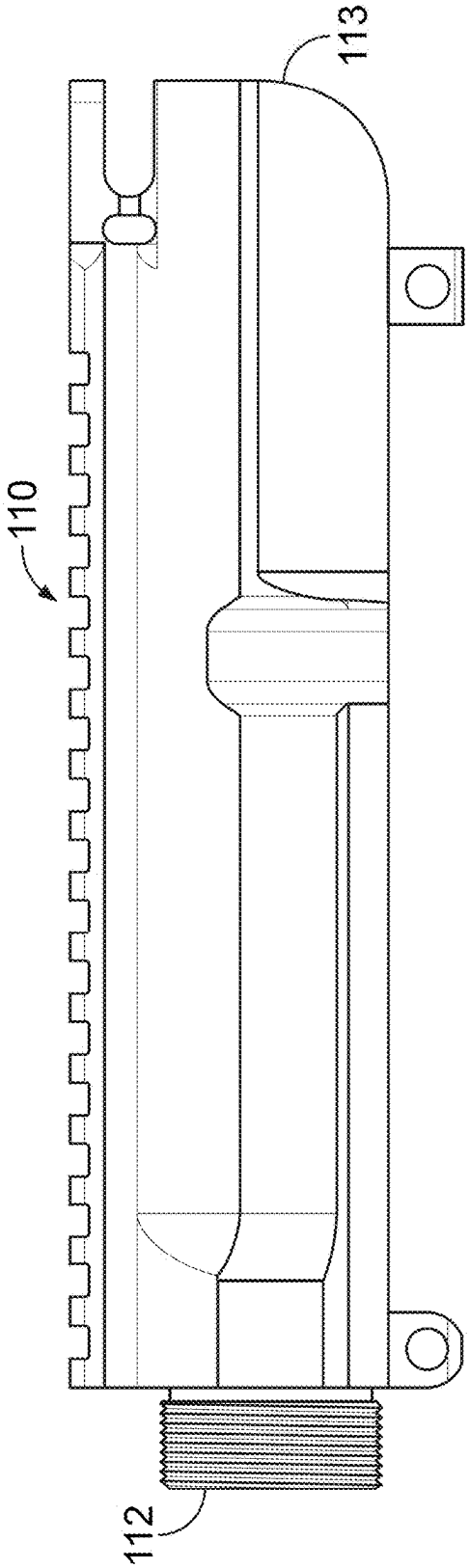

FIG. 4B

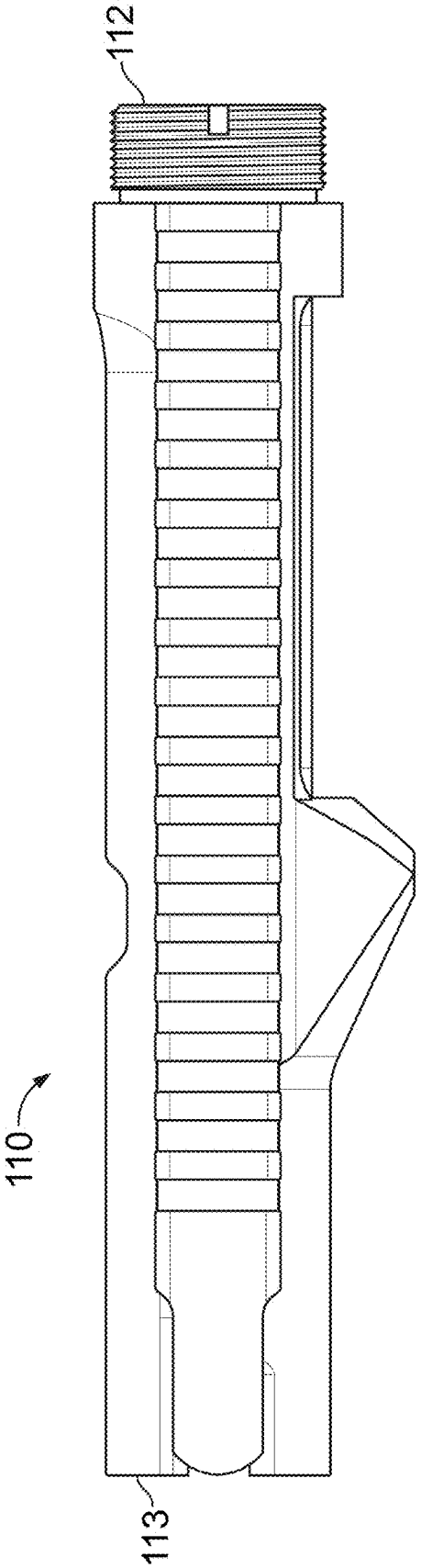

FIG. 4C

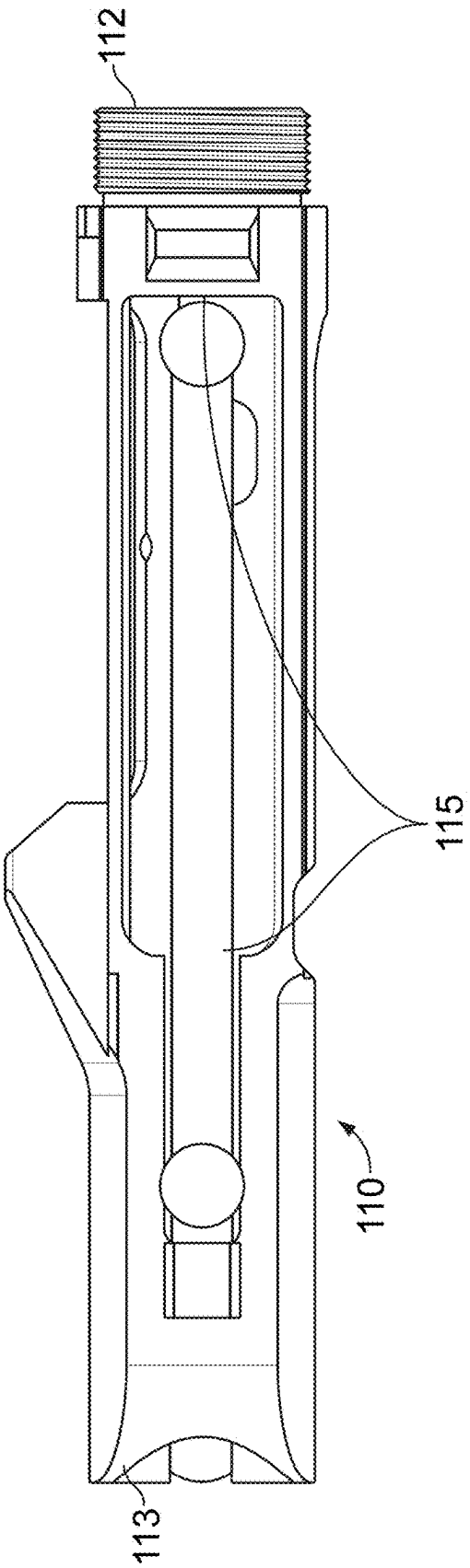

FIG. 4D

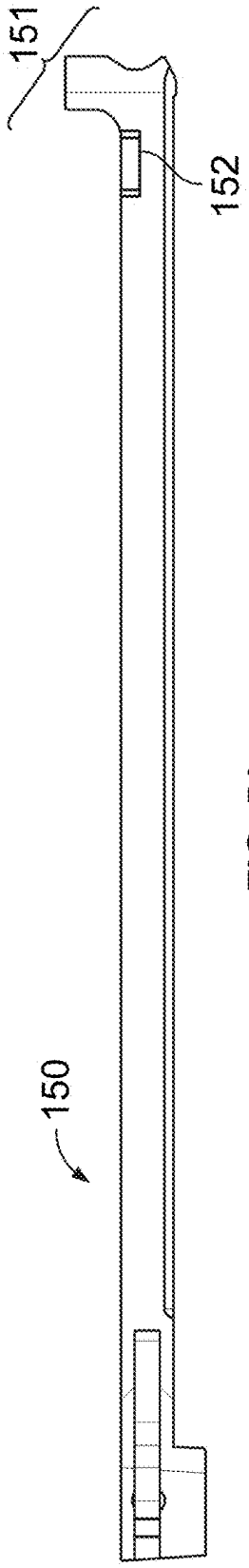

FIG. 5A

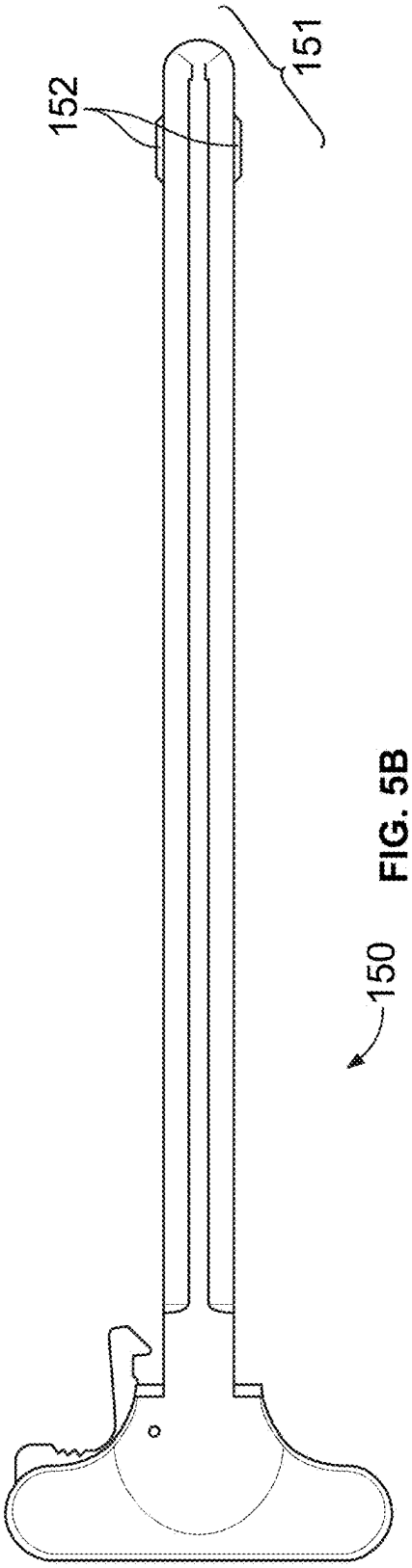

FIG. 5B

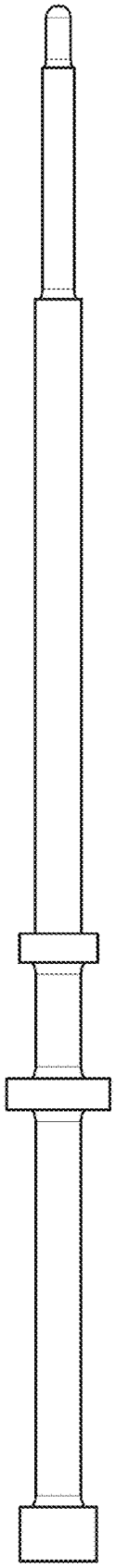

FIG. 6

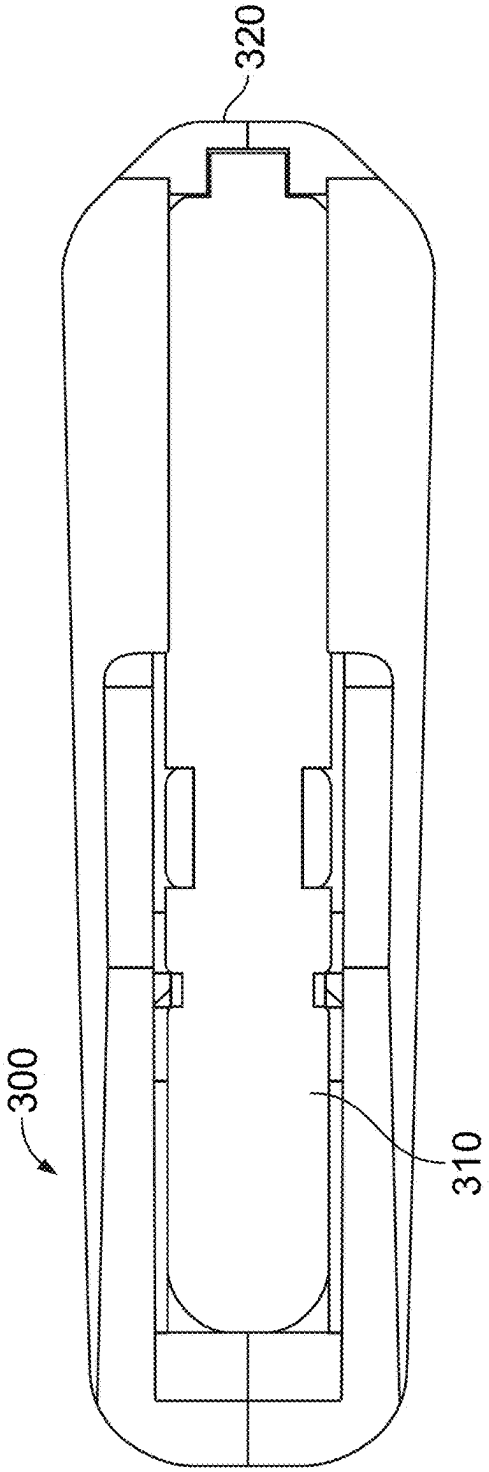

FIG. 7A

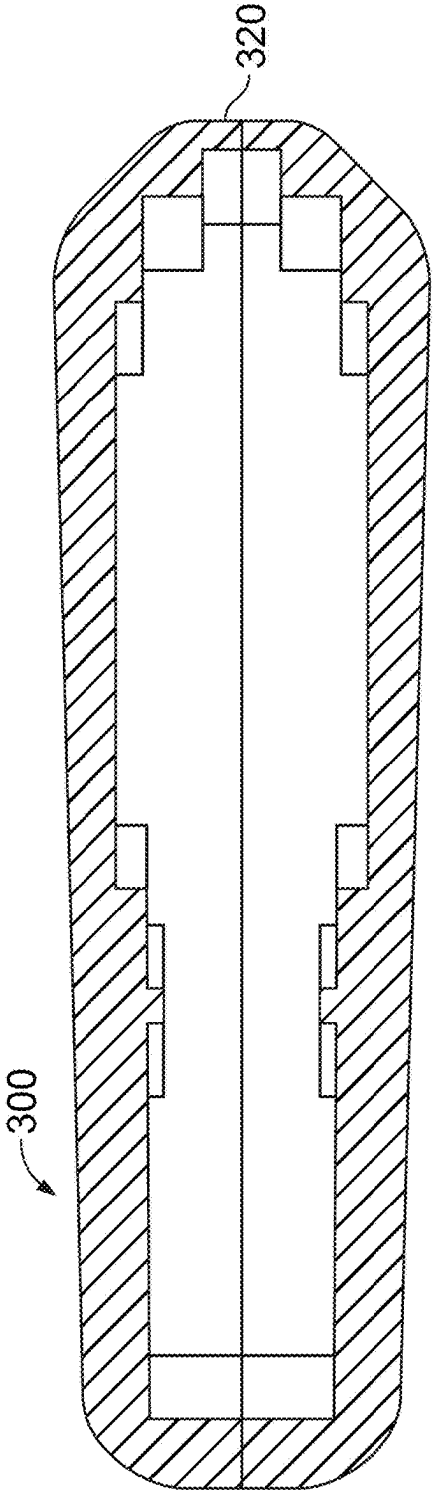

FIG. 7B

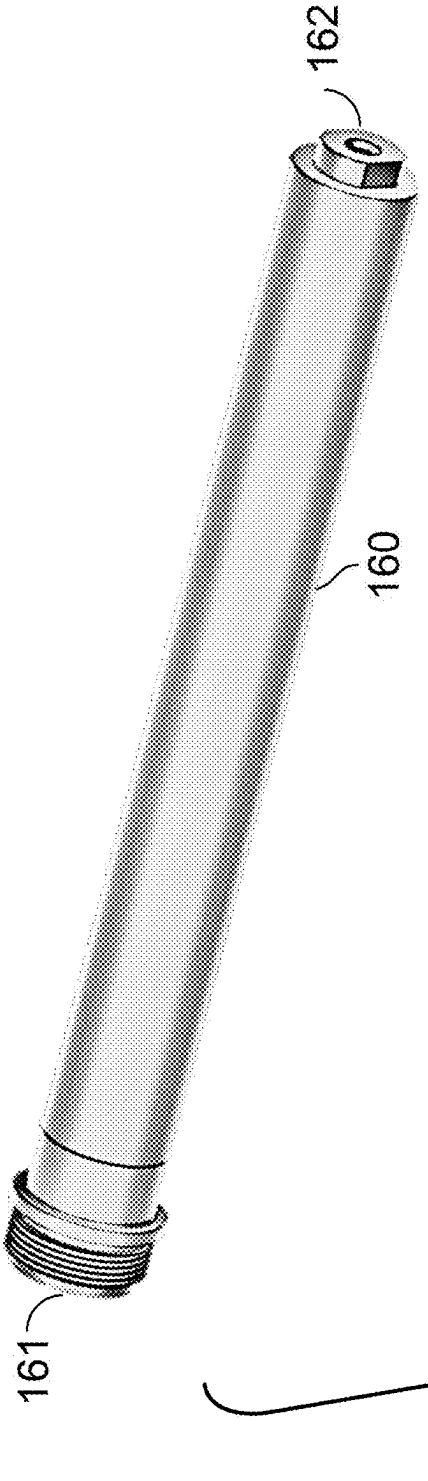

FIG. 8A

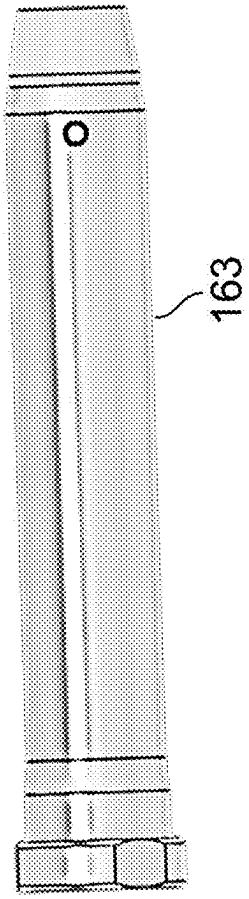

FIG. 8B

MODIFICATIONS FOR AR-10 STYLE FIREARM

BACKGROUND

AR-10 style firearms are widely used today by big game hunters and for law enforcement and tactical/defensive military uses. AR-10 style firearms are popular because of their power and accuracy at long range. Many big game hunters prefer using larger caliber ammunition, instead of the standard .308 Winchester ammunition. Traditionally, retrofitting of an AR-10 style firearm to accept larger ammunition requires elongated components that result in a firearm of increased size and weight, thereby resulting in an AR-10 style firearm that is more difficult to handle and fire.

SUMMARY

The present disclosure includes various embodiments that generally relate to an AR-10 style firearm comprising modifications that enable the AR-10 style firearm to fire a cartridge that is between 73.66 mm (2.9 inches) and 91.44 mm (3.6 inches) long without increasing the overall length and/or weight of the modified AR-10 style firearm, as compared to the standard AR-10 style firearm.

In one aspect, an AR-10 style firearm may comprise an upper receiver, and a lower receiver coupled to the upper receiver, wherein the lower receiver has a magazine well, along with a barrel coupled to the upper receiver, wherein the barrel is configured to fire a cartridge with a length between 73.66 mm and 91.44 mm, and a magazine configured to be received in the magazine well, the magazine having the cavity configured to receive a cartridge with a length between 73.66 mm and 91.44 mm.

In another aspect, the AR-10 style firearm may further comprise a buttstock coupled to a barrel, and wherein the firearm is a rotating bolt firearm that has a length of a standard AR-10 that extends from the first end of the barrel to the second end of the buttstock.

In another aspect, the AR-10 style firearm may further comprise modifications to locations and lengths of components located on, for example, the upper receiver, the lower receiver, the bolt carrier, the charging handle, and the firing pin.

In another aspect, the cavity of the magazine of the present disclosure may have a length of 101.70 mm+/−1.0 mm. In a further aspect, the magazine of the present disclosure may be comprised of aluminum, stamped steel, titanium, plastic, or a combination thereof.

The features, functions, and advantages that have been discussed can be achieved independently in various examples or may be combined in yet other examples further details of which can be seen with reference to the following description and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. **1**A-B illustrate perspective views of a firearm, in accordance with various embodiments;

FIGS. **2**A-C illustrate perspective views of a lower receiver of a firearm from the sides (FIGS. **2**A-B) and the top (FIG. **2**C), in accordance with various embodiments;

FIGS. **3**A-D illustrate perspective views of a bolt carrier from the sides (FIG. **3**A-B), the top (FIG. **3**C) and the bottom (FIG. **3**D), in accordance with various embodiments;

FIGS. **4**A-D illustrate a perspective view of an upper receiver of a firearm from the sides (FIGS. **4**A-B) the top (FIG. **4**C) and the bottom (FIG. **4**D), in accordance with various embodiments;

FIGS. **5**A-B illustrate perspective views of a charging handle from the side (FIG. **5**A) and the top (FIG. **5**B), in accordance with various embodiments;

FIG. **6** illustrates a side perspective view of the firing pin, in accordance with various embodiments;

FIGS. **7**A-B illustrate perspective views of a magazine from the top (FIG. **7**A) and the bottom (FIG. **7**B), in accordance with various embodiments;

FIGS. **8**A-B illustrate perspective views of a buffer assembly comprising a buffer tube (FIG. **8**A) and a buffer weight (FIG. **8**B), in accordance with various embodiments.

The drawings are for the purpose of illustrating examples, but it is understood that the disclosure is not limited to the arrangements and instrumentalities shown in the drawings.

DETAILED DESCRIPTION

The detailed description of exemplary embodiments provided herein makes reference to the accompanying drawings, which show exemplary embodiments by way of illustration. These exemplary embodiments are described in sufficient detail to enable one of skill in the art to practice the disclosure, and it should be understood that additional embodiments may be applicable without departing from the scope of the disclosure. Accordingly, the detailed description herein is presented for purposes of illustration only and not of limitation. For example, any reference to a singular component or step may include plural embodiments or steps and any reference to more than one component or step may include a singular embodiment or step. Further, any reference to attached, fixed, connected components or the like may include permanent, removable, temporary, partial, full and/or any other possible attachment option, and any reference to such phrases as without contact may also include reduced contact or minimal contact.

In the context of the present disclosure, devices, systems and methods may find particular use in connection with rotating bolt firearms. However, various aspects of the disclosed embodiments may apply equally to applications associated with all types of firearms, including, without limitation, automatic firearms, semi-automatic firearms, bolt action firearms, and the like. In addition, the present disclosure may be equally applicable to firearms using any suitable action including, for example, rotating bolt firearms, and to any suitable actuation system including, for example, gas piston systems, gas impingement systems, and manual actuation systems.

In various exemplary embodiments, and with reference to FIG. **1** through FIG. **7**, an AR-10 style rifle **100** is provided. In some embodiments, the firearm **100** may comprise an upper receiver **110** and a lower receiver **200**. In some embodiments, the upper receiver **110** may be operatively coupled to the lower receiver **200**. In some embodiments, the lower receiver **200** may comprise a magazine well **210**. In some embodiments, a barrel **120** may be coupled to the upper receiver **110**. In some embodiments, the barrel **120** may be configured to fire a cartridge that is between 73.66 mm and 91.44 mm in length. In some embodiments, a magazine **300** may be configured to be received in the magazine well **210**. In some embodiments, the magazine **300** may comprise a cavity **310** configured to receive a cartridge that is between 73.66 mm and 91.44 mm in length.

In some exemplary embodiments, the cavity **310** of the magazine **300** comprises a length of 101.70 mm+/−1.0 mm.

In some exemplary embodiments, the magazine well **210** of the lower receiver **200** comprises a length of 101.70 mm+/−1.0 mm.

In some exemplary embodiments, the magazine well **210** comprises two opposing sidewalls **220**, a first end having a first width **221**, and a second end having a second width **222** that is larger than the first width.

In some exemplary embodiments, the opposing sidewalls **220** of the magazine well **210** may comprise a first width **221** that ranges from 27.5 mm to 28.5 mm and a second width **222** that ranges from 23.0 mm to 24.0 mm.

In some exemplary embodiments, the magazine well **210** may comprise two opposing sidewalls **220** that are coupled to the first end **230** via rounded corners. In further exemplary embodiments, the two opposing sidewalls **220** of the magazine well **210** may be coupled to the second end **231** via rounded chamfers thereby creating a narrower slot to receive a spine **320** of the magazine **300**. Such embodiments have the benefit of advantageously reducing interference when loading the magazine **300** into the magazine well **210**. Another advantage of such embodiments includes reducing manufacturing costs by avoiding additional or specialized milling activity of components including, but not limited to, the magazine **300** and/or the magazine well **210**.

In some exemplary embodiments, the firearm **100** may comprise a buttstock **140** which may include a first end **141** and a second end **142**. In some exemplary embodiments, the first end **141** of the buttstock **140** may be coupled to a second end **122** of the barrel **120**. In further exemplary embodiments, the firearm **100** is a rotating bolt firearm that may have a length of a standard AR-10 of 958.85 mm (37.75 inches) with a 508 mm (20 inch) barrel, that extends from a first end of the barrel **121** to the second (posterior) end of the buttstock **142**.

In some exemplary embodiments, the lower receiver **200** may include (a) a pivot pin **240** that may be arranged at a first end **205** of the lower receiver **200**; (b) a takedown pin **250** that may be arranged at a second end **206** of the lower receiver **200**; and/or (c) a trigger guard **260** that may be coupled to the second end **231** of the magazine well **210**. In further exemplary embodiments, the trigger guard **260** may be arranged between the pivot pin **240** and the takedown pin **250**. In further exemplary embodiments, a safety pin/selector **270** may be positioned in a stacked arrangement with the takedown pin **250**.

In some exemplary embodiments, the pivot pin **240** and the takedown pin **250** may be linearly arranged with each other in the lower receiver **200**. In some exemplary embodiments, the pivot pin **240** and the takedown pin **250** may be spaced apart by 174.752 mm, as measured from the center of the pivot pin **240** to the center of the takedown pin **250**.

In some exemplary embodiments, a stacked arrangement between the safety pin/selector **270** and the takedown pin **250** may further comprise a first portion of the safety pin/selector **271** that is arranged below the takedown pin **250** and a second portion of the safety pin/selector **272** that is arranged distal to the takedown pin **250** relative to the first end of the barrel **121**.

In some exemplary embodiments, the takedown pin **250** is arranged within the lower receiver **200** in such a manner that a first side of the takedown pin **251** is flush with the exterior of the lower receiver **200** on the same side of the firearm **100** as a safety pin/selector **270** is located (as shown in FIG. **1**A), and a second side of the takedown pin **252** protrudes from the exterior of the lower receiver **200** on the opposing second side of the firearm **100**, as shown in FIG. **1**B.

In some exemplary embodiments, the lower receiver **200** may also comprise a bolt catch **280**, wherein the position of the bolt catch **280** is shifted to a position behind the elongated magazine well **210** towards the second (posterior) end of the lower receiver **206**. Such embodiments have the benefit of advantageously allowing for an elongated magazine well **210** that may be configured to receive a magazine **300** that may receive a cartridge that is between 73.66 mm and 91.44 mm in length.

In some further exemplary embodiments, the upper receiver **110** may also include a slot **115** located on the underside of the upper receiver, wherein the length of the slot **115** is 111.25 mm. In contrast, the length of the slot on the underside of the upper receiver in a standard AR-10 is 89.66 mm. The increased length of the slot **115** on the underside of the upper receiver is necessary to enable use of the larger ammunition in accordance with exemplary embodiments of the present disclosure. In further embodiments, an ejection port **116** located on the right side of the upper receiver may be wider than an ejection port on a standard AR-10. In some instances, the ejection port **116** is 18.24 mm wide, whereas the slot on a standard AR-10 is 14.22 mm wide. The increased width of the ejection port **116** provides a benefit of advantageously allowing for ejection of the larger ammunition or ammunition casing, in accordance with exemplary embodiments of the present disclosure.

In some exemplary embodiments, a charging handle **150** may be coupled to the upper receiver **110**, wherein the charging handle **150** has opposing sides that each have tangs **152** that may be arranged 10 mm from a first end of the charging handle **151**. Such embodiments provide the benefit of advantageously allowing the charging handle **151** to travel back farther towards a second (posterior) end of the upper receiver **113**, thereby accommodating an elongated or larger magazine **300** that may receive a cartridge that is between 73.66 mm and 91.44 mm in length. In contrast, the distance of the tangs from the first end of the charging handle in a standard AR-10 is 25.3 mm, which is not capable of receiving an elongated or larger magazine for larger caliber ammunition as provided in the present disclosure.

In some exemplary embodiments, the firearm **100** may include a bolt carrier **130** coupled to the upper receiver **110** wherein the bolt carrier **130** may comprise a gas key **136**, wherein the diameter of the bolt carrier from a first end of the bolt carrier **161** to the gas key **136** may comprise 23.62 mm, with the length from the first end of the bolt carrier **161** to the gas key **136** comprising 135.2 mm. In comparison, a standard AR-10 has a diameter of 23.62 mm for a length of 116.7 mm. The increased length of the smaller diameter provided in the present disclosure provides the benefit of reducing the weight of certain embodiments of the present disclosure. In some further embodiments, the bolt carrier **130** comprises a slot **135** on the underside of the bolt carrier, wherein the length of the slot **135** on an underside of the bolt carrier is 71 mm. In comparison, the length of the slot of the bolt carrier in a standard AR-10 is 55.9 mm. The increased length of the slot **135** according to exemplary embodiments of the present disclosure is necessary to enable use of larger ammunition, and the increased length of the slot also includes advantages of providing clearance for a relocated fire control group **290** and reducing the weight of certain embodiments of the present disclosure.

In additional exemplary embodiments, the bolt carrier **130** also includes a firing pin **137** arranged at a second end of the

bolt carrier **132**, wherein the firing pin **137** has a length of 121.6 mm. In contrast, the firing pin of a standard AR-10 has a length of 100 mm. The increased length of the firing pin according to exemplary embodiments of the present disclosure also provides advantages of enabling use of ammunition with a cartridge having a length between 73.66 mm and 91.44 mm.

In some exemplary embodiments, the magazine **300** is configured to hold 5 to 30 rounds of cartridges with a length of between 73.66 mm and 91.44 mm. In some embodiments, the magazine **300** is configured to hold 5 rounds of cartridges with a length of between 73.66 mm and 91.44 mm. Some exemplary ammunition types may include: .300 Winchester Magnum, .300 Precision Rifle Cartridge ("PRC"), 6.5 PRC, .30-06 ammunition, .270 Winchester, 7 mm Magnum, and 7 mm PRC. Other ammunition with a cartridge length between 73.66 mm (2.9 inches) and 91.44 mm (3.6 inches) would be readily known by one of ordinary skill in the art.

In some exemplary embodiments, the barrel **120** may be configured to fire a .300 Winchester Magnum cartridge. In other exemplary embodiments, the barrel **120** may be configured to fire a .300 PRC cartridge. In other exemplary embodiments, the barrel **120** may be configured to fire a 6.5 PRC cartridge. In other exemplary embodiments, the barrel **120** may be configured to fire a .30-06 cartridge. In other exemplary embodiments, the barrel **120** may be configured to fire a .270 Winchester cartridge. In other exemplary embodiments, the barrel **120** may be configured to fire a 7 mm Magnum cartridge. In still other exemplary embodiments, the barrel **120** may be configured to fire a 7 mm PRC cartridge. The barrel **120** may also be configured to fire any ammunition with a cartridge length between 73.66 mm and 91.44 mm, as would be readily known by one of ordinary skill in the art.

In some exemplary embodiments, the firearm **100** further comprises a buffer assembly **159** comprising a buffer tube **160** having a first end **161** and a second end **162**, wherein the second end of the bolt carrier **132** is received in the first end of the buffer tube **161**, a buffer spring (not pictured) and a buffer weight **163**, wherein the buffer weight has a length of 117 mm+/−3 mm and a weight of 8 oz+/−3 oz.

In some exemplary embodiments, the magazine **300** may be comprised of aluminum, stamped steel, titanium, or plastic.

In some exemplary embodiments, the firearm **100** in an unloaded condition comprises a total weight that is no more than the total weight of a standard AR-10 in an unloaded condition. In some exemplary embodiments, the total length of the firearm **100** of the present disclosure is no longer than the length of a standard AR-10 with the same respective barrel length. In some exemplary embodiments, the firearm **100** in an unloaded condition comprises a total weight that is less than other semi-automatic firearms configured to fire ammunition with a cartridge length between 73.66 mm and 91.44 mm, including but not limited to an AR-10 firearm configured to fire ammunition with a cartridge length between 73.66 mm and 91.44 mm.

Alternative implementations are included within the scope of the examples of the present disclosure in which functions may be executed out of order from that shown or discussed, including substantially concurrent or in reverse order, depending on the functionality involved, as would be understood by those reasonably skilled in the art.

The invention claimed is:

1. A firearm comprising:

an upper receiver;

a lower receiver coupled to the upper receiver, wherein the lower receiver comprises

a magazine well, wherein the magazine well has a length of 101.7 mm+/−1.0 mm;

a pivot pin arranged at a first end of the lower receiver;

a takedown pin arranged at a second end of the lower receiver;

a trigger guard coupled to a second end of the magazine well, wherein the trigger guard is arranged between the pivot pin and the takedown pin;

a safety pin; and

a bolt catch, wherein the position of the bolt catch is shifted to a position posterior to the magazine well;

a barrel coupled to the upper receiver, wherein the barrel is configured to fire a cartridge having a length between 73.66 mm and 91.44 mm;

a buttstock having a first end and a second end, wherein the first end of the buttstock is coupled to a second end of the barrel, and wherein the firearm is a rotating bolt firearm; and

a magazine configured to be received in the magazine well, the magazine having a cavity configured to receive a cartridge having a length between 73.66 mm and 91.44 mm, and

wherein the firearm has a length of a standard AR-10 of 958.85 mm (37.75 inches) with a 508 mm (20 inch) barrel, that extends from a first end of the barrel to the second end of the buttstock.

2. The firearm according to claim **1**, wherein the cavity of the magazine has a length of 101.7 mm+/−1.0 mm.

3. The firearm according to claim **1**, wherein the magazine well has two opposing sidewalls, a first end having a first width, and a second end having a second width that is larger than the first width.

4. The firearm according to claim **3**, wherein the first width ranges from 27.5 mm to 28.5 mm and the second width ranges from 23 mm to 24 mm.

5. The firearm according to claim **3**, wherein the two opposing sides are coupled to the first end via rounded corners and wherein the two opposing sides are coupled to the second end via rounded chamfers thereby creating a narrower slot to receive a spine of the magazine.

6. The firearm according to claim **1**, wherein the safety pin has a stacked arrangement with the takedown pin.

7. The firearm according to claim **1**, wherein the pivot pin and the takedown pin are linearly arranged with each other in the lower receiver and are spaced apart by 174.752 mm measured from center to center.

8. The firearm according to claim **6**, wherein the stacked arrangement between the safety pin and the takedown pin further comprises a first portion of the safety pin arranged below the takedown pin and second portion of the safety pin arranged distal to the takedown pin relative to the first end of the barrel.

9. The firearm according to claim **6**, wherein the takedown pin is arranged within the lower receiver such that a first side of the takedown pin is flush with an exterior of the lower receiver on a first side where a safety switch is located, and wherein the takedown pin protrudes from the exterior of the lower receiver on an opposing second side.

10. The firearm according to claim **1**, wherein the upper receiver further comprises:

a slot located on a underside of the upper receiver, wherein the length of the slot is 111.25 mm, and

an ejection port located on a right side of the upper receiver, wherein the ejection port is 18.24 mm wide.

11. The firearm according to claim 1, further comprising a charging handle coupled to the upper receiver, wherein the charging handle has opposing sides that each have a tang arranged 10 mm from a first end of the charging handle.

12. The firearm according to claim 1, further comprising:

a bolt carrier coupled to the upper receiver, wherein the bolt carrier comprises

a gas key, wherein the diameter of the bolt carrier from a first end of the bolt carrier to the gas key comprises 23.62 mm, and wherein the length from the first end of the bolt carrier to the gas key comprises 135.2 mm, and

a slot located on an underside of the bolt carrier, and wherein the length of the slot on the underside of the bolt carrier is 71 mm; and,

a firing pin arranged at a second end of the bolt carrier, wherein the firing pin has a length of 121.6 mm.

13. The firearm according to claim 1, wherein the magazine is configured to hold 5 to 30 rounds of cartridges having a length between 73.66 mm and 91.44 mm.

14. The firearm according to claim 13, wherein the magazine is configured to hold 5 rounds of cartridges having a length between 73.66 mm and 91.44 mm.

15. The firearm according to claim 1, further comprising:

a buffer assembly having a buffer tube with a first end and a second end, wherein a second end of the bolt carrier is received in the first end of the buffer tube, and

a buffer weight, wherein the buffer weight has a length of 117 mm+/−3 mm and a weight of 8 oz+/−3 oz.

16. The firearm according to claim 1, wherein the magazine may be made of a material selected from a group consisting of aluminum, stamped steel, titanium, or plastic.

17. The firearm according to claim 1, wherein a total weight of the firearm in an unloaded condition is no more than a total weight of a standard AR-10 in the unloaded condition.

18. The firearm according to claim 1, wherein the firearm is configured to receive a cartridge that is one or more of: .300 Winchester Magnum, .300 Precision Rifle Cartridge ("PRC"), 6.5 PRC, .30-06 ammunition, .270 Winchester, 7 mm Magnum, and 7 mm PRC.

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