The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to an improved bolt and receiver construction for automatic firearms.

The usual receiver and bolt construction for automatic firearms is generally of complicated design and consequently is extremely difficult to machine to the exacting dimensions required. This is particularly true of the bolt camming surfaces and of the locking surfaces or shoulders within the receiver against which the locking lugs on the bolt cooperate to lock the bolt to the receiver prior to discharge of the cartridge.

Accordingly, it is an object of this invention to provide a receiver and bolt of improved design thereby facilitating fabrication of such receiver.

Another object of this invention is to provide a splined liner for a receiver terminating in a shoulder to provide a locking surface for the locking lugs for the firearm bolt.

Still another object of this invention is to provide a firearm bolt having cooperating lugs thereon adapted to engage the splined liner of the receiver.

A further object of this invention is to provide an improved means whereby the bolt is rotated to its battery position.

The specific nature of the invention as well as other objects and advantages thereof will clearly appear from a description of a preferred embodiment as shown in the accompanying drawings in which:

Fig. 1 is a longitudinal sectional view of the firearms;

Fig. 2 is a side elevational view of the receiver;

Fig. 3 is a cross sectional view taken along the line 3–3 of Fig. 2;

Fig. 4 is a side elevational view of a firearm bolt;

Fig. 5 is a view similar to Fig. 4 but showing the bolt rotated 90 degrees;

Fig. 6 is a rear end view of the bolt shown in Figs. 4 and 5;

Fig. 7 is a side elevational view of the liner; and

Figure 8 is a side elevation of the splined end of the bolt, rotated approximately 72° clockwise from the position shown upon Figure 6.

The receiver assembly 1 comprises essentially a receiver 9, a magazine latch 30, a magazine latch spring 32, a liner 43, a rear sight 50 mounted on top of receiver 9, an ejector 62, a cap 61 and a buffer disk 2.

The receiver 9, Fig. 1, is in the form of a generally cylindrical hollow member defining an axial bolt-way 10 and is provided with two downwardly depending lugs, a forward lug 11, and a rearward lug 12 through which are provided coaxial holes 13 and 14 respectively, parallel to the axis of bolt-way 10 for a purpose to appear later.

In rear lug 12 is a counterbored threaded hole 15 extending obliquely upward, radial to bolt-way 10, from the left side.

An election slot 17 leads from bolt-way 10 downwardly toward the left between lugs 11 and 12. A magazine well 19 is provided in receiver 9 leading from bolt-way 10 upwardly toward the right, substantially opposite ejection slot 11, the receiver being extended around well 19 to form a wall 20. A crosswise undercut 21 is provided at the forward end of magazine wall 19 and a longitudinal slot 22 is provided in a rearward portion 22 of wall 20. A magazine latch 20 is pivotally secured in slot 22 by a transversely located pin 31.

Five inwardly projecting splines 38, preferably of equal width, are provided in the rearward half of bolt-way 10 in receiver 9, similar to the construction described in my prior Patent 2,386,205 for Firearms.

These splines, as will be shown later, are provided for cooperation with bolt 100, being rounded at the front corner for that purpose as shown at 39, and are equally spaced around the inside of the receiver 9. A slot 41 is provided extending through the wall of the receiver in alignment with holes 13 and 14 in lugs 11 and 12 and extending from the rear end of receiver 9 forward and opening into hole 14. This slot occupies the space between two of the splines, the width of slot 41 corresponding to the width of the space between the splines. A small notch 42 is provided in one side of slot 41 for a purpose to appear later.

A camming shoulder 44a is required in bolt-way 10 forward of splines 38 and facing rearward, that is, toward the splines to initiate the rotation of the bolt relative to the splines. In order to obviate the difficulty of machining such a cam surface in the receiver, a tubular liner 43 with the rear end formed to constitute shoulders 44a and 44b (Fig. 9) is provided for assembly within receiver 9, being suitably secured in fixed location therein by means of a set screw 45 through counterbored obliquely disposed threaded hole 16.

UNITED STATES PATENT OFFICE

RECEIVER AND BOLT MECHANISM FOR FIREARMS

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5 Claims. (Cl. 89—188)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)
Shoulder 44c is rounded and is arranged to provide a camming action to bolt 100 in a manner to appear later. Shoulder 44b is square and serves as a supplementary stop to prevent excessive rotation of bolt 100 as will be shown later. Liner 43 is cut away as at 45 to match ejector slot 17 and as at 47 to match magazine weld 19. In the assembled relation, edges 48 of magazine weld 47 in liner 43 serve as shoulders against which the magazine (not shown) is held for positioning.

The use of a liner for obtaining a camming shoulder within the bolt-way in the receiver, while avoiding the difficulties of making an interior radial shaving cut, provides obvious advantages in simplicity of manufacture.

A thread 66 is provided on the rear end of receiver 9 for assembling a cap 67. This cap is provided for holding a buffer disk 72 in location at the rear end of bolt-way 10 to serve as a stop for cushioning the recoil stroke of the bolt 100. On one side of cap 67 adjacent the open end is provided an oblique lug 68 and extending through such lug is a rounded, radially disposed slot 65 as shown in Fig. 1. A radial key-way 71 is provided across the forward face of lug 68 on cap 67, coinciding with the center of slot 65.

The barrel assembly 2 comprises a barrel 80 having threads 81 for assembling to receiver 9, a chamber 82, and a bore 83. Chamber 82 accommodates a cartridge 8 having a case 76. An enlarged front end bearing portion 84 is provided to serve as a bearing for a front sight 87 comprising a sleeve 88 and a vane 89, the vane being offset to the left with respect to the axis of barrel 80 in order to align with a rear sight 90. Sleeve 88 is assembled on bearing 84 and is secured in location by a dowel pin 90 provided for that purpose.

A second bearing portion 85 with a radial gas port 86 through the bottom thereof is provided somewhat to the rear of bearing 84. A sleeve member 95, integral with a gas piston 96, is mounted on bearing 85. An aperture 97, in alignment with gas port 86 extends from inside of gas piston sleeve 95 radially outwardly, thereby providing a continuous passage from the bore 83 of barrel 80 through gas piston 96.

The bolt assembly 3 consists of a bolt 100, an extractor 118, a firing pin 135, and a firing pin spring 140.

Bolt 100 is of generally cylindrical form and is provided with an axial firing pin aperture 101, terminating at its forward end in a firing pin orifice 102. The juncture of firing pin aperture 101 and firing pin orifice 102 constitutes a shoulder 103.

In the rearward portion of bolt 100 is a longitudinal slot 105 extending inwardly to intersect firing pin aperture 101. The rear portion of slot 105 is extended obliquely rearward to the right as at 106 forming at the rear an oblique cam surface 107 and at the forward end of slot extension 106 a cam surface 108. A left wall 112 of slot extension 106 serves as a stop as will be shown. A slight shoulder 109 is provided in cam surface 108, all for cooperation with other parts as will be shown. A radial vent hole 110 is provided through the wall of bolt 100, just rearward of shoulder 109 to permit escape of any gases passing through the firing pin orifice 102 as a result of a punctured primer.

In the forward end of bolt 100 is a circular recess 111 coaxial with firing pin orifice 102 for receiving the head of a cartridge 8 when in engagement therewith. An extractor 118 is provided along one side of bolt 100.

Diametrically opposite extractor 118 in bolt 100 is an ejector clearance groove 125. This groove extends from the front end of bolt 100 rearward to about the middle of the bolt at which point it is extended sideways to the left as at extension 126 of ejector clearance groove 125 and extension 126 provides clearance for extractor 118 when the bolt moves forward and rotates into the locked position.

On the rearward portion of bolt 100, five lugs 130a, 130b, 130c, 130d and 130e are provided for cooperation with splines 36 in receiver 9 in a manner similar to that described in my above referred to Patent No. 2,386,205 for Firearms. However, in accordance with this invention, lugs 130a and 130b are longer than the others, lug 130c being located at bolt end as at 131 and arranged to engage camming shoulder 44c on liner 43 in receiver 9 and thereby initiate rotation of bolt 100 toward the locked position as it reaches the end of the forward stroke. If, as a result of wear or for any other reason bolt 100 fails to stop in this locked position, shoulder 44b is provided to serve as a supplementary stop by engaging lug 130b at the appropriate position. The rear corners 132 of bolt lugs 130 are rounded for a purpose to appear later.

A firing pin 135 of substantially cylindrical form is slidably contained within bolt 100 as shown in Fig. 1.

The operating rod unit 4 consists of an operating rod 145, a set screw 150, an actuator 152, an actuator spring 159, and a spring guide 160.

Operating rod 145 is expanded at the forward end to form a cup or gas cylinder 146. The rearward end of the operating rod comprises a socket 147 and an operating arm 148.

Actuator 152 is of generally cylindrical form and has an axially aligned cylindrical stud 153 at the forward end arranged for engagement in socket 147 of the operating rod 145, being secured therein by set screw 150. Actuator 152 is substantially hollow, an axially coincident hole 154 extending through the actuator from the rear end to a point near the forward end, acting as a spring 159 being inserted in such hole. A lug 155 provided on the upper rear end of actuator 152 is arranged to be engaged in slot 156 and slot extension 156 in bolt 100, whereby the motion of actuator 152 is transmitted to bolt 100 as will be shown later. A shoulder 156, with a forwardly facing bevel 157, is provided on the underside of actuator 152 at the rear end thereof, the purpose of which will appear later. Flutes (not shown) are provided in actuator 152 for lightening purposes.

The actuator spring guide 150 in the form of a tubular member is surrounded by actuator spring 159. This guide has a collar 161 at its rear end and a radial lug 162, the collar 161 serving as a shoulder for engaging the rear end of actuator spring 159.

In assembly, actuator 152 is slidably contained within aligned holes 13 and 14 in lugs 11 and 12 respectively on receiver 9. Lug 155 on actuator 152 extends generally upward through slot 41 in receiver 9 and into slot 105 in bolt 100. By this means longitudinal motion of actuator 152 is transmitted to bolt 100. Operating rod 145 is assembled to axial stud 153 of actuator 152, gas cylinder 146 on its forward end slidably engaging gas piston 96 on barrel 80. Cap 67 is threadably
assembled with buffer disk 72 therein at the end of bolt-way 10 to the rear end of receiver 9 and with slot 69 in lug 69 in axial alignment with hole 154 in actuator 152. Actuator spring guide 155 is inserted in the rear end of actuator spring 159, the forward end of such spring being passed forwardly through slot 65 in lug 69 into hole 154 in actuator 152.

Guide 160 is now forced forwardly compressing spring 159 and telescoping into actuator 152 until lug 162 on guide 160 passes through slot 65 in lug 69 on cap 67. The guide is then rotated until lug 163 therein has passed through notch 62 in receiver slot 64 and comes into alignment with radial key-way 71 in cap lug 68 whereupon guide 160 is allowed to retract, seating lug 162 on spring guide 160 in key-way 71 in lug 69 of cap 67. In this position actuator spring 159 is under considerable compression thereby maintaining actuator 152 under a positive forward stress at all times.

A trigger mechanism 5 consisting essentially of a trigger guard 164 having a trigger slot 165, a trigger 174 having a rear stop 175, a rearwardly disposed receiver 9, a safety latch 162 having a beveled shoulder 203, a rear spring 200, a plunger 214 and plunger spring 230 is provided to control the fire of the firearm. As such mechanism constitutes no part of this invention, no further mention thereof will be made except as to describe the function thereof in cooperation with the actuator. Such trigger mechanism is mounted on the underside of receiver 9 as shown in Fig. 1.

The above described firearm is of the gas operated type, the gas being taken from the bore 92 of barrel 90 through gas port 96 into gas cylinder 145 on the end of operating rod 145, the gas pressure developed in the gas cylinder upon discharge of cartridge 8 forcing the operating rod 145 and the actuator 152 rearwardly. Lug 185 on the top of actuator 152 being engaged in slot 184 in bolt 100 moves rearwardly and engages rearward camming surface 107 in the bolt slot 105, thereby imparting an oblique thrust against the bolt, the thrust being rearward and counterclockwise. The lugs 130 on bolt 100 being in endwise engagement with spines 39 in the receiver 9, prevent rearward motion of the bolt. Bolt 100 being free to respond only to the counterclockwise rotary component of the force is therefor rotated in a counterclockwise direction until the lugs 130 on the bolt pass out of endwise engagement with spines 39 in the receiver. Lug 155 then engages the left wall 112 of slot extension 110, thereby stopping rotation of bolt 100 with spines 138 and lugs 130 in endwise relation and hence converting the motion of bolt 100 from the counterclockwise rotary movement to a rearward longitudinal movement. The rounding at 39 and 132 on spines 38 and lugs 130 respectively provides clearance for facilitating the above described translation of motion of bolt 100.

Bolt 100 now moves rearwardly, extractor 118 holding the cartridge case 76 in engagement in recess 111 in the head of the bolt and thereby withdrawing the case from chamber 82 of barrel 80. As the case 76 is moved rearwardly, it is engaged near the edge opposite extractor 118 by the ejector 52 and is thereby ejected through slot 11. Meanwhile bolt 100 has passed to the rear of magazine 119, whereupon lug 155 allowing the used cartridge case 8 in magazine (not shown) to be moved by the magazine follower (not shown) to the bottom position where it is engaged by the edge of bolt 100 on its return stroke and carried forward into the chamber 82 of barrel 80.

As actuator 152 moves rearwardly, actuator spring 159 is subjected to additional compression, hence at the end of the rearward stroke spring 159 is under maximum compression. Therefore the full compressive force of the spring is exerted forwardly against actuator 152. This force causes the actuator to immediately return forwardly, lug 155 engaging shoulder 103 on forward camming surface 108 in bolt 100 and, spines 38 and lugs 130 being in sidewise engagement, the bolt cannot rotate but instead moves forward until the spines and lugs are disengaged and the rounded shoulder 131 on lug 130 on bolt 100 engages camming shoulder 444 in liner 43 thereby camming the bolt in a clockwise direction to disengage lug 155 from shoulder 103 on camming surface 108 which thereby rotates the bolt into the fully locked position.

At this point the actuator 152 engages beveled shoulder 203 on rear end 150 on actuator 152, engaging the rearward camming face 158 on bolt 100. As actuator 152 engages the seat 107 on downward, but seat stop 176 on trigger 174 engages the rear end of slot 169 thereby preventing further downward motion and retaining shoulder 203 thereon in engagement with shoulder 103 on the actuator so that actuator 152 is stopped immediately after bolt 100 is locked in firing position.

From the foregoing description it is readily apparent to those skilled in the art that there is provided an improved firearm receiver and bolt whereby difficult and expensive machining operations are substantially eliminated resulting in greatly increased production and large savings in costs.

I claim:

1. In a firearm, the improvement comprising, a hollow receiver having a bolt-way therethrough, a cam shoulder within said bolt-way, said shoulder being generally helically disposed with respect to the axis of the bolt-way, a bolt reciprocally mounted in said bolt-way and having a rotated locked position at the forward end of its reciprocating motion, a projection on the bolt constructed and arranged to engage the cam shoulder at the forward end of the bolt's reciprocating motion, whereby the bolt is cammed toward its locked position, said bolt having a laterally disposed recess, said recess having a cam wall generally helical with respect to the axis of the bolt, an actuator slidably mounted
in the firearm, and a lug on said actuator engaged in the recess in the bolt, said lug cooperating with the cam wall to complete the rotary motion of the bolt to its locked position.

2. In a firearm, the improvement comprising, a receiver having a bolt-way therethrough, a plurality of circumferentially spaced internal splines in said bolt-way, a cam shoulder within said bolt-way, said cam shoulder being generally helically disposed with respect to the axis of the bolt-way, a bolt reciprocably mounted within said bolt-way and having a rotated locked position at the forward end of its reciprocating motion, a plurality of circumferentially spaced external lugs on said bolt, said bolt lugs slidably cooperating with said receiver splines to maintain the bolt in fixed angular alignment in the receiver during its reciprocating motion, said bolt lugs and said receiver splines being constructed and arranged so that said bolt lugs pass out of sidewise engagement with said receiver splines at the forward end of the reciprocating motion, and a projection on said bolt, said projection being constructed and arranged to engage the cam shoulder in the bolt-way as said bolt lugs and receiver splines pass out of sidewise engagement to thereby initiate rotation of said bolt into locked position.

3. In a firearm, the improvement comprising, a receiver having a bolt-way therethrough, a plurality of circumferentially spaced internal splines in said bolt-way and having a rotated locked position at the forward end of its reciprocating motion, and a plurality of circumferentially spaced external lugs on said bolt, said bolt lugs slidably cooperating with said receiver splines to maintain said bolt in fixed angular alignment in the receiver during its reciprocating motion, said bolt lugs and said receiver splines being constructed and arranged so that said bolt lugs pass out of sidewise engagement with said receiver splines at the forward end of the reciprocating motion of the bolt, one of said bolt lugs being constructed and arranged to engage the cam shoulder in the bolt-way to initiate rotation of said bolt into locked position at the forward end of the reciprocating motion of said bolt.

4. In a firearm, the improvement comprising, a receiver, a liner secured in coaxial relation within said receiver, said receiver and said liner together defining a bolt-way extending longitudinally therethrough, a cam shoulder formed on the rearward end of the liner, said cam shoulder being generally helically disposed with respect to the axis of the bolt-way, a plurality of circumferentially spaced internal splines in the bolt-way in the receiver, a bolt reciprocably mounted in the bolt-way and having a rotated locked position at the forward end of its reciprocating motion, and a plurality of circumferentially spaced external lugs on said bolt, said bolt lugs slidably cooperating with said receiver splines to maintain the bolt in fixed angular alignment in the bolt-way during all but the extreme forward portion of its reciprocating motion, said bolt lugs being longitudinally disposed relative to said receiver splines so that at the forward end of the reciprocating movement of said bolt, said lugs pass out of sidewise engagement with said receiver splines, one of said bolt lugs being constructed and arranged to engage the cam shoulder on the liner to initiate rotation of said bolt toward locked position at the forward end of its reciprocating motion.

5. In a firearm, the improvement comprising, a receiver, a liner secured in coaxial relation within said receiver, said receiver and said liner together defining a bolt-way extending longitudinally therethrough, a cam shoulder being generally helically disposed with respect to the axis of the bolt-way, a plurality of circumferentially spaced internal splines in the bolt-way in the receiver, a bolt reciprocably mounted in the bolt-way and having a rotated locked position at the forward end of its reciprocating motion, a plurality of circumferentially spaced external lugs on said bolt, said bolt lugs slidably cooperating with said receiver splines to maintain said bolt in fixed angular alignment in the bolt-way during all but the extreme forward portion of its reciprocating motion, said bolt lugs and said receiver splines being constructed and arranged so that said bolt lugs pass out of sidewise engagement with said receiver splines at the forward end of the reciprocating motion of the bolt, one of said bolt lugs being constructed and arranged to engage the cam shoulder on the liner to initiate rotation of said bolt into locked position at the forward end of the reciprocating motion of the bolt, said bolt having a laterally disposed recess, said recess having a cam wall generally helically disposed with respect to the axis of said bolt, an actuator slidably mounted in the firearm, and a lug on said actuator engaged in said recess in said bolt, said lug cooperating with said cam wall to complete the rotary motion of said bolt to its locked position.

JOHN C. GARAND.

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