Oct. 15, 1946. M. M. JOHNSON, JR 2,409,569

AUTOMATIC FIREARM

Filed May 13, 1943 2 Sheets-Sheet 1

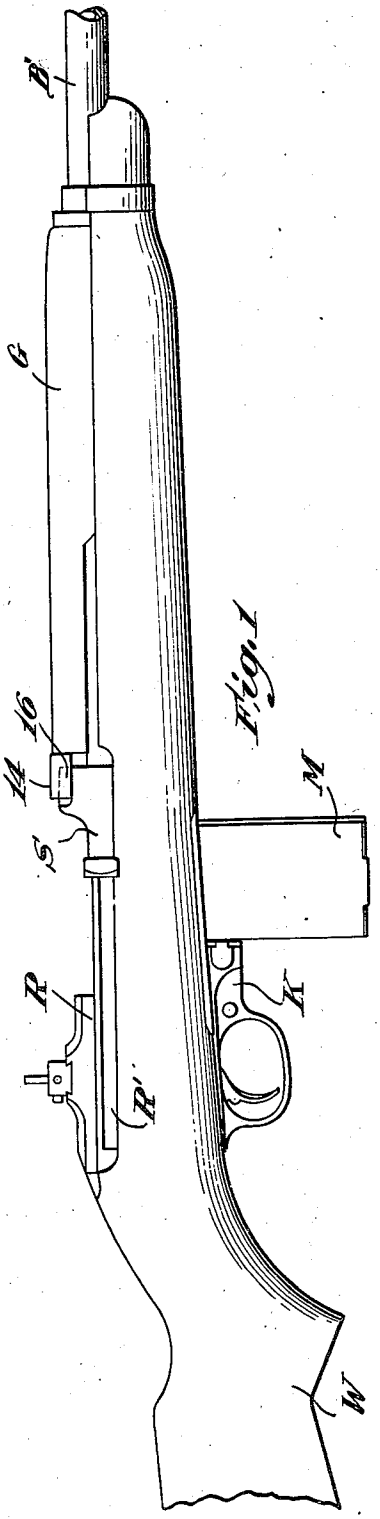

Fig. 1

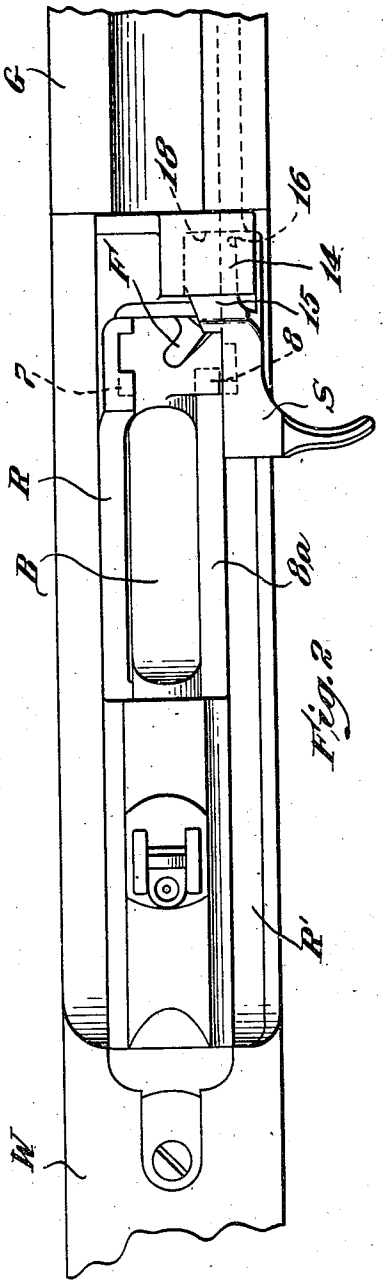

Fig. 2

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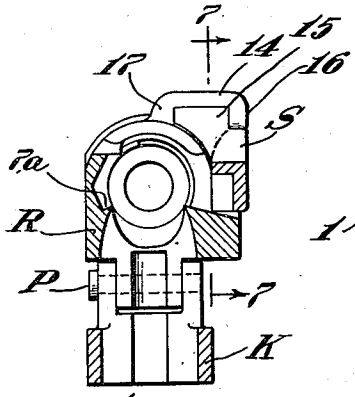


Fig. 4

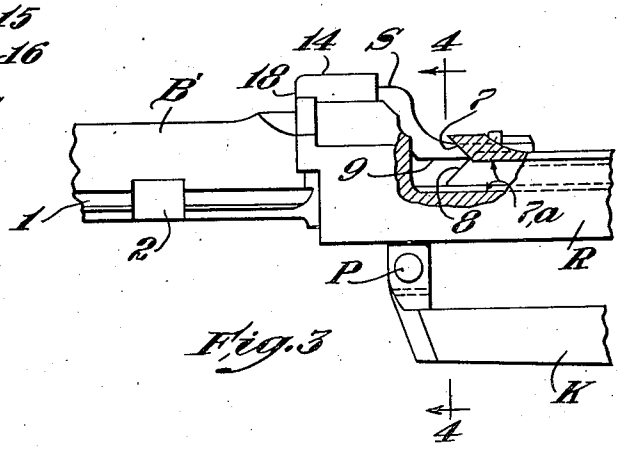


Fig. 3

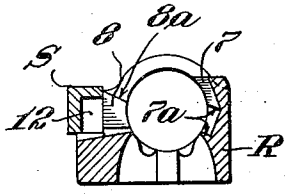


Fig. 6

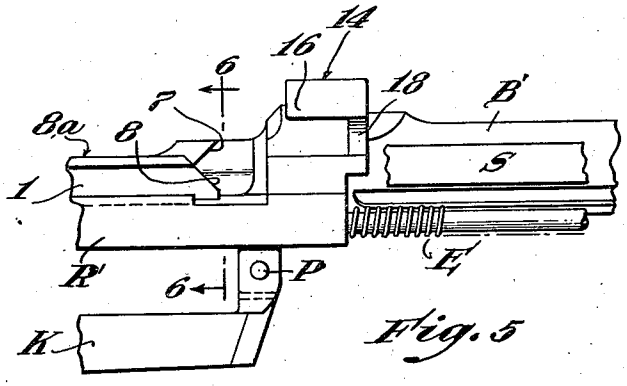


Fig. 5

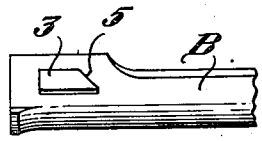


Fig. 8

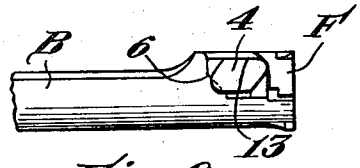
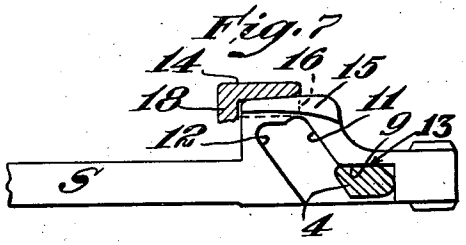


Fig. 9

Fig. 7



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Patented Oct. 15, 1946 2,409,569

UNITED STATES PATENT OFFICE

2,409,569

AUTOMATIC FIREARM

Melvin M. Johnson, Jr., Brookline, Mass., assignor to Melvin M. Johnson and said Johnson, Jr., both of Brookline, and Edward E. Rice, Boston, Mass., as trustees of Johnson Patent Trust, Boston, Mass.

Application May 13, 1943, Serial No. 486,782

4 Claims. (Cl. 42—3)

1

This invention relates to automatic guns of the type having a breech closure provided with one or more locking lugs engageable in front of abutments on the receiver to transmit the breech pressure to the receiver, the lugs being movable from their locking positions in front of the abutments to permit the breech action to recoil, together with a slide for controlling the movement of the lugs, the slide being movable in unlocking direction in response to the discharge of the firearm, and a spring for moving the slide in locking direction. While the slide may be actuated by a recoiling barrel or an inertia member, it is usually gas-operated by tapping gas from the barrel in advance of the firing chamber. While the aforesaid locking lugs may be on a separate locking piece movable transversely of the bolt, usually they are fast to the bolt and are moved into and out of locking position by rotating the bolt through an angle of the order of 20° to 30° or less. Ordinarily the abutting surfaces between the bolt lugs and the receiver abutments are disposed in a plane or planes perpendicular to the axis of the bolt. Consequently these surfaces freeze tightly together while subjected to the high breech pressure, particularly in high-power firearms of the military type. Even after the breech pressure has dropped to the point where it is safe to unlock the bolt the aforesaid engaging surfaces cling together and strongly resist the unlocking movement of the lugs. Thus the work imposed upon the slide in unlocking and opening the bolt is very high, requiring very rugged constructed of the slide mechanism and much power to insure complete functioning under all operating conditions.

Objects of the present invention are to provide a construction in which the work imposed upon the aforesaid slide is greatly reduced, in which the unlocking and opening movement of the bolt is controlled largely if not entirely by the breech pressure acting directly on the bolt through the head of the cartridge case, in which the slide mechanism may be simplified and reduced in weight, in which the operation of the firearm can be greatly increased, in which the effect of dust and dirt in the operating mechanism is reduced, in which less effort is required to unlock and retract the bolt by hand, in which the parts are subjected to less battering and wear in operation, in which there is less danger to burr and score the engaging surfaces of the locking lugs and receiver abutments and in which the operation is smoother and more reliable.

According to this invention the abutting surfaces of the aforesaid locking lugs and receiver abutments are inclined to the direction of breech pressure so that the breech pressure tends to produce unlocking movement of the lugs, and the slide is provided with an abutment surface which obstructs the unlocking movement of the lug until the slide has moved a predetermined distance from firing position. By thus inclining the engaging surfaces of the lugs and abutments the bolt is automatically unlocked by the direct thrust of the breech pressure as soon as the slide has moved far enough to permit the unlocking movement. By increasing the inclination of the abutting surfaces the unlocking component of the breech pressure may be increased as much as desired. For example the inclination may be merely sufficient to assist the slide in unlocking and retracting the bolt, or it may be large enough to do all of the work of unlocking and retracting the bolt, overcoming the friction of the cartridge case in the firing chamber and the friction and inertia of the bolt; indeed it may be great enough not only to do all of this work but also to assist in retracting the slide and compressing the recoil spring. For use in military rifles and carbines for example the inclination may be in the neighborhood of 20° to 30° with respect to planes perpendicular to the axis of the bolt. In the preferred embodiment the slide also has a cam surface for camming the locking lugs into locking position near the end of the movement of the slide toward firing position.

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For the purpose of illustration a typical embodiment of the invention is shown in the accompanying drawings in which

Fig. 1 is a right side elevation of the firearm with parts broken away;

Fig. 2 is a top plan view of the firearm with parts broken away;

Fig. 3 is a left side elevation of the parts of the firearm in the region of the firing chamber, with parts broken away;

Fig. 4 is a section on line 4—4 of Fig. 3;

Fig. 5 is a right side elevation of parts of the firearm in the region of the firing chamber, with the bolt removed and the other parts in firing position;

Fig. 6 is a section on line 6—6 of Fig. 5;

Fig. 7 is a section on line 7—7 of Fig. 4, showing the parts in firing position;

Fig. 8 is a left side elevation of the forward end of the bolt; and

Fig. 9 is a right side elevation of the forward end of the bolt.

Except for the improvements hereinafter de-

scribed the particular embodiment of the invention chosen for the purpose of illustration is like the U. S. caliber .30 SR M1 carbine and the U. S. caliber .30 M1 (Garand) semi-automatic rifle, now being manufactured for the United States Government. Like all M1 Garand rifles and M1 carbines the firearm comprises a receiver R, a barrel B', a wood stock W, a wood hand-guard G, a detachable magazine M, a sub-frame K for supporting the trigger mechanism, the sub-frame being detachably connected to the receiver at the front and rear by means including a pin P at the front (Figs. 3 and 5), a bolt B reciprocating back and forth in the receiver, an extractor F mounted on the forward end of the bolt, a gas-operated slide S for controlling the bolt and a recoil spring E for returning the bolt and slide to firing position after recoil, the recoil spring being enclosed by the right slide portion R' of the receiver. Extending longitudinally along opposite sides of the barrel are grooves 1 to receive the lips of the forward end of the slide (not shown) to guide the slide in its back and forth movement. As shown at 2 in Fig. 3 the barrel has a sloping recess to facilitate assembly.

On opposite sides of its forward end the bolt is provided with two locking lugs 3 and 4 which have surfaces 5 and 6 which engage abutment surfaces 7 and 8 on the receiver to lock the bolt in firing position. To unlock the bolt it is rotated in a counter-clockwise direction until the locking lugs 3 and 4 are out of line with the receiver abutments 7 and 8, whereupon the bolt is free to recoil without further rotation. In the closing movement the bolt reciprocates forwardly and then rotates in a clockwise direction to bring the locking lug in front of the abutments. While the bolt is reciprocating back and forth, after it has been unlocked and before it has been locked again, rotation is prevented by longitudinal guide surfaces 7a and 8a (Figs. 4, 5 and 6) on the receiver which engage the sides of the lugs 3 and 4. To control the locking and unlocking movement of the bolt the outer end of the right-hand lug 4 cooperates with a groove in the slide S comprising a lengthwise portion having a surface 9 and a sloping portion having surfaces 11 and 12 (Fig. 7).

When the parts are in firing position the upper surface 13 of the outer end of the bolt lug 4 underlies the slide surface 9 to prevent the bolt from rotating in a counter-clockwise direction from locked position. When the gun is fired the slide S is forced to the rear by the gas pressure in the barrel and after it is moved a limited distance the sloping part of the slide groove comes into alignment with the lug 4 permitting the bolt to rotate into unlocked position. Thus during the recoil of the bolt and slide together the lug 4 is in the upper end of the sloping portion of the slide groove. After recoil when the slide is moved forwardly by the recoil spring E, the sloping surface 11 of the slide engages the corresponding surface of the lug 4, thereby pushing the bolt toward closed position; and as the bolt approaches closed position the surface 11 cams the bolt into locked position, the slide S continuing until the lug 4 is under the surface 9.

According to the present invention the surfaces 5 and 6 of the locking lugs 3 and 4 are inclined instead of being parallel to a plane perpendicular to the axis of the bolt, and the cooperating abutments 7 and 8 of the receiver are correspondingly inclined, the inclination being such that the breech pressure tends to rotate the bolt toward unlocked position. However unlocking rotation of the bolt is prevented by the surface 9 engaging the upper surface 13 of the lug 4 until the slide S has recoiled a considerable distance, by which time the breech pressure has dropped to a value which, while safe for unlocking, is still sufficient to overcome the friction of the cartridge case in the firing chamber, the friction of the bolt on the receiver, the inertia of the bolt and the force of the recoil spring. Thus the slide S is relieved of all work in connection with unlocking and retracting the bolt, which work is very heavy in previous guns having locking surfaces which lie in planes perpendicular to the axis of the bolt and which therefore stick tightly together in response to the breech pressure. The only work left for the slide is the movement of the bolt from retracted position to forward position and the rotation of the bolt into locked position.

In addition to the aforesaid work of closing and locking the bolt the slide also performs the function of obstructing rotation of the bolt from locked position until the slide has recoiled far enough to release the lug 4 from the surface 9. With the surfaces 5—7 and 6—8 inclined enough to perform the work of unlocking and retracting the bolt the upward thrust on the surface 9 of the slide by the lug 4 is considerable. To counteract this thrust the receiver is provided with a flange 14 overlying the upper part 15 of the slide, the flange having a depending portion 16 outside the part 15 so that the slide is confined not only against upward movement but also against outward movement. The flange 14 is connected with the receiver not only by the inner portion 17 (Fig. 4) but also by a front wall 18 (Figs. 5 and 7). By providing the abutment 14 approximately over the place where the upward thrust is imparted to the slide, the thrust is counteracted more effectively and with less strain on the slide. This location for the abutment 14 is also advantageous for the reason that it is not in the way and does not interfere with the normal use of the firearm.

I claim:

1. An automatic firearm comprising a receiver, a reciprocating breech bolt having one or more locking lugs engageable in front of abutments on the receiver to transmit the breech pressure to the receiver, the bolt being rotatable to remove the lugs from their locking positions in front of the abutments, the abutting surfaces of said lugs and abutments being inclined to the direction of breech pressure so that the breech pressure tends to produce unlocking rotation of the bolt, a slide for controlling the movement of the bolt, the slide being movable in unlocking direction in response to the discharge of the firearm, and a spring for moving the slide in locking direction, the slide having an abutment surface which obstructs said unlocking rotation of the bolt until the slide has moved a predetermined distance from firing position in said unlocking direction, the slide having a cam surface for camming the locking lugs out of locking position after the slide has moved said predetermined distance from firing position, and the slide also having a cam surface for camming the locking lugs into locking position near the end of the movement of the slide in said locking direction.

2. An automatic firearm comprising a barrel, a receiver, a reciprocating breech bolt having one or more locking lugs engageable in front of abutments on the receiver to transmit the breech pressure to the receiver, the bolt being rotatable to remove the lugs from their locking positions in front of the abutments, the abutting surfaces of

said lugs and abutments being inclined to the direction of breech pressure so that the breech pressure tends to produce unlocking rotation of the bolt, a slide for controlling the movement of the bolt, means for moving the slide in unlocking direction in response to gas pressure in said barrel, and a spring for moving the slide in locking direction, the slide having an abutment surface which obstructs said unlocking rotation of the bolt until the slide has moved a predetermined distance from firing position in said unlocking direction, the slide having a cam surface for camming the locking lugs out of locking position after the slide has moved said predetermined distance from firing position, and the slide also having a cam surface for camming the locking lugs into locking position near the end of the movement of the slide in said locking direction.

3. An automatic firearm comprising a receiver, a reciprocating breech bolt having one or more locking lugs engageable in front of abutments on the receiver to transmit the breech pressure to the receiver, the bolt being rotatable to remove the lugs from their locking positions in front of the abutments, the abutting surfaces of said lugs and abutments being inclined to the direction of breech pressure so that the breech pressure tends to produce unlocking rotation of the bolt, a slide for controlling the movement of the bolt, the slide being movable in unlocking direction in response to the discharge of the firearm, and a spring for moving the slide in locking direction, the slide having an abutment surface which obstructs said unlocking rotation of the bolt until the slide has moved a predetermined distance from firing position in said unlocking direction, the slide having a cam surface for camming the locking lugs out of locking position after the slide has moved said predetermined distance from firing position, and the slide also having a cam surface for camming the locking lugs into locking position near the end of the movement of the slide in said locking direction, said receiver having an abutment on the side of the slide opposite to said surface to counteract the thrust of the bolt on the slide while the bolt is moving through said predetermined distance.

4. An automatic firearm comprising a barrel, a receiver, a reciprocating breech bolt having one or more locking lugs engageable in front of abutments on the receiver to transmit the breech pressure to the receiver, the bolt being rotatable to remove the lugs from their locking positions in front of the abutments, the abutting surfaces of said lugs and abutments being inclined to the direction of breech pressure so that the breech pressure tends to produce unlocking rotation of the bolt, a slide for controlling the movement of the bolt, means for moving the slide in unlocking direction in response to gas pressure in said barrel, and a spring for moving the slide in locking direction, the slide having an abutment surface which obstructs said unlocking rotation of the bolt until the slide has moved a predetermined distance from firing position in said unlocking direction, the slide having a cam surface for camming the locking lugs out of locking position after the slide has moved said predetermined distance from firing position, and the slide also having a cam surface for camming the locking lugs into locking position near the end of the movement of the slide in said locking direction, said receiver having an abutment on the side of the slide opposite to said surface to counteract the thrust of the bolt on the slide while the bolt is moving through said predetermined distance.

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