Lightweight Compact Rifle

Abstract: An automatic rifle of lightweight and extreme compactness is disclosed which is characterized by having no stock. The recoil is transmitted through the shooter's arm to the shoulder. The trigger and the handgrip are mounted at the muzzle end of the gun and are carried on a sleeve which surrounds the barrel. Thus, the trigger and the handgrip can be rotated, right or left, to accommodate the gun to the arms of the shooter. The front sight is also movable about the barrel to allow proper aiming when the trigger mechanism and handgrip are rotated. The reciprocatory bolt action is obtained by the use of propellant gases from a fired projectile, these gases being bled into a manifold which is connected to a dual-acting set of pistons for moving a slide member which carries the bolt action. A driving spring returns the bolt to press a new cartridge into firing position within the bore. The forward trigger is connected to the hammer and sear assembly through a pair of cables which pass about opposite sides of the cartridge magazine so as not to interfere with the automatic feeding of a live cartridge into the barrel when the bolt has moved to the rear.
LIGHTWEIGHT COMPACT RIFLE

BACKGROUND OF THE INVENTION

This invention relates to rifles and has the special application, although not limited thereto, to an aircrew survival weapon. Aircrews, when faced with the abandonment or destruction of their aircraft, often in hostile country, require for survival, a weapon which is light to carry, effective at intermediate range and is a fast repeater.

Description of the Prior Art

Rifles of the prior art, including the Browning automatic, which employ a stock and has the trigger at the rear end, while satisfactory for general use, are too heavy for grounded aircrews who may find it necessary to travel long distances on foot, perhaps through jungle and across rivers to the nearest friendly outpost. These and similar rifles also take up excessive valuable space in the helicopter or airplane in view of their extreme length, which is also a handicap to a parachutist in making a landing.

SUMMARY OF THE INVENTION

An object of the invention is to provide an improved rifle which is not only relatively light but is hard hitting and has good rifle accuracy, even at an intermediate range. Another object is to provide a rifle of the type mentioned having the minimum bulk and one which can be carried in aircraft, also in hand by aircrews for survival purposes and is easily maneuverable.

These objects are attached, in brief, by eliminating the stock of the gun and its attendant weight, and assigning the functions of the latter over to the shooter's arm. Another feature of the improved gun is in locating the handgrip and trigger assembly near the muzzle. This assembly is permitted to rotate and thus to accommodate the right or left-hand shooting by a crewman who will adapt the gun by moving the handgrip to conform to the configuration of his body. In this way, his aim becomes more accurate and the holding of the gun in the act of aiming becomes less arduous or tiring.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a longitudinal section of the improved gun with some of the parts shown in elevation for clearness. The front end or muzzle portion of the gun is broken off.

FIG. 2 depicts the plan view of that portion of the gun shown in FIG. 1.

FIG. 3 is a fragmentary showing, mostly in section, of the front end or muzzle portion of the gun. The trigger element is shown in elevation for clearness.

FIG. 4 represents an enlarged section, taken along line 4—4 in FIG. 1 while FIG. 5 illustrates a similarly enlarged section located at line 5—5 in FIG. 1.

FIG. 6 depicts a view similar to FIG. 5 but the section is taken at line 6—6 in FIG. 1 looking in the direction of the arrows.

FIG. 7 is a sectional view (enlarged) taken along line 7—7 in FIG. 3 while FIG. 8 is a sectional view taken along line 8—8 in FIG. 3 and looking in the direction of the arrows.

FIG. 9 represents an elevational view (enlarged) of a ring detail affixed to the barrel and having a lug which slidably fits in an arcuate slot in the end of the sleeve which surrounds the barrel.

Referring to FIGS. 1 and 2, reference character 1 designates, in general, the magazine and firing end of the improved rifle. The muzzle and trigger end of the gun is indicated at 2, with reference character 2 in FIG. 3. The barrel 3 is made of hardened steel, extending forward from a line indicated at 4 in FIG. 1 to the ordinary distance prescribed for combat rifles. The barrel 3 is provided with a circular bore 5 of uniform diameter throughout its length except at its inner end which receives a loaded cartridge 6 and is enlarged at 7 through several diameters to accommodate the outer shape of the cartridge.
themselves to be pressed outwardly slightly when the clip 23 is pressed between them so that the latter can be held firmly in place, and if necessary, a detent or projection (not shown) extending inwards from the thin sidesplates may be employed. Thus, the magazine is held temporarily but firmly in place.

Each side member 26 is provided with a longitudinal groove or slot 31 (FIG. 5) which slidably receives a metal plate or block 32. The bolt assembly, generally indicated at 33 (FIGS. 5 and 6), is of well-known type, having been used extensively in the U.S. Browning 30 A-1 automatic rifle. A complete description and photographs taken from the actual weapon using the bolt action described in general below are given at pages 326 and 327 of the publication entitled “Small Arms of the World—A Basic Manual of Military Small Arms” by W. H. B. Smith, published by the Military Service Publishing Company in 1943, 1945 and 1948. Consequently, only the bare details of the bolt action appear necessary. The slide member 32 has a downwardly extending rectangular portion 34 which fits snugly in a square recess provided in an elongate block 35 of about the same length as the slide plate. The block 35 has square sides and is provided with a dependent portion 36 which fits slidably within the side member 26 at the joint positions 27. Thus, the entire assembly of the slide member 32, the block member 35 and the dependent portion 35 can move along the grooves 31. The slide member 32 is provided with a longitudinally extending circular opening 37 as loosely to receive a long rod 38 (FIG. 1) which extends inwards from and is secured to the wall 18 for purposes as explained hereinafter. The block 35, at a position directly below the downward extending portion 34, is provided with a small opening 39 which extends through the block and is of a size as to receive relatively long firing pin 40 (FIG. 1) for detonating the cap of the live cartridge 6. The firing pin extends out slightly from the rear face 41 of the bolt assembly. As can be seen more clearly in FIG. 1, the slide 32 is actually of limited length and extends from about the rear face 41 of the bolt assembly to a short vertical reference line 42 (FIG. 1) so that the cross section of the parts between the limits of length as stated remains about the same as that shown in FIG. 5. From about the position of this short reference line 42 to the front face of the bolt assembly, which is indicated at 43, the cross section of the various parts take the form as shown in FIG. 6. In this figure, the side members 44 are similar in shape to those described in connection with FIG. 5 except that the thickened or upper portion of the members do not provide a groove for receiving a slide member. However, there is a downwardly extending square portion 45 which in effect constitutes a continuation of the portion 34 in FIG. 5 in that it is integrally formed thereto. But the thickness in the vertical direction as the member 34. The lower part of this member has an opening which carries a shaft 46 which is rotatable within said opening. A pair of plates 47 technically known as “locks” are affixed to the ends of the shaft so as to be able to turn within said opening. Each plate or lock is provided with a rearwardly extending finger 48 having a sloplike recess 49 directly underneath the portion of which will be explained hereinafter. The lower portion of each lock element is extended to form a lug member 50 of square configuration. The latter coincides with the position of a recess 51 formed in a sheet metal piece 52. The latter is contained at the rear end of the barrel at both sides and is secured thereto. The plate or lock at the upper left-hand corner of the recess 49 are provided with a top-mounted hook extractor 53 for catching the lip of a discharged cartridge to ejection the same.

An upwardly extending knob 54 is secured to the downwardly extending portion 45 (FIG. 6) in order to move the entire bolt assembly to the rear by the automatic cartridge feeding mechanism. The top member 50 has an obtuse angle 51 slightly extending inwards from the flat 52. This arrangement acts to press the end of the slide 32 against the barrel and cause the slide to move by a hand rearward until the slide first contacts a driving spring 55, and further movement will cause the pressure on a buffer spring 56, both of which surround the rod 37. The latter is caused to enter the opening 37 in the slide member 32 in order that the full compressed effects of the driving spring and the buffer in returning the assembly, can be asserted. The normal most rearward position of the slide and its associated parts 34, 35 is indicated in FIG. 1 by the dot-dash line 57. In addition to causing the ejection of any spent shell 6 which may have remained at the firing position, the rearward movement of the knob 54 will cause the block extension 36 to move over the position of the hammer-sear assembly as will be described hereinafter in order to cock the hammer. Since the entire bolt assembly has moved out of the way, the spring 52 can now elevate the false bottom 25 to bring a live cartridge into line with the bore of the barrel. When the knob 54 is released at its rearward position, the driving spring 55 will return the bolt assembly to its initial position and press the live cartridge into firing position within the barrel. Thus, the hammer has been cocked and ready to strike the firing pin, awaiting only the intiation movement at the rear assembly which will be described hereinafter.

However, assuming that the cartridge has been fired, the gas evolved by the explosion for propelling the bullet is employed in a unique manner automatically to move the bolt assembly to the rear and thus to cause ejection of the spent cartridge and further to cause the hammer to be cocked ready to fire a live cartridge.

There is in the oppositely disposed passageways 9’ a pair of pistons which extend from the manifold 9 to a position directly opposite the fingers 48 of the lock members. These pistons have an inclined end surface as seen in FIG. 1 which matches the inclined surface of the fingers 48. As the bullet passes over the port 10 (FIG. 4), a small amount of gas still under high pressure escapes through it and passes into the manifold 9. The column of gas strikes the gas pistons 58 and forces them to the right. As they move toward the bolt action, they strike the inclined surfaces of the finger members or portions 48, thereby rotating the lock members 47 and the shaft 46 which will cause the lug 50 to be withdrawn from the recesses 51. Further movement of the pistons 58 will cause the lock members to move to the right and to carry with it the entire bolt assembly until the latter has reached the position by the dot-dash lines 57. Thus, the spent cartridge will have been ejected and a live cartridge would have been forced upwardly in line with the bore of the gun and passed into the bore by the returning bolt assembly which has been forced to the left by the action of the driving spring 35. The bolt assembly is prevented from inadvertently being pushed to the rear on account of the locking effect obtained when the lug 50 enters the recess 51. It will be understood that the bolt assembly, and in particular, the lock member 47 cannot move to the rear until a cartridge has been in the gas has forced the pistons 58, which have caused the pistons 58 to move a distance to the rear and have rotated the lock members 47 in the clockwise direction to remove the lock 50 from the recess 51.

Trigger and Hammer-Sear Assembly

One of the features of the present invention is to locate the trigger at the muzzle or forward end of the barrel. Referring to FIGS. 3, 7 and 8, there is provided at this forward end a sleeve member 59 of substantial length and is able to turn within angular limits about the barrel. There is a narrow sleeve 60 of greater thickness than the sleeve 59 and attached to the latter, so that sleeve 60 is also able to turn through a limited angle around the barrel. The purpose of this locking effect of the two sleeves will be explained hereinafter. The front sleeve 60 serves as a sighting element, and as in the case of the rear sighting device 15 is provided with three equidistantly spaced notches which extend about the sleeve so that the shooter can line up the proper sighting notches of the front and rear devices. The outer surface of the sleeve 60 is given a slight bevel in order that the sighting notch will stand out cleat. In order to limit the angular movement of the sleeve 59, and the sighting element, there is provided a collar member 61 positioned at the right-hand end of the sleeve 59, this collar element being fixedly secured to the barrel. The collar member has a pin 62 (FIG. 8) which fits within a circular recess 63.
(FIG. 7) of the sleeve 50, the length of the recess being such as to permit the sleeve member to be rotated approximately 45° to the right and left of the vertical centerline. As shown more clearly in FIG. 8, the sleeve 59 is provided with a cutaway portion 64 in one side of the same. The front end of the sleeve 59 is not cut away and there is fitted and secured thereto a rectangularly shaped trigger guard 66. The latter has a rectangular cross section, fairly wide but relatively thin, and maintains a rigid shape. A part of the guard merges into the structure of the handgrip 67 but leaves a projecting portion 68. The other part of the trigger guard extends downwardly and is located at 69 where it joins the upper part of the guard that is secured to the sleeve. The other side of the handgrip 70 is also secured in any suitable manner to the lower part of the sleeve 59, at the rear of the cutaway portion as seen to the right of FIG. 3. Thus, the handgrip members 67 and 70 are adapted to rotate angularly about the barrel 3 when the sleeve 59 is turned. The walls 67, 70 of the handgrip are circumferentially grooved at 60 and are, in general, represent a rectangular-shaped member which is easy to grasp by the fingers. The interior of the handgrip is preferably hollow and may be used as storage space for extra live cartridges. At the top and within the handgrip, there is a rigid partition 72. This partition supports a pivot 73 on which the trigger plate 74 is swivelly mounted. The trigger plate is substantially rectangular except for a slinger which extends from one edge to another along the lower end of a projection 75 and is at the opposite corner of the projection 68. This projection together with projection 68 prevents the trigger plate from being swung too far to the left. The upper end of the trigger plate is tapered down and extends into the cutaway portion 64 (FIG. 8) of the sleeve 59 to provide a pivot 76. There is a stirrup 77 swivelly mounted on the pivot 76 and serving as a guide wire cable 78. This cable extends through an opening 71 in the sleeve (FIGS. 3 and 7) and continues on in a loosely surrounding guide tube 79 which is securely in any suitable manner to the lower part of the collar 61. It is apparent that, as the trigger plate is compressed or squeezed, it is caused to swing about the pivot 73 and this action will cause the cable 78 to move to the left. The cable 78 continues parallel to the barrel and enters one end of a metal box 80, this box being secured in any suitable manner to the underneath surface of the barrel. One end of the box extends downwardly, as indicated at 81, to form one of the walls for receiving the rectangularly shaped clip of live cartridges. Within the box, the cable 78 is secured to a stirrup of well-known type and to which metal bands are attached, the ends of the bands being caught against the underside of the box member 80 and threaded through the grooves 30 on opposite sides of the cartridge magazine holder, as seen in FIGS. 5 and 6. The metal bands, therefore, in effect go around on the inside of the magazine but are contained within the projections 29 so as not to interfere with the upward movement of the top cartridge, awaiting to be pushed into the gun bore. The guide tube 79 can be secured to the box member 80 in any suitable manner so that the guide tube is well supported at one end by the use of the collar 61 and at the other end by the box member 80 which in turn is secured to the underside of the barrel. The band strips pass through openings in the left-hand wall of the well portion 20 (FIG. 1) and are brought together to form the anchor of a pivot member 83. There is a shoe 84 of well-known type pivoted at 85 within the well portion, the shoe having two outstanding legs 86 and 87. The leg 86 is pivoted at 83 and is provided with a hooklike projection 88. The other leg 87 is also provided with a hooklike projection 89. The pivot 85 also carries a spring 90 which bears against the leg 86.

The hammer 91 has a rigidly mounted pivot 92 and a downwardly extending leg 93 which is pivoted at the left with a ledge 94 and at the right with a ledge 95. The usual spring 96 embraces the hammer element 91. There is a pin 97 having a partly flat surface positioned adjacent the leg 86 of the shoe and a partially circular back surface. This pin is adapted to rotate and to press the circular portion against the leg 86. The upper ledge 98 of the hammer projects above the top surface of the well portion so that, in the process of being driven to the rear, the bolt assembly cocks the hammer and the hammer is driven into the rear assembly where it is held by either the forward or rearward part of the rearward sear. The pin 97 will then press the leg 86 against the ledge 94 and position the hammer in the position of the trigger 74. If the trigger is held back, the hammer will engage the forward rearward sear notch or projection, and will be released and transferred to the forward projection upon release of the trigger plate. Thus, as the trigger plate 74 is squeezed, a pull on the cable 78 to the left is effected which releases the hammer 91 at the projections 88, 94 so that the spring 96 causes the hammer to move to its vertical position where it will strike the firing pin 40. This pin is moved to the left through the opening 39 and strikes the explosive cap on the live cartridge 6.

Operation of the Gun

The gun is suited to a right-hand or a left-hand shooter, and since the gun is supported on the forearm of the shooter or crowman, it is desirable that the handgrip 67, 70 be rotated to one side or the other of the centerline of the barrel carrying with it the trigger plate, also the sleeve member 59 and the sighting device 60. The amount of turn of these elements, which incidentally are limited by the use of the pin 52 and groove 63, is determined by the comfort of the shooter. It has been pointed out that each of the sighting devices 60 and 66, 68 are located so that the shooter in rotating the forward sleeve 59 together with this handle and trigger will find the proper lining up of the line of sight using the combination of any of the notches to give him accurate aim, notwithstanding the fact that the forward parts of the gun, except the barrel, have actually been turned to the proper angle.

The weapon, although providing the steadiness and accuracy of a rifle, does not have a stock. The functions of the stock are provided by the shooter's arm. The recoil, normally transmitted to the shooter's shoulder by the stock is, in this weapon, absorbed by the right hand (in case of the right-handed shooter) and transmitted through the shooter's arm to the shoulder. The barrel in action, normally supported by the stock, lies along the upper inside of the forearm, the action being held against the forearm by the thumb of the other hand which grasps and supports the forearm as it would the forestock on a conventional gun. The upper arm is used as a cheek rest in the same manner as a buttstock on a conventional weapon. Obviously, the improved weapon eliminates the bulk and weight of a rifle stock as well as providing for right- and left-hand operation with one easy adjustment in moving the handle and the trigger accessory to the right or left of the barrel. While I have shown and described the improved gun as employing ordinary sights, front and back, but modified in accordance with the direction in which the handgrip is swung to the right or left, it is apparent that telescopic sights may be used to advantage in which case the front sight assembly would be replaced by a nut, collar or retaining ring.

I claim:

1. An automatic rifle having a barrel; a bolt assembly positioned to the rear of the barrel; a cartridge magazine directly below the bolt assembly; means for moving the bolt assembly to the rear as a result of exploding a cartridge within the barrel; means within said magazine for placing a live cartridge in line with the bore of the rifle; spring means for returning the bolt assembly to its initial position whereby said cartridge is rammed into firing position within the bore; a rear-hammer assembly with the hammer thereof being cocked whenever the bolt assembly is moved to and from said rear position; a firing pin in line with the rear end of the cartridge; and means including a trigger mounted at the muzzle end of the barrel for causing the hammer to strike said firing pin whereby the cartridge is exploded and a projectile is caused to leave the barrel; said last-mentioned means including a cable connected to the trigger and being caused to divide into two parts at the position of the magazine, one of said parts extending around one side of the magazine and the other of said parts extending.
7 around the opposite side thereof, but both parts merging into a single element connecting with the sear of the sear-hammer assembly in order to cause the cocked hammer to strike the firing pin.

2. An automatic rifle according to claim 1 and in which said means for moving the bolt assembly to the rear consists of a pair of pistons positioned on opposite sides of the barrel and adapted to receive the gaseous discharge of the exploded cartridge, said piston being adapted to press against the forward end of the bolt assembly and cause the latter to compress the return spring means.