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

This invention relates to automatic firearms and especially to the breech mechanism thereof.

It is an object of this invention to provide an improved breech mechanism for automatic firearms.

It is another object of this invention to provide for automatic firearms a breech mechanism having simplicity of operation and a minimum number of operating parts.

It is a further object of this invention to provide for automatic firearms wherein the barrel is fixed to the receiver a slideable breech mechanism actuated by a recoiling cartridge case.

It is still further object of this invention to provide for automatic firearms a gas operated breech mechanism which utilizes the initial portion of the time-pressure curve, which is more uniform from round to round, for actuation.

It is the specific object of this invention to provide for automatic firearms a breech mechanism which includes a carrier and a bolt member, actuable to recoil position by a gas recoiled cartridge case and which, during recoil, locks and then unlocks the bolt and moves the same to recoil position for extraction and ejection of the spent cartridge case.

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

Fig. 1 is a longitudinal partially cross-sectional side view of the rear portion of the firearm showing the breech mechanism in battery position;

Fig. 2 is a view similar to Fig. 1 but shows the breech mechanism recoiled to locked position by the fired cartridge;

Fig. 3 is similar to the preceding views but shows the bolt carrier in position to unlock the bolt;

Fig. 4 is similar to the preceding views but shows the breech mechanism in recoiled position;

Fig. 5 is an enlarged perspective exploded view of the breech mechanism shown upside-down.

Shown in the figures is a firearm having a tubular receiver 12 with a barrel 13 fixedly mounted thereto and a magazine 9. Mounted in receiver 12 for slideable longitudinal movement between a battery and a recoil position is a breech mechanism 14 including a relatively massive cylindrical bolt carrier member 15 and a bolt 16. Two pairs of diametrically opposed holes 17 project from the circumference of carrier 15 and are slidably received in suitable longitudinal slideways in receiver 12 (not shown).

A pair of longitudinal holes 19 extend forwardly into
carrier 15 to receive the front portions of a pair of driving springs 20 arranged to bias breech mechanism 14 to battery position.

The bottom side of carrier 15 is slabbeted, as noted at 21, and extending upwardly therefrom is a longitudinal recess 22, arranged to slideably receive bolt 16 as hereinafter noted, and a rearwardly communicating channel 23 which provides clearances for the pivot swing of hammer 24 into contact with a firing pin 25 slidably mounted in such bolt. Hammer 24 is arranged to be actuated to cocked position by engagement of bolt 16 during recoil flight.

Extending through firing pin 25 is a transverse latch 26 which, as best illustrated in Patent 2,626,474 to John L. Lochhead, locks the firing pin in retracted position when bolt 16 is out of battery position, relative to carrier 15.

The battery position of bolt 16, relative to carrier 15, is established by the engagement of rearwardly facing shoulders 27 on the bolt with cooperating lugs 28 which extend from carrier 15 into recess 22.

Extending downwardly from the rear bottom portion of bolt 16 is a heel portion 29 having a rear end which is engageable with a lock abutment 30 in receiver 12 when the bolt has been recoiled a short distance from battery position. In the present embodiment the distance of 1/2inch from battery to bolt locked position has been proven satisfactory. Bolt 16 is actuated to recoil position by the rearward projection thereagainst of the cartridge case 42 of a fired cartridge 45 which had been lubricated by a suitable lubricant such as Teflon as shown at 18 to facilitate projection of the cartridge case during the explosion. The rear end of bolt 16 is held downwardly to insure engagement of heel portion 29 thereof with lock abutment 30, while carrier 15 continues in recoil flight after bolt 16 is locked, by engagement of a bottom side 31 of a transverse rib 32 in recess 22 with the top side of a stepped-down portion 33 at the rear portion of the bolt. When carrier 15 has recoiled to where stepped-down portion 33 is free of bottom side 31, forwardly and upwardly inclining shoulders 35 on each side of the bolt are arranged to engage mating ledges 36 in recess 22 whereby the rear end of bolt 16 is engaged upwardly to disengage heel 29 from locking abutment 30 and to engage carrier 15 for movement to recoil position.

The engagement of the inclining shoulders 35 with ledges 36 also support the rear portion of bolt 16 during recoil flight. Bottom side 31 is moved onto the top side of stepped-down portion 33 to move the rear end of bolt 16 downwardly to locked position in counterrecoil by means of a cam 34, which extends upwardly and forwardly from the rear end of bolt 16, engaging the front sloping side 46 of rib 32.

Provided through the forward portion of carrier 15 in longitudinal alignment with lugs 17 is a pair of diametrically opposed holes 37 each of which rotatably receives a guide 38 having an essentially rectangular tongue portion 39 which is slidably received by a longitudinally arranged slideway 40 in bolt 16. The engagement of the opposite ends of guide 38 with the inside perimeter of receiver 12 maintains a tongue portion 39 in engagement with slideway 40. An extractor 41 is provided on the forward end of bolt 16 for extracting the spent cartridge case 42 from the chamber of barrel 13 during recoil of bolt 16.

A handle 43 extends upwardly from carrier 15 through a slot 44 in receiver 12 for charging the firearm.

**Operation**

When the firearm is in battery, carrier 15 is pressed ordinarily by driving spring 20 and the lugs 28 therein transfer the forward thru through shoulders 27 to bolt 16 whereby the bolt is pressed against the base of chambered cartridge 45. The actuation of hammer 24 by the operator causes firing pin 25 to ignite such cartridge and
the resulting explosion forces cartridge case 42 rearwardly against bolt 16. Case 42 of cartridge 45 had previously been lubricated to facilitate the projection from barrel 13. Through the engagement of legs 28 and shoulder 27, the recoil imparted to bolt 16 is transmitted to carrier 15 and the two move rearwardly together until heel portion 29 of bolt engages locking abutment 30 in receiver 12. Whereupon, bolt 16 is stopped and cartridge case 42 is supported thereby in the chamber of barrel 12 during the remaining time of the explosion.

While carrier 15 continues in recoil flight from the inertia imparted thereto by the recoiled cartridge case 42, bolt 16 is maintained in locked position by the slidable engagement of bottom side 31 of rib 32 with the top side of stopped-down portion 33. By the time the projectile of cartridge 45 has left the muzzle of barrel 12 and the residual pressure in the bore of the barrel has dropped to a low value, carrier 15 has traveled to where stopped-down portion 33 is away from rib 32 and shoulders 35 in bolt 16 are engaged with ledges 36 of carrier 15 to move heel portion 29 out of engagement with lock abutment 30 and bolt 16 into engagement with carrier 15. Consequently, bolt 16 is accelerated into recoil flight by the inertia of the relatively massive carrier 15 and thereupon extracts spent cartridge case 42 and cocks hammer 24.

When breech mechanism 14 has been stopped in recoil position, the compressed driving spring 20 drives the breech mechanism forcibly again strip the leading cartridge 45 from magazine 9 and drive the cartridge into the chamber of barrel 13, stopping slightly forward of lock position as hereinafore noted.

From the foregoing, it is clearly apparent that there is here provided an improved breech mechanism which has the advantage of gas operated breech mechanisms in the retention of fixed barrel, gun construction, but which eliminates the disadvantages of gas cylinders, pistons and ports that require frequent cleaning, and which utilizes for the power stroke the initial portion of the time-pressure curve of the firearm which, round-to-round, is the most uniform.

Further, the breech mechanism of this invention is distinguished by its simplicity and ruggedness of construction and ease of manufacture.

Although a particular embodiment of the invention has been described in detail herein, it is evident that many variations may be devised within the spirit and scope thereof and the following claim is intended to include such variations.

I claim:

In a firearm having a receiver and a barrel with a chamber for a cartridge provided with a projectile and a case rearwardly projectable from the chamber when the cartridge is fired, a carrier slidably mounted in the receiver for reciprocation between a battery and a recoil position, said carrier being provided with a longitudinal recess in the underside of the front portion thereof and oppositely disposed holes extending laterally from said recess adjacent the front end thereof, a guide rotatably mounted in each one of said holes and having a tongue portion on the inner end thereof, a bolt received by said recess for longitudinal movement therein, longitudinal recessed guideways in opposite sides of said bolt and adjacent the front portion thereof for slidably receiving said tongue portions to slidably support the front end of said bolt and to mount said bolt for pivotal movement of the rear end thereof between a downward locked position and an upward unlocked position, a head portion in said bolt for rearwardly abutting the base of the case to transfer the recoil force of the case to said bolt for rearward movement thereof, means for transferring the rearward movement of said bolt simultaneously to said carrier for acceleration thereof from said battery position to said recoil position, a heel portion extending downwardly from the rear end of said bolt, a rear portion on said heel portion engageable with a lock abutment in the receiver for stopping said bolt when said bolt is in said lock position and when said carrier is energized sufficiently for movement to said recoil position, a transverse rib extending downwardly from the top side of said recess and having an underside and an upwardly and forwardly sloping surface on the front side, a cam portion extending upwardly and forwardly from said rear end of said bolt for engagement with said rib and for supporting the said portion of said bolt for engagement with said underside and said cam portion and being slidably engageable with said underside for maintaining said rear end portion in engagement with said locked abutment while said carrier continues rearwardly after said bolt is stopped, inclining shoulders disposed on opposite sides of said bolt, inclining ledges in said recess cooperable with said shoulders for pivoting said rear end of said bolt to said unlocked position when said stepped-down portion is free of said underside during recoil flight-of said carrier for engaging said bolt to said carrier for rearward movement therewith after the projectile has left the barrel and for supporting said rear end of said bolt in said unlocked position during movement of said bolt and said carrier together to said recoil position and resilient means for returning said carrier to said battery position.

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