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D. C. REILLY

2,399,253

SEAR MECHANISM

Filed May 23, 1944

Fig. 1

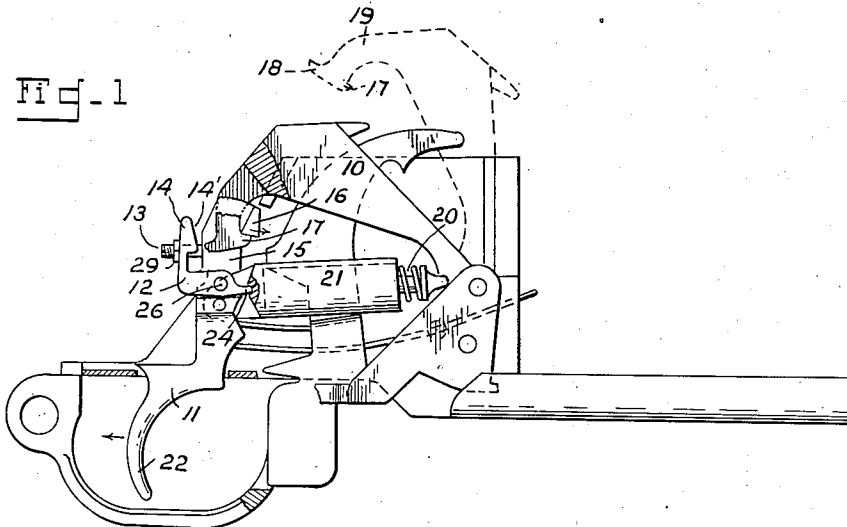


Fig. 2

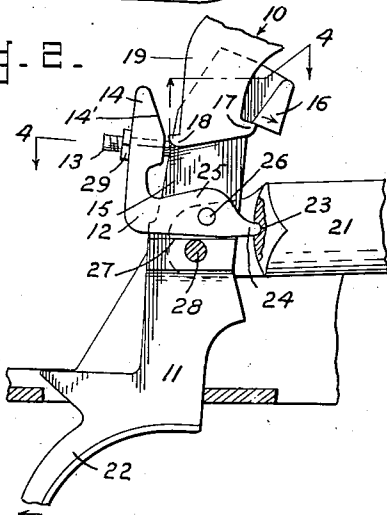


Fig. 3

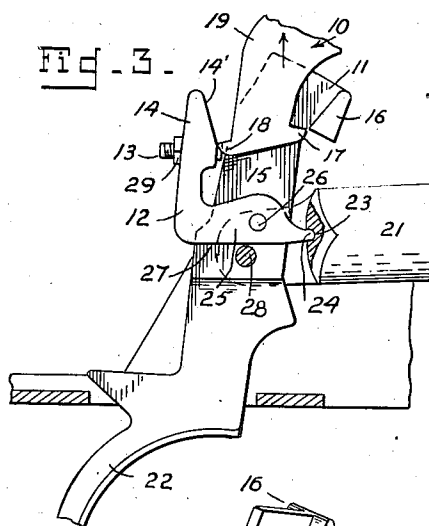


Fig. 4

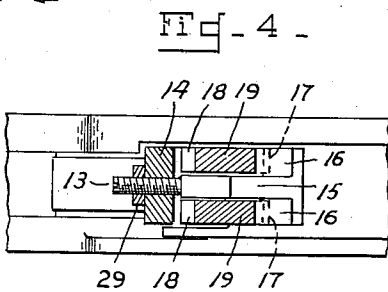
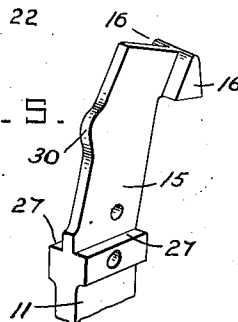


Fig. 5



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UNITED STATES PATENT OFFICE

2,399,253

SEAR MECHANISM

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Application May 23, 1944, Serial No. 536,932

4 Claims. (Cl. 42—69)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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.

The invention relates to an improved trigger, hammer and sear for firearms and particularly such as used in the U. S. rifle cal. .30 M1 sometimes known as the Garand rifle, the general firing mechanism being shown in the application of Garand, Serial No. 426,036, filed January 8, 1942, now Patent No. 2,386,205, dated Oct. 9, 1945, and developed to the design here illustrated subsequently.

It is an object of the invention to eliminate what is known as "creep" in trigger actions, which materially impairs the effectiveness of fire of arms of the general kind, even by experienced marksmen.

In some firing mechanisms the preliminary firing movement of the trigger, sometimes known as "take-up," is effected by moderate application of force, and before release of the hammer there is an increased opposition to the final movement of the trigger. This is necessary in military weapons to reduce liability of accidental operation of the trigger, but marksmen are agreed that this more resistant movement should be slight. When it extends over a range of movement of the trigger exceeding, say, .01 to .02 inch before the "let off" or release of the hammer, it becomes very noticeable to the user of the weapon and the movement up to some such desirable limit or point is called "creep." It is considered a major factor responsible for flinching, and poor shooting in general, in the cases of both untrained and experienced shooters. By adjustment of the sear in relation to the trigger to remove this "creep" action, and permit operation of the hammer or "let off" after only a few thousandths of an inch movement of the trigger under the greater opposition, it is found that effective fire of riflemen is improved from 2 per cent to 50 per cent, depending on the individual's experience and nervous condition, and other conditions attending or surrounding the firing operations.

It is therefore an aim of this invention to present a means for adjusting a weapon so that the last named manner of functioning may be attained, and—particularly as to the army rifle named—to enable this accomplishment without modifying the form or basic functions of the parts of the firing mechanism involved, as well as avoiding addition of operating parts, so that no change in present production and assembly practice is required.

A further important aim is to present a means for effecting such adjustment as indicated which will be inexpensive and may be utilized by men without expert or mechanical ability.

Additional objects, advantages, and features of invention reside in the construction, arrangement and combination of parts involved in the embodiment of the invention, as will appear from the following description and accompanying drawing, wherein:

Fig. 1 is a detail elevation of a trigger and hammer action embodying my invention;

Fig. 2 is an enlarged fragmentary view similar to Fig. 1, partly in section, after the take-up movement of the trigger has been completed;

Fig. 3 is a similar view at the moment of let-off;

Fig. 4 is a horizontal section on the line 4—4 of Fig. 2;

Fig. 5 is a perspective view of a trigger showing a modification.

Referring more particularly to the drawing, there is illustrated a familiar trigger and hammer action in cocked position, the structure, and functional relation and interaction of the operative parts being well known and understood without detailed description. The hammer 10 and trigger 11 in this device are identical in their elements, proportions and mounting with the devices as heretofore constructed, and a sear 12 is also included identical in form, size, location, and manner of mounting on the trigger, and involving a similar principle or manner of functioning between the trigger and hammer, but having incorporated therewith an adjusting screw 13, engaged from the rear through the transverse T-head 14 of the sear on an approximately horizontal line so that its forward end will impinge against the rear edge of the trigger arm 15. The trigger carries the usual lateral forwardly located let-off lugs 16 at respective sides at the upper extremity. The hammer also has the forwardly and rearwardly extended hooks 17 and 18 on the lower part of the hammer, this part of the hammer being divided so that parallel arms or claws 19 are formed at each side of the trigger, each claw with hooks 17 and 18 thereon. The mechanism includes the hammer spring 20 and its housing 21, as heretofore, and having the same functions.

The functioning of the parts only from cocked position for firing of the arm will be herein described, since the other uses and functions of the parts are well understood.

The sear head 14 functions as in the prior

mechanism, its detent arms engaging over the rear hooks 18 of the hammer arms in the initial slight return movement of the hammer from extreme cocked position while the trigger is still held depressed and before the lugs 16 return to interposed position in the path of upward movement of the hooks 17. The sear head 14 is of considerable vertical extent, so as to afford a forward cam face 14' extending the full width of the two arms 19 and hooks 18 of the hammer, its lower part being at a level with the rearwardly extended tips of the hooks 18, and sloping upward and rearwardly with a slight curve rearwardly so that slippage of the hooks thereon becomes easier as the hooks move upwardly thereon, which occurs in the present device as heretofore although limited in degree according to adjustment of the screw 13, as will be explained.

The device being cocked and to be fired, the trigger finger piece 22, formed integrally at the lower end of the trigger, is pulled rearwardly as usual. At the beginning of this movement the lugs 16 of the trigger will be over and engaged at their undersides by the forward hooks 17. The notch 23 in the rear end of the spring housing 21 is engaged by the tips 24 of the fingers 25 of the sear, these tips extending forwardly beyond the trigger arm and being located below the pivot pin 26 of the sear by which the latter is pivoted on the trigger, so that the force of the hammer spring urges the head 14 forward. As before, the sear has very slight pivotal movement on the trigger, due to shoulders 27 at each side of the trigger limiting downward and rearward movement of the sear, and because the head 14 is close to the trigger arm 15.

The housing 21 being thrust rearwardly by the hammer spring 20 against the eccentric tips 24, the sear head 14 is pressed forwardly toward the trigger arm so that the space between the head 14 and lugs 16 is less than sufficient to allow the hooks 17 and 18 to clear for upward movement. A sufficient pressure on the trigger finger piece 22 however, moves the trigger arm forward, bringing the head 14 finally against the hooks 18, causing the hooks 18 to press the sear head rearward against the force of the hammer spring as the lugs 16 slip forwardly on the front hooks 17, until clearance of the latter is effected.

Heretofore, the head 14 has rested directly against the trigger arm 15, and at initial position of the parts this head was thus held a short distance from the rear hooks 18 so that a certain slippage or take-up movement of the lugs 16 on the hooks 17 would occur before the sear was moved into pressing engagement with the extremities of the hooks 18. This "take-up" movement was somewhat more than one half the total movement required to clear the lugs 16 from the hooks 17. The total lug movement at the hook 17 is somewhat more than $\frac{3}{64}$ inch, involving about $\frac{1}{8}$ inch movement of the trigger finger piece 22 at an intermediate part.

As the surfaces of the lugs 16 are nearly tangent to an intersecting radius of the trigger pin 28, there is very slight resistance to movement of the trigger in the first or take-up part of the trigger operation (practically all due to the pressure of the hammer spring housing communicated to the trigger arm through the pivot 26 of the sear, very close to the trigger pin 28). But when movement of the trigger brings the sear against the tips of the hooks 18, further movement of the trigger requires a force several times as great. This results in a further compression

of the tissues of the finger by which the trigger is being operated, and a complete stoppage of movement of the trigger for the time being, until the rifleman increases his efforts sufficiently to continue the movement of the trigger. If this further movement continues over a few seconds (which may occur, due to the very slow movement involved when careful aim is taken), there may be a trembling of the strained muscles as well as development of other disturbing factors as heretofore noted, and others not mentioned but understood by gunnery instructors and marksmen generally.

Due to variations from standard proportions and specifications which must be allowed in the quantity production of such arms as well as other factors, a lesser proportion of "take-up" was heretofore allowed than desired, and in addition, some actions will have excess "creep" movement of extreme degree and others may have less of such excess so that there will be great uncertainty as to the performance of weapons compared to any uniform operation, all short of an ideal or desired standard; and even moderate effectiveness of a shooter may be destroyed if he has to use other than the one gun he has become accustomed to, even if of the same manufacture.

Therefore, by the use of my invention, it is possible to adjust all weapons to a high standard of function and uniformity as to take-up, sear, and let-off (by which is meant clearance of the hooks 17 from the lugs 16 in this instance).

To decrease the high pressure terminal period of operation of the trigger, the screw 13 is screwed forward toward the arm 15 of the trigger until the sear is drawn rearward such distance when the mechanism is cocked that there will be only the desired further movement of the lugs 16 necessary to clear the hooks 17 while the hooks 18 wipe against the sear head. A lock nut 29 may be employed to secure the screw 13 at adjusted positions, if desired or other means employed as found practicable.

In order to further simplify production and enable adjustment by filing, stoning, or grinding, if desired, I have shown in Fig. 5 an embodiment of the invention in which all parts are made as in prior production, except for the formation of a small integral tit, nib or nodule 30 on the back edge face of the trigger arm. In the assembly of the trigger and hammer parts which is carried out as heretofore, the nib 30 will hold the sear spaced rearward a maximum distance when the action is cocked. This distance will be an extreme, and preferred standard function or adaptation to the personal requirement of an individual is attained by filing or grinding off a portion of the apex of the nib 30. In case of wear of the let-off edges of the lug 16 and hooks 17, this may be quickly compensated for from time to time by a further reduction of the nib, which will wear less than the lugs and hooks.

In the final operation of my invention, the sear 12—14 does not actually function as a sear (although it will have previously so functioned on the tops of the hooks 18), but operates as a spring-loaded wiper while pressing on the hooks 18 of the hammer after completion of the take-up movement, and merely opposing clearance movement of the lugs 16 which actually perform the final sear function. Consequently it is not material whether the parts of the hammer engaging the sear 12 are hooks or merely broad non-projecting surfaces at the rear of the hammer.

There is a novel result in the double function relation of both sear function and subsequent cam presser action without sear function in the single pair of elements, but the invention is not limited to the use of the hooks 18.

While I have disclosed my invention in the best form known to me, it will nevertheless be understood that this is purely exemplary and other changes in construction of materials and equivalents mechanical and otherwise may be made without departure from the spirit of the invention set forth in the appended claims.

I claim:

1. A hammer and trigger assembly comprising a spring-loaded hammer movable in a fixed path and including a rearwardly extended arm having hook elements thereon extended in opposite directions laterally of the path of movement of said extension, a trigger spring-urged toward an initial position movable generally transversely of said path of the extension and having detents thereon spaced transversely of and adjacent opposite sides of said path, one of the detents being fixed on the trigger and interposed before that hook of the hammer at the side of said path in the direction of firing movement of the adjacent part of the trigger when the hammer is cocked, the other said detent being positioned and relatively movable on the trigger so as to engage the other hook of the hammer in final firing movement of the trigger and spring-urged toward the fixed detent of the trigger, and a screw engaged through the said relatively movable detent of the trigger arranged to impinge against the trigger to oppose convergent movement of this detent toward the other one beyond a limit fixed by the screw.

2. A hammer and trigger assembly comprising a spring-loaded hammer movable in a fixed path and including a rearwardly extended arm having hook elements thereon extended in opposite directions laterally of the path of movement of said extension, a trigger spring-urged toward an initial position movable generally transversely of said path of the extension and having detents thereon spaced transversely of and adjacent opposite sides of said path, one of the detents being fixed on the trigger and interposed before that hook of the hammer at the side of said path in the direction of firing movement of the adjacent part of the trigger when the hammer is cocked, the other said detent being relatively movable on the trigger and spring-urged toward the fixed detent of the trigger, and a screw engaged through the said relatively movable detent of the trigger arranged to impinge against the trigger to oppose convergent movement of this detent toward the other one beyond a limit fixed by the screw, the said relatively movable member being advanced beside said path and formed with a cam face to wipingly engage the opposed hook element of the hammer over movement of the trigger to complete let-off, and to wipe the last named hook on cocking movement of the hammer over an extent of movement of the hammer controlled by said screw.

3. In a trigger and hammer mechanism, a spring loaded hammer, a trigger having a detent thereon and mounted for detent engagement with the hammer and arranged for take-up and let-off action under moderate force, and a spring-loaded presser member on the trigger relatively movable thereon laterally of the hammer path in a direction aligned with the path of the trigger, said presser having a wiper part thereon positioned to yieldingly engage the hammer opposite the said first-named detent through movement of the presser and trigger relatively over a distance longitudinally of the trigger path, trigger carried extensible contact means being included on the presser before the wiper to wipingly engage the hammer in advance of the wiper in initial movement of the trigger constructed and adjustably extensible and retractable at will to be varied in effective length to control the extent of wiping engagement of said presser in relation to the trigger movement, said hammer having a part so positioned as to tend to engage said wiper directly at a given part of the relative movement of the trigger, whereby the let-off movement before release may be regulated.

4. A gun trigger, sear, and hammer device comprising a spring-loaded hammer pivoted for spring-urged upward and forward pivotal movement, said hammer having a rearward lower first cocked position and a normal advanced cocked position, and having an initially depending claw arm at its rear part, forwardly and rearwardly projected hooks at the extremity thereof, a spring loaded trigger pivoted below said hooks having a trigger arm extended upwardly beside said claw arm, a let-off lug at the upper end of the trigger arm positioned to engage over said forwardly projected hook at normal cocked position of the trigger and hammer and to clear the hook on full swing of the trigger, a sear pivoted on the trigger arm above the pivot of the trigger having a detent arm above its pivot movable forwardly and rearwardly and positioned to engage over the rear hook of the hammer claw at first cocked position of the hammer and full pressed position of the trigger, a spring engaged with the sear to press the sear arm toward the rear hook of the hammer claw, said sear having an upper stop part movable forwardly and back in line with the trigger arm, said sear detent arm having a face opposed to the rear hook with an extent in the direction of movement of the hook with the hammer sufficient to engage the hook slidingly when the trigger arm is at a forward position and the hook is at normal cocked position, said detent arm and let-off lug being spaced less than the extremities of the front and rear hooks and a screw engaged through the stop part of the sear in line with the trigger arm impinging against the latter and exposed rearwardly of the sear for adjustment, whereby the normal minimum clearance between the sear and let-off lug may be adjusted at will.

DEMOT C. REILLY.