Sept. 5, 1961 C. M. CHRISTIANSSON 2,998,756

RAMMING DEVICE FOR FIREARMS

Filed Dec. 11, 1958

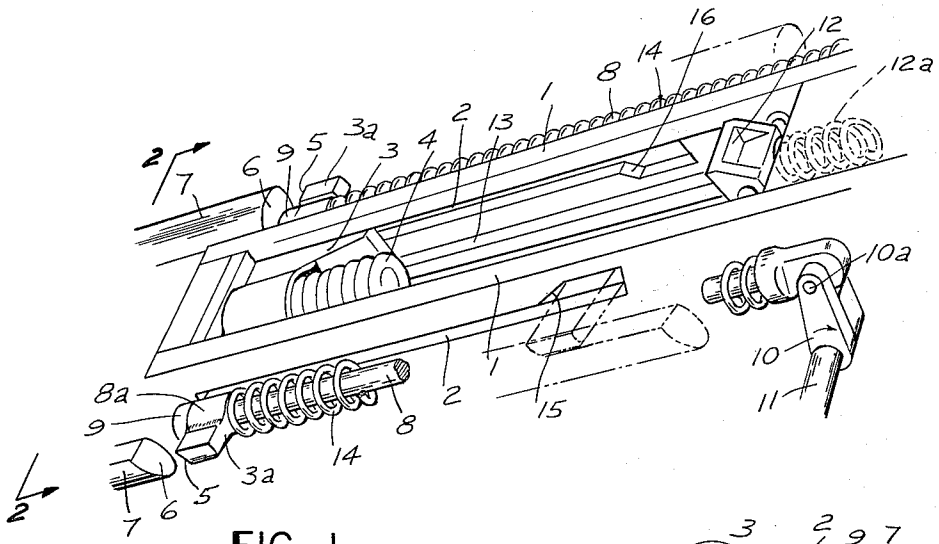

FIG. 1

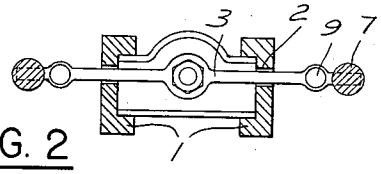

FIG. 2

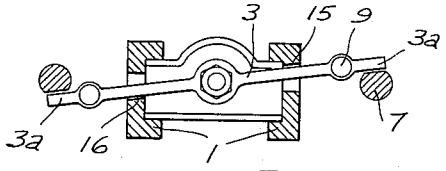

FIG. 3

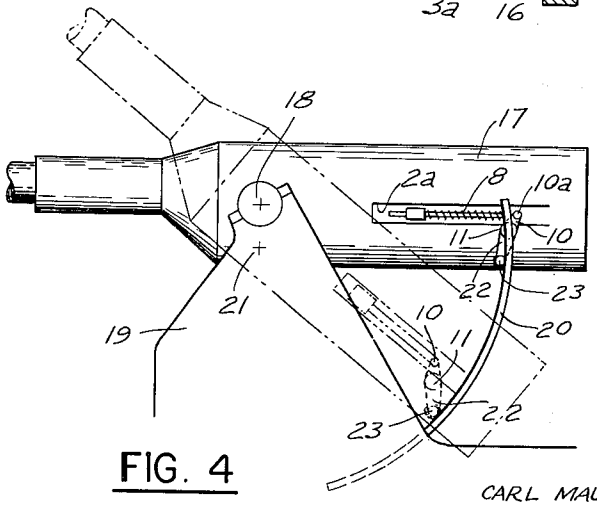

FIG. 4

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RAMMING DEVICE FOR FIREARMS

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4 Claims. (Cl. 89—47)

This invention relates to firearms and, more particularly, to a ramming device for automatic firearms.

Many types of ramming devices are provided with a ramming lug that is actuated by a spring force which executes the ramming movement of the lug and which is intended to be cocked by the recoiling parts of the firearm. Since the length of movement of the recoiling parts varies, it is necessary to design the ramming device in such a way that the cocking of the ramming lug is always completed, even at the minimum recoil length. It is also important that the recoiling parts execute their maximum movements without damaging any parts of the ramming assembly. Proper design and cooperation between associated parts are even of greater importance in automatic weapons of large calibers that are designed for a high rate of fire.

Accordingly, it is an object of the present invention to provide a ramming device in which the masses to be accelerated are as small as possible and in which impact stresses are minimized.

Another object of the present invention is to provide a ramming device for automatic firearms in which the movement of the ramming lug is cushioned in, both the ramming and cocking directions so as to impart minimum shocks to the operating parts.

An additional object of the present invention is to provide a cocking assembly for automatic firearms in which the length of travel of the ramming lug toward the ramming position is automatically adjusted in response to changes in the firing elevation of the firearm so as to provide for the additional amount of energy that is required to move a round from a ramming position to a chamber position at increased firing elevations.

Still a further object of the present invention is to provide a ramming assembly for recoiling type automatic firearms which will automatically relieve the cocking parts of the ramming lug from the continued application of force by the recoiling parts of the firearm as soon as the ramming lug has been moved into the cocked position.

All of the foregoing and still further objects and advantages of this invention will become apparent from a study of the following specification, taken in connection with the accompanying drawing, wherein:

FIGURE 1 is a fragmentary perspective view of an automatic firearm embodying a ramming device made in accordance with the present invention;

FIGURE 2 is a transverse cross-section taken along line 2—2 of FIGURE 1 showing the cross-bar forming a part of the present invention in an initial position;

FIGURE 3 is similar to FIGURE 2, showing the cross-bar in a cocking position; and

FIGURE 4 is a side view of a firearm embodying a cocking mechanism made in accordance with the present invention in several elevated positions.

Referring now more in detail to the drawing, and more particularly to FIGURES 1 to 3 thereof, a cocking mechanism made in accordance wth the present invention is shown in operative association within an automatic type firearm. This mechanism includes a frame 1 that is fixed to the elevating non-recoiling parts of the firearm, and is provided with a pair of elongated slots 2 which support a cross-bar 3 for reciprocating longitudinal movement therewithin. The center rearwardly facing portion of the cross-bar 3 has a buffer device 4 of any desired type that serves as a cushion when engaged by the ramming lug 12 which will be hereinafter more fully described.

The ends 3*a* of the cross-bar 3 extend outwardly through the slots 2 and are provided with obliquely formed bearing surfaces, 5, facing in opposite directions, that are intended to coact with mating surfaces 6 on actuated bars 7 that are fixed to recoiling parts of the elevating mass that includes the barrel and breech easing of the firearm.

A pair of rods 8, having head 9 at one end and pivotally connected to actuating levers 10 by means of pins 10*a* at the opposite end extend alongside and parallel to the frame 1. These rods are slidably received within bearing portions 8*a* at the opposite outer ends of the cross-bar 3 so that the heads 9 of the rods 8 serve as limit stops which limit the forward movement of the cross-bar 3 toward the initial position, thus further limiting the forward movement of the ramming lug 12. The ramming lug 12 is slidably supported within inwardly opening grooves 13 in the opposite sides of the main frame 1 for reciprocating longitudinal movement between an initial cocked position illustrated in FIGURE 1, and an actuated ramming position in abutment with the buffer device 4 of the cross-bar 3. In the initial position, the ramming lug 12 is releasably locked in the retracted cocked position against the action of a spring force source 12*a* by a suitable latch mechanism that may be automatically controlled by associated parts of the firearm.

As soon as the ramming lug is released, it moves forwardly under the action of the spring force source 12*a* to drive the next round into the firing chamber of the firearm, the forward ramming movement of the lug 12 being limited by the position of the buffer device 4 carried by the cross-bar 3. When the round is fired by the firearm, the recoiling bars 7 move rearwardly into driving engagement with the outer ends 3*a* of the cross-bar 3 and move the cross-bar 3 rearwardly against the action of the compression coil springs 14. Such rearward movement of the cross-bar 3 also effects rearward movement of the ramming lug 12 toward the initial position where it is retained by the aforementioned latch mechanism. As the cross-bar 3 approaches the rearmost part of its stroke, the oblique surfaces 6 of the recoiling bars 7 direct the opposite ends 3*a* of the cross-bar 3 into oppositely directed oblique terminal portions 15, 16 of the slots 2, whereby continued rearward movement of the recoiling bars 7 bypasses the ends 3*a* of the cross-bar, as shown in phantom lines in FIGURE 1, and in FIGURE 3. During the last part of the recoil movement as well as during the first part of the runout movement of the bars 7 and the rods 8, the cross-bar 3 is held in the position shown in phantom lines in FIGURE 1, the cross-bar then being pressed against the oblique terminal portions 15 and 16 under the influence of the spring force source 12*a* of the ramming lug. Also the springs 14 strive to move the cross-bar 3 towards the said oblique terminal portions 15 and 16. Due to the obliquity of these portions, the said spring forces also strive to turn the cross-bar 3 towards the bars 7. When the oblique surfaces 6 of the bars 7 pass the oblique surfaces 5 on the ends 3*a* of the cross-bar 3 during the runout movement, because of the turning of the cross-bar 3 the oblique surfaces 5 will immediately follow the oblique surfaces 6, without any impact stresses arising. During the further movement of the cross-bar 3 following the bars 7 the ramming lug 12 will be retained by its latch mechanism without any impact stresses arising. At the end of the recoiling stroke of the bars 7, and as they are withdrawn to their initial position, the compression coil springs 14 return the cross-bar 3 to the initial positon shown in FIGURE 1, where-

upon the parts are ready for the next round to be fired.

It will be noted that during both the recoil movements and the return or runout movements of the cross-bar, there will not be any impact stresses set up in the ramming device. The movement of the cross-bar **3** toward the initial position is limited by the heads or stops **9** of the rods **8** which thus also limit the ramming movement of the ramming lug **12**.

It will be recognized that different amounts of energy are required to move a round from the ramming position to the chamber position depending upon the firing elevation of the firing arm. In order to provide for the additional energy required to move the round from the ramming position to the chamber position in higher firing elevations of the firearm, and to reduce the amount of energy available for ramming the round into the chamber at lower firing elevations, cam means are provided in accordance with the present invention which serve to adjust the ramming stroke of the ramming lug **12**. As is more clearly shown in FIGURE 4 of the drawing, the levers **10** to which the rear ends of the rods **8** are pivotally connected are secured to one or more rock shafts **11** that are rotatably carried by the main frame of the firearm which may be rotatably supported by bearings upon a stationary mount **19** for movement between selected firing angles. A follower **23** eccentrically carried by each such rock shaft **11** is in sliding or rolling engagement with an arcuate cam or guide rail **20** that has a center of curvature **21** which is eccentric with the pivot axis **18** of the main frame of the firearm. Because of the difference in the positions of the pivot axis **18** and the curvature center **21** of the cam plate **20**, the follower **23** secured to the outer end of the lever **22** of each such rock shaft **11** automatically adjusts the position of the rods **8** relative to the main frame or breech casing **17** of the firearm. The movement of the rods **8** is such that as the firing angle of the firearm is increased, the stops or heads **9** are moved forwardly to increase the length of stroke of the ramming lug **12**, and as the firing angle of the firing arm is decreased, the limit stops **9** of the rods **8** are moved relatively rearwardly so as to decrease the forward ramming stroke of the ramming lug **12**.

The entire mechanism shown in FIGURE 1 is arranged within the firearm. Only the shaft **11** extends outside the breech casing, as shown in FIGURE 4, with the arms **22** and follower **23** disposed on the exterior of the casing.

While this invention has been described with particular reference to the construction shown in the drawing, it is to be understood that such is not to be construed as imparting limitations upon the invention, which is best defined by the claims appended hereto.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In a recoiling automatic firearm pivotally supported upon a mounting for adjusting firing elevation thereof, said firearm having a main frame slidably supporting a ramming lug for retractable ramming movement in one direction by a spring force source acting between said lug and said main frame, a cross-bar slidably supported for reciprocating longitudinal movement upon said frame for moving said ramming lug in an opposite direction into a cocked position, abutment means carried by said cross-bar for driven movement by recoiling parts of the firearm in said opposite direction from an initial position, guide means carried by said frame effecting partial rotation of said cross-bar out of the path of movement of the recoiling parts of the firearm upon complete retraction of said ramming lug into said cocked position, limit stops carried by said frame in the path of return movement of

said cross-bar in said one direction limiting the return movement of said cross-bar relative to said cocked position of said ramming lug, a buffer device carried by said cross-bar for impact by said ramming lug during said ramming movement in said one direction, and cam means acting between said main frame and said mounting for adjusting the position of said limit stop in response to an adjustment of the firing elevation of said firearm upon said mounting, said cam means adjusting the length of travel of said ramming lug toward said limit stops in direct proportion to changes in the firing elevation of said firearm.

2. In a recoiling automatic firearm as set forth in claim 1, wherein said limit stops comprise a pair of rods each having heads at one end adjacent to the released position of said lug, the opposite ends of said pair of rods being pivotally supported upon said frame adjacent to the cocked position of said lug, the opposite ends of said cross-bar being slidably supported upon said rods, and a compression coil spring encircling each of said rods yieldably urging said cross-bar in a direction toward said heads of said rods to return said cross-bar to said initial position.

3. In a recoiling automatic firearm as set forth in claim 2, further comprising a rock shaft pivotally supported upon said man frame, a pair of levers each secured at one end upon said rock shaft and pivotally secured at the opposite end of said opposite end of each said rod, a stationary cam carried by said main frame, and a follower eccentrically secured upon said rock shaft acting against said cam during changes in said firing elevation of said firearm.

4. In a ramming device for a recoiling automatic firearm having a main frame, a ramming lug slidably supported upon said main frame for retractable ramming movement in one direction, a spring force source acting between said ramming lug and said main frame yieldably urging said ramming lug in said one direction and yieldably resisting movement of said ramming lug in the opposite direction, a cross bar slidably supported for reciprocating longitudinal movement upon said frame in motion transmitting engagement with said ramming lug to effect movement of said ramming lug in said opposite direction into a cocked position against said spring force source, abutment means carried by said cross bar in the path of movement of recoiling parts of the firearm for driven movement of said cross bar in said opposite direction from an initial position by the recoiling movement of the recoiling parts of the firearm, guide means carried by said frame effecting partial rotation of said cross bar out of the path of movement of the recoiling parts of the firearm upon complete retraction of said ramming lug into said cocked position, said guide means including a pair of longitudinal slots in said main frame slidably receiving the opposite ends of said cross bar therethrough, each of said slots being a terminal portion adjacent to said cocked position of said ramming lug angularly related to the line of movement of said cross bar, and said terminal portions of both of said slots extending in opposite directions to accommodate limited turning movement of said cross bar out of the path of movement of said recoiling parts of the firearm.

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