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[54] **FIRING MECHANISM FOR SEMIAUTOMATIC FIREARMS**

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[58] **Field of Search**.....89/141, 145

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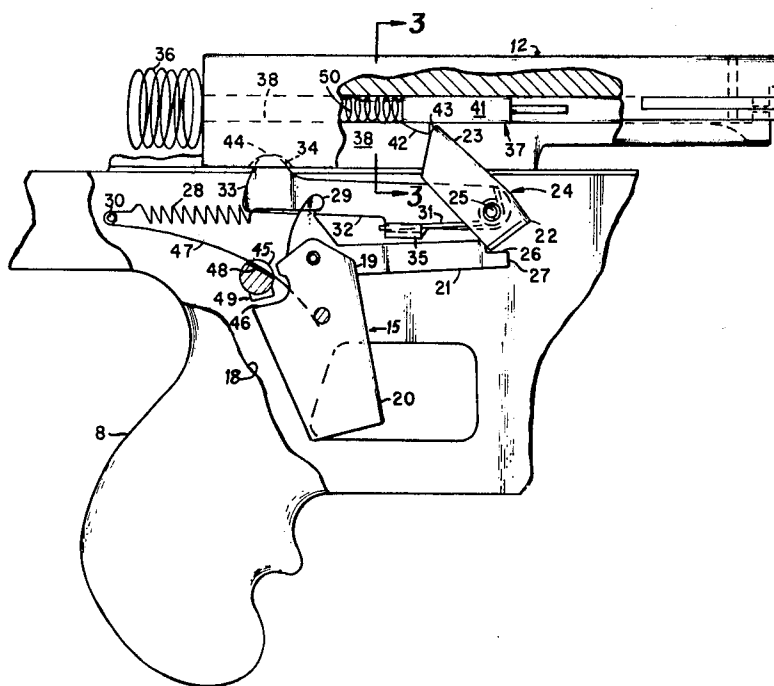
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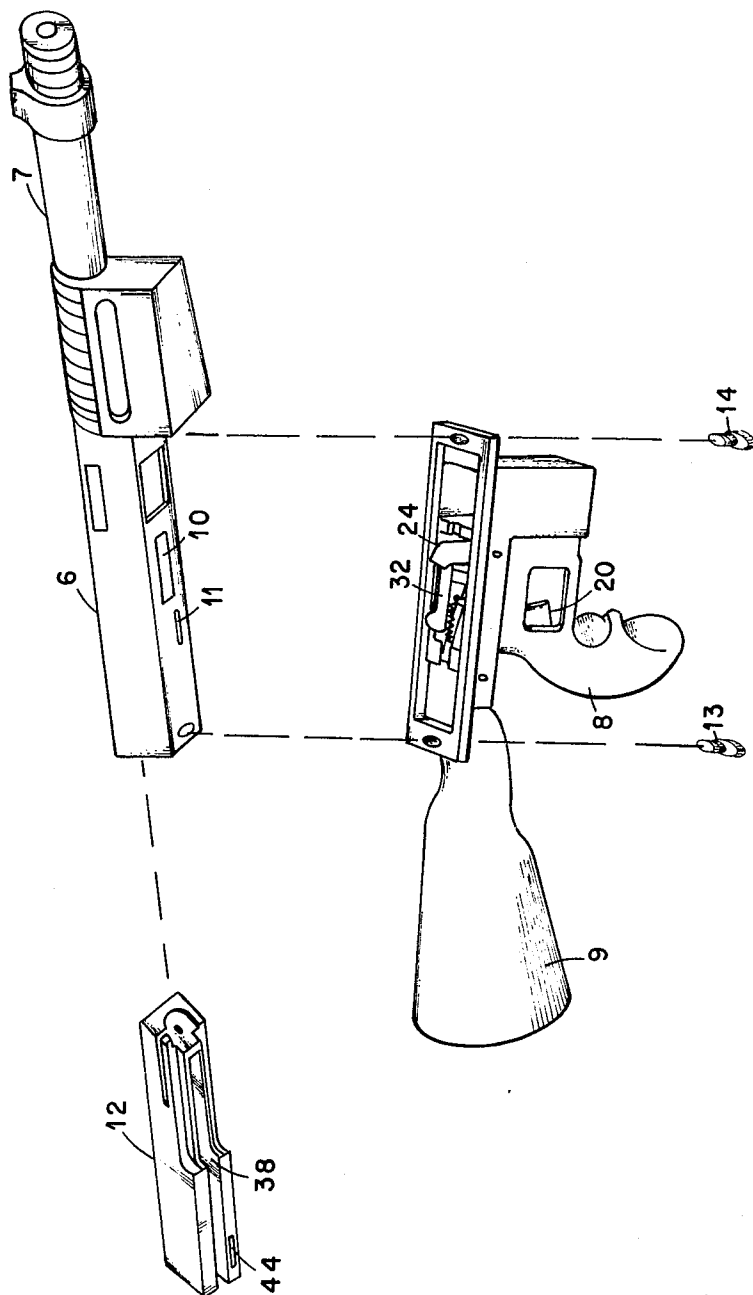
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[57] **ABSTRACT**

A firing mechanism for gas-operated semiautomatic firearms including positive disconnect means.

2 Claims, 4 Drawing Figures





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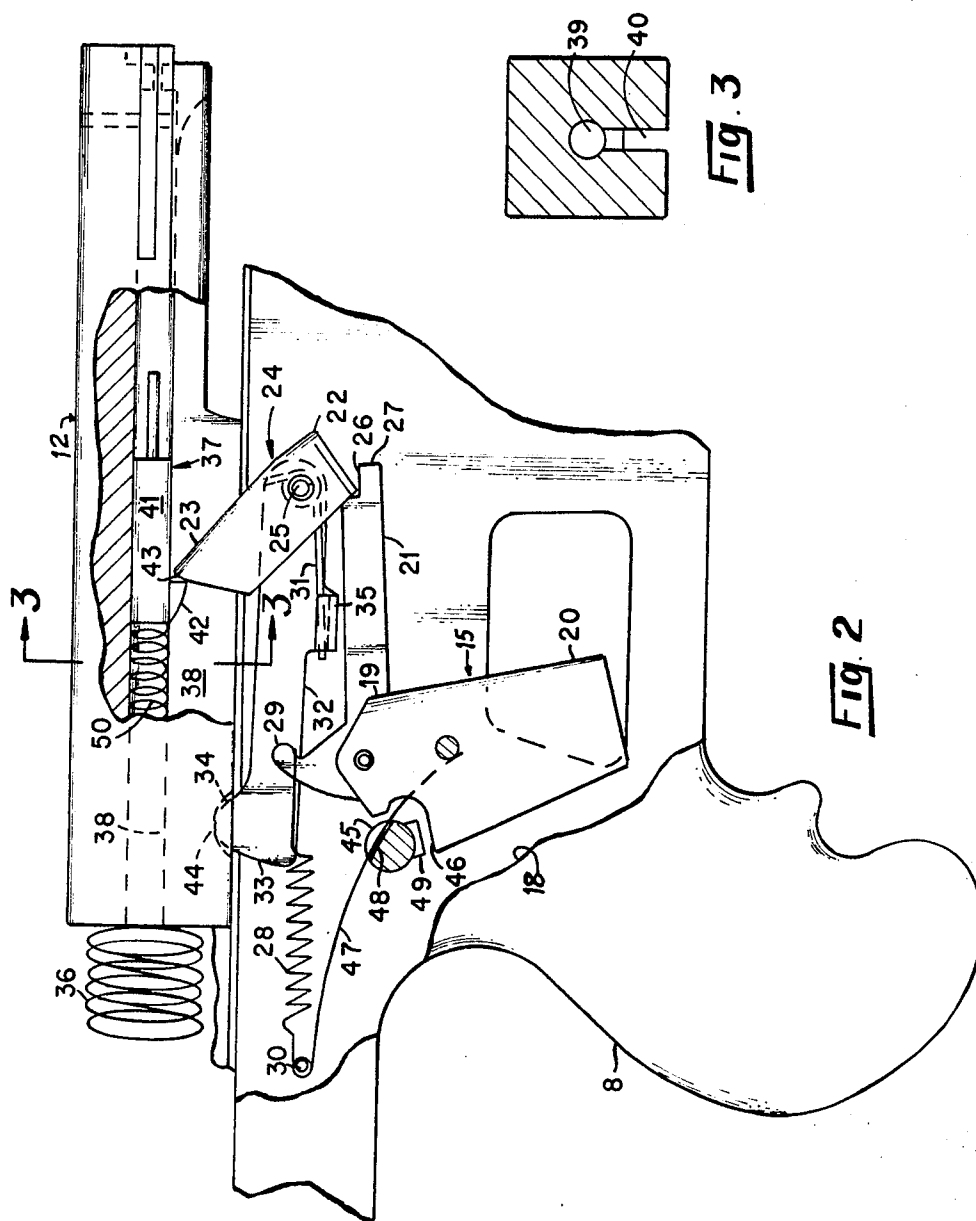


Fig. 2

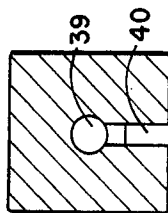


Fig. 3

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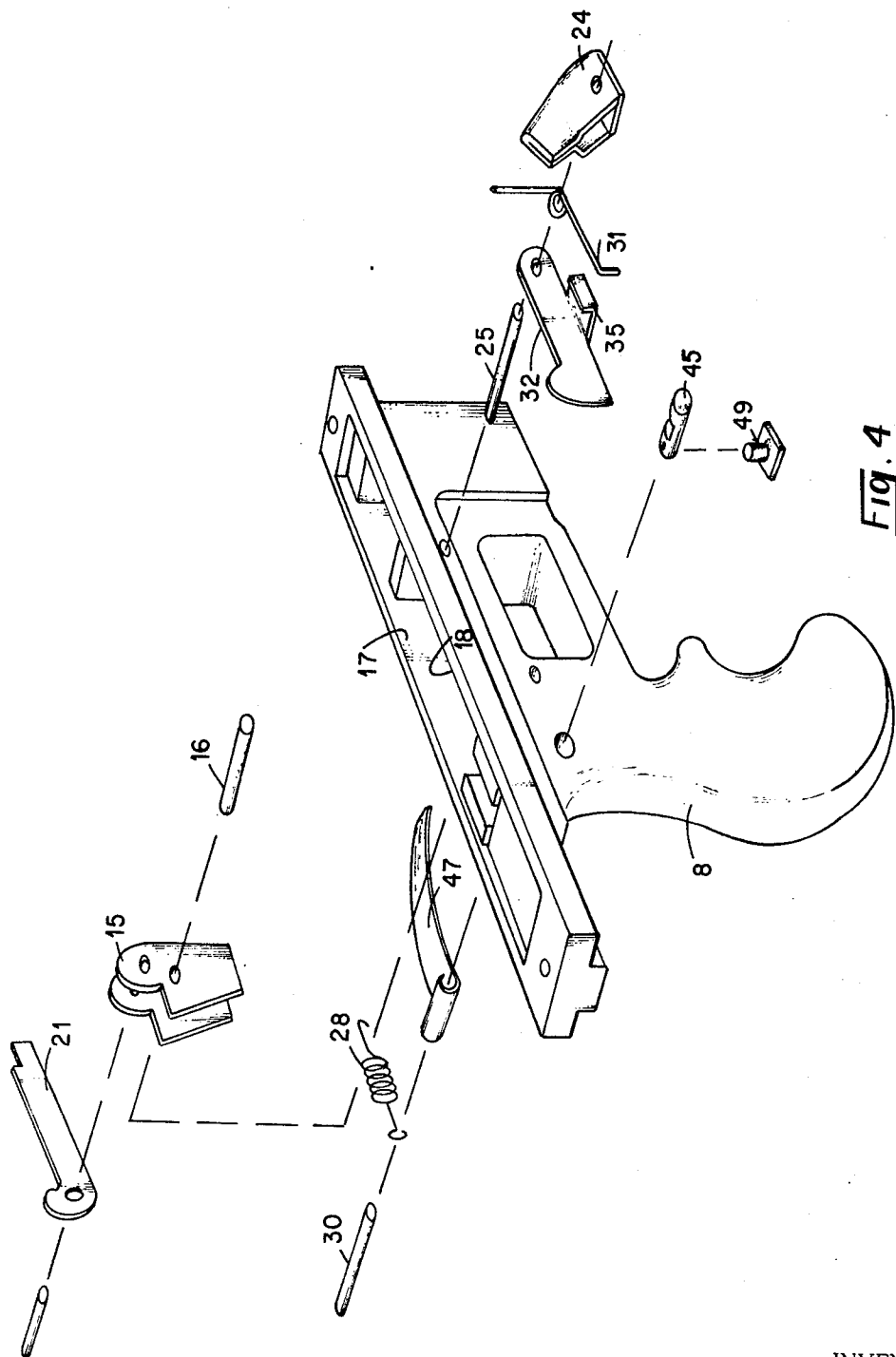


Fig. 4

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FIRING MECHANISM FOR SEMIAUTOMATIC FIREARMS

This invention relates to gas-operated semiautomatic firearms and particularly to firing mechanisms for such firearms.

Semiautomatic firearms include those firearms wherein the operating mechanism is so constructed as to preclude the completion of more than one firing cycle per each trigger-pull movement. Complicated and expensive mechanisms have been employed heretofore for achieving this purpose.

It is an object of the present invention to provide a firing mechanism for gas-operated semiautomatic firearms. It is a further object of the present invention to provide a firing mechanism for such semiautomatic firearms including a minimum of components for accomplishing the desired functioning. It is a further object to provide an inexpensive firing mechanism which provides reliable semiautomatic firing capability to a firearm. It is a further object to provide a firing mechanism for gas-operated semiautomatic firearms including positive disconnect means.

Other objects and advantages of the invention will become apparent from the detailed description taken in connection with the accompanying drawings in which:

FIG. 1 is a partly exploded schematic view of a firearm including various novel features of the present invention;

FIG. 2 is a fragmentary partly cut-away view of a firearm including various novel features of the present invention;

FIG. 3 is a sectional view of the bolt mechanism taken along line 3—3 of FIG. 2; and

FIG. 4 is an exploded schematic view of certain apparatus components of the present invention mounted within the trigger housing.

A firing cycle for purposes of this invention is deemed to be commenced upon pulling of the firearm trigger with resultant release of the firing pin to discharge the firearm. The cycle is deemed to be completed when the bolt has been forced rearwardly by the gaseous discharge emanating from the exploding cartridge and has returned to a forward fully closed position, normally with a second round of ammunition being injected into the firing chamber during the interval while the bolt is forced rearwardly. It will be understood that in a semiautomatic firearm, it is anticipated that only one round of ammunition will be discharged per each pull of the trigger.

In the usual gas-operated firearm, the firing pin is spring-biased toward contact with a chambered cartridge and held in a cocked position by a sear which is movable to release the firing pin. Such movement of the firing pin and resultant discharge of the firearm is usually initiated by a pull on the firearm trigger which is transmitted to the sear by a sear activator disposed between the trigger and sear to move the sear and release the firing pin. Deactivation of the firing mechanism not infrequently is achieved by a device termed a disconnect which is in some manner effective to block or render the firing mechanism inoperative.

The present invention comprehends a firing mechanism for a semiautomatic firearm wherein the bolt of the firearm operatively engages disconnect

means which, in turn, is disposed with respect to a sear activator of the mechanism so that depression of the disconnect in response to bolt movement holds the sear activator disengaged from a rotatable sear biased for rotation to lock the firing pin of the firearm in a cocked position. By means of this mechanism, it has been found possible to simultaneously insure that the sear is at all times biased toward a position of engagement with the firing pin to assure control over the movement of the firing pin and positive retention of the pin in its cocked position, and that the firing mechanism is maintained inoperative except when the bolt is in its firing position i.e., closed. It also has been found possible by means of the relatively uncomplicated apparatus disclosed herein to insure disengagement of the trigger of the firearm from commencement of a firing cycle by trigger pull through completion of the cycle where the bolt has returned to a fully close position, thereby precluding other than semiautomatic functioning of the firearm.

Referring specifically to FIG. 1, a hollow receiver 6 of preferably rectangular cross section having a barrel 7 secured to its forward end and a trigger housing 8 removably secured to the underside of the receiver generally comprise the contemplated firearm. In the usual firearm, the trigger housing is also secured to a stock 9. As may be seen in FIG. 1, the receiver 6 is provided with a plurality of access openings 10, 11 in the bottom thereof. As will appear more fully hereinafter, a bolt 12, also of preferably rectangular cross section, is slidably received within the hollow receiver 1.

In the depicted apparatus a trigger housing 8 serves to mount the receiver 6 and attached barrel as well as the stock 9. Screw means 13, 14 may be advantageously employed for retaining the parts in the desired assembly. The housing 8 also serves to contain several components of the firing mechanism as will appear hereinafter.

With specific reference to FIG. 2, several components of the firing mechanism are cooperatively mounted within the interior cavity of a trigger housing 8 and include a trigger 15 pivotally secured by a pin 16 extending laterally between the side walls 17, 18 of the housing 8. The pivotal point of attachment of the trigger is chosen so as to divide the trigger into top and bottom portions 19 and 20, respectively, the top portion 19 serving to pivotally receive one end of an elongated sear activator 21 which extends forwardly from the trigger 15 and terminates adjacent the lowermost portion 22 of a sear 24 rotatably mounted by pin means 25 within the trigger housing and spring-biased toward clockwise rotation by a spring 31. The sear activator 21 is provided with a notch 26 in the upper edge of its forward end 27 for engaging the lower portion 22 of the sear 24 and is spring-biased for rotation toward a position of engagement with sear 24 by means of a spring 28 leading from a lug 29 on the anchored end of the sear activator 21 rearwardly to a pin 30.

An elongated disconnect 32 is pivotally mounted at the forward end of the disconnect by pin 25 common to sear 24. The disconnect 32 preferably extends substantially horizontally rearwardly from its point of pivotal mounting to a point to the rear of trigger 15. The unattached rear end 33 of the disconnect 32 is formed with an upstanding cam lug 34 whose function will be

referred to hereinafter. As may be noted in FIG. 2, the bottom edge of the disconnect is disposed immediately above and approximately parallel with the upper edge of sear activator 21 and possesses a lug 35 extending laterally from the disconnect across the cavity of the trigger housing and in position immediately above the sear activator so that downward movement of the disconnect will cause a similar downward movement of the sear activator. Conversely, upward movement of the sear activator under the force of its biasing spring 28 urges the disconnect upward.

From the foregoing description, it will be appreciated that application of a trigger pull force to the lower portion 20 of trigger 15 moves the sear activator 21 horizontally forward and rotates the sear 24 in a counterclockwise direction. By virtue of the noncentral pivotal mounting provided for the sear 24, such counterclockwise rotation of the sear moves the upper portion 23 of the sear downwardly toward a position within the trigger housing and releases the firing pin as will be further discussed hereinafter. It will be further noted from the foregoing and FIG. 2 that depression of the disconnect 32 holds sear activator 21 down and disengaged from sear 24. The sear under these conditions, being biased toward rotation in a clockwise direction by spring 31, moves upward for purposes to appear hereinafter.

FIG. 2 also depicts a bolt mechanism 12 slidably mounted within the receiver 6 and biased toward a firing position by means of a spring 36. A firing pin 37 is disposed within a central downwardly opening channel 38 provided in bolt 12. A spring means 50 also disposed within channel 38 urges the firing pin toward a position of contact with a chambered cartridge (not shown). As may be seen in the sectional view provided in FIG. 4, this channel 38 preferably comprises a cylindrical portion 39 within which is disposed the body portion 41 of firing pin 37 and a rectangular portion 40 receiving a downwardly depending cam lug 42 on firing pin 37. The rectangular channel portion 40 also receives the upwardly extending portion 23 of sear 24 comprising a cam surface 43 for engaging the forward surface of the cam lug 42 of the firing pin. Recalling that sear 24 is spring biased for clockwise rotation, it will be realized that the sear is at all times biased toward a position of engagement with the firing pin.

From FIG. 2 it will also be seen that when the bolt 12 is in its firing position, the cam lug 35 of the disconnect 32 resides in a slot 44 of the bolt 12. This slot 44 preferably comprises a narrow dished cavity having a longitudinal dimension only slightly greater than the corresponding dimension of the cam lug 34 on the disconnect. Thus, upon movement of the bolt rearwardly following discharge of a round of ammunition, the cam lug 34 moves out of the slot 44 and the disconnect 32 is forced downwardly as the position of the slot 44 moves rearwardly as the bolt moves rearwardly. When disposed outside the slot 44, the cam lug 34 slidably contacts the flat bottom of the bolt. Movement of the cam lug out of the slot moves the disconnect to its downward position thereby carrying the lateral lug 35 of the disconnect into contact with the sear activator 21 and moving it downwardly out of engagement with sear 24. This action frees sear 24 to rotate clockwise and move into a position which will insure

engagement with the firing pin and its retention in its cocked position upon return of the bolt to its firing position.

Because the present mechanism maintains the sear activator disengaged while the bolt is out of its firing position, trigger 15 is also maintained deactivated during the interval of time between discharge of a round of ammunition and return of the bolt to its firing position. This is true even though the trigger be released or pulled during such interval, for the reason that the sear activator is maintained completely out of engagement with the sear and prevented from affecting any rotation of the sear and release of the firing pin. Accordingly, the present mechanism precludes discharge of more than one round of ammunition per each separate pull on the trigger. Upon return of the bolt to its firing position, cam lug 34 of the disconnect 32 reenters the slot 44 on the bolt 12, sear activator 21 again engages sear 24 and reactivates the trigger for commencement of a subsequent firing cycle.

The advantages of the present invention will be readily understood in connection with the following description of a full firing cycle employing the present invention. Commencing with the bolt disposed forwardly in the receiver and in its firing position, cam lug 34 of disconnect 32 resides fully within the slot 44 in the bottom of the bolt 12. When so positioned, the disconnect is in its upward position and out of contact with sear activator 21 which, as a result, pivots upwardly under the force of spring 28 and engages the bottom portion 22 of the sear 24. At the commencement of the firing cycle, the cam surface 43 of the sear 24 positively engages the forward surface of cam lug 42 on firing pin 37 thereby maintaining the firing pin in its cocked position. Discharge of the firearm is effected by exerting a rearward pull on the bottom portion of the trigger 15 thereby advancing the sear activator 21 with resultant rotation of the sear 24 and release of the firing pin 37 to move forwardly in response to force exerted by spring 50 and discharge a chambered cartridge. The expanding gases from the exploding cartridge force the bolt rearwardly in a conventional manner. Because of the very limited length dimension of the slot 44 on the bottom of the bolt, immediately upon the bolt commencing its rearward movement, the cam lug 34, hence the disconnect 32, is forced downwardly causing immediate disengagement of the sear activator from the sear, thereby freeing the sear for clockwise rotation to a position for engaging the firing pin which is carried rearwardly past the sear during rearward motion of the bolt. As the bolt returns forwardly to its firing position, the sear, which has rotated upwardly in response to its spring bias, engages the firing pin and holds it in its cock position while the bolt returns fully to its firing position.

During the interval of time when the bolt is out of its firing position, the disconnect is maintained in a downward position by virtue of its physical relationship to the bolt thereby maintaining the sear activator disengaged and deactivating the trigger during such interval. Upon return of the bolt to its firing position, the slot 44 on the bottom of the bolt returns to a position for receiving the cam lug 34 of the disconnect, permitting the disconnect to move upward and allow the sear activator, under the force of its spring, to again engage the sear and reactivate the trigger.

It will be appreciated that the up and down motion of the disconnect is of a positive nature and precludes an accidental or unintended firing of the firearm due to trigger pull movement prematurely of the bolt returning to its firing position. It further effects disengagement of the trigger at any time the bolt is opened manually so as to prevent inadvertent discharge when the bolt is open or only partly closed. This positive disengagement of the trigger during the interval of bolt movement out of its firing position also provides assurance that only one round of ammunition may be discharged per each trigger pull movement, that is, once the trigger has been pulled to discharge the firearm, no amount of trigger pull thereafter will effect further release of the firing pin until the bolt has completed a full cycle of movement and returned to its firing position and the disconnect has moved upwardly to permit reactivation of the trigger mechanism. Significantly, the positive and reliable functioning of the present firing mechanism is achieved with a minimum of apparatus thereby minimizing the manufacturing expense of the mechanism without sacrifice of safety of operation.

The present firing mechanism may advantageously be maintained inoperative during the period when the bolt is fully closed by safety means including a slide 45 laterally disposed between the side walls 17, 18 of the trigger housing at a point immediately above rearward projection 46 on the trigger 15 and movable laterally between "off" and "on" safety positions. Preferably, the slide 45 is maintained nonrotatable by means of a flat spring 47 passing from the pin 30 over a flattened surface 48 on the slide. A lug 49 provided on the bottom of the slide is positioned over the projection 46 of the trigger when the slide is moved laterally to its "on" safety position and blocks rotation of the trigger. Lateral movement of the slide to its "off" safety position moves lug 49 from blocking rotation of the trigger and firing of the firearm.

While a preferred embodiment has been shown and described, it will be understood that there is no intent to limit the disclosure, but rather, it is intended to cover all modifications and alternate constructions falling within the spirit and scope of the invention as defined in the appended claims.

What is claimed:

1. A firing mechanism for a semiautomatic firearm including a generally hollow receiver having access openings in the bottom thereof, a bolt reciprocable between firing and cocked positions slidably disposed within said receiver and having a longitudinal slideway opening toward the bottom of said bolt and accessible through one of said access openings in the bottom of said receiver, comprising in combination a firing pin spring-biased toward a firing position slidably disposed within said slideway and having a downwardly depending cam surface facing forwardly, a trigger housing disposed beneath and removably mounted to said receiver and having side and end walls defining an upwardly opening internal cavity, a sear having top and

bottom portions rotatably mounted within said trigger housing and having its top portion projecting upwardly out of said trigger housing and slidably received in the downwardly opening portion of said longitudinal slideway in said bolt, a cam surface on the uppermost end of said top portion of said sear releasably engaging the forward face of said cam surface on said firing pin to releasably retain said firing pin in its cock position, spring means biasing said sear toward rotation to a position of engagement with said firing pin, sear pin means rotatably securing said sear within said trigger housing, elongated disconnect means disposed adjacent the inner surface of one side of said trigger housing and pivoted at one end thereof by said sear pin means, a lateral lug intermediate the ends of said disconnect means and projecting substantially horizontally therefrom across the internal cavity of said trigger housing, trigger means, trigger pin means rotatably securing said trigger within said trigger housing at a point intermediate the top and bottom of said trigger means, sear activator means pivoted at one of its ends to the top of said trigger and extending forwardly within said housing and terminating adjacent the bottom portion of said sear below its pivotal mounting, notch means in the uppermost edge of the forward end of said sear activator within which said sear is engaged, whereby when said sear activator is in engagement with said sear, pivotal movement of said trigger advances said sear activator forwardly to rotate said sear to a position of disengagement with said firing pin, spring means biasing said sear activator toward a position of engagement with said sear, said sear activator being disposed immediately beneath said lateral lug of said disconnect whereby depression of said disconnect moves said lateral lug against said sear activator and forces said sear activator out of engagement with said sear thereby simultaneously releasing said sear to rotate toward a position of engagement with said firing pin and maintaining said trigger disengaged, cam lug means on the unattached end of said disconnect extending upwardly from said disconnect means through one of said access openings in said receiver and slidably engaging the bottom of said bolt whereby said disconnect is held depressed in its downward position, means defining a slot on the underside of said bolt receiving said cam lug of said disconnect and permitting upward movement of said disconnect means only when said bolt is in its firing position thereby simultaneously insuring disengagement of said trigger during the interval between each trigger pull to rotate said sear for commencing a firing cycle and completion of the firing cycle and insuring positive movement of said sear toward a position of engagement with said firing pin.

2. The firing mechanism of claim 1 wherein said disconnect comprises an elongated flat portion disposed in a plane substantially parallel to one side wall of said trigger housing and contiguous thereto, and a lateral projection intermediate the ends of said elongated portion and extending substantially horizontally therefrom across said cavity in said trigger housing.

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