Nov. 18, 1969 J. ČERMÁK ET AL 3,478,644

TRIGGER MECHANISM FOR AUTOMATIC FIREARMS FOR SELECTIVE FIRING OF A BURST OR A SINGLE SHOT

Filed April 9, 1968 2 Sheets-Sheet 1

Fig. 1

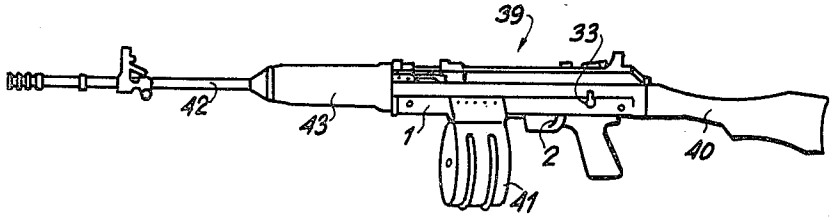


Fig. 5

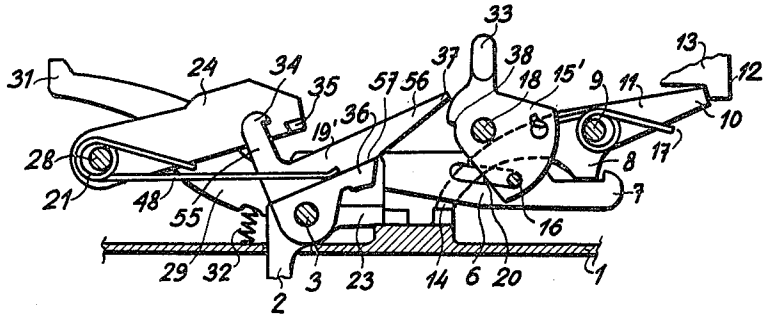
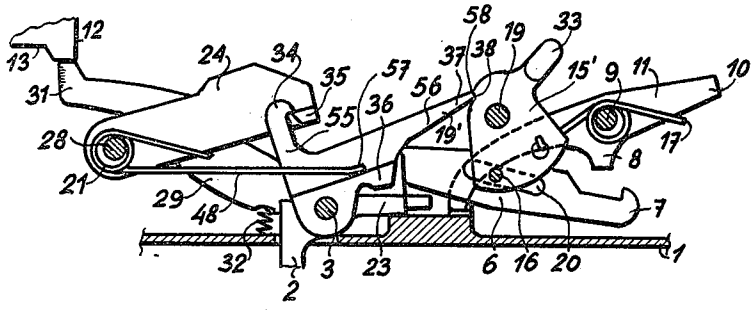


Fig. 6



INVENTORS:
Jiri ČERMÁK
Jindrich JAKUBEC
by: Arthur O. Klein, their Attorney

Nov. 18, 1969 J. ČERMÁK ET AL 3,478,644

TRIGGER MECHANISM FOR AUTOMATIC FIREARMS FOR SELECTIVE FIRING OF A BURST OR A SINGLE SHOT

Filed April 9, 1968 2 Sheets-Sheet 2

Fig.2

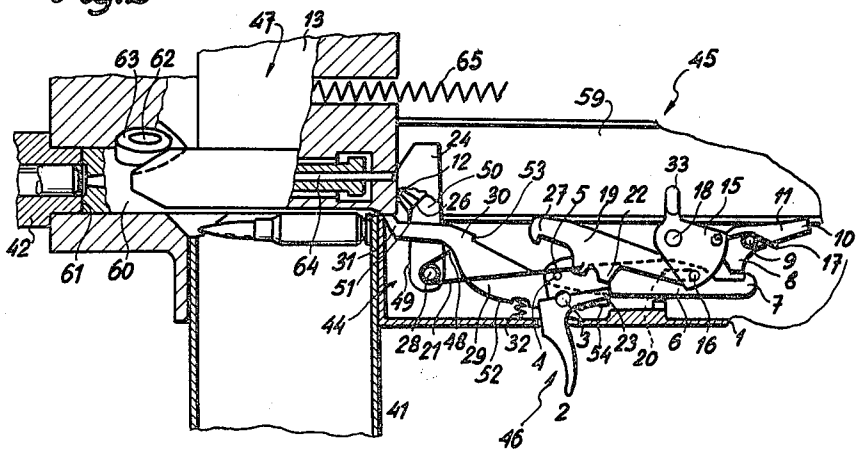


Fig.3

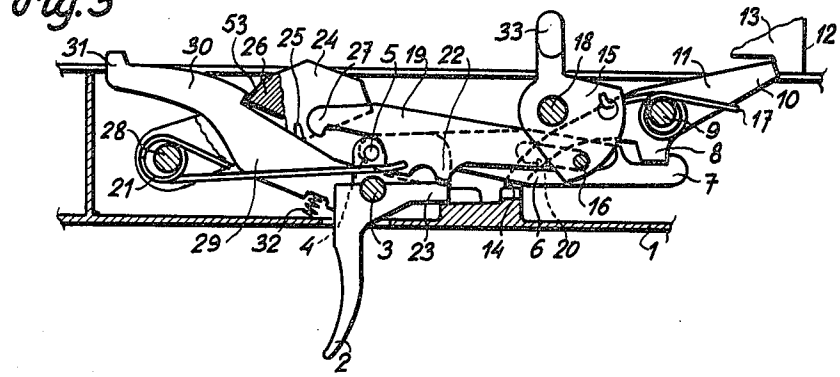
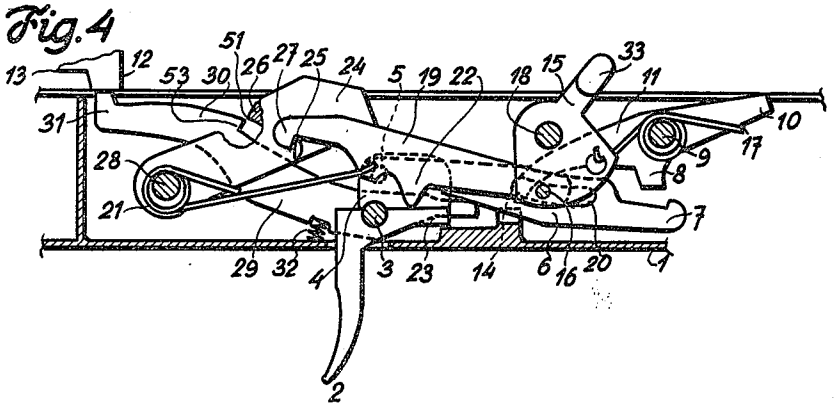


Fig.4



INVENTORS:
Jiri ČERMAK
Jindrich JAKUBEC
by: Arthur O. Klein, their Attorney

United States Patent Office 3,478,644
Patented Nov. 18, 1969

3,478,644

TRIGGER MECHANISM FOR AUTOMATIC FIREARMS FOR SELECTIVE FIRING OF A BURST OR A SINGLE SHOT

Jiří Čermák, Brno, and Jindřich Jakubec, Tišnov, Czechoslovakia, assignors to Vyzkumny a vyvojovy ustav Zavodu vseobecneho strojirenstvi, Brno, Czechoslovakia, a corporation of Czechoslovakia

Filed Apr. 9, 1968, Ser. No. 719,991
Claims priority, application Czechoslovakia, Apr. 13, 1967, 2,688/67
Int. Cl. F41c 5/02
U.S. Cl. 89—140 7 Claims

ABSTRACT OF THE DISCLOSURE

A trigger mechanism for automatic fire arms, for selective firing of a burst or a single shot which, comprises a switch which during a burst keep the tripping lever inoperative, while permitting the sear to engage a carrier catch; in its single shot position the switch deflects the tripping lever to engage the cocked hammer, while simultaneously releasing the sear from engagement with the carrier catch and the latter from engagement with the carrier. The trigger, when pulled, releases the hammer from the tripping lever, which allows the spring-loaded switch to return to its position for firing a burst.

BACKGROUND OF THE INVENTION

The present invention relates to a trigger mechanism for automatic firearms, in particular small arms.

Trigger mechanisms of automatic fire arms are usually designed so as to allow firing either in bursts or in single shots, as required. When bursts, i.e. a succession of shots, are fired, the breech block is usually released from its extreme rear position, because if prior to firing the cartridge the breech block were in its extreme forward position, there would be the risk of self-ignition of the cartridge inserted in the cartridge chamber, when after a long-lasting operation of the gun the fire is interrupted. However, with a view to the accuracy of firing, it is preferable, when firing single shots, that at the moment of pulling the trigger the breech block should be in its extreme forward position, in order to prevent the stability of the gun from being influenced by the impact of the breech block against the barrel.

Trigger mechanisms, meeting these requirements, have already been suggested, in which upon an interruption of the burst the breech block is retained in its extreme rear position, while when single shots are fired, it returns to its extreme forward position.

It is a major disadvantage of trigger mechanisms of this type, that upon a change-over to the other kind of firing, the first round of the newly selected kind of fire is fired with the breech block still in the position corresponding to the preceding kind of fire. When, for instance, the fire is interrupted after the gun has fired a burst, the breech block remains in its extreme rear position and, after the trigger mechanism has been switched over to the firing of single shots, the breech block is released from this position, which is however unfavourable with a view to the accuracy of firing. On the other hand, if after firing a single shot, the trigger mechanism is switched over to firing a burst of shots, the first cartridge is fired with the breech block in its extreme forward position, so that there is a difference between the first shot and the succeeding rounds of the burst, which fact again works out unfavourably.

SUMMARY OF THE INVENTION

The main object of the present invention is to provide a trigger mechanism in which the breech is in its extreme rear position and the trigger mechanism prepared for firing a burst of shots at any time after the fire has been interrupted, without any need for the operator to adjust the gun, even if previously a single shot had been fired, for which the operator had to adjust manually the trigger mechanism switch.

A further object of the invention is to provide a trigger mechanism, which after an adjustment of the switch enables a single shot to be fired always with the breech block in its extreme forward position, irrespective of whether the shot was preceded by a burst of fire or by a single shot.

Another object of the invention is to provide a trigger mechanism of the aforementioned type whose main parts are mounted for rotary movement so as to reduce to the minimum the risk of jamming in the moving parts as caused by impurities penetrating into the gun from the outside, which is a frequent occurrence in parts performing a sliding motion.

The present invention provides a trigger mechanism for automatic fire arms enabling their firing both in bursts and in single shots and with which the gun is always prepared for firing a burst of shots. If firing of a single shot is desired, a switch has to be actuated, which deflects a carrier catch in such a way, that the carrier moves to its extreme forward position under the action of a recoil spring. When the switch is actuated, a tripping lever secures the hammer in its cocked position until the moment when the trigger is pulled. Due to the hammer being retained by the tripping lever, the switch is at the same time secured in its turned or deflected position, and after ceasing to be secured, it returns to its initial position, in which it enables the carrier catch to retain the carrier in its rear position.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be more fully understood from the following description, when read in conjunction with the accompanying drawings, in which two embodiments of the new trigger mechanism are diagrammatically represented.

FIG. 1 is a side elevational view of the gun equipped with the trigger mechanism according to the invention;

FIG. 2 is a longitudinal section through the trigger and breech mechanism of the gun, the trigger mechanism being shown in a position when the trigger has been pulled and the cartridge just fired, the switch being set for firing a burst i.e. a succession of shots,

FIG. 3 is a fragmentary, detailed view on a larger scale showing the trigger mechanism in a section taken along the longitudinal axis of the gun, the parts being in position for firing a burst,

FIG. 4 is a similar sectional view through the trigger mechanism along the longitudinal axis of the gun, the parts being in a position for firing a single shot,

FIG. 5 is a cross-sectional view of another embodiment of the trigger mechanism, taken along the longitudinal axis of the gun, the parts of the trigger mechanism being in a position for firing a burst,

FIG. 6 is a cross-sectional view through said other embodiment of the trigger mechanism taken along the longitudinal axis of the gun, the parts being in a position for firing a single shot.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, in particular FIGS. 1 to 4, a gun marked in general with the reference numeral **39**, comprises a butt **40** fixed to a casing **1**, housing a magazine **41**. A barrel **42** is secured to the casing **1** and

is equipped with a fore end 43 for easier handling. The casing 1 forms an enclosure 44 for the trigger mechanism, as best seen from FIG. 2 and an enclosure 45 for the breech mechanism, said enclosures being adapted for receiving the trigger mechanism 46 and the breech mechanism respectively.

The casing 1 is provided with a guide 59, housing a carrier 13 with a breech block 60 adapted for sliding motion and urged in the direction towards the barrel 42 by means of a recoil spring 65. The breech block 60 carries at one end a cartridge bed 61 and two symmetrically disposed pins 62 equipped with roller 63 for positioning the breech block 60 in the casing 1. A slidably mounted striker pin 64 passes through the breech block axis and serves for firing the cartridge. A retaining claw 12, provided at the end of the carrier 13, remote from the barrel 42, serves for retaining the carrier 13 in its cocked position.

The trigger mechanism, marked in FIG. 2 in general with the reference number 46, comprises a trigger 2 rockably mounted on a trigger pin 3 secured in a trigger mechanism housing 44 provided in the receiver 1; a trigger extension 4 (see also FIGS. 3 and 4) protruding from the upper portion of the trigger 2 carries a sear pin 5, which serves as a journal for a sear 6 mounted on the pin 5 with its fore end, the rear end of the sear 6 carrying a sear tooth 7, which is adapted to engage a carrier catch 11 serving for engagement with the carrier 13. Between the sear tooth 7 and the journal of the sear 6 on the sear pin 5 a longitudinal slot 20 is provided in the sear 6, said slot 20 being adapted to receive a stud 16 of a switch 15. The trigger extension 4 has a protruding portion 23 extending substantially at right angles thereto, which in the idle or rest position of the trigger 2 bears against a wall of the receiver 1 (FIGS. 3 and 4).

A hammer 24 is journalled on a hammer pin 28 and is urged into its firing position by a torsional hammer spring 21 mounted on the hammer pin 28. An arm 49 of the hammer 24 is provided with a slot 50, a hammer catch 29 extending through said slot 50. An edge 51 of the slot 50 serves for engagement with the hammer catch 29. The hammer 24, at a point remote from the hammer pin 28, carries a hammer stud 25 (see FIGS. 3 and 4), adapted for engagement with a tripping lever 19.

The hammer catch 29 is substantially a two-armed lever journalled on the trigger pin 3. The upper surface of the longer arm 52 of the hammer catch 29 forms a shoulder 30, whose end wall 53 is adapted for engagement with said edge 51 of the slot 50 in the hammer arm 49. The fore end 31 of the hammer catch 29 can be actuated by the retaining claw 12 on the carrier 13. A hammer catch spring 32, which in the example shown in the drawing is a compression spring, bearing with one of its ends on the receiver 1 and with its other end on the longer arm 52 of the hammer catch 29, urges the latter into engagement with the retaining claw 12 of the carrier 13. The opposite shorter arm 54 of the hammer catch 29 bears on the receiver 1, if the front end 31 of the hammer catch 29 is out of engagement with the retaining claw 12 of the carrier 13 (FIG. 3).

A tripping lever 19 is mounted with one of its ends for rotation on the stud 16 of the switch 15. Under pressure of the hammer spring 21 the tripping lever 19 bears with its projection 22 on the protruding portion 23 of the trigger 2. The other end of the tripping lever 19 carries a tooth 27 adapted to engage the stud 25 of the hammer 24.

The carrier catch 11 is journalled on a pin 9 transversely mounted in the receiver 1. The upper arm 10 of the carrier catch 11 is urged into a position in which it is able to retain the carrier 13 in its rear position, while the lower arm 14 serves to restrain the rocking motion of the carrier catch 11 in counter-clockwise direction, (as can be seen from FIGS. 3 and 4), due to its engagement with the wall of the receiver 1. Said rocking motion of the carrier catch 11 is effected by a torsional spring 17 mounted on the carrier catch pin 9 and resting with one of its ends on the upper arm 10 of the carrier catch 11 and with its other end on the switch 15 so as to bias the switch in counter-clockwise direction as illustrated in FIGS. 3 and 4, i.e., the direction, in which a switch handle 33 positioned on top of the switch 15 is urged towards the gun barrel. The handle 33 extends from the receiver 1 to the outside and can be actuated by the operator's hand.

An extension 8 on the carrier catch 11 serves for engagement with the sear tooth 7.

The switch 15 is mounted for rocking movement on a pin 18 placed in the receiver 1, its stud 16, which may form an integral part of the switch, engaging the longitudinal slot 20 in the sear 6.

When the gun is to be fired, the breech mechanism 47 has to be brought into its rear position against the action of a recoil spring 65. During this movement of the breech mechanism 47 the carrier 13 turns the hammer 24 into its cocked position, in which it is retained by the slotted hammer catch 29, the end wall 53 of the shoulder 30 engaging the edge 51 of the slotted hammer 24 by the action of the spring 32 (FIG 3). Before reaching its extreme rear position, the retaining claw 12 of the carrier 13 strikes against the upper arm 10 of the carrier catch 11, rocking it against the action of the spring 17. When the claw 12 of the carrier 13 passes beyond the upper arm 10 of the carrier catch 11, the latter swings out upwards in opposite direction, under the action of the spring 17, and comes to lie against the retaining claw 12 of the carrier 13. The gun is thus prepared for firing.

When the trigger 2 is pulled, its extension 4 and the sear 6 connected therewith are moved in the direction towards the barrel 42. The sear tooth 7 which is in engagement with the extension 8 of the carrier catch 11, turns the latter in clockwise direction so that its upper arm 10 releases the retaining claw 12 of the carrier 13, which then starts to travel towards the barrel 42 under the action of the recoil spring 65. Closely before reaching its extreme forward position, the claw 12 of the carrier 13 strikes against the fore end 31 of the hammer catch 29, pressing it down against the influence of the spring 32 (see FIG. 4). The shoulder 30 of the hammer catch 29 is thus released from engagement with the edge 51 of the recessed hammer 24. Having been thus released, the hammer 24 is propelled forward by the hammer spring 21 and strikes against the firing pin 64, which fires the cartridge (see FIG. 2).

After the shot has been fired, the breech mechanism 47 is propelled, for instance by compressed powder gases, to the rear and away from the barrel 42 against the action of the recoil spring 65. During this recoil movement the carrier 13 rocks the hammer 24 into its initial or cocked position, in which it is retained by the hammer catch 29, as described above. Its recoil movement being terminated, the breech mechanism 47 returns to its fore position due to the action of the recoil spring 65. If the trigger 2 is still depressed, the carrier catch 11 remains deflected out of the path of the carrier 13, with the result that the latter is not retained in its rear position. The breech mechanism 47, therefore, advances towards the barrel 42 and the whole cycle of operation is repeated, as long as the trigger 2 remains depressed. When the trigger 2 is released, the carrier catch 11 is turned under the influence of the spring 17 into the path of the carrier 13, retaining thereby the latter in its cocked position by the engagement of its upper arm 10 with the retaining claw 12, which position is shown in FIG. 3.

If a single shot is to be fired, the switch 15 must be turned by means of the handle 33 in the direction away from the barrel 42 (as shown in FIG. 4), towards the

cocked breech mechanism. During this movement of the switch 15 the stud 16 deflects the sear 6 so as to disengage its tooth 7 from the extension 8 of the carrier catch 11, raising at the same time the lower arm 14 of the carrier catch 11, so as to release the upper arm 10 of the carrier catch 11 from engagement with the retaining claw 12 on the carrier 13, which under the action of the recoil spring 65, begins to move into its extreme fore position. During said turning movement of the switch 15 the tooth 27 of the tripping lever 19 engages the stud 25 of the hammer 24. Closely before the carrier 13 terminates its advance towards the barrel 42, the retaining claw 12 of the carrier 13 depresses the fore end 31 of the hammer catch 29, with the result that the hammer 24 is released from the shoulder 30, but is retained in its cocked position by the tooth 27 of the tripping lever 19, as shown in FIG. 4.

When the trigger 2 is pulled, its protruding portion 23 strikes against the projection 22 of the tripping lever 19, lifting the latter and disengaging thereby the tooth 27 from the stud 25 of the hammer 24. When the tooth 27 of the tripping lever 19 has been brought out of engagement with the hammer stud 25, the switch 15 returns to its original position under the action of the spring 17, so that the sear 6 and the carrier catch 11, too, assume their initial position in which the tooth 7 of the sear 6 engages the extension 8 of the carrier catch 11. The released hammer 24 strikes, under the action of its spring 21, against the firing pin 64, which fires the cartridge. The carrier 13 recoils, propelled by powder gases, to its rear position, where it is retained by the upper arm 10 of the carrier catch 11, which bears on the retaining claw 12 of carrier 13. If a further single shot is to be fired, the switch 15 must be turned in the aforementioned manner. If the switch 15 is not turned, the gun is prepared for firing a burst of shots.

A modified embodiment of the trigger mechanism according to the present invention is shown in FIGS. 5 and 6. This embodiment, in its main parts, is identical with the aforedescribed embodiment, with the exception of the switch 15′ and the tripping lever 19′.

The tripping lever 19′, journalled on the trigger pin 3, is equipped with an arm 55 carrying a tripping claw 34 for optional engagement with a hammer stud 35 and with an extended arm 37 adapted for engagement with the switch 15′. The hammer spring 21 presses the tripping lever 19′ into engagement with the hammer stud 35 and with the switch 15′, one end 48 of said spring 21 bearing on a flat surface 57 arranged in the upper part of the tripping lever 19′. A projection 36 is provided on the tripping lever 19′ below said flat surface 57, the protruding portion 23 of the trigger 2 abutting against said projection 36, when the trigger is pulled.

The switch 15′ is provided with a cam surface 38 in its part facing the barrel 42, said arm 37 of the tripping lever 19′ bearing against it. The cam surface 38 is interrupted by a recess having an end wall 58, the arm 37 of the tripping lever 19′ bearing against said end wall 58, when the switch 15′ is turned in clockwise direction, i.e. with its handle 33 away from the barrel, as shown in FIG. 6.

If a burst of shots has to be fired, the tripping lever 19′ is inoperative and assumes a position shown in FIG. 5 of the drawings. When the switch 15′ is set for firing a single shot, as shown in FIG. 6 (and described in detail in connection with the first embodiment), the cam surface 38 enables a slight rocking motion of the tripping lever 19′, whose tripping claw 34 engages the stud 35 on the hammer 24, while the arm 37 of the tripping lever 19′ comes to bear against the end wall 58 of the cam surface 38, securing thereby the switch 15 in its turned position.

The carrier 13, when terminating its forward movement, depresses with its retaining claw 12 the fore end 31 of the hammer catch 29, with the result that the hammer 24 is now retained in its cocked position by the tripping claw 34 of the tripping lever 19′, engaging the hammer stud 35.

If the trigger 2 is pulled, its horizontal protruding portion 23 lifts the projection 36 of the tripping lever 19′, which causes the tripping claw 34 to release the hammer stud 35. The hammer 24 is thus propelled under the action of its spring 21 against the firing pin 64, which fires the cartridge. The switch 15′ returns to its original position by the action of the spring 17, thereby enabling the carrier catch 11 to be turned to a position, in which its upper arm 10 comes to lie in the path of the carrier 13 and the sear tooth 7 to engage the extension 8 provided on the carrier catch 11. The shot having been fired, the carrier 13 recoils to its rear position cocking thereby the hammer 24. In its rear position the carrier 13 is retained by the catch 11. If it is desired to fire a further single shot, the switch 15′ has again to be turned in the above described manner, as otherwise the gun is ready for firing a burst of shots.

We claim:

1. A trigger mechanism for a fire arm capable of selectively firing a single shot and a burst of shots and having a barrel, a receiver and a breech mechanism mounted in the receiver for reciprocal movement between its extreme forward and cocked positions and for feeding cartridges to the barrel and comprising in combination:

(a) a trigger,

(b) a sear journalled on said trigger,

(c) a carrier catch adapted to retain the breech mechanism in its cocked position and to be actuated by the sear to release the breech mechanism for forward movement,

(d) hammer means adapted to be cocked by the recoiling breech mechanism and to fire the cartridge,

(e) a hammer catch adapted to retain the hammer in its cocked position and to be actuated by the breech mechanism to release the hammer for firing the cartridge,

(f) a tripping lever adapted for selective engagement with the hammer means to retain them in their cocked position,

(g) a switch adapted for cooperation with the tripping lever to bring the latter selectively into engagement with said hammer means, and

(h) releasing means on said switch for simultaneous release of the sear out of engagement with the carrier catch and of the carrier catch with the breech mechanism.

2. A trigger mechanism for an automatic fire arm having a receiver and a breech mechanism mounted for longitudinal reciprocal movement in said receiver between its extreme forward and cocked positions, comprising in combination:

(a) a trigger journalled in the receiver and having a protruding portion adapted to bear on said receiver and a trigger extension,

(b) a hammer mounted for rotation in the receiver and adapted to be brought into cocked position by the breech mechanism during its movement between its extreme forward and cocked positions,

(c) a tripping lever adapted for selective engagement with the hammer in its cocked position,

(d) spring means for actuating said hammer and tripping lever,

(e) a carrier catch tiltably mounted in the receiver for selectively retaining the breech mechanism in its cocked position,

(f) a sear rotatably connected to said trigger extension for selectively engaging said carrier catch to release the cocked breech mechanism for forward movement,

(g) a switch rockably mounted in the receiver and comprising means for a temporary change of position of said carrier catch, sear and tripping lever,

(h) a spring for urging the carrier catch into the path

of the breech mechanism upon its movement into its extreme forward position, and

(i) a hammer catch adapted for retaining the hammer in its cocked position upon movement of the breech mechanism into its rear position.

3. A trigger mechanism as in claim 1 wherein the switch is provided with spring means for returning the switch from the position for firing a single shot into its position for firing a burst of shots.

4. A trigger mechanism as in claim 2, whehrein said hammer comprises two claws, one for selectively retaining the hammer in its cocked position by means of the tripping lever and the other for retaining the hammer in its cocked position by means of the hammer catch upon movement of the breech mechanism to its rear position.

5. A trigger mechanism as in claim 1, wherein the tripping lever consists of a spring-loaded longitudinal member, journalled with one end on the switch and provided with a hammer engaging tooth at its other end and with a trigger engaging projection between its ends.

6. A trigger mechanism as in claim 1 wherein the tripping lever comprises an arm provided with a tripping claw for slectively retaining said hammer, a lever arm

adapted for cooperation with said switch and a flat surface against which one end of the hammer actuating spring is bearing.

7. A trigger mechanism as in claim 1, wherein the switch comprises a cam surface serving to bring the tripping lever into engagement with the hammer upon a deflection of the switch in the direction towards the cocked breech mechanism and further a switch stud engaging the sear and the carrier catch for disengaging the sear from the carrier catch and simultaneously disengaging the carrier catch from the breech mechanism upon deflection of the switch in the direction towards the cocked breech mechanism.

References Cited

UNITED STATES PATENTS

2,858,741 11/1958 Simpson ---------- 89—140

BENJAMIN A. BORCHELT, Primary Examiner

STEPHEN C. BENTLEY, Assistant Examiner

U.S. Cl. X.R.

89—143