Nov. 27, 1945. J. DOBŘEMYSL 2,389,960

AUTOMATIC GUN

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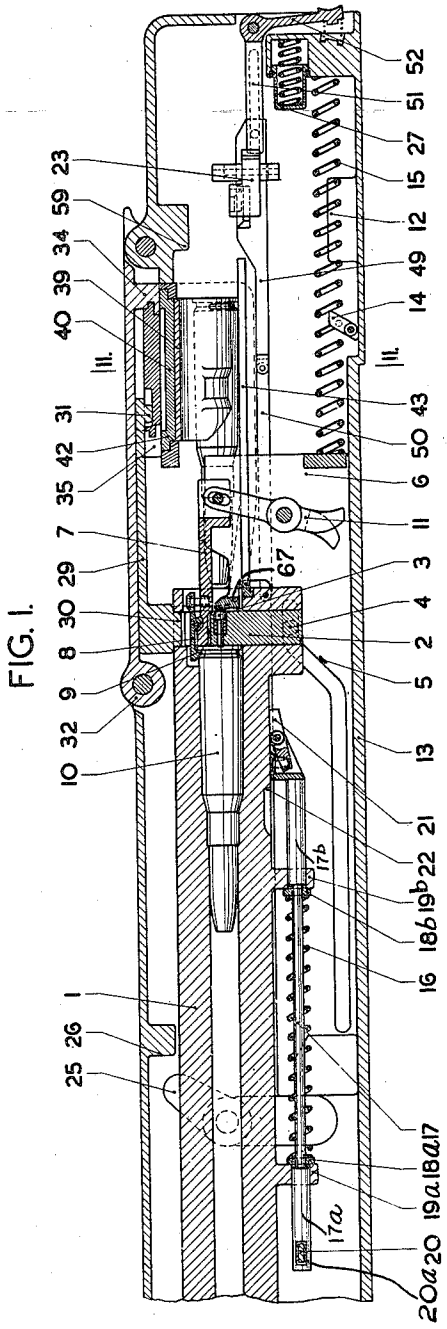


FIG. 1.

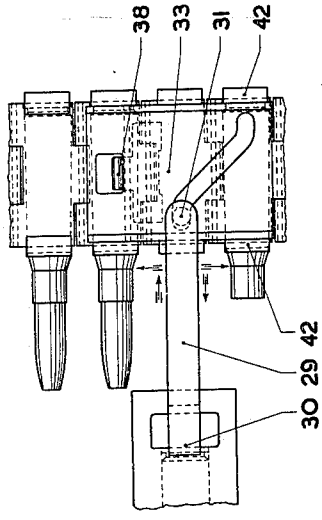


FIG. 3.

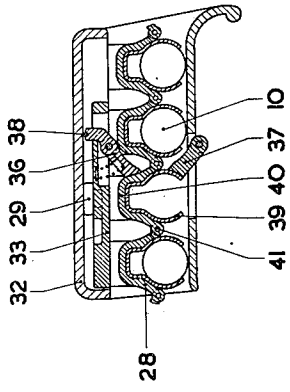


FIG. 2.

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FIG. 4.

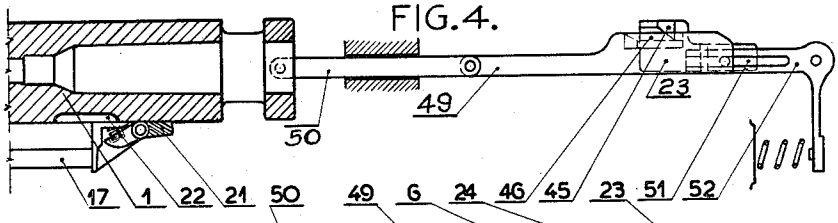


FIG. 5.

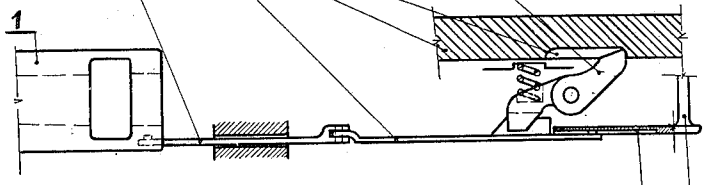


FIG. 6.

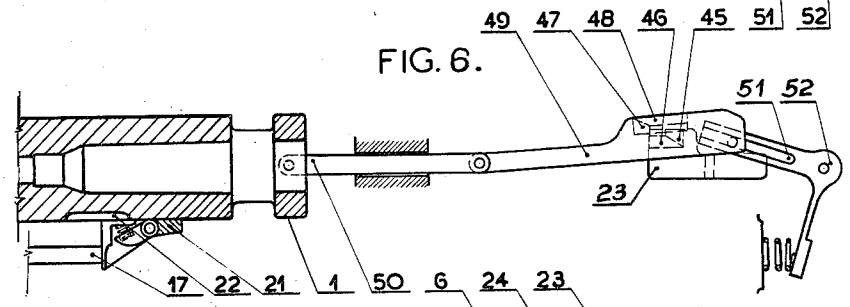


FIG. 7.

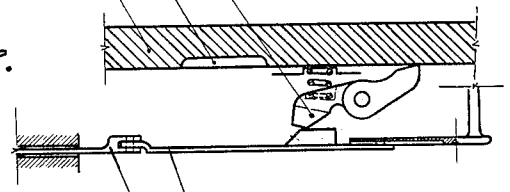
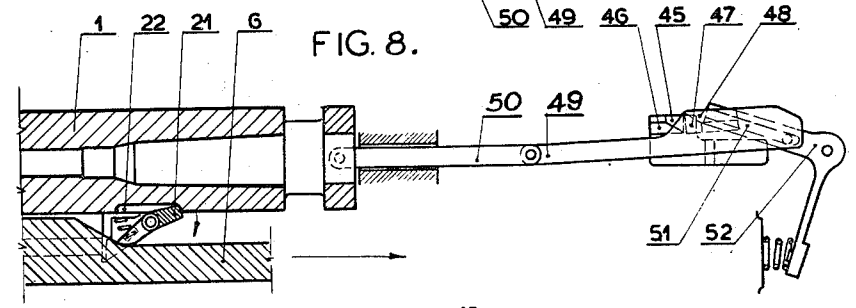


FIG. 8.



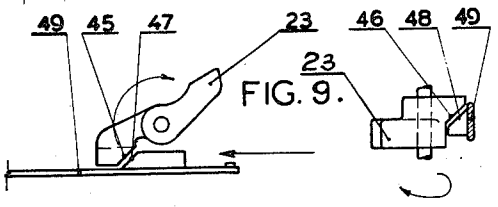


FIG. 9.

FIG. 10.

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UNITED STATES PATENT OFFICE

2,389,960

AUTOMATIC GUN

Josef Dobřemysl, London S. W. 15, England

Application January 21, 1941, Serial No. 375,166
In Great Britain January 25, 1940

6 Claims. (Cl. 89—3)

The present invention relates to automatic guns of the short recoil, belt fed type having a recoiling breech block action slide for actuating a transversely sliding breech block, and means for returning the empty cartridge cases to the belt.

The principal object of this invention is to provide an improved mechanism having certain advantages particularly when applied to guns of large calibre such as are used in anti-tank or anti-aircraft defense, as well as for aircraft, tanks or other purposes where a highly efficient gun is needed.

According to the invention, automatic guns of the type herein referred to are characterized by a combination of means retaining the barrel in its recoil position until the action slide has reached its rearmost position in which it is retained by a sear mechanism, and means on the trigger mechanism controlled by the barrel and rendering the sear mechanism inoperative against releasing the carrier until the barrel returns to its fore position.

The accompanying drawings represent, by way of example, a gun according to the invention.

Figure 1 is a longitudinal section of the relevant part of the gun.

Figure 2 is a cross-section along the line 11—11 of Figure 1 through the feeding mechanism.

Figure 3 is a plan view of the feeding device.

Figure 4 represents diagrammatically the trigger mechanism in a side view.

Figure 5 is the respective plan view of the trigger mechanim in its normal position.

Figure 6 shows the trigger mechanism in its operative position.

Figure 7 is the corresponding plan view.

Figure 8 represents the position of the trigger mechanism during the recoil of the barrel.

Figure 9 includes an explanatory plan view of the trigger pawl, and

Figure 10 is a corresponding front view, partly in section.

The barrel 1 has in its rear part a suitable slot for the transversely sliding breech block 2. The breech block may preferably travel on a path slightly inclined to a plane perpendicular to the axis of the gun, in order to allow an easy opening of the breech block. In this case it is provided with a perpendicular surface abutting the bottom of the cartridge.

The firing pin 3 is housed in the breech block 2. The latter is provided with studs or projections 4 engaging and cooperating with guiding grooves 5 arranged in the breech block action slide 6 and serving to impart vertical opening or closing movement to the breech block 2 upon recoil or return movement of the action slide 6 respectively. A cartridge transporting device consisting of a carriage 7 carrying a cartridge extractor 8 (see Fig. 1) is mounted for sliding movement on the upper part of the action slide 6. The extractor is provided with a hook 9 for engaging the cartridges 10 at their rim or bottom portion. An actuating lever 11 for the carriage 7 is journalled in the action slide 6. The lower part of the lever 11 is shaped as a fork, the one arm of which engages a fixed abutment or surface 12 on the bottom of the casing 13 of the gun and the other a tiltable or shiftable abutment 14. This arrangement is more particularly described in the specification of my divisional patent United States Patent 2,365,459 filed March 31, 1942. A recoil spring 15 for the action slide 6 is mounted in the rear part of the gun. The recoil and braking spring 16 for the barrel 1 is arranged so as to allow a yielding mounting of the barrel 1 both in forward and backward directions. For this purpose a rod 17 is firmly anchored in the casing of the gun by means of a wedge or the like member 20, passing through suitable apertures in the side walls of the casing and through an aperture 20a in the fore end of the rod 17. The fore part 17a of the rod 17 has a greater diameter than the central part of the latter and similarly a part 17b of greater diameter is provided at the rear end of the rod 17. The parts 17a and 17b of the rod 17 pass through suitable apertures in projections 19a and 19b of the barrel 1 respectively, the latter being adapted for sliding movement along the parts 17a, 17b.

A ring 18a is mounted at the front end of the central part of the rod 17 and a similar ring 18b is arranged at the rear end. The fore ring 18a rests with its fore surface partly against the projection 19a of the barrel and partly against the thicker part 17a of the rod 17. The rear ring 18b is arranged in a similar manner but symmetrically to the fore ring 18a. A recoil spring 16 is interposed between the two rings 18a and 18b.

In normal position, as shown in Fig. 1, the rings 18a and 18b are pressed apart by the recoil spring 16 and abut the projections 19a and 19b of the barrel 1 and the thicker parts 17a and 17b of the rod 17 respectively.

If upon recoil the barrel moves backwards, its projection 19a carries in rearward direction the ring 18a, which is free to slide along the central part of the rod 17. The rear ring 18b is, however, prevented from moving to the rear by the

thick part 17b of the rod 17, firmly anchored in the gun casing. As a result the spring 16 is tensioned and after absorbing the surplus of recoil energy, expands again, moving the fore ring 18a and by its intermediary the barrel 1 forward, until the ring 18a abuts the thicker part 17a of the rod 17.

If by any reason the barrel continues its forward movement over its normal position, the projection 19b carries the ring 18b forward and presses the spring 16, because the ring 18a is held in position by the part 17a of the rod 17. The surplus of energy absorbed, the spring returns the barrel 1 into its rear position by pressing the ring 18b rearward, and this cycle of operations is repeated until the equilibrium is restored.

The rear end of the rod 17 is firmly connected with a bearing for a catch 21, which may cooperate with a recess 22 in the barrel, as will be more fully described later.

A pawl 23 (see Fig. 1 and Figs. 4–10) is mounted in the casing of the gun and adapted to engage a corresponding recess 24 in the action slide 6 (see Figs. 5 and 7) and to retain the action slide 6 in its rear position.

An accelerating lever 25 (see Fig. 1) for the action slide 6 is journaled on the barrel 1, one arm of the lever 25 being arranged for cooperation with a shoulder 26 of the casing and the other arm with the action slide 6. Upon recoil of the barrel 1 the upper arm of the lever 25 engages the shoulder 26 and the lower end of the lever imparts an accelerated movement to the carrier. A buffer 27 for the action slide may be arranged in the rear part of the arm.

The feeding movement of the cartridge belt 28 (see Fig. 2) is derived from the barrel 1. A feeding rod 29 (see Fig. 3) formed with projections or the like 30 and 31 on its ends is mounted for sliding movement in the cover 32 of the gun. The fore projection 30 of the rod 29 is anchored in the barrel 1, preferably in the slot for the breech block and the rear projection 31 engages a curved or cam groove in the feeding carriage or slide 33. The feeding carriage is mounted for sliding movement in guides 34, 35 in the cover 32, and carries a feeding pawl 36. A retaining pawl 37 fixed in the arm retains the belt against backwards movement. The arrangement is such that the barrel upon recoil prepares the feeding device for the feeding operation which takes place upon forward movement of the barrel.

Means are provided to allow the belt to be withdrawn from the gun without the necessity of opening the cover 32. Such means are more fully described in the specification of my co-pending patent application Ser. No. 381,654, filed March 4, 1941.

The belt may be of any design. In a preferred embodiment the links of the belt consist each of an elastic sleeve 39 which holds the cartridge 10, the sleeve being secured to a carrying piece 40. The carrying pieces 40 are connected into a chain by any suitable means such as bolts, wire spirals etc. 41. The advantage of this arrangement is that the strains to which the belt is subjected are not transmitted to the elastic sleeve so that the danger of cartridges falling out of the belt is avoided. Each link is provided with guiding projections 42 on its front and rear ends, said projections serving to guide and hold the link in its position in the gun even when the link is empty.

The cartridges or the cartridge cases are supported along their path from the belt into the chamber and back by supports 43 (see Figs. 1 and 7), which may have the form of rods anchored in the barrel 1 and guided in the action slide 6.

A primary extractor or releasing organ releasing the cartridge cases from the barrel after the breech block has been opened may be used. Such an extractor is more particularly described in the specification of my divisional patent, United States Patent 2,366,840, filed March 31, 1942.

The pawl 23 (see Figs. 4–10) which serves to retain the action slide in the rear position is provided with a projection presenting two inclined faces 45 and 46. Corresponding inclined faces 47 and 48 are arranged on a link 49, one end of which is pivotably connected to a rod 50 anchored in the barrel 1, so that the link 49 takes part in the movements of the barrel. The other end of the link 49 is mounted slidably in a guide 51, mounted for rocking movement with the trigger lever 52. A suitable safety catch (not shown) may be provided preventing automatically the trigger lever to be accidentally pressed after it has been released. Such safety catch may be formed by a plate or the like mounted for sliding movement on the trigger lever and pressed by a spring into securing position. In order to press the trigger the safety catch must first be pushed aside and upon the releasing trigger it returns into its securing position by the influence of the spring.

Any desired means may be arranged for actuating the trigger mechanism from a distant point, such as a cable, pneumatic, hydraulic or electric device.

The cocking operation may be performed by any suitable means. In a preferred embodiment of the invention one or two cocking rods are used, said rods being mounted for sliding movement in the casing and adapted to engage the action slide 6. The slots for the actuating tooth of the cocking rod and for the handle are overbridged by a wall in order not to weaken the casing.

Any desired device for cocking from a distant point may be used, such as by a cable, pneumatic, hydraulic, electric, etc., means, without any alteration of the arm.

The arrangement of the firing pin is shown in Fig. 1. The firing pin 3 is mounted in the breech block 2 and has its operative end rounded or provided with an inclined surface. This causes the positive movement of the firing pin back upon opening of the breech block if the spring of the firing pin 3 fails to operate or if the firing pin becomes jammed in the cartridge, so that the tip of the firing pin cannot break away. The firing pin 3 may be actuated by an extension 67 on the action slide 6 in the last part of its forward movement to firing position.

The gun according to the invention operates as follows:

When the gun has been cocked the action slide 6 is retained in its rear position by the pawl 23 (see also Fig. 5). The breech block is open and the carriage 7 is in its retracted position on the action slide 6. The lower part of the actuating lever 11 is directed forward and abuts against the surface 12. The cartridge belt may be now inserted into the gun as far as the stop.

If the trigger 52 is pressed, the guide 51 is swung upwards (see Fig. 6) carrying with it the link 49. Its incline 48 engages the incline 46 on the pawl 23 (see explanatory Fig. 9) and swings

out the pawl which in turn releases the action slide 6 for forward movement under the influence of the recoil spring 15. During the first part of the forward movement of the action slide 6 the lower end of the lever 11 slides over the face 12, so that the carriage moves together with the action slide 6. The extractor 8 engages the respective cartridge 10 and pushes it forward. The hook 9 springs behind the rim or into the groove of the cartridge. When the lower end of the lever 11 engages the abutment 14, the lever 11 is rocked, and as is more fully described in the specification of my divisional application Serial Number 436,989 filed March 31, 1942, brings the cartridge 10 into the chamber. In the next stage of operation the action slide 6 closes the breech block 2 by means of the projections 4 and grooves 5. After the breech block has been closed the action slide still moves forward through a certain distance until it actuates the firing pin 3 and fires the cartridge.

After the shot has been fired, the barrel 1, the breech block 2 and the action slide 6 are moving backwards as one unit. After a certain distance the accelerating lever 25 (see Fig. 1) engages the shoulder 26 and accelerates the recoil movement of the action slide 6 with regard to the barrel 1, so that the breech block 2 is brought into the open position.

The carriage 7 does not take part in the first stage of this accelerated movement of the action slide 6 and moves together with the barrel 1 until the empty cartridge case has been pushed out of the chamber by the primary extractor or releasing organ. From this moment the carriage 7 begins to move quicker than the action slide in backward direction and draws the empty cartridge case back into the belt, i. e. into that link of it, from which it has been previously drawn out. During all this movement the cartridges of the cartridge case is supported by the supports 43. The carriage continues in its movement back together with the action slide 6, until the rear arm of the extractor 8 strikes an abutment 59 so that the extractor 8 is rocked out of engagement with the cartridge case, after the latter has been drawn into the proper position in the link. If in the meantime the trigger 52 has been released the action slide 6 is retained in its rear position, by the pawl 23.

It is important that the barrel should not start its forward movement which would cause the cartridge belt to move as long as the carriage 7 has not drawn the empty cartridge back into the belt. This is accomplished by the catch 21, engaging a recess 22 in the barrel and holding it in its rear position as long as the catch is not released by an incline on the action slide (see Fig. 8) when the latter has reached its rear position.

Further it is necessary that the action slide 6 should not be released by the pawl 23 for forward movement before the barrel has finished its forward movement and brought a new cartridge in register with the action slide and carriage 7.

This is insured by the cooperation of the inclines 45 and 46 on the pawl 23 with the inclines 47, 48 on the link 49 in the following manner:

The link 49, which is connected with the barrel 1, and, therefore, takes part on its recoil and return movements, has its rear end mounted for sliding movement on the guade 51. In the normal position of the trigger mechanism, as shown in Figures 4 and 5 the guide is in a horizontal position, i. e. parallel with the axis of the gun, and the inclines 45, 46 are opposite to, but clear of the inclines 47, 48 on the line 49. If the trigger is depressed, the guide 51, which is firmly connected with the trigger, is swung into the inclined position shown in Figures 6 and 8 and carries with it the rear end of the link 49, which is hereby swung upwards. During this movement the incline 48 on the link strikes against the correspond incline 46 on the pawl 23, see Figure 9, with the result that the pawl 23 is rocked out of engagement with the recess 24 in the action slide 6, leaving the latter free to move forward and fire the cartridge.

If the trigger is released, the guide 51, returns to its original horizontal position. The link 49, which performs a recoil and return movement together with the barrel, moves with its rear end in the guide 51 in a horizontal direction and returns finally into its original position shown in Figures 4 and 5, whereiln the inclines 47, 48 on the link are opposite to and clear of the inclines 45, 46 on the pawl 23. The gun is thus propared for a new round.

If after the shot has been fired, the trigger 52 is kept depressed or depressed again before the barrel has finished its recoil and return movements, the guide 51, being connected with the trigger 52, is inclined from its original horizontal position, see Figures 6 and 8. The rear end of the link 49, being mounted slidably in the guide 51, moves during the recoil and return movements of the barrel in this inclined guide 51, i. e. during recoil movement downwards to the right hand side and during return movement upwards in left hand direction, Figures 6 and 8.

As soon as the barrel and with it the link 49 have finished their return movement, the rear end of the link, moving in the guide upwards to the left, strikes with its inclines 47, 48 the inclines 45, 46 of the pawl 23 and rocks the latter out of engagement with the action slide.

It is clear that the inclines can only engage if the guide 51 is raised, i. e. if the trigger is depressed, and if the barrel is in its fore position in which the inclines on the link are opposite the inclines on the pawl 23.

The barrel may be provided with a muzzle brake and/or another suitable braking device, such as hydraulic brakes, buffers, or recuperators and with one or more recoil springs.

The firing mechanism may be adapted to various requirements, according to the purpose of the gun, for instance different arrangement of the firing device will be used if the gun is intended for infantry or for aircraft, tanks or the like.

The improved gun according to the invention has a number of considerable advantages over those of known designs.

The gun according to the invention has a number of considerable advantages over arms of known designs.

The use of a breech block of the type herein referred to allows the gun to be closed in the barrel itself, so that the recoil forces act centrally through the centre of forces. There are substantially no forces acting outside this center and causing couples of forces which would tend to rock the gun when fired. The gun may be mounted on the axis of the barrel, i. e. in the center of the forces. This is very advantageous for proper mounting.

The part of the gun behind the chamber is extremely short and does not exceed substantially the length of one full cartridge. In consequence, the mounting may be very low, so that the tilting momentum of the arm is reduced to a minimum

value. If the gun is mounted in a tank or the like it occupies a very small space.

The recoil movements of the parts of the gun take place in the interior and are not transmitted to the cartridges, which remain in rest relatively to the outer part of the gun.

The shells do not touch any part of the gun during the whole feeding movement, so that any danger of a premature explosion, when shells are used, is positively avoiled. The safety of the gun is further increased by the fact that the cartridges are fed in a plane containing the axis of the barrel and need not be tilted when introduced into the chamber.

All important operative movements are performed during the forward movement of the mechanism of the gun, so that it can never occur that a live cartridge remains in the chamber.

The gun may be easily adapted for feeding from either side as will be readily understood from the foregoing.

I claim:

1. An automatic gun comprising a casing, a barrel, a breech block action slide, said barrel and said action slide being mounted in said casing for reciprocable movement therein during their recoil and counter recoil, a recoil spring mounted between said barrel and said casing, a second recoil spring mounted between said casing and said action slide, a trigger lever pivotably mounted on said casing, link means comprising one portion attached to and movable with said barrel and a second portion movable in a direction transverse to the axis of recoil and slidably connected to said trigger lever whereby said second portion can be moved by said trigger lever and barrel to an operative position, a sear pivotally mounted in said casing and located between said action slide and said second portion, said sear having a portion adapted to engage the action slide for holding said slide in rear position, a projection mounted on said second portion arranged to move said sear to releasing position upon movement of said second portion to operative position by said trigger lever, said projection being so positioned on said second portion to render the trigger lever inoperative to release the sear until the barrel and link means returns to forward position.

2. An automatic gun comprising a casing, a barrel, an action slide, means in said casing supporting said barrel and action slide for reciprocating motion relatively to said casing and to each other between a firing position and a recoil position, recoil springs mounted between said barrel and said casing and said action slide and said casing, a sear pivotally mounted in said casing having a portion engageable with said action slide to hold said action slide in recoil position, link means connected to said barrel for movement therewith, a projection on said link means adjacent said sear when said barrel is in firing position and disposed rearwardly of said sear when said barrel is in recoil position, a trigger member pivotally mounted on said casing, means connecting said trigger member to said link means for moving said projection into a position to engage said sear and release said action slide when said barrel is substantially in firing position and into another position spaced from said sear in all positions of said barrel.

3. An automatic gun comprising a casing, a barrel, an action slide, means in said casing supporting said barrel and said action slide for reciprocating movement relatively to said casing and to each other between a firing position and a recoil position, a recoil spring mounted between said barrel and said casing, a recoil spring mounted between said action slide and said casing, a sear pivotally mounted in said casing, means on said action slide engageable with said sear when said action slide is in recoil position for retaining said action slide in recoil position, a trigger member pivotally mounted on said casing, a link member pivotally connected to and movable with said barrel and movable transversely of the axis of said barrel, means connecting said trigger member to said link member to move the latter transversely of the axis of said barrel to a first position when said trigger member is actuated and to a second position when said trigger member is released, and tripping means on said link member engageable with said sear to release said action slide for movement to firing position when said barrel is substantially in firing position and said link member is in said first position, said tripping means being out of engagement with said sear in all positions of said barrel when said link member is in said second position.

4. An automatic gun comprising a casing, a barrel, an action slide, means in said casing supporting said barrel and said action slide for reciprocating movement relatively to said casing and to each other between a firing position and a recoil position, a recoil spring mounted between said action slide and said casing, a sear pivotally mounted in said casing, means on said action slide engageable with said sear when said action slide is in recoil position for retaining said action slide in recoil position, a trigger member pivotally mounted on said casing for movement between a first position and a second position, a link member pivotally connected to and movable transversely of the axis of said barrel, means connecting said trigger member to said link member to move the latter transversely of the axis of said barrel, to a first position when said trigger member is moved to its first position and to a second position when said trigger member is moved to its second position, and tripping means on said link member constructed and arranged to engage with said sear to release said action slide for movement to firing position when said barrel is in firing position and said link member is in said first position, said tripping means constructed and arranged to be out of engagement with said sear in all positions of said barrel when said link member is in said second position.

5. An automatic gun comprising a casing, a barrel, an action slide, means in said casing supporting said barrel and said action slide for reciprocating movement relatively to said casing and to each other between a firing position and a recoil position, separate recoil absorbing means in said casing normally urging said barrel and said action slide into firing position, a sear movably mounted in said casing and engageable with said action slide to releasably retain it in its recoil position, a trigger member mounted on said casing for movement between a first position and a second position, link means connected to and movable with said barrel between its firing and recoil positions, said link means further being constructed and arranged to move transversely of said barrel, means connecting said trigger member to said link means for moving the latter transversely of said barrel during movement of the trigger from the first to the second position, and means on said link means constructed and arranged to engage said sear to release said action slide when said barrel is substantially in firing position and said

trigger member is moved to said first position, said link means also constructed and arranged to be moved transversely by said trigger in the opposite direction to position said sear engaging means out of engagement with said sear in all positions of said barrel when said trigger member is moved to said second position.

6. An automatic gun comprising a casing, a barrel, an action slide, means in said casing supporting said barrel and said action slide for reciprocating movement relatively to said casing and to each other between a firing position and a recoil position, separate recoil absorbing means in said casing normally urging said barrel and said action slide into firing position, a sear movably mounted in said casing and engageable with said action slide to releasably retain it in its recoil position, a trigger member mounted on said casing for movement between a first position and a second position, link means connected to and movable with said barrel between its firing and recoil positions, said link means also being constructed and arranged to be moved transversely of said barrel, means connecting said trigger member to said link means for moving the latter transversely of said barrel during movement of the trigger from the first position to the second position, and means on said link means constructed and arranged to engage said sear to release said action slide when said barrel is substantially in its firing position and said trigger member is in said first position, said link means being constructed and arranged to be moved transversely by said trigger in the opposite direction to position said sear engaging means out of engagement with said sear in all positions of said barrel when said trigger member is moved to its second position.

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