

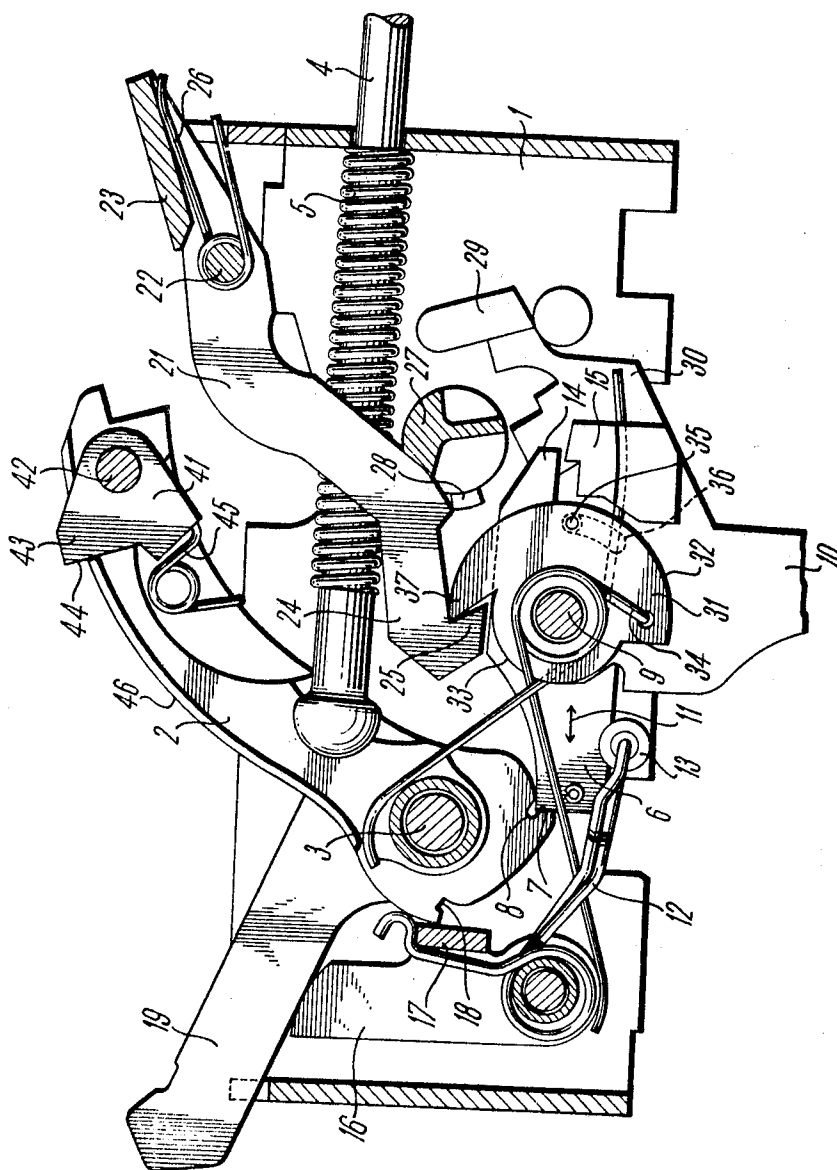
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TRIGGER MECHANISM FOR AUTOMATIC FIREARMS

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TRIGGER MECHANISM FOR AUTOMATIC FIREARMS

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8 Claims

ABSTRACT OF THE DISCLOSURE

A trigger mechanism for automatic firearms employing a hammer firing device, having a means for converting both from semi-automatic to full-automatic firing and, simultaneously, from closed bolt to open bolt operation, including a catch lever which, when the firearm is in an automatic firing mode, projects into the passive movement of the breech block, catching and holding the breech block in its rearward position, and further including a driving member for displacing the catch lever from its normal position.

This invention relates to a trigger mechanism for automatic firearms having a changeover device to change both from semi-automatic to full-automatic firing and simultaneously, from firing from closed bolt position to firing from open bolt position, said mechanism being disposed in a trigger box and comprising a catch lever which in its normal position, with the weapon set for automatic firing, projects into the path of movement of the breech block, catching and holding the latter in its rearmost position, the trigger of said mechanism being provided with a driving member for displacing said catch lever from its normal position.

A trigger mechanism of this type for a weapon of the pin firing type is known, in which two side rollers are provided on the trigger and engaged by an arm of the catch lever under the action of a spring, provided the catch lever has been released by the safety roll when setting the weapon for automatic firing. The arrangement is such that when the trigger is pulled, the end of the trigger projecting into the path of movement of the breech block is displaced from said path of movement whereas when the trigger is released, the catch lever follows the trigger and reenters the path of movement of the breech block and then catches the latter to terminate a burst.

This known arrangement has the disadvantage that the movements of the catch lever, which follows the movements of the trigger, are relatively slow compared to the movement of the breech block. This is why the catch lever can assume any position when the breech block comes into catching position so that the possibility exists for the engaging surfaces on the catch lever and the breech block to barely overlap. When the trigger is further released, the catch lever will not continue to come into engagement with the breech block, as it is maintained in its position by friction between the breech block and its catching surface, said friction being very high due to the heavy pressure exerted by the closing spring. This involves the risk of this insufficient engagement between the breech block and the catch lever being released by any vibrations that may be set up, causing

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utterly uncontrollable advance of the breech block and the firing of a shot. This is a source of considerable danger.

The invention has as its object to avoid these disadvantages of the known arrangement and to provide a trigger mechanism ensuring that the catch lever comes into full engagement with the breech block so that unintentional advance of the breech block is safely eliminated. This problem is solved according to the invention by mounting on the same pivot with the trigger a backing plate adapted to be rotated relative to the trigger through a smaller angle than the angle of rotation of the trigger, preloading the backing plate in the direction of trigger motion and providing the same with two sectors of different radii separated by a steep flank, and providing the catch lever at its end located in the trigger box with a hook-shaped lug engaging the larger-radius sector of the backing plate with the trigger pulled, until it comes within reach of the smaller-radius sector of the backing plate carried along by the trigger when the latter is released and drops abruptly onto said last-mentioned sector.

Thus, in the trigger mechanism according to the invention the catch lever does not follow the trigger movement when the trigger is released, but is maintained by the backing plate in the position in which its end is outside of the path of movement of the breech block, until the driving member for displacing the catch lever provided on the trigger has been displaced clear of the catch lever sufficiently for the catch lever to return to its normal position without being prevented therefrom by said driving member. Only then is the catch lever released by the backing plate so that, under the action of its loading spring, it can be returned abruptly to its normal position. The spring and the mass have been selected so that the speed at which the catch lever moves to its normal position is high compared to that of the breech block, whereby it is ensured that the catch lever reaches its normal position under any circumstances and comes into full engagement with the breech block when the latter is caught. In this manner, the aforementioned danger is completely eliminated. When the trigger is operated, the driving member provided on the same comes into engagement with the catch lever to displace the same without the backing plate changing at once its position. Only when the catch lever has been lifted sufficiently for its hook-shaped lug to slide off the flank between the two sectors of the backing plate is the backing plate, which until then has remained at rest, rotated by its loading spring so that the larger-radius sector of the backing plate backs up the hook-shaped lug of the catch lever. This has the added advantage that the position of the trigger, once the weapon has been released, is no longer very critical because any burst released is interrupted only when the trigger is released sufficiently to be close to its normal position. The long distance which the trigger has to travel in the direction of its normal position before a burst is interrupted has the advantage that the trigger need not be maintained at all costs in a rearmost position but can perform certain movements under the influence of the recoil movements of the weapon, without the burst being thereby interrupted unintentionally.

In a preferred embodiment of the invention, the trigger and the backing plate are coupled to each other by a pin-and-slot connection, the slot in the backing plate enabling the necessary movement relative to the trigger

to be performed. The backing plate is conveniently loaded by a leg spring encircling its pivot, said leg spring having the advantage of permitting a large spring travel despite its relatively small space requirement.

In a preferred embodiment of the invention, a known trigger mechanism of the hammer firing type is employed, the catch lever and the backing plate being additionally incorporated therein. A trigger mechanism of the hammer firing type generally offers the possibility of releasing the trigger precisely at the moment when the breech block has passed by the end of the catch lever, while a detent provided on the hammer is still within reach of the trigger lever. In this case, the hammer can still be caught while the breech block is moving forward to introduce a cartridge into the barrel which has run hot during firing. In order to eliminate this possibility, in the preferred embodiment of the invention the detent on the hammer and the trigger lever are associated so that the detent will come within reach of the trigger lever to be caught by the latter if when the weapon is being cocked, the hammer is rotated beyond the position in which it engages in its cocked position the under side of the breech block. The hammer is rotated beyond the said position due to its inertia when during the return travel of the breech block it is moved at high speed. By this it is ensured that the hammer can be caught only during the return travel but not during the forward movement of the breech block. This eliminates the possibility of a cartridge being fed into the cartridge chamber of a barrel that has run hot during firing, without said cartridge being fired by means of the hammer and/or firing pin, so that the danger of spontaneous firing is eliminated and maximum safety in handling the weapon is ensured. Thus, the catching of the hammer by the trigger lever depends on the condition that the hammer is cocked at high speed, such as is done by the returning breech block upon the firing of a cartridge. If however, the weapon is cocked by hand, the breech block is moved at a low speed which does not suffice to throw the hammer beyond the aforementioned position. In order to avoid operating errors due to this arrangement, a further embodiment of the invention provides a sprung projection on the hammer near the free end thereof, said projection projecting above the surface of the hammer facing towards the breech block and having an end face disposed approximately perpendicularly to the path of movement of the breech block and facing towards the latter. Because of this projection, when engaged by the breech block the hammer is rotated through a wider angle than corresponds to the position in which it engages the under side of the breech block. Therefore, it can be caught positively by the trigger lever even when cocking the weapon by hand or when shooting cartridges having an insufficient charge. However, since the projection is spring loaded, the hammer can engage the under side of the breech block immediately upon snapping home in the trigger lever. The projection can be defined in simple manner by the nose of a pull-over lever supported pivotally on the hammer, said pull-over lever having its pivot disposed closer to the end of the hammer than its end face and being maintained by a spring in a rest position in which its nose extends through a recess in the surface of the hammer facing towards the breech block.

The invention is described and illustrated more particularly in conjunction with the accompanying drawing which shows an embodiment of the invention.

The figure shows diagrammatically a longitudinal section of a trigger mechanism according to the invention, parts unimportant to the invention having been omitted.

The trigger mechanism shown in the drawing is designed for weapons with hammer firing and comprises a trigger box 1 in which all parts of the trigger device are accommodated. Said parts comprise a hammer 2 supported pivotally on a pivot 3 and loaded by a pressure fork 4, said pressure fork being under the action of a

helical compression spring 5 supported against the trigger box 1.

The hammer 2 is maintained in the position shown in the drawing by a trigger lever 6 engaging with its nose 7 a corresponding detent 8 on the outer surface of the hammer. The trigger lever 6 is pivotably supported on the same pivot 9 as the trigger 10 and is moreover movable in the directions indicated by the dual arrow 11. It is forced in the direction of the surface of the hammer 2 by a roller 13 mounted on the legs of a spring 12. Moreover, a spring (not shown) tends to hold the trigger lever 6 in its left-hand position as shown in the drawing. When the trigger 10 is operated to fire a shot, the rear nose 14 is carried along by the lug 15 provided on the trigger 10 so that the trigger lever 6 is rotated counterclockwise as shown in the drawing and its nose 7 is moved out of the detent 8. The hammer 2 can then strike forward and release a shot in known manner. The catching pawl 16 whose transverse web coacts with another detent 18 on the hammer 2 releases the hammer 2 in known manner only when the release lever 19 has been forced downwards by the advancing breech block. The construction and function of the trigger device described thus far are known so that they need not be discussed in greater detail.

The trigger device shown in the drawing includes further a catch lever 21, which is pivotably supported near its upper end on a pivot 22 and disposed in such a manner that, in the position shown, its upper end 23 projects out of the trigger box 1 and into the path of movement of the breech block, whereas its end 24 located within the trigger box extends to a point adjacent the pivot 9 of the trigger 10 and is provided with a hook-shaped lug 25 extending substantially radially of the pivot 9 and at the same time, approximately tangentially of the circle around the pivot 22 of the catch lever 21. The latter is loaded by a leg spring 26 disposed on the pivot 22 of said catch lever, said spring 26 tending to maintain the end 23 of the lever in the path of movement of the breech block. In the position shown, a breech block would be maintained in its rearmost position by the end 23 of the catch lever 21. In order to have a weapon firing from closed bolt position for semi-automatic firing, a lug 28 is provided on the safety roll 27, said lug enabling the catch lever 21 to be rotated clockwise sufficiently for its end 23 to clear the path of movement of the breech block when changing to semi-automatic firing. Consequently, the breech block retained by the catch lever when the weapon is set for full-automatic firing, is released when changing to semi-automatic firing so that it will feed a cartridge and move into its locked position.

With the weapon set for full-automatic firing as illustrated in the drawing, the catch lever 21 is displaced from the position shown by a lug 29 when the trigger is pulled, said lug 29 being provided on an arm 30 connected to the trigger 10. Further, a backing plate 31 is rotatably supported on the pivot 9 mounting the trigger 10, said backing plate being provided with a relatively large-radius sector 32 and a considerably smaller-radius sector 33. The backing plate 31 is loaded by a leg spring 34, which tends to swivel the backing plate counterclockwise as shown in the drawing, that is, in the same direction in which the trigger 10 is operated. Inserted in the plate 31 is a pin 35 engaging an arc-shaped slot 36 in the trigger 10, said slot being concentric with the pivot 9. The pin 35 and the slot 36 are so arranged that the backing plate 31 is maintained in the position shown against the action of its spring 34 when the trigger is released. In this case, the hook-shaped lug on the inner end of the catch lever 21 engages over the nose 37, said nose being limited by the flank between the larger-radius sector 32 and the smaller-radius sector 33 of the backing plate 31.

When the trigger 10 of the mechanism shown is operated, the lug 29 of the trigger comes into engagement on and displaces the catch lever 21. The backing plate 31 remains at first in the position shown, in which its nose 37 engages the hook-shaped lug 25 of the catch lever 21.

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The slot 36 is of sufficient length to enable the trigger 10 to swivel. If then, the catch lever 21 has been rotated sufficiently for the hook-shaped lug 25 to release the nose 37 of the backing plate, said backing plate is swivelled counterclockwise abruptly by the spring 34 to the extent permitted by the slot 36. It then backs up with its larger-diameter sector 32 the hook-shaped nose 25 on the catch lever 21 so that said lever cannot return to its initial position. In this position, the end 23 of the catch lever is clear of the path of movement of the breech block so that the latter can advance unimpeded. Also, the lug 15 provided on the trigger 10 has displaced the trigger lever 6 clear of the detent 8 on the hammer 2 so that automatic firing results.

If the automatic firing is to be interrupted and the trigger 10 is released, the catch lever 21 remains in its position last described, as it is backed up by the plate 31, although the lever is released by the lug 29. Only after the trigger 10 has been swivelled clockwise through a considerable angle is the pin 35 on the backing plate 31 carried along by the end of the slot 36 so that now the backing plate 31 is rotated together with the trigger 10. If then, the nose 37 of the backing plate slides off the hook-shaped lug 25 on the catch lever 21, the latter is returned abruptly into the initial position shown by the spring 26. The lug 29 provided on the trigger 10 does not hamper this movement of the catch lever so that the speed of this movement depends exclusively on the force of the spring 26. Consequently, this movement can take place rapidly and vigorously enough to positively move the catch lever 21 to the position shown, even if the breech block when releasing the catch is positioned directly forwardly of the end 23 of the lever. In this manner it is ensured that the end 23 of the catch lever fully engages the breech block so that the latter cannot come loose under the action of vibrations and move forward unintentionally.

In order to ensure that the hammer 2 cannot be caught by the trigger lever 6 with the breech block advancing when the trigger 10 is released, to prevent a cartridge being introduced without being fired into the barrel heated by automatic firing, the length of the trigger lever 6, its range of movement in the directions indicated by the dual arrow 11 and the position of the detent 8 on the hammer 2 are tuned to each other so that even with the trigger 10 released, the detent 8 will come within reach of the nose 7 of the trigger lever 6 only if the hammer 2 is rotated much farther than to its position of engagement on the under side of the breech block, during whose return movement the hammer is cocked. Rather, the hammer 2 must swing beyond said position under the influence of its inertia, to come into engagement with the nose 7 of the trigger lever 6. This swinging movement is ensured at the high speeds encountered when firing normal ammunition.

It may happen, however, that when defective ammunition is fed the breech block will not return sufficiently for the hammer 2 to swing over with its detent 8 to within reach of the catch lever 6, and when the weapon is cocked by hand, the speeds are not reached that would produce such swinging movement. In order to ensure even in this case that the detent 8 engages the nose 7 of the trigger lever, a pull-over lever 41 is pivotally supported on a pivot 42 at the free end of the hammer 2. Said pull-over lever 41 has a nose 43 which penetrates through a corresponding recess in the hammer 2 and has an end face 44 facing towards the breech block, and which is substantially vertically positioned on the path of movement of the breech block when the hammer is cocked. The pivot 42 is disposed closer to the end of the hammer 2 than the end face 44, and the lever 41 is loaded by a spring 45, which maintains the lever 41 in a rest position in which its nose 43 projects above the surface 46 of the hammer 2 facing towards the breech block. When the breech block during its return movement runs up with its back face against the end face 44

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of the pull-over lever 41, the hammer 2 is rotated additionally by an amount corresponding to the height of the end face 44, until the breech block slides over the nose 43 of the pull-over lever 41 thereby rotating it against the action of the spring 45 sufficiently for the nose 43 to disappear substantially in the recess in the hammer 2. In this manner, an additional swivel motion is accomplished, whereby the detent 8 comes within reach of the nose 7 of the trigger lever 6. This additional swivel motion, however, takes place only during the return and not during the advance of the breech block so that the safety feature provided by the aforementioned arrangement of the detent 8 and the nose 7 is fully maintained. Nevertheless, troublefree operation of the weapon is ensured even when firing ammunition whose propelling force is insufficient and when loading the weapon by hand.

The invention can be applied not only to trigger mechanisms of the hammer firing type, but for example also to mechanisms of the pin firing type.

What I claim is:

1. A trigger mechanism for automatic firearms having a changeover device to change both from semi-automatic to full-automatic firing and simultaneously from firing from closed bolt position to firing from open bolt position, said mechanism being disposed in a trigger box and comprising a catch lever which in its normal position, with the firearm set for automatic firing, projects into the path of movement of the breech block, catching and holding the latter in its rearmost position, the trigger of said mechanism being provided with a driving member for displacing said catch lever from its normal position, characterized in that on the same pivot (9) as the trigger (10), a backing plate (31) is supported, said backing plate being able to be rotated relative to said trigger through a smaller angle than the angle of rotation of said trigger, that said backing plate is preloaded in the direction of motion of the trigger and has two sectors (32 and 33) of different radii separated by a steep flank, and that said catch lever (21) at its end located in the trigger box (1) has a hook-shaped lug (25), said lug engaging the larger-radius sector (32) of said backing plate when the trigger has been pulled, until it comes within reach of the smaller-radius sector (33) of the backing plate carried along by the trigger when the latter is released and drops abruptly on to said last-mentioned sector.

2. A mechanism as claimed in claim 1, characterized in that said trigger (10) and said backing plate (31) are coupled to each other by a pin-and-slot connection (35, 36).

3. A mechanism as claimed in claim 1, characterized in that said backing plate (31) is loaded by a leg spring (34) encircling the pivot (9) thereof.

4. A mechanism as claimed in claim 1, characterized in that the flank provided on the backing plate (31) and the hook-shaped lug (25) on the catch lever (21) extend substantially in the direction of motion of said hook-shaped lug.

5. A trigger mechanism as claimed in claim 1, further comprising a hammer firing means.

6. A mechanism as claimed in claim 5 having a sprung trigger lever (6) and on the hammer, a detent (8) for said trigger lever, characterized in that said detent (8) and said trigger lever (6) are arranged so that the detent comes within reach of and can be caught by the trigger lever only when the hammer (2) as the weapon is being cocked is rotated beyond the position in which it engages the under side of the breech block in its cocked condition.

7. A mechanism as claimed in claim 6, characterized in that a sprung projection (41) is provided on said hammer (2) near its free end, said projection projecting beyond the surface (46) of the hammer facing towards the breech block and having an end face (44) disposed

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approximately perpendicularly to the path of movement of the breech block and facing towards the latter.

8. A mechanism as claimed in claim 7, characterized in that said projection is formed by the nose (43) of a pull-over lever (41) pivotally supported on said hammer, the pivot of said pull-over lever being disposed closer to the end of said hammer (2) than the latter's end face (44) and said pull-over lever (41) being held by a spring (45) in a rest position in which its nose (43) extends through a recess in the surface (46) of the hammer facing towards the breech block.

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