

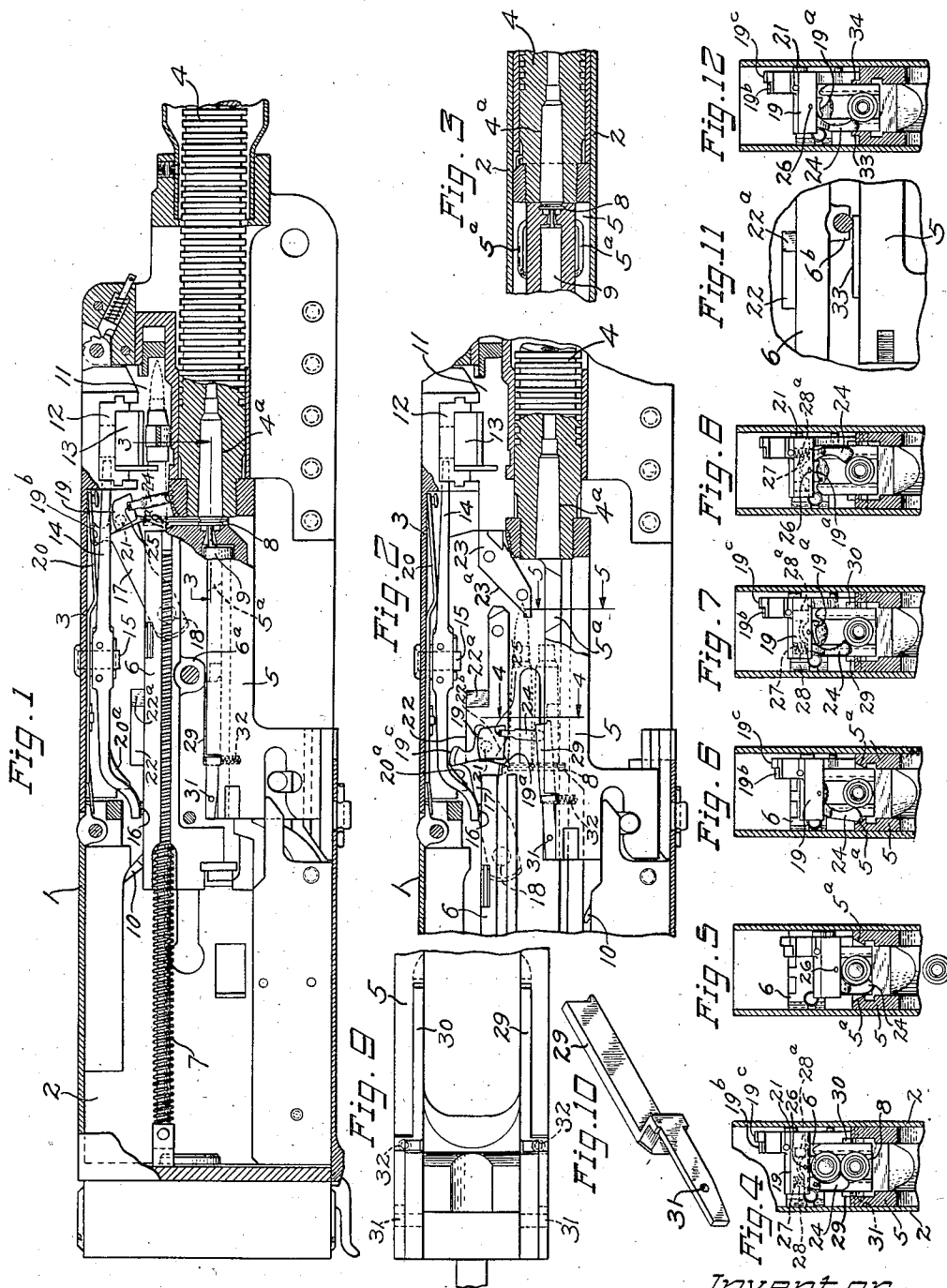
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EJECTOR GUIDE FOR AUTOMATIC MACHINE GUNS

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EJECTOR GUIDE FOR AUTOMATIC
MACHINE GUNS

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The present invention is particularly applicable to an automatic machine gun of the type disclosed in Patent No. 1,293,021 issued to J. M. Browning on February 4, 1919. An automatic machine gun of this type has an extractor which is carried by the reciprocable breech bolt and which is adapted to engage a cartridge to withdraw it from the cartridge belt as the breech bolt moves rearward upon recoil. The extractor serves not only to withdraw the cartridge but also serves, during rearward movement, to move the cartridge downward into alignment with the chamber of the barrel so that it may be moved into the said chamber as the breech bolt again moves forward. Carried by the extractor is a downward extending member which cooperates with the extractor to prevent the live cartridge from moving downward too rapidly and which also serves as an ejector to eject the empty shell of the cartridge which has been fired. The ejector is yieldably connected with the extractor so as to be capable of lateral movement so that, as it moves upward, it may free itself from the live cartridge; and this necessary yieldable mounting of the ejector has made it possible for the ejector, under certain circumstances, to move laterally when in contact with the empty shell, with the resulting possibility of failure to eject the said empty shell.

The principal object of the present invention is to provide a guide means for the extractor which is so constructed and located as to prevent the lateral movement thereof at the time of ejection without, however, interfering with the lateral movement which is necessary when the ejector must free itself from the live cartridge.

A further object of the invention is to provide a guide means of the type described, adapted to cooperate with a reversible ejector so as to guide it in either of its relatively reversed positions.

A still further object of the invention is to provide a guide means of the type described, which is of such character that it may be applied to an existing machine gun of the Colt-Browning type, without changing or altering any part of the gun other than the barrel extension. To this end the ejector guide is constructed so as to automatically move vertically during reciprocation of the breech bolt.

In the accompanying drawing two embodiments of the invention are shown, but it will be understood that the drawing is intended for illustrative purposes only and is not to be con-

strued as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Of the drawing:

Fig. 1 is a fragmentary longitudinal sectional view of an automatic firearm embodying the invention.

Fig. 2 is a fragmentary longitudinal section view similar to Fig. 1 but showing the parts in different relative positions.

Fig. 3 is a fragmentary horizontal sectional view taken along the line 3—3 of Fig. 1.

Fig. 4 is a fragmentary transverse vertical sectional view taken along the line 4—4 of Fig. 2.

Fig. 5 is a view somewhat similar to Fig. 4 but showing the extractor and ejector moved downward to fully eject the shell of the exploded cartridge and to bring the live cartridge into alignment with the chamber of the barrel. In this view the barrel extension is shown in section along the line 5—5 of Fig. 2.

Fig. 6 is a view somewhat similar to Fig. 4 but showing the construction which has been heretofore used, without the ejector guides to which the present invention particularly relates. In this view no live cartridge is shown, and the ejector is shown as having yielded laterally in such a manner as to fail to eject the shell of the exploded cartridge.

Fig. 7 is a view similar to Fig. 4 but showing the manner in which the ejector guide prevents the lateral yielding which is shown in Fig. 6.

Fig. 8 is a view similar to Fig. 7 but showing the ejector in reversed position.

Fig. 9 is an enlarged fragmentary plan view of the rear part of the barrel extension showing the ejector guides to which the invention particularly relates.

Fig. 10 is a perspective view on the same scale as Fig. 9 showing one of the ejector guides separately.

Fig. 11 is a fragmentary view similar to Fig. 1 but showing an alternative construction for the ejector guide.

Fig. 12 is a view similar to Fig. 7 but showing ejector guides of the form shown in Fig. 11.

The machine gun as shown in the drawing is of the well-known Colt-Browning type. It comprises a breech casing 1 which contains the breech mechanism, this casing being rectangular in form and having two opposite side plates 2, 2 and a cover 3 pivoted at the front and movable upward to expose the interior mechanism. Projecting from the casing at the front is a barrel 4 which upon recoil is movable rearward to a

limited extent. Formed in the barrel at the rear thereof is a suitable firing chamber 4^a adapted to receive a cartridge. Connected with the barrel at the rear end thereof and bodily movable therewith is a barrel extension 5.

Mounted on the barrel extension for longitudinal movement independently thereof is a breech bolt 6. A reaction spring 7 is provided which resists rearward recoil movement of the breech bolt and which tends to immediately return the breech bolt in the forward direction after recoil. As shown in Fig. 3, the breech bolt is provided at the front with a vertical slot or guideway 8 for receiving and retaining the rear portion of the cartridge shell. Preferably and as shown, each shell is annularly grooved and the vertical ribs at the opposite sides of the groove or guideway 8 enter grooves in the shell. Mounted in the breech bolt 6 for longitudinal movement relatively thereto is a firing pin 9 which is adapted to be moved to cocked position during recoil by means of a cocking lever 10. The firing pin is held in cocked position by means of a suitable sear which is moved at the proper time to release the pin and effect firing.

Extending transversely through the gun near the front thereof is a feed channel 11 into which a cartridge belt may be fed. Mounted in a downward extension of the cover 3 immediately above the feed channel is a feed slide 12 which is adapted to move transversely. This slide carries a pawl 13 which is adapted to engage the forward cartridge of the cartridge belt to move it into firing position. For operating the slide 12 there is provided a feed lever 14 which is pivotally mounted on a stud 15 projecting downward from the cover 3. The slide 12 is provided with a notch and the forward end of the lever 14 projects into the notch. At the rear end of the lever 14 there is provided a depending stud 16 which extends into a cam groove formed in the upper surface of the breech bolt 6. It will be obvious that when the breech bolt moves rearward the lever 14 will be moved in the one direction, thus correspondingly moving the slide. When the breech bolt again moves forward the lever 14 is rotated in the opposite direction, thus moving the slide 12 and the pawl 13 in the feeding direction and advancing the forward cartridge of the belt to a central position.

It is sometimes desirable to provide for the optional feeding of the cartridge belt either from left to right or from right to left, and when this is desired the slide 12 with the pawl 13 thereon is so constructed as to be bodily reversible, two different notches being provided therein for receiving the forward end of the lever 14. In order to properly operate the said lever 14 for either left hand feeding or right hand feeding, two alternative breech bolts with differently formed cam grooves therein may be provided, as disclosed in the Tansley Patent No. 1,803,352; or a single bolt may be provided with different cam paths therein, as disclosed in the Moore and Pfeiffer Reissued Patent No. 19,159. The details of the reversible feed mechanism constitute no part of the present invention and further description thereof is unnecessary.

Pivotally mounted on the breech bolt, as for instance at the left side thereof, is an extractor 17, this extractor being provided with a pivot stud 18 which extends into a suitable transverse hole in the breech bolt. Formed at the front of the extractor is a transversely extending head 19 having a tooth 19^a extending downward and

adapted to be entered in the annular groove at the rear of the cartridge as clearly shown in Fig. 1. The extractor serves through the agency of the tooth 19^a to withdraw the cartridge from the belt and carry it rearward when the breech bolt moves rearward upon recoil.

Carried by the cover 3 is a cam spring 20 which engages a surface 19^b on the upper part of the head 19 as the extractor moves rearward. The cover 3 is also provided with a cam rib 23^a which engages a surface 19^c on the upper part of the head 19. These cams 20 and 23^a serve to positively move the extractor downward about its pivotal axis, thus carrying the cartridge downward into the said vertical slot 8 formed in the front end of the breech bolt. Carried by the head 19 at the left side thereof is a spring pressed plunger 21 adapted to cooperate with a cam plate 22 at the left side of the casing. As the extractor moves rearward the plunger 21 is forced inward by a beveled surface 22^a on the plate 22. When the extractor reaches its rearmost position the plunger 21 returns to its projecting position. When the extractor is in its rearmost position the plunger 21 thereon engages the cam surface 22^b on the plate 22 to additionally move the extractor in the downward direction as the breech bolt moves forward. The extractor is thus moved downward far enough to bring the cartridge into alignment with the firing chamber 4^a in the rear end of the barrel and the cartridge is moved into this firing chamber by the breech bolt as it moves forward. There is also provided at the left side of the casing a cam plate 23 and a cam surface 23^a on this plate engages the plunger 21 to move the extractor upward to its initial position during the latter part of the forward movement. Thus the extractor is returned to the position shown in Fig. 1 where it can engage another cartridge, which in the meantime has been moved by the feeding mechanism into proper position.

In order that the cartridge may be retained in proper relationship with the extractor during the rearward and downward movements thereof as described, it is necessary to provide a retaining element which partly surrounds the cartridge and which cooperates with the slot 8 in the front end of the breech bolt to prevent the cartridge from moving by gravity away from the extractor. This retaining element is indicated in the drawing at 24, and it will be understood that the element 24 must be located at the side of the extractor 17 corresponding to the direction of feed, that is, if the feed is from left to right, the retaining element must be at the right and if the direction of feed is from right to left, the retaining element must be at the left. The retaining element 24 also acts as an ejector for the shell of the exploded cartridge, as will presently be explained.

When the feed is reversible, as is preferred, the retaining element or extractor 24 is also reversible, and it may be constructed in the manner disclosed in the before-mentioned Tansley Patent No. 1,803,352. The head 19 is provided with a transverse slot 25 therein which is open at the bottom. This slot is in front of the tooth 19^a and is adapted to receive the upper transverse portion of the retaining element 24. A pivot pin 26 extends longitudinally through registering holes in the extractor head 19 and through a corresponding hole in the retaining element. In this way the said retaining element is mounted for limited pivotal movement with respect to the extractor. A spring 27 seated in a recess 28 in the extractor head serves to bias the retaining

element for movement in the inward direction, that is, to the direction to more firmly engage the cartridge. From an inspection of Fig. 4 it will be apparent that the retaining element 24 serves to engage the cartridge so as to hold it in the groove 8 in proper relationship to the tooth 19^a of the extractor. Without the retaining element 24 the cartridge would drop and could not, therefore, be controlled by the extractor.

As already stated, the element 24 must be at the side of the cartridge corresponding to the direction of feed, and when the cartridge may be fed in either direction it is necessary to provide for the reversal of the element 24. It will be apparent that with the construction described the element 24 may be removed by removing the pin 26. At the same time the spring 27 may be removed. The parts are then assembled in reversed positions, as shown in Fig. 8, the pin 26 entering the same holes as before and the spring 27 entering a recess 28^a at the left side of the ejector head.

The element 24 not only serves to hold the cartridge in proper relationship to the extractor as described but it also serves in cooperation with the live cartridge as an ejector to engage the shell of the next preceding exploded cartridge and to positively eject it downward from the slot 8, as shown in Figs. 4 and 5. The empty shell may fall out by gravity, but if it fails to thus fall out it will positively be ejected by the live cartridge and by the element 24 approximately when the breech bolt is in its rearmost position. After the extractor 19 and the ejector 24 have moved downward to the position shown in Fig. 5, they immediately move upward again and the ejector 24 yields laterally against the resistance of the spring 27 so as to pass by the live cartridge. The barrel extension is beveled at 5^a to permit such lateral yielding.

As already explained, the live cartridge serves during normal operation of the gun to assist in the ejection of the exploded shell of the next preceding cartridge. However, upon the firing of the last cartridge of a belt there is no succeeding live cartridge to assist in ejecting the empty shell and the ejector 24 must be solely relied upon to effect ejection. Under some circumstances, in a gun not incorporating the present invention, the ejector 24 instead of operating in the normal and intended manner may yield laterally, as shown in Fig. 6, and on account of such lateral yielding may fail to eject the shell, a jamming of the parts being the result. This lateral yielding and jamming is particularly likely to occur when the size of the shell is different from the size for which the gun was primarily designed. In order to positively prevent the lateral yielding shown in Fig. 6 a guide 29 is provided on the barrel extension as shown in Figs. 4 and 7, this guide being so positioned that it controls the downward movement of the ejector 24 and prevents it from moving laterally, as shown in Fig. 6. This guide insures the positive ejection of the shell of the exploded cartridge without any possibility of jamming.

It will be apparent that the guide 29 is so positioned that, although preventing lateral yielding of the ejector during ejection, it leaves the ejector entirely free for lateral yielding during subsequent upward movement when it is necessary to pass by the live shell during normal operation of the gun. In other words, the ejector is prevented from yielding laterally when adjacent the guide as shown in Figs. 4 and 7, but is free to

yield laterally when adjacent the beveled cut 5^a as shown in Fig. 5.

The guide 29 not only positively prevents lateral yielding but it makes it possible for the spring 27 to be much lighter than has heretofore been necessary. With the earlier construction the spring 27 has been made very heavy in order to prevent, so far as possible, the undesirable lateral yielding shown in Fig. 6. This heavy spring has made it unnecessarily difficult for the ejector to yield laterally to pass by the live cartridge and has thus caused unnecessary resistance to the normal functioning of the feeding mechanism of the gun.

When the gun is provided with a reversible feed mechanism and with a reversible ejector, as herein shown and described, there is provided not only the guide 29 but also a second guide 30 which is similar thereto but which is located at the opposite side of the barrel extension. It will be understood that only one of the guides 29 and 30 functions at one time. The guide 29 functions when the parts are adjusted for feeding from left to right, as shown in Fig. 7, and the guide 30 functions when the parts are adjusted for feeding from right to left, as shown in Fig. 8.

The guides 29 and 30 are so constructed and mounted that they may be applied to an existing gun of the Colt-Browning type without modifying any part of the gun other than the barrel extension. To this end the guides are constructed as shown in detail in Figs. 9 and 10. Each guide consists of two connected relatively offset parts which are adapted to be entered in correspondingly offset recesses in the corresponding side portion of the barrel extension. Each guide is pivoted to the barrel extension at 31 and is normally held in its uppermost position by means of a spring 32. In order to avoid interference with a portion of the breech bolt, specifically the boss 6^a thereof, each guide is automatically movable downward and upward as the breech bolt reciprocates. Each boss 6^a engages the top surface of the corresponding guide to force it downward against the action of the spring 32 when the bolt moves forward to the position shown in Fig. 1. When the bolt moves rearward the guide is released by the boss 6^a and is moved upward by the spring 32 into its operative position, as shown in Fig. 2.

When it is not desirable or necessary to avoid modification of the breech bolt of the gun a somewhat simpler guide means may be provided, as shown in Figs. 11 and 12. As shown in these figures, guides 33 and 34 are rigidly connected with the barrel extension or are formed integrally therewith. The reciprocating breech bolt is provided with alternative bosses 6^b which are cut away to clear the guides, and the pin extending through the boss is also cut away to provide clearance for the guides. The function of the guides 33 and 34 is the same as that of the guides 29 and 30 already described and repetition is unnecessary.

What I claim is:

1. In an automatic machine gun comprising a barrel and barrel extension, a reciprocable breech bolt having a vertical groove for retaining the rear portion of a cartridge shell, mechanism for feeding a cartridge belt transversely, an extractor carried by the breech bolt and adapted to withdraw a cartridge from the belt as the breech bolt moves rearward upon recoil, means operative during recoil for relatively moving the extractor to

transfer the said cartridge downward into the groove in the bolt and into alignment with the chamber of the barrel, and a downward extending ejector carried by the extractor and yieldably held so as to be capable of lateral movement, the said ejector as it moves downward serving to eject the empty cartridge shell and the said ejector as it subsequently moves upward yielding laterally to pass by the live cartridge in alignment with the chamber, the combination with the aforesaid parts, of a guide on the barrel extension serving to prevent lateral yielding of the ejector during ejection and so positioned as to leave the ejector free for lateral yielding during subsequent upward movement.

2. In an automatic machine gun comprising a barrel and barrel extension, a reciprocable breech bolt having a vertical groove for retaining the rear portion of a cartridge shell, mechanism for feeding a cartridge belt from left to right or from right to left, an extractor carried by the breech bolt and adapted to withdraw a cartridge from the belt as the breech bolt moves rearward upon recoil, means operative during recoil for relatively moving the extractor to transfer the said cartridge downward into the groove in the bolt and into alignment with the chamber of the barrel, and a downward extending reversible ejector carried by the extractor and yieldably held so as to be capable of lateral movement, the said ejector as it moves downward serving to eject the empty cartridge shell and the said ejector as it subsequently moves upward yielding laterally to pass by the live cartridge in alignment with the chamber, the combination with the aforesaid parts, of two similar oppositely located guides on the barrel extension serving selectively according to the reversal of the ejector to prevent lateral yielding thereof during ejection, the said guides being so positioned as to leave the ejector free for lateral yielding during subsequent upward movement.

3. In an automatic machine gun comprising a barrel and barrel extension, a reciprocable breech bolt having a vertical groove for retaining the rear portion of a cartridge shell, mechanism for feeding a cartridge belt transversely, an extractor carried by the breech bolt and adapted to withdraw a cartridge from the belt as the breech bolt moves rearward upon recoil, means operative during recoil for relatively moving the extractor to transfer the said cartridge downward into the groove in the bolt and into alignment with the chamber of the barrel, and a downward extending ejector carried by the extractor and yieldably held so as to be capable of lateral movement, the said ejector as it moves downward serving to eject the empty cartridge shell and the said ejector as it subsequently moves upward yielding laterally to pass by the live cartridge in alignment with the chamber, the combination with the aforesaid parts, of a guide on the barrel extension

serving to prevent lateral yielding of the ejector during ejection and so positioned as to leave the ejector free for lateral yielding during subsequent upward movement, the said guide being automatically movable downward to avoid interference with a portion of the bolt when the latter is in its forward position.

4. In an automatic machine gun comprising a barrel and barrel extension, a reciprocable breech bolt having a vertical groove for retaining the rear portion of a cartridge shell, mechanism for feeding a cartridge belt from left to right or from right to left, an extractor carried by the breech bolt and adapted to withdraw a cartridge from the belt as the breech bolt moves rearward upon recoil, means operative during recoil for relatively moving the extractor to transfer the said cartridge downward into the groove in the bolt and into alignment with the chamber of the barrel, a downward extending ejector carried by the extractor and yieldably held so as to be capable of lateral movement, the said ejector as it moves downward serving to eject the empty cartridge shell and the said ejector as it subsequently moves upward yielding laterally to pass by the live cartridge in alignment with the chamber, and two similar oppositely located guides on the barrel extension serving to prevent lateral yielding of the ejector during ejection and so positioned as to leave the ejector free for lateral yielding during subsequent upward movement, each of the said guides being automatically movable downward to avoid interference with a portion of the bolt when the latter is in its forward position.

5. In an automatic machine gun comprising a barrel and barrel extension, a reciprocable breech bolt having a vertical groove for retaining the rear portion of a cartridge shell, mechanism for feeding a cartridge belt transversely, an extractor carried by the breech bolt and adapted to withdraw a cartridge from the belt as the breech bolt moves rearward upon recoil, means operative during recoil for relatively moving the extractor to transfer the said cartridge downward into the groove in the bolt and into alignment with the chamber of the barrel, a downward extending ejector carried by the extractor and yieldably held so as to be capable of lateral movement, the said ejector as it moves downward serving to eject the empty cartridge shell and the said ejector as it subsequently moves upward yielding laterally to pass by the live cartridge in alignment with the chamber, and a horizontally pivoted guide on the barrel extension serving to prevent lateral yielding of the ejector during ejection and so positioned as to leave the ejector free for lateral yielding during subsequent upward movement, the said guide being automatically movable downward about its pivotal axis to avoid interference with a portion of the bolt when the latter is in its forward position.

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