Nov. 13, 1945. G. T. BIXBY 2,388,670

FEED MECHANISM FOR CARTRIDGE BELTS

Filed May 22, 1942

FIG. 1.

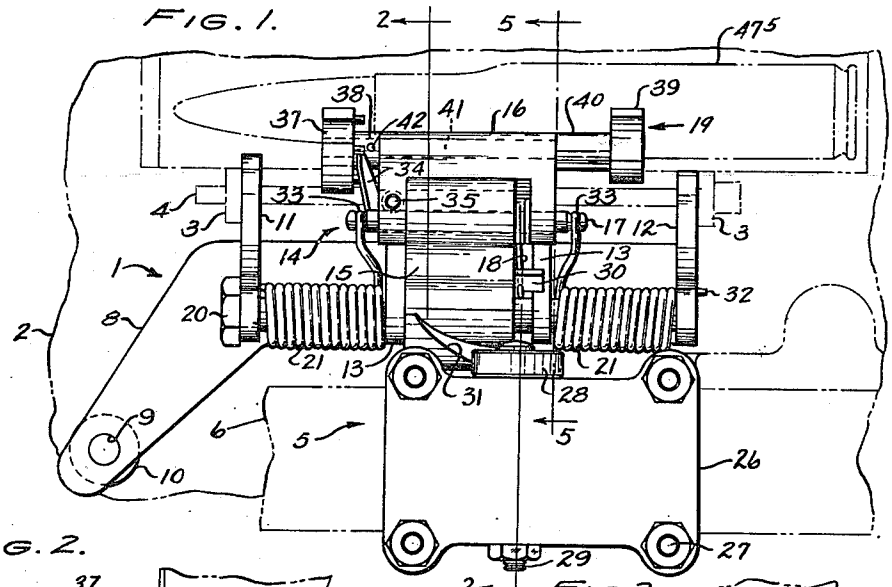


FIG. 2.

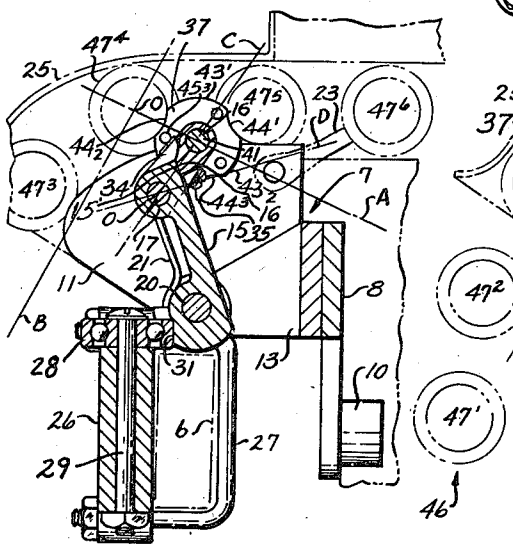
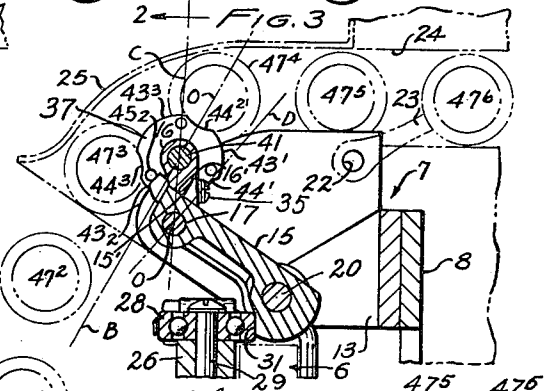


FIG. 3



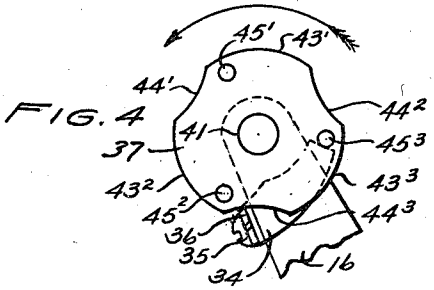
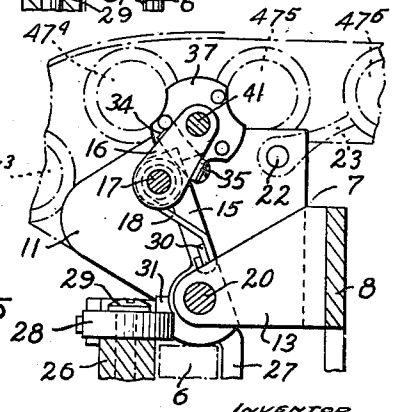


FIG. 4

FIG. 5



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FEED MECHANISM FOR CARTRIDGE BELTS

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7 Claims. (Cl. 89—33)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to cartridge belt feed mechanisms actuated by the firing oscillations (i. e. by the recoil and counterrecoil) of automatic weapons.

It is an object of the invention to provide a compact structure directly securable to the gun attachments of presently existing nonactuated belt feeding mechanisms.

Another object of the invention is to effect complete feeding spool elimination through the introduction of a pawl mechanism adapted to directly contact and drive forward any ammunition belt guided directly thereabove.

The invention makes available a structure so simple in basic operation as to require a minimum of changes to make it readily adaptable to both right and left hand feeds.

It also provides a mechanical arrangement in which all part movements due to cam actuation (i. e. due to gun recoil) merely place the pawl mechanism in a position awaiting belt movement.

As a result of the above arrangement, the fine feeding adjustment normally incident to direct ratchet drives is eliminated, cam compressed coil springs being used to effect actual cartridge belt advancement upon gun counterrecoil.

With the foregoing and other objects in view, the invention resides in the novel arrangement and combinations of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departure from the spirit of the invention.

A practical embodiment of the invention is illustrated in the accompanying drawing, wherein:

Figure 1 is a side elevation of the improved feeding mechanism, with one caliber .50 round and associated weapon parts shown in phantom outline;

Figure 2 is a sectional view taken on the line 2—2 of Figure 1, with caliber .50 rounds and associated weapon parts shown in phantom outline;

Except for pawl parts repositioning, due to weapon recoil, the showing of Figure 3 is similar to that of Figure 2;

Figure 4 is an enlarged end view of the cartridge finger stop or ratchet, and

Figure 5 is a sectional view taken on line 5—5 of Figure 1.

Referring jointly to Figures 1 through 3 of the drawing, my invention consists of a booster 1 fixed to the caliber .50 machine gun shown in phantom outline 2 by means of the presently existing mounting lugs and retaining pin shown in additional phantom outlines 3 and 4; and of the cam contactor 5 longitudinally adjustably attached to the immovable extension rod shown in phantom outline 6 (i. e., the last named part remains entirely stationary during weapon firing). The forward end of the rod shown in outline 6 is fixed to a gun adapter located forward (i. e., to the left) of the part showing of Figure 1.

The booster 1 consists of a support 7 made up of a longitudinally disposed back plate 8 to which is welded or otherwise suitably attached a front cartridge belt guide plate 11, a rear cartridge belt guide plate 12, and a centrally disposed pawl mounting bracket 13; a pawl mechanism 14 consisting of a driven lever 15, a yoke shaped driving lever 16, a pivot pin 17, a spring 18 and a contacting finger assembly 19; a pawl mechanism shaft 20; and two coil springs 21. In Figure 1 of the drawing, it will be noted that the front (i. e., left hand) end of the back plate 8 slopes downwardly and forwardly to provide a mounting hole 9 for a pilot 10. The pilot 10 fits snugly in a pilot hole provided in the gun of outline 2, thereby furnishing the booster 1 additional support against "twisting" under firing shock.

As shown in Figures 2 and 3 of the drawing, the outer (i. e., left hand) portions of the front and rear cartridge belt guide plates 11 and 12 are sector shaped, with the longitudinal center line of the pawl mechanism shaft 20 passing directly through the apexes thereof. This arrangement permits ammunition belt pickup from below. Horizontal feeding of the ammunition belt can be equally well provided for by minor rearrangement of the pawl mechanism 14 with respect to a horizontally disposed top surface for the cartridge belt guide plates. The upper inner corner of each of the aforesaid guide plates is provided with a hole 22 through which the presently existing retaining pin of outline 4 passes. The last named pin also constitutes the supporting axle of the "belt holding pawl" shown in phantom outline 23, a later described element forming an essential part of the gun feedway shown in phantom outline 24. If desired, the upper and end surfaces of the gun feedway of outline 24 can be extended outwardly and slightly downwardly through in-

stallation of the cartridge belt cover shown in phantom outline 25.

The cam contactor 5 consists of a mounting plate 26 secured to the outer (i. e., left hand in Figures 2 and 3) portion of the extension rod shown in phantom outline 6 by means of two U-bolts 27 and a roller bearing 28 secured to the uppermost surface of the mounting plate 26 by a bolt 29. As best indicated with reference to the parts showing of Figure 1, the cam contactor 5 is normally (longitudinally) adjusted such that the axis of the bolt 29 is just coming into alignment with the rear (i. e., right hand) face of the driven lever 15.

The numerous novel structural features of the three sub-assemblies comprising the pawl mechanism 14 are separately dealt with immediately below. Maximum forward or clockwise positioning of the driven lever 15 is controlled by a stop lug 30 on said lever contacting with the inclined upper edge of the bracket 13, best shown in Figure 1 of the drawing. Periodic rearward or counterclockwise actuation of the driving lever 15 from the semi-upright (unfired gun) position of Figure 2 to the pronounced outwardly canted (fired gun) position of Figure 3 is accomplished by the incorporation of a helical cam 31 at the lever base. A readily understandable side profile of the helical cam 31 is shown in Figure 1. Return of the driven lever 15 from the (fired gun) positioning of Figure 3 to the (unfired gun) positioning of Figure 2 is accomplished by inserting the outwardly turned ends 32 of the coil springs 21 through longitudinal disposed anchor holes provided in the front and rear cartridge belt guide plates 11 and 12 (adjacent to the axle supporting holes therethrough), by inserting the pawl mechanism axle 20, and by lastly positioning the hooked upper ends 33 of the coil springs 21 within the recesses provided at the ends of the hinge pin 17; which final parts positioning is clearly illustrated in Figure 1. In closing, as viewed in Figures 2 and 3, it will be noted that the upper inner edge of the driven lever 15 is flat as indicated at 15' and is constantly engaged by the flat lower portion 16' of the yoke shaped driving lever 16 under the influence of spring 18, Figs. 1 and 5.

As viewed in Figure 1 of the drawing, the gap between the inner surfaces of the yoked ends of the driving lever 16 is sufficiently in excess of the longitudinal width of the driven lever 15 to provide ample room for additional installation, upon the hinge pin 17, of the spring 18 (the lower end of which is hooked around the under surface of the stop lug 30, Figure 5, and the upper end of which passes beneath and slightly beyond the lowermost of the two slightly in-turned faces of the base portion of the yoke-shaped driving lever 16, as seen in Figure 5). Presence of the throw-up spring 18 normally maintains the lengthwise axis of the driving lever 16 in the reference line positioning OC indicated in Figures 2 and 3 of the drawing. Clockwise deviation from normal lever 16 positioning is delat with below. As viewed in Figure 1, the forward (i. e., left hand) arm of the driving lever 16 is drilled and tapped to provide for the installation of a flanged spring pawl 34, a screw 35, and a lockwasher 36. The spring 34, in conjunction with three "stop pins" later described in connection with the enlarged view of Figure 4, constitute what is commonly referred to as a ratchet (i. e., the spring pawl 34 performs the function of a common pawl; while the front "finger disk" described immediately below, in combination with the above referred to "stop pins," performs the function of a common ratchet wheel).

As shown in Figures 1 through 4 of the drawing, the contactor finger assembly 19 consists of a front finger disk 37 provided with a rearwardly projecting spacer collar 38, and a rear finger disk 39 provided with a forwardly projecting spacer rod 40 and a still more forwardly projecting axle 41 (i. e., the last named passes through both the driving rod base portion and the front finger disk 37). The disks 37 and 39 are retained in proper fixed interrelationship by means of a pin 42 passed through a hole provided in the spacer collar 38. The front finger disk 37 is composed of two (rather blunt) fingers 43^1 and 43^2, joined by a common arcuate side 44^1, and of additional finger 43^3, joined to the finger 43^1 by a common arcuate side 44^2 and to the finger 43^2 by a common arcuate side 44^3. As viewed in the enlargement of Figure 4, the counterclockwise tip of each of the aforesaid fingers is longitudinally drilled to receive three rearwardly projecting and fixed stop pins 45^1, 45^2, and 45^3; which, in combination with the front finger disk 37, form in effect a common ratchet wheel. The rear finger disk 39 duplicates the three finger arrangement of the front finger disk 37 with the single exception that the common arcuate sides of the former are longer and deeper than those of the latter (i. e., the "front" sides duplicate bullet contour, while the "rear" sides duplicate cartridge casing contour). In order to better describe the operation of my invention, I have additionally illustrated (in Figures 2 and 3) an upwardly and inwardly fed cartridge belt 46 by means of the six rounds shown in phantom outline 47^1 through 47^6.

Prior operation description, it should be noted that positioning of the ammunition belt 46 is identical for both Figures 2 and 3. It should also be noted that Figures 1 and 2 represent an unfired gun positioning of parts, while Figure 3 represents a fired gun positioning of parts (i. e., in the latter, the pawl mechanism 14 is represented in its most outwardly or counterclockwise positioning, poised for movement of the round of present outline 47^4 into the positioning of the round of present outline 47^5). It should be still further noted that for each inward "stroke" of the pawl mechanism 14, a round occupying the present Figure 3 positioning of outline 47^5 will first depress down and pass over, then be locked against outward escapage by, the belt holding pawl of outline 23. Returning to Figure 1, it will be noted that under unfired gun conditions, the visible portion of the helical cam 31 projects increasingly outwardly, from right to left, directly in the path of the most inwardly disposed portion of the contacting surface of the longitudinally fixed roller bearing 28. It therefore follows that right hand movement of the gun of outline 2, together with its attached booster mechanism 1 (as a result of round firing), results in constantly increasing outwardly movement of the pawl mechanism 14 until the extreme positioning of Figure 3 is accomplished.

During the pawl mechanism repositioning referred to in the preceding paragraph, two closely interrelated parts movements occur. Firstly, the front and rear finger disks 37 and 39 slidingly "roll around," respectively, adjacent bullet and cartridge casing surfaces of the round of outline 47^4 (i. e., if a reference line OA be used to indicate initial positioning of the front finger disk 37 of Figure 2, the arcuate side 44^2 slides

around its adjacent bullet surface in a clockwise direction until the aforesaid disk reaches a final positioning indicated by a second reference line OB in both Figures 2 and 3). Secondly, during the entire period of the above described movement of the front and rear finger disks 37 and 39, the yoked driving lever 16 of Figures 2 and 3 is continuously executing a "jack knife" movement with respect to the driven lever 15 (i. e., if the levers 16 and 15 of the pawl mechanism 14 be compared, respectively, to the "blade" and "handle" of a common jack knife, starting from the initial full open position represented by the reference line OC, the "blade", 16 continues to "close" up to the maximum closed positioning represented by a second reference line OD, after which it simply reverses the aforesaid movement by returning to the full open position of reference line OC). At this point, it should be especially noted that in passing from the front finger disk positioning of Figure 2 (i. e., from a positioning in which the contacting finger assembly 19 is in advance of the round of outline 47^4) to the same positioning of Figure 3 (i. e., to a positioning in which the contacting finger assembly 19 is immediately behind the round of outline 47^4). the engaging tip of the leaf spring 34 has shifted from an original position behind the driven face of the stop pin 45^3 to a new positioning behind the driven face of the stop pin 45^2. Therefore, with return of the gun of outline 2 to the longitudinal positioning of Figure 1 (i. e., upon complete removal of the cam restraint of Figure 3), the coil springs 21 will immediately force the pawl mechanism 14 back into the unfired gun positioning of Figure 2, thereby repositioning the round of present outline 47^4 into the positioning of the round of present outline 47^5. In accomplishing the above described round movement, it is also worthy of note that the "thrust" exerted by the driving arcuate surfaces of the front and rear finger disks 37 and 39 is resolved substantially along the centerline of the ammunition belt 46.

Although the descriptions of this specification are specific to the illustrations of Figures 1 through 4, or readily understood modifications thereof, it is to be understood that there can be departures therefrom which still clearly fall within the field and scope of the subject invention, and I therefore do not wish to be restricted thereto, but only insofar as the appended claims are so limited.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A cartridge belt feed mechanism for automatic guns, comprising spaced plates adapted to be carried by a recoiling portion of the gun and normal to the center line thereof, a shaft mounted in said plates, an operating lever rockably mounted at one end on said shaft, and an arm pivotally mounted on the other end of said lever, an axle adjacent the lever and rotatably carried by said arm, cartridge feed discs mounted on the axle, a stop carried by the arm and engaging the lever to limit the movement of the arm relative to the lever, yielding means for keeping the stop in engagement with the lever, a cam carried by the lever, means adapted to be fixed in the path of movement of said cam for engagement with the cam on the recoil of the gun portion to actuate said lever to position said discs for advancing a cartridge, means carried by the arm and means carried by a cartridge feed disc cooperating to advance a cartridge when the lever is moved toward the gun on counterrecoil, and means for actuating the lever upon said counterrecoil to feed a cartridge.

2. In a cartridge belt feed mechanism for automatic guns, a pivoted operating lever, cartridge advancing means carried by the lever and comprising an arm pivoted to said lever, an axle rotatably mounted in said arm, discs rotatably carried by said axle and having cartridge engaging portions, laterally extending pins on one of said discs, a spring pawl carried by said arm ratcheting over said pins in one direction of the movement of the lever, and engaging said pins in the other direction to prevent retrograde movement of said discs.

3. A cartridge belt feed mechanism for automatic guns comprising spaced plates adapted to be carried by the gun, a shaft mounted in said plates, an operating lever rockably mounted on the shaft, a yoke-shaped member having arms pivotally connected with the operating lever, the pivot between said lever and arms having extensions beyond the arms, anchored spiral springs surrounding the shaft, the free end of the springs engaging said pivot extensions and urging the lever toward the gun, means for limiting the movement of the lever in such direction, an axle carried by said yoke-shaped member and having cartridge engaging and advancing discs rotatably mounted thereon, means carried by the yoke-shaped member for engagement with the operating lever to limit the relative movement between said lever and said member, spring means for normally urging the yoke shaped member away from the gun, means carried by the yoke-shaped member cooperating with the cartridge engaging and advancing discs to prevent retrograde movement of said discs, a cam on the operating lever, and a fixed member cooperating with the cam to rock the lever away from the gun upon the recoil thereof.

4. A cartridge feed mechanism for automatic guns, comprising spaced plates adapted to be carried by the gun and normal to the center line thereof, a shaft mounted in the plates, an operating lever rockably mounted at one end on said shaft, and movable toward and from the gun, an arm pivotally mounted on the other end of the lever, an axle adjacent the upper end of said lever and rotatably carried by said arm, cartridge feed means mounted on the axle for advancing a cartridge upon the movement of the lever toward the gun, a cam carried by the operating lever and adapted to be engaged by means carried by the gun upon recoil of the gun to actuate said lever to position said cartridge means for advancing the cartridge, and spring means for actuating said lever upon the counterrecoil of the gun to feed a cartridge.

5. In a cartridge feed mechanism for automatic guns, a pivoted operating lever movable to and from the gun, oppositely disposed cartridge advancing discs rotatably carried by the lever and formed with a plurality of depressed arcuate portions in their peripheries arranged to successively engage and partially embrace the cartridge in feeding the same, positive means for moving the lever in one direction to position said discs for advancing a cartridge, and spring means for moving said lever in the other direction to advance the cartridge.

6. The invention of claim 5 characterized in that the positive means for moving the lever comprises a helical cam on the lower end of said le-

ver adjacent the pivotal point thereof and a fixed member constructed and arranged to coact with said cam to move said lever, and the spring means comprises a coil spring having operative connection with the upper end of said lever.

7. In a cartridge belt feed mechanism of automatic guns, a pivoted operating lever movable to and from the gun, a member pivotally mounted on the upper end of said member, a horizontal extending axle carried by said member, oppositely disposed cartridge advancing discs rotatably carried by said axle and provided with a plurality of equally spaced depressed arcuate portions in their peripheries arranged to successively engage and partially embrace the cartridge to be fed, positive means for moving the lever in one direction to position said discs for advancing a cartridge, and spring means for moving said lever in the other direction to advance the cartridge.

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