Nov. 16, 1948. P. H. DIXON 2,453,786

FEED MECHANISM FOR RAPID FIRE GUNS

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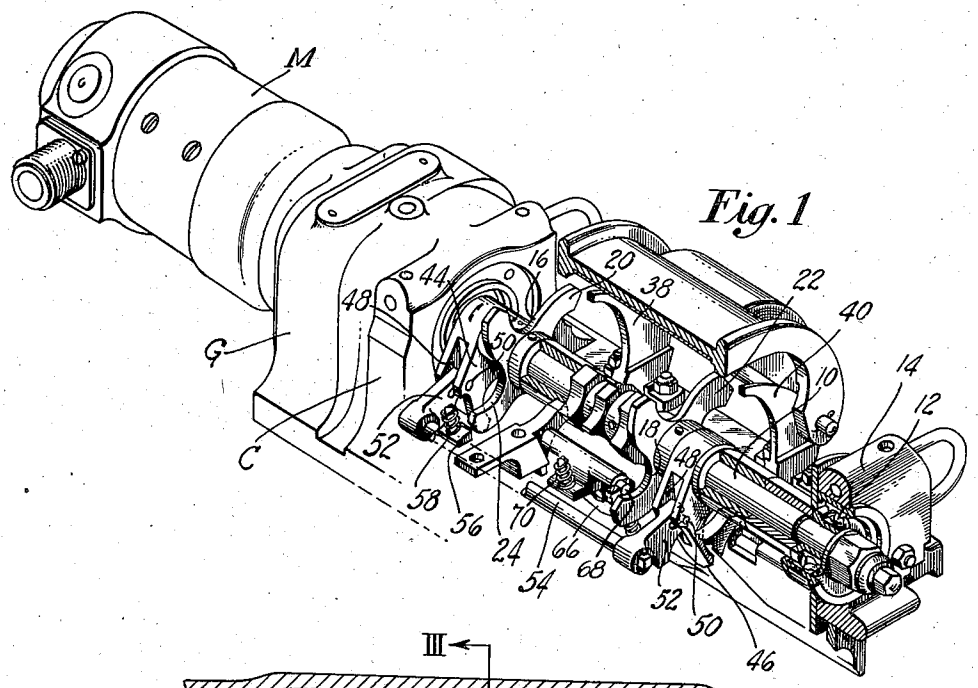


Fig. 1

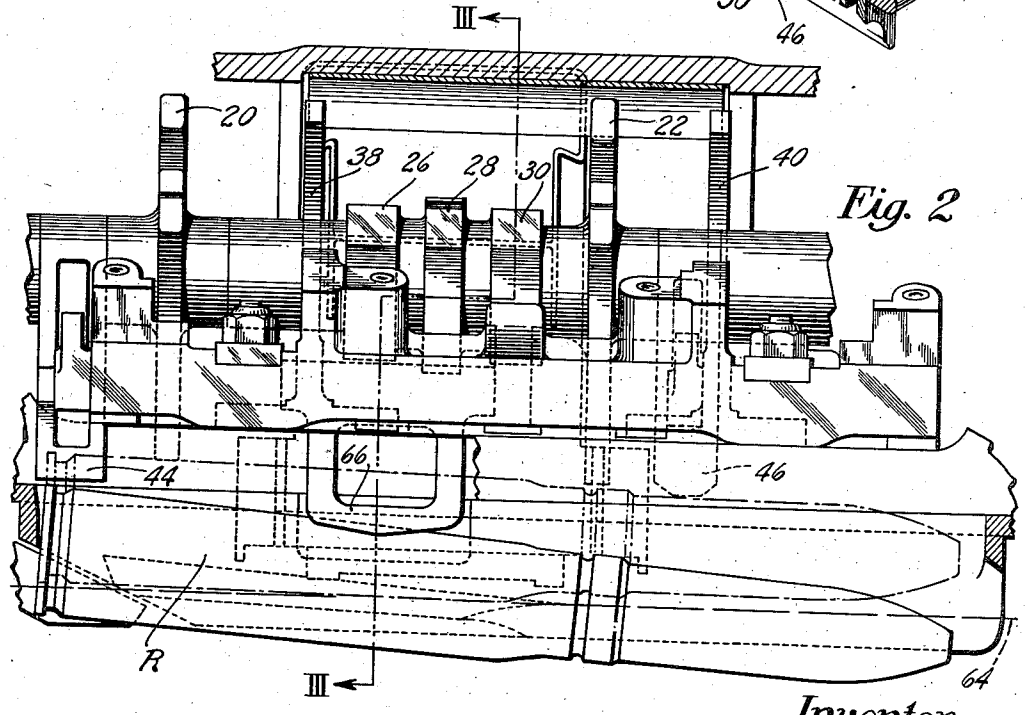


Fig. 2

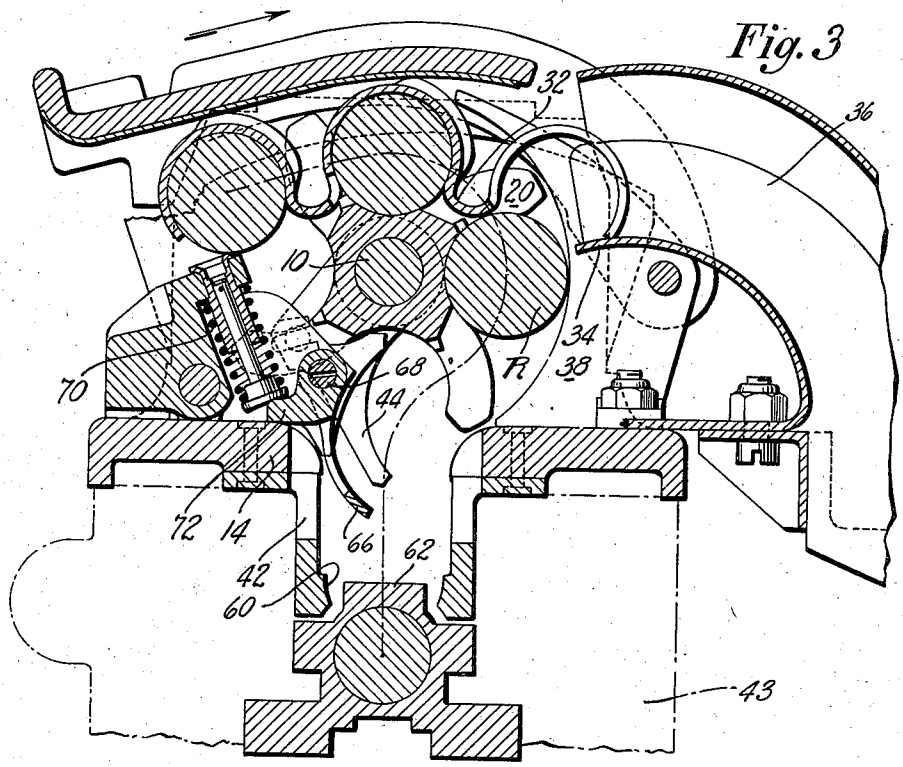
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Fig. 3



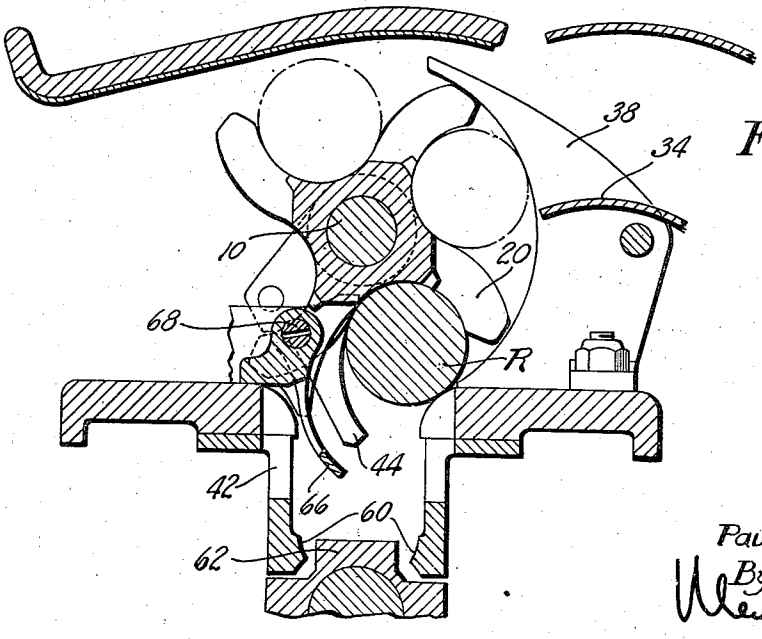


Fig. 4

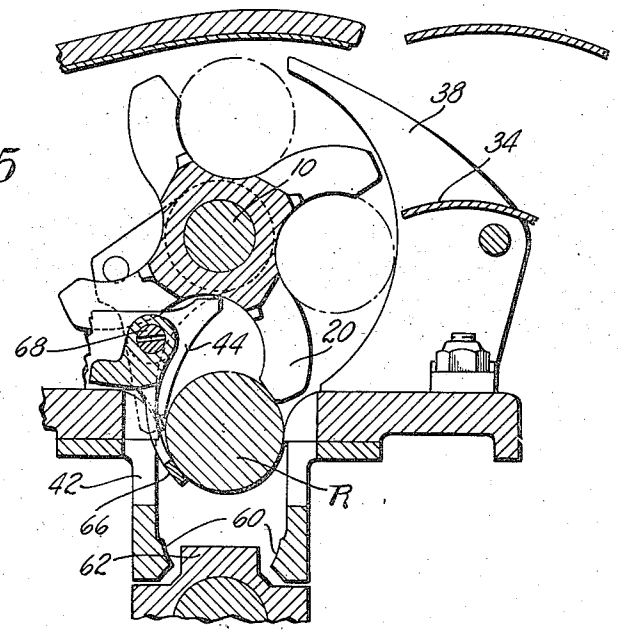
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FEED MECHANISM FOR RAPID FIRE GUNS

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Fig. 5



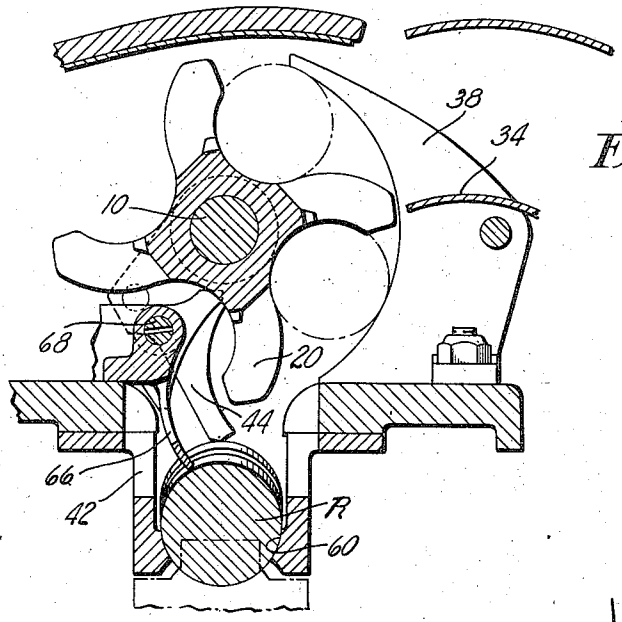


Fig. 6

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UNITED STATES PATENT OFFICE

2,453,786

FEED MECHANISM FOR RAPID-FIRE GUNS

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1 Claim. (Cl. 89—33)

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This invention relates to rapid fire guns and particularly to automatic guns of the type in which cartridges are fed downward into the top of a receiver casing which encloses the breech mechanism of the gun. An example of a gun of this type is the 20 mm. Hispano-Suiza airplane cannon.

For success in feeding the cartridges accurately and reliably to the proper position in the path of the reciprocating breech bolt of such a gun at the required high rate of speed, often 700 or more rounds per minute, it is essential not only that the cartridges be fed unfailingly at the required rate to the entrance of the receiver but that each cartridge be kept under absolute control in the receiver until it is picked up by the breech bolt to be rammed into the firing chamber in the gun barrel.

The only practical form in which ammunition can be supplied to a gun at such a high rate is that of a belt composed of cartridges connected by links, which must be stripped from the cartridges, one at a time, as they reach the receiver of the gun, and the object of the present invention is to provide an improved cartridge feeding mechanism which is not only powerful enough to feed a heavy cartridge belt intermittently at the required speed but which will also separate the rounds successively from the belt and keep each cartridge, including the last cartridge from the belt, continuously under complete control while feeding it downward into the receiver until the cartridge is engaged and rammed forward by the breech bolt of the gun during counterrecoil.

With feeders heretofore used on guns of this type it has been impossible to fire the last round or rounds from the belt because no provision other than the push exerted by following rounds was made for forcing a cartridge down into the receiver through the distance from the position where the cartridge enters the receiver to the position where the cartridge is engaged by the breech bolt. This distance includes space sufficient to accommodate a loose cartridge, which will not descend accurately under the influence of gravity alone and is liable to cause jamming of the gun if it is not kept under complete control.

A feature of the present invention consists in the combination with motor driven means for feeding an ammunition belt to the receiver of a gun, and means for separating successive rounds from the belt, of means for forcing each individual round downward in the receiver until it rests upon ways from which it is rammed by the reciprocating breech bolt, and holding it down upon said ways until it is removed therefrom by the breech bolt. The rounds are thus kept under complete control at all times, regardless of gun vibration or position, and the last round from the belt is positioned and fired with the same certainty as any other round.

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The invention will be best understood and appreciated from reading the following detailed description of one practical embodiment thereof in connection with the accompanying drawings, in which

Fig. 1 is a perspective view, with parts broken away to reveal the cartridge feeding mechanism;

Fig. 2 is a view partly in elevation and partly in section, on a larger scale, showing the feeding mechanism with a cartridge in position to be rammed;

Fig. 3 is a cross-sectional view on the line III—III of Fig. 2; and

Figs. 4, 5 and 6 are views similar to Fig. 3 showing a cartridge in successive positions until it reaches ramming position.

Referring now to Fig. 1, M indicates an electric motor which provides power for operating mechanism for feeding an ammunition belt to the receiver of a gun. The motor M is connected, through gearing contained in a housing G and a friction clutch contained in a housing C, to a shaft 10 the outer end of which is supported in a bearing 12 mounted in a stationary supporting frame 14.

Affixed to the shaft 10 are star wheels 16, 18 each of which has four radiating cartridge engaging fingers 20 and 22 respectively. The advance faces 24 of these fingers are curved to fit the perimeter of a cartridge R at the location where the cartridge is to be engaged by the fingers. Inasmuch as the cartridge case tapers somewhat, the radius of curvature of the faces 24 on the rear star wheel 16 is slightly greater than that of the corresponding faces on the front star wheel 18 and the depth of the throat between adjacent fingers is greater than that of the throat between the corresponding fingers of the feed wheel 18, in order that the axis of a cartridge in engagement with the fingers of the two feed wheels 16, 18 shall be parallel with the axis of the shaft 10 by which the wheels are driven.

Also affixed to the shaft 10 are three stripper cams 26, 28, 30 which are designed to engage and strip from an on-coming cartridge one of the links 32 which connect a series of cartridges to form an ammunition belt. As shown in Fig. 3,

the leading ends of the links, after the links are stripped from the cartridges, are caught by the lower wall 34 of a link chute 36 through which the links are conducted away from the gun upon which the feed mechanism is being used, while the cartridges are kept under the control of the feed fingers 20, 22 by stationary retaining plates 38 and 40 respectively, until they pass downward into a feed throat 42 which extends into the upper portion of the receiver 43 of the gun.

As will be apparent from an inspection of Figs. 3, 4 and 5, wherein the cartridges are to be considered as moving in the direction indicated by the arrow on Fig. 3, each cartridge will be under the positive control of the feed wheels 16, 18, and the retaining plates 38, 40, until the cartridge reaches the position shown in Fig. 5. Prior to this stage, however, the cartridge will have reached and engaged a pair of loading fingers 44 and 46 which are loosely mounted upon the shaft 10 for pivotal movement about the axis of said shaft (see Fig. 1). Each of the fingers 44, 46 is notched as shown at 48 and a pin 50 extending across the notch is engaged in the notched end of an operating lever 52 pivotally supported upon a horizontal rod 54. Each operating lever has a laterally projecting shelf 56 upon which bears a spring 58 tending constantly to depress the notched inner end of the operating lever and, consequently, to move the finger 44 or 46 inward around the axis of the shaft 10. As soon as a cartridge engages the fingers 44, 46, which occurs at approximately the time when the cartridge reaches the position shown in Fig. 4, the said fingers begin to yield toward the left and eventually reach the position shown in Fig. 5 at which time the cartridge can start to move downward into the throat 42. By examining Fig. 5 it may be seen that the cartridge at this stage in its progress is about to leave the control of the finger 20 and, inasmuch as pressure is being exerted upon the cartridge by the fingers 20 and 44 in a line well above a diameter of the cartridge, the cartridge will be moved forcibly downward in the throat 42 until the finger 44 moves to the right, above the cartridge, to the position shown in Fig. 6. At this time the cartridge rests upon inclined supporting ways 60, formed in the bottom portion of the throat 42, in the position shown in Fig. 2, where it is ready to be engaged by the breech bolt 62 of the gun and rammed into the firing chamber. The dash line 64 in Fig. 2 indicates the plane of the top of the breech bolt 62 and if the cartridge, in its passage from the position illustrated in Fig. 5 toward that illustrated in Fig. 6, should encounter the breech bolt 62 it will merely be held down on the upper face thereof until the bolt has recoiled sufficiently to permit the cartridge to be forced down upon the supporting ways 60.

In its descent from the position shown in Fig. 5 to that shown in Fig. 6 the cartridge is also under the control of a retaining finger 66 which is pivoted upon a stationary pin 68 (Figs. 1 and 3) and is under the influence of a spring 70 tending always to move the finger in a counterclockwise direction as viewed in Figs. 3 to 6. A lug 72, upon which the force of the spring 70 is exerted, is integral with the finger 66 and limits the counterclockwise movement of the latter by engagement

with a portion of the frame 14, as shown in Fig. 3. The retaining finger 66 cooperates with the finger 44 to keep the cartridge continuously under control while the cartridge is on its way down in the throat 42 and at the end of the descent of the cartridge moves in above the cartridge case (see Figs. 2 and 6) to aid in holding the cartridge down accurately upon the ways 60.

The supporting ways 60 upon which the cartridge is deposited are inclined downward from the rear toward the front of the gun in order that the cartridge shall be in the position shown in full lines in Fig. 2, which is the correct position to ensure the proper entry of the cartridge into the firing chamber of the gun barrel. In this position the retaining finger 66 engages the cartridge case about midway of its length and cooperates with the rear loading finger 44 to retain the cartridge accurately upon the supporting ways. The broken lines in Fig. 2 show the position of the cartridge as its projectile end is just leaving the lower end of the front loading finger 46 but is still under the influence of the rear loading finger 44 and the retaining finger 66, these latter two fingers operating forcibly to move the cartridge down to its final inclined position. The motor M runs continuously and, through the gear G and friction clutch C, exerts a continuous torque upon the shaft 10 and feed wheels 16, 18, tending continually to advance the cartridge belt and the cartridges stripped therefrom, which it does as rapidly as the cartridges are removed from the supporting ways 60 by the reciprocating breech bolt 62 of the gun and it will be apparent that, with a motor of sufficient power, cartridges will be fed and kept under complete control at any rate which the gun may require.

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

The combination, with a gun having a reciprocating breech bolt and a receiver into the top of which cartridges are fed downward, of motor driven means for feeding an ammunition belt to the top of the receiver, means for separating a cartridge from the belt, cartridge supporting ways in the receiver adjacent to the breech bolt, loading fingers beneath the belt feeding means for receiving the separated cartridge, means for actuating the fingers to force said cartridge down upon said ways, and a retaining finger for holding said cartridge down on the ways until it is removed therefrom by the breech bolt during counter-recoil.

PAUL H. DIXON.

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