

[54] MACHINE GUN HAVING DUAL FEEDING MEANS FOR SELECTIVELY FEEDING CARTRIDGES

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[73] Assignee: **The United States of America as represented by the Secretary of the Army, Washington, D.C.**

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[52] **U.S. Cl.**..... **89/130, 89/198**

[51] **Int. Cl.**..... **F41d 11/06**

[58] **Field of Search** 89/129, 130, 198, 27 G

[56] **References Cited**

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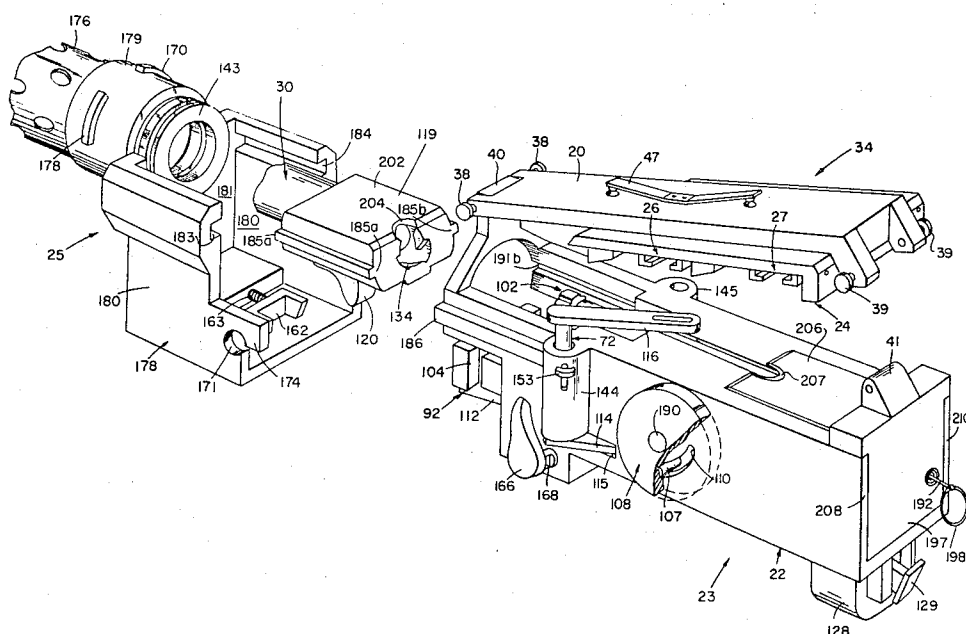
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[57] **ABSTRACT**

This disclosure relates to machine guns. Its features include: two feeding means mounted in tandem in a feed tray slideably mounted on the gun receiver for selectively feeding cartridges from two separate cartridge belts; receiver operating slide inertia control comprising energy absorption means responsive to the rate of movement of the operating slide effective to compensate for different cartridge propellant characteristics by absorbing increasing amounts of slide energy at increasing slide speeds; quick release mounting for the receiver and barrel including a retaining element, a receiver element removably supported in the retaining element and a barrel element removably supported both in the receiver element and the retaining element; a removable receiver back plate with locking means effective to prevent removal of the back plate when the operating slide springs are dangerously compressed in cocked position; an accelerator in contact with both the barrel actuator and the operating slide for immediate operation of the slide upon firing; a cable secured to the operating slide provided with a handle for cocking the operating slide; and a novel buffer for cushioning the movement of the barrel into firing position.

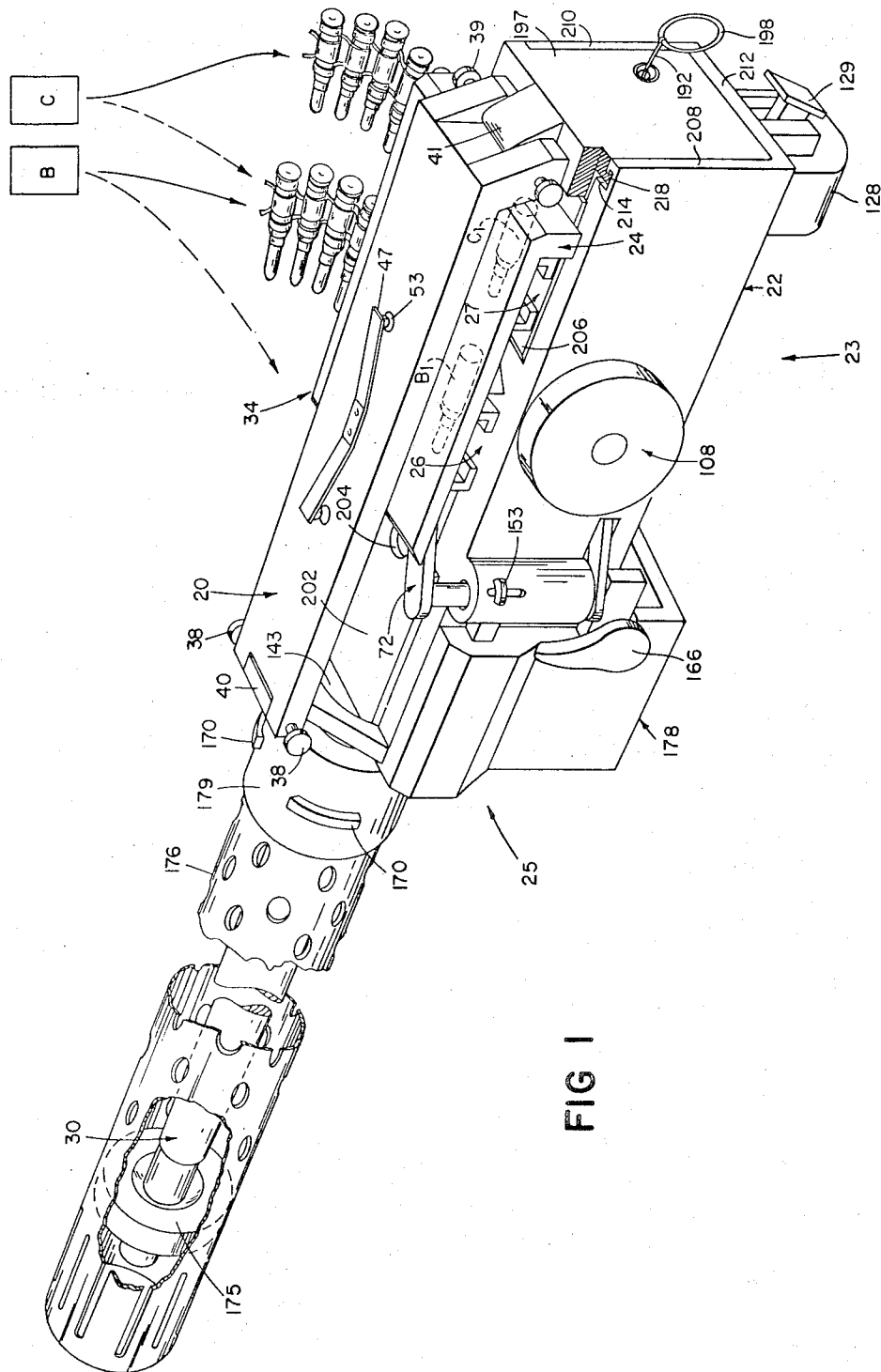
2 Claims, 14 Drawing Figures



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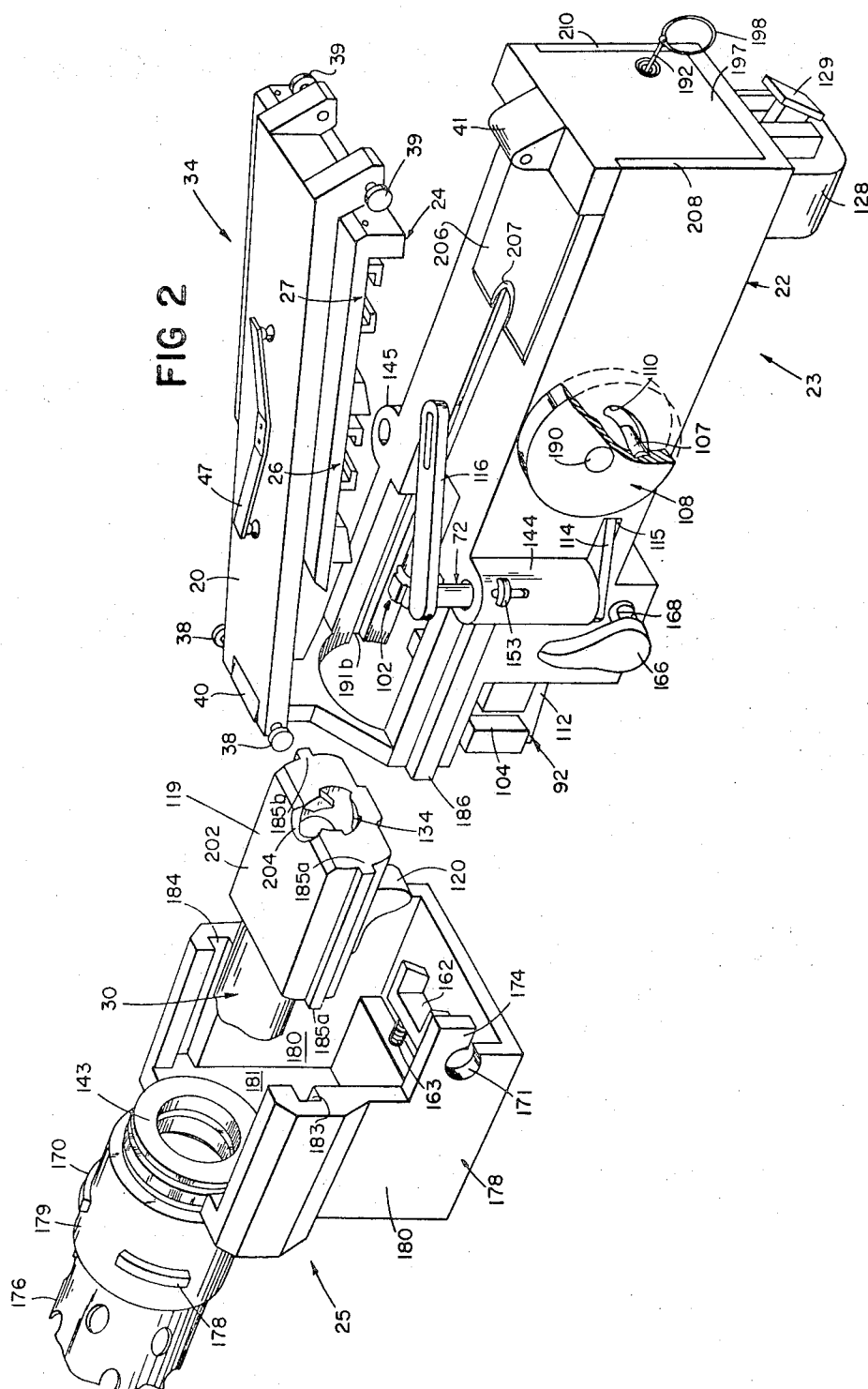
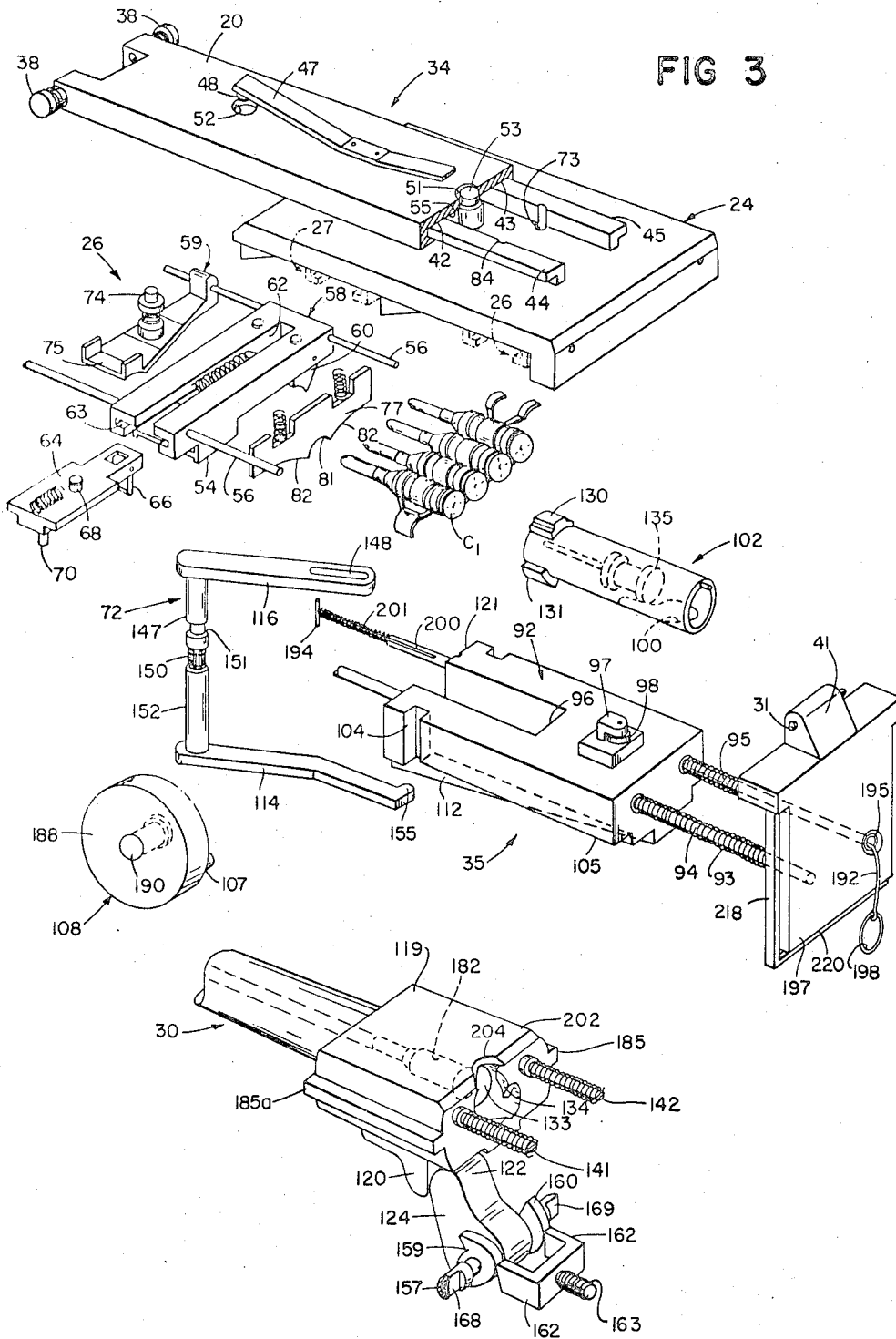


FIG 3



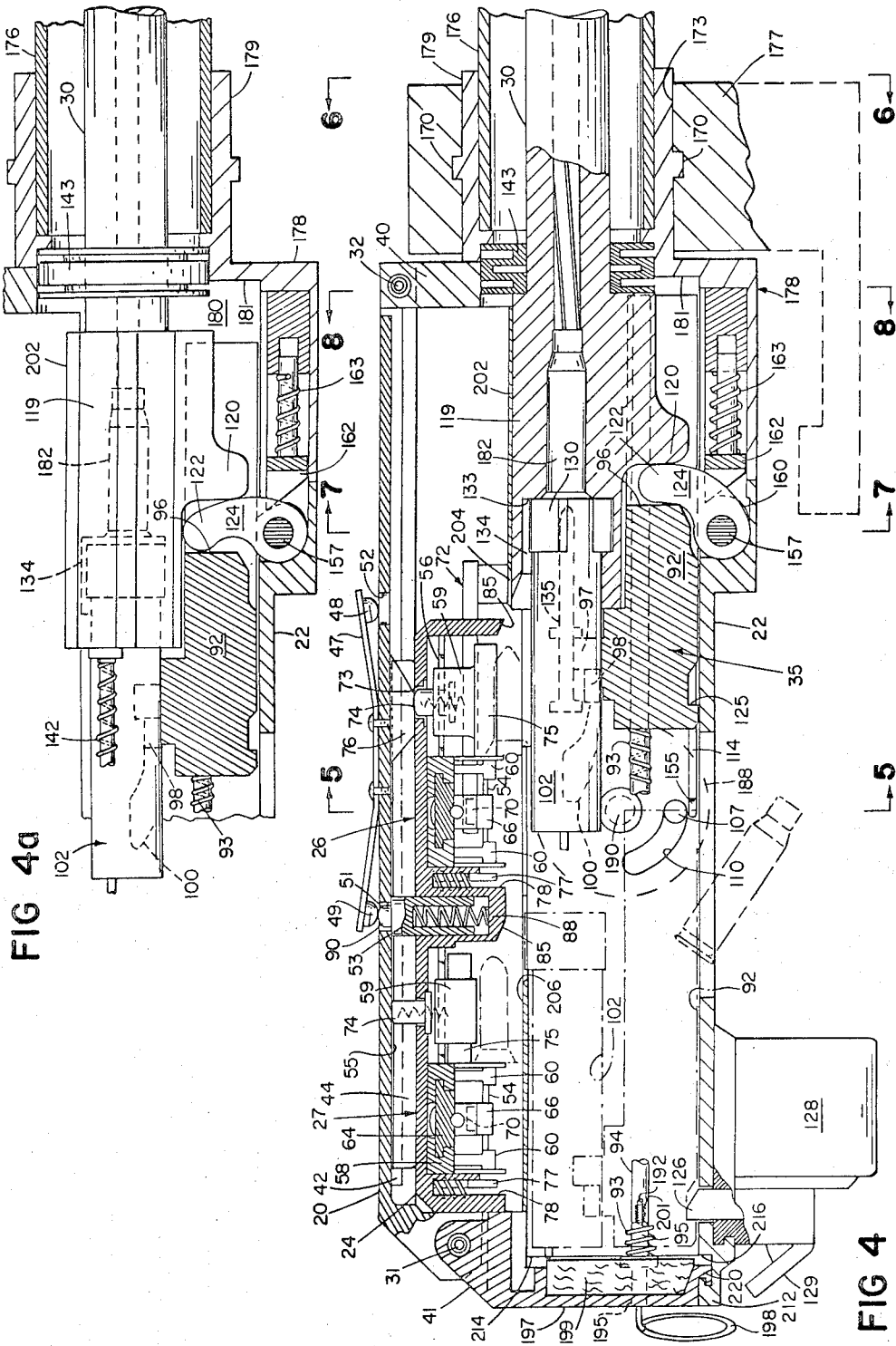
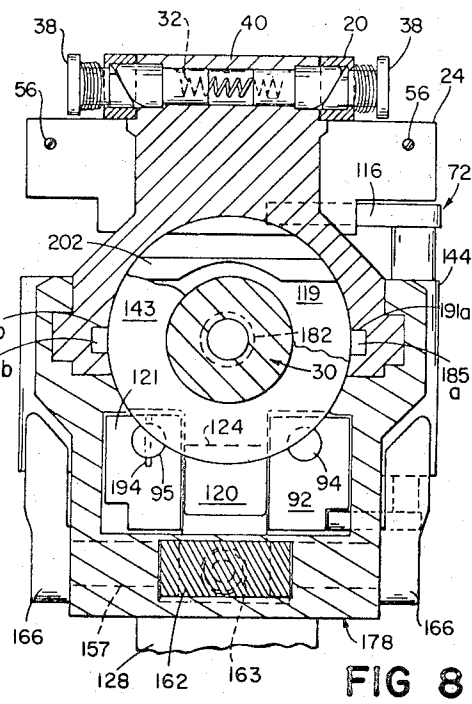
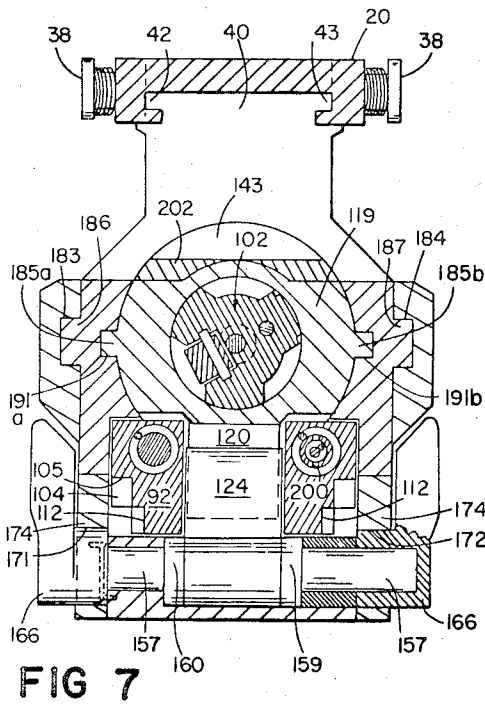
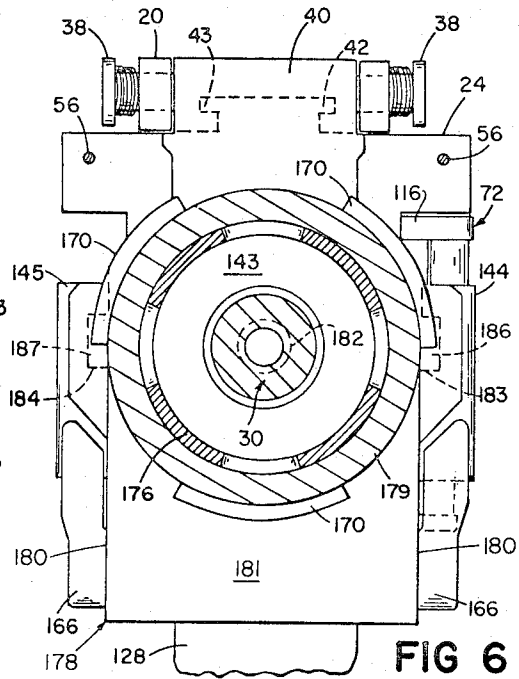
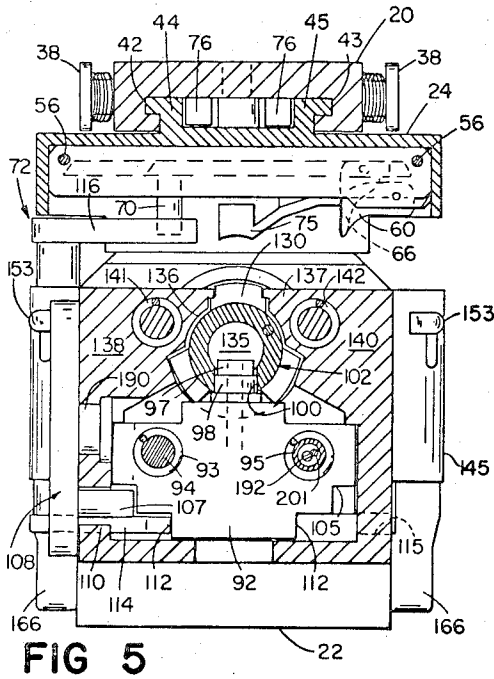
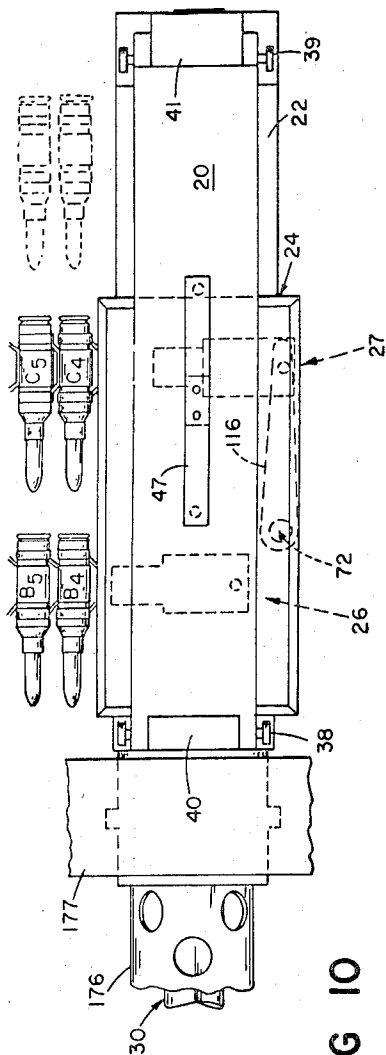


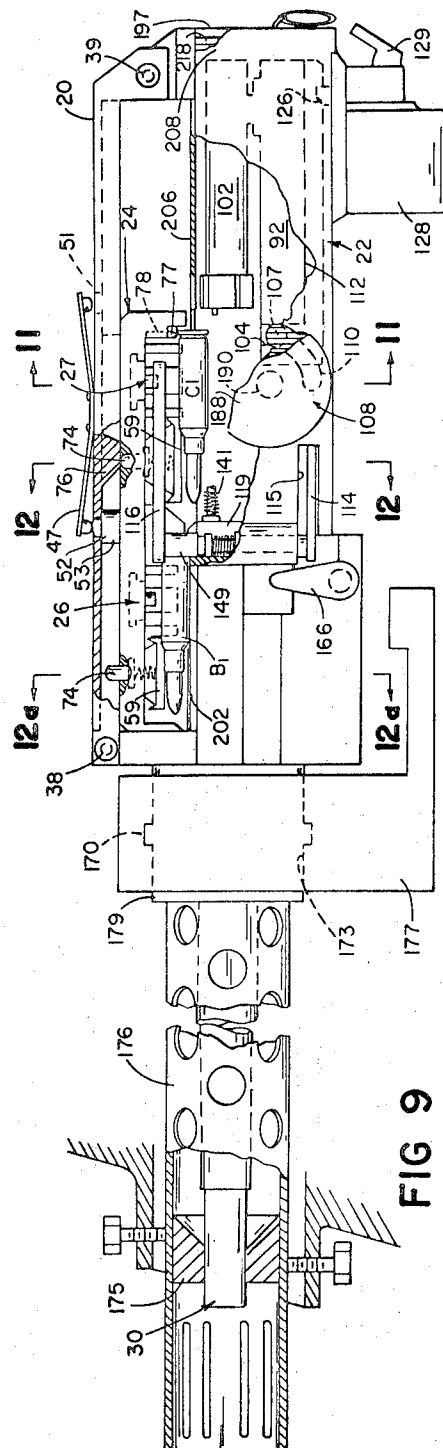
FIG 4a

FIG 4





○
●
●



96F

FIG 12a

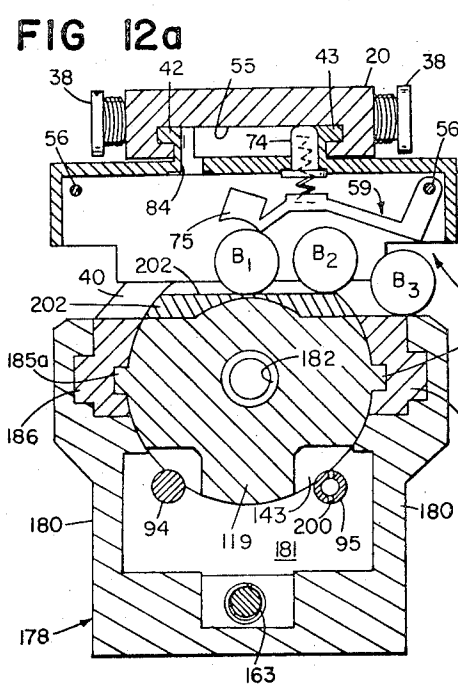


FIG 12

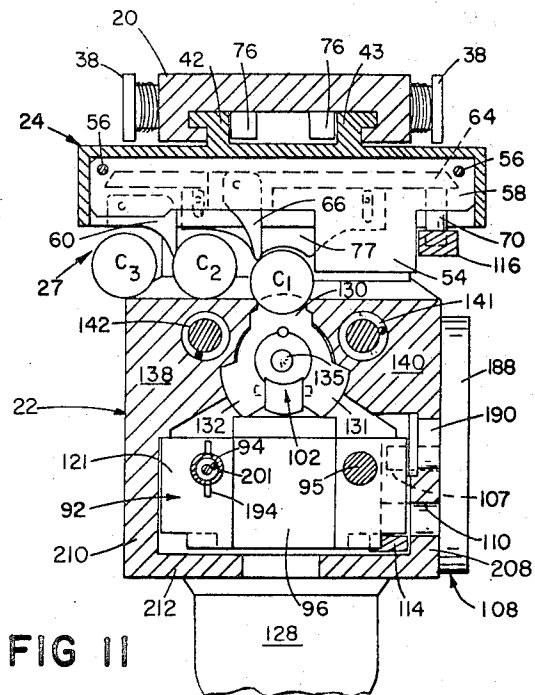
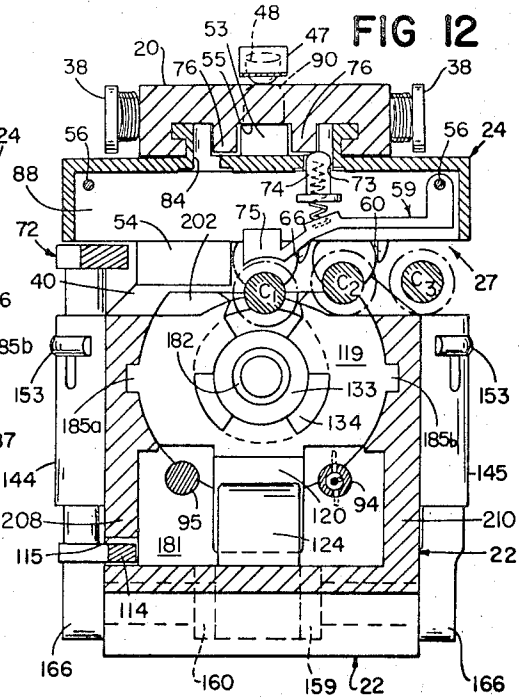


FIG 11

MACHINE GUN HAVING DUAL FEEDING MEANS FOR SELECTIVELY FEEDING CARTRIDGES

This application is a division of applicant's previously filed patent application Ser. No. 40,168 filed May 25, 1970, now U.S. Pat. No. 3,680,432 issued Aug. 1, 1972.

The invention herein described was made in the course of or under a contract or subcontract thereunder with the Department of the Army.

This invention relates to improvements in machine guns.

There is currently available a selection of special purpose ammunition for use in the M-73 machine gun as adapted for vehicular installation, including NATO ammunition and armor piercing flechette. Unfortunately, selectable use of such ammunition in tank installations has in part been hampered by the difficulty of changing cartridge belts due to limited loading access provided therein. However, improvement of the ease of cartridge selection in such installations is critically needed due to the rapidly changing nature of targets encountered. Space limitations also complicate another aspect of the machine gun servicing in tank installations which is the changing of overheated barrels.

Also, there is needed compensation for the difference in recoil energy transmitted to the breech mechanism by the discharge of cartridges having varying propellant characteristics. Absent such compensation, should the breech recoil absorbing mechanism be set properly for the high energy cartridge, use of a low energy cartridge would result in runaway firing.

Accordingly, it is a major object of the present invention to provide a dual feed mechanism capable of immediate cartridge selection from two cartridge belts.

It is another object of the invention to provide automatic compensation for excess recoil energy of the breech enabling concurrent use of cartridges having different propellant energy characteristics.

Accordingly, the above objects are accomplished in one respect by providing, in a machine gun having a receiver with a cartridge feeding aperture, dual feed means mounted on said receiver for selective feeding to said receiver of two types of cartridge. Preferably, such dual feed mechanism consists of two separate feeding means mounted in tandem alignment in a feed tray slideably moveable for selectively feeding cartridges alternatively from two separate cartridge belts engaged in the feeding means into the breech mechanisms for loading and firing. There may be provided cartridge lifting means for lifting the cartridges during their movement into a non-feeding position. Also there may be included a slide operated feed lever detachably mounted on the receiver for selectively operating one of the feeding means in either the right hand or left hand direction.

In another respect the invention features in a machine gun having a reciprocating operating slide moved from and to a firing position in recoil by firing of a cartridge and in counter recoil by spring means, the improvement comprising operating slide inertia control means comprising energy absorption means responsive to the rate of movement of the operating slide effective to absorb increasing amounts of slide energy at increasing slide speeds, such mechanism preferably consisting of an inertial fly wheel, rotatably mounted on the machine gun receiver, having cam means for driving it.

Preferably, it operates in both directions during the terminal portion of slide reciprocation most remote from the firing position ensuring proper operation of the slide despite variation in recoil force developed by different cartridges.

In a further respect the invention features a machine gun especially adapted for tank installation in that it features quick release mounting means for its receiver and barrel including a retaining element, a receiver element removably supported in the retaining element and a barrel element removably supported both in the receiver element and the retaining element.

Still other features of the invention consist of a cable secured to the operating slide passing rearwardly through the rear wall of the receiver, provided with a handle for moving the operating slide to its cocked position, and a novel buffer means for cushioning the movement of the barrel into firing position.

For the purposes of more fully explaining the above and still further objects and features of the invention, reference is now made to the following detailed description of a preferred embodiment thereof, together with the accompanying drawings, wherein:

FIG. 1 is an isometric view of the dual feed machine gun according to the present invention with the forward portion of the barrel broken away;

FIG. 2 is an isometric disassembled view of the gun of FIG. 1;

FIG. 3 is an isometric disassembled view of internal mechanisms of the gun of FIG. 1 showing the barrel assembly and the feed tray separated from the breech assembly;

FIG. 4 is a longitudinal sectional view of the gun of FIG. 1, with the operating slide in the firing position;

FIG. 4a is a sectional view of the breech shown in FIG. 4 with the barrel, accelerator and slide displaced rearwardly in the cocked position;

FIG. 5 is a transverse sectional view of the machine gun receiver taken along line 5-5 of FIG. 4;

FIG. 6 is a transverse sectional view of the machine gun receiver taken along line 6-6 of FIG. 4;

FIG. 7 is a transverse sectional view of the machine gun receiver taken along line 7-7 of FIG. 4;

FIG. 8 is a transverse sectional view of the machine gun receiver taken along line 8-8 of FIG. 4;

FIG. 9 is a side view of the gun of FIG. 1 with portions cut away with both feed mechanisms loaded with tandem-aligned cartridge belts;

FIG. 10 is a top view of the gun shown in FIG. 11 showing the two tandemly-aligned cartridge belts;

FIG. 11 is a transverse sectional view of the machine gun receiver taken along line 11-11 of FIG. 9;

FIG. 12 is a transverse sectional view of the machine gun receiver taken along line 12-12 of FIG. 9;

FIG. 12a is a transverse sectional view of the machine gun receiver taken along line 12a-12a of FIG. 9.

Referring generally to the drawings, the mechanism of the present invention in its preferred embodiment, as best shown isometrically as assembled in FIG. 1 and disassembled in part in FIG. 2, is designed to replace the M73 machine gun in all of the vehicles currently employing that weapon. Of particular interest is the compact design of the receiver 22 and dual feed assembly 34 of the present invention which accommodates two belt feed mechanisms described hereinafter all without exceeding the space envelope of the M73 receiver element. Thus, in FIG. 1 is shown feed tray

bracket 20 mounted on the rectangular receiver shown generally as 23, for slideably supporting feed tray 24 containing two separate belt feed mechanisms 26 and 27 for alternatively feeding cartridges, which may have differing propellant characteristics, contained in separate cartridge belts all as hereinafter more fully described. The receiver 22 is provided with an operating slide 92 having an inertia control with energy absorption means in the form of a rotary bounce controller system 108 for controlling the operation of slide 92 (see FIG. 3) by absorbing increasing amounts of slide energy at increasing slide speeds to compensate for differing cartridge propellants and a slide operated feed lever 72 for actuating a given belt feed mechanism responsive to reciprocal travel of said slide, all as hereinafter more fully explained.

FIG. 2, being an exploded view of FIG. 1, shows the machine gun major subassemblies disassembled, including dual feed assembly 34, a novel quick release mounting assembly including a retaining element shown generally at 25, a removable barrel 30 and receiver assembly shown generally at 23, all for expediting barrel changing under operating conditions in the field.

As seen in FIGS. 1, 2, 3, and 4, the dual feed assembly 34 mounted on the receiver for selective feeding of two types of cartridge comprises a feed tray bracket 20 detachably hinged at opposite ends by hinge latches 38 and 39 (see FIGS. 4, 5, and 8). Each hinge latch consists of a spring loaded plunger (see FIG. 8) having wedge shaped ends for engaging latches 31 and 32 provided in mounting brackets 40 and 41 secured to opposite ends of receiver assembly 22. Channels 42 and 43 are included in the lower surface of feed tray bracket 20 slideably to engage longitudinal rails 44 and 45 provided on the top of feed tray 24 (see especially FIG. 3 where feed tray bracket 20 is partially broken away), such that feed tray 24 is moveable longitudinally relative to the receiver from a rear feeding position shown in FIGS. 1 and 4 to a forward feeding position shown in FIG. 9, each adjacent the receiver cartridge feeding aperture. Leaf spring 47, being positioned along the longitudinal axis of feed tray bracket 20 and secured to the central portion thereof, is provided with rounded projections 48 and 49 for alternate insertion in latch seats 51 and 52 respectively to urge tray latch 53 out of engagement with a given seat to unlock feed tray 24. A longitudinal groove 55 extends along the central axis of the lower surface of feed tray bracket 20 passing beneath seats 51 and 52 for guideably receiving tray latch 53 projecting upwardly from feed tray 24 when said tray latch is not in engagement with either seat 51 or 52. Also a rectangular round stop 54 (see FIGS. 3 and 11) is provided for positioning a terminal cartridge within receiver 22.

Also included in the feed assembly 34 are two axially spaced identical belt feed mechanisms 26 and 27 aligned in tandem and contained in transverse slots provided in feed tray 24. Each feed mechanism, as seen in FIGS. 3 and 4, comprises two like longitudinal pins 56 extending the length of feed tray 24 for fixedly mounting in transverse alignment with said feed tray a slide guide 58 and rotatably mounting a cartridge depressor 59 positioned forward of each slide guide 58. Each slide guide 58 is provided with spring loaded holding pawls 60 for engaging a cartridge (i.e., C_2 seen in FIG. 11) disposed in an ammunition belt, a down-

wardly extending stop 54 for positioning the terminal cartridge, i.e., C_1 , a spring, a transverse groove 62 and a channel 63 for slideably receiving a feed slide 64 for reciprocal movement therein. Each feed slide 64 is provided with a downward extending spring loaded feed pawl 66 rotatably mounted on said slide for engaging the terminal cartridge (i.e., C_1) in the ammunition belt being fed, a guide post 68 for engaging groove 62 and a journal 70 for connection with belt feed lever 72. Each cartridge depressor 59 includes a top mounted spring plunger 74 extending through respective opening 73 and curved tip 75 for engaging the projectile end of a cartridge to be loaded to tilt said cartridge downwardly. Disposed transversely intermediate pins 56 but not in engagement therewith, a rear cartridge guide 77, also included in each belt feed mechanism, is respectively slideably received in transverse slot 78 provided in feed tray 24 positioned respectively rearwardly from each slide guide 58. Being spring loaded to exert a downward force on the primer end of a cartridge to be loaded, each rear cartridge guide 77 is provided with a central groove 81 and cam surface 82 inclined upwardly in a left or right hand direction as required for cooperation with said cartridge during feeding. Spring relief cams 76, having inclined front and rear surfaces, project downwardly from feed tray bracket 20 from a position offset of and adjacent channels 42 and 43, for depressing plunger 74 for urging cartridge depressor 59 of belt feed mechanism 26 downwardly into engagement with the projectile end of a cartridge contained therein only when said belt feed mechanism occupies the mid feeding position directly below leaf spring 47 shown in FIG. 4 and adjacent the cartridge feeding aperture.

The construction of belt feed mechanism 26 and 27 are such that, by respectively removing pins 56, cartridge depressor 59 and slide guide 58 containing feed slide 64 may be reoriented 180° and remounted on said pins to convert the direction of feeding from right hand as shown in FIG. 1 to left hand feed, belt feed lever 72 also being reversed to accomplish this. To permit such reorientation, opening 84 is provided respectively adjacent each opening 73 in feed tray 24, offset to the right of the center line of said tray for receiving plunger 74. Surfaces 85 inclined downwardly and forwardly are provided on the front wall and intermediate wall 88 of feed tray 24 to assist in guiding a cartridge during loading for chambering. Tray latch 53, consisting of a spring loaded piston contained in a cylindrical chamber 86 provided in the intermediate wall 88 of feed tray 24, is provided with a tip 90 for alternatively engaging latch seat 51 when said feed tray is in the rear position and latch seat 52 when said feed tray is in the forward position. As seen in FIG. 4, when feed tray 24 is in the rear position, feed mechanism 26 is positioned in the central portion of receiver assembly 22 adjacent rear barrel extension 119 and thus occupies the mid feeding position adjacent the cartridge feeding aperture, and when said feed tray is in the forward position, feed mechanism 27 is in the mid feeding position.

Included in the breech mechanism 35 shown in FIGS. 3, 4 and 5 is operating slide 92 mounted in receiver 22 for reciprocal movement in recoil from a forward firing position to a rear cocked position. It is slideably mounted on two axial drive spring guides 94 and 95 having coiled operating springs 93 mounted on removable back plate 197.

Back plate 197 is mounted on receiver 22 in such manner as to prevent the dangerous release of operating springs 93 when the gun is cocked. To this end, locking means is provided in the form of cooperating "L" slides supporting both plate 197 in said receiver for movement thereof in a direction perpendicular to the direction of force of springs 93. More specifically, receiver 22 is provided with internal "L" section side grooves 208 and 210 and bottom groove 212, while back plate 197 is provided with cooperating "L" section side tongues 214 and bottom tongue 216. Grooves 208, 210 and 212 are of a width sufficient to accept tongues 214 and 216, but the force of springs 93 tends to lock the tongue and groove configuration locking lips into overlapping condition effective in the installed locked position to prevent sliding release of the back plate in the receiver.

Operating slide 92 has side arms with inner walls joined by connecting wall 96 and is provided with an upwardly extending bracket 97 horizontally supporting roller 98 for engaging cam surface 100 provided in rotary front locking bolt 102. On the opposite outer vertical side walls of slide 92, vertical cam surfaces 104 and horizontal cam surfaces 105 are provided for cooperation with lug 107 projecting inwardly from rotary bounce control system 108 through arcuate slot 110 (see FIG. 4) contained in the side walls of receiver 22. Also provided on opposite sides of slide 92 are inwardly and rearwardly sloping vertical cam surfaces 112 extending longitudinally inwardly below horizontal cam surface 105 for cooperation with the operating lever 114 of belt feed lever 72. When in the forward closed position (see FIG. 4), slide 92 extends beneath rear barrel extension 119 formed integrally with barrel 30, having a downwardly projecting actuator 120, to urge arcuate accelerator 124 pivotally disposed within receiver 22 into intimate contact with connecting wall 96 when slide 92 is in firing position. Notch 125 is also provided in the bottom of operating slide 92 for engaging sear 126 extending vertically from rear mounted trigger mechanism 128 secured to the base of receiver 22 to lock said slide in the open bolt, cocked position. Preferably trigger mechanism 128 is solenoid operated and is provided with a manual trigger 129.

As seen in FIG. 5, bolt 102, being horizontally supported by slide 92 with roller 98 in engagement with cam surface 100 and the top of bracket 97 adjacent the base of firing pin 135, is laterally supported by inner curved surfaces 136 and 137 of opposite inwardly projecting shoulder members 138 and 140 of receiver 22. Adjacent ends of shoulder members 138 and 140 are spaced to permit lug 130 to project upwardly from bolt 120 for engaging the base of a cartridge (i.e., C₁ seen in FIG. 11) positioned thereabove by feed mechanism 26 during counter recoil of slide 92. Disposed on the barrel end of bolt 102 are three lugs 130, 131 and 132 for rotatably engaging cam surfaces of locking ring 134 provided in rear barrel extension 119 for locking said bolt securely against rear barrel face 133. Longitudinally disposed within shoulder members 138 and 140 are two shaft mounted barrel springs 141 and 142 for absorbing recoil energy and returning barrel assembly 30 to its firing position. Secured in mounting block 25 surrounding its central opening through which barrel 30 extends is barrel buffer spring 143 for cushioning the movement of said barrel into firing position, said buffer spring having a central opening through which

said barrel extends and a plurality of peripheral radial slots extending from its inner and outer periphery and overlapping one another to a major extent. A stop is provided on barrel 30 in the form of a shoulder for engaging buffer spring 143.

As seen in FIGS. 1 and 2, feed arm 72, having a vertically arranged shaft member pivotally mounted in a detachable manner in sleeve 144 secured to the left wall of receiver 22, is provided with a top mounted feed arm 116 extending horizontally to engage journal 70 of belt feed mechanism 26 with elongated slot 148, and a bottom mounted angular operating arm 114 extending horizontally through elongated opening 115 provided in receiver 22 to engage cam surface 112 of slide 92 during the reciprocal travel of said slide. The vertical shaft member of feed arm 72 includes shaft sleeve 147 splined to receive shaft 150 extending upwardly from post 152 of greater diameter. Being spring loaded (see FIG. 9), shaft sleeve 147 is slideably moveable on shaft 150 in a vertical plane responsive to manual displacement of depressor 153 mounted on housing 144 and having a tip engaging recess 151 provided on said shaft sleeve, for displacing feed arm 116 relative to journal 70 for disengagement therefrom. A like housing 145 is provided on the right wall of receiver 22 for mounting feed lever 72 therein for cooperation with slide 92 and operating feed mechanism 26 when aligned for left hand feed.

As seen in FIGS. 3 and 4, accelerator 124 is rotatably mounted on transverse shaft 157 intermediate return cams 159 and 160 secured to said accelerator, said shaft being rotatably journaled in opposite walls of receiver 22 to position said accelerator below barrel extension 119 with arcuate tip 122 in contact both with barrel actuator 120 and forward slide face 96 in firing position for immediate actuation of said slide upon firing. Plunger actuated wedge members 162 are continually urged by spring 163 against return cams 159 and 160 tending to rotate accelerator 124 in a clockwise direction as viewed in FIG. 4 toward accelerator 120 to maintain contact therewith. Disposed at the terminal ends of shaft 157 are like latch handles 166 for manually rotating said shaft to orient recesses 168 and 169 for locking and unlocking receiver 22 with respect to mounting block 178.

The quick release mounting assembly includes retaining element 25, a perforated barrel guard 176, and a mounting block 178 with barrel buffer spring 143 at the receiver end and barrel positioning guide tube 175 within the surrounding flash suppressor portion of guard 176 at the muzzle end, block 178 being formed integrally with conventional mounting ring 179 provided with locking lugs 170. As seen in FIGS. 4 and 9, the mounting assembly is rigidly supported by support 177 (e.g., a tank turret mount) having an aperture 173 for engaging mounting ring 179 of construction similar to the mounting ring used on the M73 tank machine gun. Having a front wall 181 with a central bore perpendicular thereto, a pair of vertical side walls 180 laterally spaced on each side of said central bore and a horizontal base, mounting block 178 includes a generally rectangular interior space for receiving the forward portion of receiver 22 and is provided with arms 174 extending rearwardly including apertures 171 and 172 each having lower open sector partially cut away such that the portions of shaft 157 containing recesses 168 and 169 may be received within said apertures. Hori-

zontal internal slide ways 183 and 184 parallel to said central bore and with open ends remote therefrom are contained in opposite walls 180 for supporting external receiver slide guide rails 186 and 187 (see FIGS. 2 and 7) positioned on opposite side walls of receiver 22 for removably supporting said receiver in said mounting block. Latch handles 166 are admitted to apertures 171 and 172 only when recesses 168 and 169 are properly aligned. Rotating shaft 157 by means of latch handle 166 arranges latch recesses 168 and 169 in the enclosed sector of apertures 171 and 172 for holding mounting block 178 in secure engagement with receiver 22. With receiver 22 thus locked, barrel 30 is held in proper alignment by internal slide slots 191a and 191b provided in the inner walls of receiver 22 which slideably receive rails 185a and 185b provided on rear barrel extension 119, a stop being provided to limit rearward movement of said barrel in said receiver. A chamber 182 is provided in rear barrel extension for receiving a cartridge to be fired.

The slide inertia controlling rotary bounce flywheel system 108 (see FIGS. 1, 2, 4, and 9) has operating cam means including a cam follower lug 107 extending inwardly through arcuate slot 110 of less than 90° angular extent for cooperation with horizontal cam surface 105 and vertical cam surface 104, the latter of which serves to rotate said flywheel only during the terminal portion of operating slide reciprocation from the firing position, both during recoil and counter recoil of operating slide 92. Central journal 190 of said system is received in a bearing provided in the midsection of the left wall of receiver 22. Inertial wheel 188 of substantial mass is rotatably supported on journal 190 in a vertical plane parallel with said left wall.

Disposed within drive spring guide 95, charging cable 192 (see FIG. 3) secured by T-bolt 194 at one end and provided with circular handle 198 at the other free end extends through opening 195 in back plate 197 mounted at the rear of receiver 22. A longitudinal slot 200 is provided in drive guide 95 through which tee bolt 194 reaches to engage the front wall 121 of slide 92 when in the forward position. During reciprocal displacement of slide 92 during firing, charging cable 192 remains stationary, as T-bolt 194 and charging cable 192 are held at the forward end of slotted guide 95 by cable return spring 201. However, when cocking of the breech is desired, handle 198 may be manually pulled, to withdraw T-bolt 194 and retract slide 92, the force of the drive springs 93 being overcome.

Mounted on top of rear barrel extension 119 is lifter plate 202 having an inclined cam ramp 204 for guiding a cartridge (i.e., B₁ as seen in FIG. 9) upwardly when feed tray 24 is moved to the forward feeding position for avoiding interference of said cartridge with said rear barrel extension. A similar ramp plate 206 having a cam ramp 207 is provided in the rear portion of receiver 22 for guiding cartridge C₁ contained in feed mechanism 27 upwardly during rearward travel of feed tray 24.

For loading, feed tray bracket 20 is released from bracket 41 by depressing hinge latch 39, permitting said feed tray bracket and feed tray 24 to be arcuately raised, being hinged by latch 38. Terminal portions of two ammunition belts transversely aligned in tandem on the right side of receiver 22 are laid on the top of said receiver directly beneath belt feed mechanisms 26 and 27 contained in elevated feed tray 24, whereupon

feed tray bracket 20 is lowered and relatched to bracket 41. If desired, feed tray bracket 20 may alternatively be released at the forward end from bracket 40 by depressing like hinge latch 38. Upon relatching of feed tray bracket 20, respective belt feed mechanisms 26 and 27 engage the terminal cartridges in the cartridge belts and belt feed lever 72 engages journal 70 of feed mechanism 26 positioned in the mid feeding position of the receiver 22 shown in FIG. 4.

When it is desired to change the cartridge belt to be fed and fired, the rear portion of leaf spring 47 is manually depressed to drive projection 49 against tray latch 53, unlocking feed tray 24 from feed tray bracket 20. By manually depressing lever 153, belt feed lever 72 is displaced downwardly out of engagement with journal 70 contained in belt feed mechanism 26. Being free to slide along rails 44 and 45, feed tray 24 is manually transported forwardly to align belt feed mechanism 27 in the mid feeding portion of receiver 22 shown in FIG. 4.

As belt feed mechanism 26 moves forward to occupy a position above rear barrel extension 119, plunger 74 rides upwardly on the forward incline of spring relief cam 76, lifting cartridge depressor 59 away from cartridge B₁ of the forward cartridge belt permitting said cartridge to be ramped up by lifter plate 202. As belt feed mechanism 27 reaches the mid feeding position, tray latch 53 automatically engages latch seat 52 and respective plunger 74 of said belt feed mechanism is cammed down by spring relief cam 76 urging respective cartridge depressor 59 against the within carried terminal cartridge C₁ for urging said cartridge downward for loading through the receiver cartridge feed aperture (see FIGS. 12 and 12a). Release of lever 153 allows belt feed lever 72 to rise responsive to spring force to automatically engage respective journal 70 of belt feed mechanism 27. Belt feed mechanism 27 is now ready to feed rounds from the selected belt immediately following the change of position of feed tray 24, thereby providing first round selectability, as is an important feature. No displacement of cartridge belt containers (i.e., ammunition boxes) is needed to facilitate reciprocal movement of feed tray 24 as standard cartridge belts have sufficient flexibility in a 9" length to bend the required 3.5" traverse.

The breech mechanism, similar in principle to that of the 7.62 MM M60 mechanism, is cocked by retracting operating slide 92 rearwardly to cocked position in receiver 23 by means of charging cable 192 until sear 126 engages notch 125. As slide 92 is transported rearwardly, along guide tubes 94 and 95, the rounded tip 155 of operating lever 114 rides on cam surface 112, being cammed outwardly to rotate belt feed lever 72 (see FIG. 11), and drive feed slide 64 transversely inwardly within slide guide 58 with feed pawl 66 displacing cartridge C₁ inwardly to abut stop 54 for alignment with bolt 102 and chamber 182. As cartridge C₁ is moved inwardly, cartridge C₂, being linked thereto, passes inwardly beneath holding pawl 60 until said pawl engages the outer edges of cartridge C₂ for preventing outward displacement.

The breech consisting of bolt 102 and slide 92 is released from the open bolt position by manually depressing trigger 129 and is driven in counter recoil toward chamber 182 by drive springs 93 mounted on drive guides 94 and 95 on back plate 197 to engage accelerator 124 and abut rear barrel face 133 to close the breech. Bolt 102, being carried forwardly by bracket

97 on slide 92, passes directly beneath the former position of cartridge C₁ with lug 130 stripping said cartridge from its link. Being tilted downwardly by cartridge depressor 59, cartridge C₁ is guided into chamber 182 by surface 85 and by the tapered rear opening of locking ring 134. As bolt 102 closes against the rear face 133 of barrel 30 lugs 130, 131 and 132 ride in cam surfaces in locking ring 134 to rotate said bolt 60° and cam cartridge C₁ home, whereupon bracket 97 drives firing pin 35 into the primer of cartridge C₁ for firing. During forward transport of slide 92, operating lever 114 rides inwardly along cam surface 112 permitting belt feed lever 72 to swing inwardly responsive to spring force, driving feed slide 64 and feed pawl 66 transversely outwardly to engage cartridge C₂ for feeding.

After firing the chambered cartridge, barrel 30 moves rearwardly in recoil a limited distance and actuator 120, being in intimate contact with accelerator 124, immediately drives said accelerator against operating slide 92 for immediate acceleration thereof. A slide 92 is accelerated rearwardly in recoil, roller 98 first moves along the dwell portion of cam surface 100 providing an interval between the start of said slide's rearward motion and the start of bolt 102 unlocking, thereby permitting continuous control of said slide by accelerator 124. After accelerator 124 drives slide 92 to a velocity of about 25.4 feet per second, bolt 102 is rotated by roller 98 riding along the rear portion of cam surface 100 and unlocked from locking ring 134. At the time of unlocking of bolt 102, residual pressure within chamber 182 imparts up to 1.0 lb.-second impulse to the body of bolt 102 to maintain breech velocity in recoil at about 24.0 feet per second until arrested by rotary bounce inertia controller system 108. Excess recoil energy of the barrel assembly 30 is absorbed by springs 141 and 142, which later release this energy to return barrel 30 in counter recoil to its firing position.

During the recoil stroke of slide 92, the spent cartridge case is extracted and ejected downwardly through an aperture in receiver 22, the twin operating springs 93 are compressed and the belt feed lever 72 cranks feed slide 64 transversely in slide guide 58 of a given belt feed mechanism, positioning a new cartridge above bolt 102 in the feed tray 24.

As slide 92 retreats in recoil, cam post 107 extending inwardly from rotary bounce inertia controller system 108 rides first along horizontal cam surface 105 and thence is engaged by vertical cam surface 104 to rotate rotary bounce controller 108 backwardly through an arc of slightly less than 90° (see FIGS. 3 and 9). Rotation of the inertial wheel 188 of the bounce controller 108 arrests slide 92 with a cushioning effect at the end of the recoil stroke. More significantly, during counter recoil of slide 92, counter rotation of rotary bounce controller 108, caused by lug 107 being driven arcuately downwardly along cam 104, retards the beginning of the counter recoil stroke to permit the cartridge being fed additional time to settle in front of bolt lug 130, absorbs excess slide energy due to high energy cartridges, permits sear 126 additional time to engage notch 125 after trigger 129 is released and permits use of a simple buffer pad in base plate 197.

The releasable locking means normally locks the receiver element in the retaining element with the barrel element supporting portion between the retaining element front wall and the receiver element rear stop with the barrel extending through said retaining element

bore. To remove barrel 30 from the machine gun, as may be necessary under combat conditions, receiver 22 is unlocked from mounting block 178 by turning the releasable locking latch handle 166 ¼ of a turn to clear shaft 157 from apertures 171 and 172. After unlocking, receiver assembly 22 is withdrawn rearwardly 2 ½ inches until receiver guide rails 186 and 187 clear ways 183 and 184 to disengage said receiver 22 and the within contained breech assembly 35 from the mounting assembly 25. The rear barrel extension 119 being thus exposed, barrel 30 may then be pulled rearwardly a distance of 20 inches for complete disengagement from mounting block 178. Thus, sliding movement of the receiver element away from the retaining element front wall upon release of the locking means frees the receiver element from both the retaining element and the barrel element for subsequent removal of the barrel element from the retaining element by movement of the barrel element through the receiver element central opening. Thereafter a second barrel assembly may be inserted in barrel guard 176 all without special realignment and bore sighting.

For removal of receiver back plate 197, it is first necessary to uncock the gun, since until this is done the pressure of springs 93 prevents manual release of its locking lip means by pushing it forward. However, in uncocked position in which springs 93 are not so highly compressed as to be dangerous, forward hand pressure on back plate 197 will move it forwardly to release the locking lips so that plate 197 can be slid transversely to remove it.

What is claimed is:

1. In a machine gun having a receiver with a reciprocating operating slide mounted therewithin moved from and to a firing position in recoil by firing and in counter recoil by spring means, the improvement which comprises a rotary inertia member pivotally mounted on an outer side of said receiver, a substantially 90° arcuate slot through said outer side disposed radially outwardly from the pivotal axis of said inertia member and adjacent the periphery of said inertia member, the forward terminus of said slot being disposed substantially along a vertical line passing through said pivotal axis and the rearward terminus of said slot being disposed substantially along a horizontal line passing through said pivotal axis and rearwardly of said pivotal axis, a lug carried by said inertia member disposed to extend through said arcuate slot normally at the forward terminus thereof incident to said slide being disposed in the firing position, said inertia member and said lug being disposed opposite and adjacent to the rear end of said slide normally in the firing position thereof, said slide having a vertical cam slot adjacent to the front end thereof on the side adjacent to said inertia member, said cam slot being disposed for engagement with said lug in response to recoil movement of said slide thereby to bring said cam slot into engagement with said lug and rotate said inertia member sufficiently to dispose said lug at the rearward terminus of said arcuate slot with the result that a locking effect is provided at the end of the recoil stroke of said slide.

2. The invention as defined in claim 1 and wherein said vertical cam slot is of a length coextensive with the vertical distance of movement of said lug from the forward terminus of said arcuate slot to the rearward terminus thereof, said lug and said vertical cam slot being responsive to counter recoil action of said spring means to move said lug downwardly in said vertical cam slot thereby rotating said inertia member in an opposite direction and delaying counter recoil movement of said slide until said lug clears the lower edge of said vertical cam slot.

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