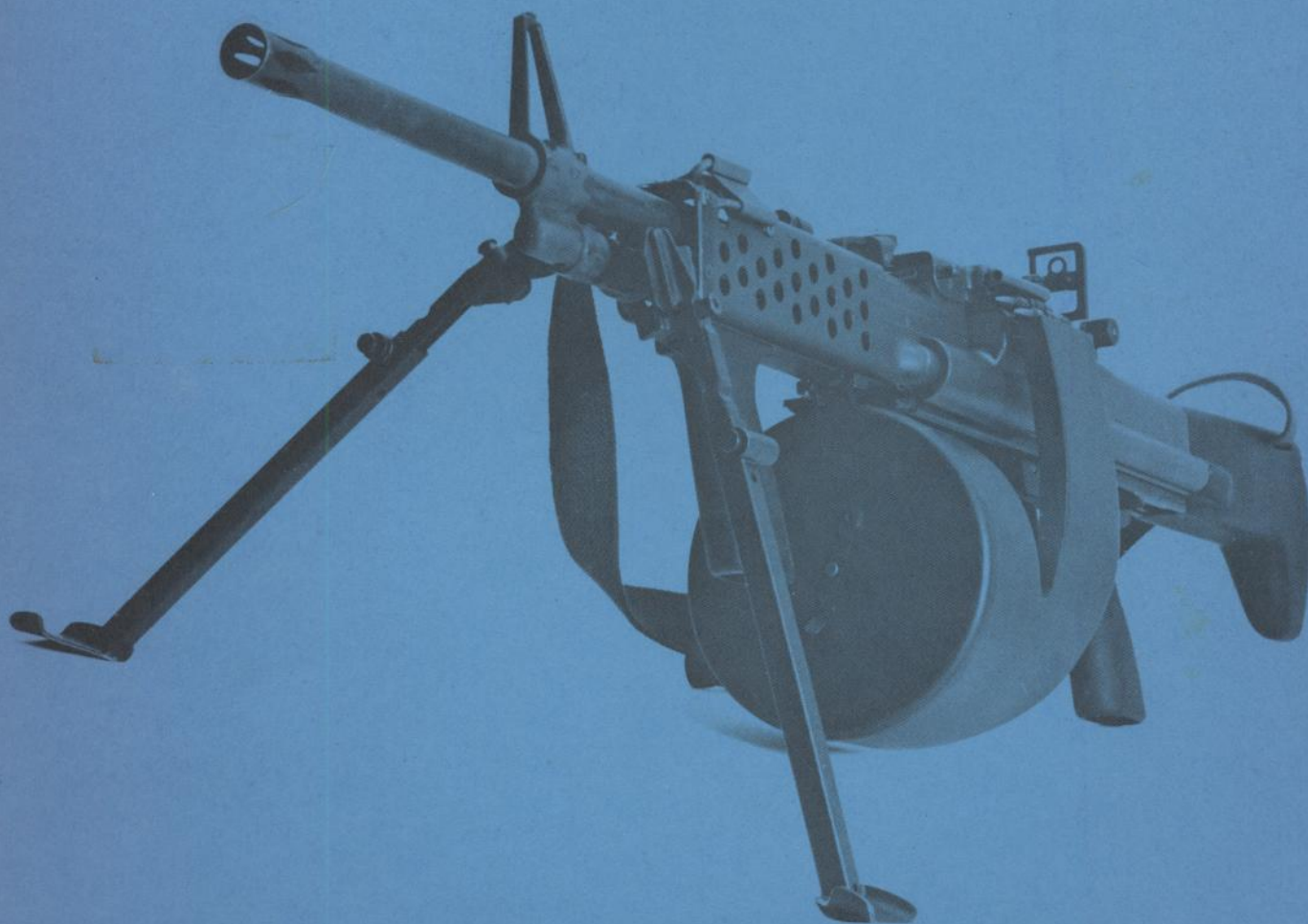


LIGHT MACHINE GUN

5.56mm CMG-2



Colt Industries  **Colt's Inc.**
Military Arms Division

LIGHT MACHINE GUN

5.56mm CMG-2

Report No. 850-2071

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TABLE OF CONTENTS

Section		Page
1	INTRODUCTION	1-1
2	DESCRIPTION	2-1
	2-1 General Description	2-1
	2-2 Detailed Description	2-7
3	OPERATING INSTRUCTIONS	3-1
4	CYCLE OF OPERATION	4-1
5	MAINTENANCE PROCEDURES	5-1

SECTION 1

INTRODUCTION

SECTION 1

INTRODUCTION

Colt's Military Arms Division recognizes the need for a versatile light machine gun to provide increased fire support for combat units in the field. The fluidity of tactical situations currently being experienced demands a weapon which can be easily transported for long distances with sufficient ammunition to be effective without frequent resupply. The weapon must be so designed that it is reliable when operated in extremes of adverse climatic and terrain conditions. Colt's CMG-2 described herein offers the most practical trade-off of design parameters to obtain the required durability and sustainability of operation.

Colt's CMG-2 is a one man light machine gun capable of placing an accurate, sustained volume of fire on tactical targets in support of the individual riflemen. Design consideration was given to the basic field problems and to the functional aspects of deployment for this type of weapon.

The CMG-2 is a compatible support weapon for the M-16 series weapons. It is designed to fire the Colt's 68 grain ball round for greater range and better penetration than that obtainable with the M193 Ball 5.56mm round. However, the weapon functions equally well when the M193 Ball and M196 Tracer rounds are fired. The 650 RPM cyclic rate provides greater sustainability of fire than weapons which have a higher natural cyclic rate. This allows better overlap of the fire of the individual rifles in the infantry unit and optimum volume of fire on the target.

SECTION 2

DESCRIPTION

SECTION 2

DESCRIPTION

2-1. GENERAL DESCRIPTION

The proposed weapon is designated as Colt's Machine Gun, Model 2 (CMG-2). It is a lightweight, gas operated, link belt fed, air-cooled machine gun utilizing the 5.56 mm cartridge. Single rounds, short bursts, or automatic fire (approximately 650 rounds per minute) can be easily fired. The gun is designed to be fired from the shoulder or hip and, with the bipod, from the sitting and prone positions by either left or right handed gunners with equal ease. The quick-change barrel feature extends the life of the weapon. The primary use of this weapon is for ground operations.

The CMG-2 is designed to provide a high level of performance, reliability, and long service life by use of simple, rugged mechanisms which are readily producible. This simplicity of design will facilitate manufacture, training, maintenance and logistics.



Figure 2-1. Colt's Machine Gun, Model 2 (CMG-2)

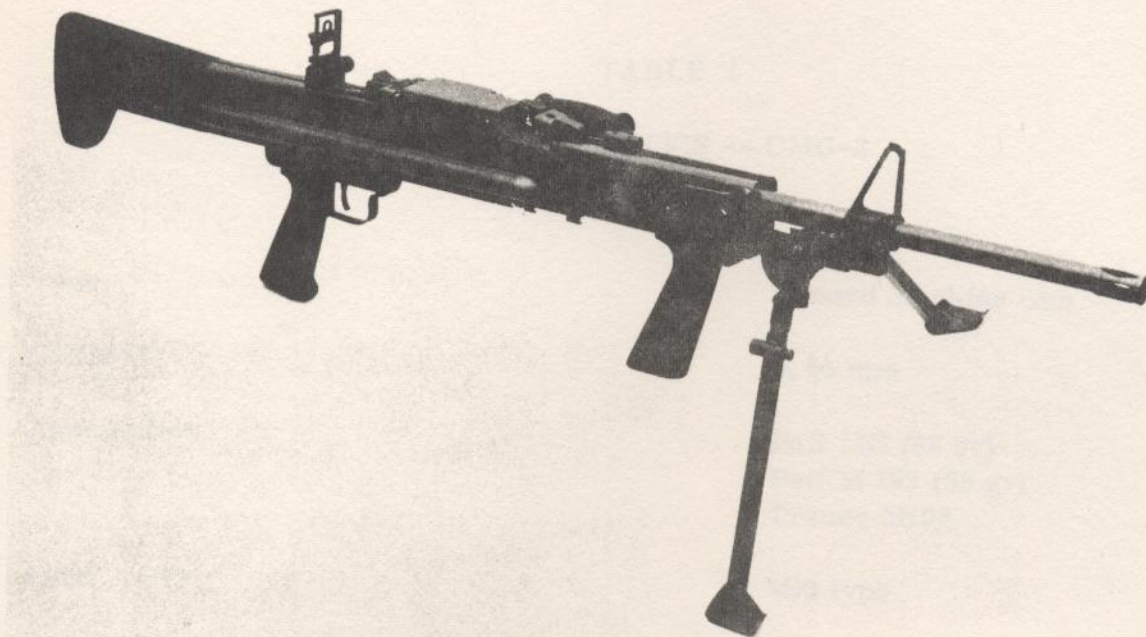


Figure 2-2. CMG-2, Right Side



Figure 2-3. CMG-2, Left Side

TABLE 1
CHARACTERISTICS -- CMG-2

Type	Ground Machine Gun
Caliber	5.56 mm
Ammunition	Ball MG (68 gr) Ball M 193 (55 gr) Tracer M196
Link	M13 type
Overall length	41 15/16"
Weights	
Weapon w/o bipod	13.0 lbs
Bipod	1.56 lbs
Spare barrel	4.125 lbs
Magazine	1.57 lbs
Rate of fire	650 rds per min. (approx.)
Type of operation	Gas
Method of feeding	Link belt
Capacity of magazine	150 rds.

TABLE 2

TABULATED DATA -- CMG-2

Total components basic weapon	138
Bipod (Government furnished) M14 Type	35
Standard components (Rivets, screws, etc.)	30
Magazine	16
Barrel (spare)	10
Combination Tool	6
Total Drawings	146
Standard component drawings (rivets, screws, etc.)	19
Detail Drawings	112
Assembly drawings	15

TABLE 3

UNIQUE FEATURES -- CMG-2

- a) The fire control group is used to charge the weapon.
- b) The extractor is a machined groove in the face of the bolt eliminating it as a repair part.
- c) The ejector is a three piece cam actuated pivot arm which is receiver mounted and easily removable.
- d) The feed mechanism is a six-piece unit, mounted on the side of the receiver. It is actuated by cams on the bolt carrier. The feed pawls engage the ammunition belt from underneath permitting a simple, short and lightweight feed tray cover.
- e) The firing pin has a striker point on each end which provides for foolproof assembly and extended service life.
- f) Disassembly and reassembly of the weapon for field or detail stripping can be readily accomplished without the use of tools except in one instance, i.e., a cartridge is required to remove and assemble the forward grip and gas cylinder.

- | | | | |
|-----|---------------------------|-----|--------------------------|
| 1. | Butt Stock | 20. | Gas Cylinder |
| 2. | Hydraulic Fluid | 21. | Gas Piston |
| 3. | Buffer Housing | 22. | Grip Plunger |
| 4. | Buffer Plunger | 23. | Grip |
| 5. | Receiver | 24. | Bolt Carrier |
| 6. | Rear Sight Base | 25. | Barrel Socket |
| 7. | Lateral Adjustment Knob | 26. | Feed Tray |
| 8. | Rear Sight Leaf | 27. | Cartridge Guide |
| 9. | Rear Sight Aperture | 28. | Guide Rod (2 req'd) |
| 10. | Elevation Adjustment Knob | 29. | Ejector |
| 11. | Feed Tray Cover Latch | 30. | Bolt Assembly |
| 12. | Feed Tray Cover | 31. | Firing Pin |
| 13. | Carrying Handle | 32. | Cam Follower Pin |
| 14. | Barrel Latch | 33. | Cam Follower |
| 15. | Barrel | 34. | Sear |
| 16. | Front Sight | 35. | Trigger |
| 17. | Gas Expansion Chamber | 36. | Main Assembly Latch |
| 18. | Gas Port | 37. | Trigger Mechanism Latch |
| 19. | Gas Exhaust Port | 38. | Driving Spring (2 req'd) |

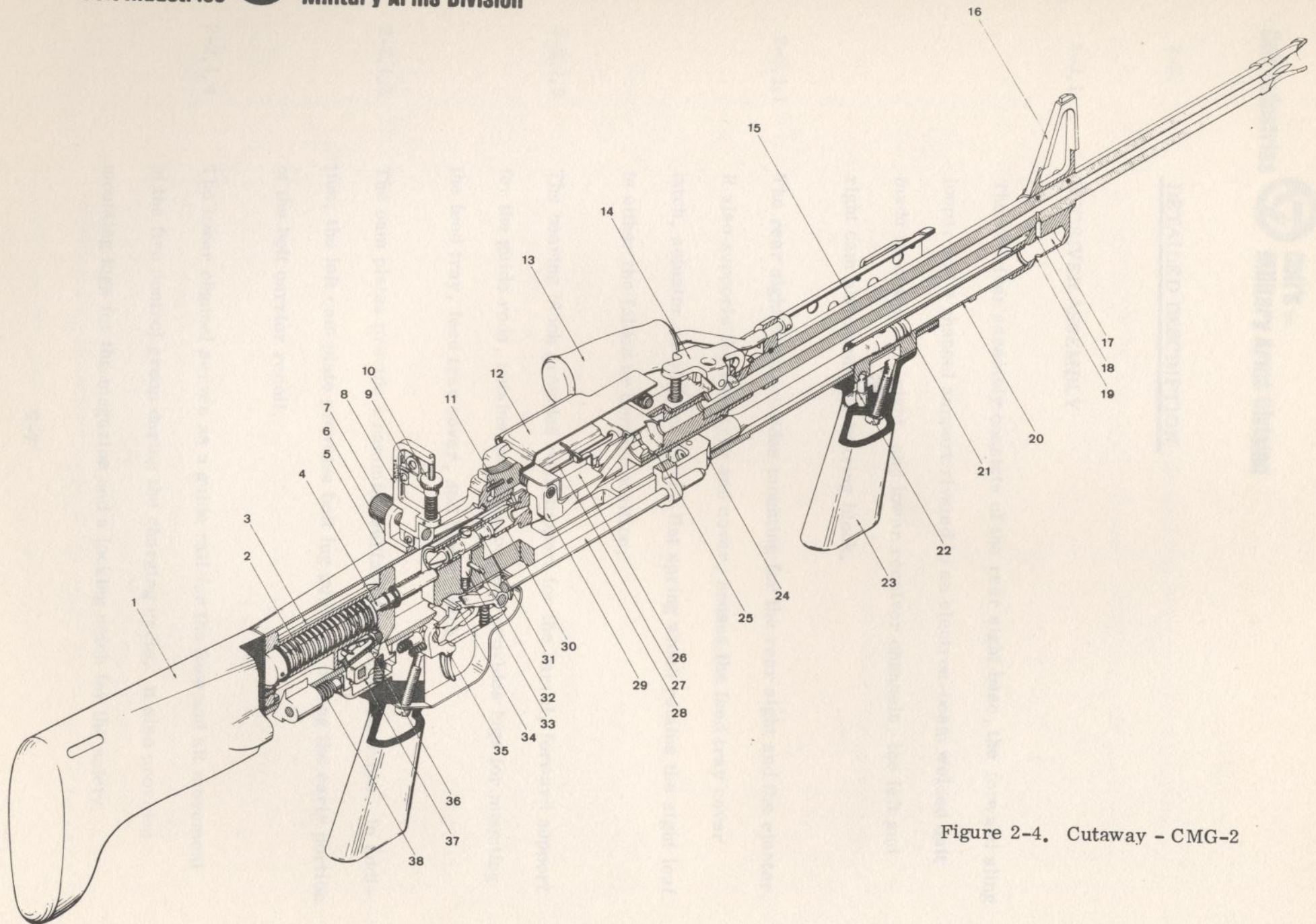


Figure 2-4. Cutaway - CMG-2

2-2. DETAILED DESCRIPTION

2-2.1 RECEIVER ASSEMBLY

The receiver assembly consists of the rear sight base, the forward sling loops, and a channel support riveted to an electron-beam welded unit made up of the left, right, and lower receiver channels, the left and right cam plates and the bearing block.

2-2.1.1 The rear sight base provides mounting for the rear sight and the ejector. It also supports the feed tray and cover, houses the feed tray cover latch, actuator cover latch, and a flat spring which retains the sight leaf in either the folded or upright position.

2-2.1.2 The bearing block provides rear support for the barrel, forward support for the guide rods, retains the actuator, and provides lugs for mounting the feed tray, feed tray cover, and barrel latch.

2-2.1.3 The cam plates provide a camming surface for the follower pin. In addition, the left cam plate provides bolt lug guidance during the early portion of the bolt carrier recoil.

2-2.1.4 The lower channel serves as a guide rail for the fore and aft movement of the fire control group during the charging cycle. It also provides mounting lugs for the magazine and a locking notch for the safety.



2-2.1.5 The forward portion of the side channels provides a shroud for the barrel and the rear portion houses and supports the feeding and operating groups.

2-2.2 BARREL ASSEMBLY

The barrel assembly is a quick change type with fixed headspace. The gun carrying handle is attached to facilitate changing hot barrels.

2-2.2.1 The flash suppressor is machined into the barrel tube. This simplifies fabrication and eliminates two repair parts.

2-2.2.2 The twist of the rifling in the barrel tube is one turn in 8 7/8 inches. This degree of twist is necessary to stabilize Colt's 68 grain projectile. It also provides adequate stabilization for the standard 55 grain projectile.

2-2.2.3 The one piece front sight is non-adjustable and permanently attached to the barrel tube. The gas port, gas expansion chamber, gas exhaust port, and forward barrel support are integral with the sight.

2-2.2.4 The barrel socket is permanently attached to the barrel tube and contains the cartridge chamber and bolt locking recess. It also provides the rear barrel support, the flange for the barrel locking latch, and the notch for the barrel latch key.

2-2.3 OPERATING GROUP

The operating group consists of the bolt carrier assembly, driving springs, guide rods, and buffer and buttstock assembly. In addition, the body of the bolt carrier houses the bolt assembly, firing pin, bolt cam follower, follower spring and follower pin. The group is removed as one unit from the receiver by depressing a latch contained in the buffer housing.

2-3.3.1 The bolt carrier and the gas piston are rigidly attached. The piston also serves as the bolt carrier front support as it slides in the gas cylinder. The rear of the carrier is supported and guided by the two driving spring guide rods. The cams for the feeding mechanism are machined into the left side. The ejector actuating lug is also located on the left side, aft of the cams. An opening in the body of the carrier is provided to permit passage of ejected cartridge cases. The sear notch is located on the lower aft portion of the body. The body of the carrier houses the bolt assembly, firing pin, bolt cam follower, follower spring and follower pin.

2-3.3.2 The bolt assembly is a rotary locking four piece unit consisting of the bolt, the cartridge retaining plunger, the plunger spring, and the plunger retaining pin. The bolt has eight locking lugs at the forward end. The cartridge seat, the extractor, and the cartridge retaining lip are

machined into the face of the bolt. A hole in the face of the bolt is provided for the cartridge retaining plunger. The body of the bolt is hollow to accept the firing pin. The bolt locking cam is machined into the bolt body. The firing pin is constructed with a tapered striker point at each end and has a hole in the mid-section for the cam follower. The cam follower is a straight pin, contoured at one end compatible with the firing pin hole in the bolt, and has a spring seat hole at the opposite end. A cross hole in the mid-section is provided for the follower pin. The follower pin is a straight pin with the center section undercut to provide retention with the cam follower.

2-2.3.3

The guide rods are straight tubular shafts. An undercut at one end to accept the retaining plate and a shoulder at the other end to hold the bolt carrier captive provide unit assembly retention of the operating group. The rods also serve as guide rails for the driving springs and the bolt carrier. The shouldered end of the left rod serves as the forward bearing surface of the feed mechanism actuator. The two rods are interchangeable.

2-2.3.4

The hydraulic buffer is a sealed unit attached to the buttstock. It has a protruding plunger and contains the main assembly latch. The buffer housing also supports the rear portion of the guide rods and holds the guide rod retaining plate captive.



2-2.4

FIRE CONTROL

The fire control group is a 16-piece unit which also serves as the charging mechanism. It is simple in design, requiring no tools for disassembly or assembly. The grip is a one-piece plastic molding attached to the housing. The trigger guard, while rigidly attached, can be removed for firing with winter mittens. The crossbolt safety is also the trigger pivot pin. The sear serves as the bolt carrier catch when charging the weapon. The mechanism does not require retaining pins as the sear pivot pin, crossbolt safety and locking latch are held in place by the lower receiver channel when the group is assembled to the weapon. The ejection port cover, which also serves as the stop for the group when charging the weapon, is attached to the rear of the trigger housing.

2-2.5

FEED MECHANISM

The feed mechanism's main components are the actuator assembly, actuator cover, feed tray, and feed tray cover assembly. The forward end of the actuator pivots about the left guide rod. The rear bearing of the actuator is guided between the outside of the receiver channel and inside of the actuator cover. The actuator roller follows the lower cam path on the bolt carrier. The lug located above the roller follows the upper cam path on the bolt carrier. The feed pawls, which are attached to the upper portion of the actuator, protrude through the base of the feed tray.

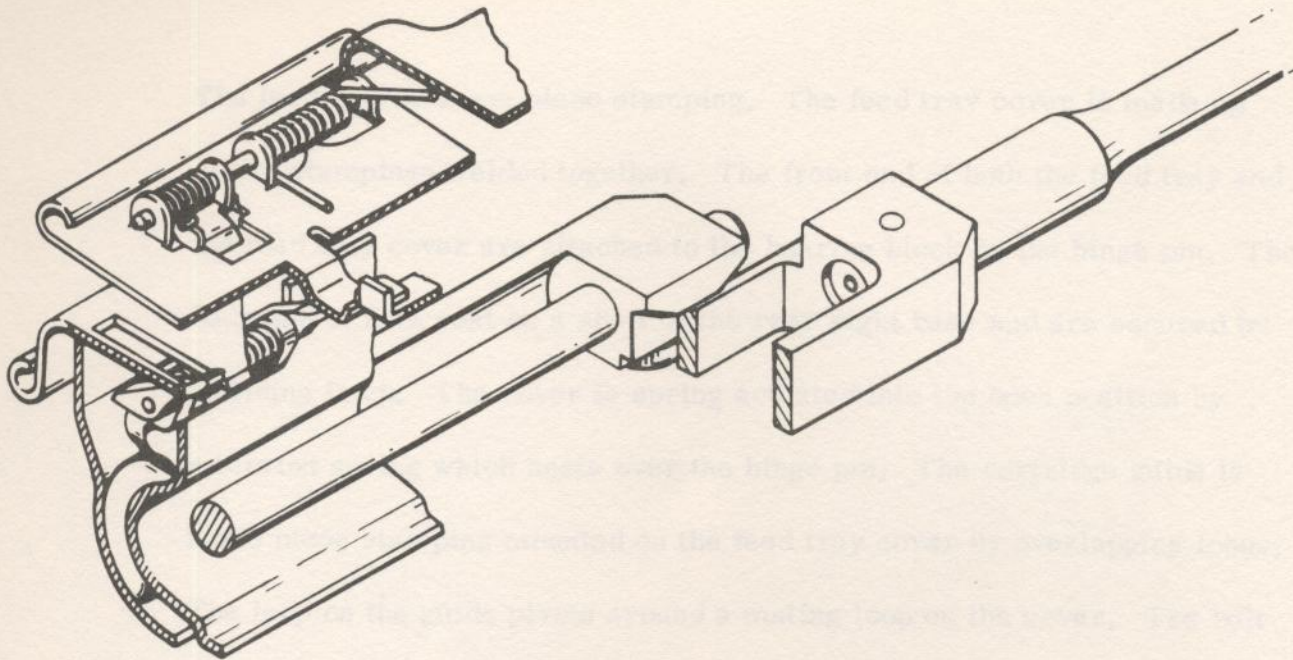


Figure 2-5. Cutaway - Feed Mechanism

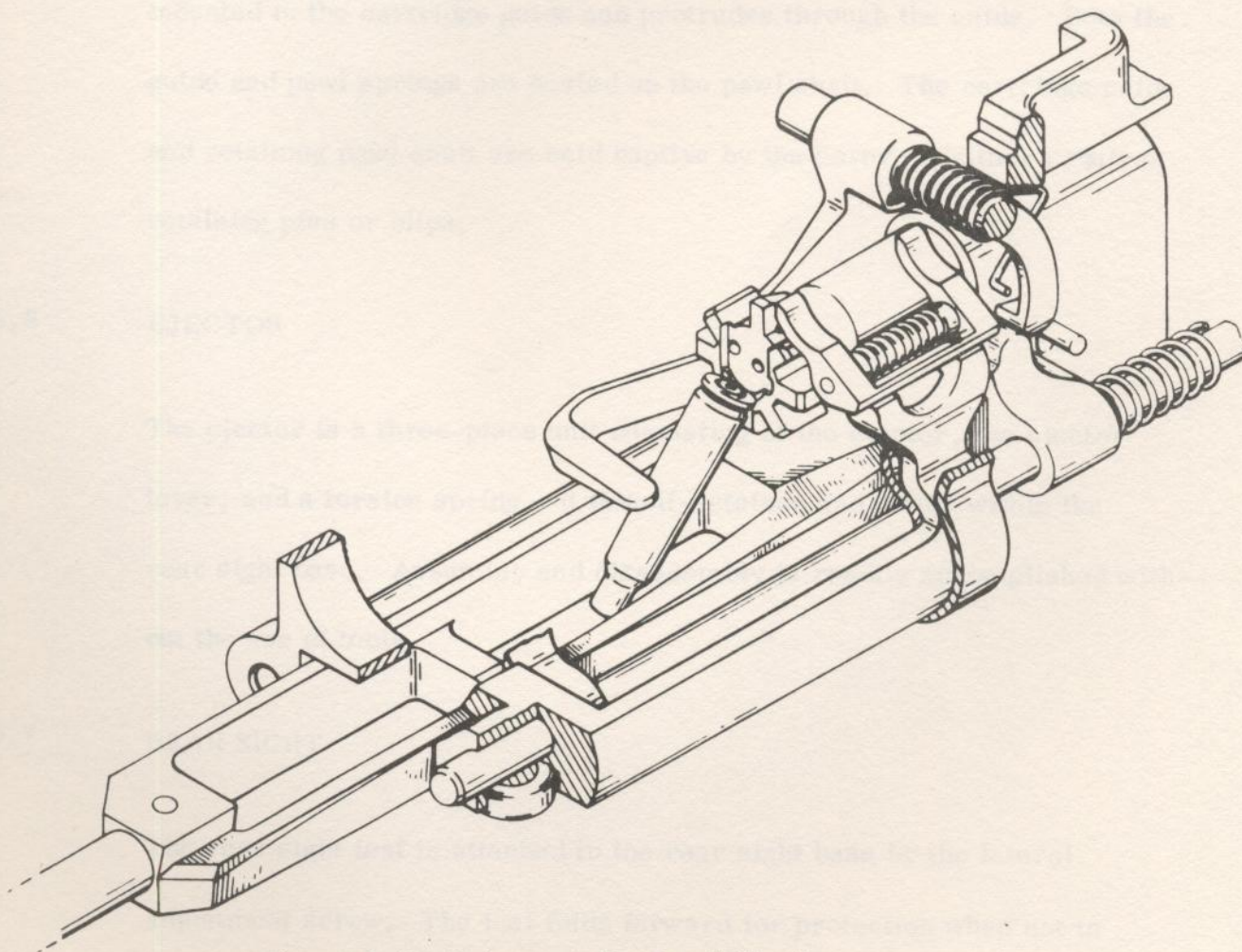


Figure 2-6. Cutaway - Feed and Ejection

The feed tray is a one piece stamping. The feed tray cover is made up of two stampings welded together. The front end of both the feed tray and the feed tray cover are attached to the bearing block by the hinge pin. The back end of both rest on a shelf of the rear sight base and are secured by a sliding latch. The cover is spring actuated into the open position by a torsion spring which nests over the hinge pin. The cartridge guide is a one piece stamping mounted on the feed tray cover by overlapping loops. The loop on the guide pivots around a mating loop on the cover. The belt retaining pawl is also a one piece stamping. It pivots about a shaft mounted in the cartridge guide and protrudes through the guide. Both the guide and pawl springs are nested on the pawl shaft. The cartridge guide and retaining pawl shaft are held captive by the cover. Neither requires retaining pins or clips.

2-2.6

EJECTOR

The ejector is a three-piece unit consisting of the ejector, the ejector lever, and a torsion spring. It is self-retained and pivots within the rear sight base. Assembly and disassembly is readily accomplished without the use of tools.

2-2.7

REAR SIGHT

The rear sight leaf is attached to the rear sight base by the lateral adjustment screw. The leaf folds forward for protection when not in

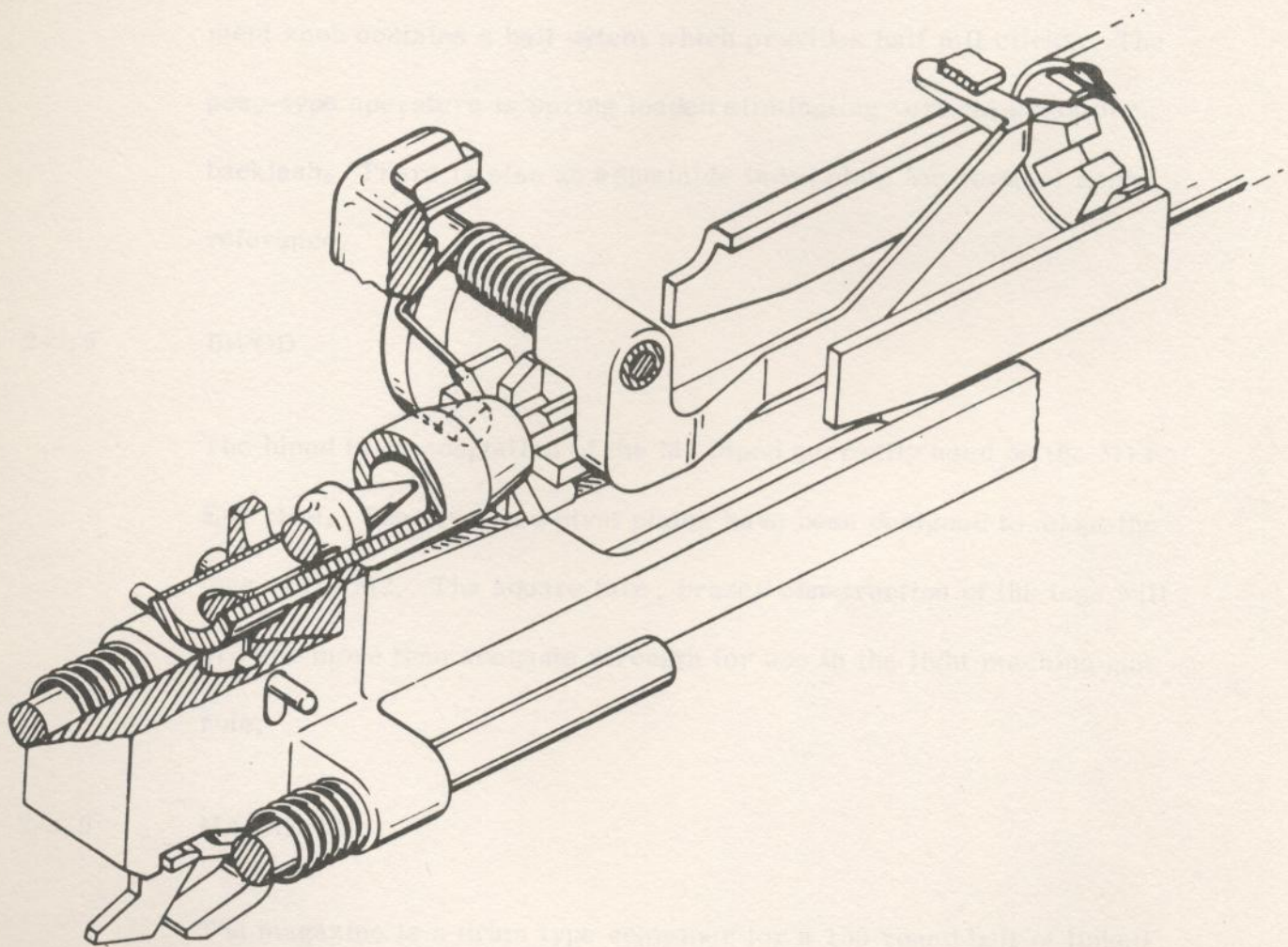


Figure 2-7. Cutaway - CMG-2 Firing Pin, Bolt, Ejector

use. It is held in the upright or folded position by a flat spring. The lateral adjustment knob contains two spring loaded ball detents which prevent backlash. Lateral adjustment is one mil per click. An adjustable index plate is provided for lateral zero reference. The elevation adjustment knob contains a ball detent which provides half mil clicks. The peep-type aperture is spring loaded eliminating vertical adjustment backlash. There is also an adjustable index plate for vertical zero reference.

2-2.8

BIPOD

The bipod is an adaptation of the M2 bipod currently used on the M14 E-2 rifle. The pivot and pivot plates have been designed to adopt the legs of the M2. The square tube, brazed construction of the legs will provide more than adequate strength for use in the light machine gun role.

2-2.9

MAGAZINE

The magazine is a drum type container for a 150 round belt of linked ammunition. Construction is of thin-walled sheet metal stampings. The magazine is teflon coated to reduce frictional drag of the ammunition belt. It is mounted underneath the weapon on the lower receiver channel, forward of the ejection port. An integral helical chute provides guidance of the ammunition belt from the magazine to the feed tray.

SECTION 3
OPERATING INSTRUCTIONS

SECTION 3

OPERATING INSTRUCTIONS

3.1 LOADING

The feed tray cover is opened by sliding the latch, located at the forward end of the rear sight base, rearward releasing the cover which is pivoted to the open position by a torsion spring. The ammunition belt, with the open side of the links down, is placed on the feed tray, locating the lead cartridge immediately in front of the feed pawls. The feed tray cover is then closed and latched by the spring-loaded cover latch. The bolt can be retracted at this time or prior to loading the weapon. The bolt is retracted by depressing the latch lever located at the rear left side of the trigger housing, sliding the trigger housing forward to its stopping surface on the lower channel automatically engaging the sear with the bolt carrier, and then pulling the trigger housing rearward by its grip to its stopping surface on the back plate, automatically engaging the trigger housing latch with the receiver. The weapon is now ready to fire. To unload the weapon, open the feed tray cover and remove the ammunition belt from the feed tray.

3.2 SAFETY OPERATION

The weapon is placed in the safe mode by pushing the cross-bolt safety, located directly above the trigger, from right to left, mechanically preventing the sear from becoming disengaged from the bolt carrier.

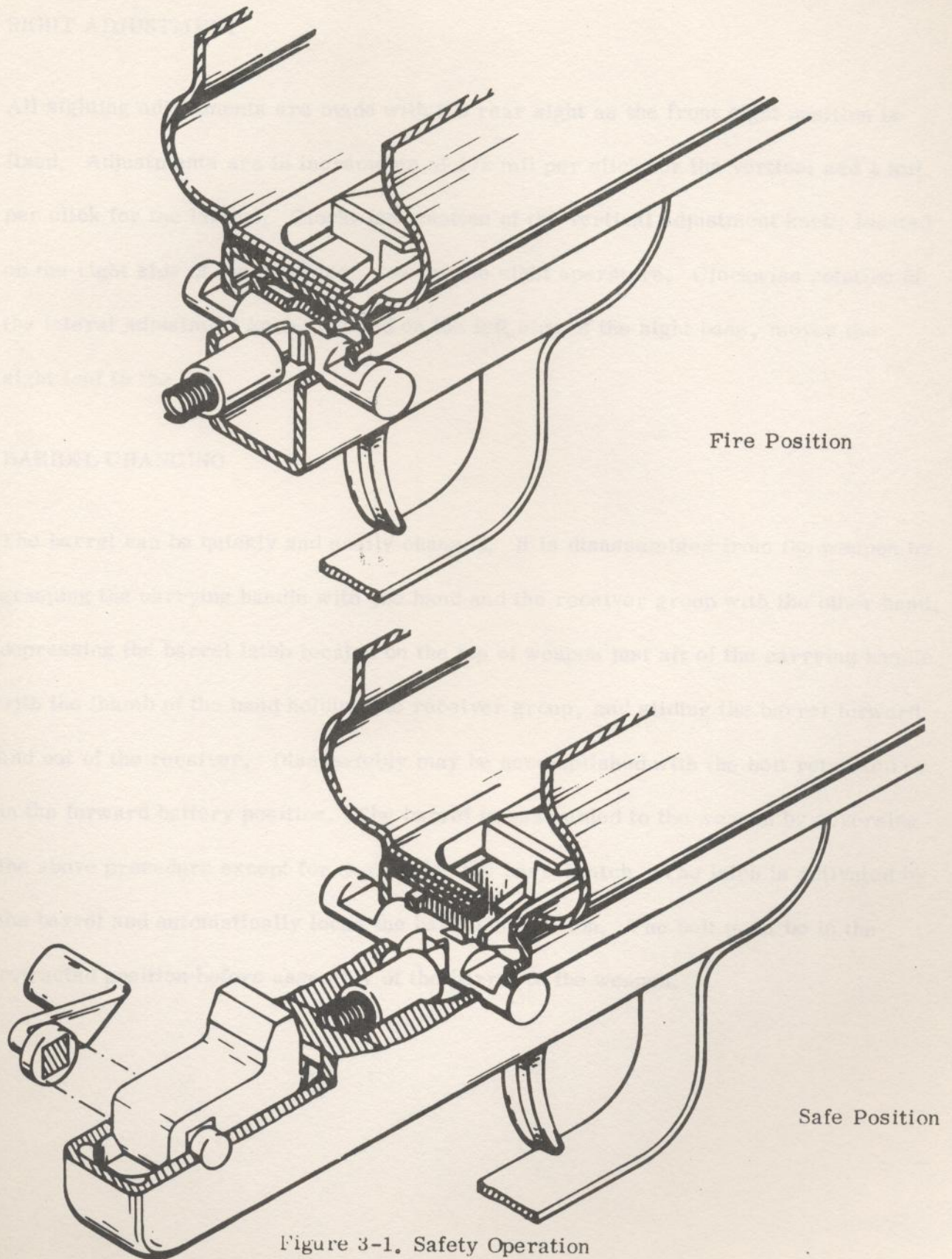


Figure 3-1. Safety Operation

3.3 SIGHT ADJUSTMENT

All sighting adjustments are made with the rear sight as the front sight position is fixed. Adjustments are in increments of 1/2 mil per click for the vertical and 1 mil per click for the lateral. Clockwise rotation of the vertical adjustment knob, located on the right side of the sight leaf, lowers the sight aperture. Clockwise rotation of the lateral adjustment knob, located on the left side of the sight base, moves the sight leaf to the left.

3.4 BARREL CHANGING

The barrel can be quickly and easily changed. It is disassembled from the weapon by grasping the carrying handle with one hand and the receiver group with the other hand, depressing the barrel latch located on the top of weapon just aft of the carrying handle with the thumb of the hand holding the receiver group, and sliding the barrel forward and out of the receiver. Disassembly may be accomplished with the bolt retracted or in the forward battery position. The barrel is assembled to the weapon by reversing the above procedure except for depressing the barrel latch. The latch is activated by the barrel and automatically locks the barrel in position. The bolt must be in the retracted position before assembly of the barrel to the weapon.

SECTION 4

CYCLE OF OPERATION

SECTION 4

CYCLE OF OPERATION

The Colt Machine Gun is a fully automatic weapon, fired from the open bolt. A rearward movement of the trigger depresses the sear, releasing the bolt carrier which is propelled forward by the driving springs. The cartridge stripping lug on the bolt contacts the base of the cartridge during the forward travel of the bolt carrier, stripping it from the link, and driving it into the chamber. The base of the cartridge slides down the face of the bolt as it leaves the feed tray. It is held in contact with the face of the bolt by a lip which engages the extractor groove in the cartridge. The extractor is fully engaged when the cartridge becomes aligned with the chamber. The cartridge retaining plunger, which was depressed by the cartridge during the feeding, returns at this time to its forward position preventing the cartridge from prematurely moving up and out of the extractor before ejection. The follower pin, as the bolt lugs enter the socket, contacts the cam plates depressing the cam follower which unlocks the bolt from the carrier. Subsequent to chambering the cartridge, the bolt is rotated 22.5 degrees, fully engaging its eight locking lugs with the mating lugs in the barrel socket. This rotation is imparted by the cam follower acting on the cycloidal cam path in the bolt. The firing pin, which is affixed to the bolt carrier by the cam follower, continues forward three eighths of an inch, after the bolt is rotated to the lock position, and strikes the primer.

Gas is bled through a port in the barrel and front sight into the expansion chamber through a hole in the top of the piston. The expanding gases in the hollow piston and

front sight chamber force the bolt carrier rearward misaligning the hole in the piston with the gas port in the front sight and cutting off the gas flow. The gas cutoff provides a regulated impulse to the piston partially compensating for variations in ammunition. The gas exhaust port is exposed after only 0.6 of an inch rearward movement of the bolt carrier. Early exhausting of the gas at relatively high pressure provides a scavenging effect which reduces fouling accumulation in the gas system.

The bolt dwells before rotating to the unlocked position for three eighths of an inch of rearward movement of the bolt carrier. The cartridge is extracted subsequent to bolt unlocking. The cam follower is raised by a compression spring, locking the bolt to the carrier as the bolt is being withdrawn from the barrel socket. (The cam follower is held down during bolt rotation and firing by the follower pin and the cam plates in the receiver.)

The ejector lever contacts a lug on the side of the bolt carrier after the forward end of the fired case clears the socket. (Allowances have been made for whole cartridges.) This activates the ejector which pivots in the rear sight base striking the fired case and ejecting it down through the openings in the bolt carrier and receiver. The ejector and lever are returned to their original position by a torsion spring after the lever is disengaged from the lug on the carrier. The lever is deflected by the lug on the bolt carrier during the counter-recoil stroke without imparting movement to the ejector and is returned to its original position by the torsion spring.

Feeding of the linked ammunition belt is also accomplished during rearward movement of the bolt carrier. The cam on the side of the bolt carrier pivots the actuator through 30 degrees, positioning the first cartridge in the belt one sixteenth of an inch past the center of the stripping slot in the feed tray. This assures engagement of the belt retaining pawl under heavy belt pull conditions. The feed pawls engage the cartridge belt from underneath. The actuator is returned to its original position by the cam on the top surface of the bolt carrier during the counter-recoil phase.

The belt retaining pawl engages the ammunition belt from above, contacting the link. The cartridge guide depresses the cartridge into the stripping slot of the feed tray and holds the link while the cartridge is being stripped. The links are forced out the right side of the feed tray by successive rounds.

The rearward movement of the bolt carrier is arrested by the hydraulic buffer. The excess energy of the recoiling mass is absorbed and dissipated within three quarters of an inch of stroke of the buffer plunger.

The bolt carrier is propelled forward by the driving springs continuing the firing cycle unless the trigger is released.

SECTION 5

MAINTENANCE PROCEDURES

SECTION 5

MAINTENANCE

5.1 INTRODUCTION

The CMG-2 machine gun is designed to be maintenance free for extended periods of operation. When required, disassembly of the weapon is easily and rapidly performed without the use of tools. All areas of the weapon are readily accessible for cleaning. Minimal lubrication is required.

5.2 DISASSEMBLY

5.2.1 The barrel is disassembled from the weapon as described in paragraph 3.4.

5.2.2 The operating group is disassembled from the weapon by depressing the main assembly latch, located at the bottom of the receiver just forward of the buttstock, and sliding the group rearward from the receiver. The fire control group must be in the forward position to permit access to the main assembly latch. Disassembly of the operating group is normally not required as all areas of the group requiring lubrication are now accessible. Disassembly of the operating group, if desired, is accomplished in the following sequence: remove the guide rod retaining plate from the buffer housing; separate the guide rods from the buffer-buttstock assembly; remove the driving springs from the guide rods; push the guide rods forward and remove them from the bolt carrier; depress the follower pin, push the bolt to the rear, remove the follower pin and push the bolt forward permitting the cam follower to protrude up through the bolt carrier; lift out the cam follower; push the bolt forward and out of the carrier; remove the firing pin from the bolt; remove the cam follower spring from the bolt carrier.

- 5.2.3 The fire control group is disassembled from the weapon by sliding it fully forward, depressing the trigger and then sliding it rearward separating it from the receiver. Disassembly of the fire control group is normally not required as it requires minimum lubrication. Disassembly of this group is accomplished as follows: while holding the sear slightly depressed, push the sear pivot pin from the channel; lift the sear and sear spring from the channel; while holding the fire control group latch slightly depressed, pull the latch lever from the channel; lift the latch and latch spring from the channel; rotate the safety forward 90° and pull it from the channel; lift out the trigger; remove the safety detent, the detent spring and the trigger spring.
- 5.2.4 The ejector assembly is removed from the weapon in the following manner: with the feed tray and cover held open the ejector assembly is pivoted upwards 90° , moved to the left as far as it will go, the right side is pivoted forward, the assembly is then moved to the right and lifted from the receiver. The ejector assembly is disassembled by releasing the spring tension on the lever and separating it from the ejector.
- 5.2.5 The feed tray and cover assembly are not normally disassembled from the weapon. If required, it is accomplished in the following manner: with the feed tray and cover assembly held in the vertical position the hinge pin is pushed from the left to the right until the retaining lug on the pin is free of the cover; the feed tray is released allowing it to return to the horizontal position; the hinge pin is pulled free and the cover assembly, cover spring and feed tray are lifted from the receiver. To disassemble the cartridge guide from the cover, depress the guide and slide it rearward until the tab on the guide is aligned with the slot in the link chute plate, release the guide allowing the tab to rise above the plate and then, while holding the guide slightly depressed,

slide it rearward and free of the cover. The retaining pawl shaft can then be removed from the guide, releasing the retaining pawl and spring and the cartridge guide spring.

5.2.6 The bipod is removed from the weapon by rotating it 180°, moving it forward and separating it from the gas cylinder.

5.2.7 The actuator and cover are disassembled from the weapon by depressing the actuator cover latch, pivoting the cover away from the latch and lifting it from the receiver. The actuator is then lifted free of the receiver.

5.2.8 The forward grip and gas cylinder are disassembled from the weapon by inserting a cartridge point in the slot at the rear of the grip, depressing the retaining plunger, and sliding the grip rearward and free of the gas cylinder dovetail. The gas cylinder is then removed from the receiver. Disassembly of the forward grip and gas cylinder from the weapon is the only step for which a tool, i.e., a cartridge, is required.

5.3 CLEANING

Standard weapon cleaning procedures are applicable to the CMG-2. A scraping tool is provided to remove carbon accumulations from the gas port, front sight expansion chamber, and the gas piston.

5.4 LUBRICATION

MIL-L-46000 lubricant sparingly applied to all wear and bearing surfaces, except in the gas system, after each cleaning and as required, will provide smooth weapon function and increased service life.

5.5 ASSEMBLY

The assembly procedure for the weapon is the reverse of the disassembly procedure.



Figure 5-1. Field Stripped.

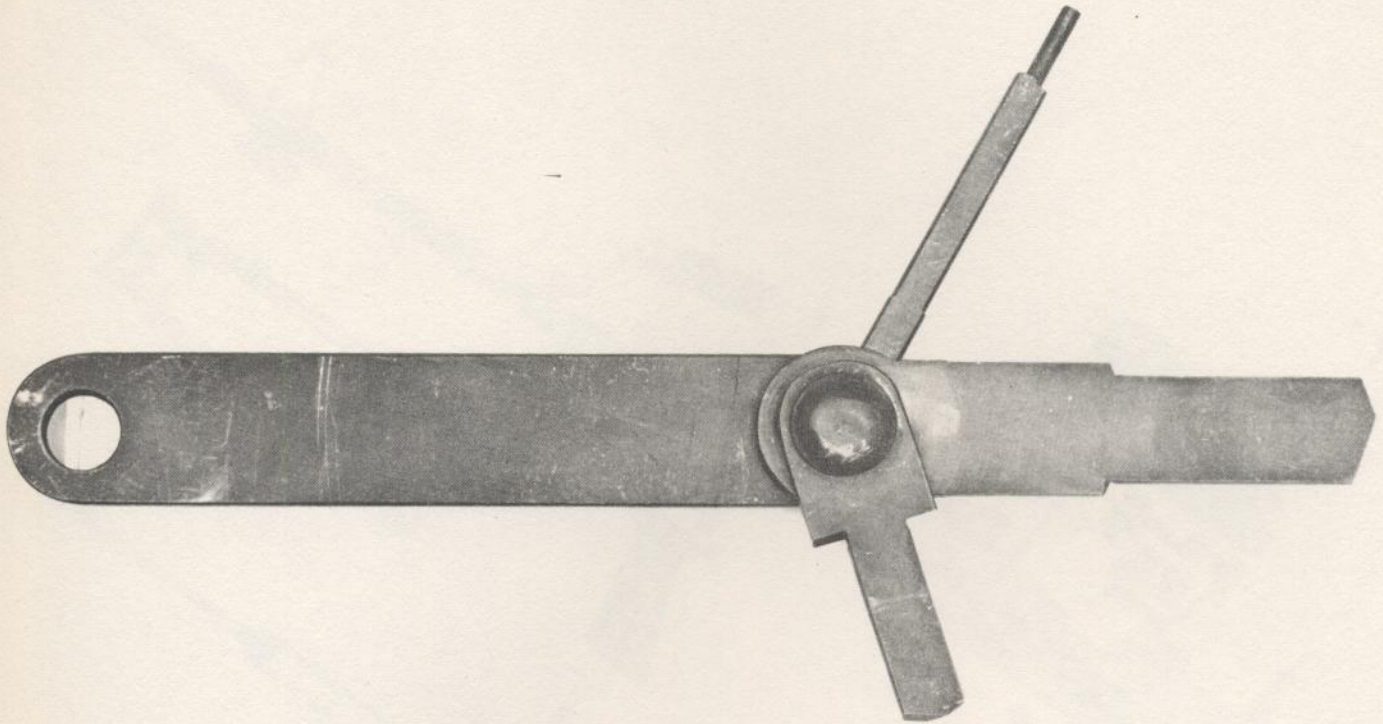


Figure 5-2. Scraping Tool, CMG-2.

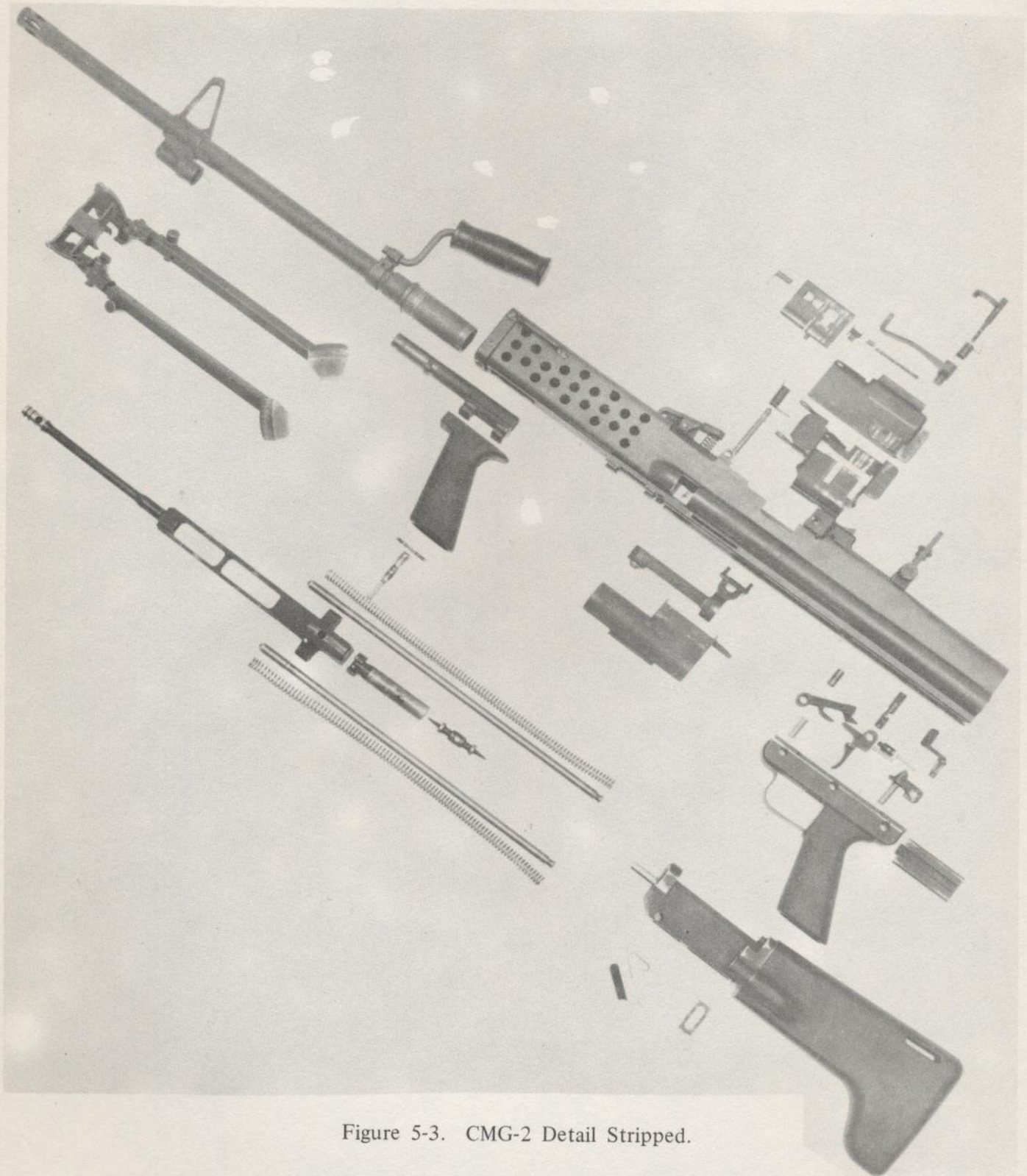


Figure 5-3. CMG-2 Detail Stripped.