DEPARTMENT OF THE ARMY TECHNICAL MANUAL **TM 5-3810-207-35**

DEPARTMENT OF THE AIR FORCE TECHNICAL ORDER **TO 36C23-3-37-21**

FIELD AND DEPOT MAINTENANCE MANUAL
CRANE-SHOVEL, BASIC UNIT, TRUCK MTD
20 TON, 3/4 CU YD, GASOLINE DRIVEN
6 X 6 (QUICKWAY MODEL M-200)
NON-WINTERIZED
CRANE SERIAL NUMBERS 20-026 THROUGH 20-500
CARRIER SERIAL NUMBERS 59-026C THROUGH 59-500C
(FSN 3810-542-4982)
WINTERIZED TO MINUS 65 DEGREES
CRANE SERIAL NUMBERS 20-001 THROUGH 20-025
CARRIER SERIAL NUMBERS 59-001C THROUGH 59-025C
(FSN 3810-542-4980)

DEPARTMENTS OF THE ARMY AND THE AIR FORCE
JUNE 1962

SAFETY PRECAUTIONS

Before Operation

Use adequate lifting devices and slings when replacing major components.

Never disconnect any air lines without first exhausting all air pressure form the air system.

Keep machinery deck free of grease, oil, ice and mud to prevent slipping and falling.

During Operation

When using jacks to lift parts of the machine, be sure they rest on solid footing and use wooden blocks above the jacks to prevent slipping.

Heavy parts which have to be lifted from the crane should be lowered completely for safety.

After Operation

Stop the engine and disengage the clutch before performing adjustments, lubricating, cleaning and maintenance of the equipment.

Always lower the crane boom to the ground before performing maintenance on the hydraulic system or boom assembly.

TM 5-3810-207-35
TO 36C23-3-37-21
Change No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington D.C., 2 December 1991

DIRECT SUPPORT, GENERAL SUPPORT AND DEPOT MAINTENANCE MANUAL
CRANE-SHOVEL, BASIC UNIT: TRUCK MOUNTED; 20 TON: 3/4 CU YD: GASOLINE DRIVEN: 6X6 (QUICKWAY MODEL M-200) NON-WINTERIZED, NSN 3810-00-542-4982; WINTERIZED TO MINUS 65 DEGREES, NSN 3810-00-542-4980

TM 5-3810-207-35.27 June 1962 is changed as follows:

Cover: The manual cover is changed to read as shown above.

Add the following WARNING to "Safety Precautions" on the inside front cover., and on page 30. preceding paragraph 46:

WARNING

If NBC exposure Is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal Instructions.

By Order of the Secretaries of the Army and the Air Force:

GORDON R. SULLIVAN
General, United States Army
Chief of Staff

Official:

MILTON H. HAMILTON
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Approved for public release; distribution is unlimited.

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***TM 5-3810-207-35**
TO 36C23-3-37-2

TECHNICAL MANUAL
No. 5-3810-207-35
TECHNICAL ORDER
No. 36C23-3-37-2

DEPARTMENT OF THE ARMY

AND THE AIR FORCE

WASHINGTON 25, D. C., 27 June 1962

FIELD AND DEPOT MAINTENANCE MANUAL

CRANE-SHOVEL, BASIC UNIT TRUCK MOUNTED: 20 TON 3/4 CU YD; GASOLINE DRIVEN, 6x6 (QUICKWAY MODEL M-200) NON-WINTERIZED CRANE SERIAL NUMBERS 20-026 THROUGH 20-500 CARRIER SERIAL NUMBERS 59-026C THROUGH 59-500C (FSN 3810-542-4982) WINTERIZED TO MINUS 65 DEGREES CRANE SERIAL NUMBERS 20-001 THROUGH 20-025 CARRIER SERIAL NUMBERS 59-001C THROUGH 59-025C (FSN 3810-542-4980)

*This manual supersedes TM 5-3810-207-35, 1 February 1960, including 1, 2 October 1961.

TAGO 5080A

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the use of field and depot maintenance personnel maintaining the Quickway Model M-200 Crane-Shovel. They provide information on the maintenance of the equipment which is beyond the scope of the tools, equipment, personnel, or supplies normally available to using organizations.

b. Appendix I contains a list of applicable publications. The Maintenance Allocation Chart is in TM 53810-207-20. Field and depot maintenance repair parts are listed in TM 5-3810-20735P.

c. Numbers in parentheses on illustrations indicate quantity. Numbers preceding nomenclature callouts on illustrations indicate the preferred maintenance sequence.

d. Report all deficiencies in this manual on DA Form 2028. Submit recommendations for changes, additions, or deletions to The Commanding General, Military Construction Supply Agency/U. S. Army Engineer Maintenance Center, Corps of Engineers, ATTN: MCSDM, P. O. Box 119, Columbus 16, Ohio. Direct communication is authorized.

e. Report unsatisfactory equipment performance and suggestions for equipment improvement as specified in AR 700-38.

2. Record and Report Forms

For record and report forms applicable to field and depot maintenance, refer to TM 38-750.

Note. Applicable forms, excluding standard Form 46 which is carried by the operator, shall be kept in a canvas bag mounted on the equipment.

Section II. DESCRIPTION AND DATA

3. Description

A general description of the crane-shovel, the location and description of the identification and instruction plates, and information on the difference in models are contained in TM 5-3810-207-10. A more detailed description of the components is contained in TM 5-3810-207-20. The repair and maintenance instructions are described in appropriate sections of this manual.

4. Tabulated Data

a. Craneshovel.

Manufacturer	Quickway Truck Shovel Co.
Model number	M-200
Designated use	Back hoe, crane, clamshell, dragline, shovel and pile, driver

b. Crane Engine.

Engine	Gasoline
Manufacturer	Continental Motors Corp.
Model	BS-415
Serial numbers	20-001 through 20-500
Horsepower	110 at 1800 rpm (revolutions per minute)
Number of cylinders	6
Cooling	Liquid
Compression at cranking	Cold 100 lb (pounds) hot speed 125 lb
Bore	414 in. (inch)
Stroke	4 in.
Displacement	415 cu. in. (cubic inches)
Governed speed	1800 rpm
Oil pressure at 1800 rpm	40-50 lb
Minimum oil pressure (at 7 lb idle)	
Firing order	1-5-3-6-2-4

Valve springs:
Outside diameter .....1.3125 in.
Wire size .....0.172 in.
Force required to compress spring to 1.67 in .....58.8 lb ±*3.5 lb
Force required to compress spring to 1.226 in .....137 lb + 7 lb

c. Crane Engine Repair and Replacement Standards. Table I lists manufacturer's sizes, tolerances, clearances, and maximum allowable wear and clearance.

d. Carrier Engine.

Engine .....Gasoline
Manufacturer .....Continental Motors Corp.
Model .....SS 6749
Serial numbers .....59001C through 59500C
Horsepower .....227 at 2600 rpm
Number of cylinders 6
Cooling .....Liquid
Compression at cranking.....Cold 80 lb hot 85 lb speed
Bore .....5 3/8 in.
Stroke .....5 1/2 in.
Displacement .....749 cu in.
Governed speed .....1650 rpm
Cycle 4
Rotation of flywheel end.....Counterclockwise
Firing order 1-5-3-6-2-4
Valve springs:
Wire gage:
Outer .....0.225 in.
Inner .....0.172 in.
Force required to compress inner spring to 2.59375 in. 41 lb min to 49 lb max
Force required to compress inner spring to 2.03125 in. 95 lb min to 105 lb max
Force required to compress outer spring to 2.75 in. 85 lb min to 95 lb max
Force required to compress outer spring to 2.1875 in. 192 lb min to 20 lb max
Valve seat angle .....45 deg (degrees)
Valve face angle.....45 deg

e. Carrier Engine Repair and Replacement Standards. Table II lists manufacturer's sizes, tolerances, clearances, and the maximum allowable wear and clearance.

Table I. Crane Engine Repair and Replacement Standards.

	Manufacturer's dimensions and tolerance in inches		Desired clearance		Maximum allowable wear	Maximum allowable clearance
	Min	Max.	Min	Max.		
Crane Engine						
Pistons:						
Piston to cylinder			0. 004	0.004		
Piston pin hole in piston (dia)	1.2498	1.2501	0.0001	0.0002		
Ring groove dia:						
1st (top)	3.770	3. 780				
2d and 3d	3.834	3.844				
4th	3.794	3.804				
Ring groove width:						
1st	0.097	0.098				
2d and 3d	0.1265	0.1275				
4th	0.251	0.252				
Ring land dia						
1st	4.216	4.220				
2d	4.220	4.224				
3d and 4th	4.225	4.229				
Skirt dia (perpendicular to pin bore)	4.245	4.247				
Piston rings:						
1st (chrome) (compression):						
Width	0.0925	0.0935				
Thickness	0.202	0.212				
Gap clearance			0.013	0.025		
Side clearance			0.0035	0.0055		

	Manufacturer's dimensions and tolerance in inches		Desired clearance		Maximum allowable wear	Maximum allowable clearance
	Min	Max.	Min	Max.		
2d and 3d (compression):						
Width	0.123	0.124				
Thickness	0.170	0.180				
Gap clearance			0.013	0.025		
Side clearance			0.0025	0.0045		
4th (oil)						
Width	0.248	0.249				
Thickness	0.170	0.180				
Gap clearance				0.013	0.025	
Side clearance				0.002	0.001	
Piston pin.						
Length	3.620	3.625				
Pin dia	1.2498	1.2500				
Pin to piston			0.0001	0.0002		
Bushing id (finished)	1.2503	1.2506				
Bushing length	1.552	1.572				
Bushing od	1.4420	1.4440				
Connecting rods.						
Length (center to center)	8.246	8.248				
Bushing hole dia	1.437	1.438				
Bearing hole dia	2.7130	2.7135				
Bearing thickness.	0.0748	0.0753				
Width at bearing end	1.6775	1.6795	0.006			0.010
Crankshaft.						
Main journal dia	2.9985	2.9995	0.0025	0.0025		
Main journal limits			0.0012	0.0039		
Crankshaft end play			0.005	0.008		
Crankpin dia	2.560	2.561	0.0026	0.0026		
Crankpin limits			0.0014	0.0039		
Crankpin length	1.6855	1.6875				
Camshaft						
Journal dia (all)	2.242	2.243				
Cam lift:						
Intake	0.3395					
Exhaust	0.352					
Camshaft bushing id	2.2445	2.2450	0.0015	0.0030		
Camshaft end play			0.005	0.009		
Valves.						
Valve length (overall)	6 1/16					
Stem dia	0.4335	0.4345				
Head dia:						
Intake	1.995	2.005				
Exhaust	1.620	1.630				
Valve and seat angle	45°					
Stem clearance (desired):						
Intake			0.0025	0.0025		
Exhaust			0.0055	0.0055		
Stem clearance (limits):						
Intake			0.0015	0.0035		
Exhaust			0.0045	0.0065		
Valve guide.						
Length						
Intake	2 13/16					
Exhaust	3 3/8					
Outside dia:						
Intake and exhaust	0.813	0.814				

	Manufacturer's dimensions and tolerance in inches		Desired clearance		Maximum allowable wear	Maximum allowable clearance
	Min	Min.	Min	Max.		
Inside dia:						
Intake----------	0.4360	0.4370	----------	----------	----------	----------
Exhaust----------	0.4390	0.4400	----------	----------	----------	----------
Valve seat face (top) to top of guide:						
Intake----------	1 1/78	----------	----------	----------	----------	----------
Exhaust----------	1 5/16	----------	----------	----------	----------	----------
Valve Springs.						
Outside dia:----------	1 5/16	----------	----------	----------	----------	----------
Wire size----------	0.0172	----------	----------	----------	----------	----------
Spring length (valve closed):						
Underload of 51.3 to 58.3 lb----------	1.67	----------	----------	----------	----------	----------
Tension limit (min weight closed)-------	----------	----------	----------	----------	----------	46.27 lb
Spring length (valve open):						
Underload of 130 to 144 lb----------	1.226	----------	----------	----------	----------	----------
Tension limit (min weight open)---------	----------	----------	----------	----------	----------	117 lb
Crankcase.						
Cylinder dia----------	4.249	4.251	----------	----------	0.008	----------
Main bearing bore in block----------	3.1913	3.1920	----------	----------	----------	----------
Tappet hole dia----------	1.125	1.126	----------	----------	----------	----------

Table II. Carrier Engine Repair and Replacement Standards.

	Manufacturer's dimensions and tolerance in inches		Desired clearance		Maximum allowable wear	Maximum allowable clearance
	Min	Min.	Min	Max.		
Carrier Engine						
Pistons:						
Piston to cylinder (desired)----------	----------	----------	0. 008	0.008	----------	----------
Piston pin hole in piston (dia)	1.7499	1.7501	----------	----------	1.7503	
Ring groove dia:						
1st, 2d and 3d ----------	4.876	4.886	----------	----------	----------	----------
4th ----------	4.836	4.846	----------	----------	----------	----------
Ring groove width:						
1st ----------	0.0975	0.0975	----------	----------	0.1005	----------
2d and 3d ----------	0.1255	0.1265	----------	----------	0.1285	----------
4th ----------	0.2505	0.2512	----------	----------	0.2535	----------
Ring land dia						
1st ----------	5.333	5.337	----------	----------	----------	----------
2d----------	5.339	5.343	----------	----------	----------	----------
3d and 4th ----------	5.344	5.348	----------	----------	----------	----------
Skirt dia (perpendicular to pin bore)------	5.367	5.369	----------	----------	----------	----------
Piston rings:						
1st ring (top (chrome) (compression):						
Width----------	0.0925	0.0935	----------	----------	----------	----------
Thickness----------	0.208	0.218	----------	----------	----------	----------
Gap clearance----------	----------	----------	0.018	0.032	----------	----------
Side clearance----------	----------	----------	0.004	0.006	----------	0.0085
2d and 3d (compression):						
Width----------	0.123	0.124	----------	----------		----------
Thickness----------	0.208	0.218	----------	----------	----------	----------
Gap clearance----------	----------	----------	0.018	0.032	----------	----------
Side clearance----------	----------	----------	0.0015	0.0035	----------	0.006

	Manufacturer's dimensions and tolerance in inches		Desired clearance		Maximum allowable wear	Maximum allowable clearance
	Min	Max.	Min	Max.		
4th ring (oil)						
Width	0.248	0.249				
Thickness	0.208	0.218				
Gap clearance	0.018	0.032	0.018	0.032		0.006
Side clearance	0.0015	0.0035	0.0015	0.0035		
Piston pin.						
Length	4.524	4.529				
Pin dia	1.7498	1.7500			1.7495	
Pin to piston			0.0001	0.0030		
Bushing id (finished)	1.7503	1.7505	0.0003-	0.0007		0.0017
Bushing length	1 15/16					
Bushing od	1.941	1.944				
Connecting rods.						
Length (center to center)	10.498	10.502				
Bushing hole dia	1.937	1.938				
Bearing hole dia	3.6915	3.6950				
Bearing thickness.	0.0950	0.0955			0.0945	
Width at bearing end	2.426	2.428	0.008	0.012		
Crankshaft.						
Main journal dia	3.749	3.750	0.0020	0.0046	3.748	0.005
Main journal limits			0.0012	0.004		
Crankshaft end play			0.005	0.008		0.010
Crankpin dia	3.499	3.500	0.002	0.004	3.498	0.0045
Crankpin limits			0.0005	0.0035		
Camshaft						
Journal dia (all)	2.2470	2.2480			2.2465	
Cam lift:	0.374					
Camshaft bushing id	2.2495	2.2500			2.2510	
Camshaft end play			0.004	0.006		
Tappets						
Tappet dia	0.6082	0.6087			0.6072	
Tappet guide id	0.6089	0.6101	0.0019	0.0002	0.6111	0.0029
Valves.						
Valve length (overall)	7 1/4					
Stem dia	0.4955	0.4965			0.4935	
Head dia	2.245	2.255				
Valve and seat angle	45°	45°				
Stem clearance (desired):						
Intake			0.002	0.002		
Exhaust .			0.0035	0.0035		
Stem clearance (limits*):*						
Intake			0.0008	0.0023		0.0043
Exhaust .			0.0025	0.0045		0.0065
Valve guides						
Length:						
Intake	3 13/16					
Exhaust	4 1/8					
Outside dia:						
Intake and exhaust	0.8755	0.8765				
Inside dia						
Intake	0.4973	0.4978			0.4993	
Exhaust	0.4990	0.5000			0.5015	
Cylinder head face to top of guide:						
Intake	1 17/32					
Exhaust	1 1/2					

	Manufacturer's dimensions and tolerance in inches		Desired clearance		Maximum allowable wear	Maximum allowable clearance
	Min	Min.	Min	Max.		
Valve springs.						
Outside dia:						
Outer----------	1.8875	1.9075	----------	----------	----------	----------
Inner ----------	1.3550	1.3750	----------	----------	----------	----------
Wire gage:						
Outer .----------	0.225	----------	----------	----------	----------	----------
Inner----------	0.172	----------	----------	----------	----------	----------
Spring length (valve closed):						
Outer (under load of 85 to 95 lb)---------	2 3/4	----------	----------	----------	----------	----------
Inner (under load of 41 to 49 lb)----------	2 19/32	----------	----------	----------	----------	----------
Tension limits (in pounds):						
Outer (min weight closed)----------	----------	----------	----------	----------	----------	77 lb
Inner (min weight closed)----------	----------	----------	----------	----------	----------	37 lb
Spring length (valve opened):						
Outer (under load of 192 to 208 lb)------	2 3/4	----------	----------	----------	----------	----------
Inner (under load of 95 to 105 lb---------	2 1/32	----------	----------	----------	----------	----------
Tension limits (in pounds):						
Outer (min weight open)----------	----------	----------	----------	----------	----------	----------
Inner (min weight open)----------	----------	----------	----------	----------	----------	----------
Crankcase.						
Cylinder dia----------	5.375	5.377	----------	----------	5.385	----------
Main bearing bore in block----------	4.002	4.003	----------	----------	----------	----------
Rocker arms and Shaft						
Arm to shaft clearance----------	----------	----------	0.0005	0.0015	----------	----------

f. Carrier.

Manufacturer .....K. W. Dart Truck Co.
Model.....M-1200
Designed use.....Carrier of crane

g. Carrier Clutch.

Manufacturer .....Lipe-Rollway Corp.
Model.....150-1-466
Type.....ML

h. Transmission.

Manufacturer Fuller Manufacturing Co.
Model.....5-C-650

i. Transfer Case.

Manufacturer Rockwell Standard Corp.
Model.....T-226-B-15
Ratio 2.48-1

j. Front Axle.

Manufacturer Rockwell Standard Corp.
Model.....F234WX2
Ratio 10.17-1

k. Rear Axles.

Manufacturer Rockwell Standard Corp.
Front rear model.....RDFPX22
Rear rear model RDRPX46
Ratio10.26-1

l. Adjustments.

(1) Crane engine.

Spark plugs .....0.035 inch
Tappets (hot).....0.014-0.015 inch
Fan belt .....¼ to ½ in. depression midway between generator pulley and crankshaft pulley
Distributor.....0.020 inch

(2) Crane.

Swing clutch - 0.015 in. between drum and clutch lining at each point
Boom hoist brakeband .....¾ in. between head of
.....adjusting screw and
.....brake arm
Boom hoist return spring..... 1/32 in. between spring coils when brake is engaged

(3) Carrier engine.

Spark plugs ..... 0.035 inch
Fan belt ¾ to 1 in. depressed midway between generator pulley and crankshaft pulley
Distributor .....0.020 inch

Rocker arms valves (hot):
Intake 0.020
Exhaust .....0.024 inch

m. Crane Nut and Bolt Torque Data.

Cylinder head nuts .....70-75 ft-lb (foot-pounds)
Main bearings .....8-95 ft-lb
Center main bearing..... 100-110 ft-lb
Flywheel.....8--95 ft-lb
Manifold.....50-5 ft-lb
Gear cover and water pump.....2-30 ft-lb
Flywheel housing.....80-90 ft-lb
Camshaft nut.....120-130 ft-lb

n. Carrier Nut and Bolt Torque Data.

Cylinder head capscrews .....150-160 ft-lb
Rocker arm capscrews.....60-70 ft-lb
Main bearings.....95-105 ft-lb
Center main bearing.....125135 ft-lb
Connecting rod bearings .....75-85 ft-lb
Water pump.....25-30 ft-lb
Flywheel.....150-160 ft-lb

o. Time Standards. Table III lists the number of manhours required under normal conditions to perform the indicated maintenance and repair for the crane-shovel. Components are listed under the appropriate functional index. The times listed are not intended to be rigid standards. Under adverse conditions, the operations will take longer; but under ideal conditions with highly skilled mechanics, most of the operations can be accomplished in considerably less time.

Table III. Time Standards

Lubrication and			*Man/hours*
01	ENGINE (CRANE)		
	0100	ENGINE ASSEMBLY	
		Engine assembly---------- (To drain and refill to proper level.)	0.6
	0106.2	OIL FILTERS	
		Filter, oil---------- (To clean housing and install new element and gasket.)	0.5
	0106.5	CRANKCASE VENTILATION	
		Breather ---------- (To remove, clean, and replace.)	0.2
02	CLUTCH		
	0200	CLUTCH ASSEMBLY	
		Clutch assembly ---------- (To lubricate fittings.)	0.1
03	FUEL SYSTEM		
	0302.4	FUEL PUMP, GASOLINE	
		Fuel pump ---------- (To remove, clean and in-stall bowl and screen.)	0.1
	0304	AIR CLEANER	
		Air cleaner---------- (To clean and refill oil cup to proper level.)	0.4
	0306	TANKS, LINES, FITTINGS	
		Tank, fuel ---------- (To drain water and sediment and replenish fuel.)	0.8
05	COOLING SYSTEM		
	0501	RADIATOR	
		Radiator ---------- (To replenish coolant.)	0.1
	0504	WATER PUMP	
		Pump, water---------- (To lubricate fitting.)	0.1
06	ELECTRICAL SYSTEM (ENGINE AND VEHICULAR)		
	0603	STARTER	
		Starter ---------- (To oil sparingly.)	0.1
	0604.1	DISTRIBUTOR	
		Distributor---------- (To lubricate cam and wick.)	0.5
	0604.6	IGNITION COIL: WIRING, SPARK PLUGS	
		Spark plugs (all) ---------- (To remove, clean, and replace.)	1.0
	0612	BATTERIES	
		Batteries---------- (To clean and replenish electrolyte.)	0.2
43	HYDRAULIC, AIR AND VACUUM SYSTEMS (EXCLUDE BRAKE SYSTEMS)		
	4300	HYDRAULIC SYSTEM	
		Hydraulic system---------- (To replenish fluid in cylinders.)	0.3
60	STEAM BOILERS; WATER HEATERS; HEATING UNITS; BURNERS		
	6000.1	PERSONNEL HEATERS	
		Heaters, personnel ---------- (To remove strainer, clean housing, and install new strainer element when required.)	0.5
	6002	FUEL SYSTEM	
		Pumps and strainers ---------- (To remove fuel pump strainer and filter strainer, clean and replace.)	0.5
74	CRANES, SHOVELS OR EARTH-WORKING EQUIPMENT		
	7400	SHOVEL FRONT ATTACHMENT	
		Shovel front attachment---------- (To lubricate fittings.)	0.3

Lubrication and *Man/hours*

7401 CRANE, DRAGLINE OR CLAMSHELL ATTACHMENT
Crane, dragline, or clamshell ------ 0.2
(To lubricate fittings.)

7402 JIB BOOM ASSEMBLY
Jib boom assembly---------- 0.3
(To lubricate fittings.)

7403 BACK HOE ATTACHMENT
Back hoe attachment ---------- 0.2
(To lubricate fittings.)

7404 PILEDRIVER ATTACHMENT
Piledriver ---------- 0.2
(To lubricate fittings.)

7405 BASE; DECK
Crane assembly ---------- 0.4
(To lubricate fittings.)

76 FIREFIGHTING EQUIPMENT

7603 FIRE EXTINGUISHERS
Extinguisher, fire ----------0.05
(To clean and check charge.)

Carrier Section

01 ENGINE (CARRIER) CONTINENTAL MODEL SS6749

0100 ENGINE ASSEMBLY
Engine ---------- 0.6
(To drain and refill to proper level.)

0106.2 OIL FILTERS
Filter assembly, oil ---------- 0.6
(To clean housing and install new element and gasket.)

0106.5 CRANKCASE VENTILATION
Breather assembly ---------- 0.2
(To remove, clean, and replace.)

02 CLUTCH

0200 CLUTCH ASSEMBLY
Clutch assembly ---------- 0.2
(To lubricate fittings.)

03 FUEL SYSTEM

0304 AIR CLEANER
Air cleaner---------- 0.4
(To clean and refill to proper level with oil.)

0306 TANKS, LINES AND FITTINGS
Tank ---------- 0.3
(To drain water and sediment and replenish fuel.)

05 COOLING SYSTEM

0501 RADIATOR
Radiator---------- 0.1
(To replenish coolant.)

0504 WATER PUMP
Pump, water ---------- 0.1
(To lubricate fitting.)

Lubrication and *Man/hours*

06 ELECTRICAL SYSTEM (ENGINE AND VEHICULAR)

0603 STARTER
Starter ---------- 0.1
(To lubricate wick.)

0604.1 DISTRIBUTOR
Distributor---------- 0.5
(To lubricate cam and wick.)

0604.6 IGNITION COIL: WIRING, SPARK PLUGS
Spark plugs ---------- 1.3
(To remove, clean, and replace.)

0612 BATTERIES
Batteries---------- 0.2
(To clean and replenish electrolyte.)

07 TRANSMISSION

0700 TRANSMISSION ASSEMBLY
Transmission assembly ---------- 0.4
(To drain and refill to proper level.)

08 POWER TRANSFER (REGULAR MECHANICAL TRANSFER ONLY)

0800 POWER TRANSFER ASSEMBLY
Power transfer assembly---------- 0.3
(To drain and refill to proper level.)

0806.7 VENTILATION, BREATHERS
Breathers, ventilation ---------- 0.2
(To clean.)

09 PROPELLER SHAFT

0900 PROPELLER SHAFTS
Propeller shaft assemblies ---------- 0.3
(To lubricate fittings.)

10 FRONT AXLE

1000 FRONT AXLE ASSEMBLY
Axle assembly, front---------- 0.3
(To drain and refill to proper level.)

1005 VENTILATION
Breather, ventilation ---------- 0.2
(To clean.)

11 REAR AXLE

1100 REAR AXLE ASSEMBLY
Axle assembly, rear ---------- 0.3
(To drain and refill to proper level.)

1105 VENTILATION
Breather ---------- 0.2
(To clean.)

12 BRAKES (OTHER THAN SPECIAL PURPOSE)

1206 MECHANICAL BRAKE CONTROLS
Controls, brake ---------- 0.2
(To lubricate fittings.)

Lubrication and *Man/hours*

1208.1 AIR BRAKE SYSTEM
Brake system, air ---------- 0.2
(To drain moisture from reservoir.)

1209 AIR COMPRESSOR ASSEMBLY
Compressor assembly, air---------- 0.4
(To remove, clean, and replace breather.)

13 WHEELS AND TRACKS

1311 WHEEL ASSEMBLY
Bearings ---------- 3.2
(To remove, clean, repack, and replace.)

1313 TIRES, TUBES
Tires ---------- 0.4
(To gage and fill to proper pressure.)

14 STEERING

1401 STEERING ASSEMBLY
Steering gear assembly---------- 0.4
(To drain and refill to proper level.) Drag link; Tie rod -------- 0.1
(To lubricate fittings.)

1413 TANKS: RESERVOIR
Reservoir, hydraulic---------- 0.2
(To fill to proper level.)

15 FRAME

1503 PINTLES AND TOWING ATTACHMENTS
Pintle ----------0.05
(To lubricate fittings.)

1507 LANDING GEAR; LEVELING JACKS (MECHANICAL OR HYDRAULIC)
Outrigger front ----------0.05
(To lubricate fittings.)
Rear outrigger assembly----------0.05
(To lubricate fittings.)

16 SPRINGS AND SHOCK ABSORBERS

0601.1 FRONT SPRINGS
Springs, front ----------0.05
(To lubricate fittings.)

1605 TORQUE, RADIUS AND STABILIZER RODS
Torque rods ----------0.05
(To lubricate fittings.)

60 STEAM BOILERS; WATER HEATERS; HEATING UNIT: BURNERS

6000.1 PERSONNEL HEATERS
Heater, personnel---------- 0.5
(To clean strainer housing and install new element when needed.)

6002 FUEL SYSTEM
Pumps and strainers---------- 0.5
(To clean element and housing.)

Lubrication and *Man/hours*

76 FIREFIGHTING EQUIPMENT

7603 FIRE EXTINGUISHERS
Extinguisher, fire ----------0.05
(To clean and check charge.)

Crane Section

Removal and replacement *Man/hours*

01 ENGINE

0100 ENGINE ASSEMBLY
Engine, gasoline----------16.0
(Includes removal and replacement of engine clutch shaft sprocket, cab, clutch, radiator, heat duct, fuel line, and wiring.)

0101 CRANKCASE, BLOCK, CYLINDER HEAD
Block ----------23.0
(Engine out of unit-includes removal and replacement of externally mounted accessories, fly-wheel, timing gear cover, cylinder head, oil pan, pistons, valves, camshaft, and crankshaft.)
Cylinder head 5.0 (Includes removal and replacement of hoses, bracket, regulator, distributor, spark plugs, and thermostat housing.)

0102 CRANKSHAFT
Crankshaft assembly---------- 8.0
(Engine out of unit-includes removal and replacement of flywheel, timing gear cover, oil pan, oil pump, and connecting rod caps.)
Bearings ---------- 6.0
(Engine out of unit-includes removal and replacement of oil pan and oil pump.)
Crank-jaw and pulley---------- 3.0
(Includes removal and replacement of radiator.)

0103 FLYWHEEL ASSEMBLY
Flywheel (engine in unit) ---------- 7.0
(Includes removal and replacement of chain case and clutch.)
Flywheel (engine out of unit)------ 1.1
(Engine out of unit.)

0104 PISTONS, CONNECTING RODS
Pistons; rings; pins; retainers -----14.0
(Engine out of unit-includes removal and replacement of cylinder head, oil pan, and oil pump.)

Removal and replacement		Man/hours
	Bearings, rod	4.0
	(Engine out of unit-includes removal and replacement of oil pan and oil pump.)	
	Rods, connecting	14.0
	(Engine out of unit-includes removal and replacement of pistons.)	
0105	VALVES AND TIMING SYSTEM	
0105.1	VALVES	
	Valves	8.0
	(Includes removal and replacement of cylinder head and tappet covers.)	
	Valve seat, inserts	9.2
	(Includes removal and replacement of valves.)	
	Spring; Guides and locks	10.0
	(Includes removal and replacement of valves.)	
0105.2	ROCKER ARMS, TAPPETS	
	Tappets	8.2
	(Includes removal and replacement of valves.)	
	Valve cover	0.5
0105.3	CAMSHAFTS	
	Camshafts	16.0
	(Engine out of unit-includes removal and replacement of tappets, oil pump, fuel pump, and timing gear cover.)	
	Bushings	18.0
	(Engine out of unit-includes removal and replacement of camshaft and oil pan.)	
0105.5	TIMING GEARS	
	Gears, timing	6.7
	(Includes removal and replacement of radiator, water pump, governor, and timing gear cover.)	
0106	ENGINE LUBRICATION SYSTEM	
0106.1	OIL PUMP	
	Pump, oil	3.9
	(Includes removal and replacement of oil pan.)	
0106.2	OIL FILTERS	
	Filter, oil	0.7
	Element and gasket	0.3
0106.3	OIL COOLER	
	Cooler, oil	0.5
	Valve bypass	0.3

Removal and replacement		Man/hours
0106.4	PRESSURE REGULATOR OR RELIEF VALVES	
	Pressure relief valve	0.4
0106.5	CRANKCASE VENTILATION	
	Breather	0.05
	Filler and fittings	0.4
0106.6	OIL PAN, LINES, LEVEL GAGE	
	Oil pan (engine in unit)	3.4
	(Includes removal and replacement of starter, heater tube, oil pan shroud, and shield assembly.)	
	Oil pan (engine out of unit)	2.2
	(Engine out of unit-includes removal and replacement of starter.)	
	Gage, level	0.05
	Hoses	0.2
	Fittings	0.2
0108	MANIFOLDS	
	Manifold, intake	1.9
	(Includes removal and replacement of carburetor, primer lines and fittings, and check valve.)	
	Manifold, exhaust	2.3
	(Includes removal and replacement of muffler and air duct.)	
02	CLUTCH	
0200	CLUTCH ASSEMBLY	
	Clutch assembly	5.9
	(Includes removal and replacement of chain case.)	
0201	CLUTCH DISKS AND PLATES	
	Plate assembly, floating	5.7
	(Includes removal and replacement of clutch.)	
	Plate, driving	5.8
	(Includes removal and replacement of clutch.)	
0202	CLUTCH RELEASE MECHANISM	
	Yoke, cross-shaft, and throw out	5.5
	(Includes removal and replacement of clutch housing.)	
	Linkage and lever	1.5
03	FUEL SYSTEM	
0301	CARBURETOR: FUEL INJECTOR	
	Carburetor	0.8
0302.4	FUEL PUMP, GASOLINE	
	Fuel pump	0.5
	Bowl and gasket	0.1

Removal and replacement			Man/hours
	0304	AIR CLEANER	
		Air cleaner	0.6
	0306	TANKS, LINES, FITTINGS	
		Tank, fuel	1.0
		Cap	0.05
		Lines; fittings and strainers (each)	0.4
	0308	ENGINE SPEED GOVERNOR	
		Governor assembly	0.7
	0311	PRIMING SYSTEM	
		Pump and fittings	0.4
		Lines	0.3
	0312	ACCELERATOR, THROTTLE, OR CHOKE CONTROLS	
		Controls, throttle	0.7
		Choke controls	0.4
04	EXHAUST SYSTEM		
	0401	MUFFLER AND PIPES	
		Muffler	1.0
		Pipes and clamps	1.4
		(Includes removal and replacement of muffler.)	
05	COOLING SYSTEM		
	0501	RADIATOR	
		Radiator	2.5
		(Includes removal and replacement of oil cooler and water hoses.)	
		Cap	0.05
		Shutter	0.8
		Controls, shutter	0.4
	0502	COWLING, DEFLECTORS, AIR DUCT, SHROUD	
		Shroud	0.5
	0503	LINES AND FITTINGS, HOSES, PIPES, CLAMPS	
		Fittings; hoses; pipes; clamps	0.6
	0504	WATER PUMP	
		Pump, water	1.5
		(Includes removal and replacement of fan guard, fan belts, and hoses.)	
	0505	FAN ASSEMBLY	
		Fan	0.6
		Guard	0.2
		Belt	0.9
		(Includes removal and replacement of fan guard and fan.)	
	0506	WATER MANIFOLDS, HEADERS, THERMOSTATS AND HOUSING, GASKETS	
		Thermostat housing and gasket	0.7
		Thermostat	0.7
06	ELECTRICAL SYSTEM (ENGINE AND VEHICULAR)		
	0601	GENERATOR	
		Generator assembly	0.8
		Brushes	1.9
		(Includes removal and replacement of generator.)	
	0601.1	GENERATOR SPECIAL DRIVE	
		Belt	1.2
		(Includes removal and replacement of fan and fan belt.)	
	0602	GENERATOR REGULATOR	
		Regulator, generator	0.5
	0603	STARTER	
		Starter	1.0
		Brushes and solenoid switch	1.6
		(Includes removal and replacement of starter.)	
	0604	IGNITION COMPONENTS	
	0604.1	DISTRIBUTOR	
		Distributor	0.9
		Points; condenser; rotor cap	0.7
	0604.6	IGNITION COIL: WIRING, SPARK PLUGS	
		Ignition coil	0.3
		(Includes removal and replacement of distributor cover.)	
		Wiring	0.1
		Spark plugs (each)	0.1
	0607	INSTRUMENT OR ENGINE CONTROL PANEL	
		Panel	5.0
		(Includes removal and replacement of switches, circuit breakers, lights, gages, and wiring.)	
		Switches (each)	0.7
		Circuit breakers (each)	0.7
		Lights (each)	0.6
		Gages (each)	0.7
		Wiring harness	2.7
		Lamps	0.05
	0608	MISCELLANEOUS ITEMS	
		Slave receptacle	0.5
	0609	LIGHTS	
	0609.1	HEAT, TAIL, AND MARKER LIGHTS	
		Lights, marker	0.4
		Doors; Lights and lenses	0.2
	0609.2	ADDITIONAL LIGHTS	
		Dome lights	0.4
		Lens; lamp; rim	0.2
		Floodlights (each)	0.4
		Doors; Lamps and gaskets	0.2
	0612	BATTERIES	
		Batteries	0.5
		Box, battery	1.2
		(Includes removal and replacement of batteries and heat ducts.)	

Removal and replacement			Man/hours
		Clamp	0.05
		Cables	0.8
	0613	HULL OR CHASSIS WIRING HARNESS	
		Cab wiring	4.8
	0615	RADIO SUPPRESSION	
		Components, suppression	0.8
17		BODY; CAB; HOOD; HULL	
	1700	BODY, CAB ASSEMBLY	
		Cab assembly	16.5
		(Includes removal and replacement of gantry sheave assembly, front gantry legs, heat ducts, wiring, throttle and choke control, fuel lines, exhaust pipe and muffler, wiper, lights, shutter, instrument panel, heat control box, and heater.)	
		Cab assembly	6.8
		(Includes removal and replacement of only those items necessary to remove cab from upper assembly as follows: gantry sheave assembly, front gantry legs, ducts from heater, wiring from engine, throttle and choke controls, fuel lines, exhaust pipe, and muffler.)	
	1708	DOORS; HATCHES; HOOD	
		Doors and hatches	0.8
		Glass	1.2
	1704	PANELS	
		Panel cable housing	0.7
		Shield	1.8
		Glass	1.2
	1706	UPHOLSTERY, SEATS, CARPETS	
		Seats	0.4
		Mats	0.1
22		MISCELLANEOUS BODY, CHASSIS OR HULL, AND ACCESSORY ITEMS	
	2202.1	MIRRORS, REFLECTORS, DEFROSTERS, WIPERS, AIR HORNS	
		Defrosters	0.4
		Reflectors	0.3
		Wipers	0.6
		Arm	0.2
		Blade	0.06
	2202.2	INTERCOM DEVICES	
		Horn	0.4
		Button	0.4
		Wiring	0.4

Removal and replacement			Man/hours
	2207	WINTERIZATION EQUIPMENT	
		Hose and clamps (each)	0.8
		Thermostatic controlled air flow deflector assemblies and manifold (each)	0.8
		Wiring (each)	0.8
		Switch, thermostat, oil sump	1.5
		Shroud, oil pan	0.7
		Panels, engine	0.6
	2210	DATA PLATES AND INSTRUCTION HOLDERS	
		Plates, data	0.6
		(Includes stamping of data on new plate.)	
		Plates, instruction, holders	0.3
26		ACCESSORIES, PUBLICATIONS, TEST EQUIPMENT, AND TOOLS	
	2602.1	ACCESSORIES	
		Accessories	0.06
	2602.2	COMMON TOOLS	
		Tools, common	0.05
	2602.4	PUBLICATIONS	
		Publications	0.06
43		HYDRAULIC, AIR, AND VACUUM SYSTEMS (EXCLUDE BRAKE SYSTEMS)	
	4301	HOSE, PIPE, FITTINGS, TUBING	
		Hoses and fittings (each)	0.8
		Packing gland, tubing	0.4
	4305	MANIFOLD AND/OR CONTROL VALVES	
		Master cylinders	0.6
	4307	HYDRAULIC CYLINDERS	
		Clutch cylinders	0.4
	4309	HYDRAULIC CONTROLS AND/OR MANUAL CONTROLS	
		Controls	1.0
60		STEAM BOILERS; WATER HEATERS; HEATING UNITS; BURNERS	
	6000.1	PERSONNEL HEATERS	
		Heater, personnel	0.8
		Control	0.6
		Control box	0.4
	6002	FUEL SYSTEM	
		Pumps	0.7
		Strainers	0.7
	6002.1	BURNER ASSEMBLY	
		Igniters	1.6
	6002.2	FUEL TANK	
		Lines and fittings	0.4
	6002.3	BLOWER ASSEMBLY	
		Blower assembly	1.2
	6004	EXHAUST SYSTEM	
		Pipes and clamps	1.0

Removal and replacement			Man/hours
	6005	COMBUSTION CHAMBER	
		Liners; Insulation	2.3
		(Includes removal and replacement of blower and combustion casing.)	
74		CRANES, SHOVELS, OR EARTH-WORKING EQUIPMENT	
	7400	SHOVEL FRONT ATTACHMENT	
		Shovel front attachment	5.6
		(Includes installation of crowd and rerack mechanism; dipper trip and control; shovel boom, dipper and handle as a unit; hoist, boom, and trip cables.)	
	7400.1	SHOVEL BOOM	
		Boom, shovel	7.0
		(Includes removal and replacement of cables, dipper and handle as a unit, and shipper shaft.)	
	7400.2	SHIPPER SHAFT	
		Shipper shaft	5.0
		(Includes removal and replacement of dipper and handle as a unit.)	
	7400.3	CROWD AND RERACK MECHANISM	
		Crowd, rerack	3.5
		(Installation only.)	
		Chains (each)	0.8
	7400.4	DIPPER	
		Dipper	2.0
		(Includes removal and replacement of hoist and trip cables at dead end and padlock block.)	
		Teeth	0.6
		Dipper latch	1.0
	7400.5	DIPPER HANDLE	
		Dipper handle	4.0
		(Includes removal and replacement of dipper.)	
	7400.6	PADLOCK BLOCK	
		Padlock block	0.8
		(Includes removal and replacement of hoist cable at dead end.)	
		Sheave	0.8
	7401.1	CRANE, DRAGLINE OR CLAMSHELL BOOM	
		Boom -	1.5
		(Installation only - includes installation of boom harness.)	

Removal and replacement			Man/hours
	7401.2	HOOK BLOCK	
		Hook block	0.3
		(Includes installation only.)	
	7401.3	TAGLINE	
		Tagline	0.5
		(Includes installation only.)	
	7401.4	CLAMSHELL BUCKET	
		Bucket, clamshell	0.5
		(Includes installation only.)	
		Teeth	2.5
	7401.5	DRAGLINE BUCKET	
		Bucket, dragline	2.3
		(Includes removal and replacement of fair-lead.)	
		Teeth	0.6
	7401.6	FAIR-LEAD	
		Fair-lead	1.5
		Sheaves and rollers (each)	0.5
	7401.7	BOOM HARNESS	
		Boom harness	2.0
		Sheaves (each)	0.7
	7402.1	JIB BOOM	
		Jib boom	1.8
		(Includes removal and replacement of mast.)	
	7402.2	MAST	
		Mast	1.3
	7402.3	CABLES; PULLEYS, PINS, BUSHINGS	
		Cables (each)	0.5
		Pulleys (each)	0.7
		Shafts (each)	0.5
		Pins (each)	0.3
		Bushings (each)	1.1
	7403	BACK HOE ATTACHMENT	
		Back hoe attachment	2.0
		(Includes installation of cables, and boom, bucket, and handle as a unit.)	
	7403.1	HOE BOOM	
		Boom, hoe	2.5
		(Includes removal and replacement of bucket and handle.)	
	7403.2	MAST	
		Mast	1.5
	7403.3	BUCKET AND HANDLE	
		Bucket and handle	1.2
		(Includes removal and replacement of cables at dead end.)	
		Teeth	0.3
	7403.4	PULLEY BLOCK	
		Block, pulley	0.4
		Bushings (all)	1.2

Removal and replacement		Man/hours
7403.6	BOOM CRADLE	
	Boom cradle	1.1
7404	PILEDRIVER ATTACHMENT	
	Piledriver	3.0
	(Includes installation of leads, catwalk, and hammer.)	
	Catwalk	1.0
7405	BASE; DECK	
	Crane assembly	8.5
	(Includes removal and replacement of rollers.)	
7405.1	ROTATING BASE	
	Machinery deck	80.0
	(Includes removal and replacement of crane assembly, cab, fuel tank, engine, rear gantry frame, machinery, battery box, controls, and lights.)	
	Bushing, deck	8.2
	(Includes removal and replacement of crane assembly.)	
	Conical rollers and brackets (all)	6.0
7406	MACHINERY DECK MECHANISM ASSEMBLIES	
7406.1	ENGINE CLUTCH SHAFT	
	Chain transfer sprocket	4.2
	Chain	3.2
7406.2	JACKSHAFT OR CENTER DRIVE SHAFT	
	Jackshaft assembly	6.3
	(Includes removal and replacement of jackshaft drive sprocket.)	
7406.3	HORIZONTAL SWING SHAFT	
	Swing shaft assembly	10.0
	(Includes removal and replacement of cab.)	
	Clutch bands (each)	1.0
	Chain tightener	1.5
	Chain assembly	1.5
7406.4	HOIST SHAFT	
	Hoist shaft assembly	11.0
	(Includes removal and replacement of cab.)	
	Chain assembly	0.9
	(Includes removal and replacement of guard.)	
	Brake and clutch bands (each)	0.9
	Chain tightener	0.9
	(Includes removal and replacement of chain guard.)	
7406.5	GEAR GUARDS AND SHIELDS	
	Guard, gear (each)	0.5

Removal and replacement		Man/hours
7406.8	VERTICAL SWING SHAFT	
	Shaft, vertical swing assembly	11.5
	(Includes removal and replacement of horizontal swing shaft.)	
7406.9	SWING LOCK AND/OR BRAKE	
	Swing lock	0.6
	Swing brake	0.8
	Lining	1.7
	(Includes removal and replacement of band.)	
7406.11	DIPPER TRIP	
	Dipper trip	1.1
	(Includes installation only.)	
7406.12	MACHINERY GEAR CASE OR FRAME	
	Case, gear	4.7
	(Includes removal and replacement of main drive sprockets.)	
7406.13	INDEPENDENT OR PRECISION BOOM HOIST	
	Boom hoist assembly	15.5
	(Includes removal and replacement of cab and jackshaft.)	
	Clutch and brakeband (each)	1.8
	Chain assemblies	1.5
7406.14	MACHINERY MECHANISM CONTROLS	
	Levers (each)	0.6
	Linkage (average)	0.4
7406.15	GANTRY	
	Frame	7.2
	(Includes removal and replacement of cab.)	
	Sheaves (all)	1.4
7406.17	SAFETY BOOM STOP	
	Cables, safety	0.4
7408	MOUNTING BASE	
	Gear, trunnion base	8.7
	(Includes removal and replacement of crane assembly.)	
7499	CABLES AND ROPES	
	Cables; Ropes (each)	0.4 to 1.0
76	FIREFIGHTING EQUIPMENT	
7603	FIRE EXTINGUISHERS	
	Extinguisher, fire	0.05
	Carrier Section	
01	ENGINE	
0100	ENGINE ASSEMBLY	
	Engine	11.7
	(Includes removal and replacement of hood, rear engine panel, radiator	

hoses, sending units, starter, hydraulic pump, exhaust pipe and muffler, disconnection and reconnection of fuel lines, throttle linkage, choke cable, wiring at generator and starter, air lines at compressor, linkage at clutch and transmission, and propeller shaft at transmission; also includes removal and replacement of transmission and clutch from engine.)

0101 CRANKCASE, BLOCK, CYLINDER HEAD

Block---33.0
(Engine out of unit-includes removal and replacement of cylinder head, flywheel, timing gear cover, oil pan, pistons, crankshaft, camshaft, tappets, and externally mounted accessories.)

Cylinder head ---10.0
(Includes removal and replacement of manifolds, water manifold, rocker arms, and valves.)

0102 CRANKSHAFT

Crankshaft assembly ---- 9.3
(Engine out of unit-includes removal and replacement of timing gear cover, flywheel and housing, oil pan, oil pump filler blocks, and disconnection and reconnection of connecting rods.)

Bearings, main ---- 3.8
(Engine out of unit includes removal and replacement of oil pan and oil pump.)

Damper ---- 0.6

Drive pulley---- 5.0

Crank-jaw---- 0.3

0103 FLYWHEEL ASSEMBLY

Flywheel (engine installed)--- 7.0
(Includes removal and replacement of clutch and transmission.)

Flywheel (engine out of unit) --- 0.9

0104 PISTON, CONNECTING RODS

Piston; Rings; Pins; Retainers---14.0
(Engine removed includes removal and replacement of cylinder head, oil pan, and oil pump.)

Bearings, rod---- 5.0
(Engine removed - includes removal and replacement of oil pan and oil pump.)

Connecting rods ---14.00
(Engine removed - includes removal and replacement of pistons.)

0105 VALVES AND TIMING SYSTEM

0105.1 VALVES

Valves ---- 9.3
(Includes removal and replacement of cylinder head and rocker arms.)

Valve seats ---10.0
(Includes removal and replacement of valves.)

Springs; guides and locks ---10.0
(Includes removal and replacement of valves.)

0105.2 ROCKER ARMS, TAPPETS

Rocker arms ---- 2.1
(Includes removal and replacement of throttle linkage, breather housing, and rocker arm covers.)

Gaskets and covers ---- 0.8
(Includes removal and replacement of throttle linkage and breather housing.)

Push rods---- 3.1
(Includes removal and replacement of rocker arms.)

Tappets---18.5
(Includes removal and replacement of camshaft.)

0105.3 CAMSHAFT

Camshaft---18.0
(Engine removed - includes removal and replacement of oil pump, accessory drive unit, cylinder head, fuel pump, timing gear cover, and push rods.)

Bushings ---20.0
(Engine removed - includes removal and replacement of camshaft.)

0105.5 TIMING GEARS

Gears, timing ---- 5.1
(Engine removed - includes removal and replacement of fan, dampener, crankshaft pulley, and timing gear cover.)

Removal and replacement *Man/hours*

0106 ENGINE LUBRICATION SYSTEM

0106.1 OIL PUMP

Pump assembly, oil ---------- 3.5
(Includes removal and replacement of oil pan shroud and oil pan.)

0106.2 OIL FILTERS

Filter assembly, oil ---------- 0.5

Element and gasket ---------- 0.5

0106.3 OIL COOLER

Cooler, oil (w/housing) ---------- 2.0
(Includes removal and replacement of oil filters.)

0106.4 PRESSURE REGULATOR OR RELIEF VALVES

Pressure relief valve, oil system ---------- 2.2

0106.5 CRANKCASE VENTILATION

Breather assembly ---------- 0.4

Conical rollers and brackets (all) ---------- 6.0

0106.6 OIL PAN, LINES, LEVEL GAGE

Oil pan ---------- 2.9
(Includes removal and replacement of oil pan shroud.)

Gage, level ---------- 0.01

0108 MANIFOLDS

Manifolds, intake ---------- 1.9
(Includes removal and replacement of primer lines, breather tube, and carburetor.)

Manifold, exhaust ---------- 2.6
(Includes removal and replacement of intake manifold.)

0109 DRIVING MECHANISMS

0109.1 ACCESSORY DRIVE

Governor drive cable ---------- 0.4

Shaft and gear housing ---------- 1.7
(Includes removal and replacement of access panel and distributor.)

02 CLUTCH

0200 CLUTCH ASSEMBLY

Clutch assembly ---------- 6.0
(Includes removal and replacement of transmission.)

0201 CLUTCH DISKS AND PLATES

Disks ---------- 7.0
(Includes removal and replacement of clutch.)

Removal and replacement *Man/hours*

0202 CLUTCH RELEASE MECHANISM

Clutch release ---------- 6.3
(Includes removal and replacement of clutch.)

Clutch linkage ---------- 1.5
(Includes removal and replacement, of toeboards.

03 FUEL SYSTEM

0301 CARBURETOR, FUEL INJECTOR

Carburetor ---------- 2.0

0302.4 FUEL PUMP, GASOLINE

Pump, fuel . ---------- 1.0

0304 AIR CLEANER

Air cleaner ---------- 0.7

0306 TANKS, LINES AND FITTINGS

Tank. ---------- 1.3

Lines; Fittings (each) ---------- 0.5

Cap ---------- 0.2

0308 ENGINE SPEED GOVERNOR

Governor assembly ---------- 1.4

0311 PRIMING SYSTEM

Pump ---------- 0.7

Lines ---------- 0.6

Fittings ---------- 0.2

0312 ACCELERATOR, THROTTLE OR CHOKE CONTROLS

Accelerator controls ---------- 0.7

Choke controls ---------- 0.4

04 EXHAUST SYSTEM

0401 MUFFLER AND PIPES

Muffler ---------- 0.7

Pipes ---------- 1.5

Clamps.. ---------- 0.3

05 COOLING SYSTEM

0501 RADIATOR

Radiator ---------- 4.7
(Includes removal and replacement of fan, shroud, water pump shutter and hoses; also includes disconnection and reconnection of shutter control at shutters.)

Cap ---------- 0.05

Shutter; Controls, shutter ---------- 2.5

0502 COWLING, DEFLECTORS. AIR DUCT SHROUD

Shroud ---------- 0.6
(Includes removal and replacement of fan.)

0503 LINES AND FITTINGS, HOSES, PIPES, CLAMPS

Pipes; lines; hoses (each) ---------- 0.6

Clamps; fittings (each) ---------- 0.3

Removal and replacement *Man/hours*

0504 WATER PUMP
- Pump, water ---------- 2.5
  (Includes removal and replacement of fan blade, steering pump, hoses, and belts:)

0505 FAN ASSEMBLY
- Fan blade. ---------- 0.8
- Fan pulley---------- 2.8
  (Includes removal and replacement of fan blade and water pump.)
- Belt ---------- 1.1
  (Includes removal and replacement of blade.)

0506 WATER MANIFOLDS, HEADERS, THERMOSTATS AND HOUSING, GASKETS
- Manifold, water---------- 1.5
  (Includes removal and replacement of hoses.)
- Thermostat ---------- 0.8
  (Includes removal and replacement of hose and housing.)

06 ELECTRICAL SYSTEM (ENGINE AND VEHICULAR)

0601 GENERATOR
- Generator---------- 1.7
- Brushes ---------- 2.2

0602 GENERATOR REGULATOR
- Regulator, generator---------- 0.6

0603 STARTER
- Starter ---------- 1.5
- Solenoid ---------- 0.8
- Brushes ---------- 2.3

0604 IGNITION COMPONENTS

0604.1 DISTRIBUTOR
- Distributor---------- 1.3
  - Cap---------- 0.5
- Condenser---------- 0.8
- Rotor---------- 0.3
- Points---------- 0.9

0604.6 IGNITION COIL: WIRING, SPARK PLUGS
- Ignition coil ---------- 0.6
  (Includes removal and replacement of distributor cap.)
- Wiring (each) ---------- 0.1
- Spark plugs (each)---------- 0.1

0607 INSTRUMENT OR ENGINE CONTROL PANEL,
- Panel ---------- 8.0
  (Includes removal and replacement of wiring, switches, gages, lights, controls, and primer pump.)

Removal and replacement *Man/hours*
- Wiring (each)---------- 0.4
- Switches (each) ---------- 0.8
- Gages (each) ---------- 0.9
- Light (each---------- 0.8
- Lamp, dash light---------- 0.1

0608 MISCELLANEOUS ITEMS
- Stoplight switch---------- 0.6
- Turn signal switch---------- 1.5
- Flasher unit----------0.05
- Fuses ----------0.05
- Slave receptacle ---------- 0.6

0609 LIGHTS

0609.1 HEAD, TAIL., AND MARKER LIGHTS
- Headlights (each) ---------- 0.8
- Sealed unit---------- 0.4
- Tail. marker, turn signal lights (each) ---------- 0.5
- Doors; lenses; lamps; gaskets ------- 0.2

0609.2 ADDITIONAL LIGHTS
- Dome and blackout lights (each) ---------- 0.4
- Doors; lenses; lamps; gaskets ------- 0.2

0611 HORN; SIREN
- Horn---------- 0.5
- Button---------- 1.4
- Wiring ---------- 1.5

0612 BATTERIES
- Batteries---------- 0.8
- Cables (each)---------- 0.4
- Boxes ---------- 1.2
  (Includes removal and replacement of batteries.)

0613 HULL OR CHASSIS WIRING HARNESS
- Cab and chassis wiring---------- 8.0

0615 RADIO SUPPRESSION
- Components, suppression (each)---------- 0.6

0617 TRAILER COUPLINGS
- Trailer couplings, electrical -------- 0.8

07 TRANSMISSION

0700 TRANSMISSION ASSEMBLY
- Transmission assembly ---------- 5.2
  (Includes removal and replacement of propeller shaft, clutch housing, transmission linkage, and clutch linkage.)

0701 TRANSMISSION CASE
- Case, transmission ----------10.5
  (Includes removal and replacement of transmission and all internal components of transmission.)

0702 TRANSMISSION SHAFTS

Removal and replacement *Man/hours*

0702.1 INPUT SHAFT
Shaft; gear; bearing ---------- 6.1
(Includes removal and replacement of transmission.)

0702.3 OUTPUT SHAFT; MAIN SHAFT
Shaft; gears; bearings ---------- 7.8
(Includes removal and replacement of transmission.)

0702.5 IDLER SHAFT; COUNTERSHAFTS
Shafts; gears; bearings ---------- 10.0
(Includes removal and replacement of transmission.)

0704 TRANSMISSION TOP COVER ASSEMBLY
Cover assembly ---------- 1.9
(Includes disconnection and reconnection of linkage at transmission.)

0704.1 CONTROL SHAFTS, RODS
Shafts and rods, control ---------- 2.3
(Includes removal and replacement of engine access panel.)

08 POWER TRANSFER (REGULAR MECHANICAL TRANSFER ONLY)

0800 POWER TRANSFER ASSEMBLY
Power transfer assembly ---------- 4.2
(Includes removal and replacement of linkage, propeller shafts, and hand brake.)

0801 TRANSFER CASE
Case, transfer ---------- 10.0
(Includes removal and replacement of power transfer and all internal components.)

0802 POWER TRANSFER SHAFTS

0802.1 INPUT SHAFT
Shaft; gear; bearings; seals -------- 8.3
(Includes removal and replacement of power transfer.)

0802.3 IDLER SHAFTS
Shaft; gear; bearings ---------- 8.6
(Includes removal and replacement of power transfer.)

0802.6 OUTPUT SHAFT; MAIN SHAFT
Shaft; gear; bearings; seals ----- 9.0
(Includes removal and replacement of power transfer.)

Removal and replacement ---------- *Man/hours*

0804 SHIFT LEVERS, SHAFTS, YOKES
Shifter assembly ---------- 0.7

0806.7 VENTILATION, BREATHERS
Breathers, ventilation ---------- 0.2

09 PROPELLER SHAFT

0900 PROPELLER SHAFTS
Propeller shaft assemblies (each) ---------- 1.2

10 FRONT AXLE

1000 FRONT AXLE ASSEMBLY
Axle assembly, front ---------- 4.2
(Includes removal and replacement of wheels; disconnection and reconnection of propeller shaft springs, air lines, drag link, and shock absorbers.)

1001 HOUSING, BEAM, HOUSING COVERS, PLUGS
Housing ---------- 10.3
(Includes removal and replacement Of axle assembly and all internal components of assembly.)
Plugs ---------- 0.1

1002 DIFFERENTIAL
Differential assembly ---------- 9.4
(Includes removal and replacement of front axle assembly and axle shafts.)

1004 STEERING
Arm ---------- 0.9
(Includes removal and replacement of drag link at arm.)
Flanges ---------- 4.4
(Includes removal and replacement of axle shafts.)
Spindle ---------- 2.9
(Includes removal and replacement of brakeshoes and drum.)

1005 VENTILATION
Breather, ventilation ---------- 0.2

1006 SHAFT
Shafts ---------- 2.0
(Includes removal and replacement of hub, drum, shoes, and spindle.)
Universal joints ---------- 3.5
(Includes removal and replacement of shafts.)
Drive flange ---------- 1.5

Removal and replacement *Man/hours*

11 REAR AXLE

1100 REAR AXLE ASSEMBLY
- Axle assembly, rear (tandem unit) ---------- 4.3
  (Includes removal and replacement of propeller shaft, torque rods, and brake lines.)
- Axle assembly, rear (each) ---------- 7.0
  (Includes removal and replacement of rear tandem unit, rear propeller shaft, and wheels.)

1101 HOUSING, BEAM, HOUSING COVERS, PLUGS
- Housing ---------- 16.0
  (Includes removal and replacement of axle assembly and all internal components.)
- Plugs ---------- 0.05

1102 DIFFERENTIAL
- Differential assembly ---------- 7.0
  (Includes removal and replacement of rear tandem unit and axle shafts.)

1105 VENTILATION
- Breather ---------- 0.2

1106 SHAFTS
- Shafts, axle ---------- 1.6

1108 WALKING BEAMS, STUB AXLES, AND PARTS
- Walking beams (each) ---------- 8.0

12 BRAKES (OTHER THAN SPECIAL PURPOSE)

1201 HANDBRAKES
- Brake, hand ---------- 3.0
  (Includes removal and replacement of propeller shaft.)
- Hand lever ---------- 0.8
- Linkage ---------- 0.3

1202 SERVICE BRAKES
- Brakes, service (1 wheel) ---------- 3.5
  (Does not include spider.)
- Shoes (1 wheel ---------- 2.5

1206 MECHANICAL BRAKE CONTROLS
- Controls, brake (each) ---------- 0.5

1208 AIR BRAKES

1208.1 AIR BRAKE SYSTEM
- Brake system, air lines (each) ---------- 0.4
- Fittings (each) ---------- 0.2

1208.3 BRAKE CHAMBERS, DIAPHRAGMS, VALVE, FILTERS
- Brake chambers (each) ---------- 0.5
- Valves (each) ---------- 0.5

Removal and replacement *Man/hours*

1209 AIR COMPRESSOR ASSEMBLY
- Compressor assembly, air --------- 2.0
  (Includes removal and replacement of pulley, coolant lines, and air lines from the compressor.)

1209.3 AIR RESERVOIR, FITTINGS
- Reservoir, air (each) ---------- 0.9
- Fittings (each) ---------- 0.2

1211 TRAILER BRAKE CONNECTIONS AND CONTROLS
- Valves; coupling ---------- 0.6
- Lines ---------- 0.4
- Fittings ---------- 0.2

13 WHEELS AND TRACKS

1311 WHEEL ASSEMBLY
- Wheel assembly ---------- 1.2
- Hubs; seals; drums ---------- 1.9
- Bearings ---------- 1.9

1313 TIRES, TUBES
- Tires ---------- 1.2
- Tubes ---------- 1.2

14 STEERING

1401 STEERING ASSEMBLY
- Steering gear assembly ---------- 6.0
- Drag links; Tie rod (each) ---------- 1.2

1410 HYDRAULIC PUMP OR FLUID MOTOR ASSEMBLY
- Pump assembly, hydraulic ---------- 0.4

1410.1 PUMP DRIVE
- Belts ---------- 1.1
  (Includes removal and replacement of fan blade.)
- Pulley ---------- 0.5

1411 HOSE, LINES, FITTINGS
- Hose; Lines (each) ---------- 0.4
- Fittings (each ---------- 0.2

1412 HYDRAULIC OR AIR CYLINDERS
- Hydraulic cylinders (each) ---------- 0.5

1413 TANKS; RESERVOIR
- Reservoir, hydraulic ---------- 0.3

1414 STEERING SYSTEM VALVES

1414.1 STEERING VALVES
- Valve, steering ---------- 0.8

1414.2 RELIEF VALVES
- Valve, relief ---------- 0.3

15 FRAME

1501 FRAME ASSEMBLY
- Frame assembly ---------- 80.0
  (Includes removal and replacement of upper assembly; engine, clutch and transmission as a unit; axle assemblies; transfer case; cab; radiator; outriggers; wiring; lines, and ring gear.)

Removal and replacement *Man/hours*

1501.3 BUMPERS, GUARDS, ROLLERS
- Guard ---------- 2.0
  (Includes removal and replacement of radiator shutter control.)

1503 PINTLES AND TOWING

ATTACHMENTS
Pintle ---------- 0.3
1507 LANDING GEAR; LEVELING JACKS (MECHANICAL OR HYDRAULIC)
Outrigger, front (each) ---------- 0.5
Rear outrigger assembly ---------- 1.0
Floats ---------- 0.1
16 SPRINGS AND SHOCK ABSORBERS
1601 MAIN SPRINGS
1601.1 FRONT SPRINGS
Springs, front ---------- 4.2
1604 SHOCK ABSORBER EQUIPMENT
1604.1 SHOCK ABSORBERS
Absorbers, shock (each) ---------- 0.7
1605 TORQUE, RADIUS AND STABILIZER RODS
Torque rods (each) ---------- 1.2
17 BODY; CAB; HOOD; HULL
1700 BODY, CAB ASSEMBLY
Cab assembly ---------- 9.4
(Includes removal and replacement of wiring, engine hood, back panel and access panel, air and fuel lines, throttle and choke controls, heater and ducts, instrument panel thermostat, wiper, door glass, vents, and seat.)
1701.1 FENDERS, SAND SHIELDS, RUNNING BOARDS
Fender, right front ---------- 3.9
(Includes removal and replacement of hood, side and rear panel, sand, shield, and battery box.)
Fender, left front ---------- 11.0
(Includes removal and replacement of cab.)
Fenders, rear (each) ---------- 0.9
1702 ENGINE SIDE PANELS
Panels, engine side ---------- 1.5
(Includes removal and replacement of heat ducts.)
1703 DOORS; HATCHES; HOOD
Doors ---------- 0.5
Hood ---------- 0.4
Glass ---------- 1.1

Removal and replacement *Man/hours*
1704 PANELS
Ventilators (each) ---------- 0.4
Access panel ---------- 0.5
Glass ---------- 1.2
1706 UPHOLSTERY, SEATS, CARPETS
Seats ---------- 0.5
Mat floor ---------- 0.3
22 MISCELLANEOUS BODY, CHASSIS OR HULL AND ACCESSORY ITEMS
2202.1 MIRRORS, DEFLECTORS, DEFROSTERS, WIPERS, AIR HORNS
Mirrors and reflectors ---------- 0.4
Defrosters ---------- 0.4
Windshield wipers ---------- 0.6
Arm ---------- 0.2
Wiper blades ---------- 0.05
Hoses and clamps (each) ---------- 0.4
Air flow deflectors ---------- 0.5
2207 WINTERIZATION EQUIPMENT
Hoses and clamps (each) ---------- 0.4
Thermostatic controlled air flow deflector assemblies ---------- 0.7
Wiring (each) ---------- 0.3
Thermocouple ---------- 0.5
Shroud, oil pan ---------- 1.0
2210 DATA PLATES AND INSTRUCTION HOLDERS
Plates, data ---------- 0.5
(Includes stamping data on new plate.)
Plates, caution, and instruction holders ---------- 0.2
26 ACCESSORIES, PUBLICATIONS, TEST EQUIPMENT AND TOOLS
2602.2 COMMON TOOLS
Tools, common ---------- 0.05
2602.4 PUBLICATIONS
Publications ---------- 0.05
47 GAGES (NON-ELECTRICAL); WEIGHTING AND MEASURING DEVICES
4700 INSTRUMENTS, SPEED AND DISTANCE
4701.1 SPEEDOMETER
Speedometer ---------- 1.2
4709 PRESSURE GAGES
Air pressure gage ---------- 0.9
50 PNEUMATIC EQUIPMENT
5001 CRANKCASE, BLOCK, CYLINDER HEAD
Crankcase ---------- 5.0
(Includes removal and replacement of compressor, cylinder head, pistons, block, and crankshaft.)

Removal and replacement		*Man/hours*
	Block	4.5
	(Includes removal and replacement of compressor, cylinder head, and pistons.)	
	Cylinder head	2.9
	(Includes removal and replacement of compressor and valves.)	
6002	CRANKSHAFT	
	Crankshaft assembly	3.4
	(Includes removal and replacement of compressor.)	
50023	COMPRESSOR DRIVE	
	Pulley	0.5
	Belt	1.3
	(Includes removal and replacement of fan belts.)	
5004	PISTONS, CONNECTING RODS	
	Pistons; connecting rods	4.0
	(Includes removal and replacement of compressor, cylinder head, and base.)	
5005	VALVES AND TIMING MECHANISM	
5005.1	VALVES, SPRINGS, SEATS, GUIDES	
	Valves; springs; seats; caps	2.5
	(Includes removal and replacement of compressor.)	
5006	LUBRICATIONS SYSTEM COMPONENTS	
5006.3	OIL PAN	
	Base	2.4
	(Includes removal and replacement of compressor.)	

Removal and replacement		*Man/hours*
5008	AIR INTAKE	
	Strainer assembly	0.4
5009.3	UNLOADER VALVES, COMPRESSOR INTAKE	
	Pistons; bushings; seat; spring	2.9
	(Includes removal and replacement of cylinder head.)	
5010	COMPRESSOR COOLING	
	Lines; fittings (each)	0.4
60	STEAM BOILERS; WATER HEATERS; HEATING NITS; BURNERS	
6000.1	PERSONNEL HEATERS	
	Heater, personnel	0.8
	Control	0.6
	Control box	0.4
6002	FUEL SYSTEM	
	Pumps	0.7
	Strainers	0.7
6002.1	BURNER ASSEMBLY	
	Igniters	1.6
6002.2	FUEL TANKS	
	Lines and fittings	0.4
6002.3	BLOWER ASSEMBLY	
	Blower assembly	1.2
	(Includes removal and replacement of heater.)	
6004	EXHAUST SYSTEM	
	Pipes and clamps	0.5
6005	COMBUSTION CHAMBER	
	Liners, insulation	2.3
	(Includes removal and replacement of blower and casing.)	
76	FIREFIGHTING EQUIPMENT	
7603	FIRE EXTINGUISHERS	
	Extinguisher, fire	0.05

CHAPTER 2

GENERAL MAINTENANCE INSTRUCTIONS

Section I. SPECIAL TOOLS AND EQUIPMENT

5. Special Tools and Equipment

No special tools or equipment are needed for maintenance of the crane-shovel model M-200 by the field and depot personnel.

6. Field and Depot Maintenance Repair Parts

Field and depot maintenance repair parts are listed and illustrated in TM 5-3810-20735P.

7. Specially Designed Tools and Equipment

No specially designed tools and equipment are needed for maintenance of the crane-shovel model M-200 by the field and depot personnel.

Section II. TROUBLESHOOTING

8. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the crane-shovel or any of its components. Each trouble symptom stated is followed by a list of probable causes of trouble. The possible remedy recommended is described opposite the probable cause

9. Crane Engine Lacks Power

Probable cause	*Possible remedy*
Defective carburetor	Repair carburetor (pars. 48-50).
Burnt or faulty valves	Replace or repair valves (pars. 91-93).
Defective piston rings	Replace piston rings (pars. 103-105).
Blown head gasket	Replace head gasket (pars. 88-90).

10. Crane Engine Starting Motor Will Not Crank Engine

Probable cause	*Possible remedy*
Defective starting motor	Repair starting motor (pars. 68-70).
Internal engine seizure	Replace the engine (par. 45).

11. Crane Engine Cranks But Does Not Start

Probable cause	*Possible remedy*
Defective carburetor	Repair carburetor (pars. 48-50).

12. Crane Engine Overheating

Probable cause	*Possible remedy*
Defective radiator	Replace radiator (pars. 76-78).
Defective water pump	Repair water pump (pars. 80-82).

13. Crane Engine Stalls Frequently

Probable cause	*Possible remedy*
Defective carburetor	Repair carburetor (pars. 48-50).
Defective distributor	Repair distributor (pars. 72-74).
Defective valves	Replace or repair valves (pars. 91-93).

14. Crane Engine Oil Pressure Low

Probable cause	*Possible remedy*
Defective oil pump	Replace or repair oil pump (pars. 99-101).

15. Crane Engine Knocks and Other Noises

Probable cause	*Possible remedy*
Defective crankshaft main bearings.	Replace crankshaft main bearings (pars. 123-125).
Defective connecting rod bearings.	Replace connecting rod bearings (pars. 103-105).

Probable cause	*Possible remedy*
Loose pistons or wrist pins.	Replace pistons or wrist pins (pars. 103-105).
Broken piston rings	Replace piston rings (pars. 103-105).
Broken valve springs	Replace valve springs (pars. 91-93).
Defective camshaft	Replace camshaft bearings (pars. 119-121).
Worn timing gears	Replace timing gears (pars. 116-117).
Loose engine mounting bolts.	Tighten or replace mounting bolts (par. 45).

16. Crane Engine Oil Consumption High

Probable cause	*Possible remedy*
Worn, broken, or stuck piston rings.	Replace piston rings (pars. 103-105).
Worn pistons	Replace pistons (pars. 103-105).
Worn valve guides	Replace valve guides (pars. 91-93).

17. Crane Engine Clutch Noisy

Probable cause	*Possible remedy*
Defective clutch shaft bearing.	Replace clutch bearings (pars. 84-86).
Broken lever pins or levers.	Replace levers or pins (pars. 84-86).
Broken collar or yoke	Replace collar or yoke (pars. 84-86).

18. Crane Engine Clutch Slips

Probable cause	*Possible remedy*
Worn lining segments or plates.	

19. Crane Engine Clutch Drags

Probable cause	*Possible remedy*
Warped clutch plates	Replace clutch plates (pars. 84-86).
Worn or broken levers or pins.	Replace levers and pins (pars. 84-86).

20. -Carrier Engine Lacks Power

Probable cause	*Possible remedy*
Defective carburetor	Repair carburetor (pars. 203-205).
Burnt or faulty valves	Replace or repair valves (pars. 243-245).
Defective piston rings	Replace piston rings (pars. 255-257).
Blown head gasket	Replace head gasket (pars. 243-245).

21. Carrier Engine Starting Motor Will Not Crank Engine

Probable cause	*Possible remedy*
Defective starting motor	Repair starting motor (pars.215-217).
Internal engine seizure	Replace the engine (par. 46).

22. Carrier Engine Cranks But Does Not Start

Probable cause	*Possible remedy*
Defective carburetor	Repair carburetor (pars. 203-205).

23. Carrier Engine Overheating

Probable cause	*Possible remedy*
Defective radiator	Replace radiator (pars 227-229).
Defective water pump	Repair water pump (pars. 231-233).

24. Carrier Engine Stalls Frequently

Probable cause	*Possible remedy*
Defective carburetor	Repair carburetor (par 203-205).
Defective distributor	Repair distributor (pars. 219-221).
Defective valves	Replace or repair valves (pars. 243-245).

25. Carrier Engine Oil Pressure Low

Probable cause	*Possible remedy*
Defective oil pump	Replace or repair oil pump (pars. 251-253).

26. Carrier Engine Knocks and Other Noises

Probable cause	*Possible remedy*
Defective crankshaft main bearings.	Replace crankshaft main bearings (pars. 283-285).
Defective connecting rod bearings.	Replace connecting rod bearings (pars. 255-257).
Loose pistons or wrist pins.	Replace pistons or wrist pins (pars. 255-257).
Broken piston rings	Replace piston rings (pars. 255-257).
Broken valve springs	Replace valve springs (pars. 243-245).
Defective camshaft bearings.	Replace camshaft bearings (pars. 279-281).
Worn timing gears	Replace timing gears (pars .275-277).
Loose engine mounting bolts.	Tighten or replace mounting bolts (par. 46).

27. Carrier Engine Oil Consumption High

Probable cause	*Possible remedy*
Worn, broken, or stuck piston rings.	Replace, piston rings (pars. 255-257).
Worn pistons	Replace pistons (pars. 255-257).
Worn valve guides	Replace valve guides (pars. 243-245).

28. Carrier Engine Clutch Noisy

Probable cause	*Possible remedy*
Defective clutch shaft bearing.	Replace clutch bearing (pars. 263-265).
Defective throwout bearing.	Replace throwout bearings (pars. 263-265).

Probable cause	*Possible remedy*
Loose mounting bolts	Tighten or replace bolts (par. 268-65).
Defective collar or yoke	Replace collar or yoke (pars 263-265).

29. Carrier Engine Clutch Slips

Probable cause	*Possible remedy*
Worn lining segment or plates.	Replace lining segments or plates (pars. 268-265).

30. Carrier Engine Clutch Drags

Probable cause	*Possible remedy*
Defective, worn, or glazed clutch facings	Replace clutch disk (pars. 263-265).
Worn pressure plate release levers	Replace levers (pars. 263-265).
Defective splines in hub or shaft	Replace parts (pars. 266-265).

31. Crane Hoist Gears Noisy

Probable cause	*Possible remedy*
Worn gear teeth	Replace gear (pars. 147-149).
Worn or scored bushings	Replace bushings (pars. 147-149).
Bent hoist shaft	Replace hoist shaft (pars. 147-149).

32. Crane Swing Gear Noisy or Pulsations in Operations

Probable cause	*Possible remedy*
Worn gear teeth	Replace gear (pars. 159-161).
Worn or scored bearings	Replace bearings (pars. 159-161).
Bent swing shaft	Replace swing shaft (pars. 159-161).

33. Crane Revolving Frame Rocks in Operation

Probable cause	*Possible remedy*
Damaged rotating frame ring gear.	Replace ring gear (pars. 167-169).

34. Crane Revolving Frame Will Not Rotate

Probable cause	*Possible remedy*
Worn or loose shaft bushing	Replace bushing (pars 167-169).
Worn or scored bushings	Replace bushings (pars. 167-169).
Defective ring or pinion gears.	Replace gears (pars. 167-169).

35. Crane Boom or Hoist Operation Rough

Probable cause	*Possible remedy*
Bent drive shaft	Replace drive shaft (pars. 147-149).
Inner boom gear binding	Replace gear bushing (pars. 147-149).
Broken daft bushings	Replace shaft bushing (pars 147-149).
Broken shaft	Replace shaft (pars. 147-149).

36. Dipper Stick Does Not Operate Properly

Probable cause	*Possible remedy*
Defective shipper shaft	Replace shipper shaft (pars 171-173).

37. Carrier Has No Brake Action, Insufficient Action, or Brakes Apply Slowly

Probable cause	*Possible remedy*
Worn brake linings	Replace linings (par 889-341).
No air pressure	Replace or repair air compressor (pars. 81-.

38. Carrier Brakes Grab or Act Unevenly

Probable cause	*Possible remedy*
Worn or oil soaked linings	Replace linings (para 84-345).

39. Carrier Front Axle Noisy

Probable cause	*Possible remedy*
Broken axle	Replace axle (pars 403-405).
Worn or broken differential or pinion gears.	Replace gears (pars. 408-405).
Worn or broken differential or pinion bearings.	Replace bearings (pars. 403-405).
Worn splines on axle shaft	Replace axle shaft (pars. 403-405).
Worn splines on pinion shaft.	Replace pinion shaft (pars. 403-405).

40. Carrier Rear Axle and Tandem Unit Noisy

Probable cause	*Possible remedy*
Broken pinion or differential gears	Replace gears (pars 419-421).
Worn or defective differential or pinion bearings.	Replace bearings (pars. 419-421).
Worn splines on pinion shaft or propeller shaft yoke	Replace shaft or yoke (pars. 419-421).
Worn or defective equalizing beam	Replace equalizing blew (pars. 41-417).
Worn or defective torque rods	Replace torque rods. (pars. 411-418).

41. Carrier Transmission Noisy

Probable cause	*Possible remedy*
Loom transmission mounting bolts	Tighten or replace bolts (pars. 807-809).
Defective gears	Replace gears (pars. 307-309).

Probable cause	*Possible remedy*
Defective bearings	Replace bearings (pars. 307-309).
Defective spline shaft	Replace spline shaft (pars.307-309).

42. Carrier Gear Shifting Difficult

Probable cause	*Possible remedy*
Broken or bent yokes	Replace yokes or shifting bar housing (pars. 307-309).
Defective gear teeth	Replace gear (pars. 307-309).
Housing and assembly out of alinement.	Replace housing assembly (pars. 259-261).
Worn or damaged clutch facings.	Replace clutch disk (pars. ,268-265).

43. Carrier Transfer Case Noisy

Probable cause	*Possible remedy*
Loose transfer case mounting bolts.	Tighten or replace bolts (pars. 311- 313).
Defective gears	Replace gears (par. 311-313).
Defective bearings	Replace bearings. (pars 311-313).
Defective spline shaft	Replace spline shaft (pars. 311-313)

Section III. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS OR AUXIUARIES

44. Crane Cab Assembly

a. Removal.

(1) Remove the front end attachments as necessary (TM 53810-207-10).

(2) Remove the gear and chain guards and gantry sheave assembly (TM 5-3810-207-20).

(3) Disconnect the control panel instruments and engine controls (TM 5-3810-207-20).

(4) Remove the crane cab assembly from the crane base as instructed on figure 1.

b. installation.

(1) Install the crane cab assembly as illustrated on figure 1.

(2) Connect the control panel instruments and engine controls (TM 5-3810-207-20).

(8) Install the gear and chain guards and gantry sheave assembly (TM 5-810- 207-20).

(4) Install the front end attachments as necessary (TM 543810-207-10).

45. Crane Engine Assembly

a. Removal.

(1) Remove the crane cab (par. 44).

(2) Drain the cooling system (TM 5-3810-207-10).

(8) Disconnect the battery cables (TM 5-3810-207-20).

(4) Disconnect the fuel line (TM 5-3810-207-20).

(5) Disconnect the cab heater (TM 5-3810-207-20).

(6) Disconnect the master clutch linkage (TM 53810-207-20).

(7) Remove the main drive chain case, chain, and drive gear (TM 54810-207-20).

(8) Remove the engine wiring harness (par. 64).

(9) Remove the clutch assembly (par. 84).

(10) Remove the crane engine assembly as instructed on figure 2.

b. Installation.

(1) Install the crane engine assembly as illustrated on figure 2.

(2) Install the clutch assembly (par. 86).

(3) Install the engine wiring harness (par. 66).

(4) Install the main drive chain case, chain, and drive gear (TM 5-3810-207-20).

(5) Connect the master clutch linkage (TM 5-3810-207-20).

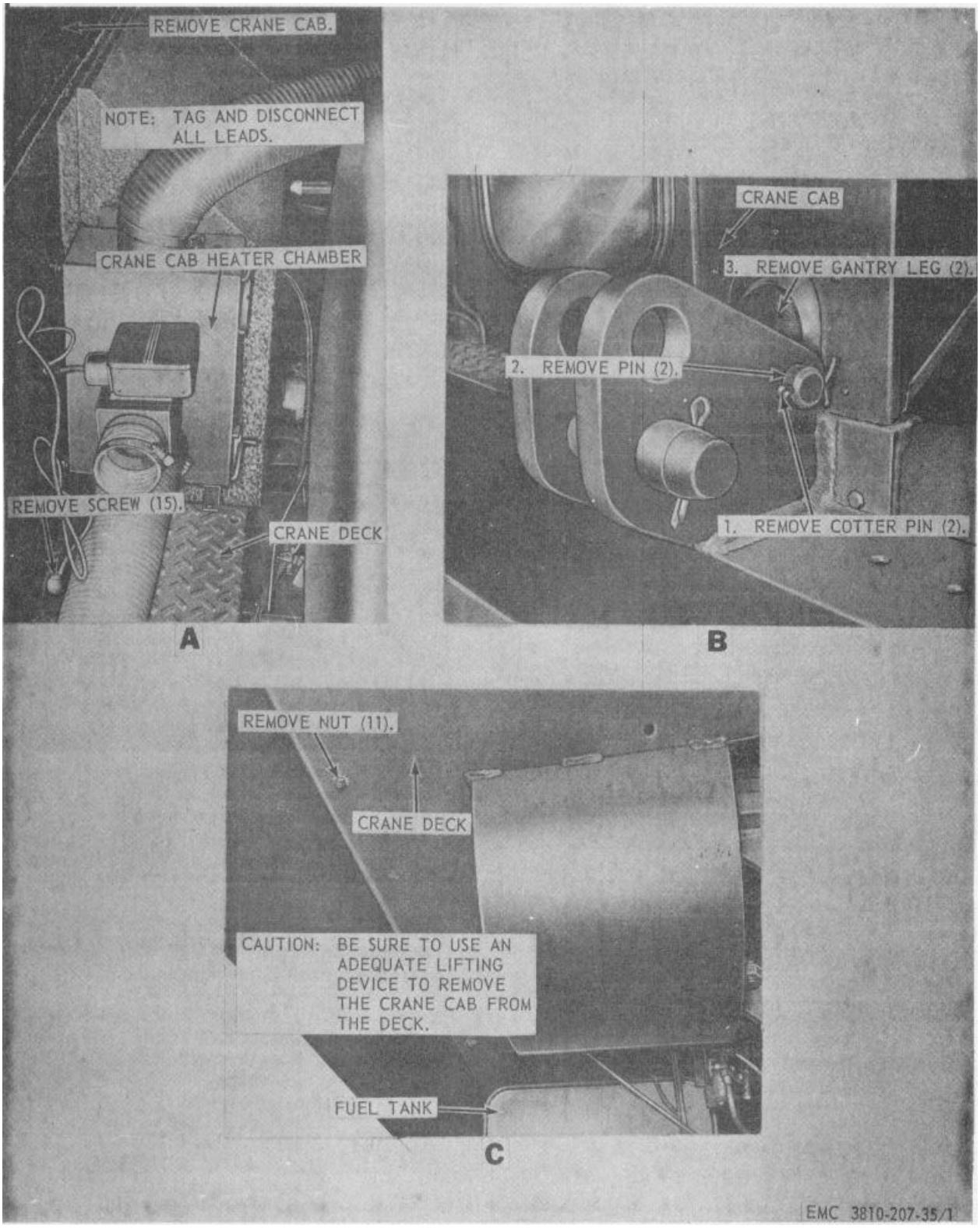
(6) Connect the cab heater (TM 5-3810-207-20).

(7) Connect the fuel line (TM 5-3810-207-20).

(8) Connect the battery cables (TM 5-3810-207-20).

(9) Fill the cooling system (TM 543810-207-20).

(10) Install the crane cab (par. 44).



A. Crane cab inside, removal points
B. Crane gantry leg, removal points
C. Crane cab lower, removal points

Figure 1. Crane cab assembly, removal and installation.

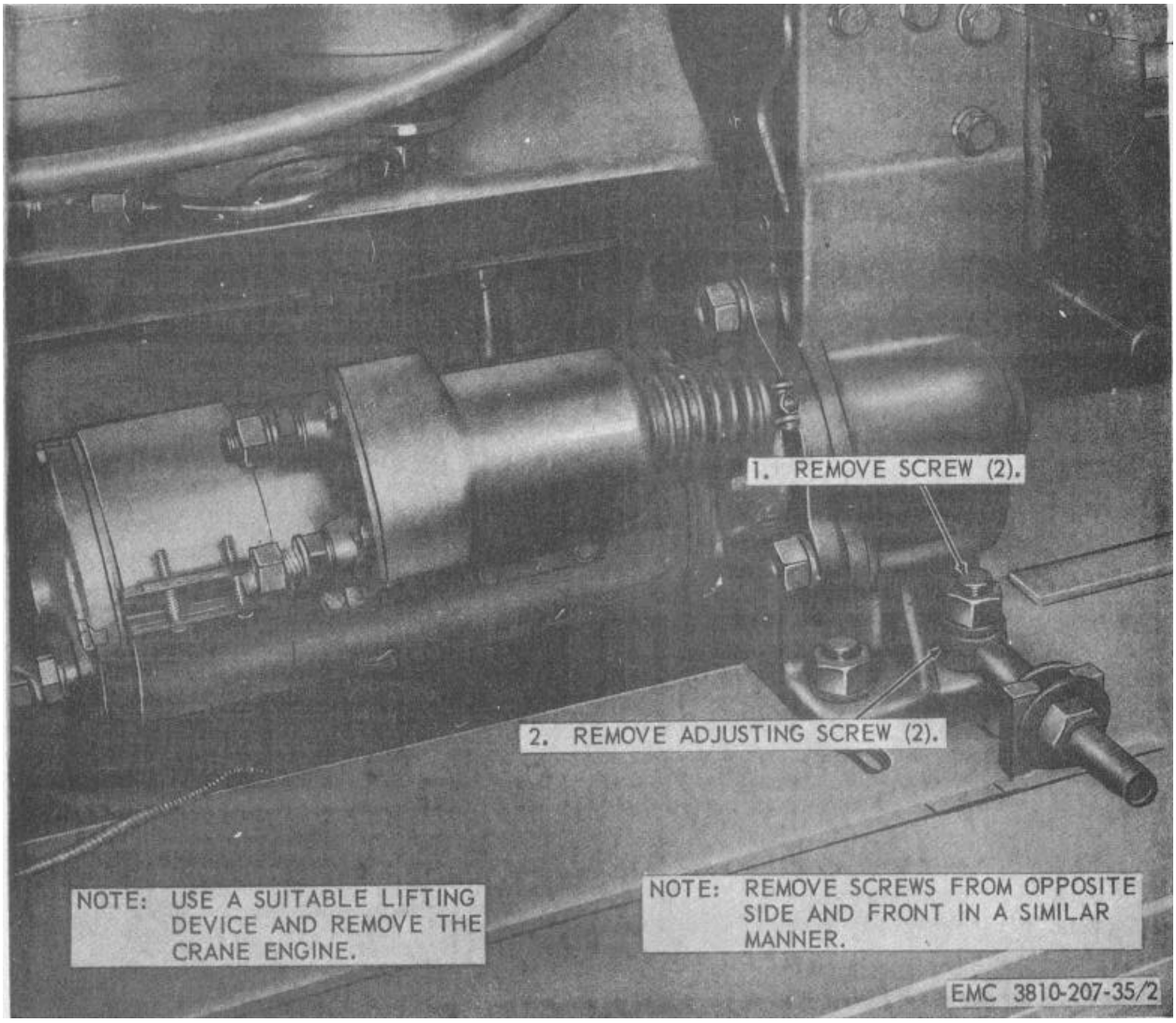
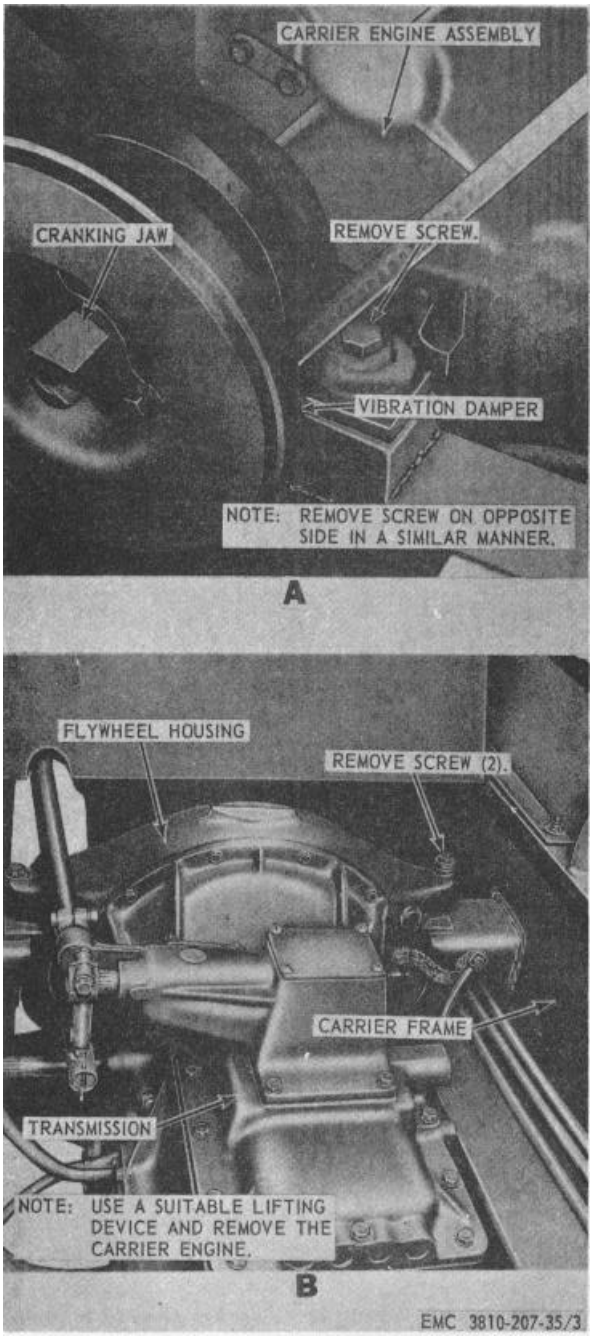


Figure 2. Crane engine assembly, removal and installation.

46. Carrier Engine Assembly

a. Removal.

(1) Drain the cooling system (TM 5-3810-207-10).
(2) Remove the engine hood (TM 5-3810-207-20).
(3) Disconnect the battery cable (TM5-3810-207-20).
(4) Disconnect the fuel line (TM 5-3810-207-20).
(5) Disconnect the clutch linkage (TM5-3810-207-20).
(6) Disconnect the throttle linkage (TM 53810-207-20).
(7) Remove the oil pan heating wire (TM 53810-207-20).
(8) Remove the hydraulic steering oil pump (TM 53810-207-20).
(9) Remove the engine priming pump lines (TM 53810-207-20).
(10) Remove the engine back panel (TM 5-3810-207-20).
(11) Remove the air cleaner, duct, and shroud (TM 5-3810-207-20).



A. Engine front mount, Installed view
B. Engine rear mount, installed view

Figure 3. Carrier engine assembly, removal and installation.

(12) Remove the exhaust pipe and muffler (TM 5-3810-207-20).
(13) Disconnect the air compressor lines (TM 5-3810-207-20).
(14) Disconnect the transmission housing control rods (TM 5-3810-207-20).
(15) Remove the transmission assembly (par. 307).
(16) Remove the carrier engine assembly as instructed on figure 3.

b. Installation.

(1) Install the carrier engine assembly as illustrated on figure 3.
(2) Install the transmission assembly (par. 309).
(3) Connect the transmission housing control rods (TM 5-3810-207-20).
(4) Connect the air compressor lines (TM 5-3810-207-20).
(5) Install the exhaust pipe and muffler (TM 543810-207-20).
(6) Install the air cleaner, clutch, and shroud (TM 5-3810-207-20).
(7) Install the engine back panel (TM 5-3810-207-20).
(8) Install the engine priming pump lines (TM 5-3810-207-20).
(9) Install the hydraulic steering oil pump (TM 5-3810-207-20).
(10) Install the oil pan heating wire (TM 5-3810-207-20).
(11) Connect the throttle linkage (TM 5-3810-207-20).
(12) Connect the clutch linkage (TM 5-3810-207-20).
(13) Connect the fuel line (TM 5-3810-207-20).
(14) Connect the battery cables (TM 5-3810-207-20).
(15) Install the engine hood (TM 5S810-207-20).
(16) Fill the cooling system (TM 5-3810-207-10).

Chapter 3

CRANE ENGINE REPAIR INSTRUCTIONS

Section I. CRANE ENGINE CARBURETOR ASSEMBLY

47. General

An updraft-type carburetor is used on the crane engine. This side-intake, single-venturi carburetor is sealed, protecting all internal parts from dirt and moisture. All air for fuel air mixture and engine operation is drawn through the air cleaner.

48. Crane Engine Carburetor Assembly Removal and Disassembly

a. Removal. Remove the carburetor (TM 5-3810-207-20).

b. Disassembly. Disassemble the carburetor in the numerical sequence as illustrated on figure 4.

49. Crane Engine Carburetor Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent.

b. Inspection and Repair.

(1) Inspect all parts for cracks, bends

1 Screw, ¼ -28 x 3/4 in. (6 rqr)
2 Washer, lock, 1/4 in. (6 rqr)
3 Carburetor body
4 Gasket
5 Idle adjusting needle
6 Idle needle spring
7 Float axle
8 Float
9 Fuel valve
10 Fuel valve seat
11 Fuel valve seat washer
12 Idle jet
13 Screw, 8-82 x 3/8 in.
14 Venturi
15 Filter head
16 Filter head washer 50
17 Filter element
18 Vacuum channel screw
19 Throttle plate screw (2 rqr)
20 Throttle plate
21 Throttle shaft
22 Pin, cotter, A6 x 3/4 in.
23 Spring retainer
24 Lever spring
25 Screw, 10-24 x 9/16 in.
26 Throttle clamp lever
27 Shaft driver
28 Throttle stop pin
29 Screw, 6-32 x 5/8 in.
29 (Screw, 6-82 x 5/8 in. (2 rqr)
80 Stop lever pin
31 Throttle stop lever
32 Shaft seal retainer
33 Throttle shaft seal
34 Bushing
35 Bushing
36 Plug
37 Pump
38 Power jet valve
39 Main jet adjustment screw
40 Washer, 3/8 in.
41 Main jet
42 Washer
43 Plug
44 Washer, No. 8
45 Power and accelerator jet
46 Washer, brass, No. 8
47 Bowl drain plug
48 Intake drip plug
49 Screw, 4-40 x 1/4 in. (2 rqr)
50 Washer, lock, No. 4 (2 rqr)
51 Choke plate
52 Nut, 6-2
53 Washer, lock, No. 6
54 Screw, 6-82 x 7As in.
55 Choke bracket
56 Nut, 6-82
57 Screw, 6-82 x 7/16 in. (2 rqr)
58 Tube clamp
59 Bracket screw
60 Choke bracket
61 Choke shaft
62 Plug
63 Washer, brass, 1/4 in.
64 Discharge jet
65 Washer, nonmetallic, 1/4 in.
66 Well vent jet
67 Check valve
68 Fuel bowl

Figure 4. Crane engine assembly, exploded view.

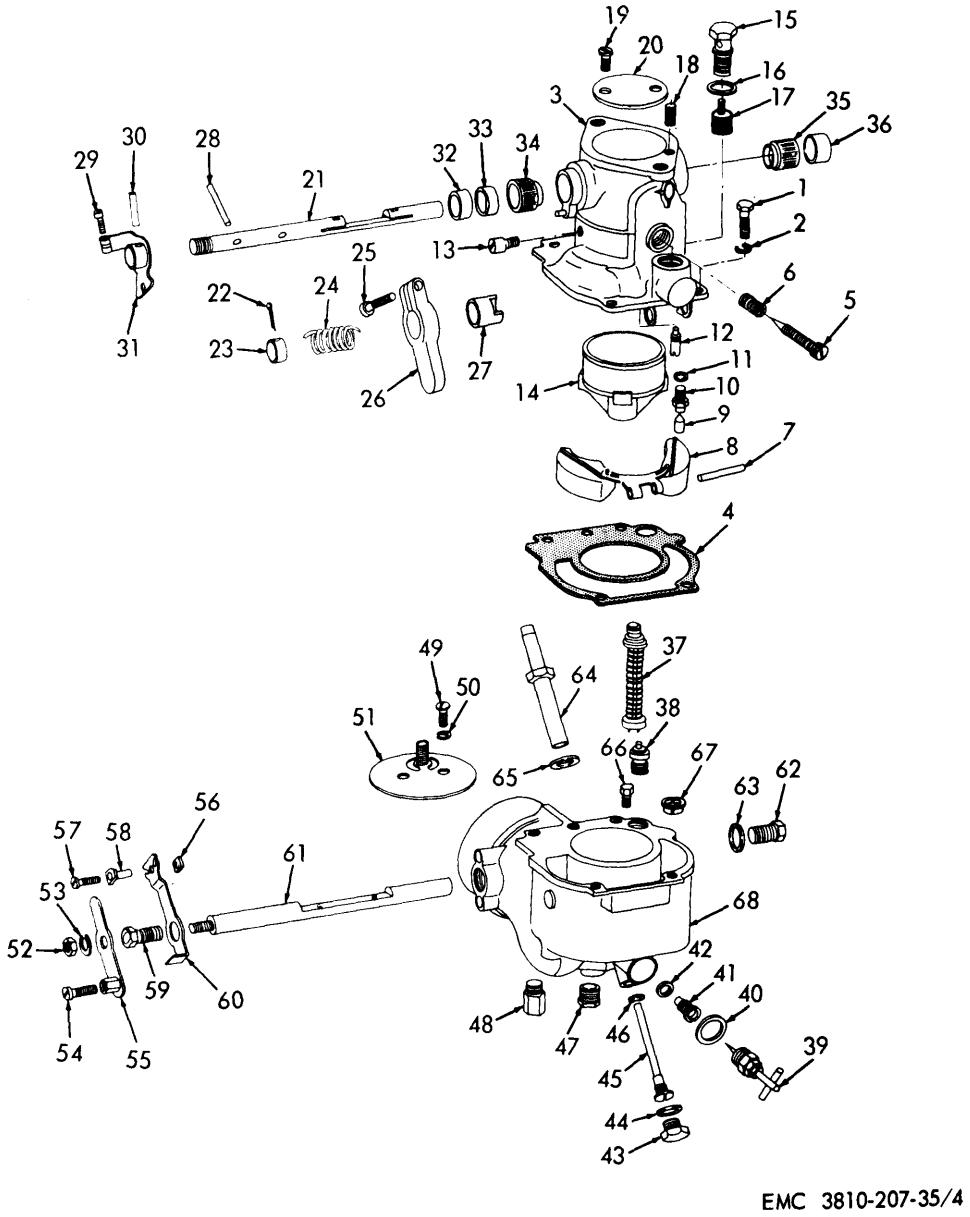


Figure 4. Crane engine carburetor assembly, exploded view-Continued.

warpage, excessive wear, or other damage. Replace all badly worn or damaged parts. Replace the gasket and seal.

(2) Inspect the fuel valve and seat for scoring, pits, and excessive wear. If damaged or worn, replace as a set.

50. Crane Engine Carburetor Assembly Reassembly and Installation

a. Reassembly. Reassemble the carburetor in the reverse of the numerical sequence as illustrated on figure 4.

b. Installation. Install the carburetor assembly (TM 5-3810-207-20).

Section II. CRANE ENGINE SPEED GOVERNOR ASSEMBLY

51. General

The crane engine speed governor assembly is a centrifugal, flyball-type. With this type of governor, it is the interaction of the two forces employed that achieves the regulation desired. The first is the centrifugal force developing in the balls inside the governor. This force is transferred to the carburetor throttle controls, tending to close the throttle as the speed of the engine increases. The second force is exerted by the governor spring and tends to hold the throttle in wide open position. When these two forces are in balance, the engine is operating at the pre set governor speed.

52. Crane Engine Speed Governor Assembly Removal and Disassembly

a. Removal. Remove the crane engine speed governor assembly from the engine (TM 5-3810-207-20).

b. Disassembly. Disassemble the crane engine speed governor assembly in the numerical sequence as illustrated on figure 5.

53. Crane Engine Speed Governor Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent.

b. Inspection and Repair.

(1) Inspect all parts for excessive wear and other damage. Replace defective parts. Replace all gaskets

(2) Inspect the ball driver on the governor shaft for possible need of replacement. If needed, heat the driver to remove brazing, and press the driver from the shaft. Press a new driver on the shaft and secure it by brazing.

54. Crane Engine Speed Governor Assembly Reassembly and Installation

a. Reassembly. Reassemble the crane engine speed governor assembly in the reverse of the numerical sequence as illustrated on figure 5.

b. Installation. Install the crane engine speed governor assembly on the engine (TM 5-3810207-20).

Section III. CRANE ENGINE FUEL TANK

55. General

The crane engine fuel tank is a 50 gallon, steel constructed tank, mounted on the left side of the cab underneath the deck plate.

56. Crane Engine Fuel Tank Removal

a. Drain the crane engine fuel tank (TM 5-8810-207-10).

b. Remove the fuel lines and level gage (TM 5-3810-207-20).

c. Remove the crane engine fuel tank from the underside of the deck plate as instructed on figure 6.

57. Crane Engine Fuel Tank Cleaning, Inspection, and Repair

a. Cleaning. Clean the fuel tank with live steam. Dry thoroughly.

b. Inspection and Repair.

(1) Inspect the fuel tank for rust, small leaks;, cracks, and other damage.

(2) To locate leaks, fill the tank with water with all but one outlet closed or plugged. Apply 8 to 5 psi of air pressure to the tank. Turn leak uppermost and repair by welding. Test again for leaks.

Warning: Be sure tank is completely filled with water to prevent fumes from gathering and causing an explosion.

(3) Remove the fuel tank cap slowly until the air pressure is relieved.

(4) Drain the water from the tank. Dry thoroughly.

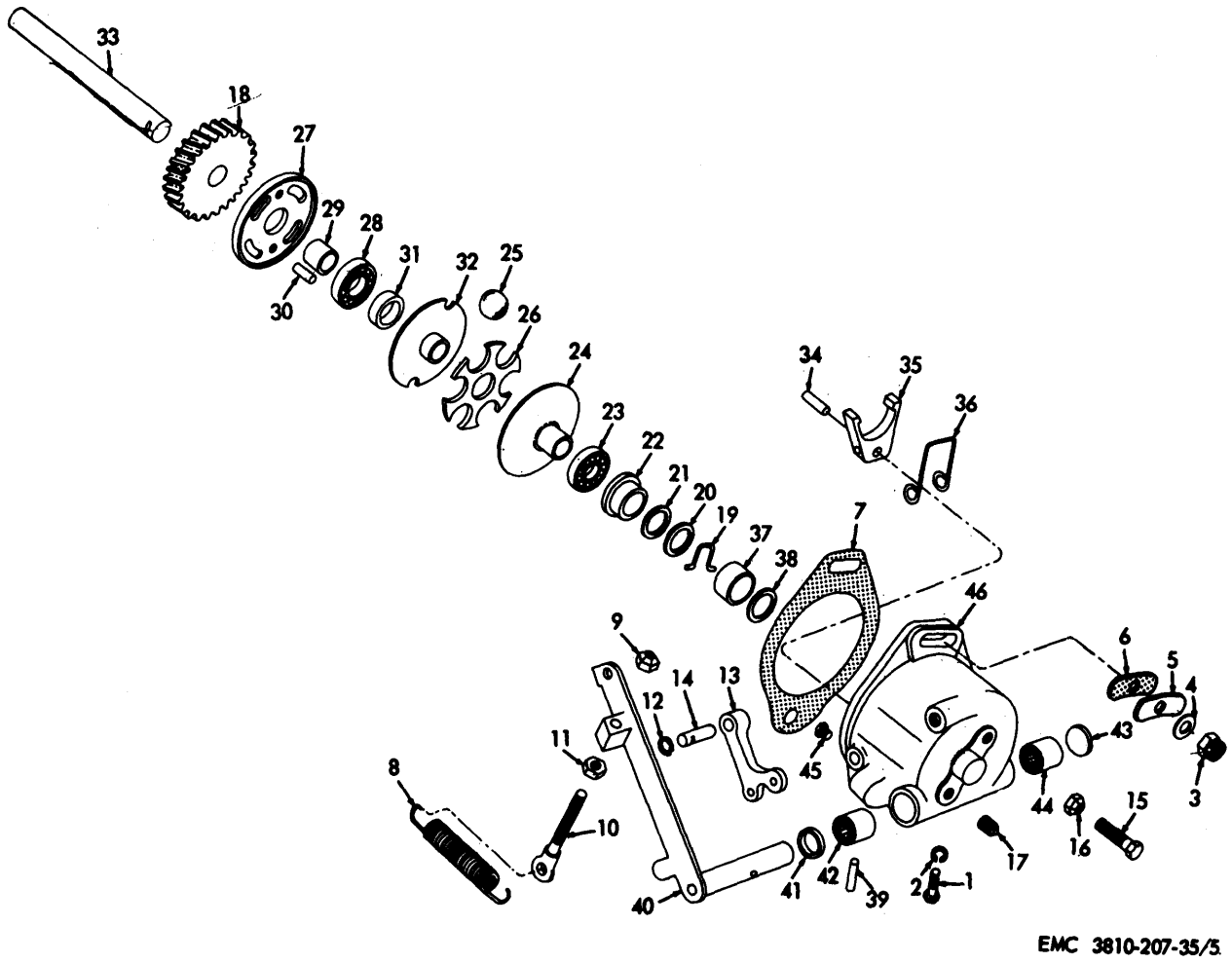
(5) Replace or repair a defective tank.

58. Crane Engine Fuel Tank Installation

a. Install the crane engine fuel tank on the underside of the deck plate in the reverse of the instructions on figure 6.

b. Install the fuel lines and level gage (TM5-3810-207-20).

c. Fill the crane engine fuel tank (TM 5-3810-207-10).



1	Screw, cap, 3/8-16 x 11/8 in.	24	Upper race
2	Washer, lock, 3/8 in.	25	Ball (6 rqr)
8	Nut, 3/8 -16	26	Ball drive
4	Copper gasket	27	Base
5	Mounting plate	28	Ball bearing
6	Gasket	29	Bushing
7	Gasket	30	Pin (2 rqr)
8	Governor spring	31	Thrust washer
9	Locknut	32	Lower race
10	Adjusting screw	33	Drive shaft
11	Locknut	34	Pin
12	Retaining ring	85	Fork
13	Control lever	86	Bumper spring
14	Pin	37	Bushing
15	Adjusting screw	38	Thrust washer
16	Locknut	39	Pin
17	Pipe plug	40	Governor lever
18	Gear	41	Oil seal
19	Clip	42	Needle bearing
20	Flat washer (as rqr)	43	Expansion plug
21	Ball stop washer	44	Needle bearing
22	Fork base	45	Locating screw
23	Thrust bearing	46	Body

Figure 5. Crane engine speed governor assembly, exploded view.

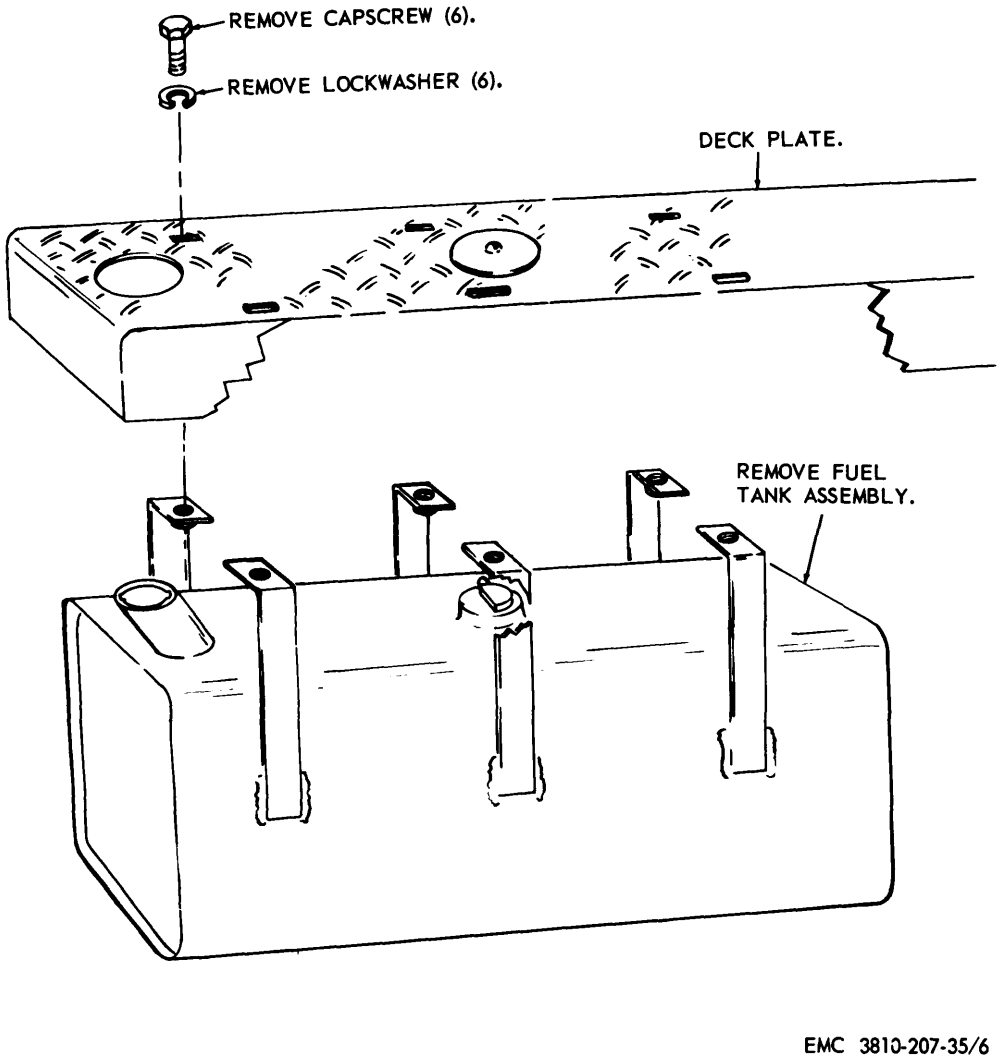


Figure 6. Crane engine fuel tank, removal and installation.

Section IV. CRANE ENGINE GENERATOR ASSEMBLY

59. General

The crane engine generator assembly is a 4pole, shunt-type unit with sealed ball bearings in both the drive end frame and the commutator end frame. The generator serves a dual purpose: it supplies electrical energy for lights, ignition, and accessories, and it serves to recharge the batteries by furnishing current to make up for cranking and other power supplied by the batteries while the generator is not in operation. The armature rotates between the field coils and produces voltage. The generator is cooled by a fan mounted on the drive pulley. The generated current is discharged to the electrical system through the armature and field terminals. The generator rotates clockwise with a brush tension of 28 ounces. The field current at 800 Fahrenheit is 1.00-1.05 amperes at 24 volts. The cold output of the generator at 4000 revolutions per minute is 40 amperes at 28 volts.

60. Crane Engine Generator Assembly Removal and Disassembly

a. Removal. Remove the crane engine generator assembly from the crane engine assembly (TM 5-3810-207-20).

b. Disassembly. Disassemble the crane engine generator assembly in the numerical sequence as illustrated on figure 7.

61. Crane Engine Generator Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent.

b. Inspection and Repair. Inspect all parts for excessive wear or other damage. Repair or replace all defective parts. Refer to TM 5-764 for armature and field coil tests.

62. Crane Engine Generator Assembly Reassembly and Installation

a. Reassembly. Reassemble the crane engine generator assembly in the reverse of the numerical sequence as illustrated on figure 7.

b. Installation. Install the crane engine generator assembly on the crane engine assembly (TM 5-3810-207-20).

Section V. CRANE INSTRUMENT PANEL AND WIRING HARNESS

63. General

The crane instrument panel is located on the right side of the crane cab and contains the necessary gages, instruments, and wiring for proper operation of the crane engine.

64. Crane Instruments Panel and Wiring Harness Removal

a. Remove the light switches (TM 5-3810-207-20).

b. Remove the water temperature light, dashlight, and low oil pressure light (TM 5-3810-207-20).

c. Remove the engine starter switch (TM 5-3810-207-20).

d. Remove the horn button, choke control, and power receptacle (TM 5-3810-207-20).

e. Remove the ammeter, coolant temperature gage, oil pressure gage, and fuel gage (TM 5-3810-207-20).

f. Remove the instrument panel and wiring harness as instructed on figure 8.

65. Crane Instrument Panel and Wiring Harness Cleaning and Inspection

a. Cleaning. Clean the instrument panel with an approved cleaning solvent and dry thoroughly. Clean the wiring harness with a lint-free dry cloth.

b. Inspection. Inspect all parts for excessive wear or damage. Replace all damaged or defective parts.

66. Crane Instrument Panel and Wiring Harness Installation

a. Install the crane instrument panel and wiring harness as illustrated on figure 8.

b. Install the ammeter, coolant temperature gage, oil pressure gage, and fuel gage (TM 5-3810-207-20).

c. Install the horn button, choke control, and power receptacle (TM 5-3810-207-20).

d. Install the engine starter (TM 5-3810-207-20).

e. Install the water temperature light, dashlight, and low oil pressure light (TM 5-3810-207-20).

f. Install the light switches (TM 5-3810-207-20).

Section VI. CRANE ENGINE STARTER ASSEMBLY

67. General

The crane engine starter assembly is a heavy duty type with over-running clutch-type drive. The starter turns at 6,000 rpm, drawing 23.4 volts at 30 maximum amperes with no load, and develops 20 foot pounds torque, drawing 6.6 volts at 200 maximum amperes when locked. The starting motor has four poles using eight

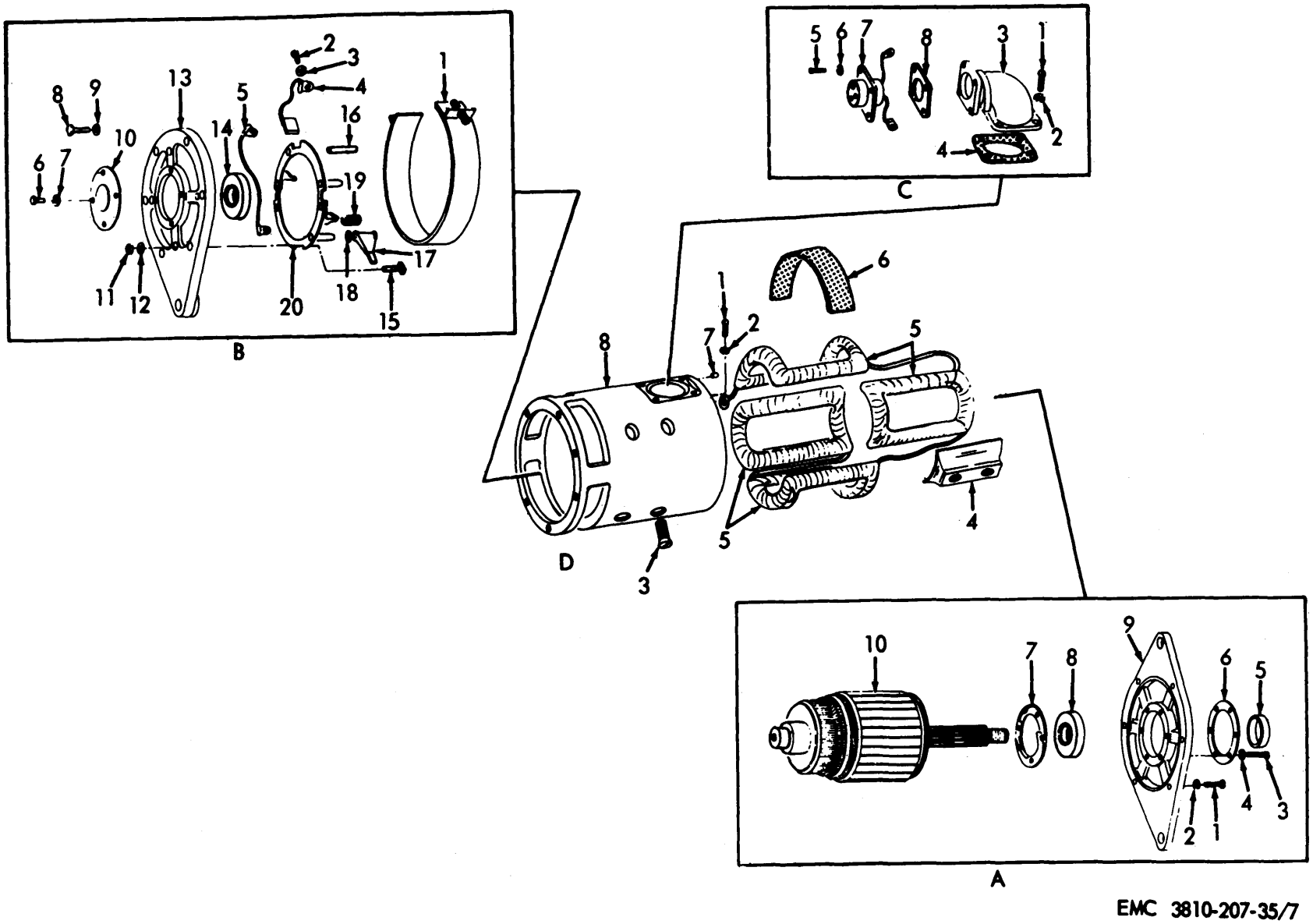


Figure 7. Crane engine generator assembly, exploded view.

1 Screw, cap, M(-28 x 1 in. (6 rqr)
2 Washer, lock, 13 in. (6 rqr)
8 Screw, 10-82 x 1l% in. (6 rqr)
4 Washer, lock, IT, No. 10 (6 rqr)
5 Collar

1 Cover band assembly
2 Screw, 10-82 x 3/8 in. (5 rqr)
8 Washer, lock, No. 10 (5 rqr)
4 Brush (4 rqr)
5 Lead assembly
6 Screw, 10-82 x 3/8 in. (4 rqr)
7 Washer, lock, No. 10 (4 rqr)
8 Screw, cap, 1-28 x 1 in. (6 rqr)
9 Washer, lock, ¼ in. (6 rqr)
10 End cover plate

1 Screw, 10-82 x 1A6 in. (4 rqr)
2 Washer, lock, No. 10 (4 rqr)
3 Elbow
4 Gasket

1 Screw, 10-32 x 3/8 in. (5 rqr)
2 Washer, lock, No. 10 (5 rqr)
3 Pole shoe screw (8 rqr)
4 Pole shoe (4 rqr)

6 Retaining plate, external
7 Retaining plate, internal
8 Bearing, sealed
9 Drive end frame
10 Armature

A. Armature and drive end frame

11 Nut, No. 10-82 (4 rqr)
12 Washer, lock, No. 10 (4 rqr)
18 Commutator end plate.
14 Bearing, sealed
15 Screw, special (4 rqr)
16 Dowel pin, 3/16 x 1/2 in.
17 Brush arm (4 rqr)
18 Spacer washer
19 Spring (4 rqr)
20 Brush plate assembly

B. Commutator end fram and brushes

5 Screw, 10-32 x 13/16 in. (4 rqr)
6 Washer, lock, No. 10 (4 rqr)
7 Terminal receptacle
8 Spacer block

C. Outlet receptacle

5 Field coil (4 rqr)
6 Insulation band
7 Dowel pin, 3/16 x 3/4 in.
8 Field coil frame

D. Field coils, field coil frame, and pole shoes

Figure 7. -Continued.

brushes and has an intermediate bearing to support the armature shaft in the middle, while the ends are supported by bushings.

68. Crane Engine Starter Assembly Removal and Disassembly

a. Removal. Remove the starter (TM 5-3810-207-20).

b. Disassembly. Disassemble the starter in numerical sequence as illustrated on figure 9.

69. Crane Engine Starter Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thorough

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective parts. Refer to TM 5-764 for armature and field coil tests.

70. Crane Engine Starter Assembly Reassembly and Installation

a. Reassembly. Reassemble the starter in the reverse of the numerical sequence as illustrated on figure 9.

b. Installation. Install the starter (TM 5-3810-207-20).

Section VII. CRANE ENGINE DISTRIBUTOR ASSEMBLY

71. General

The crane engine distributor assembly is a 24-volt grounded type distributor. The distributor is radio suppressed through a built-in system consisting of a primary connection capacitor, an ignition coil capacitor, and resistors at each high tension outlet of the distributor cap, as well as one built into the rotor. The primary terminal inlet is set at an angle to the distributor housing, to prevent mounting space.

72. Crane Engine Distributor Assembly Removal and Disassembly

a. Removal. Remove the distributor (TM5-3810-207-20).

b. Disassembly. Disassemble the distributor numerical sequence as illustrated on figure10

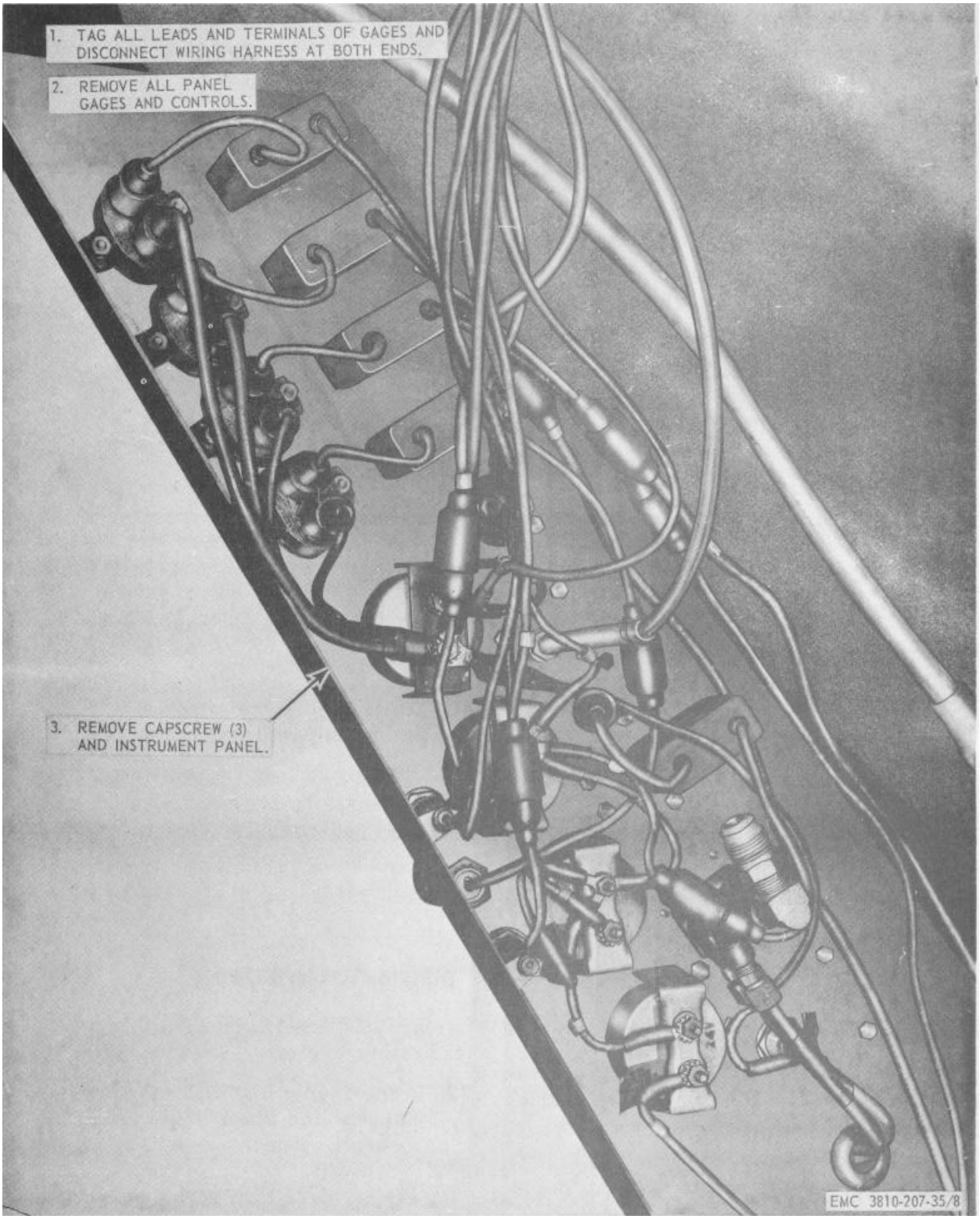


Figure 8. Crane instrument panel and wiring harness, removal and installation.

73. Crane Engine Distributor Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with a dry, lint free cloth and compressed air.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective parts.

74. Crane Engine Distributor Assembly Reassembly and Installation

a. Reassembly. Reassemble the distributor in the reverse of the numerical sequence as illustrated on figure 10.

b. Installation. Install the distributor (TM 5-3810-207-20).

Section VIII. CRANE ENGINE RADIATOR ASSEMBLY

75. General

The crane engine radiator assembly is a one piece core unit mounted on the front engine support. Coolant is circulated from the coolant pump to the radiator where it is cooled, and then recirculated through the coolant passages.

76. Crane Engine Radiator Assembly Removal

a. Drain the radiator (TM 5-3810-207-10).

b. Remove the oil cooler (TM 5-3810-207-20).

c. Disconnect radiator hoses (TM 5-3810-207-20).

d. Remove fan guard and shroud (TM 5-3810-207-20).

e. Remove the radiator as instructed on figure 11.

77. Crane Engine Radiator Assembly Cleaning, Inspection and Repair

a. Flush the inside of the radiator with an approved cleaning solvent. Avoid high pressure so as not to damage the radiator core.

b. Clean the radiator core with compressed air or water under pressure from the fan side of the core.

c. Clean the overflow line with compressed air.

d. Plug all openings in the radiator.

e. Insert air hose in radiator outlet pipe and caulk around the hose.

f. Immerse the radiator in water and apply 5 psi air pressure to the radiator.

g. Watch for signs of air bubbles.

h. Remove the radiator from the water and disconnect air hose.

i. Replace or repair a damaged or defective radiator.

78. Crane Engine Radiator Assembly Installation

a. Install the radiator as illustrated on figure 11.

b. Install fan guard and shroud (TM 5-3810-207-20).

c. Connect the radiator hoses (TM 5-3810-207-20).

d. Install the oil cooler (TM 5-3810-207-20).

e. Fill the radiator (TM 5-3810-207-10)

Section IX. CRANE ENGINE WATER PUMP ASSEMBLY

79. General

The crane engine water pump assembly is an impeller-type pump. The pump, which is belt-driven from the crankshaft, incorporates a carbon-type shaft seal with a spring-loaded bellows for proper tension. The total pump output of hot water from the engine block is circulated through the radiator and then returned to the lower engine block to complete the cooling water cycle.

80. Crane Engine Water Pump Assembly Removal and Disassembly

a. Removal. Remove the water pump (TM 5-3810-207-20).

b. Disassembly. Disassemble the water pump in numerical sequence as illustrated on figure12

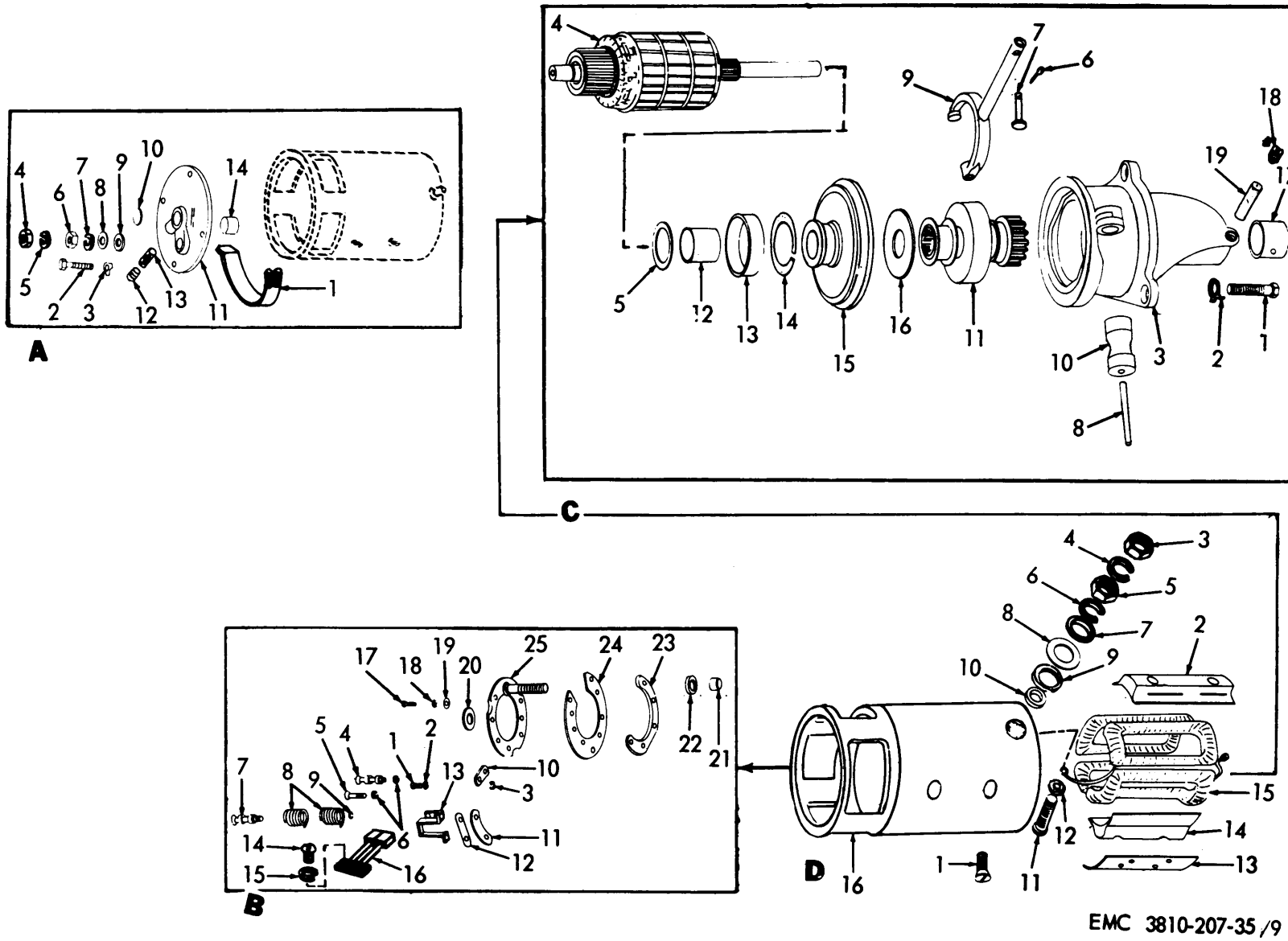


Figure 9. Crane engine starter assembly, exploded views.

1	Cover band	8	Washer, flat, ½ in.
2	Screw, cap, U-28 x 13/8 in. (4 rqr)	9	Insulating washer
8	Washer, lock, special, ¼ in. (4 rqr)	10	End frame plug
4	Nut, ½ -13	11	Commutator end frame
5	Washer, lock, ¼ in.	12	Commutator end plug
6	Nut, ½ -13	13	Commutator end wick
7	Washer, lock ½ in.	14	Commutator end bushing

A Commutator end frame

1	Screw, machine, 10-32 x 3/8 in. (2 rqr)	14	Screw, machine, 8-32 x 4 in. (8 rqr)
2	Washer, lock, No. 10 (2 rqr)	15	Washer, lock, No. 8 (8 rqr)
3	Insulating washer (2rqr)	16	Brush (8 rqr)
4	Ground brush holder screw. (2 rqr)	17	Screw, machine, 8-32 x ½ in. (8 rqr)
5	Screw, machine, 10-32 x 5/8 in. (2 rqr)	18	Washer, lock, No. 8 (8 rqr)
6	Washer, lock, No. 10 (2 rqr)	19	Washer, fiat, No. 8 (8 rqr)
7	Insulating brush holder screw (2 rqr)	20	Commutator end spacer washer
8	Brush spring (8 rqr)	21	Insulating bushing
9	Washer, lock, No. 8 (8 rqr)	22	Insulating washer
10	Ground brush spacer plate (2 rqr)	28	Brush holder attaching plate
11	Insulating brush holder plate (2 rqr)	24	Insulating brush plate
12	Insulating brush holder spacer plate (2 rqr)	26	Brush plate stud
13	Brush holder (4 rqr)		

B. Brush plate, holders, and brushes

1	Screw, machine, 14-28 x lit in. (3 rqr)	11	Drive assembly
2	Washer, lock, special, 34 in. (3 rqr)	12	Center bearing bushing
3	Drive housing	13	Wick retainer ring
4	Armature	14	Center bearing wick
5	Armature spacer washer	15	Center bearing
6	Pin, cotter, is 1/16 x 14 in.	16	Brake washer
7	Pin	17	Bushing
8	Dowel pin	18	End plug
9	Shift lever	19	Oil wick
10	Shift shaft		

C. Armature and drive housing

1	Pole shoe screw, 3/8 -16 x ¼ in. (8 rqr)	9	Insulating washer
2	Pole shoe	10	Insulating bushing
3	Nut, ½ -13	11	Terminal stud
4	Washer, lock, % in.	12	Insulating washer
5	Nut, ½ -13	13	Coil insulating strip (3 rqr)
6	Washer, lock, ¼ in.	14	Pole shoe (3 rqr)
7	Washer, fiat, % in.	15	Field coil assembly
8	Insulating washer	16	Field frame

D. Pole shoe. field coil and frame assembly

Figure 9.-Continued

81. Crane Engine Water Pump Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective parts.

82. Crane Engine Water Pump Assembly Reassembly and Installation

a. Reassembly. Reassemble the water pump in the reverse of the numerical sequence as illustrated on figure 12.

b. Installation. Install the water pump (TM 5-3810-207-20).

Section X. CRANE ENGINE CLUTCH ASSEMBLY

83. General

The crane engine is equipped with a friction-type twin-disk clutch assembly that is inclosed within its own housing and is bolted to the engine flywheel housing. Engagement and disengagement of the clutch is by lever. The friction plate is engaged by splines into a driving plate bolted to the flywheel.

84. Crane Engine Clutch Assembly Removal and Disassembly

a. Removal.

(1) Remove the hoist gear guard and shields (TM 5-3810-207-20).

(2) Remove the engine clutch assembly as instructed on figure 18

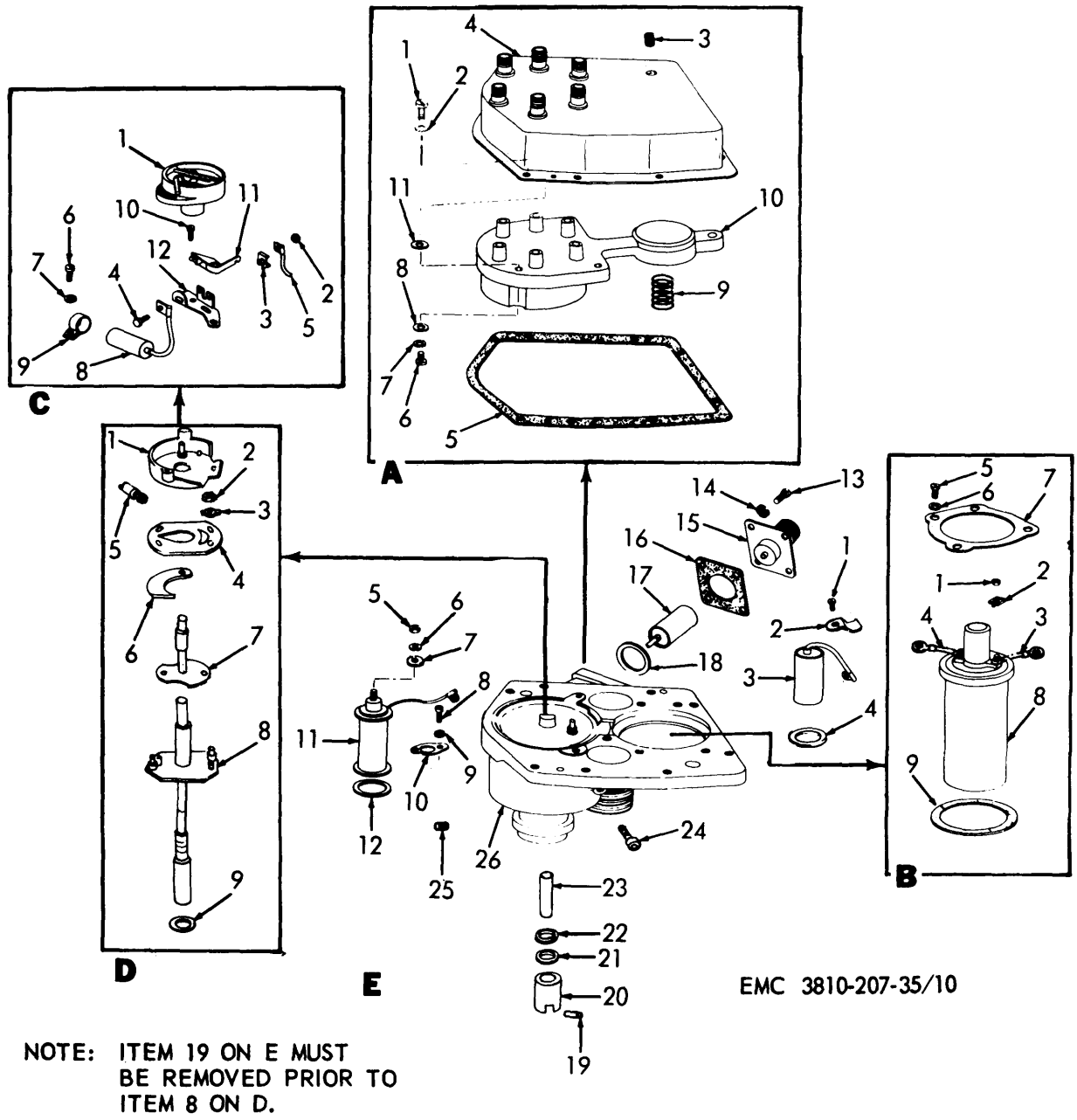


Figure 10. Crane engine distributor assembly, exploded view.

1 Screw, 10-32 x 7A6 in. (8 rqr)
2 Washer, lock, ET, No. 10 (8 rqr)
3 Plug, 3/8 -24 x 1/8 in.
4 Cover
5 Gasket
6 Screw, 10-32 x ¼ in. (2 rqr)

1 Nut, 10-32 (2 rqr)
2 Lock, special (2 rqr)
3 Coil condenser wire
4 Jumper wire
5 Screw, 10-32 x ½ in. (4 rqr)

1 Rotor
2 Nut, 6-32
3 Lock, special
4 Screw, cap, 6-32 x 3/8
5 Jumper wire
6 Screw, 8-32 x 14 in.

1 Breaker plate
2 Nut, 8-32 (2 rqr)
3 Lockplate (2 rqr)
4 Cover
5 Weight spring (2 rqr)

1 Screw, 8-32 x 3/8 in.
2 Lock, special
3 Ignition coil condensor
4 Spring
5 Nut, 8-32
6 Washer, lock, No. 8
7 Washer, flat, No. 8
8 Screw, 8-32 x 3/8 in. (2 rqr)
9 Washer, lock, No. 8 (2 rqr)
10 Bracket
11 Resistor
12 Spring
13 Screw, 6-32 x 3/8 in. (4 rqr)
7 Washer, lock, No. 10 (2 rqr)
8 Washer, flat, No. 10 (2 rqr)
9 Spring
10 Distributor cap
11 Gasket (2 rqr)

A. Distributor cap

6 Washer, lock, No. 10 (4 rqr)
7 Plate
8 Coil
9 Gasket

B. Ignition coil

7 Washer, lock, No. 8
8 Condenser
9 Bracket
10 Screw, 8-32 x 1/8 in. (2 rqr)
11 Breaker point
12 Contact and support point

C. Rotor and points

6 Weight.(4 rqr)
7 Cam
8 Shaft and weight base assembly
9 Thrust washer

D. Breaker plate and weight base assembly

14 Washer, lock, No. 6 (4 rqr)
15 Terminal coupling
16 Gasket
17 Condenser
18 Spring
19 Pin
20 Coupling
21 Shim, 0.05 in. (as rqr)
22 Shim, 0.10 in. (as rqr)
23 Sleeve bearing
24 Breather
25 Plug, 3/8 -24 x 1/8 in.
26 Distributor housing

E. Distributor housing, resistor, and condensors

Figure 10.-Continued.

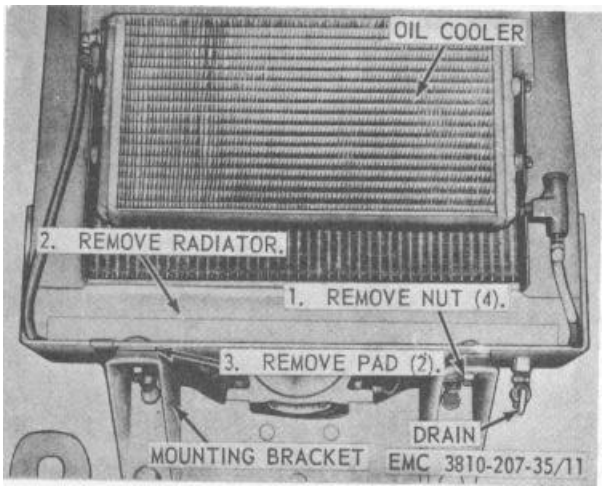


Figure 11. Crane engine radiator assembly, removal and installation.

b. Disassembly. Disassemble the engine clutch assembly in numerical sequence as illustrated on figure 14.

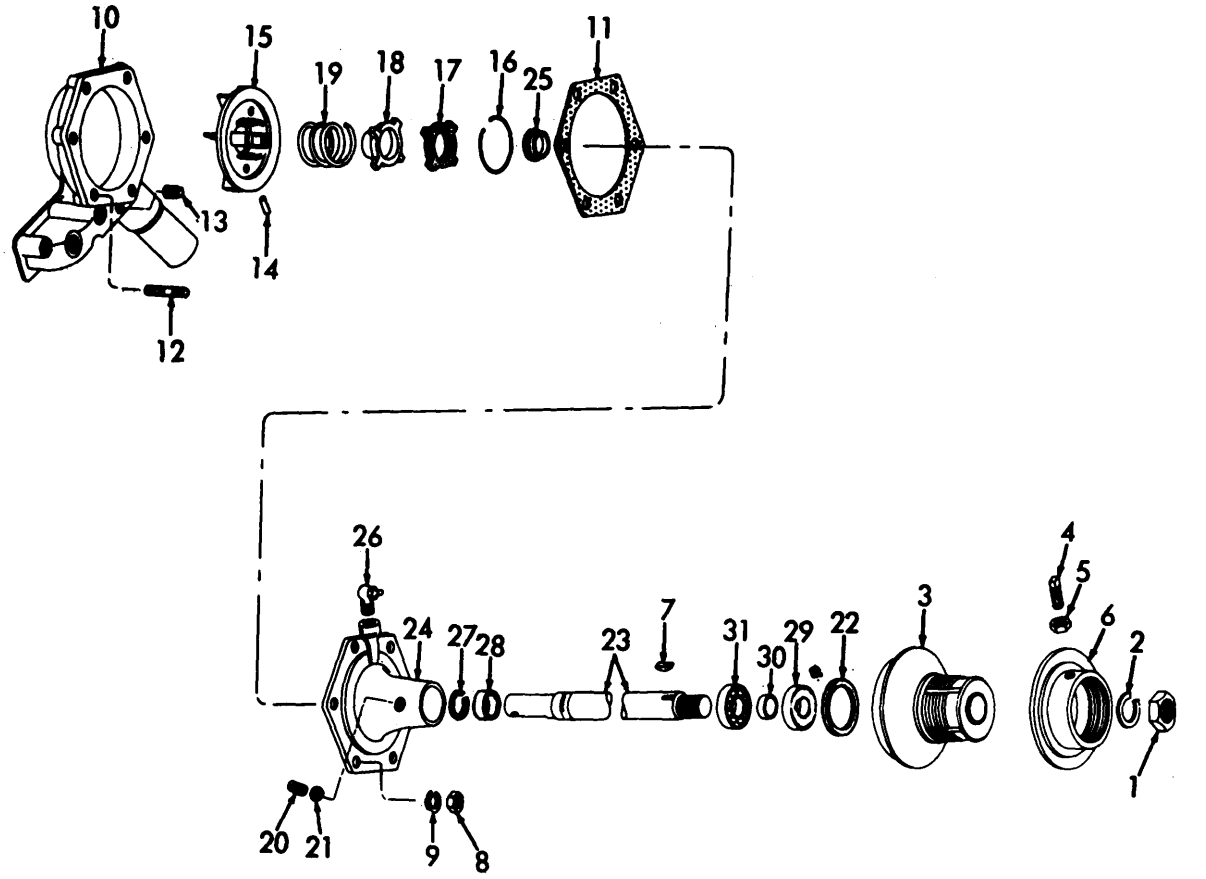
85. Crane Engine Clutch Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect drive plate segments for heat discoloring. Inspect all parts for excessive wear and damage. Check end play for proper clearance of 0.004 to 0.007 inch. Replace or repair all defective parts.

86. Crane Engine Clutch Assembly Reassembly and Installation

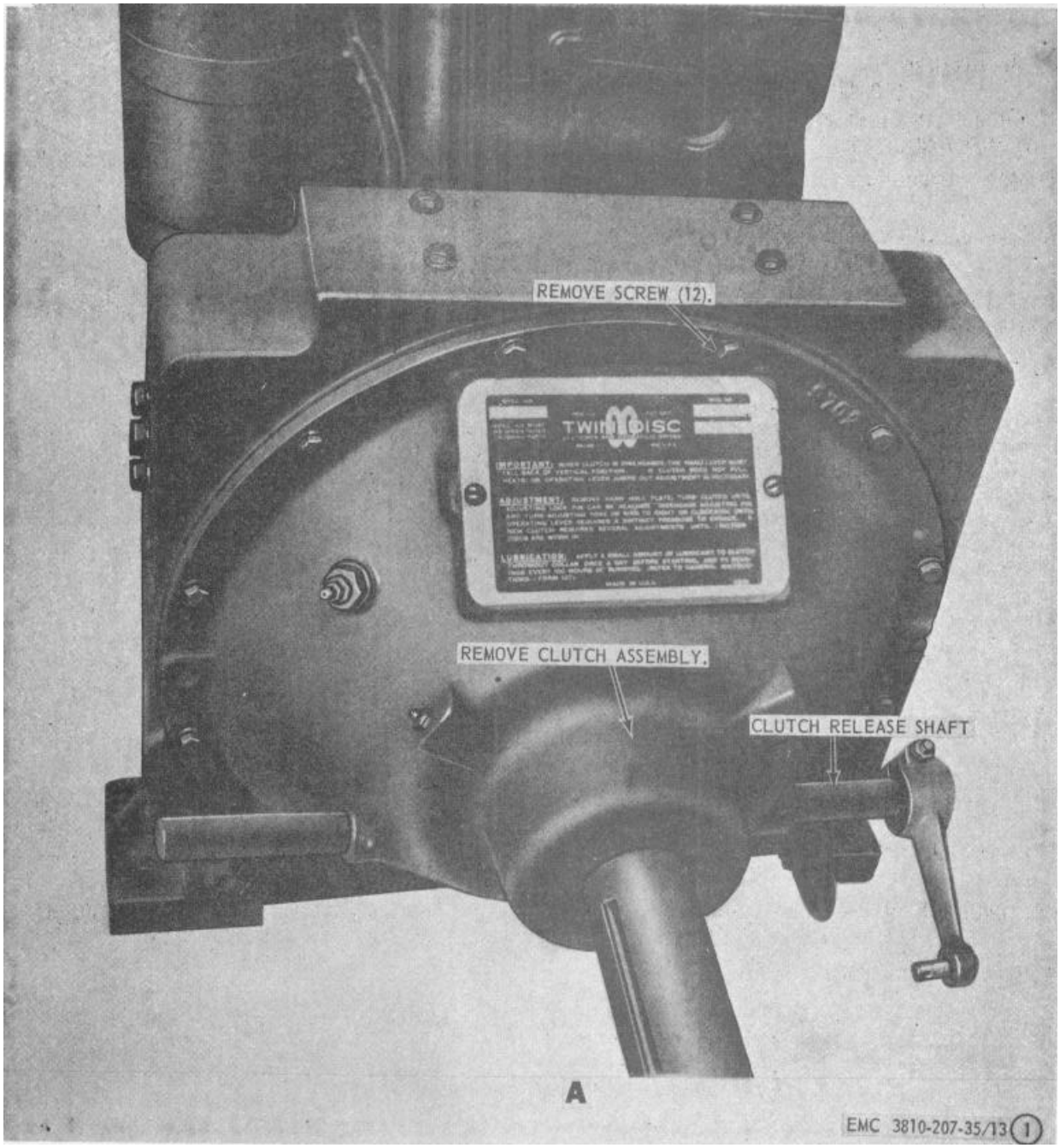
a. Reassembly. Reassemble the engine clutch assembly in the reverse of the numerical sequence as illustrated on figure 14.



EMC 3810-207-35/12

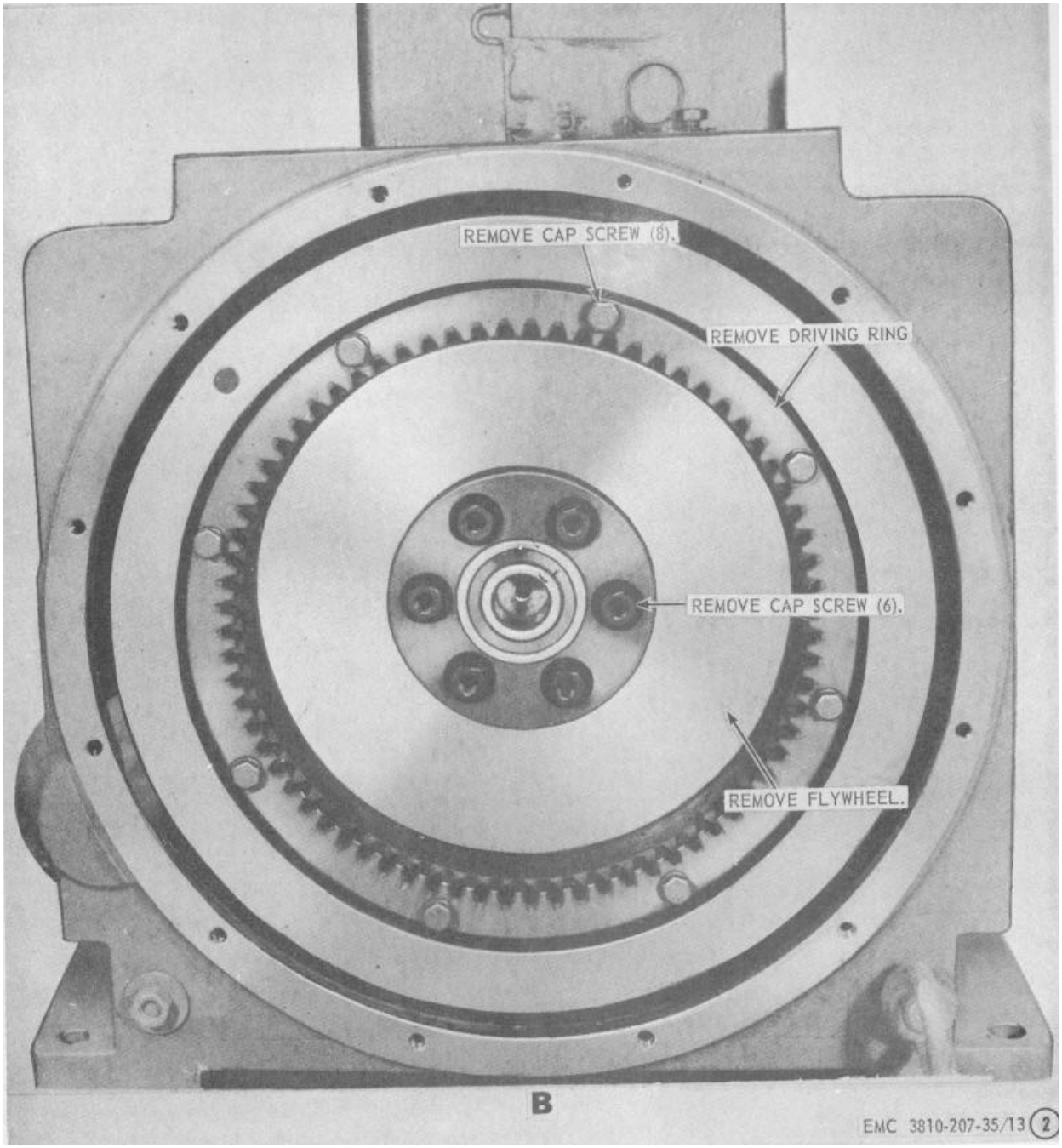
1	Nut, ½ -20	17	Carbon seal
2	Washer, lock, ½ in.	18	Bellows seal
3	Fan hub	19	Seal spring
4	Screw ¼ -20 x ⅝ in.	20	Screw, ¼ -20 x ½ in.
5	Nut, ¼ -20	21	Nut, ¼ -20
6	Adjustable flange	22	Seal
7	Key	23	Shaft
8	Nut, ¼ -20 (6 rqr)	24	Support
9	Washer, lock, min. (6 rqr)	25	Bushing
10	Body	26	Fitting
11	Gasket	27	Snap ring
12	Stud, ¼ -20 x 1/16 in. (6 rqr)	28	Retainer
13	Plug	29	Ball bearing
14	Pin	30	Spacer
15	Impeller	31	Ball bearing
16	Snap ring		

Figure 12. Crane engine water pump assembly, exploded view.



A. Clutch housing

Figure 13. Crane engine clutch assembly, removal and installation.



B. Ring gear and flywheel

Figure 13.-Continued.

b. Installation.

(1) Install the engine clutch assembly as illustrated on figure 13.

(2) Install the hoist gear guard and shields (TM 543810-207-20).

Section XI. CRANE ENGINE CYLINDER HEAD ASSEMBLY AND VALVES

87. General

The crane engine cylinder head assembly is of the L-head type. The spark plugs are mounted in the cylinder head.

88. Crane Engine Cylinder Head Assembly Removal

a. Drain the cooling system (TM 5-3810-207-10).

b. Remove the generator regulator (TM 5-3810-207-20).

c. Remove the spark plugs (TM 5-3810-207-20).

d. Remove the thermostat housing and thermostat (TM 5-3810-207-20).

e. Remove the distributor (TM 5-3810-207-20).

f. Remove the oil filters (TM 5-3810-207-20).

g. Remove the cylinder head as instructed on figure 15.

89. Crane Engine Cylinder Head Assembly Cleaning and Inspection

a. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspect all parts for excessive wear and damage. Check cylinder head flatness. Length-wise it should not exceed 0.004 inch low in center, gradually decreasing toward the ends. Crosswise it should not exceed 0.003 inch low.

c. Replace all defective parts.

90. Crane Engine Cylinder Head Assembly Installation

a. Install the cylinder head as illustrated on figure 15.

b. Install the oil filters (TM 5-3810-207-20).

c. Install the distributor (TM 5-3810-207-20).

d. Install the thermostat housing and thermostat (TM 543810-207-20).

e. Install the spark plugs (TM 53810-207-20).

f. Install the generator regulator (TM 5-3810-207-20).

g. Fill the radiator (TM 5-3810-207-10).

91. Crane Engine Valve Assemblies Removal and Disassembly

a. Removal.

(1) Remove the valve covers and valve cover gaskets (TM 5-3810-207-20).

(2) Remove the cylinder head (par. 88).

(3) Remove the valve assemblies from the engine block as instructed on figure 16.

b. Disassembly. Disassemble the valve assemblies in the numerical sequence as illustrated on figure 17.

92. Crane Engine Valve Assemblies Cleaning, Inspection, and Repair

a. Cleaning.

(1) Clean all parts with an approved cleaning solvent.

(2) Clean carbon from valves, valve stems, and cylinder block and from around valve seats and ports.

b. Inspection and Repair.

(1) Inspect the valves for burned seats and pitted or bent stems. Stem diameter should be 0.4335 to 0.4345 inch. Replace valves with bent stems or badly burned faces.

(2) Inspect the inside of each valve guide for proper clearance. Intake should be 0.4360 to 0.4370 inch. Exhaust should be 0.4390 to 0.4400 inch.

(3) Grind and reface any burned valves as necessary.

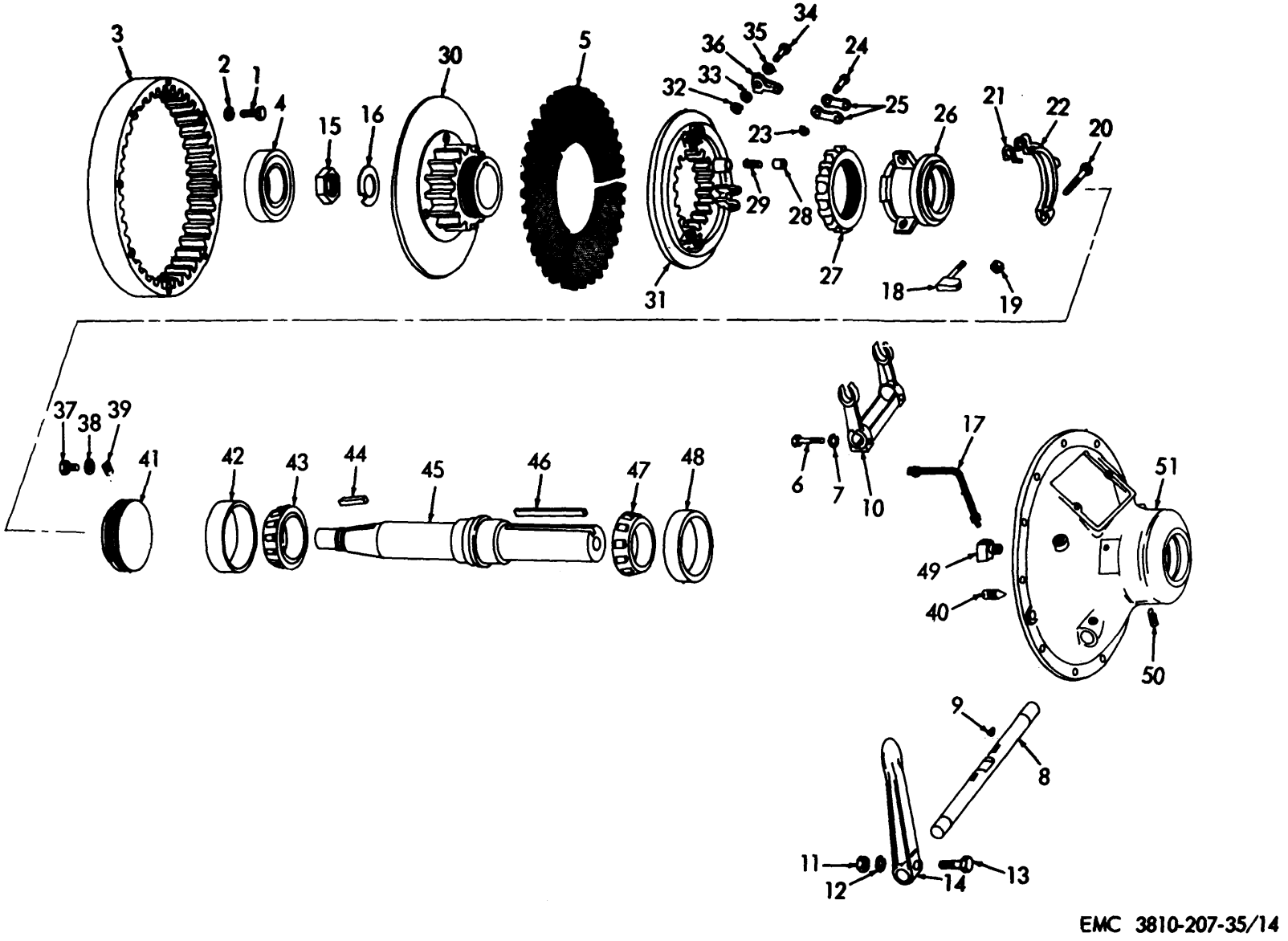


Figure 14. Crane engine clutch assembly, exploded view.

1 Screw, cap, 3/8 -16 x 1% in. (8 rqr)
2 Washer, lock, 3/8 in. (8 rqr)
3 Driving gear
4 Pilot bearing-
5 Drive plate segment (3 rqr)
6 Screw, cap, 3/8 -16 x 1 1/2 in. (2 rqr)
7 Washer, lock, 3/8 in. (2 rqr)
8 Operating- shaft
9 Woodruff key, No. 15 (2 rqr)
10 Yoke
11 Nut, 3/8 -24
12 Washer, lock, 3/8 in.
13 Screw, cap, 3/8 -24 x 2 in.
14 Operating shaft lever
15 Hub nut
16 Hub nut lockwasher
17 Hose
18 Fitting
19 Nut, 3/8 -24 (2 rqr)
20 Screw, cap, 3/8 -24 x 24 in. (2 rqr)
21 Shim (2 rqr)
22 Collar segment (2 rqr)
23 Link pin retainer (6 rqr)
24 Link pin (6 rqr)
25 Lever link (Q rqr)
26 Sliding sleeve
27 Adjusting ring
28 Lock adjusting pin
29 Pin lock spring
30 Hub plate
31 Floating plate
32 Lever pin retainer
33 Lever pin spring washer (8 rqr)
34 Lever pin '(6 rqr)
35 Lever pin spring washer (3 rqr)
36 Lever (8 rqr)
37 Screw, cap, 5/16 -18 x 5/8 in.
38 Washer, lock, 3/8 in.
39 Retainer bearing lock
40 Set screw, 5/16 -18 x % in.
41 Bearing retainer
42 Spacer
43 Shaft bearing
44 Key, 3/8 x % x 2 1/2 in.
45 Clutch shaft
46 Key, 5/8 x 5/8 x 4 3/8 in.
47 Shaft bearing
48 Bearing cup (2 rqr)
49 Fitting
50 Oil cup (2 rqr)
51 Clutch housing

Figure 14. -Continued.

(4) Inspect the valve springs for proper tension. They should have a load of 98 to 99 pounds when compressed to 1 3/8 inches. Replace springs when they do not come within limits.
(5) Inspect the tappets for worn threads, scores, cracks, and wear or pitting on the face. Replace defective tappets. Tappet hole diameter should be between 1.125 and 1.126 inch.
(6) Inspect tappet adjusting screws and nut locks for worn or damaged threads. Replace if defective.

93. Crane Engine Valve Assemblies Reassembly and Installation

a. Reassembly. Reassemble the valve assemblies in the reverse of the numerical sequence as illustrated on figure 17.

b. Installation.
(1) Install the valve assemblies in the engine block in the reverse of the instructions on figure 16.
(2) Install the cylinder head (par. 90).
(3) Install the valve cover gaskets and valve covers (TM 5-3810-207-20).

Section XII. CRANE ENGINE OIL PAN AND FILLER BLOCKS

94. General

The crane engine oil pan is mounted on the bottom of the engine block and houses the oil for the engine lubricating system.

95. Crane Engine Oil Pan and Filler Blocks Removal and Disassembly

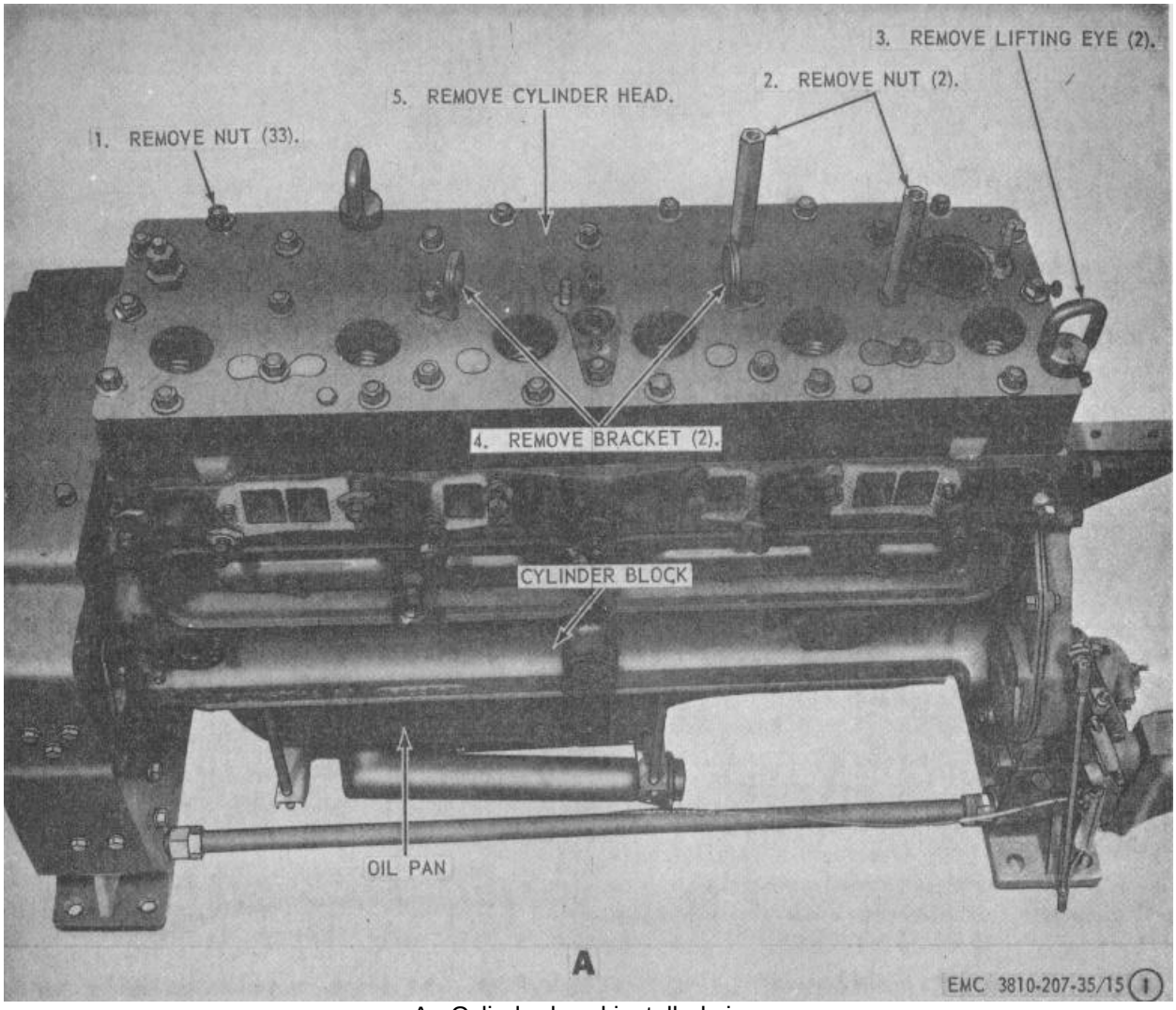
a. Removal.
(1) Remove the crane engine (par. 45).
(2) Remove the oil pan as instructed on figure 18.

b. Disassembly. Disassemble the crane engine oil pan and filler blocks in the numerical sequence as illustrated on figure 19.

96. Crane Engine Oil Pan and Filler Blocks Cleaning and Inspection

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection. Inspect all parts for excessive wear or damage. Replace all defective parts



A. Cylinder head installed view

Figure 15. Crane engine cylinder head assembly, removal and installation, and nut tightening sequence.

97. Crane Engine Oil Pan and Filler Blocks Reassembly and Installation

a. Reassembly. Reassemble the oil pan and filler blocks in the reverse of the numerical sequence as illustrated on figure 19.

b. Installation.

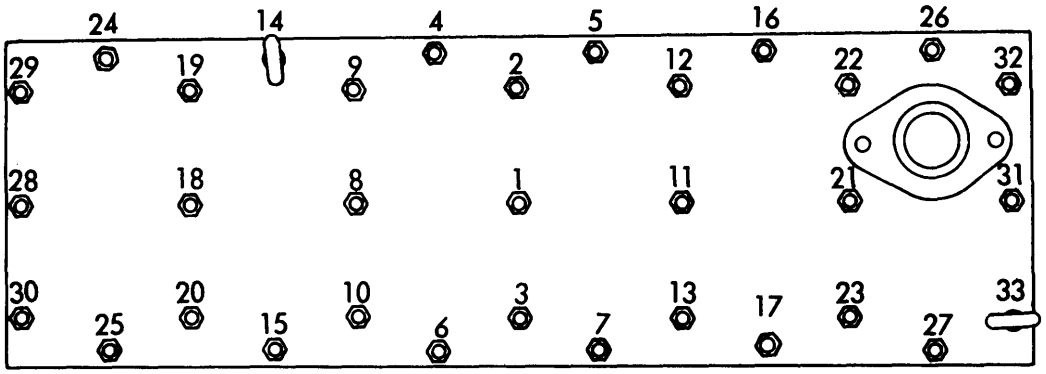
(1) Install the oil pan as illustrated on figure 18.

(2) Install the crane engine (par. 45).

Section XIII. CRANE ENGINE OIL PUMP ASSEMBLY

98. General

The crane engine oil pump assembly is internally mounted on the underside of the crane engine center bearing cap. The pump is the helical-gear type and is driven by a special gear on the camshaft. Equipped with a oil screen which floats near the top of oil in the crankcase, the pump takes the cleanest portion of the oil rather than using the portion at the bottom of the oil pan where any sediment might have collected. The oil pump supplies oil pressure to the main bearings, connecting rod bearings cam-shaft bearings, and timing gears. The



B. Cylinder head nut tightening sequence

Figure 15. -Continued.

oil pump forces oil through the oil filter and the oil cooler. When the engine is hot, the pump delivers from 10 to 15 pounds per square inch pressure at idle speed, and from 30 to 50 pounds per square inch pressure at sustained governed speed.

99. Crane Engine Oil Pump Assembly Removal and Disassembly

a. Removal.

(1) Remove the crane engine oil pan (par. 95).

(2) Remove the oil pump assembly as instructed on figure 20.

b. Disassembly. Disassemble the oil pump assembly in the numerical sequence as illustrated on figure 21.

100. Crane Engine Oil Pump Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective parts.

101. Crane Engine Oil Pump Assembly Reassembly and Installation

a. Reassembly. Reassemble the oil pump in the reverse of the numerical sequence as illustrated on figure 21.

b. Installation.

(1) Install the oil pump assembly as illustrated on figure 20.

(2) Install the crane engine oil pan (par. 97).

Section XIV. CRANE ENGINE PISTON AND CONNECTING ROD ASSEMBLIES

102. General

The pistons used on the crane engine are equipped with four rings each: one chrome ring at top of piston, two compression rings, and one oil ring. The connecting rods have the insert-type bearing shells. The bronze piston pin bushing is pressed in the boss of the connecting rod.

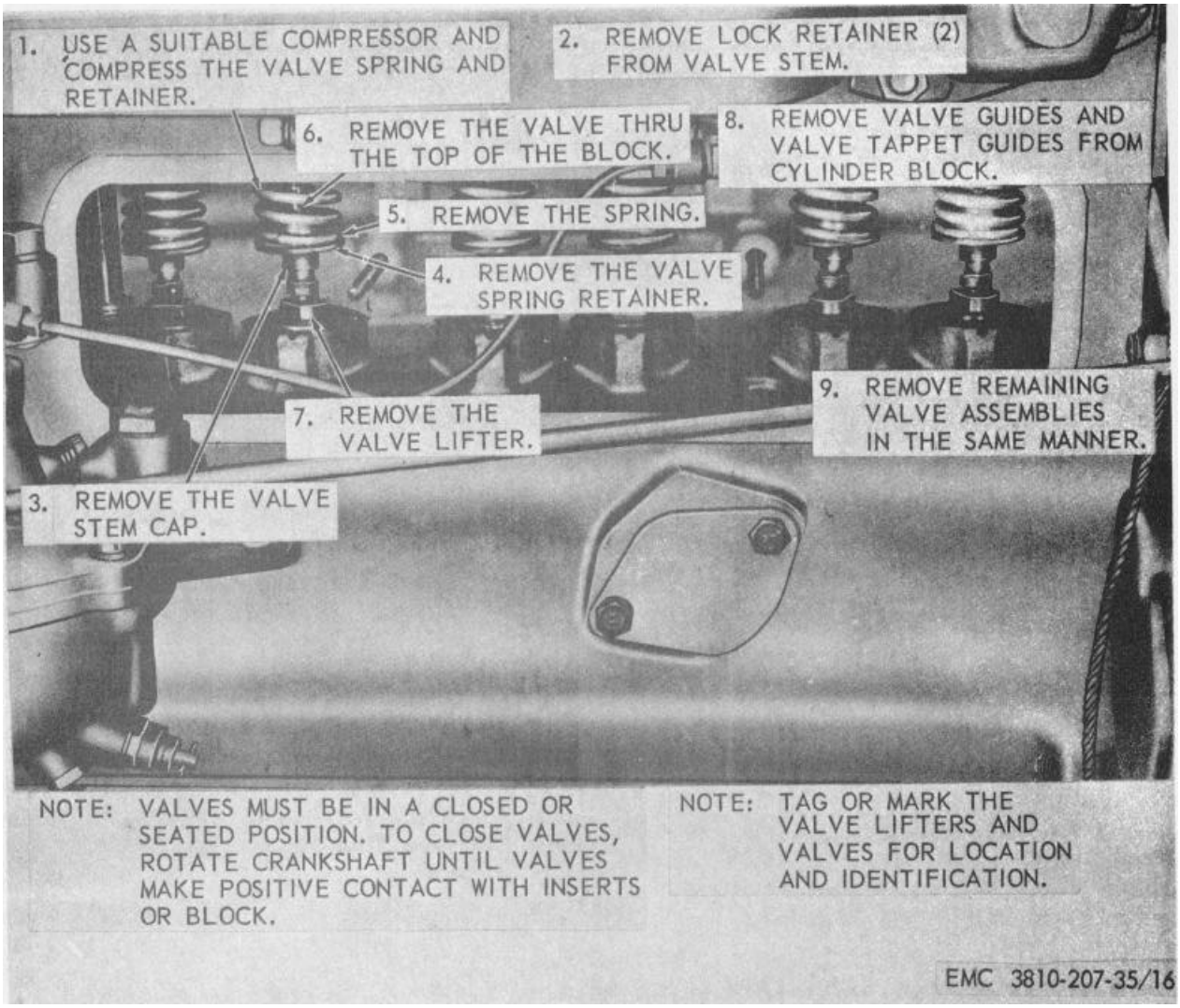


Figure 16. Crane engine valve assemblies, removal and installation.

103. Crane Engine Piston and Connecting Rod Assemblies Removal and Disassembly

a. Removal.

(1) Remove the crane engine oil pan (par. 95).

(2) Remove the crane engine cylinder head (par. 88).

(3) Remove the crane' engine piston and connecting rod assemblies from the engine block as instructed on figure 22.

b. Disassembly. Disassemble the piston and connecting rod assemblies in the numerical sequence as illustrated on figure 23.

104. Crane Engine Piston and Connecting Rod Assemblies Cleaning, Inspection, and Repair

a. Cleaning.

(1) Clean all parts with an approved cleaning solvent.

(2) Remove carbon deposits from all parts. Remove all loose carbon particles with compressed air or a lint-free cloth.

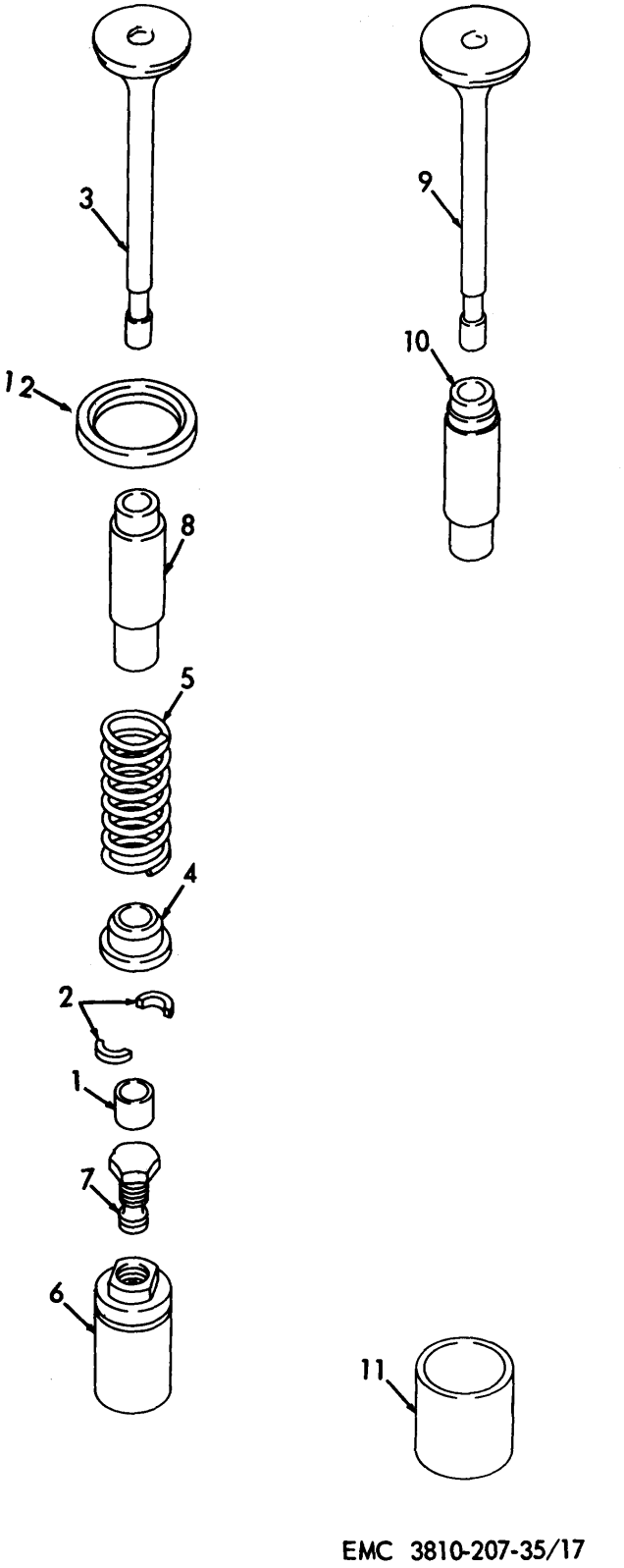


Figure 17. -Crane engine valve assemblies, exploded view.

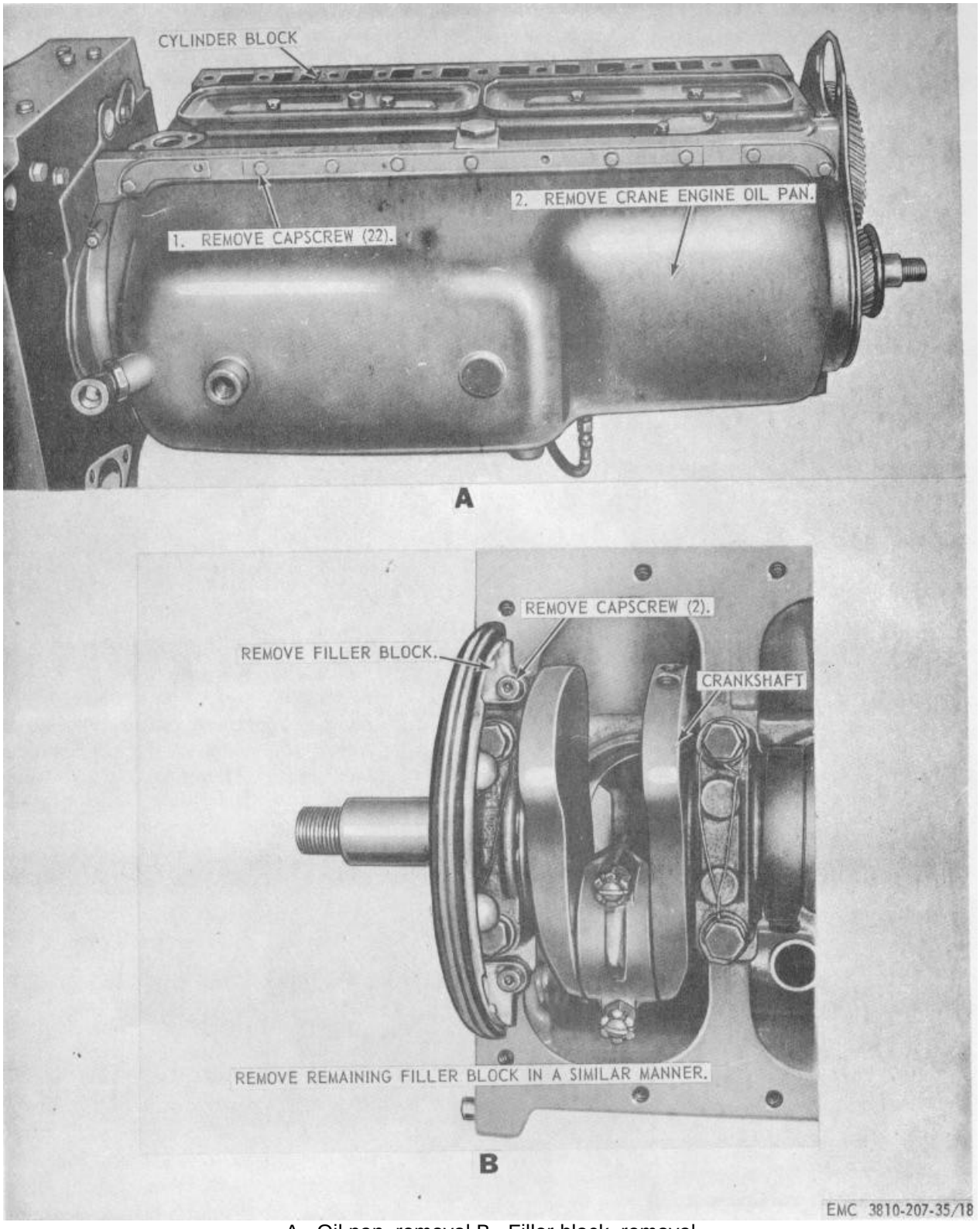
1 Valve stem cap (12 rqr)
2 Valve spring lock retainer (24 rqr)
3 Exhaust valve (6 rqr)
4 Valve spring retainer (12 rqr)
5 Valve spring (12 rqr)
6 Tappet (12 rqr)
7 Adjusting screw (12 rqr)
8 Exhaust valve guide (6 rqr)
9 Intake valve (6 rqr)
10 Intake valve guide (6 rqr)
11 Valve tappet guide bushing (12 rqr)
12 Valve seat insert (6 rqr)

Figure 17. -Continued.

b. Inspection and Repair.

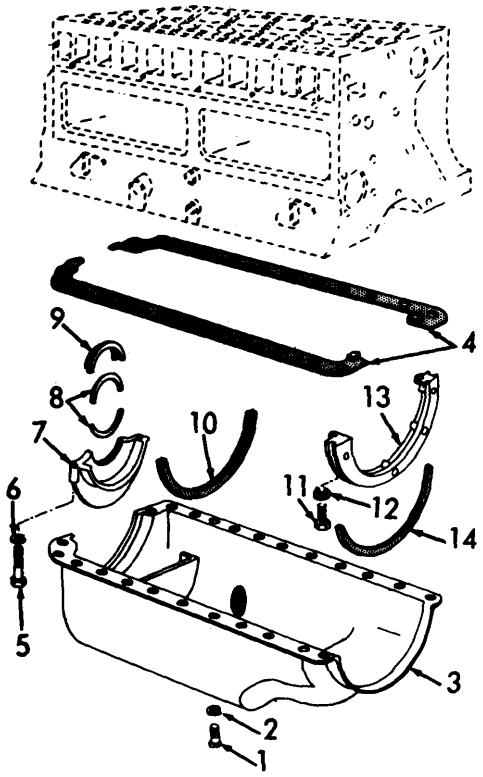
(1) Inspect the pistons for wear, galling, scoring, burned condition, and out-of-round. The piston diameter is 4.288 inches minimum and '4.241 inches maximum. The wing groove width diameter is 0.097 inch minimum and 0.098 maximum. Replace defective pistons.

(2) Inspect piston for cylinder bore fit and clearance. Pistons should be fitted with the cylinder bore of the block at room temperature, 680-75°F. Check the piston fit in the cylinder bore using a strip of 0.004 inch feeler gage stock, the feeler being attached to a small scale of approximately 15 pounds capacity. The correct piston fit is obtained when the feeler gage can be withdrawn from between the piston and cylinder wall with a pull of 5-10 pounds on the scale. The feeler gage must be inserted between the piston and cylinder wall midway between the piston pin bosses, where the diameter of the. piston is the greatest. Check the fit of the piston when it is 2 inches down in the cylinder bore in an inverted position. The correct piston to cylinder wall clearance is 0.004 inch. Piston clearance should be in accordance with specification shown in the limits and clearance table.



A. Oil pan, removal B. Filler block, removal

Figure 18. Crane engine oil pan and filler block, removal and installation.



EMC 3810-207-35/19

1 Screw, cap, 3/8-16 x 1 in. (22 rqr)
2 Washer, lock, 3/8 in. (22 rqr)
3 Oil pan
4 Oil pan gasket
5 Screw, cap, 5/16-18 x 8 in. (2 rqr)
6 Washer, lock, X/5/16 in. (4 rqr)
7 Filler block, rear
8 Filler block seal, rear
9 Rear bearing oil guard
10 Filler block gasket
11 Screw, cap, 5/16-18 x 7/8 in. (2 rqr)
12 Washer, lock 5/16 in. (2 rqr)
13 Filler block, front
14 Filler block gasket

Figure 19. Crane engine oil pan and filler block, exploded view.

(3) Inspect the connecting rods for alignment; straighten or replace all defective connecting rods.

(4) Inspect piston pin bushings for oil openings and turning in the connecting rod. Replace all defective piston pin bushings. If a new bushing is used, the piston bushing must be reamed to 0.002 inch clearance of the piston pin, and a light push with the hand should install the pin in the bushing at room temperature, 68° - 75°F.

(5) Inspect the piston rings for wear, cracks, breaks, and check the ring end gap clearance in the cylinder bore. The gap clearance should be 0.025 inch between the ring ends with the ring installed in the cylinder bore. To check the ring clearance, insert a piston in the cylinder bore in the inverted position, insert each piston ring one at a time about 2 inches down in the cylinder bore, and bring the bottom edge of the piston up against the ring to square the ring in the cylinder bore. Check the ring end gap with a feeler gage. If the ring end gap clearance is not as specified, the ring must be filed or honed to specification, or the ring must be replaced.

(6) Check the clearance between the connecting rod bearings and the throws on the crankshaft. The proper clearance of the connecting rod bearings is 0.0012 inch minimum to 0.0039 inch maximum. The desired connecting rod bearing clearance is 0.0025 inch. If the connecting rod bearing clearance is not as specified, replace the connecting rod bearing or replace the crankshaft.

105. Crane Engine Piston and Connecting Rod Assemblies Reassembly and Installation

a. Reassembly. Reassemble the crane engine piston and connecting rod assemblies in the reverse of the numerical sequence as illustrated on figure 23.

b. Installation.

(1) Install the crane engine piston and connecting rod assemblies in the engine block in the reverse of the instructions on figure 22.

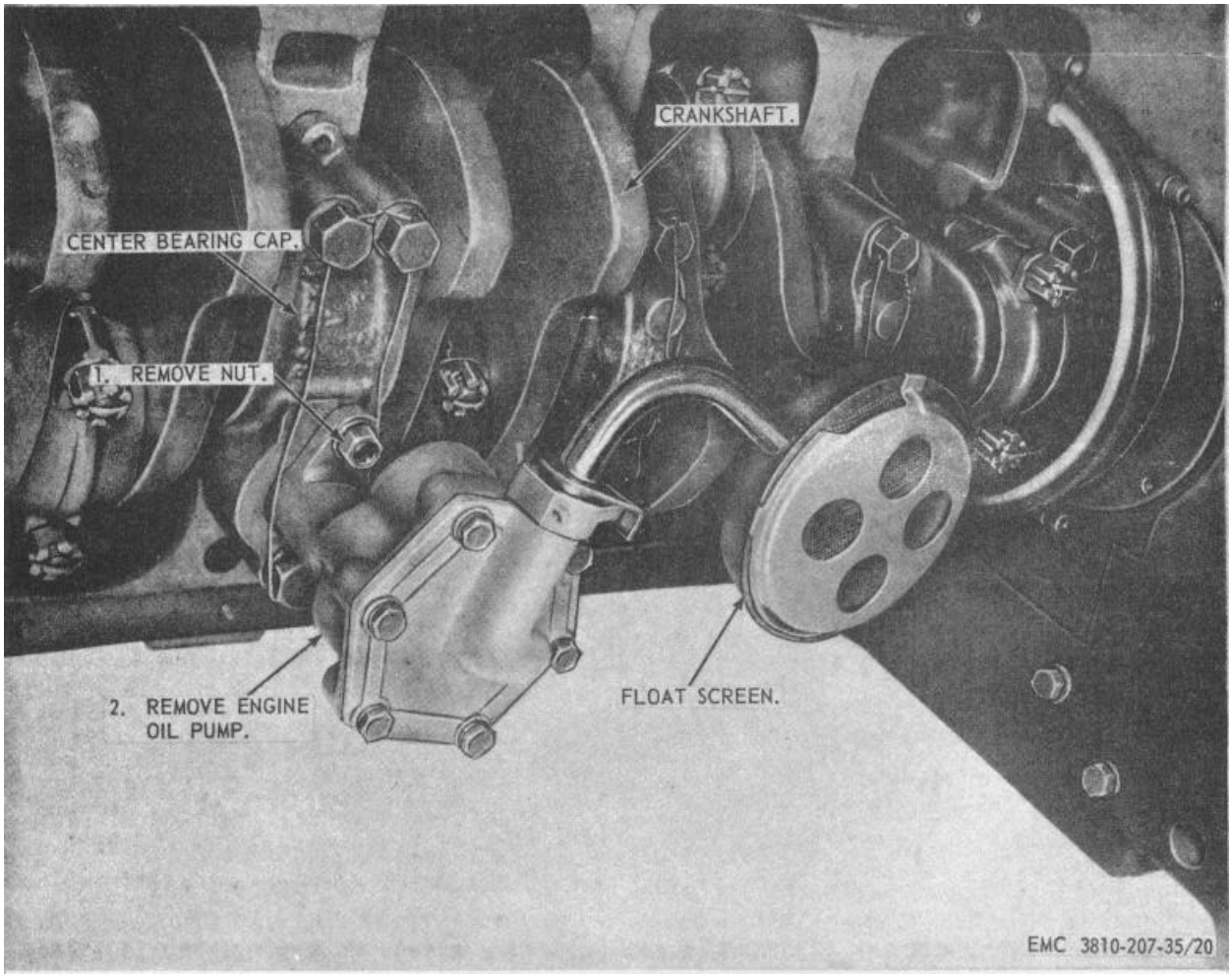


Figure 20. Crane engine oil pump, removal and installation.

(2) Install the crane engine cylinder head (par. 90).

(3) Install the crane engine oil pan (par. 97).

Section XV. CRANE ENGINE FLY WHEEL AND FLYWHEEL HOUSING

106. General

The crane engine flywheel is attached to the crankshaft flange at the rear of the crane engine. A flywheel ring gear that meshes with the starter pinion to turn the engine over is shrunk on the forward surface of the flywheel. The housing also bolts to the clutch housing.

107. Crane Engine Flywheel and Flywheel Housing Removal and Disassembly

a. Removal.

(1) Remove the starter (TM 5-3810-20720).

(2) Remove the crane engine (par. 45).

(3) Remove the crane engine clutch (par. 84).

(4) Remove the flywheel and flywheel housing as instructed on figure 24.

b. Disassembly. Disassemble the flywheel and ring gear in numerical sequence as illustrated on figure 25.

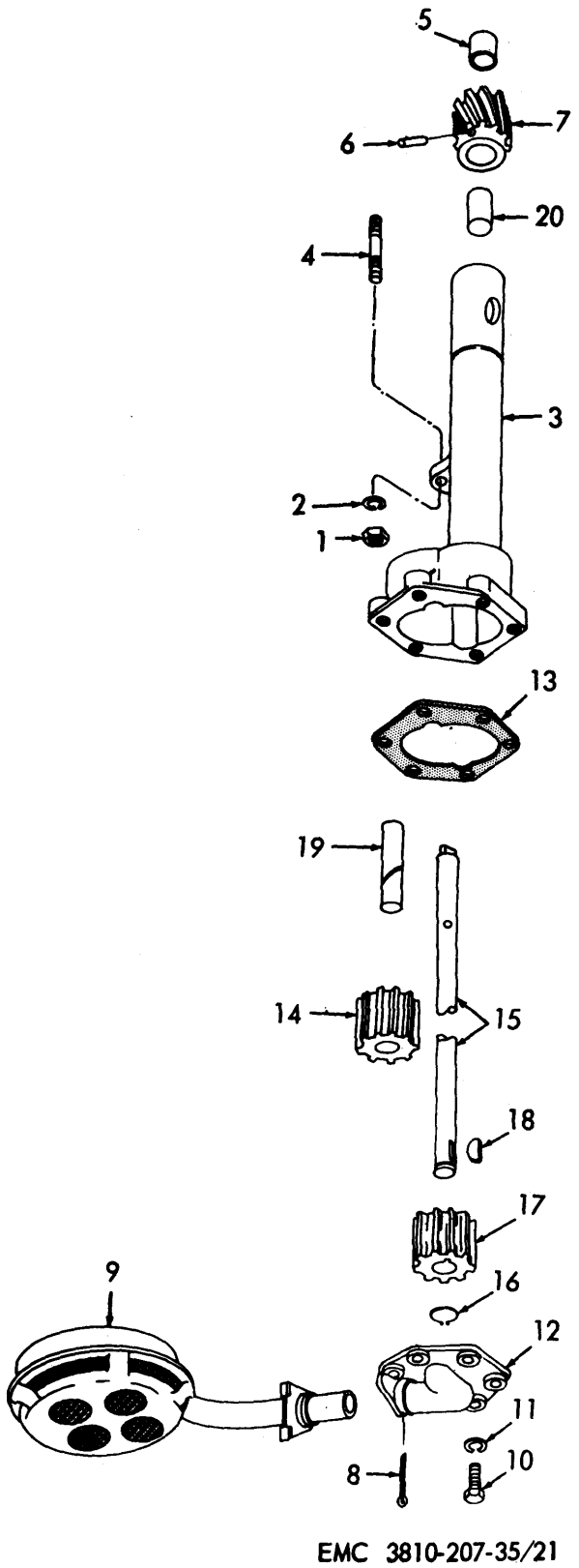


Figure 21. Crane engine oil pump assembly, exploded view.

1 Nut, 3/8-16
2 Washer, lock, 3/8 in.
3 Body
4 Stud, 3/8-16 x 1 3/8 in.
5 Sleeve
6 Pin, 5/32 in.
7 Helical gear
8 Pin, cotter, 1 1/4 x 1 3/8 in.
8 Body
9 Float screen
10 Screw, cap, 1/4-20 x 3/4 in. (6 rqr)
11 Washer, lock, 1/4 in. (6 rqr)
12 Cover
13 Gasket
14 Idler gear
15 Drive shaft
16 Snap ring
17 Driver gear
18 Key
19 Shaft
20 Bushing

Figure 21.-Continued.

108. Crane Engine Flywheel and Flywheel Housing Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective parts. With an approved indicator check the flywheel run-out and counterbore. In both cases the maximum indicator reading must not exceed 0.008 inch.

109. Crane Engine Flywheel and Flywheel Housing Reassembly and Installation

a. Reassembly. Reassemble the flywheel and flywheel housing in the reverse of the numerical sequence as illustrated on figure 25.

b. Installation.

(1) Install the flywheel and flywheel housing as illustrated on figure 24.

(2) Install the crane engine clutch (par. 86).

(3) Install the crane engine (par. 45).

(4) Install the starter (TM 5-3810-20720).

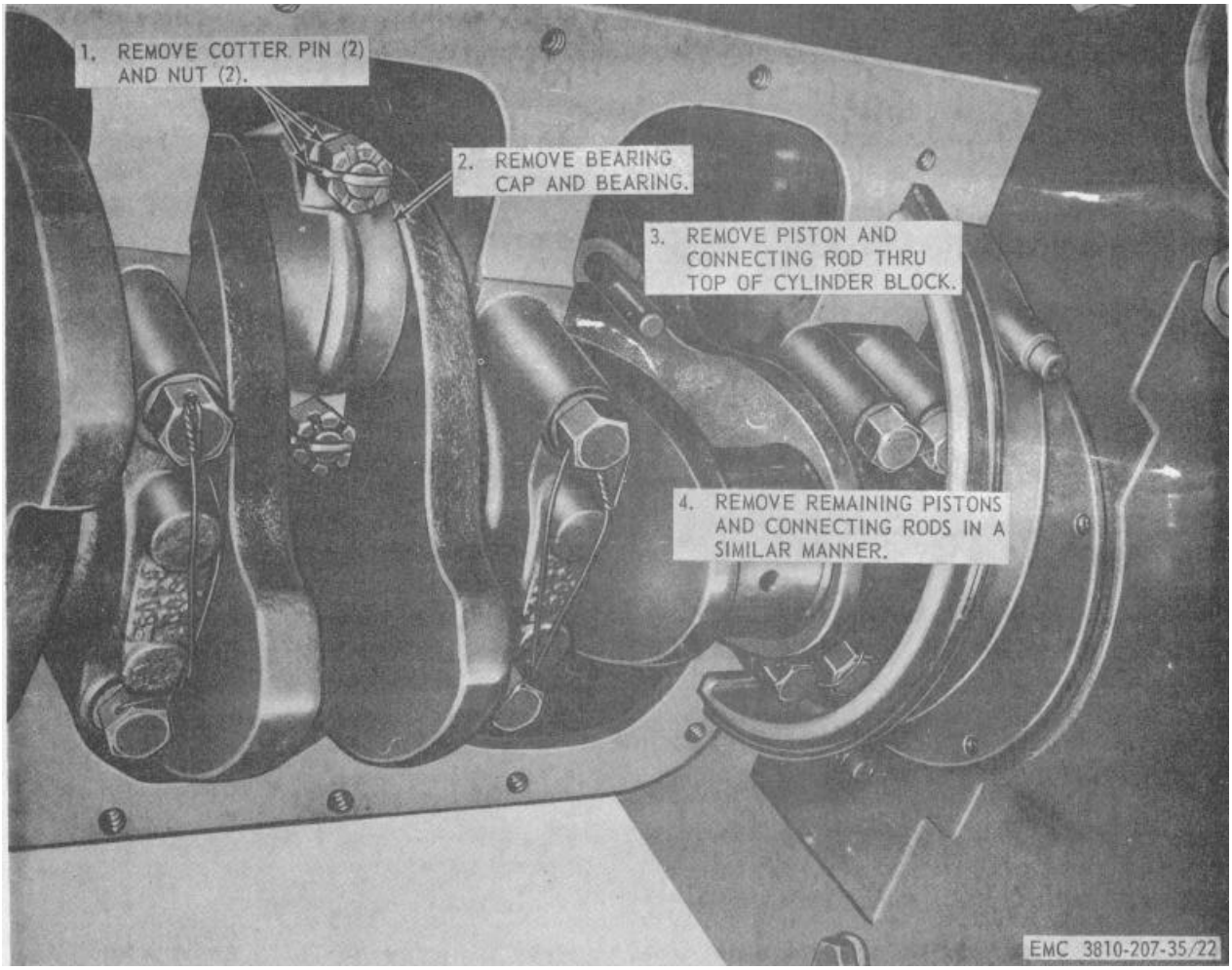


Figure 22. Crane engine piston and connecting rod assembly, removal and installation.

Section XVI. CRANE ENGINE FRONT MOUNT AND PULLEY ASSEMBLY

110. General

The crane engine pulley assembly is connected directly to the engine crankshaft and serves as an external means for starting the crane engine. The crane engine front mount is bolted to the revolving crane machinery deck.

111. Crane Engine Front Mount and Pulley Assembly Removal and Installation

a. Removal.

(1) Remove the fan belts (TM 5-3810207-20).

(2) Remove the crane engine (par. 45).

(3) remove the radiator (par. 76).

(4) Remove the front mount and pulley assembly as instructed on figure 26.

b. Disassembly. Disassemble the front mount and pulley assembly in numerical sequence as illustrated on figure 27.

112. Crane Engine Front Mount and Pulley Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective parts.

113. Crane Engine Front Mount and Pulley Assembly Reassembly and Installation

a. Reassembly. Reassemble the front mount and pulley assembly in the reverse of the numerical sequence as illustrated on figure 27.

b. Installation.

(1) Install the front mount and pulley assembly as illustrated on figure 26.

(2) Install the radiator (par. 78).

(3) Install the crane engine (par. 45).

(4) Install the fan belts (TM 5-3810-20720).

Section XVII. CRANE ENGINE TIMING GEAR COVER AND TIMING GEARS

114. General

The crane engine timing gear cover is used for the front engine mount and in cases the crankshaft and camshaft gears. It is also used to mount the engine speed governor. The crankshaft and camshaft gears are helically cut to provide greatest meshing surface. The crankshaft gear drives the camshaft gear at one-half engine speed. The camshaft gear drives the engine speed governor.

115. Crane Engine Timing Gear Cover and Timing Gears Removal

a. Remove the fan and generator drive belts (TM 5-3810-207-20).

b. Remove the engine speed governor (TM 5-3810-207-20).

c. Remove the radiator (par. 76).

d. Remove the crankshaft pulley (par. 111).

e. Remove the timing gear cover and timing gears as instructed on figure 28.

116. Crane Engine Timing Gear Cover and Timing Gears Cleaning and Inspection

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection. Inspect the gears for excessive wear and damage. Check the backlash of the timing gears. Force the mating teeth as far apart as possible with a feeler gage; if the clearance is 0.002 inch or greater, the gears must be replaced. Always replace gears in pairs.

117. Crane Engine Timing Gear Cover and Timing Gears Installation

a. Install the timing gears and timing gears cover as illustrated on figure 28.

b. Install the crankshaft pulley (par. 113)1.

c. Install the radiator (par. 78).

d. Install the engine speed governor (TM 53810-207-20).

e. Install the generator and fan drive belts (TM 5-3810-207-20).

Section XVIII. CRANE ENGINE CAMSHAFT ASSEMBLY

118. General

The crane engine camshaft assembly is driven by means of the camshaft gear which meshes with the crankshaft gear mounted on the crankshaft. The camshaft is supported in the cylinder block by four removable bearings. The camshaft, in conjunction with the tappets, opens and closes the valves. The camshaft operates the oil pump through a gear on the oil pump and gear on the camshaft.

119. Crane Engine Camshaft Assembly Removal

a. Remove the front mount and pulley (par. 111).

b. Remove the valves (par. 91).

c. Remove the oil pump (par. 99).

d. Remove the timing gears (par. 115).

e. Remove the camshaft assembly as instructed on figure 29.

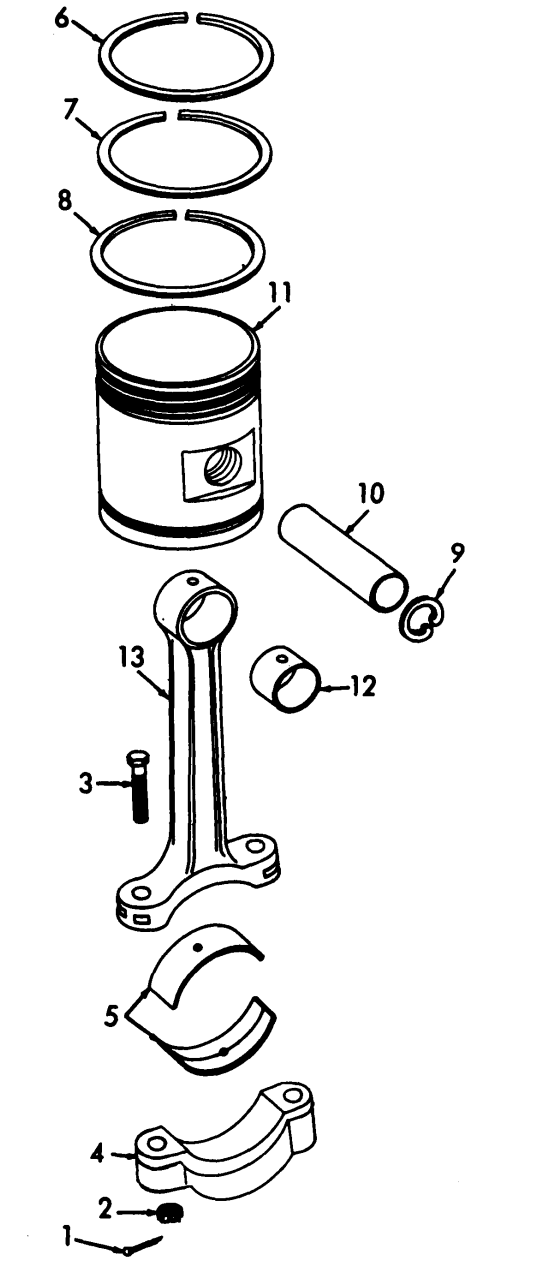


Figure 23. Crane engine piston and connecting rod assembly, exploded view.

1 Pin, cotter, 3/32 x 3/4 in. (12 rqr)
2 Nut, 1/2-20 (12 rqr)
3 Bolt, special (12 rqr)
4 Rod cap (6 rqr)
5 Bearing shell (12 rqr)
6 Top ring (6 rqr)
7 Compression ring. (12 rqr)
8 Oil ring (6 rqr)
9 Retainer (12 rqr)
10 Piston pin (6 rqr)
11 Piston (6 rqr)
12 Bushing (6 rqr)
13 Connecting rod (6 rqr)

Figure 23. -Continued.

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120. Crane Engine Camshaft Assembly Cleaning and Inspection

a. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspect the camshaft bearing journal for diameter of 2.242 inch minimum to 2.243 inch maximum.

c. Inspect the cam lift clearance, the intake should be 0.3395 inch, and the exhaust 0.352 inch.

d. Inspect the camshaft end play for a clearance of 0.005 inch minimum to 0.009 inch maximum.

e. Inspect the camshaft bushings for tolerance of 2.2445 inch minimum and 2.2450 inch maximum. Inspect the bushing clearance for '.0015 inch minimum and 0.0030 inch maximum, with an allowable wear of 0.005 inch.

f. Inspect the tappet hole for a diameter of 1.125 inch minimum to 1.126 inch maximum diameter.

g. Inspect the tappet hole clearance for 0.0005 inch minimum to 0.002 inch maximum.

h. Replace all damaged or defective parts.

121. Crane Engine Camshaft Assembly Installation

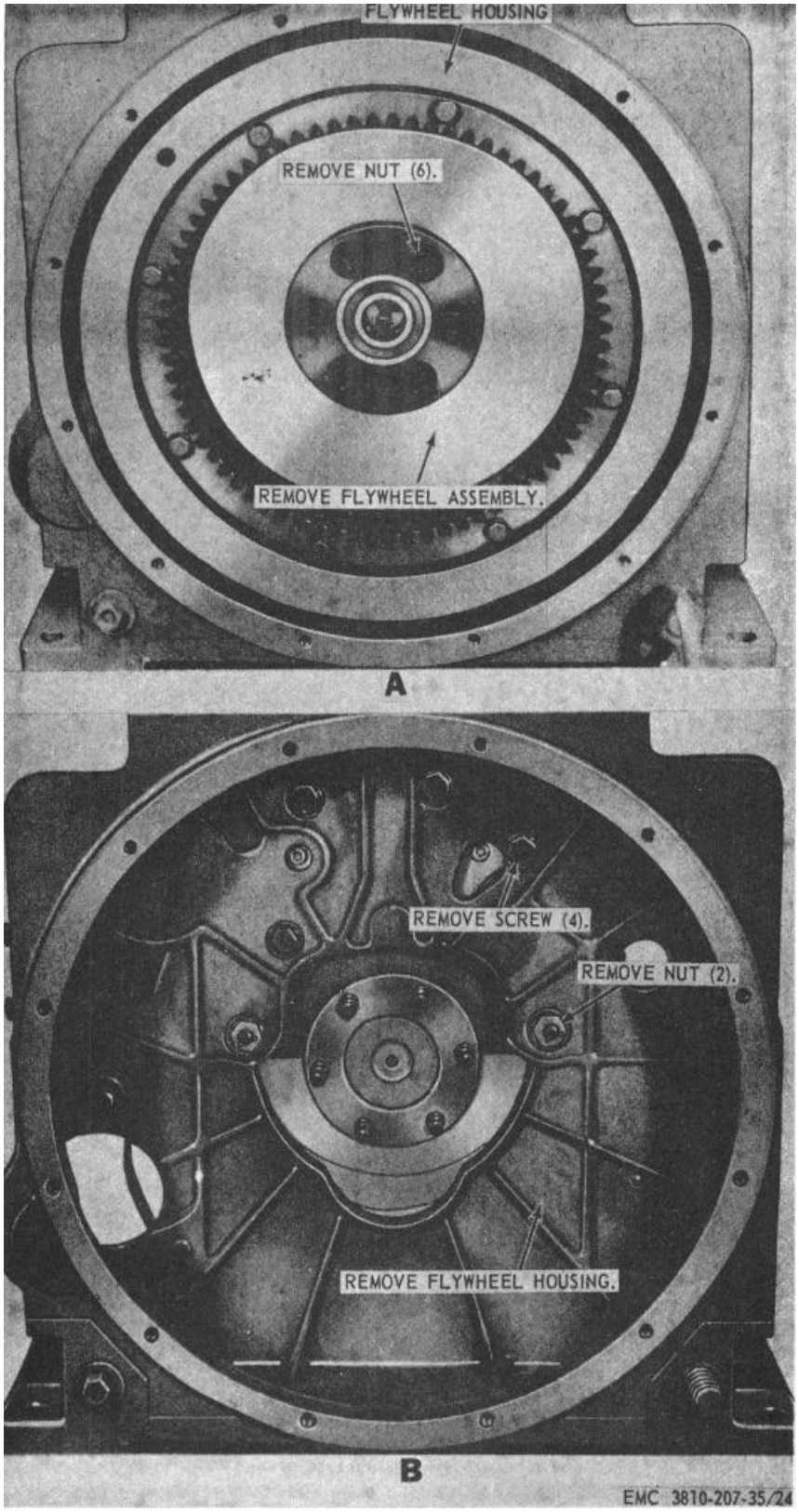
a. Install the camshaft assembly as illustrated on figure 29.

b. Install the timing gears (par. 117).

c. Install the oil pump (par. 101).

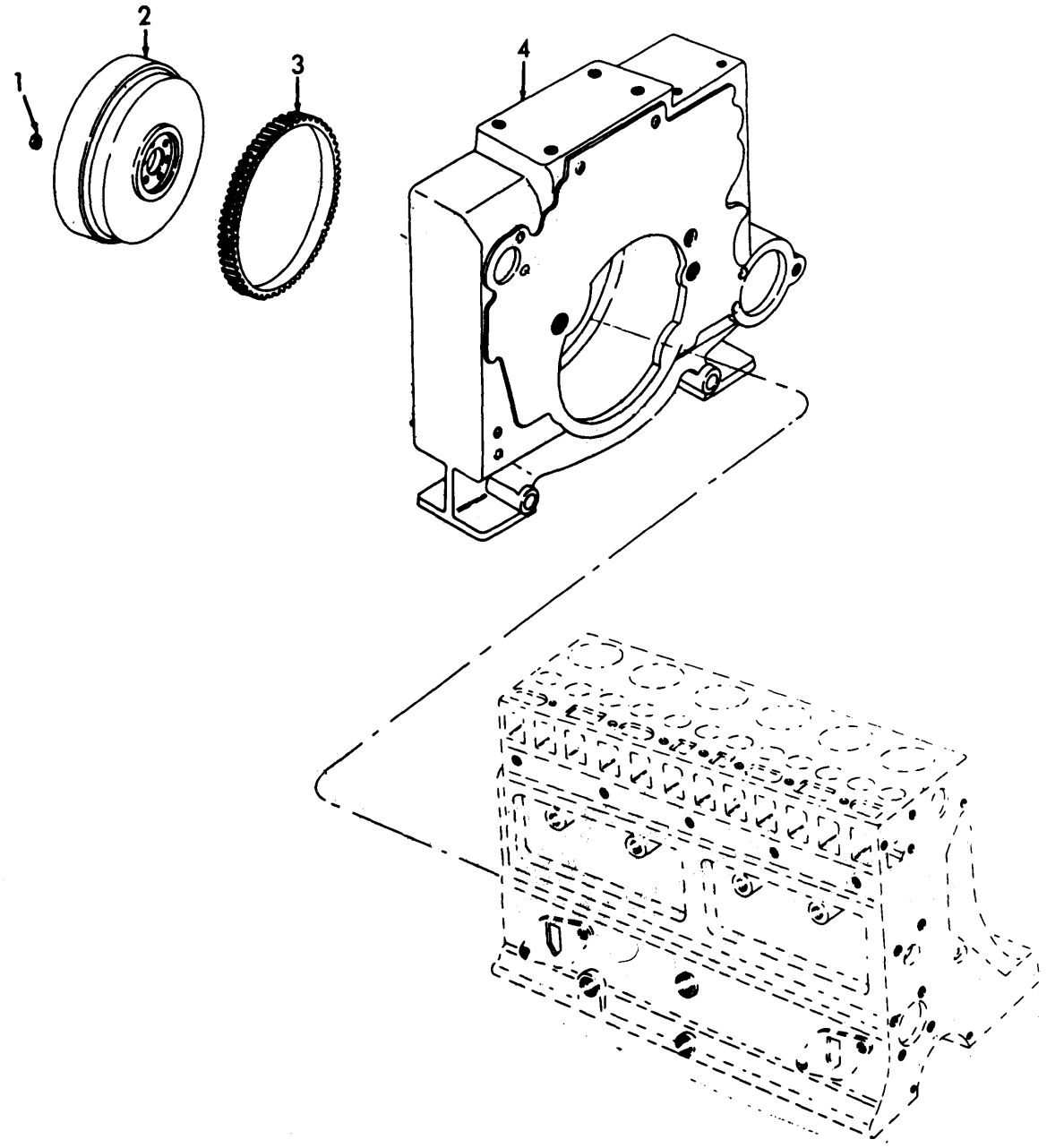
d. Install the valves (par. 93).

e. Install the front mount and pulley (par. 113).



A. Flywheel, removal B. Flywheel housing, removal

Figure 24. Crane engine flywheel and flywheel housing, removal and installation.



1 Nut, 1/2-20 (6 rqr)
2 Flywheel
3 Ring gear
4 Flywheel housing

Figure 25. Crane engine flywheel, ring gear, and flywheel housing exploded view.

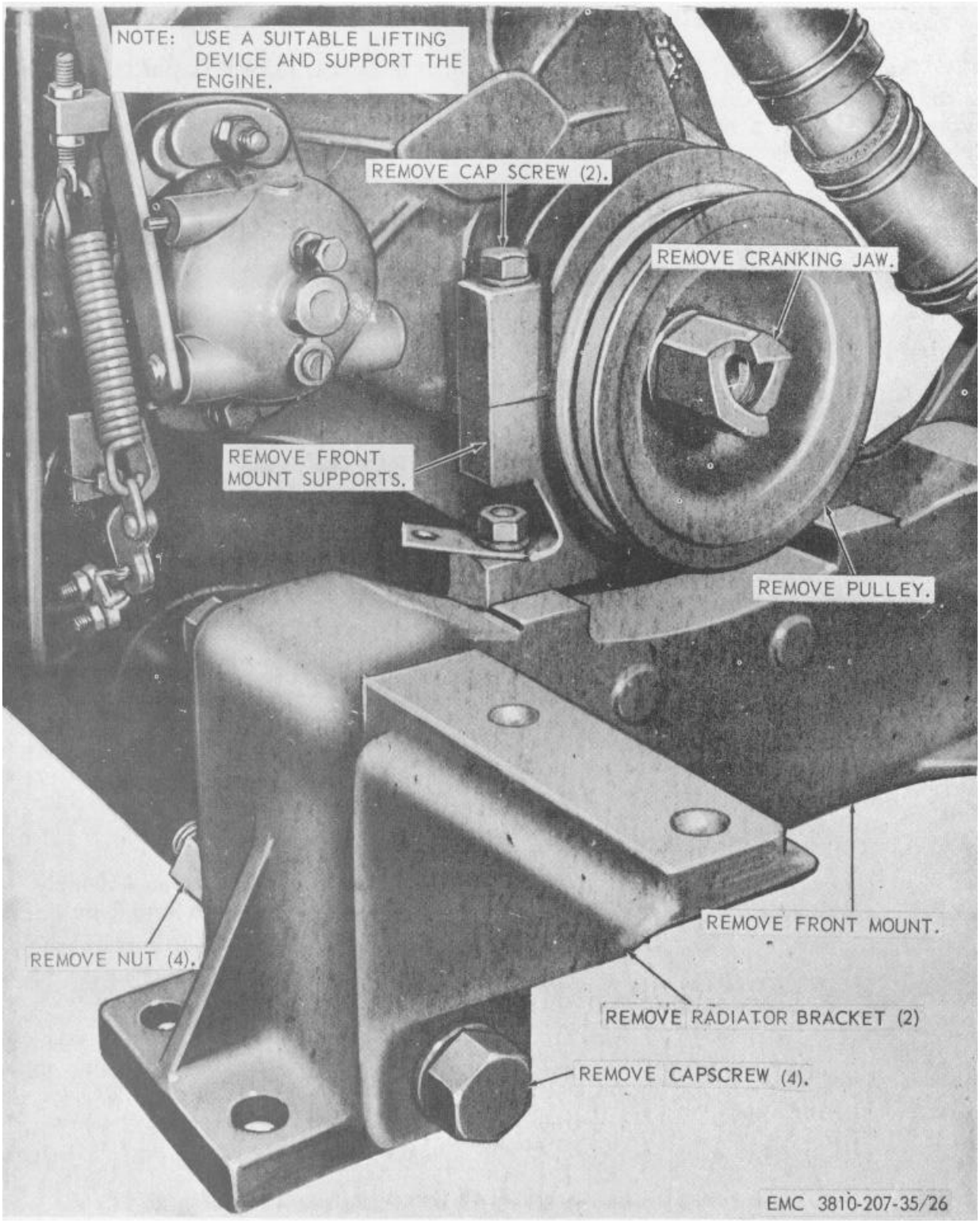
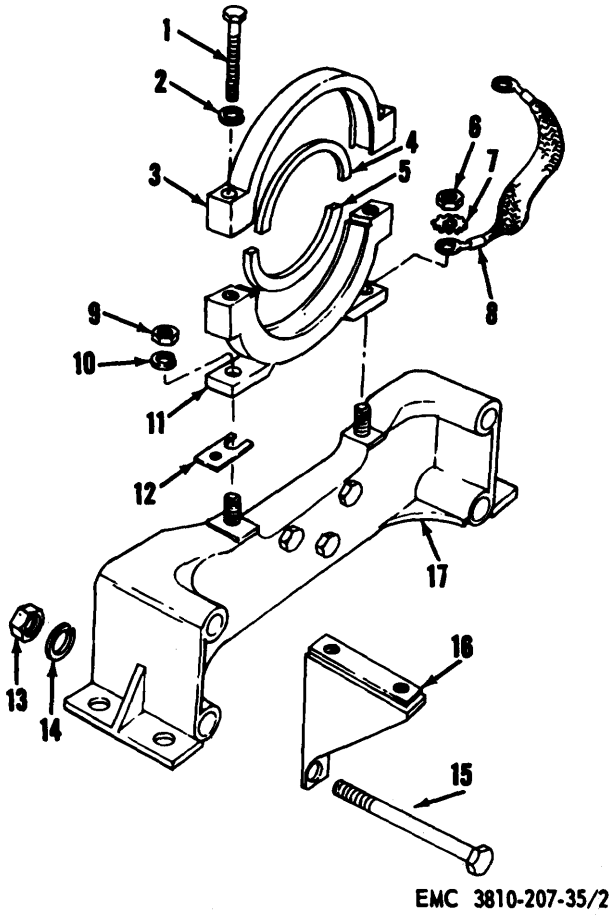


Figure 26. Crane engine front mount and pulley assembly, removal and installation.

122. General

The crane engine crankshaft assembly is forged of high carbon steel and is carried on seven large main bearings. Special attention must be paid to the end play of the crankshaft as excessive play may cause damage to the front main bearings. The crankshaft is drilled for continuous lubrication. It is both statically and dynamically balanced. The front end of the shaft is machined to extend through the oil seal in the front cover, to accommodate the fan drive pulley.



1 Screw, cap, i-13 x 8A in. (2 rqr)
2 Washer, lock, % in. (2 rqr)
3 Trunnion, upper
4 Liner
5 Liner
6 Nut, %-13
7 Washer, lock, IET, % in.
8 Ground strap
9 Nut, %-18
10 Washer, lock, % in.
11 Trunnion, lower
12 Shim
13 Nut, %-10 (4 rqr)
14 Washer, lock, (4rqr)
15 Screw, cap, %-10 x 6 in. (4 rqr)
16 Radiator support (2 rqr)
17 Front engine mount

Figure 27. Crane engine front mount assembly, exploded view.

123. Crane Engine Crankshaft Assembly Removal and Disassembly

a. Removal.

(1) Remove the front mount and pulley (par. 111)

(2) Remove the flywheel and housing (par. 107).

(3) Remove oil pan and filler blocks (par. 95).

(4) Remove the oil pump (par. 99).

(5) Remove the connecting rod caps (par. 103).

(6) Remove the timing gears (par. 115).

(7) Remove the crankshaft assembly as instructed on figure 30.

b. Disassembly. Disassemble the crane engine crankshaft assembly as illustrated on figure 31.

124. Crane Engine Crankshaft Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts in an approved cleaning solvent and dry thoroughly.

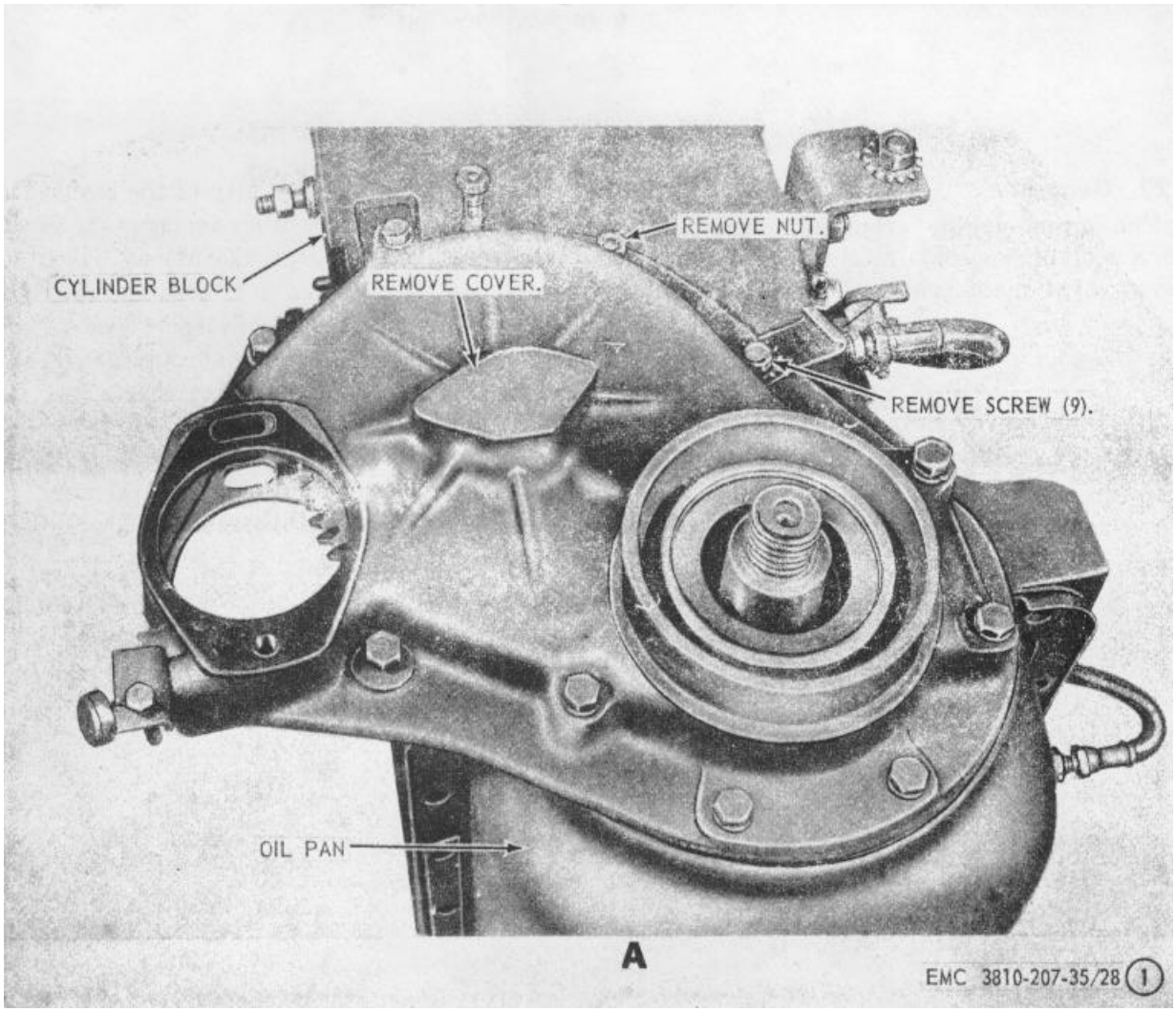
b. Inspection and Repair.

(1) Inspect the crankshaft for scored or damaged bearing journals, cracks, breaks, or other damage. Replace a defective crankshaft as necessary.

(2) Inspect the connecting rod bearings and crankshaft main bearings for scores, cracks, breaks, or excessive wear.

(3) Inspect the bearing caps for breaks, cracks, or other damage.

(4) Inspect the main bearing journals, the 1



A. Timing gear cover, installed

Figure 28. Timing gear cover and timing gears, removal and installation.

diameter should measure between 2.9985 and 2.9995 inches.

(5) Inspect the crankshaft end play, it should measure between 0.005 and 0.008 inch.

(6) Inspect the crankpin. The diameter should measure between 2.560 and 2.561 inches. The length should measure between 1.6855 and 1.6875 inches.

125. Crane Engine Crankshaft Assembly Reassembly and Installation

a. Reassembly. Reassemble the crane engine crankshaft assembly as illustrated on figure 31.

b. Installation.

(1) Install the crankshaft assembly as illustrated on figure 30.

(2) Install the timing gears (par. 117).

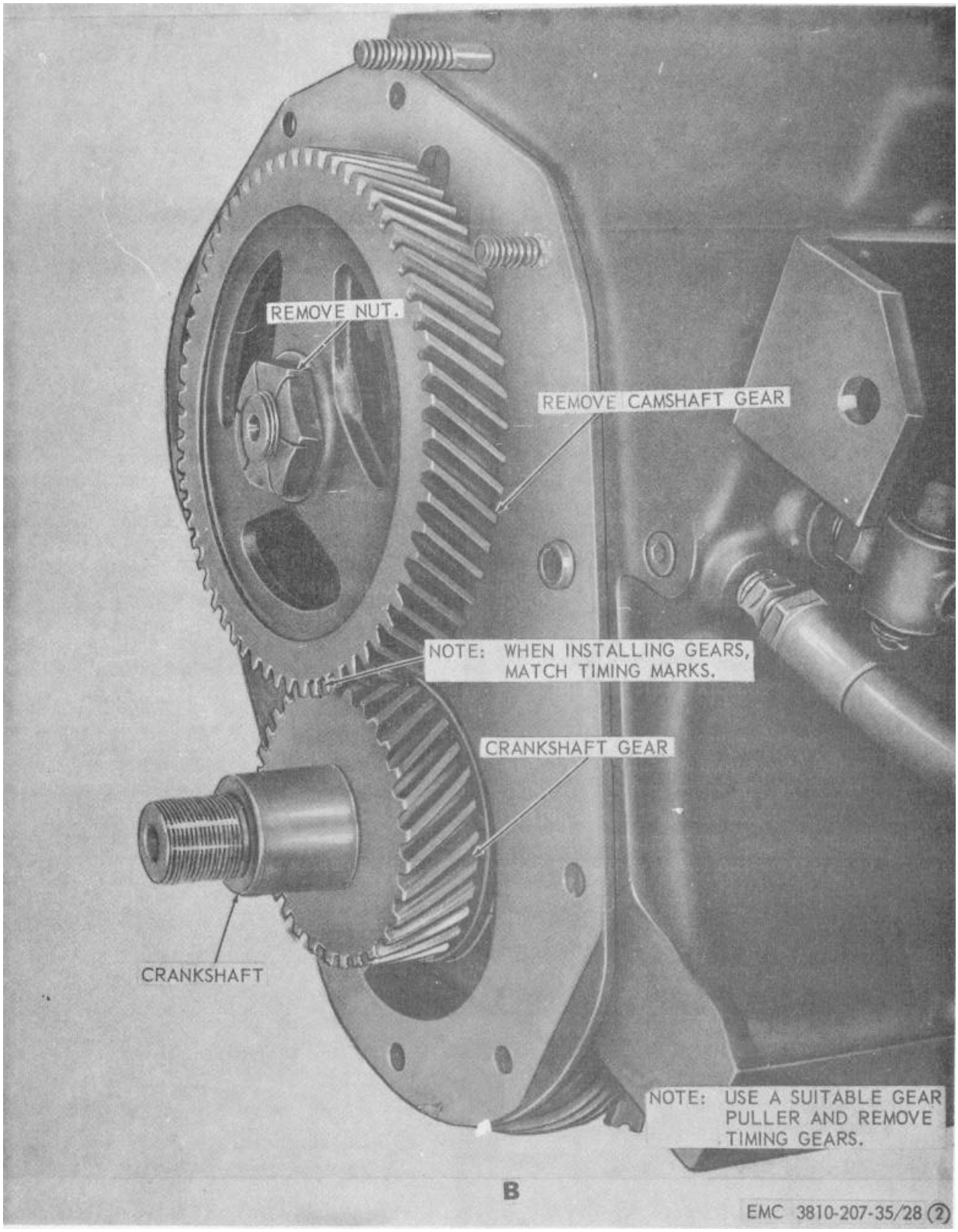
(3) Install the connecting rod caps (par. 105).

(4) Install the oil pump (par. 101).

(5) Install the oil pan and filler blocks (par. 97).

(6) Install the flywheel and housing (par. 109).

(7) Install the front mount and pulley (par. 113)



B. Timing gears, installed

Figure 28. -Continued.

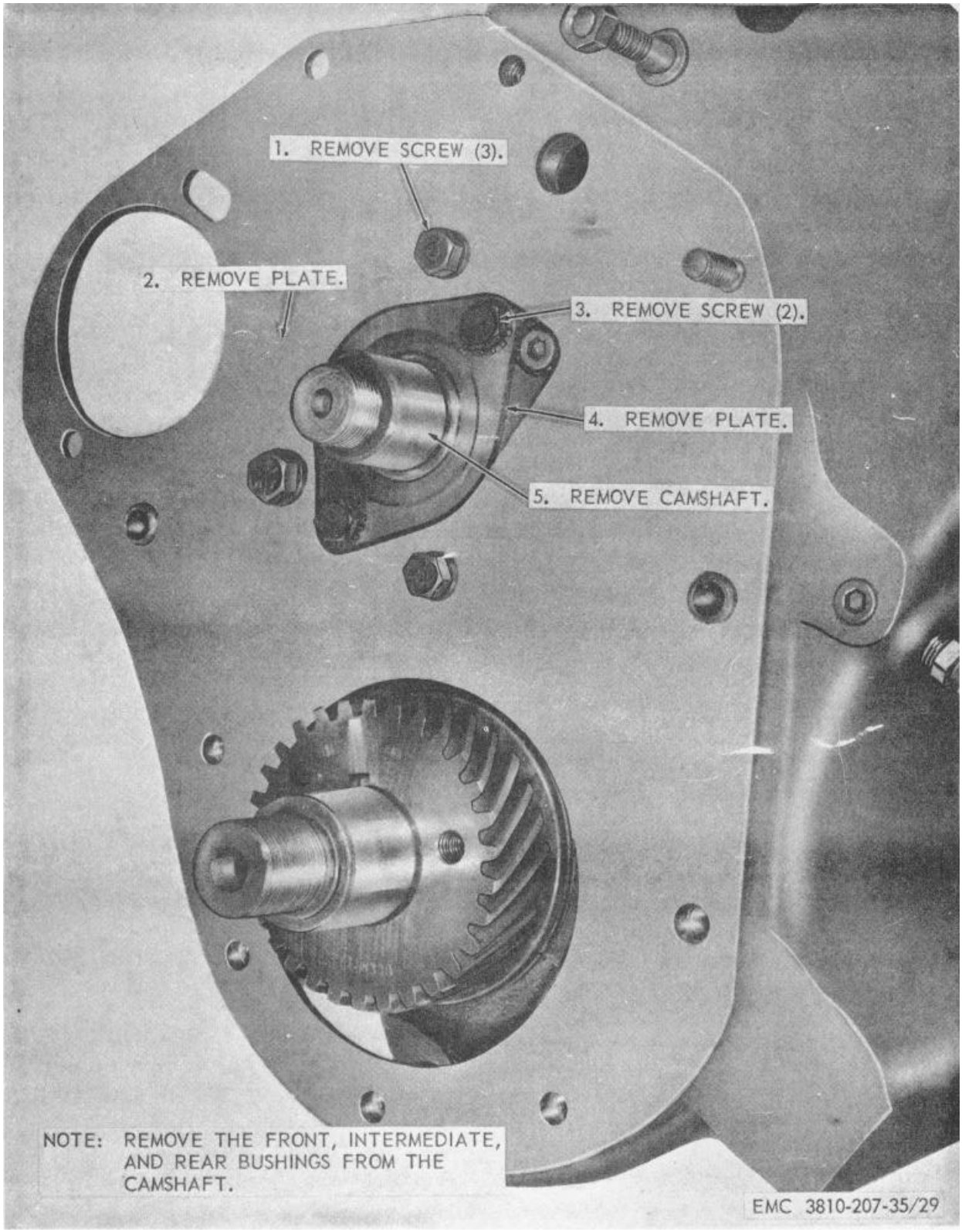


Figure 29. Crane engine camshaft assembly, removal and installation.

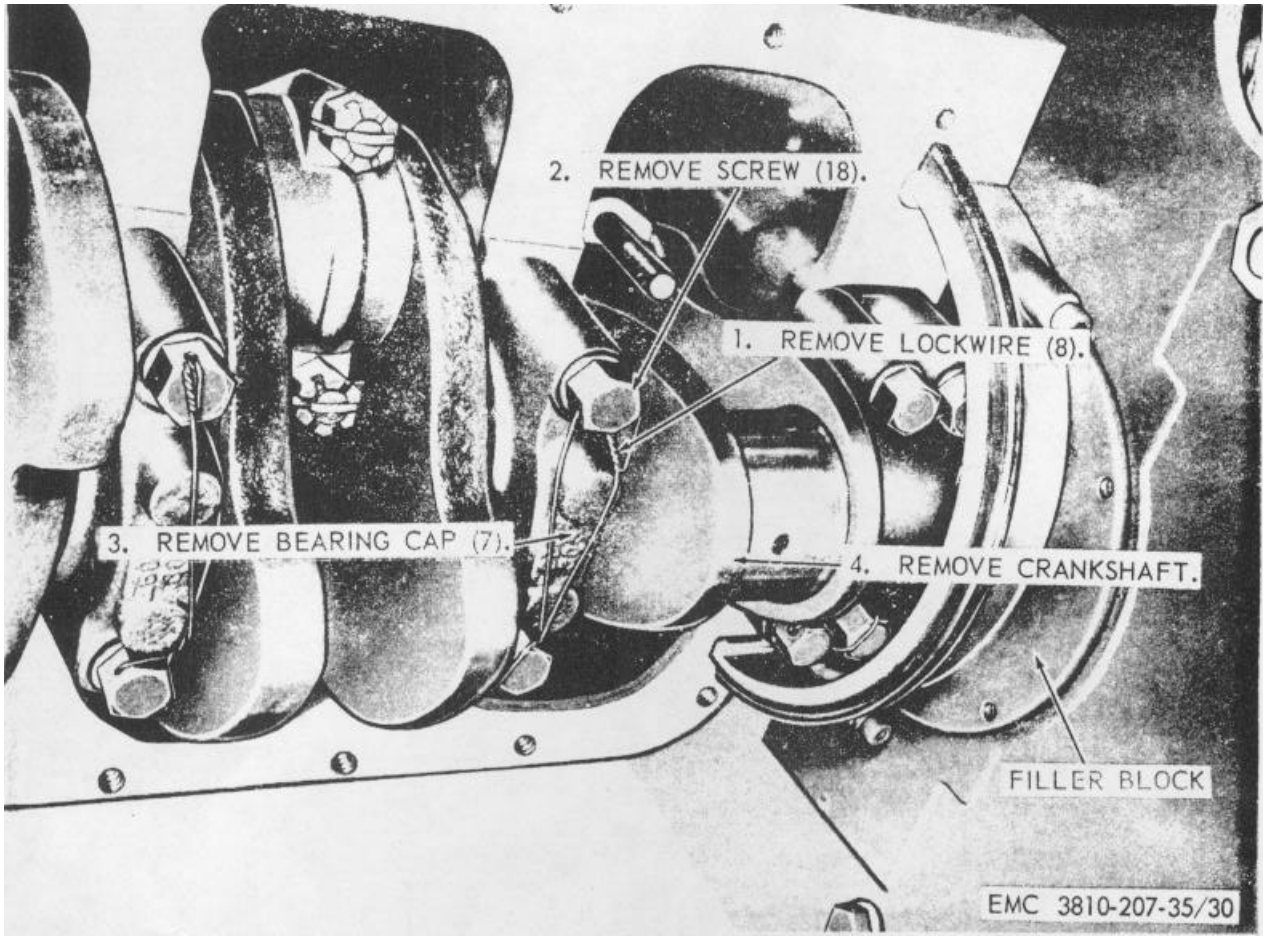


Figure 30. Crane engine crankshaft assembly, removal and installation.

Section XX. CRANE ENGINE BLOCK

126. General

The crane engine block is a solid, one-piece, iron-alloy casting. It houses the crankshaft, camshaft, connecting rods, pistons and valves. The block has full length water jacket around the cylinders and has water passages around the valves for cooling. Drilled oil passages carry oil under pressure to all bearings and moving parts requiring lubrication.

127. Crane Engine Block Removal and Disassembly

a. Removal.

(1) Remove the carburetor, distributor, governor, generator, fuel pump, generator regulator, water pump, and spark plugs (TM 5-3810-207-20).

(2) Remove the radiator (par. 76).

(3) Remove the valves (par. 91).

(4) Remove the piston (par. 103).

(5) Remove the crankshaft (par. 123).

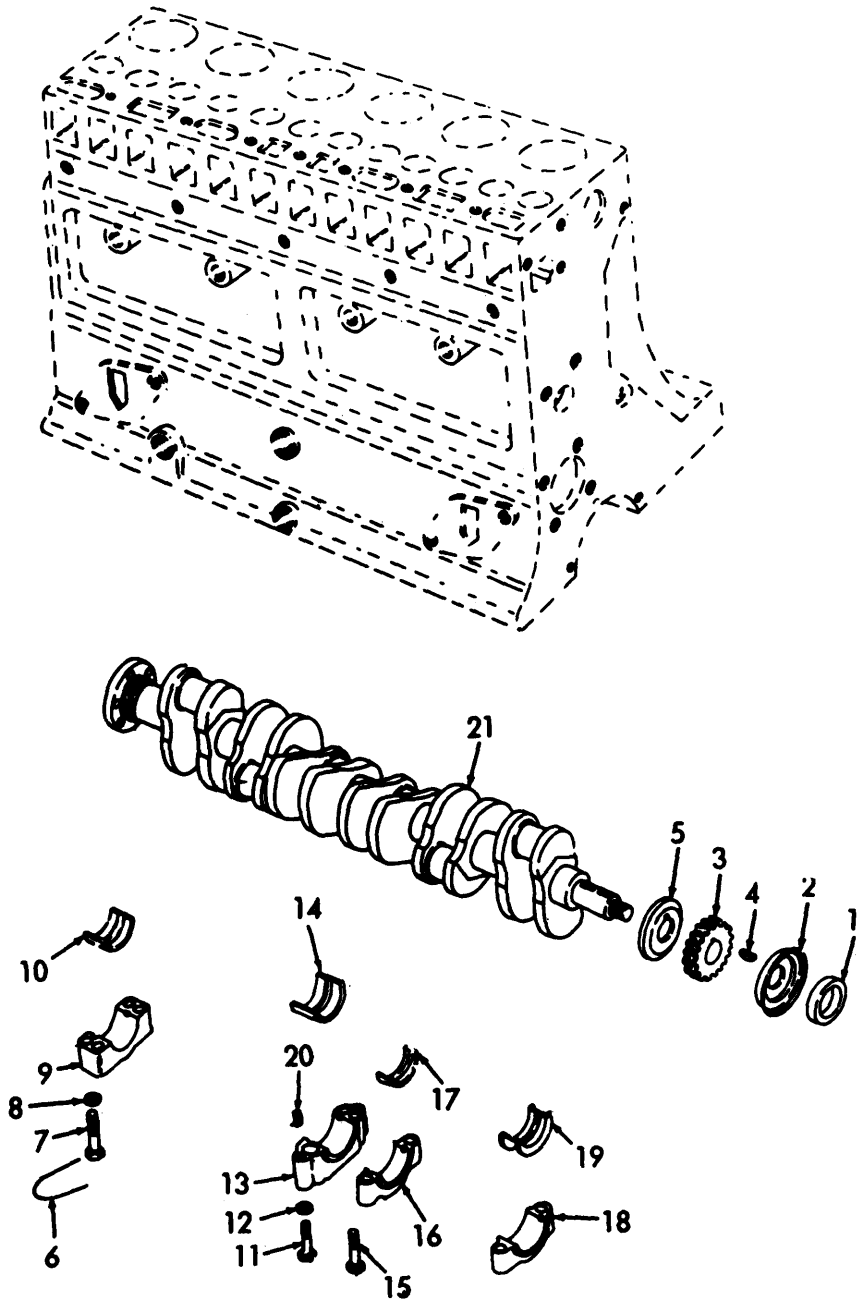
(6) Remove the camshaft (par. 119).

(7) Remove the engine block.

b. Disassembly. Disassemble 'the crane engine block as illustrated on figure 32.

128. Crane Engine Block Cleaning and Inspection

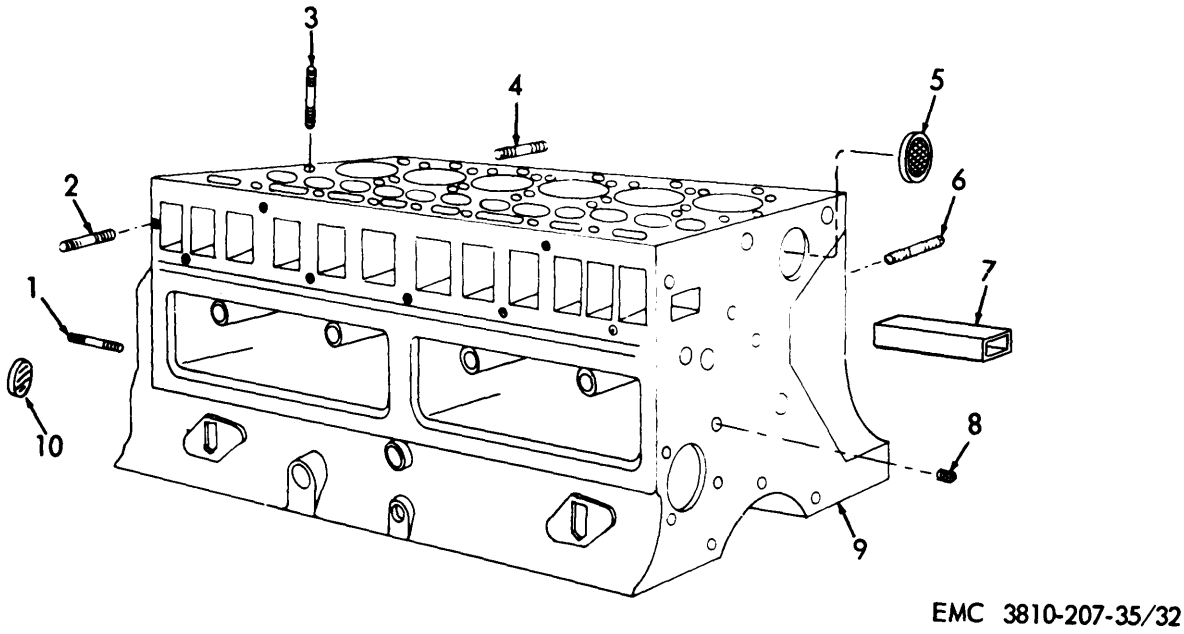
a. Soak the engine block in a strong caustic



EMC 3810-207-35/31

1	Dust seal	9	Crankshaft bearing cap, rear	16	Crankshaft bearing cap, front and rear intermediate (4 rqr)
2	Oil slinger	10	Crankshaft bearing, rear (2 rqr)		
3	Gear	11	Screw, cap drilled hd, 9/16-12 a 5/8 in. (2 rqr)	17	Crankshaft bearing,. front and rear intermediate (8 rqr)
4	Key (2 rqr)				
4	Thrust plate	12	Washer lock (2 rqr)		
6	Lockwire (8 rqr)	13	Crankshaft bearing cap, center	18	Crankshaft bearing cap, front
7	Screw cap, drilled hd, 1/2-18 x b in. (14 rqr)	14	Crankshaft bearing center (2 rqr)	19	Crankshaft bearing front (2 rqr)
		15	Screw, cap, drilled hd, ½-13 x 8 1/2 in. (2 rqr)	20	Dowel (2 rqr)
8	Washer, lock, 1/2 in. (28 rqr)			21	Crankshaft

Figure 31. Crane engine crankshaft assembly, exploded view.



1	Stud, ½ -13 x 2 in. (2 rqr)	6	Stud, ½ -13 x 1 ¾ in. (2 rqr)
2	Stud, 7/16 -14 x 1 7/8 in. (11 rqr)	7	Water distribution tube
3	Stud, 7/16-20 x 4 1/4 in. (33 rqr)	8	Plug, 3/8 in.
4	Stud, 5/16-18 x 1 5/8 in. (4 rqr)	9	Engine block
5	Freeze plug, cut type (5 rqr)	10	Freeze plug

Figure 32. Crane engine block, exploded view.

solvent for 2 hours; remove and clean with live steam.

b. Clean water and oil passages.

c. Inspect for wear and damage.

d. Check the machined surfaces of the block with a straight edge and feeler gage. If the surfaces are warped more than 0.010 inch, replace block as necessary.

e. Inspect all mounting hardware for stripped or damaged threads. Replace all defective hardware as necessary.

f. Inspect the engine block for cracks, breaks, or other damage. Replace a cracked or broken engine block as necessary.

g. Inspect the cylinder diameter. It should measure between 4.249 and 4.251 inches.

129. Crane Engine Block Reassembly and Installation

a. Reassembly. Reassemble the crane engine block as illustrated on figure 32.

b. Installation.

(1) Install the engine block.

(2) Install the camshaft (par. 121).

(3) Install the crankshaft (par. 125) (4) Install the pistons (par. 105).

(5) Install the valves (par. 93).

(6) Install the radiator (par. 78).

(7) Install the carburetor, distributor, governor, generator, fuel pump, generator regulator, water pump, and spark plugs (TM 53810-207-20).

CHAPTER 4

CRANE HYDRAULIC SYSTEM REPAIR INSTRUCTIONS

Section I. CRANE HYDRAULIC MASTER CYLINDER ASSEMBLIES

130. General

The master cylinder piston is connected to the brake control lever through linkage and when force is applied to the brake control lever it is transmitted to the master cylinder piston. The piston forces the fluid under pressure through the lines into the clutch cylinder, which moves the piston in the clutch cylinder outward actuating the clutch. When the master cylinder control lever is released or set in neutral position the clutch release springs return the displaced fluid to the master cylinder. The boom hoist master cylinder bore is 1 inch; main hoist master cylinder, 11/2 inches; the power down master cylinder, 134 inches.

131. Crane Hydraulic Master Cylinder Assembly Removal and Disassembly

a. Removal. Remove the master cylinder assembly (TM 5-3810-207-20).

b. Disassembly. Disassemble the master cylinder assembly in numerical sequence as illustrated on figure 33.

132. Crane Hydraulic Master Cylinder Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly. Cleanliness is of extreme importance when repairing hydraulic components.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective parts.

133. Crane Hydraulic Master Cylinder Assembly Reassembly and Installation

a. Reassembly. Reassemble the master cylinder assembly in the reverse of the numerical sequence as illustrated on figure 33.

b. Installation. Install the master cylinder assembly (TM 5-3810-207-20).

Section II. CRANE CLUTCH HYDRAULIC CYLINDERS

134. General The clutches of the crane are hydraulically actuated. Each clutch cylinder has a companion master cylinder. When actuating the control lever, hydraulic fluid is displaced from the master cylinder passing through a copper line, shaft rotating gland, main shaft fluid hose, and into the clutch cylinder. The piston in the clutch cylinder then moves outward to actuate the clutch. When the control lever is released or set in neutral position, the clutch release springs return displaced fluid to the master cylinder.

135. Crane Clutch Hydraulic Cylinder Assembly Removal and Disassembly

a. Removal. Remove the crane clutch hydraulic cylinder assembly (TM 5-3810-207-20).

b. Disassembly. Disassemble the crane clutch hydraulic cylinder assembly in numerical sequence as illustrated on figure 34.

136. Crane Clutch Hydraulic Cylinder Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

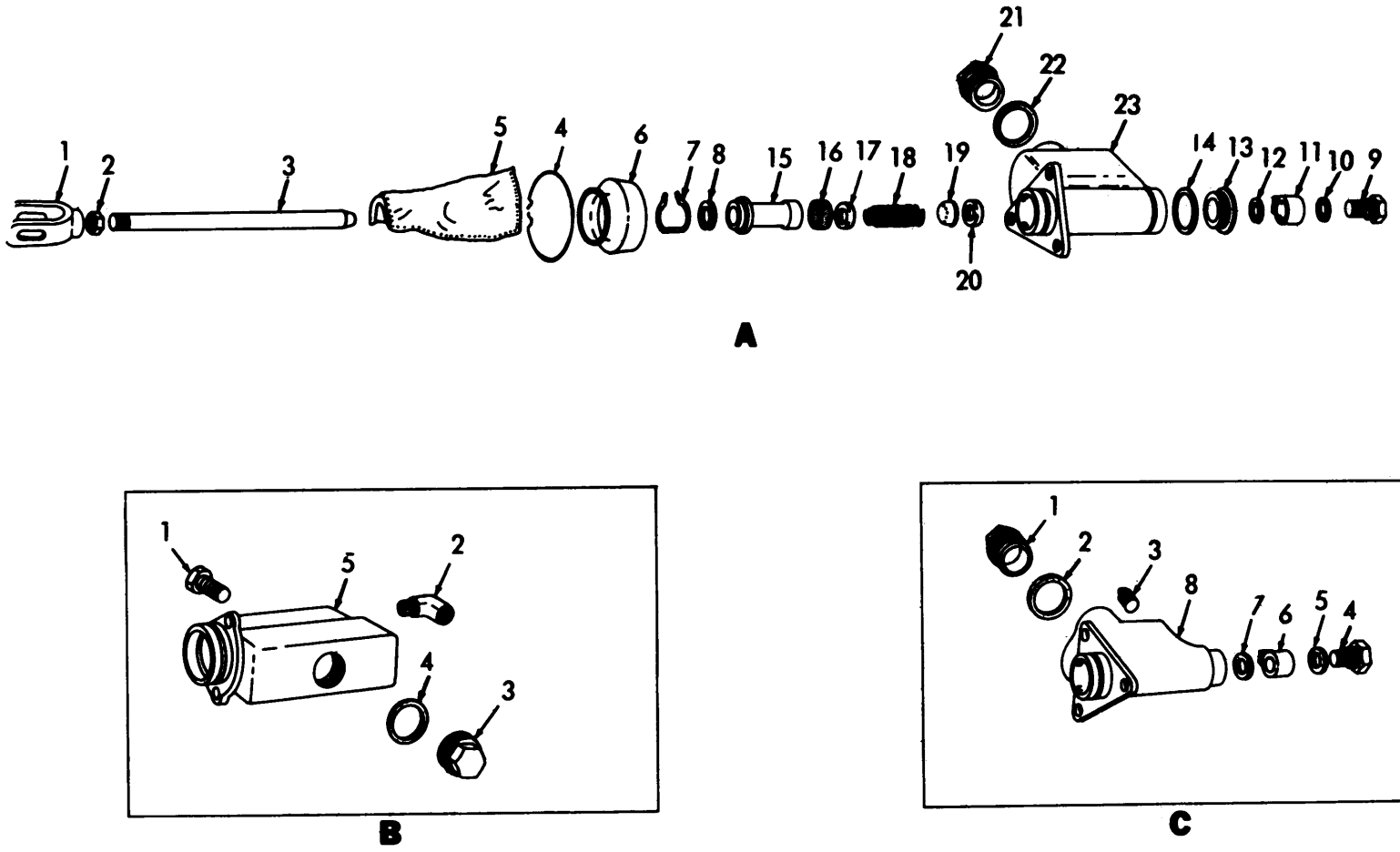


Figure 33. Crane hydraulic master cylinder assemblies, exploded view.

1	Clevis	13	Adapter
2	Locknut, % in.	14	Gasket
3	Piston rod	15	Piston
4	Boot lockwire	16	Secondary cup
5	Boot	17	Spring seat
6	Bellows	18	Piston spring
7	Lockwire	19	Check valve
8	Stop plate	20	Valve seat
9	Connector bolt	21	Filler cap
10	Gasket	22	Gasket
11	Connector	23	Cylinder body
12	Gasket		

A. Boom hoist master cylinder

1	Plug	4	Gasket
2	Elbow	5	Cylinder body
3	Cap		

B. Main hoist master cylinder body

1	Cap	5	Gasket
2	Gasket	6	Outlet fitting
3	Plug	7	Gasket
4	Cylinder body	8	Connector bolt

C. Power-down master cylinder body

Figure 33.-Continued.

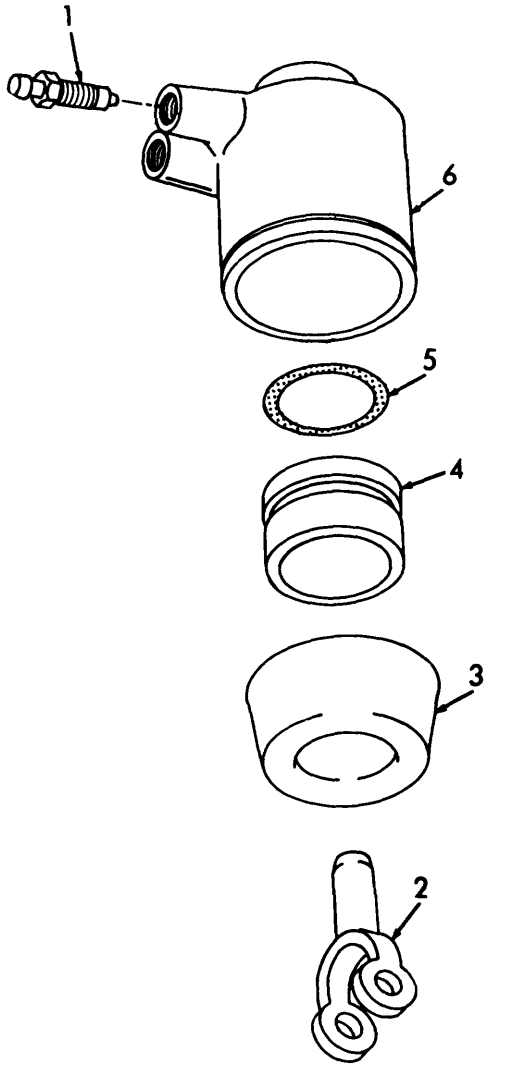
Cleanliness is of extreme importance when repairing hydraulic components.

b. Inspection and Repair. Clean all parts with an approved cleaning solvent and dry thoroughly. Replace or repair all defective parts.

137. Crane Clutch Hydraulic Cylinder Assembly Reassembly and Installation

a. Reassembly. Reassemble the crane clutch hydraulic cylinder assembly in the reverse of the numerical sequence as illustrated on figure 34.

b. Installation. Install the crane clutch hydraulic cylinder assembly (TM 5-3810-20720).



1	Bleeder valve	4	Piston
2	Clevis	5	O-ring
3	Bellows, rubber	6	Cylinder body

Figure 34. Crane clutch. hydraulic cylinder, exploded view.

CHAPTER 5

CRANE ROTATING FRAME BASE ASSEMBLY REPAIR INSTRUCTIONS

Section I. CRANE MAIN HOIST SHAFT ASSEMBLY

138. General

The crane main hoist shaft assembly is mounted on the revolving frame between the horizontal swing shaft and the jackshaft assemblies. It is secured to the frame by two pillow blocks which are bolted to the frame and is chain driven from the jackshaft. The cable drums are held stationary by the brakes until the individual clutch assembly is engaged, which in turn rotates the clutch and brake drums. The main hoist shaft assembly can be removed as a unit without disturbing either horizontal swing or jackshaft assemblies.

139. Crane Main Hoist Shaft Assembly Removal and Disassembly

a. Removal.

(1) Remove the main drum drive chain guard (TM 5-3810-207-20).

(2) Remove the main drum and boom hoist drive chains (TM 53810-20720).

(3) Remove the packing glands and brakeband assemblies (TM 5-3810-207-20).

(4) Remove the crane cab assembly (par. 44).

(5) Remove the main hoist shaft assembly as instructed on figure 35.

b. Dissemble. Disassemble the crane main hoist shaft assembly in numerical sequence as illustrated on figure 36.

140. Crane Main Hoist Shaft Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or replace all damaged parts.

141. Crane Main Hoist Shaft Assembly Reassembly and Installation

a. Reassembly. Reassemble the crane main hoist shaft assembly in the reverse of the numerical sequence as illustrated on figure 36.

b. Installation.

(1) Install the crane main hoist shaft assembly as illustrated on figure 35.

(2) Install the crane cab assembly (par. 44).

(3) Install the packing glands and brakeband assemblies (TM 5-3810-20720).

(4) Install the main drum and boom hoist drive chains (TM 5-3810-207-20).

(5) Install the main drum drive chain guard (TM 53810-207-20).

Section II. JACKSHAFT ASSEMBLY

142. General

The jackshaft is located below and to the rear of the main hoist shaft assembly and is secured by two pillow blocks which are bolted to the same part of the revolving frame as the hoist shaft. The jackshaft is the means for transmitting power from the crane engine to other shaft

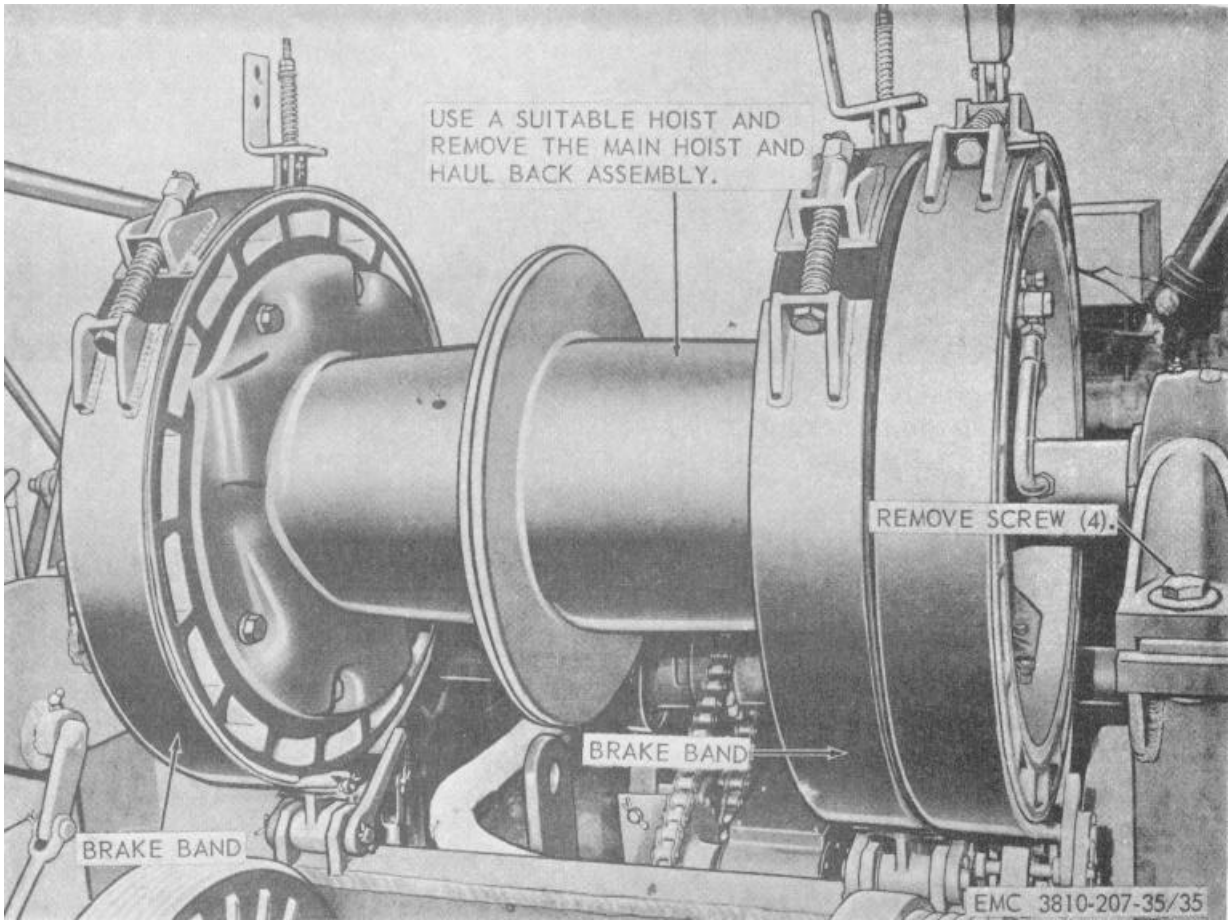


Figure 35. Crane main hoist shaft assembly, removal and installation.

assemblies. The jackshaft assembly consists of a main drive sprocket, jackshaft-to-swing shaft drive sprocket, main hoist shaft drive sprocket, jaw clutch assembly, and jackshaft.

143. Jackshaft Assembly Removal and Disassembly

a. Removal.

(1) Remove the transfer case, swing drive chain guard, and main drum drive chain guard (TM 5-3810-207-20).

(2) Remove the power transfer chain swing shaft drive chain and main hoist power-down chain (TM 5-3810207-20).

(3) Remove the main drive sprocket (TM 5-3810-207-20).

(4) Remove the crane cab (par. 44).

(5) Remove the jackshaft assembly as instructed on figure 37.

b. Disassembly. Disassemble the jackshaft assembly in numerical sequence as illustrated on figure 38.

144. Jackshaft Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective parts.

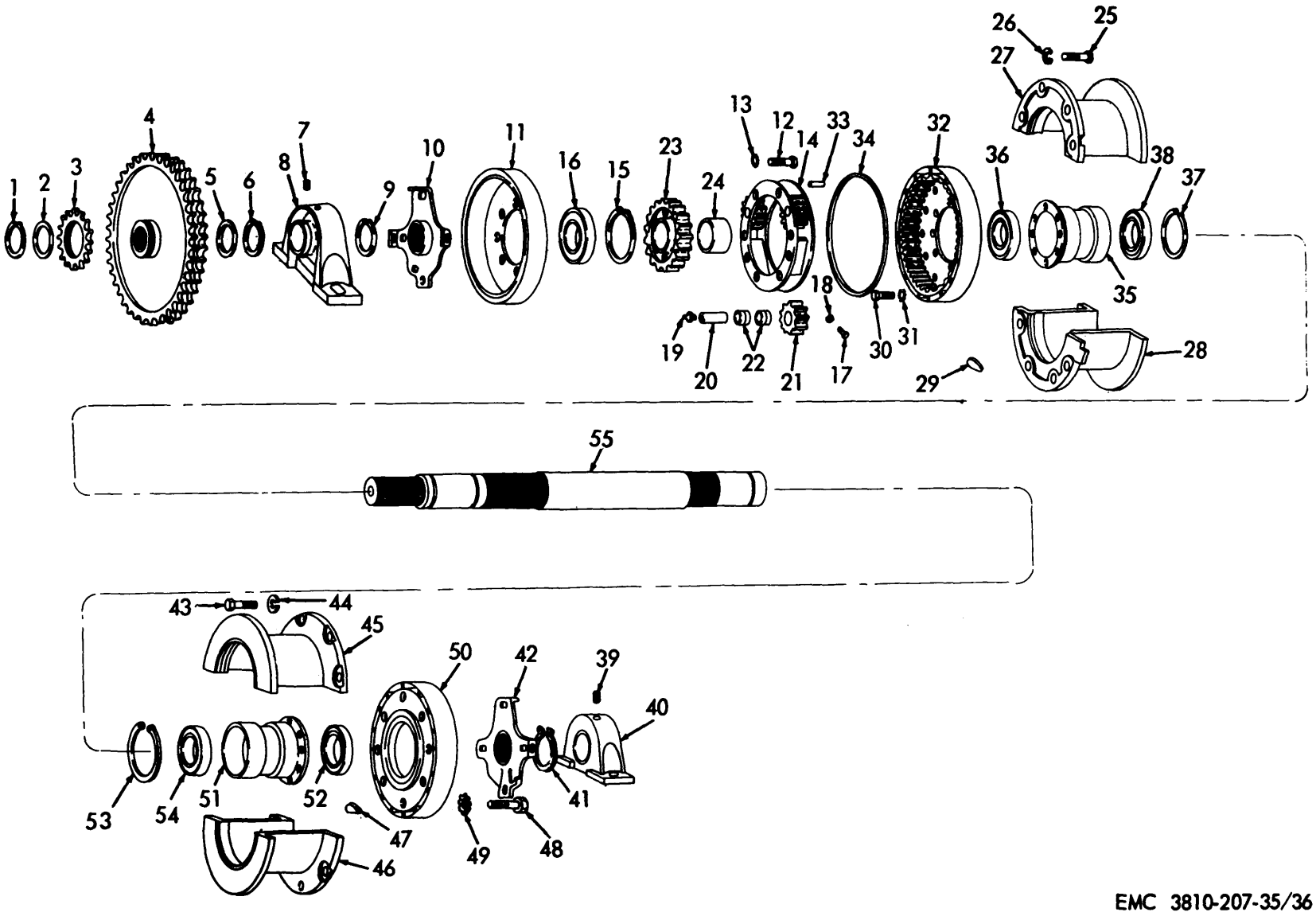


Figure 36. Crane main hoist shaft assembly, exploded view.

1 Snap ring
2 Adjusting shim (8 rqr)
8 Boom hoist drive sprocket
4 Main drum drive sprocket
6 Adjusting shim (8 rqr)
6 Snap ring
7 Setscrew, special (8 rqr)
8 Pillow block
9 Snap ring
10 Left side clutch driver
1l Left-hand clutch drum
12 Screw, cap, 5/8-18 x 1 in. (6 rqr)
18 Washer, lock, ET, 5/8 in. (6 rqr)
14 Planetary gear retaining ring
15 Snap ring
16 Left-hand clutch drum bearing
17 Screw, cap, 10-32 x 1 in. (3 rqr)
18 Nut, 10-32 (8 rqr)
19 Fitting (8 rqr)
20 Planetary gear shaft (8 rqr)
21 Load lowering planetary gear (3 rqr)
22 Planetary gear bearing (6 rqr)
23 Load lowering drive gear
24 Drive gear spacer
25 Screw, cap, 5/8-18 x 1 in. (7 rqr)
26 Washer, lock, 5/8 in. (7 rqr)
27 Top left-hand drum lagging
28 Bottom left-hand drum lagging
29 Wire rope wedge
30 Screw, cap, 5/8-18 x 11 in. (8 rqr)
81 Washer, lock, ET, 5/8 in. (8 rqr)
82 Right-hand drum
88 Roller pin, 3/16 x ¾ in. (4 rqr)
84 Thrust ring
85 Drum hub
86 Drum hub outer bearing
87 Snap ring
88 Drum hub inner bearing
89 Setscrew, special (8 rqr)
40 Pillow block,
41 Snap ring
42 Right side clutch driver
48 Screw, cap, 5/8-18 x 1 in. (7 rqr)
44 Washer, lock, 5/8 in. (7 rqr)
45 Top right-hand drum lagging
46 Bottom right-hand drum lagging
47 Wire rope wedge
48 Screw, cap, 5/8-18 x 1 1/2 in. (8 rqr)
49 Washer, lock, ET, 5/8 in. (8 rqr)
50 Right-hand clutch drum
51 Drum hub
52 Drum hub outer bearing
58 Snap ring
54 Drum hub inner bearing
55 Hoist and haul back shaft

Figure 36. -Continued.

145. Jackshaft Assembly Reassembly and Installation

a. Reassembly. Reassemble the jackshaft assembly in the reverse of the numerical sequence as illustrated on figure 88.

b. Installation.

(1) Install the jackshaft assembly as illustrated on figure 37.

(2) Install the crane cab (par. 44).

(3) Install the main drive sprocket (TM 5-3810-207-20).

(4) Install the power transfer chain, swing shaft drive chain, and main hoist power-down chain (TM 5-3810207-20).

(5) Install the transfer case, swing drive chain guard, and main drum drive chain guard (TM 5-3810-207-20).

Section III. BOOM HOIST SHAFT AND GEARCASE ASSEMBLY

146. General

The boom hoist shaft assembly consists of the boom hoist clutch, clutch drum, brakedrum, cable drum, boom hoist drive chain sprocket, and the boom hoist gear assembly. The shaft is supported on the revolving frame by two pillow block bearing units. The purpose of the power-down or overrunning cam clutch is to lower the boom under power at a speed controlled by the engine throttle setting.

147. Boom Hoist and Gearcase Assembly Removal and Disassembly

a. Removal.

(1) Remove the cab assembly and the main hoist shaft (pars. 44, 139).

(2) Remove the boom hoist shaft drive chain and chain guards, hydraulic lines and packing gland assembly (TM 5-3810-207-20).

(3) Remove the boom hoist shaft and

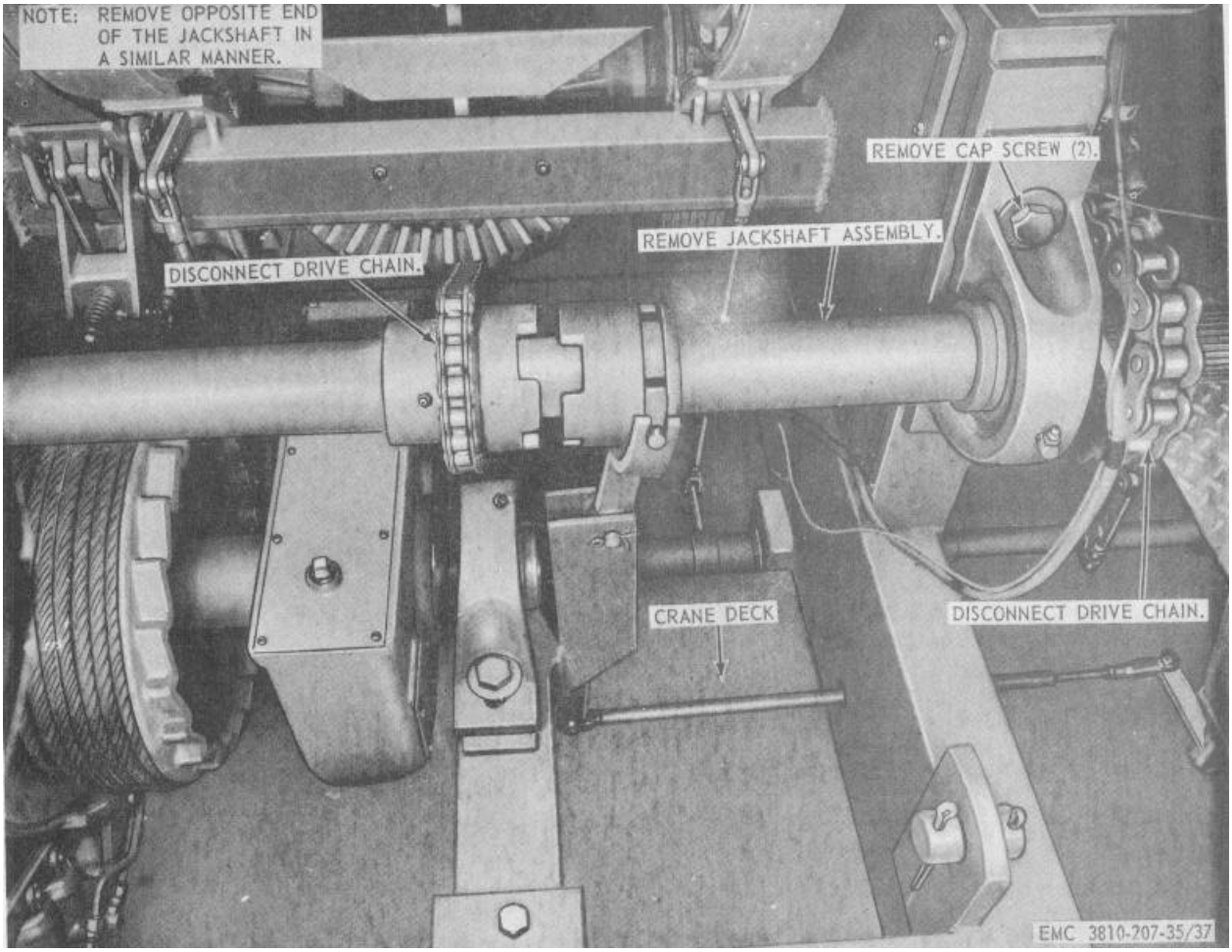


Figure 37. Jackshaft assembly removal and installation.

gearcase assembly from the revolving frame as instructed on figure 39.

b. Disassembly. Disassemble the boom hoist shaft and gearcase assembly in numerical sequence as instructed on figure 40.

148. Boom Hoist Shaft and Gearcase Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent.

b. Inspection and Repair.

(1) Inspect the boom hoist clutch drum for cracks, scores or out-of-round.

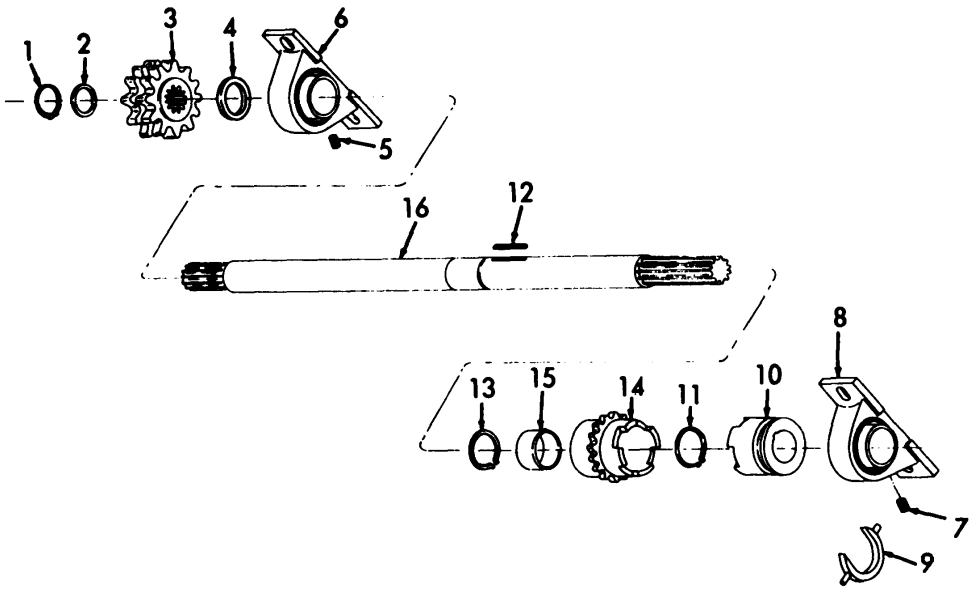
(2) Inspect the clutch drum drive hub for cracks, breaks or other damage. Repair or replace a damaged clutch drum drive hub.

(3) Inspect the boom hoist wire rope drum for cracks or breaks. Repair or replace a damaged boom hoist wire rope drum.

(4) Inspect the boom hoist main shaft for bends or excessive wear. Repair or replace a bent or excessively worn boom hoist main shaft as necessary.

(5) Inspect the drum shaft pillow bearing block for cracks or excessive wear. Repair or replace a cracked or excessively worn drum shaft pillow bearing block as necessary.

(6) Inspect the power boom hoist gearcase for cracks or breaks. Repair or replace a damaged power boom hoist gearcase as necessary.



EMC 3810-207-35/38

1 Snap ring
2 Adjusting shim (3 rqr)
8 Hoist and haul back drive sprocket
4 Adjusting shim (3 rqr)
5 Screw, set, %-16 x % in.
6 Pillow block
7 Screw, set, %-16 x % in.
8 Pillow block
9 Jaw clutch control collar
10 Sliding jaw clutch
11 Snap ring
12 Jaw clutch key
13 Snap ring
14 Revolving jaw clutch
15 Jaw clutch bushing (2 rqr)
16 Jackshaft

Figure 38. Jackshaft assembly, exploded view.

(7) Inspect the bearings in the boom hoist gearcase for cracks or excessive wear. Repair or replace bearings as necessary.

(8) Inspect the snap rings on the boom hoist shaft and gearcase assembly for breaks or weak spring tension. Replace snap rings as necessary.

(9) Inspect the boom hoist power-down driver for cracks, breaks, or other damage. Repair or replace damaged boom hoist power-down driver as necessary.

(10) Inspect the boom hoist power-down gear for broken teeth or other damage. Repair or replace gear as necessary.

(11) Inspect the gear sprocket for excessive wear or other damage. Repair or replace damaged sprocket as necessary.

(12) Inspect all power boom hoist gearcase covers for dents or bends. Repair or replace covers as necessary.

(13) Inspect all mounting hardware for stripped or burred threads. Replace

any damaged mounting hardware as necessary.

149. Boom Hoist Shaft and Gearcase Assembly Reassembly and Installation

a. Reassembly. Reassemble the boom hoist shaft and gearcase assembly in the reverse of the numerical sequence as instructed on figure 40.

b. Installation.

(1) Install the boom hoist shaft and gear case assembly on the revolving frail in the reverse of the instructions on figure 39.

(2) Install the boom hoist shaft drive chain and chain guards, hydraulic lines, and packing gland assembly (TM 5-3810-207-20).

(3) Install the cab assembly and the main hoist shaft (pars. 44, 141).

Section IV. CRANE CHAIN TIGHTENER

150. General

An adjustable mounted idler sprocket is placed between the driving and driven sprockets of the swing drive chain to provide a means of maintaining the proper tension and to compensate for wear on the swing drive chain. Adjustment is accomplished by loosening the nut on the mounting stud of the idler sprocket and raising or lowering the sprocket to obtain the desired chain tension.

151. Crane Chain Tightener Removal and Disassembly

a. Remove the crane chain tightener (TM 5-3810-207-20).

b. Place the idler sprocket in a suitable press, and press the sleeve and bearing from the sprocket.

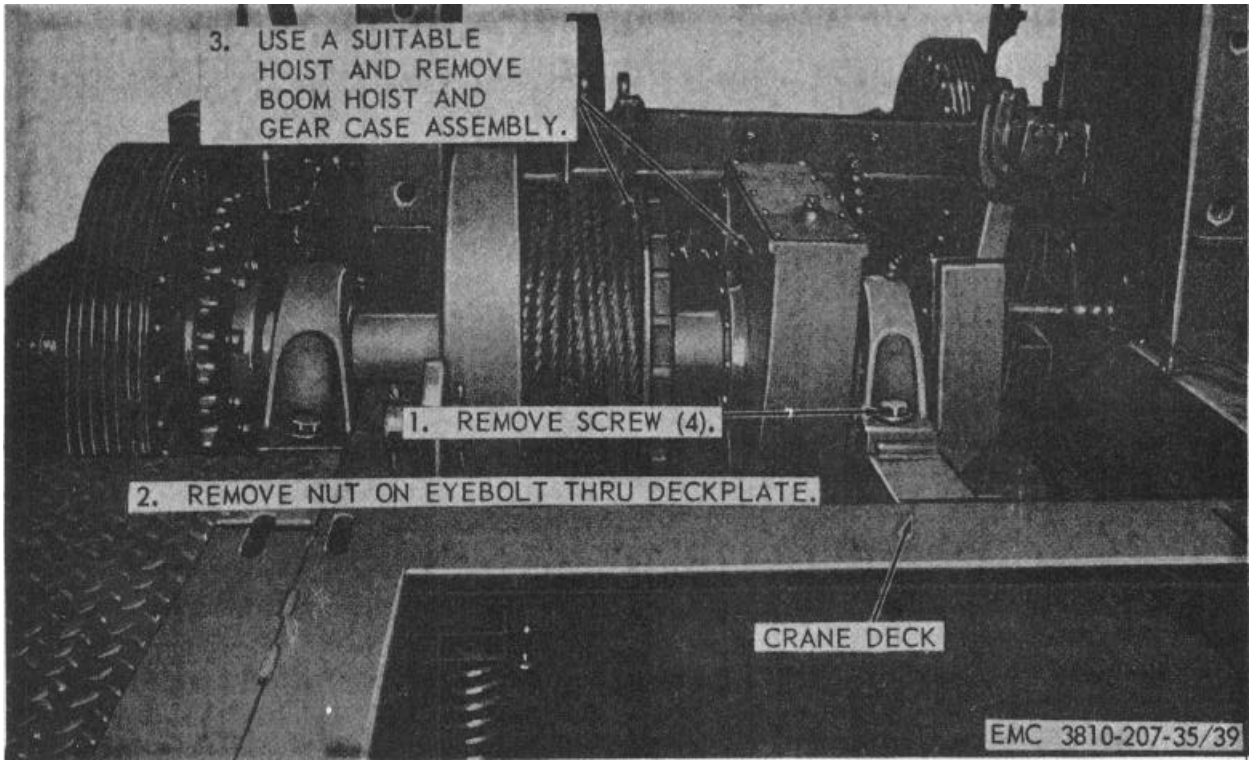


Figure 39. Boom hoist shaft and gearcase assembly, removal and installation.

152. Crane Chain Tightener Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective parts.

153. Crane Chain Tightener Reassembly and Installation

a. Place the idler sprocket in a suitable press, and press the bearing and sleeve in the sprocket.

b. Install the crane chain tightener (TM 53810-207-20).

Section V. CRANE HORIZONTAL SWING SHAFT ASSEMBLY

154. General

The crane horizontal swing shaft assembly is attached to the revolving frame below and forward of the main hoist shaft assembly. This assembly has two beveled swing gears which drive the vertical swing shaft assembly in either direction. The beveled swing gear bearings are prelubricated for the life of the bearings and the beveled swing gears are lubrication with open gear compound.

155. Crane Horizontal Swing Shaft Assembly Removal and Disassembly

a. Removal.

(1) Remove the operator's seat (TM 58810-207-20).

(2) Drain the hydraulic fluid from both rotating glands (TM 5-3810-207-20).

(8) Remove the swing gear guard (TM 58810-207-20).

(4) Remove the swing shaft drive chain (TM 5-3810-207-20).

(5) Remove the rotating glands (TM 58810-207-20).

(6) Disconnect the safety pawl, house lock, and swing brake lever linkage (TM 5-3810-207-20).

(7) Remove the swing brake band from the clutch drum (TM 5-3810-207-20).

(8) Remove the crane cab (par. 44).

(9) Remove the crane horizontal swing shaft assembly as instructed on figure 41.

b. Disassembly. Disassemble the crane horizontal swing shaft assembly in numerical sequence as illustrated on figure 42.

156. Crane Horizontal Swing Shaft Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective parts.

157. Crane Horizontal Swing Shaft Assembly Reassembly and Installation

a. Reassembly. Reassemble the crane horizontal swing shaft assembly in the reverse of the numerical sequence as illustrated on figure 42.

b. Installation.

(1) Install the crane horizontal swing shaft assembly as illustrated on figure 41.

(2) Install the crane cab (par. 44).

(3) Install the swing brakeband to the clutch drum (TM 5-3810-207-20).

(4) Connect the safety pawl, house lock and swing brake lever linkage (TM 543810-207-20).

(5) Install the rotating glands (TM 53810-207-20) (6) Install the swing shaft drive chain (TM 5-3810-207-20).

(7) Install the swing gear guard (TM 53810-207-20).

(8) Fill both rotating glands with hydraulic fluid (TM 5-3810-207-20).

(9) Install the operator's seat (TM 53810-207-20).

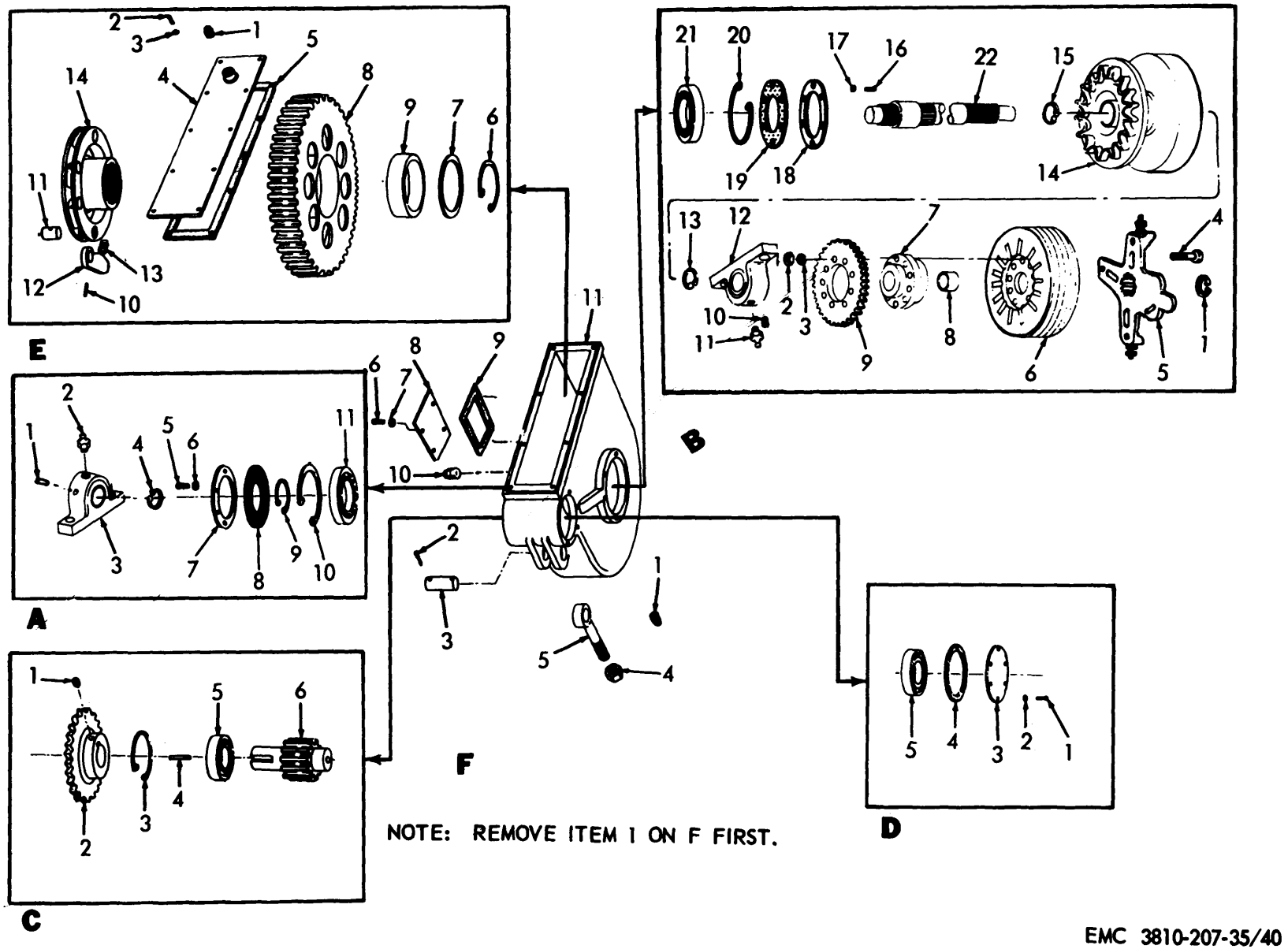


Figure 40. Boom hoist shaft and gearcase assembly, exploded view.

1 Screw, set, ½-20 x 5/8 in.
2 Fitting, lubrication
3 Pillow block bearing
4 Snap ring
5 Screw, 10-32 x 1/2 in. (6 rqr)
6 Washer, lock, No. 10 (6 rqr)
7 Retainer
8 Seal
9 Snap ring
10 Snap ring
11 Bearing

A. Pillow block and bearing

1 Snap ring
2 Nut, 1/2-20 (8 rqr)
3 Washer, lock, 1/2 in. (4 rqr)
4 Screw, cap, 1/2-20 x 3 1/4 in. (8 rqr)
5 Clutch spider
6 Boom hoist clutch drum
7 Clutch drum drive hub
8 Hub bearing (2 rqr)
9 Clutch drum drive sprocket
10 Setscrew, 1/2-20 x 5/8 in.
11 Fitting, lubrication
12 Pillow block bearing
13 Snap ring
14 Boom hoist wire rope drum
15 Snap ring
16 Screw, 10-32 x 1/2 in. (6 rqr)
17 Washer, lock, 1/2 in. (6 rqr)
18 Retainer
19 Seal
20 Snap ring
21 Bearing
22 Boom hoist main shaft

B. Boom hoist shaft and drums

1 Setscrew, 1/2-20 x 5/8 in.
2 Gear sprocket
3 Snap ring
4 Key
5 Bearing
6 Boom hoist pinion and shaft gear

C. Boom hoist pinion end shaft gear

1 Screw, 10-32 x ½ in. (6 rqr)
2 Washer, lock, No. 10 (6 rqr)
3 Cover
4 Gasket
5 Bearing

D. Cover and bearing

1 Plug, pipe, 1/2 in.
2 Screw, 10-32 x 1/2 in. (10 rqr)
3 Washer, lock, No. 10 (10 rqr)
4 Gearcase cover
5 Gasket
6 Snap ring
7 Washer, special
8 Boom hoist power-down gear
9 Bushing
10 Pin, roll, 3/16 x 1 3/8 in.
11 Pawl pin
12 Pawl
13 Pawl spring
14 Boom hoist power-down driver

E. Boom hoist power-down gear and driver

1 Plug, pipe, 1/2 in.
2 Pin, cotter, 3/16 x 1 1/2 in. (2 rqr)
3 Pin
4 Nut, 1 in. - 24
5 Eyebolt
6 Screw, 10-32 x 1/2 in. (4 rqr)
7 Washer, lock, No. 10 (4 rqr)
8 Inspection hole cover
9 Cover gasket
10 Plug, pipe, 1/4 in.
11 Power boom hoist gearcase

F. Boom hoist gearcase

Figure 40. -Continued.

Section VI. VERTICAL SWING SHAFT ASSEMBLY

158. General

The crane vertical swing shaft assembly is driven by the horizontal swing shaft assembly through the beveled swing gears on the horizontal swing shaft and bevel gear on the vertical swing shaft assembly. A machined gear on the bottom end of the vertical swing assembly meshes with the turntable gear on the carrier and provides a means of rotating the crane shovel to the desired position.

159. Vertical Swing Shaft Assembly Removal and Disassembly

a. Removal.

(1) Remove the horizontal swing shaft assembly (par. 155).

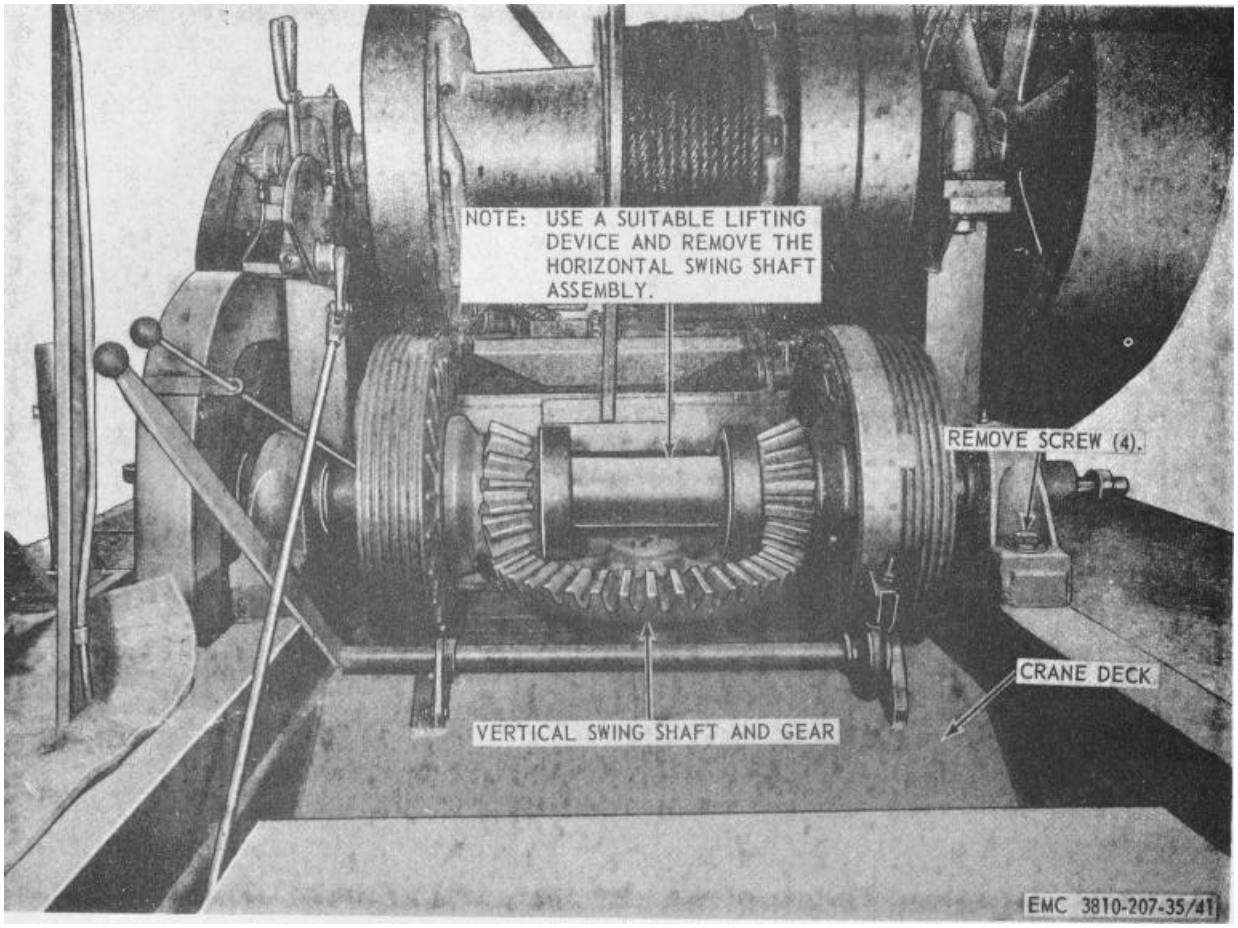
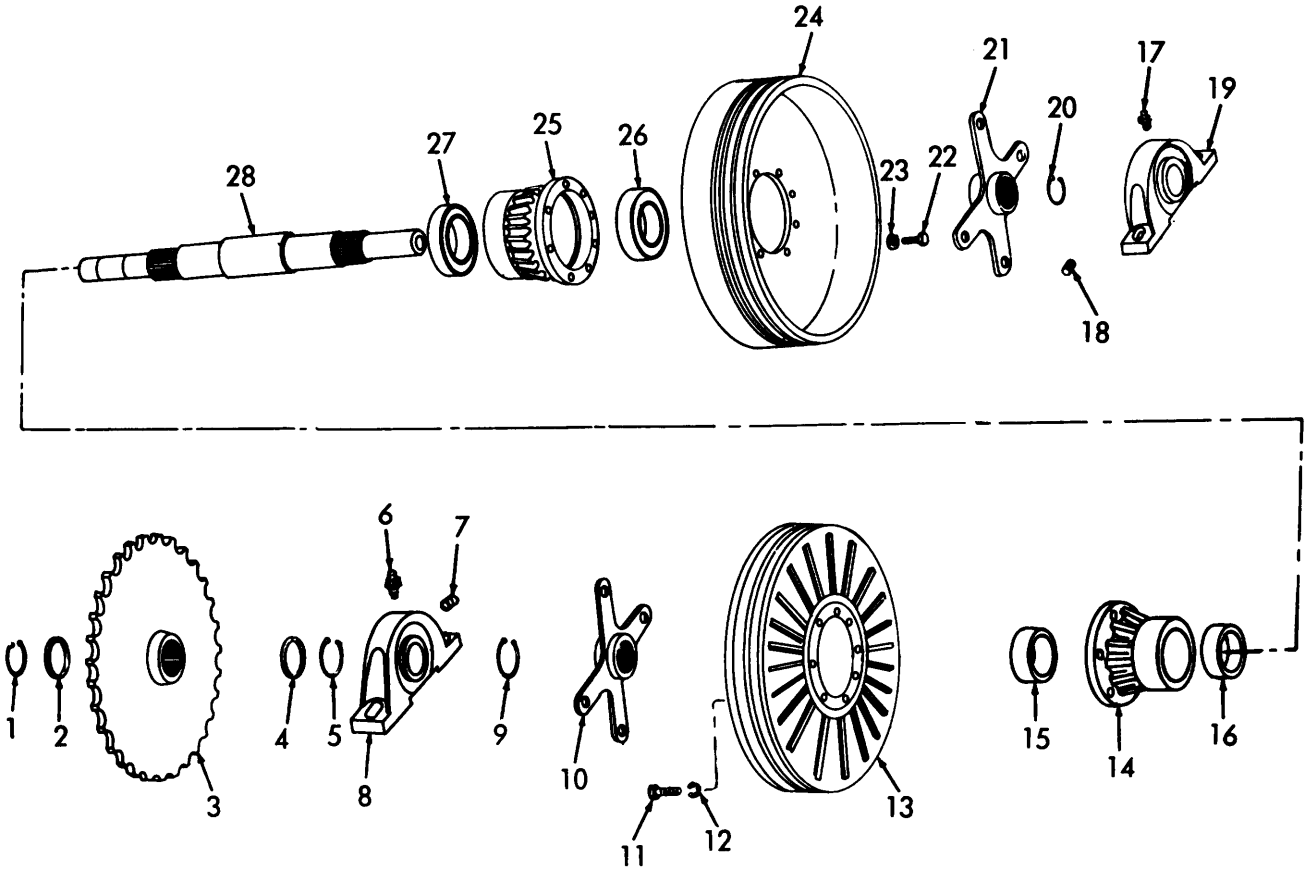


Figure 41. Crane horizontal swing shaft assembly, removal and installation.



1	Snap ring	15	Bearing
2	Retaining shim	16	Bearing
3	Swing shaft drive sprocket	17	Fitting, lubrication
4	Retaining shim	18	Screw, set
5	Snap ring	19	Pillow block
6	Fitting, lubrication	20	Snap ring
7	Screw, set	21	Swing clutch driver, left
8	Pillow block	22	Screw, cap, ½ -20 x 1½ in. (8 rqr)
9	Snap ring	23	Washer, lock, ½ in. (8 rqr)
10	Swing clutch driver, right	24	Left swing clutch drum
11	Screw, cap, ½ 20 x 1½ in. (8 rqr)	25	Swing bevel and drum hub gear
12	Washer, lock, ½ in. (8 rqr)	26	Bearing
13	Right swing clutch drum	27	Bearing
14	Swing bevel and drum hub gear	28	Swing shaft

Figure 42. Crane horizontal swing shaft assembly, exploded view.

(2) Remove the vertical swing shaft assembly as instructed on figure 43.

b. Disassembly. Disassemble the vertical swing shaft in numerical sequence as illustrated on figure 44.

160. Vertical Swing Shaft Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

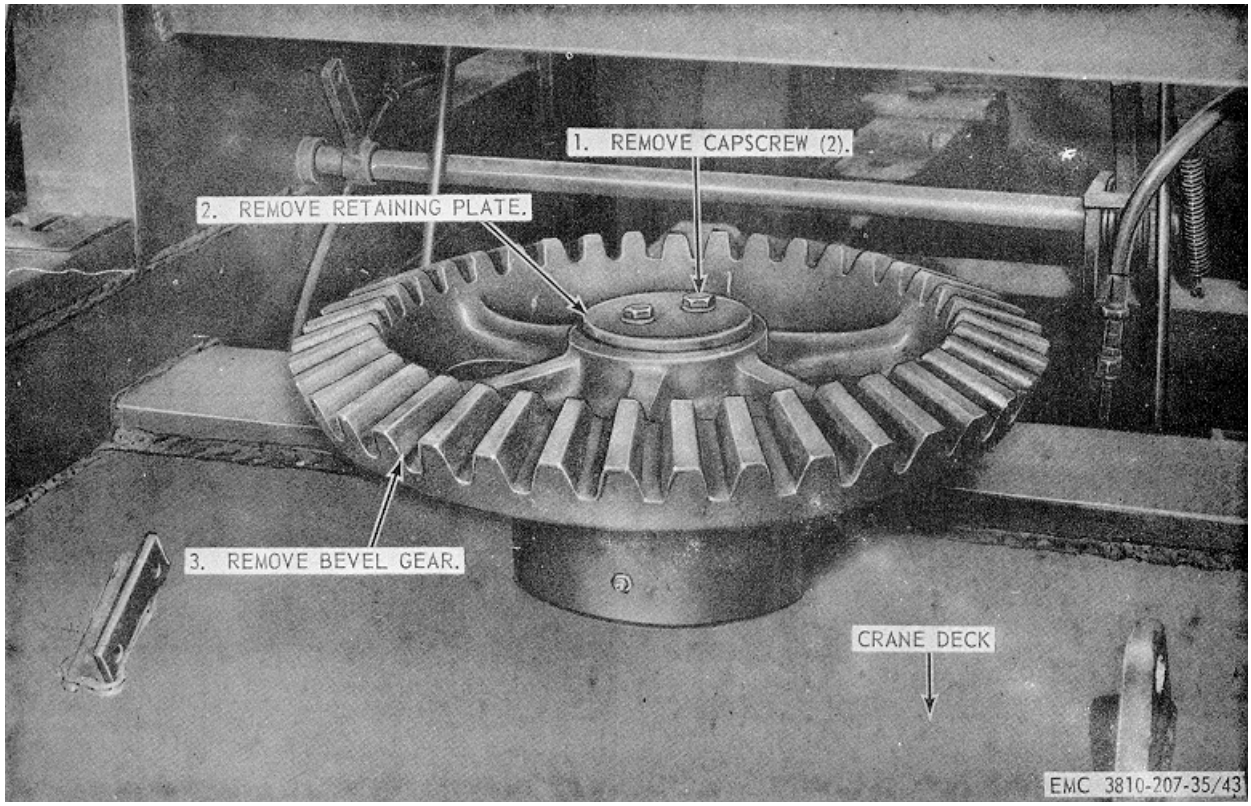


Figure 43. Vertical swing shaft assembly, removal and installation.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective parts.

161. Vertical Swing Shaft Assembly Reassembly and Installation

a. Reassembly. Reassemble the vertical swing shaft assembly in the reverse of the numerical sequence as illustrated on figure 44.

b. Installation.

(1) Install the vertical swing shaft assembly as illustrated on figure 43.

(2) Install the horizontal swing shaft assembly (par. 157).

Section VII. CRANE ROTATING FRAME BASE ASSEMBLY

162. General

The crane rotating main frame base supports the entire crane assembly that includes the deck machinery, operator's platform, cab, engine, front end equipment, and counterweight box. It is a structural iron unitized series of weldments designed to fit the requirements of the rotating-type crane. A fill of concrete in the rear of the frame base serves as the counterweight for front end loads. Rotation is by means of rollers attached to the main frame base, operating around a carrier mounted ring gear and center pin.

163. Crane Rotating Frame Base Assembly Removal

a. Remove the front end attachments (TM 5-3810-207-20).

b. Remove the front and rear roller assemblies (TM 5-3810-207-20).

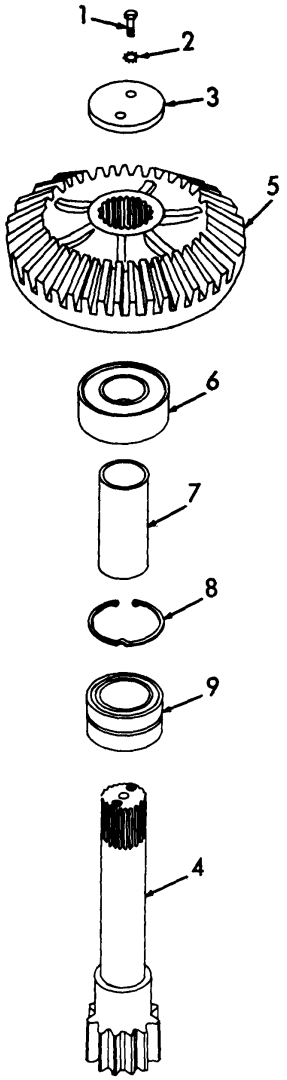
c. Remove the crane operator's cab (par. 44).
d. Remove the operating controls (TM 5-3810-207-20).
e. Remove the hydraulic oil lines and cylinders (TM 5-3810-207-20).
f. Remove the crane engine (par. 45).
g. Remove the rear gantry legs (par. 187).
i. Remove the fuel tank (par. 56).
i. Remove the lights and reflectors (TM 5-3810-207-20).
j. Remove the main hoist assembly (par. 139).
k. Remove the jackshaft assembly (par. 143).
l. Remove the boom hoist shaft assembly (par. 147).
m. Remove the horizontal swing shaft assembly (par. 155).
n. Remove the vertical swing shaft assembly (par. 159).

164. Crane Rotating Frame Base Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean the crane rotating frame base with live steam.
b. Inspection and Repair. Inspect the crane rotating frame base for excessive wear or damage. Replace or repair a damaged or defective rotating frame base assembly.

165. Crane Rotating Frame Base Assembly Installation

a. Install the vertical swing shaft assembly (par. 161).
b. Install the horizontal swing shaft assembly (par. 157).
c. Install the boom hoist shaft assembly (par. 149).
d. Install the jackshaft assembly (par. 145).
e. Install the main hoist assembly (par. 141).
f. Install the lights and reflectors (TM 5-3810-207-20).
g. Install the fuel tank (par. 58).
h. Install the rear gantry legs (par. 189).



EMC 3810-207-35/44

1 Screw, cap, ½-20 x 1½ in. (2 rqr)
2 Washer, lock, ET ½ in. (2 rqr)
3 Retaining plate
4 Vertical swing spur gear and shaft
5 Shaft bevel gear
6 Upper bearing
7 Bearing spacer
8 Snap ring
9 Lower bearing

Figure 44. Vertical swing shaft assembly, exploded view.

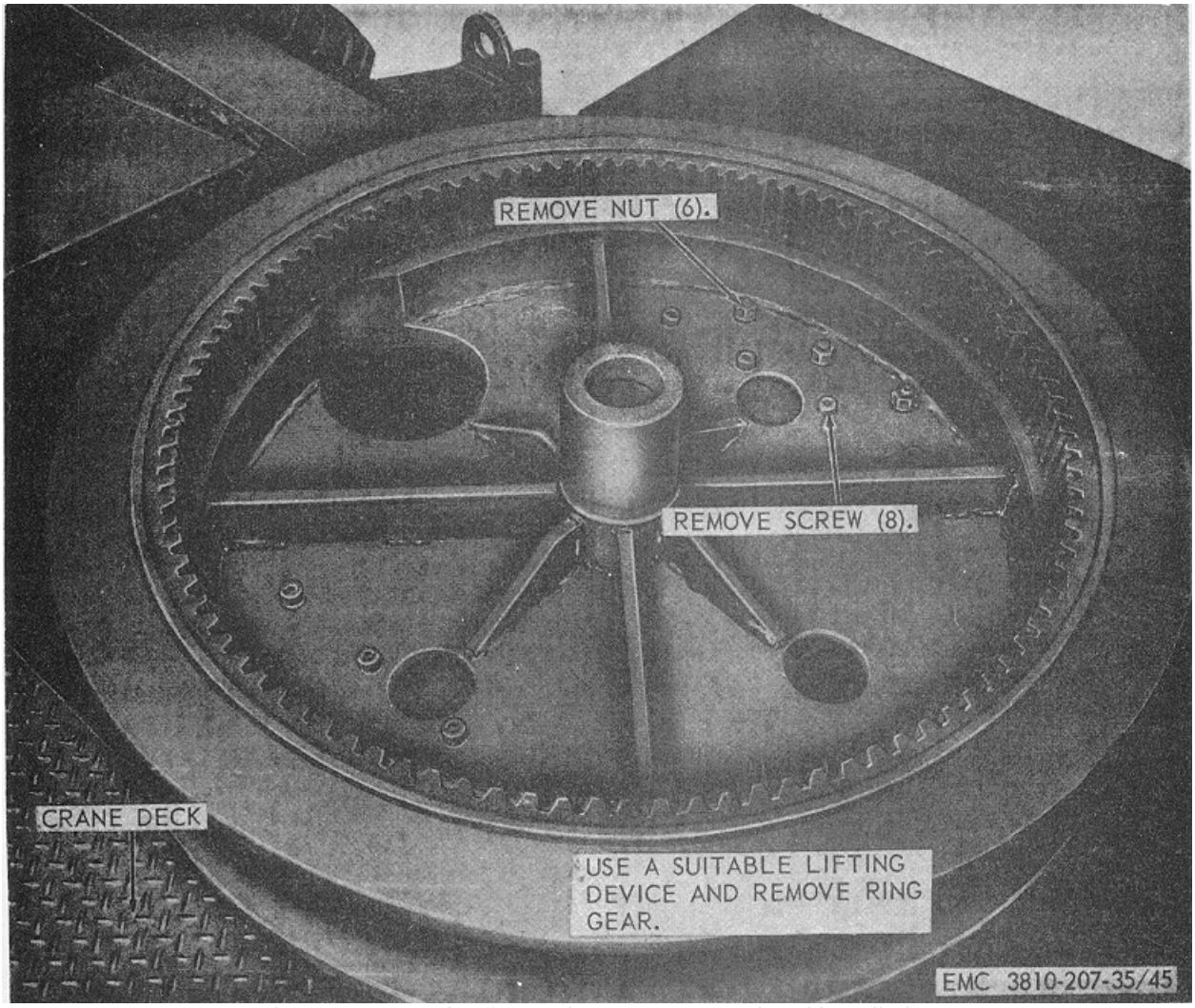


Figure 45. Rotating frame ring gear, removal and installation.

i. Install the crane engine (par. 45).

j. Install the hydraulic oil lines and cylinders (TM 5-3810-207-20).

k. Install the operating controls (TM 5 8810-207-20).

l. Install the operator's cab (par. 44).

m. Install the front and rear rollers assemblies (TM 5-3810-207-20).

n. Install the front end attachments (TM 5-3810-207-20).

Section VIII. ROTATING FRAME RING GEAR

166. General

A dual flanged center, hub-type ring gear, is bolted to the carrier frame and serves as the swing or tracking gear in which the crane assembly rotating gear and rollers operate.

167. Rotating Frame Ring Gear Removal

a. Remove the front end attachments (TM 5-3810-207-20).

b. Remove the crane rotating frame base assembly (par. 163).

c. Remove the rotating frame ring gear as instructed on figure 45.

168. Rotating Frame Ring Gear Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts.

169. Rotating Frame Ring Gear Installation

a. Install the rotating frame ring gear as illustrated on figure 45.

b. Install the crane rotating frame base assembly (par. 165).

c. Install the front end attachments (TM 5-3810-207-10).

CHAPTER 6

CRANE SHOVEL FRONT END ATTACHMENT REPAIR INSTRUCTIONS

Section I. SHIPPER SHAFT ASSEMBLY, BOOM SHEAVES AND PULLEY

170. General

The shaft and sheave bushings are located on the shovel boom. The shipper shaft is mounted through the shovel boom, which operates the dipper handle by means of a rack which is welded to the dipper handle.

171. Shipper Shaft Assembly Removal and Disassembly

a. Removal.

(1) Remove the dipper handle (TM 5 3810-207-20).

(2) Remove the dipper trip assembly (TM 5-3810-207-20).

(3) Remove the shipper shaft assembly as instructed on figure 46.

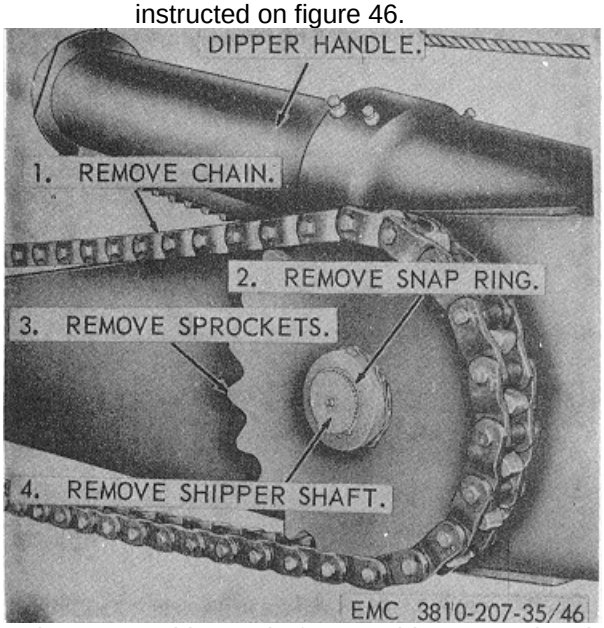


Figure 46. Shipper shaft assembly, removal and installation.

b. Disassembly. Disassemble the shipper shaft assembly as illustrated on figure 47.

172. Shipper Shaft Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean the bushings with an approved cleaning solvent. Dry thoroughly.

b. Inspection and Repair. Inspect the bushings for scoring, pitting, excessive wear, or other damage. Replace defective bushings as necessary.

173. Shipper Shaft Assembly Reassembly and Installation

a. Reassembly. Reassemble the shipper shaft assembly as illustrated on figure 47.

b. Installation.

(1) Install the shipper shaft assembly as illustrated on figure 46.

(2) Install dipper trip assembly (TM 5-3810-207-20).

(3) Install the dipper handle (TM 5-3810-207-20).

174. Bail Block Sheave Bushing Removal

a. Remove the bail block sheave (TM 5-3810-207-20).

b. Using a suitable press, remove the bushing from the bail block sheave.

175. Bail Block Sheave Bushing Cleaning, Inspection, and Repair

a. Cleaning. Clean the bushings with an approved cleaning solvent. Dry thoroughly.

b. Inspection and Repair. Inspect the bushings for scoring, pitting, excessive wear, and other damage. Replace defective bushings as necessary.

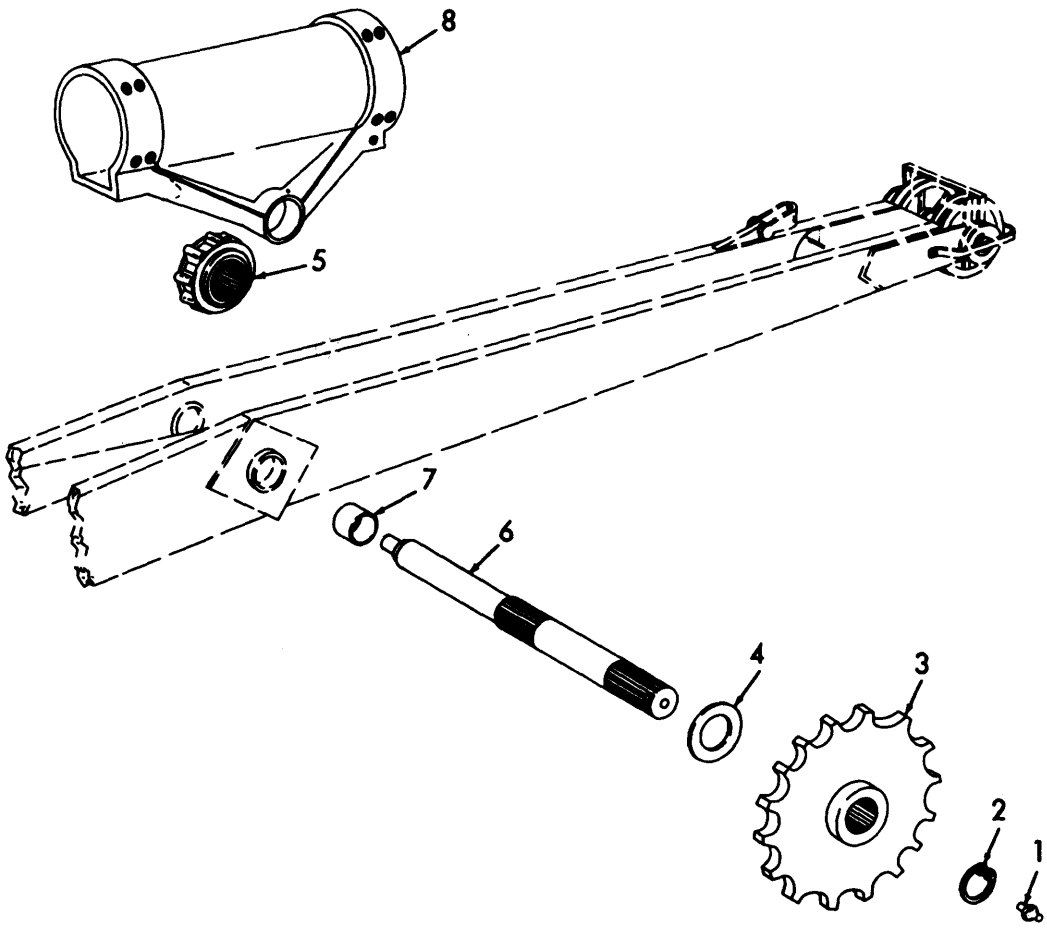


Figure 47. Shipper shaft assembly, exploded view.

1	Fitting, lubrication, 1/8 in.	4	Washer	7	Bushing (2 rqr)
2	Snap ring	5	Pinion gear	8	Saddle block
3	Sprocket	6	Shipper shaft		

176. Bail Block Sheave Bushing Installation

a. Using a suitable press, install the bail block sheave bushings in the bail block sheave.

b. Install the bail block sheave (TM 54810-207-20).

177. Boom Harness Sheave Bushing Removal

a. Remove the boom harness sheave (TM 6-5810-207-20).

b. Using a suitable press, remove the bushings from the boom harness sheave.

178. Boom Harness Sheave Bushing Cleaning, Inspection, and Repair

a. Cleaning. Clean the bushings with an approved cleaning solvent. Dry thoroughly.

b. Inspection and Repair. Inspect the bushings for scoring, pitting, excessive wear, or other damage. Replace defective bushings as necessary.

179. Boom Harness Sheave Bushing Installation

a. Using a suitable press, install the bushings in the boom harness sheave.

b. Install the boom harness sheave (TM 5-3810-207-20).

180. Pulley Block Sheave Bushing Removal

a. Remove the pulley block sheave (TM 5-3810-207-20).

b. Using a suitable press, remove the bushings from the pulley block sheave.

181. Pulley Block Sheave Bushing Cleaning, Inspection, and Repair

a. *Cleaning*. Clean the bushings with an approved cleaning solvent. Dry thoroughly.

b. *Inspection and Repair*. Inspect the bushings for scoring, pitting, excessive wear, and other damage. Replace defective bushings as necessary.

182. Pulley Block Sheave Bushing Installation

a. Using a suitable press, install the bushings in the pulley block sheave.

b. Install the pulley block sheave (TM 5-3810-207-20).

183. Gantry Frame Sheave Bushing Removal

a. Remove the gantry frame sheave (TM 5-3810-207-20).

b. Using a suitable press, remove the bushings from the gantry frame sheave.

184. Gantry Frame Sheave Bushing Cleaning, Inspection, and Repair

a. *Cleaning*. Clean the bushings with an approved cleaning solvent. Dry thoroughly.

b. *Inspection and Repair*. Inspect the bushings for scoring, pitting, excessive wear, and other damage. Replace defective bushings as necessary.

185. Gantry Frame Sheave Bushing Installation

a. Using a suitable press, install the bushings in the gantry frame sheave.

b. Install the gantry frame sheave (TM 5-3810-207-20).

Section II. CRANE GANTRY FRAME

186. General

The crane gantry frame is a supporting device used to support the boom. It is mounted on the crane frame by means of pins and is constructed of heavy steel.

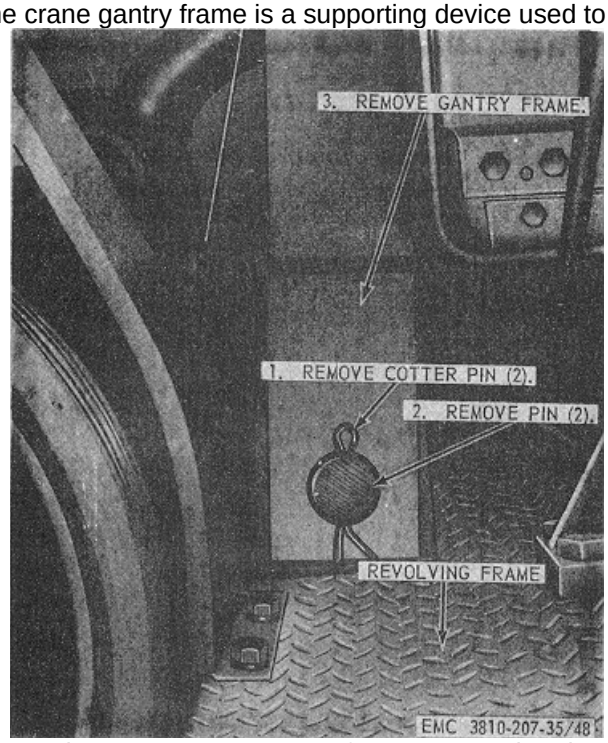


Figure 48. Crane gantry frame, removal and installation.

187. Crane Gantry Frame Removal

a. Remove the crane gantry sheave blocks (TM 5-3810-207-20).

b. Remove the crane operator's cab assembly (par. 44).

c. Remove the crane gantry frame from the revolving frame as instructed on figure 48.

188. Crane Gantry Frame Cleaning, Inspection, and Repair

a. Cleaning. Clean the crane gantry frame with an approved cleaning solvent.

b. Inspection and Repair. Inspect the crane gantry frame and pin for cracks, breaks, bends, excessive wear, or other damage. Repair or replace defective crane gantry frame or pin as necessary. Replace cotter pins.

189. Crane Gantry Frame Installation

a. Install the crane gantry frame on the revolving frame as illustrated on figure 48.

b. Install the operator's cab assembly (par. 44).

c. Install the crane gantry sheave blocks (TM 53810-207-20).

CHAPTER 7

HEATER REPAIR INSTRUCTIONS

Section I. CRANE CAB AND ENGINE HEATER

190. General

The crane cab and engine heater is a fresh air heater consisting of a generator-type vaporizer burner and combustion chamber that discharges the products of combustion through a heat exchanger surrounding the combustion chamber. A blower unit supplies combustion and ventilating air and a control housing contains the necessary fuel and electrical controls.

191. Crane Cab and Engine Heater Removal and Disassembly

a. Removal.

(1) Remove the crane cab and engine heater (TM 5-3810-207-20).

(2) Remove the crane cab and engine heater controls and control box (TM 3810-207-20).

(3) Remove the crane cab and engine heater blower (TM 5-3810-207-20).

b. Disassembly. Disassemble the crane cab and engine heater in numerical sequence as illustrated on figure 49.

192. Crane Cab and Engine Heater Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts.

193. Crane Cab and Engine Heater Reassembly and Installation

a. Reassembly. Reassemble the crane cab and engine heater in the reverse of the numerical sequence as illustrated on figure 49.

b. Installation.

(1) Install the crane cab and engine heater blowers (TM 5-3810-207-20).

(2) Install the crane cab and engine heater controls and control box (TM 5-3810-207-20)'.

(3) Install the crane cab and engine heater (TM 5-3810-207-20).

Section II. CARRIER ENGINE HEATER

194. General

The carrier engine heater is similar to the crane engine heater and operates in a similar manner. Heat is supplied from two sources within the heater; fresh air that is circulated over and around the combustion chamber and heat exchanger; and exhaust gases that are products of combustion. The heated fresh air is used for heating the engine oil pan, engine compartment, and battery compartment.

195. Carrier Engine Heater Removal and Disassembly

a. Removal.

(1) Remove the carrier engine heater (TM 5-3810-207-20).

(2) Remove the carrier engine heater controls and control box (TM 5-3810-207-20).

(3) Remove the carrier engine heater blower assembly (TM 5-3810-207-20).

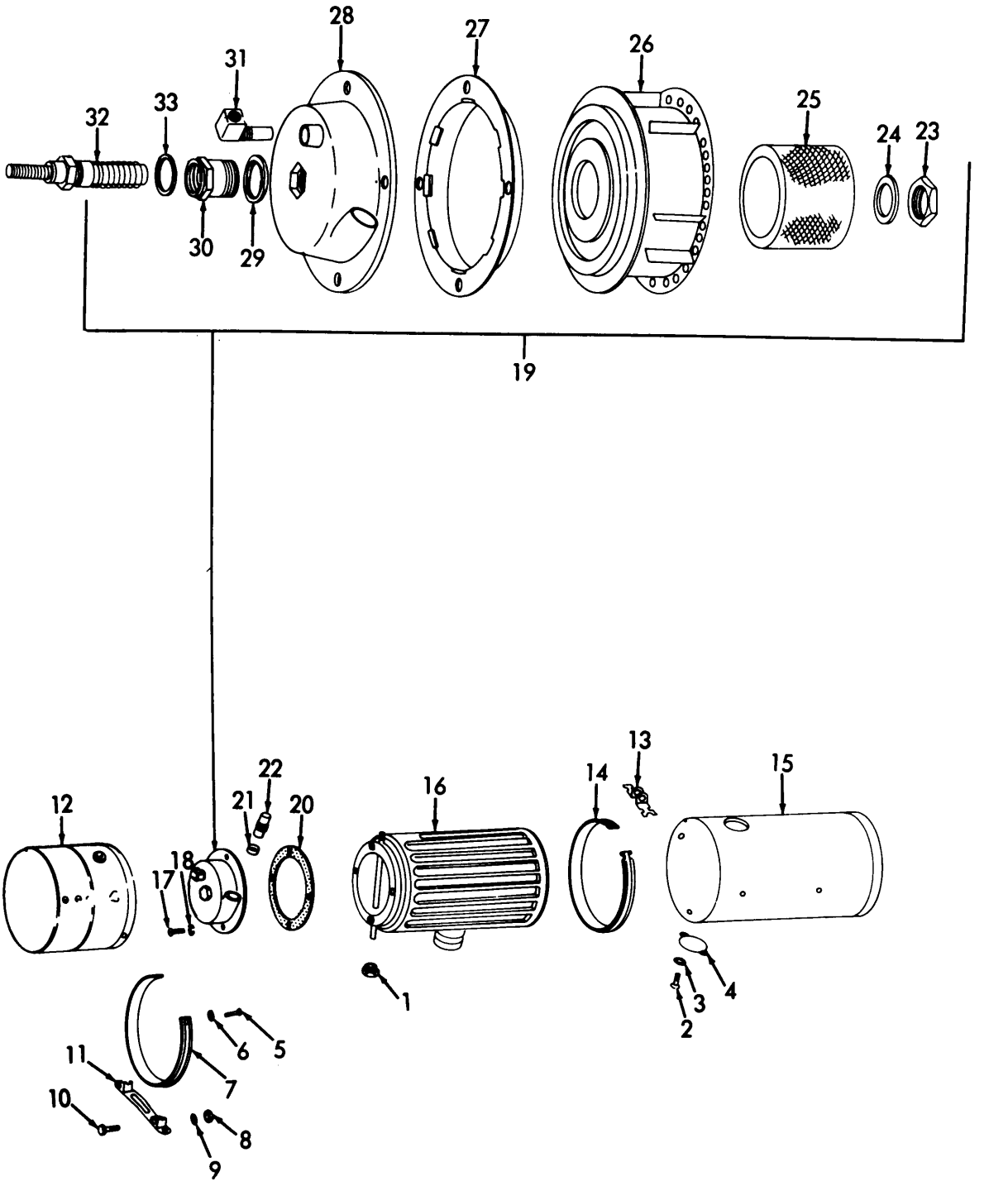


Figure 49. Crane cab and engine heater, partial exploded view.

1 Cap
2 Screw, machine, 8-32 x ¼ in. (2 rqr)
3 Washer, lock, IET, No. 8 (2 rqr)
4 Switch plate
5 Screw, machine, 10-32 x 5/16 in. (8 rqr)
6 Washer, lock, IET, No. 10 (8 rqr)
7 Rear heater ring
8 Nut, hex I'rl,-18 (5 rqr)
9 Washer, lock, IET, 5/16 in. (5 rqr)
10 Screw, cap, hex hd, 5/16-18 x 1½ in. (5 rqr)
11 Heater base assembly
12 Blower casing assembly
13 Heater clamp
14 Front mounting ring
15 Combustion casing assembly
16 Combustion chamber assembly
17 Screw, machine, 10-32 x 9/16 in. (4 rqr)
18 Washer, lock, IET, No. 10 (4 rqr)
19 Burner assembly
20 Burner gasket
21 Hose clamp
22 Duct tube
23 Wick retaining nut
24 Wick retainer washer
25 Burner wick assembly
26 Generator assembly
27 Mixing ring
28 Burner head
29 Igniter sleeve gasket
30 Igniter sleeve
31 Elbow assembly
32 Igniter
33 Igniter gasket

Figure 49. -Continued.

b. Disassembly. Disassemble the carrier engine heater (par. 191).

196. Carrier Engine Heater Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent.

b. Inspection and Repair.

(1) Inspect the rings, clamps, casing assembly, funnel, chamber assembly, generator, fan, support assembly, scroll, and the scroll body, for dents, cracks, bends, or other damage. Replace parts as necessary.

(2) Inspect the screws, nuts, igniter, sleeve, elbow, and cap for stripped threads or other damage. Replace defective parts as necessary.

(3) Use a wire to clean out the holes in the burner wick.

(4) Inspect the wires for deteriorated or cut covering and loose connections. Repair or replace defective wire as necessary.

(5) Always use new grommets, gaskets, and washers, during reassembly.

197. Carrier Engine Heater Reassembly and Installation

a. Reassembly. Reassemble the carrier engine heater (par. 193).

b. Installation.

(1) Install the carrier engine heater blower (TM 5-3810-207-20).

(2) Install the carrier engine heater controls and control box (TM 5-3810-207-20).

(3) Install the carrier engine heater (TM 5-3810-207-20).

Section III. CARRIER CAB HEATER

198. General

The carrier cab heater is mounted on the outside rear of the cab, near the bottom of the rear panel. The purpose of the heater is to deliver fresh, heated air to the cab and defrosters.

199. Carrier Cab Heater Removal and Disassembly

a. Removal.

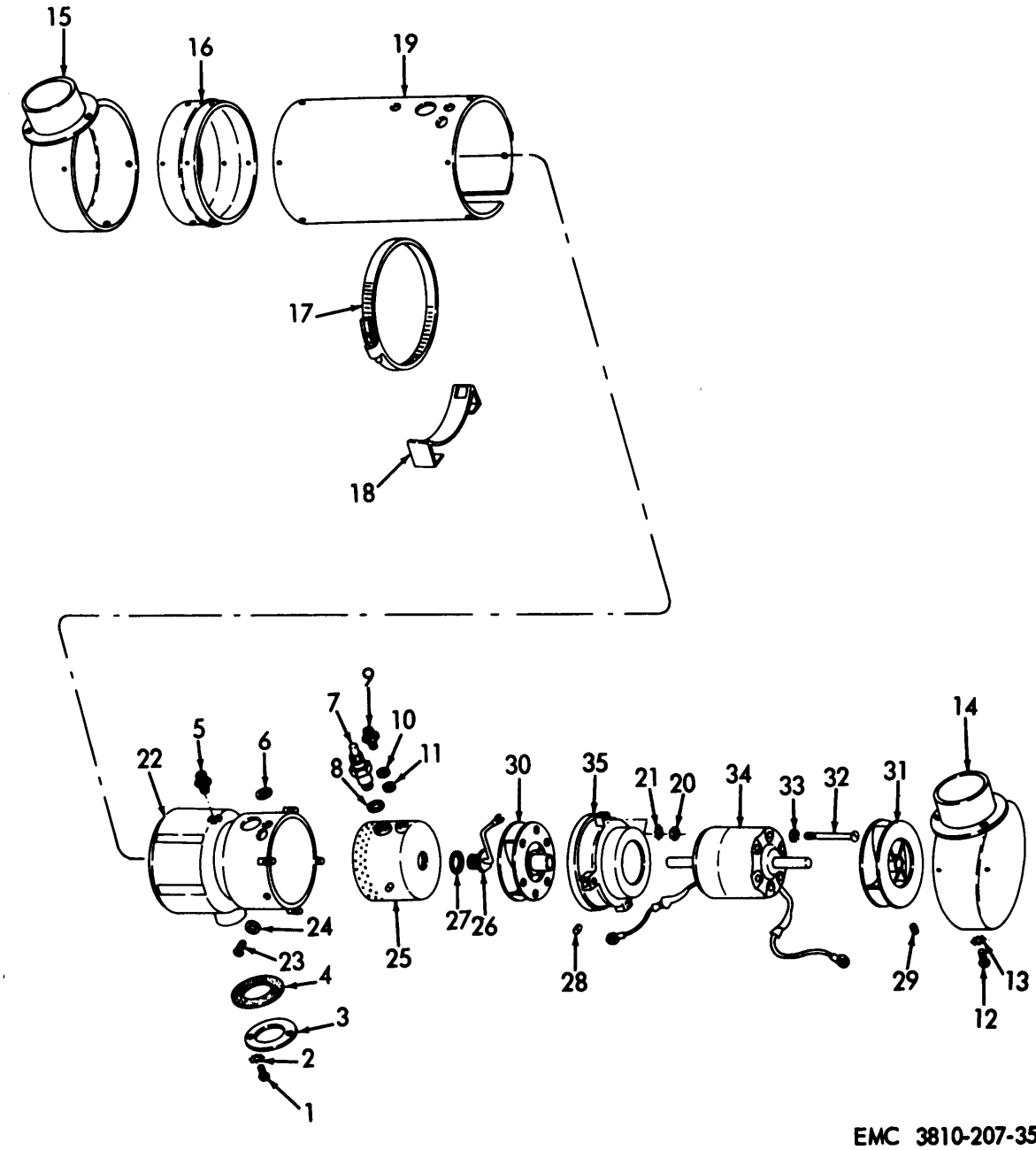
(1) Remove the carrier cab heater (TM 5-3810-207-20).

(2) Remove the carrier cab heater control box (TM 5-3810-207-20).

b. Disassembly. Disassemble the carrier cab heater in numerical sequence as illustrated on figure 50.

200. Carrier Cab Heater Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.



EMC 3810-207-35/50

1 Screw, machine, 10-32 x ¼ in. (2 rqr)
2 Washer, lock, ET, No. 10 (2 rqr)
3 Stack seal
4 Gasket
5 Nipple, special
6 Seal
7 Igniter
8 Gasket
9 Union
10 Washer
11 Gasket
12 Screw, machine, 10-2 x ¼ in. (12 rqr)
13 Washer, lock, ET, No. 10 (12 rqr)
14 Outlet chamber
15 Intake chamber
16 Intake cover
17 Clamp band (2 rqr)
18 Bracket (2 rqr)
19 Casing
20 Nut, 8-32 (4 rqr)
21 Washer, lock, ET, No. 8 (4 rqr)
22 Combustion chamber
23 Screw, machine, 8-32 x ¼ in. (2 rqr)
24 Washer, special (2 rqr)
25 Burner assembly
26 Preheater
27 Gasket
28 Setscrew
29 Setscrew
30 Fan
31 Fan
32 Screw, machine, 10-2 x 2¾ in. (2 rqr)
33 Washer, lock, No. 10 (2 rqr)
34 Motor
35 Blower shell

Figure 50. Carrier cab heater, exploded view.

TAGO 5030A

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or re- pair all defective parts.

201. Carrier Cab Heater Reassembly and Installation

a. Reassembly. Reassemble the carrier cab heater in the reverse of the numerical sequence as illustrated on figure 50.

b. Installation.

(1) Install the carrier cab heater control box (TM 5-3810-207-20).

(2) Install the carrier cab heater (TM 5-3810-207-20).

CHAPTER 8

CARRIER ENGINE REPAIR INSTRUCTIONS

Section I. CARRIER ENGINE CARBURETOR ASSEMBLY

202. General

The carrier carburetor assembly is mounted on the intake manifold on the right side of the carrier engine. The carburetor is a down-draft-type duplex carburetor with a concentric float bowl design. This design assists in the proper metering of air and fuel to the engine, without flooding, when the vehicle is operated on extreme angles. It is a sealed and balanced carburetor as all the air for fuel bowl chamber ventilation and idling must come through the air cleaner. The two venturi, each with a cast-in secondary venturi, are used to aid in the complete vaporization of the fuel. The power jet and accelerator pump systems are operated by engine vacuum and are completely protected from dirt.

203. Carrier Engine Carburetor Assembly Removal and Disassembly

a. Removal. Remove the carrier engine carburetor assembly (TM 5-3810-207-20).

b. Disassembly. Disassemble the carrier engine carburetor assembly in numerical sequence as illustrated on figure 51.

204. Carrier Engine Carburetor Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts.

205. Carrier Engine Carburetor Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier engine carburetor in the reverse of the numerical sequence as illustrated on figure 51.

b. Installation. Install the carrier engine carburetor assembly (TM 5-3810-207-20).

Section II. CARRIER ENGINE SPEED GOVERNOR ASSEMBLY

206. General

The carrier engine speed governor is driven by a flexible cable from the auxiliary drive shaft and contains four balanced weights. A shaft and spider assembly, which supports the four weights is turned at Y2 the speed of the engine camshaft. As the carrier engine runs faster, the spider shaft and weights are revolved faster with the resulting centrifugal force adding upward thrust against a sleeve and collar. The collar actuates the throttle shaft through a bellcrank, spring, and bushing arrangement. A spring retained with an adjusting screw pushes against the opposite side of the collar so that the throttle is not limited or closed unless the engine speed exceeds a predetermined safe operating maximum.

207. Carrier Engine Speed Governor Assembly Removal and Disassembly

a. Removal. Remove the carrier engine speed governor assembly (TM 5810-207-20).

b. Disassembly. Disassemble the carrier engine speed governor assembly in the numerical sequence as illustrated on figure 52.

208. Carrier Engine Speed Governor Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts with an approved cleaning solvent and dry thoroughly.

209. Carrier Engine Speed Governor Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier engine speed governor assembly in the reverse of the numerical sequence as illustrated on figure 52.

b. Installation. Install the carrier engine speed governor assembly (TM 5-3810-207-20).

Section III. CARRIER ENGINE GENERATOR ASSEMBLY

210. General

The carrier engine generator assembly is a 4-pole, shunt-type unit with sealed ball bearings in both the drive end frame and the commutator end frame. The generator serves a dual purpose: it supplies electrical energy for lights, ignition and accessories, and it serves to recharge the batteries by furnishing current to make up for cranking and other power supplied by the batteries while the generator is not in operation. The armature rotates between field coils and produces voltage. The generator is cooled by a fan mounted on the drive pulley. The generated current is discharged to the electrical system through the armature and field terminals. The generator rotates clockwise with a brush tension of 28 ounces. The field current at 80° Fahrenheit is 1.00-1.05 amperes at 24 volts. The cold output of the generator at 4000 revolutions per minute is 40 amperes at 28 volts.

211. Carrier Engine Generator Assembly Removal and Disassembly

a. Removal. Remove the carrier engine generator assembly (TM 5-3810-207-20).

b. Disassembly. Disassemble the carrier engine generator assembly (par. 60).

212. Carrier Engine Generator Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry: thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective parts. Refer to TM 5-764 for armature and field coil tests.

213. Carrier Engine Generator Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier engine generator assembly (par. 62).

b. Installation. Install the carrier engine generator assembly (TM 53810-207-20).

Section IV. CARRIER ENGINE STARTER ASSEMBLY

214. General

The carrier engine starter assembly is a heavy-duty type with an overrunning clutch drive. The starting motor turns at 6X000 rpm, drawing 23.4 volts at 30 maximum amperes with no load, and develops 20 foot-pounds of torque, drawing 6.6 volts at 200 maximum amperes when locked. The starting motor has 4 poles using 8 brushes and has an intermediate bearing to support the armature shaft in the middle, while the ends are supported by bushings.

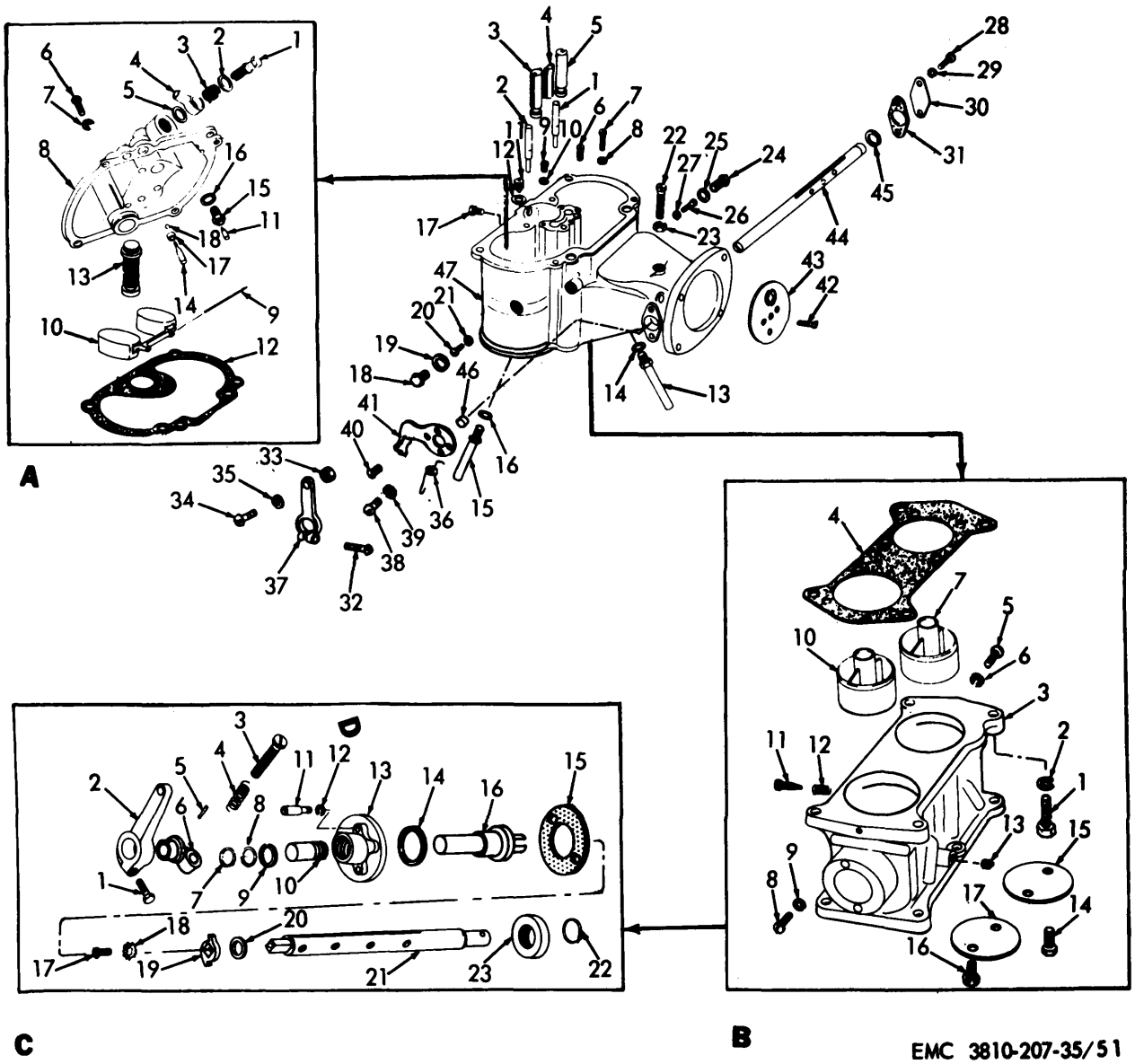


Figure 51. Carrier engine carburetor assembly, exploded view.

215. Carrier Engine Starter Assembly Removal and Disassembly

a. Removal. Remove the carrier engine starter assembly (TM 5-3810-207-20).

b. Disassembly. Disassemble the carrier engine starter assembly (par. 68).

216. Carrier Engine Starter Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective parts. Refer to TM 5-764 for armature and field coil tests.

217. Carrier Engine Starter Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier engine starter assembly (par. 70).

b. Installation. Install the carrier engine starter assembly (TM 53810-207-20).

1 Filter plug
2 Washer
3 Filter screen
4 Union body
5 Fiber washer
6 Screw, cap, ¼ -20 x ¾ in. (4 rqr)
7 Washer, lock, 1A in. (4 rqr)
8 Bowl cover
9 Float axle
10 Float
11 Needle valve
12 Gasket
13 Pump
14 Idle jet (2 rqr)
15 Valve seat
16 Seat gasket
17 Check valve body
18 Check valve ball

A. Carburetor cover, float, pump and idle jets

1 Screw, 10-24 x 1 in. (4 rqr)
2 Washer, lock, No. 10 (4 rqr)
3 Throttle body
4 Gasket
5 Screw, 8-32 x 9/16 in.
6 Washer, lock. No. 8
7 Venturi
8 Screw, 8-32 x 9/16 in.
9 Washer, lock, No.8
10 Venturi
11 Idle adjusting needle
12 Spring
13 Plug, ping
13 Plug, pipe, 1/8 in.
14 Screw, 10-24 x ½ in. (2 rqr)
15 Throttle plate
16 Screw, 10-24 x ½ in. (2 rqr)
17 Throttle plate x in. (2 rqr)

B. Carburetor venturi, idle needle, and throttle body

1 Screw, 10-32 x 9/16 in.
2 Throttle lever
3 Screw, 10-32 x 13/8 in.
4 Spring
5 Pin
6 Throttle stop
7 Bevel washer
8 Washer, special
9 Packing
10 Sleeve bearing
11 Idle stop screw (2 rqr)
12 Washer, lock, No. 6 (2 rqr)
13 Support
14 Spacer
15 Gasket
16 Shaft
17 Screw, 10-32 x ½ in.
18 Lock
19 Drive
20 Spacer
21 Throttle shaft
22 Snap ring
23 Bearing

C. Carburetor lever and shaft

1 Accelerator jet
2 Accelerator jet
3 Metering well
4 Secondary metering well
5 Metering well
6 Well vent jet
7 Idle compensator jet (2 rqr)
8 Jet washer (2 rqr)
9 Pump check valve
10 Check valve disk
11 Power jet and valve
13 Discharge jet
13 Discharge jet
14 Jet washer
15 Discharge jet
16 Jet washer
17 Plug, pipe, 41/8 in. (3 rqr)
18 Main passage plug
19 Plug washer
20 Main jet
21 Jet washer
22 Screw, 1032 x 11X in.
23 Nut, 10-32
23 Nut, 10-32
24 Main passage plug
25 Plug washer
26 Main jet
27 Jet
27 Jet washer
28 Screw, 10-32 x 11/8 in. (2 rqr)
29 Washer, lock, No. 10 (2 rqr)
30 Choke shaft cover plate
31 Cover plate gasket
32 Screw, 10-32 x %7/ in.
33 Nut, 10-32
34 Screw, 10-32 x 1 in.
35 Washer, flat, No. 10
36 Choke spring
37 Choke lever
38 Screw, 10-32 x 14% in. (2 rqr)
39 Washer, lock, No. 10 (2 rqr)
40 Screw, 1032 x r1 in.
41 Cover plate
42 Screw, 8-32 x 7/8 in. (3 rqr)
43 Choke plate
44 Choke shaft
45 Washer, lock, 3/8 in.
46 Choke shaft washer
47 Fuel bowl

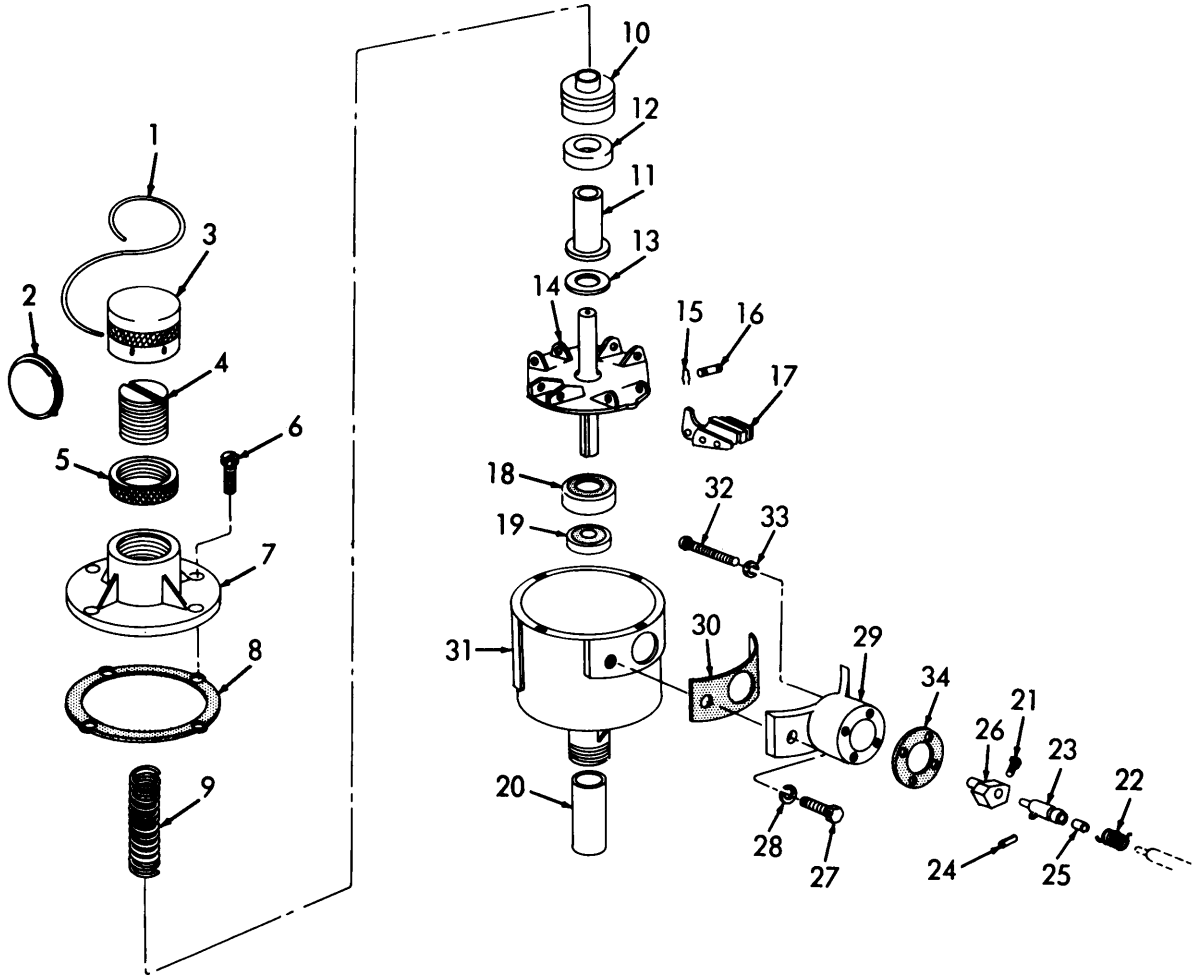
D. Carburetor metering wells, main jets, choke shaft, and fuel bowl

Figure 51--Continued.

Section V. CARRIER ENGINE ASSEMBLY

218. General

A waterproof-type distributor is used on the carrier engine. This model is automatic, 24 volts, ground-type with a flange mounting. A waterproof primary connection on the distributor housing encloses a feed through capacitor which is part of the radio interference suppression circuit built into the distributor. The radio interference suppression system includes another capacitor connected between the ignition coil positive terminal and ground, as well as built-in resistors at each high tension outlet of the molded cap and also one built into the



1 Wire (2 rqr)
2 Brass seal (2 rqr)
3 Cap
4 Adjusting screw
5 Locknut
6 Screw, 10-24 x 8A in. (4 rqr)
7 Cap body
8 Gasket
9 Spring
10 Yoke collar
11 Thrust sleeve
12 Bearing
13 Washer
14 Spider
15 Clip (8 rqr)
16 Weight pin (4 rqr)
17 Weight (4 rqr)
18 Bearing
19 Seal
20 Bushing
21 Setscrew, 10-24 x k4 in.
22 Spring
23 Bushing and pin assembly
24 Pin, roll, % x 1%2 in.
25 Needle bearing (2 rqr)
26 Bellcrank
27 Screw, cap, 12-20 x % in. (2 rqr)
28 Washer, lock, 14 in. (2 rqr)
29 Bracket
30 Gasket
31 Governor body
32 Screw, 1032 x l1A in. (4 rqr)
33 Washer, lock, No. 10 (4 rqr)
34 Gasket

Figure 52. Carrier engine speed governor assembly, exploded view.

rotor. This type distributor also has built-in shaft lubrication. The shaft bearing is made of porous metal and extends from the upper to the lower part of the housing, spanning an oil reservoir. During operation, the oil seeps through the bearing, providing continuous shaft lubrication over relatively long periods of use.

219. Carrier Engine Distributor Assembly Removal and Disassembly

a. Removal. Remove the carrier engine distributor assembly (TM 5-3810-207-20).

b. Disassembly. Disassemble the carrier engine distributor assembly (par. 72).

220. Carrier Engine Distributor Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with a dry, lint-free cloth and compressed air.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective parts.

221. Carrier Engine Distributor Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier engine distributor assembly (par. 74).

b. Installation. Install the carrier engine distributor assembly (TM 5-3810-207-20).

Section VI. CARRIER ENGINE ACCESSORY DRIVE ASSEMBLY

222. General

The carrier engine accessory drive assembly is externally mounted on the left side of the carrier engine block. The accessory drive assembly is driven from the carrier engine camshaft gear by a helical gear which also drives the carrier engine oil pump assembly. The distributor is mounted on top end of the accessory drive shaft. The drive shaft for the governor drive cable is also mounted on the accessory drive housing and is gear-driven from the accessory drive shaft.

223. Carrier Engine Accessory Drive Assembly Removal and Disassembly

a. Removal.

(1) Remove the carrier engine governor drive cable and distributor assembly (TM 5-3810-207-20).

(2) Remove the carrier engine accessory drive assembly as instructed on figure 53.

b. Disassembly. Disassemble the carrier engine accessory drive assembly in numerical sequence as illustrated on figure 54.

224. Carrier Engine Accessory Drive Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts.

225. Carrier Engine Accessory Drive Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier engine accessory drive assembly in the reverse of the numerical sequence as illustrated on figure 54.

b. Installation.

(1) Install the carrier engine accessory drive assembly as illustrated on figure 53.

(2) Install the distributor assembly and carrier engine governor drive cable (TM 5-3810207-20).

Section VII. CARRIER ENGINE RADIATOR ASSEMBLY

226. General

The carrier engine radiator assembly consists of an upper tank, core, and a lower tank. The upper and lower tanks are soldered to the core. The radiator filler is welded into the upper tank and the overflow tube is soldered in the filler.

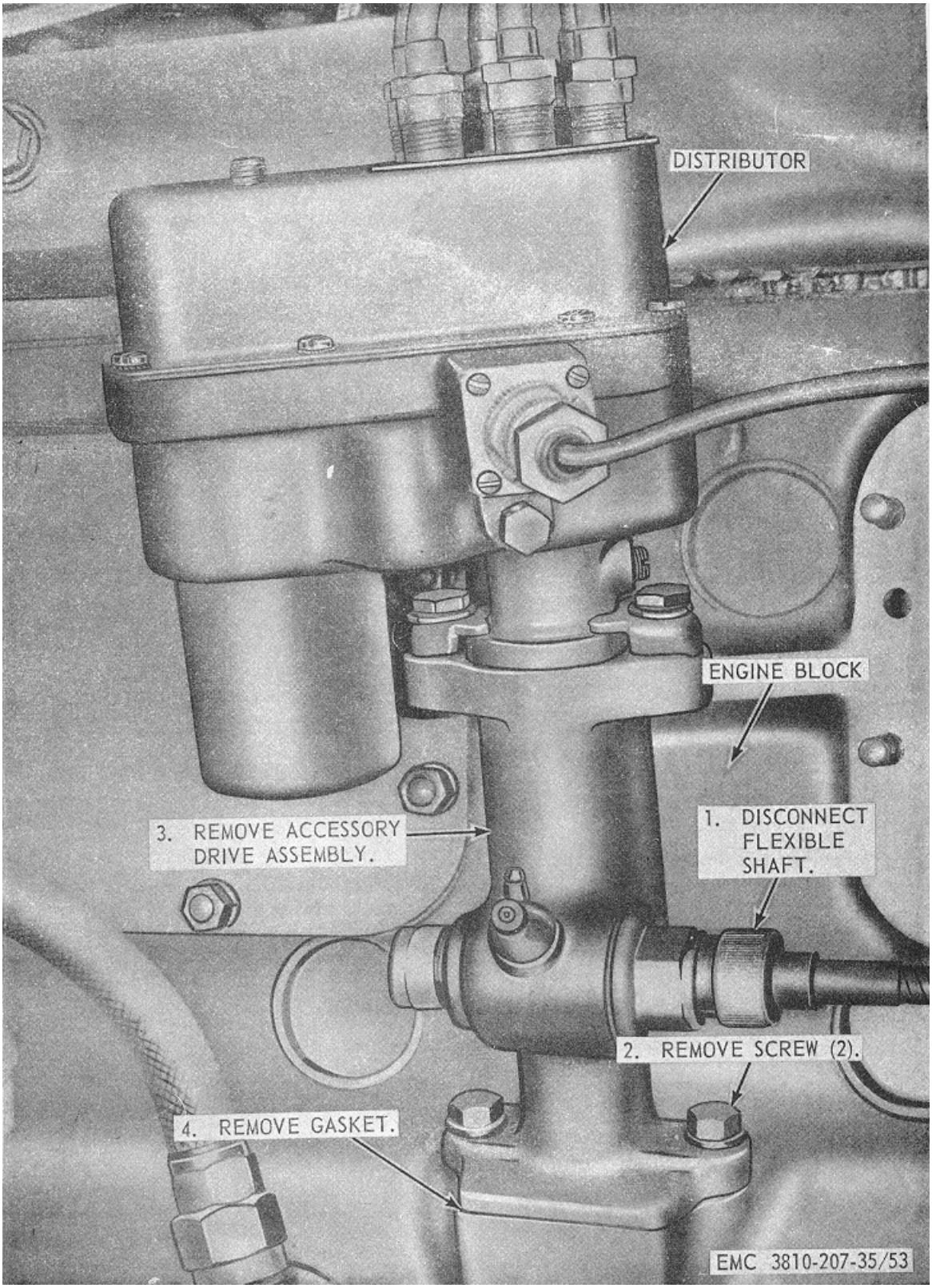
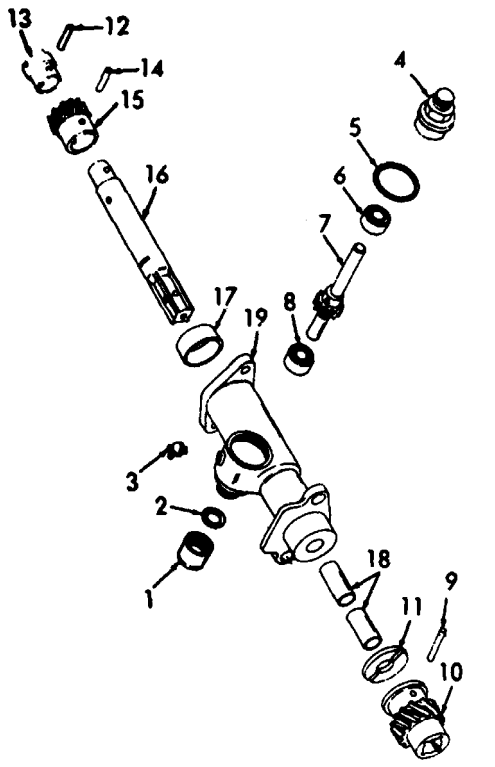


Figure 53. Carrier engine accessory drive assembly, removal and installation.



EMC 3810-207-35/54

1 Cap
2 Gasket
3 Fitting, lubrication
4 Bearing retainer
5 Gasket
6 Ball bearing
7 Gear and shaft
8 Ball bearing
9 Pin,5/32 x 1 1/8 in.
10 Gear
11 Washer, thrust
12 Pin, 5/32 x 13/16 in.
13 Coupling
14 Pin, 5/32 x 7/8 in.
15 Governor drive gear
16 Shaft
17 Sleeve bearing
18 Bushing (2 rqr)
19 Housing

Figure 54. Carrier engine accessory drive assembly, exploded view.

The radiator has an inlet opening melded into the lower tank and a drain valve threaded in the lower portion of the lower tank.

227. Carrier Engine Radiator Assembly Removal

a. Drain the carrier engine radiator assembly (TM 5-3810-207-10).

b. Disconnect the radiator hoses (TM 5-3810-207-20).

c. Remove the fan and fan shroud (TM 5-3810-207-20).

d. Remove the carrier engine radiator assembly as instructed on figure 55.

228. Carrier Engine Radiator Assembly Cleaning, Inspection, and Repair

a. Flush the inside of the radiator with an approved cleaning solvent.

b. Clean the radiator core with compressed air or water under pressure from the fan side of the core.

c. Clean the overflow lines with compressed air.

d. Plug all openings in the radiator.

e. Insert air hose in radiator outlet pipe and caulk around hose.

f. Immerse the radiator in water and apply 5 psi air pressure to the radiator.

g. Watch for signs of air bubbles.

h. Remove the radiator from the water and disconnect air hose.

i. Replace or repair a damaged or defective radiator.

229. Carrier Engine Radiator Assembly Installation

a. Install the carrier engine radiator assembly as illustrated on figure 55.

b. Install the fan and shroud (TM 53810-207-20).

c. Connect the radiator hoses (TM 5-3810-207-20).

d. Fill the radiator assembly (TM 5-3810-207-10).

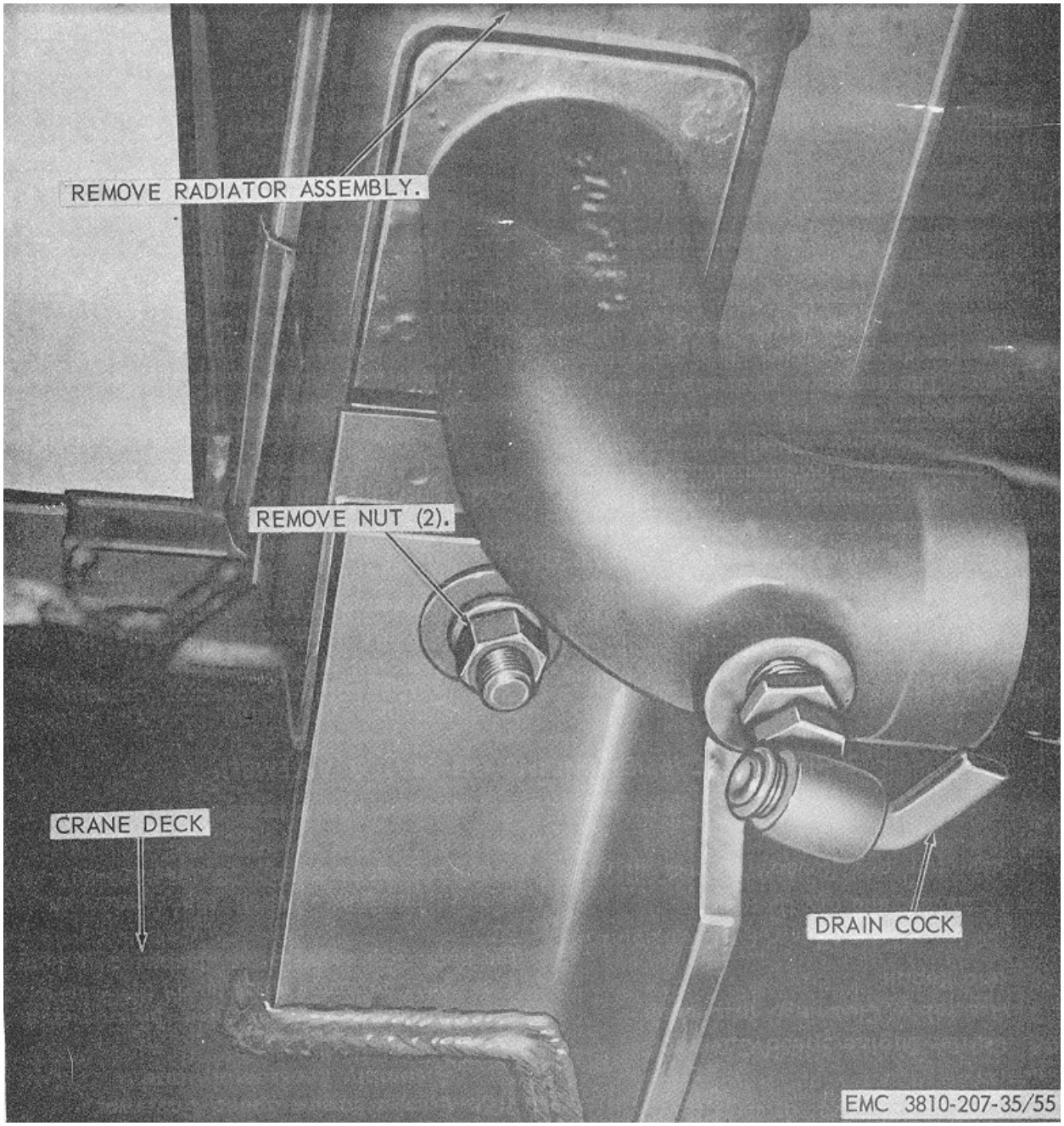


Figure 55. Carrier engine radiator assembly, removal and installation.

Section VIII. CARRIER ENGINE WATER PUMP ASSEMBLY

230. General

The carrier engine water pump assembly is a centrifugal-type pump, packless, having a spring-loaded, carbon-graphite seal riding against a polished steel face. The shaft is carried on two ball bearings, and driven with V-belts from the crankshaft.

231. Carrier engine Water Pump Assembly Removal and Disassembly

a. Removal. Remove the carrier engine water pump assembly (TM 53810-207-20).

b. Disassembly. Disassemble the carrier engine water pump assembly in numerical sequence as illustrated on figure 56.

232. Carrier Engine Water Pump Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or re- pair all defective parts.

233. Carrier Engine Water Pump Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier engine water pump assembly in the reverse of the numerical sequence as illustrated on figure 56.

b. Installation. Install the carrier engine water pump assembly (TM 5-3810-207-20).

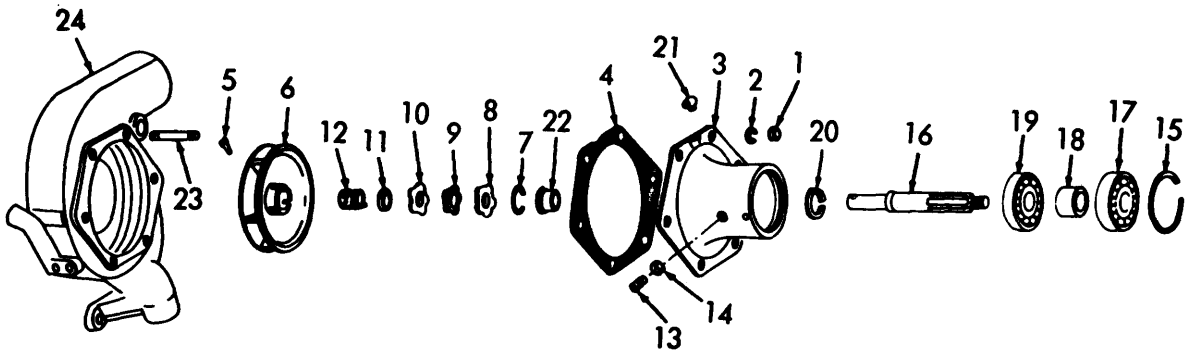
Section IX. CARRIER ENGINE OIL FILTER BASE AND OIL COOLER ASSEMBLY

234. General

The carrier engine oil filter base and oil cooler assembly are mounted on the left side of the engine block. The filter base also serves as the housing for the cooler. Oil forced from the oil pump is circulated to the oil cooler by means of a cross passage and gallery line in the engine block. Except for a small percentage that is bled off through the filters, the total output of the oil pump is delivered to the oil filter base, where it passes around and through the oil passages of the cooler. To prevent the oil passages from becoming plugged by sludge and lacquer, and shutting off the oil from the engine, a bypass valve opens when sufficient resistance builds up in the oil cooler allowing the oil to go directly from the pump into the main oil gallery line. Water from the engine cooling system circulates through the cooler to provide the exchange of heat necessary for safe operating temperature.

235. Carrier Engine Oil Filter Base and Oil Cooler Assembly Removal

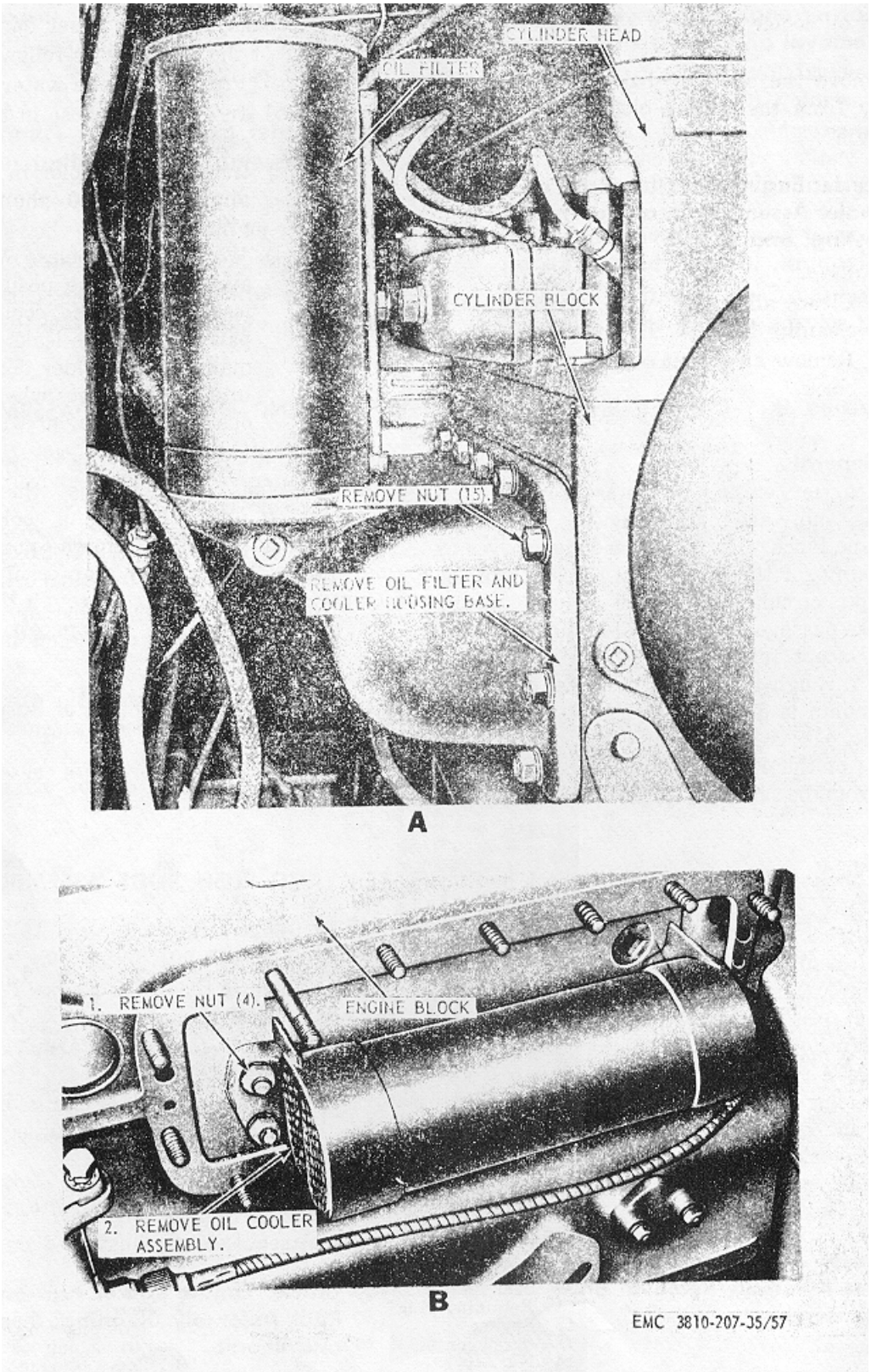
a. Remove the carrier engine assembly (par. 46).



EMC 3810-207-35/56

1	Nut, 3/8 -16 (6 rqr)	9	Rubber seal	17	Bearing
2	Washer, lock, 3/8 in. (6 rqr)	10	Seal retainer	18	Spacer
8	Support	11	Retaining ring	19	Bearing
4	Gasket	12	Spring	20	Retaining ring
5	Pin	13	Screw brass, ¼ -20 x 1 ¼ in.	21	Fitting lubrication
6	Impeller	14	Nut, ¼ 20	22	Sleeve Searing
7	Snap ring	15	Retaining ring	23	Stud, 3/8-16 x 1 7/16 in. (6 rqr)
8	Carbon seal	16	Shaft	24	Body

Figure 56. Carrier engine water pump assembly, exploded view.



A. Carrier oil filter base assembly, removal and installation

B. Carrier oil cooler, removal and installation

Figure 57. Carrier engine oil filter, base and oil cooler assembly, removal and installation.

b. Remove the oil filters from the oil filter base and oil cooler assembly (TM 5-3810-207-20).

c. Remove the oil filter base and oil cooler assembly from the engine block as instructed on figure 57.

236. Carrier Engine Oil Filter Base and Oil Cooler Assembly Cleaning, Inspection, Testing, and Repair

a. Cleaning.

(1) Clean all parts with an approved cleaning solvent. Dry thoroughly.

(2) Remove all gasket residue from engine block.

(3) Soak the cooler in an approved solvent to loosen the corrosion and sludge deposits. Fill and drain the water passage of the cooler with solvent several times to assure the removal of any foreign matter from inside the cooler. Blow out all passages of the cooler with clean compressed air. Dry thoroughly.

b. Inspection, Testing, and Repair.

(1) Inspect the oil filter base for cracks, breaks, chips, or other damage and for pits, burrs, or warping along mating surfaces. Replace a defective oil filter base assembly.

(2) Inspect the oil cooler for cracks, breaks, dents, or other damage.

(3) Test the oil cooler as follows:

(a) Plug one of the water passages.

(b) Insert an air hose in the oil passage.

(c) Immerse the cooler in water and apply 15 to 20 pounds of air pressure.

(d) Watch for bubbles. When they appear, note the position of the leaks. Mark the cooler for re- pair. Solder the leaks with care, making sure solder does not leak into core passages where it would obstruct the flow of water.

(4) Replace all gaskets each time the oil filter base assembly and oil cooler are removed.

237. Carrier Engine Oil Filter Base and Oil Cooler Assembly Installation

a. Install the carrier engine oil filter base and oil cooler assembly on the engine block as instructed on figure 57.

b. Install the oil filters on the carrier engine oil filter base and oil cooler assembly (TM 5-3810-207-20).

c. Install the carrier engine assembly (par. 46).

Section X. CARRIER ENGINE ROCKER ARM AND PUSH RODS ASSEMBLY

238. General

An overhead valve system is used on the carrier engine. Cam actuated push rods operate the rocker arms mounted on the engine cylinder head and enclosed within oil-tight covers. The action of the rocker arms opens and closes the valves during each engine cycle. Drilled passages in the cylinder head provide lubrication for the rocker arm assemblies, and ports on the side of the engine provide passages for fuel vapors and exhaust gases.

239. Carrier Engine Rocker Arm and Push Rods Assembly Removal and Disassembly

a. Removal.

(1) Remove the intake and exhaust manifolds (TM 54810-207-20).

(2) Remove the water manifold (TM 5-3810-207-20).

(3) Remove the spark plugs (TM 5-3810-207-20).

(4) Remove the rocker arm covers (TM 5-3810-207-20).

(5) Remove the carrier engine rocker arm and push rods assembly as instructed on figure 58.

b. Disassembly. Disassemble the carrier engine rocker arm and push rods assembly in numerical sequence as illustrated on figure 59.

240. Carrier Engine Rocker Arm and Push Rods Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

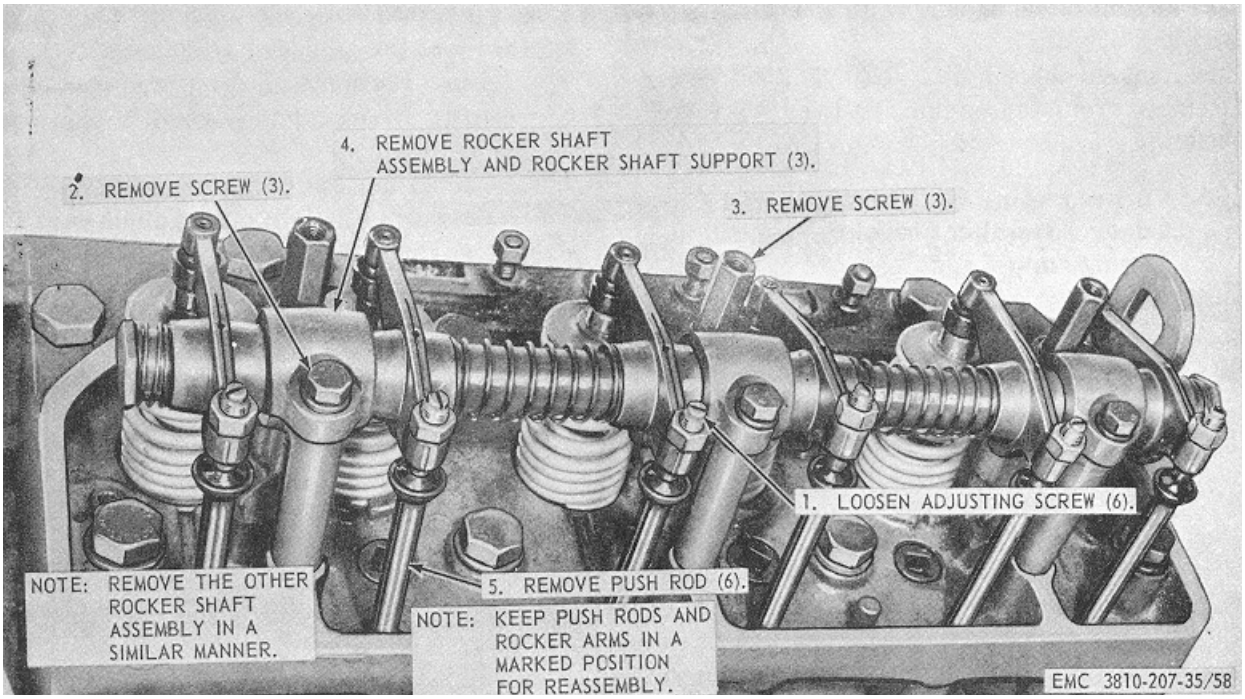


Figure 58. Carrier engine rocker arm shaft and push rods assembly, removal and installation.

b. Inspection and Repair. Inspect all parts for excessive wear, defects, and damage. Replace or repair all damaged or defective parts. Inspect the rocker arm-to-shaft clearance. The clearance should measure from 0.0005 to 0.0015 inch.

241. Carrier Engine Rocker Arm and Push Rods Assembly Reassembly and Installation

a. *Reassembly*. Reassemble the carrier engine rocker arm and push rods assembly in the reverse of the numerical sequence as illustrated on figure 59.

b. Installation.

(1) Install the carrier engine rocker arm and push rods assembly as illustrated on figure 58.
(2) Install the rocker arm covers (TM 5-3810-207-20).
(3) Install the spark plug (TM 5-3810-207-20).
(4) Install the water manifold (TM 5-3810-207-20).
(5) Install the intake and exhaust manifolds (TM 5-3810-207-20).

Section XI. CARRIER ENGINE CYLINDER HEAD AND VALVES

242. General

The carrier engine cylinder head consists of two sections, front and rear. The cylinder head houses the exhaust and intake valves. The exhaust valves are made of heat resistant steel.

243. Carrier Engine Cylinder Head and Valves Removal and Disassembly

a. Removal.

(1) Remove the carrier engine rocker arm and push rods assembly (par. 239).

(2) Remove the carrier engine cylinder head and valves as instructed on figure 60.

b. Disassembly. Disassemble the carrier engine cylinder head and valves in numerical sequence as illustrated on figure 61.

244. Carrier Engine Cylinder Head and Valves Cleaning, Inspection, and Repair

a. *Cleaning*. Clean all parts in an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Inspect the valve springs for a minimum spring length of 2 ¾ inch at 85 to 95 pounds, and 2 19/32 inches at 41 to 49 pounds for the outer and inner springs respectively. Inspect the valve stems for a minimum allowable wear diameter of 0.4935 inch. Replace or repair all damaged or defective parts. The valve head diameter should be between 2.245 and 2.255 inches.

245. Carrier Engine Cylinder Head and Valves Reassembly and Installation

a. Reassembly. Reassemble the cylinder head and valves in the reverse of the numerical sequence as illustrated on figure 61.

b. Installation.

(1) Install the cylinder head and valves as illustrated on figure 60.

(2) Install the carrier engine rocker arm and push rods assembly (par. 241).

Section XII. CARRIER ENGINE OIL PAN

246. General

The carrier engine oil pan is a steel, sump type pan with an eighteen quart capacity. The engine lubricating oil, that lubricates the engine components, is equipped with a measuring device to determine the quantity of oil available in the pan. An inspection cover is provided to aid in making necessary pressure adjustments on the oil pump within the engine block.

247. Carrier Engine Oil Pan Removal and Disassembly

a. Removal.

(1) Drain the crankcase (TM 5-3810-207-10).

(2) Remove the handhold cover and gage rod (TM 5-3810-207-20).

(3) Remove the carrier engine oil pan as instructed on figure 62.

b. Disassembly. Disassemble the carrier engine oil pan in numerical sequence as illustrated on figure 63.

248. Carrier Engine Oil Pan Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective parts.

249. Carrier Engine Oil Pan Reassembly and Installation

a. Reassembly. Reassemble the carrier engine oil pan in the reverse of the numerical sequence as illustrated on figure 63.

b. Installation.

(1) Install the carrier engine oil pan as illustrated on figure 62.

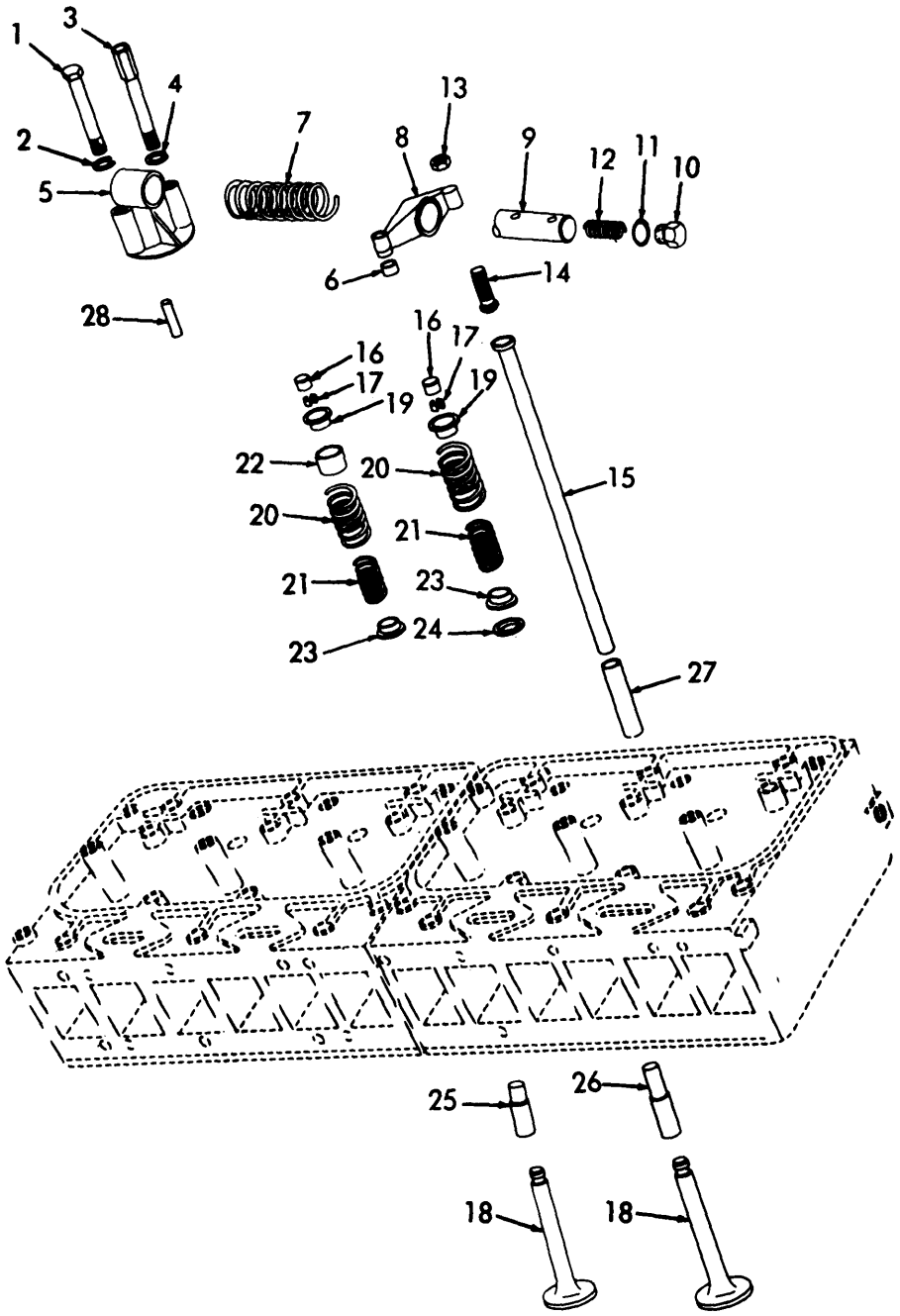
(2) Install the handhole cover and gage rod (TM 5-3810-207-20).

(3) Fill the crankcase (TM 5-3810-207- 10).

Section XIII. CARRIER ENGINE OIL PUMP ASSEMBLY

250. General

The carrier engine oil pump is a gear-type pump that is spline-shaft driven from the accessory drive unit operating from the camshaft. The pump is equipped with a float-type screen through which all oil flows to the pump as it is drawn from the oil supply in the oil pan. An adjustable Spring actuated plunger in the pump,



EMC 3810-207-35/59

Figure 59. Carrier engine rocker arm and push rod assembly, exploded view.

1 Shaft support screw, 3/8-16 x 4 (6 rqr)
2 Washer, lock, 3/8 in. (6 rqr)
3 Shaft support screw, special (6 rqr)
4 Washer, lock, 3/8 in. (6 rqr)
5 Rocker shaft support (6 rqr)
6 Ball socket (12 rqr)
7 Spring, long (4 rqr)
8 Rocker arm (12 rqr)
9 Rocker arm shaft (2 rqr)
10 Rocker arm shaft plug (4 rqr)
11 Oil plug gasket (4 rqr)
12 Spring, short (4 rqr)
13 Adjusting screw nut (12 rqr)
14 Adjusting screw (12 rqr)
15 Push rod (12 rqr)
16 Valve stem cap (12 rqr)
17 Valve spring retainer lock (24 rqr)
18 Valve, intake and exhaust (12 rqr)
19 Valve spring upper retainer (12 rqr)
20 Outer valve spring (12 rqr)
21 Inner valve spring (12 rqr)
22 Valve stem inlet guard (6 rqr)
23 Valve spring lower retainer (12 rqr)
24 Exhaust valve spacer (6 rqr)
25 Intake valve stem guide (6 rqr)
26 Exhaust valve stem guide (6 rqr)
27 Push rod tube (12 rqr)
28 Dowel, rocker shaft to support (2 rqr)

Figure 59-Continued.

relief valve is equipped to vary the oil pressure to meet the engine requirements.

251. Carrier Engine Oil Pump Assembly Removal and Disassembly

a. Removal.

(1) Remove the carrier engine oil pan (par. 247).

(2) Remove the carrier engine oil pump assembly as instructed on figure 64.

b. Disassembly. Disassemble the carrier engine oil pump assembly in numerical sequence as illustrated on figure 65.

252. Carrier Engine Oil Pump Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Inspect the gears to check for excessive backlash between teeth. There should not be more than 0.010 inch between teeth. Inspect the clearance between the gear teeth and pump body. The clearance should be between 0.003 and 0.004 inch. Replace or repair all defective parts.

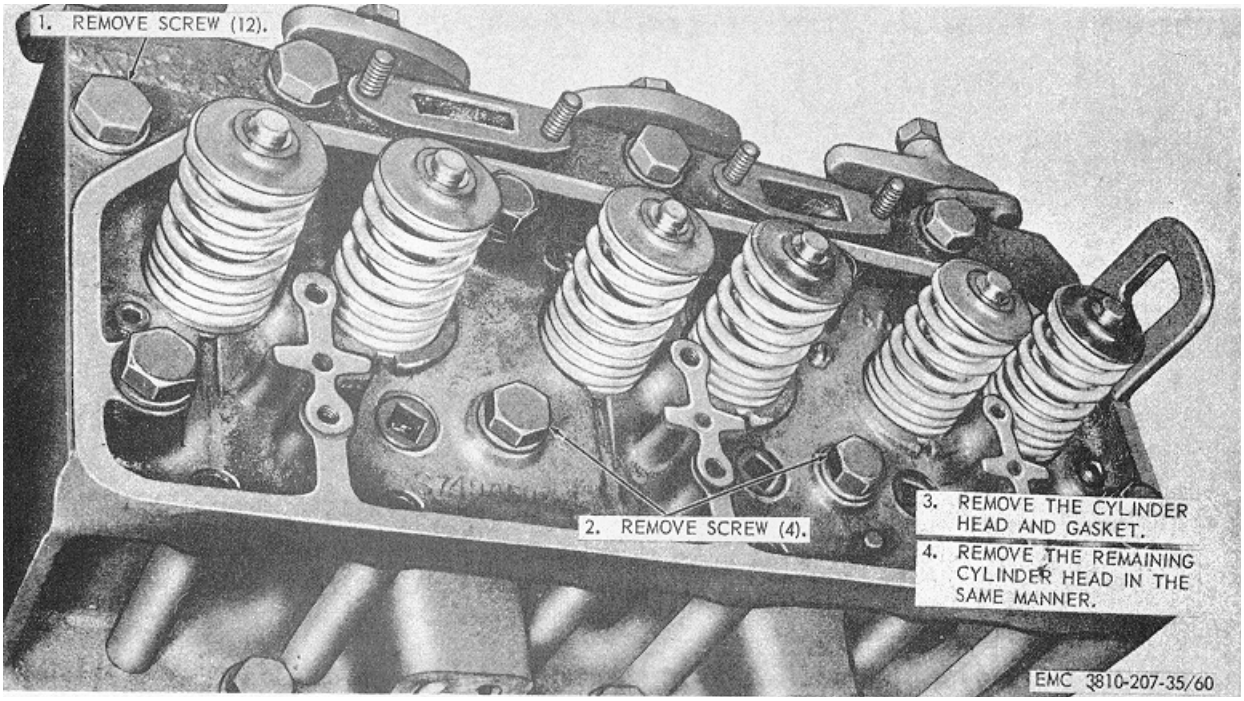


Figure 60. Carrier engine cylinder head and valves, removal and installation

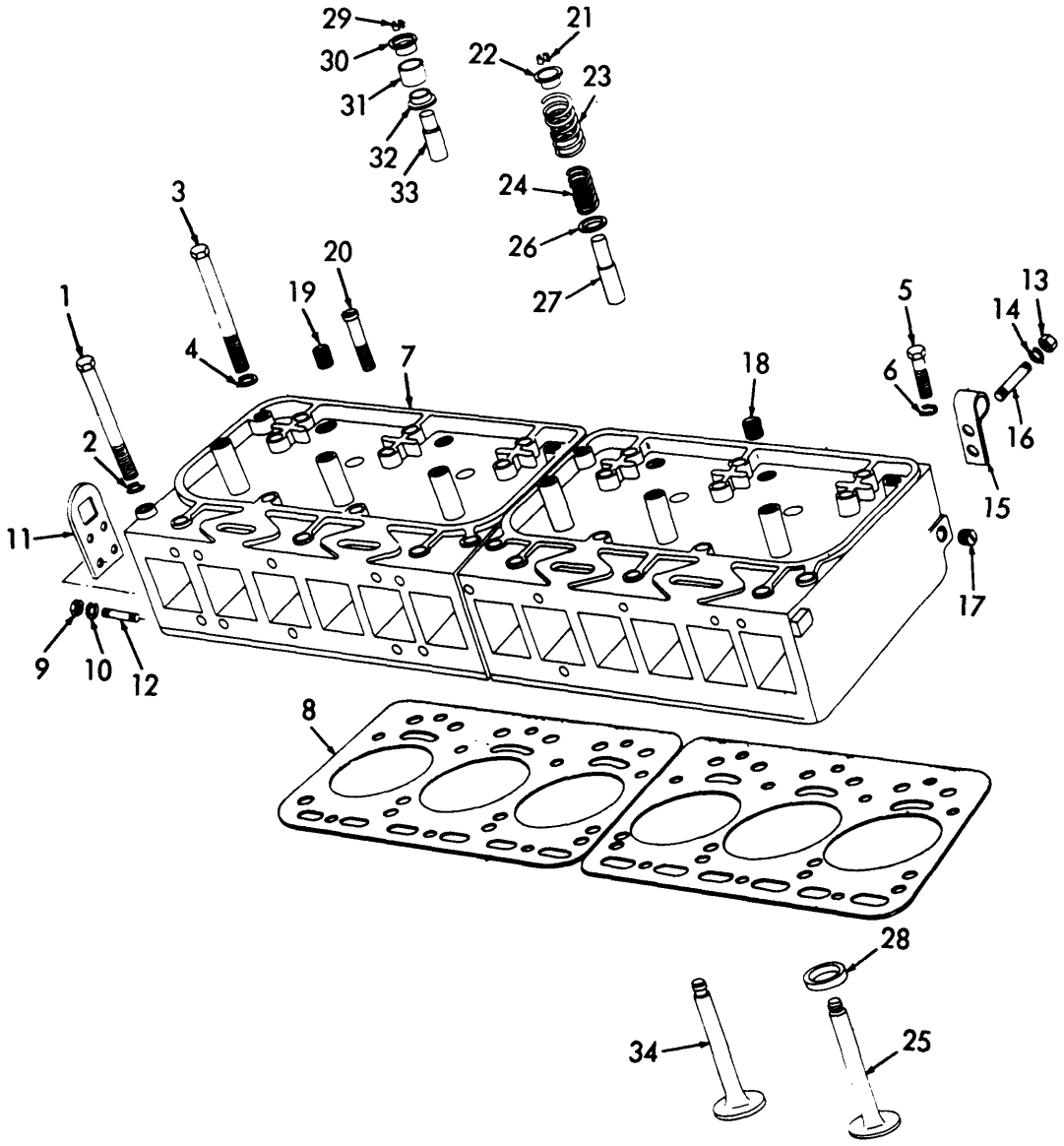


Figure 61. Carrier engine cylinder head and valves, exploded view.

253. Carrier Engine Oil Pump Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier engine oil pump assembly in the reverse of the numerical sequence as illustrated on figure 65.

b. Installation.

(1) Install the carrier engine oil pump assembly as illustrated on figure 64.

(2) Install the carrier engine oil par (par. 249).

1 Screw, cap, 5/8-11 x 7% in. (18 rqr)
2 Lockwasher, 5/8 in. (18 rqr)
3 Screw, cap, 5/8-11 x 6%e in. (4 rqr)
4 Lockwasher, 5/8 in. (4 rqr)
5 Screw, cap, 5/8-11 x 1% in. (6 rqr)
6 Lockwasher, 5/8 in. (6 rqr)
7 Rear cylinder head
8 Gasket (2 rqr)
9 Nut, 3/8-16 (4 rqr)
10 Lockwasher, 3/8 in. (4 rqr)
11 Rear lifting eye
12 Stud, 3/8-16 x 13/8 in. (4 rqr)
13 Nut, 1/2-13 (2 rqr)
14 Lockwasher, 1/2 in. (2 rqr)
15 Front lifting eye
16 Stud, 1/2-13 x 2 13/16 in. (2 rqr)
17 Plug, 1/8 in. NPT (4 rqr)
18 Plug, 3/4 in. NPT (6 rqr)
19 Plug, socket, 1/4 in. (4 rqr)
20 Screw, slotted head, 1/8 in. NPT (2 rqr)
21 Valve spring retainer lock (12 rqr)
22 Valve spring upper retainer (6 rqr)
23 Outer valve spring (12 rqr)
24 Inner valve spring (12 rqr.)
25 Exhaust valve (6 rqr)
26 Exhaust valve spacer (6 rqr)
27 Exhaust valve stem guide (6 rqr)
28 Exhaust valve seat insert (6 rqr)
29 Valve spring retainer lock (12 rqr)
30 Valve spring upper retainer (6 rqr)
31 Valve stem guard (6 rqr)
32 Valve spring lower retainer (12 rqr)
33 Intake valve stem guide (6 rqr)
34 Intake valve (6 rqr)

Figure 61-Continued.

Section XIV. CARRIER ENGINE CONNECTING ROD AND PISTON ASSEMBLIES

254. General

The carrier engine pistons are made of aluminum alloy and are grooved for four piston rings. The two upper grooves are for the compression rings, the second groove also holds an expansion ring. The two lower grooves are for

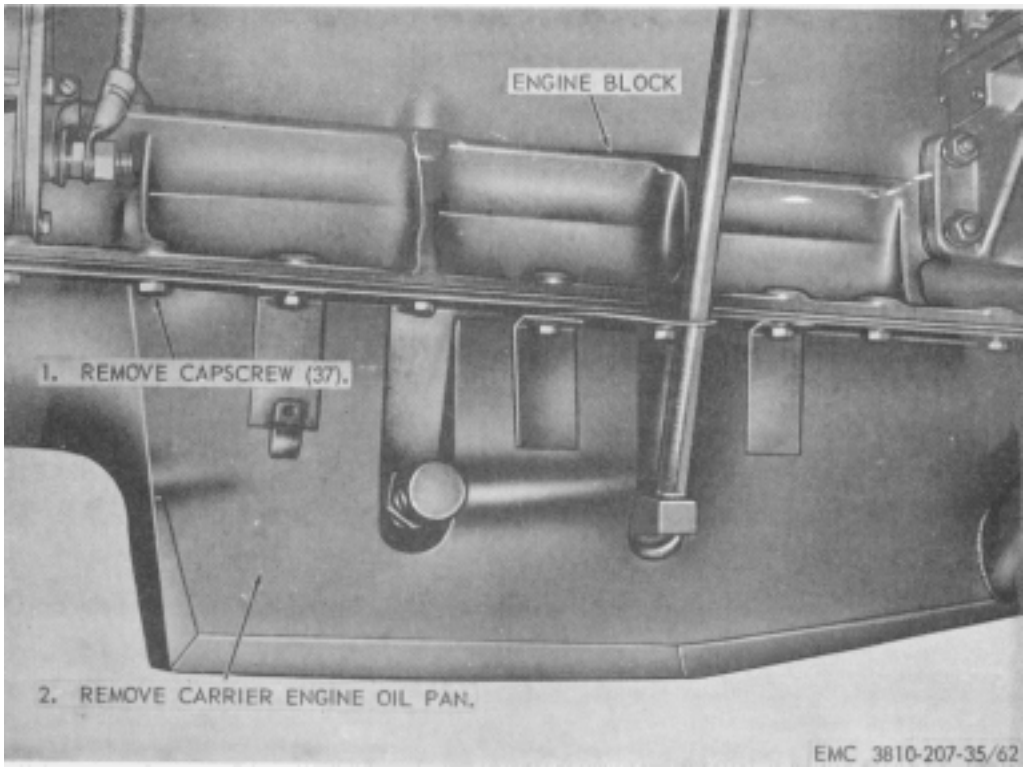
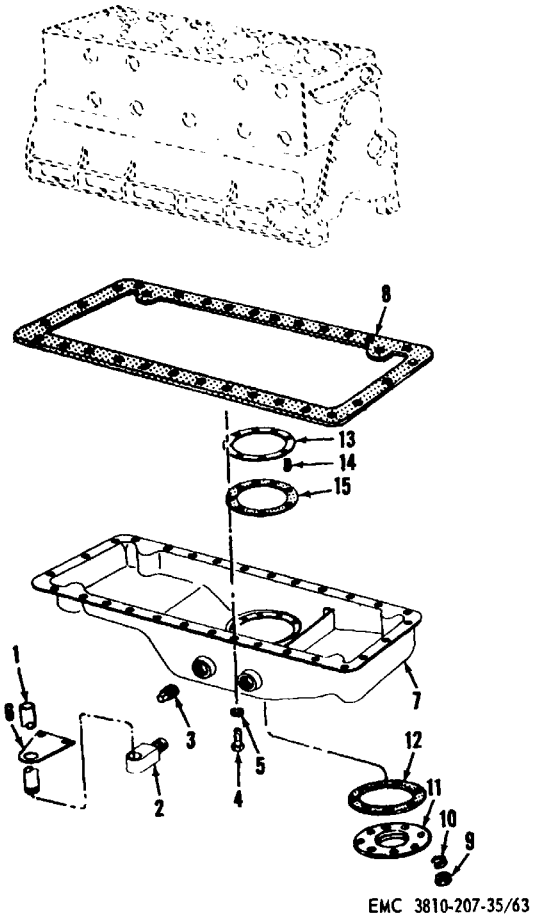


Figure 62. Carrier engine oil pan, removal and installation.



1 Oil tube
2 Oil tube adapter
3 Plug, pipe, 3/4 in. NPT
4 Screw, cap, 3/8-16 x 1 in. (32 rqr)
5 Washer, lock, 3/8 in. (32 rqr)
6 Oil tube mounting bracket
7 Oil pan
8 Gasket
9 Nut, hex, 1/4-20 (8 rqr)
10 Washer, lock, 14 in. (8 rqr)
11 Handhold cover
12 Gasket (2 rqr)
13 Handhold reinforcement ring
14 Stud, 1/4-20 x 7/8 in. (8 rqr)
15 Gasket

Figure 63. Carrier engine oil pan, exploded view.

the oil rings, the fourth groove also holds an expansion ring. The piston pins are held in place i in the piston with two retaining rings to prevent contact with the cylinder walls. The connecting rods are drilled for lubrication. The connecting rods and caps are matched sets and are marked with matched numbers. Always replace rods and caps as a matched set.

255. Carrier Engine Connecting Rod and Piston Assemblies Removal and Disassembly

a. Removal.

(1) Remove the carrier engine cylinder head (par. 243).

(2) Remove the carrier engine oil pan (par. 247).

(3) Remove the connecting rod and piston assemblies as instructed on figure 66.

b. Disassembly. Disassemble the carrier engine connecting rod and piston assemblies in numerical sequence as illustrated on figure 67.

256. Carrier Engine Connecting Rod and Piston Assemblies Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair.

(1) The standard finished size of the piston pin is 4.524 to 4.539 inches long, diameter is 1.7498 to 1.7500 inches. Fit in piston boss is 0.018 to 0.003 inch, and 0.003 to 0.007 inch in rod bushing. The rod bushing is 115r6 inches long, 1.941 to 1.944 inches outside diameter, and 1.7503 to 1.7505 inches inside diameter.

(2) The correct piston ring gap clearance for this engine is 0.018 to 0.032 inch. Install the piston ring in cylinder. Invert the piston in the cylinder and push piston against the ring until the ring is square with the cylinder bore. Remove the piston.

(3) Check the piston ring gap with a feeler gage. If the gage exceeds 0.032 inch, replace the ring. If the gap is less than 0.018 inch, file the end of the ring until proper clearance is obtained.

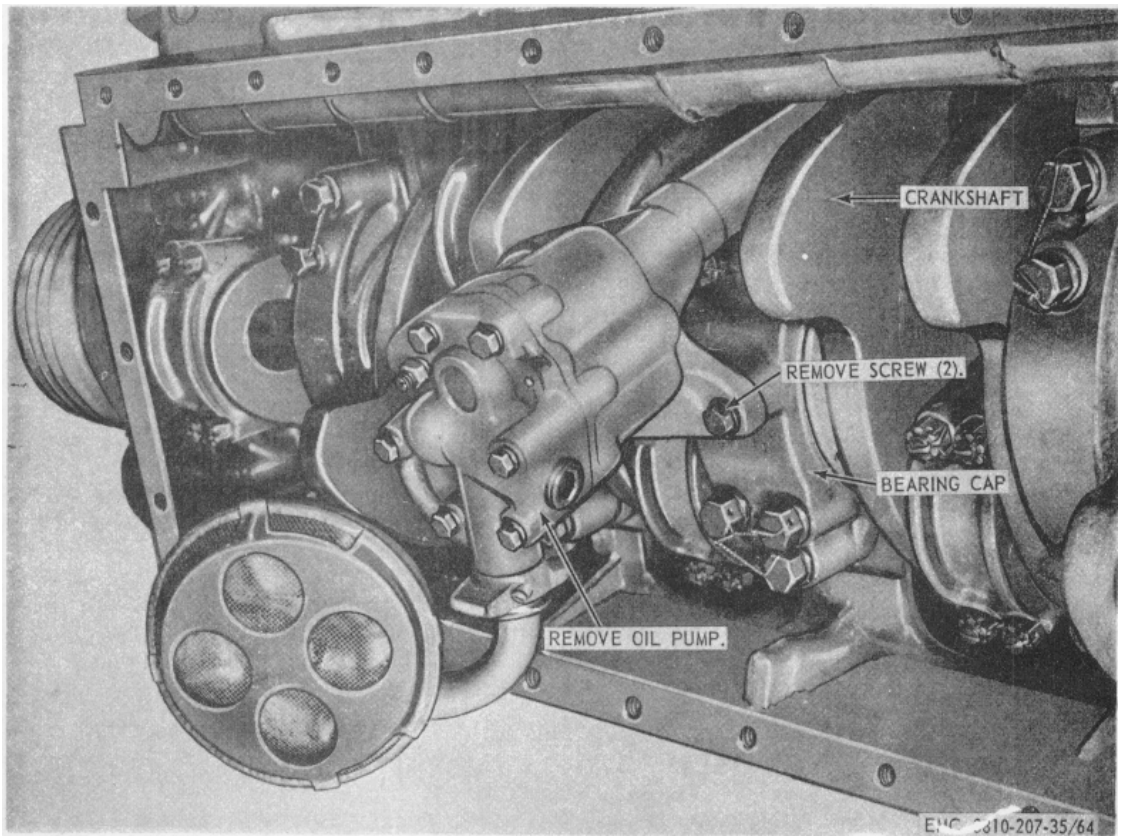


Figure 64. Carrier engine oil pump assembly, removal and installation.

(4) Check the piston ring groove clearance. The correct clearance for first ring is 0.004 to 0.006 inch, second, third, and fourth rings are 0.0015 to 0.0035 inch. Install the piston rings on the piston and attempt to slide the feeler gage in the groove between the piston ring and piston land.

(5) If the feeler gage will not slide in the groove between the ring and land or if the rings are sprung, distorted, or excessively worn, replace the rings.

(6) Fit the piston in the cylinder bore with an 0.008 inch feeler gage. Attach the feeler gage to a spring scales.

(7) Invert the piston and feeler gage over the cylinder. Place the feeler gage and the piston in the cylinder. Withdraw the feeler gage and observe the scale reading.

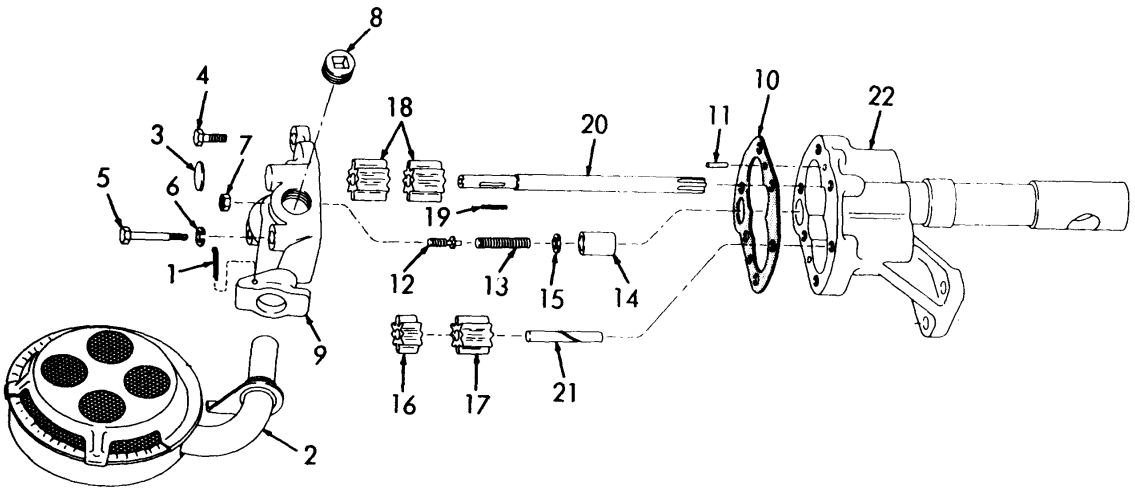
(8) The proper scale reading is from 5 to 10 pounds. Test the cylinder bore in several places.

(9) The proper thickness of the rod bearings is 0.0950 to 0.0955 inch. The wear limit is 0.005 inch.

(10) Replace or repair all damaged or defective parts. Always replace bearings as matched sets.

257. Carrier Engine Connecting Rod and Piston Assemblies Reassemblies and Installation

a. Reassembly. Reassemble the carrier engine connecting rod and piston assemblies in the reverse of the numerical sequence as illustrated on figure 67.



1 Pin, cotter 1/16 x 1/2 in.
2 Screened float
3 Plug
4 Screw, cap, 1/4-20 x % in. (2 rqr)
5 Screw, cap, 1/4-20 x 1% in. (4 rqr)
6 Washer, lock, 1/4 in. (4 rqr)
7 Adjusting screw locknut
8 Plug, pipe,3/4 in.
9 Pump body cover
10 Gasket
11 Pin (2 rqr)
12 Relief valve adjusting screw
13 Relief valve plunger spring
14 Relief valve plunger
15 Shim (4 rqr)
16 Lower idler gear
17 Upper idler gear
18 Drive gear (2 rqr)
19 Key
20 Drive shaft
21 Idler gear shaft
22 Pump body

Figure 65. Carrier engine oil pump assembly, exploded view.

b. Installation.
(1) Install the carrier engine connecting rod and piston assemblies as illustrated on figure 66.
(2) Install the carrier engine oil pan (par. 249).
(3) Install the carrier engine cylinder head (par. 245)

Section XV. CARRIER ENGINE CLUTCH HOUSING

258. General

A cast steel clutch housing incloses the clutch mechanism. The housing provides access to the clutch for inspection and adjustments as well as for clutch bearing lubrication. Remote operation of the clutch is by linkage connected to a shaft operated yoke located in the clutch housing.

259. Carrier Engine Clutch Housing Removal and Disassembly

a. Removal.
(1) Disconnect the propeller shaft (TM 5-3810-207-20).
(2) Disconnect the transmission controls (TM 5-3810-207-20).
(3) Remove the carrier transmission (par. 307).
(4) Remove the carrier engine clutch housing as instructed on figure 68.

b. Disassembly. Disassemble the carrier engine clutch housing in numerical sequence as illustrated on figure 69.

260. Carrier Engine Clutch Housing Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

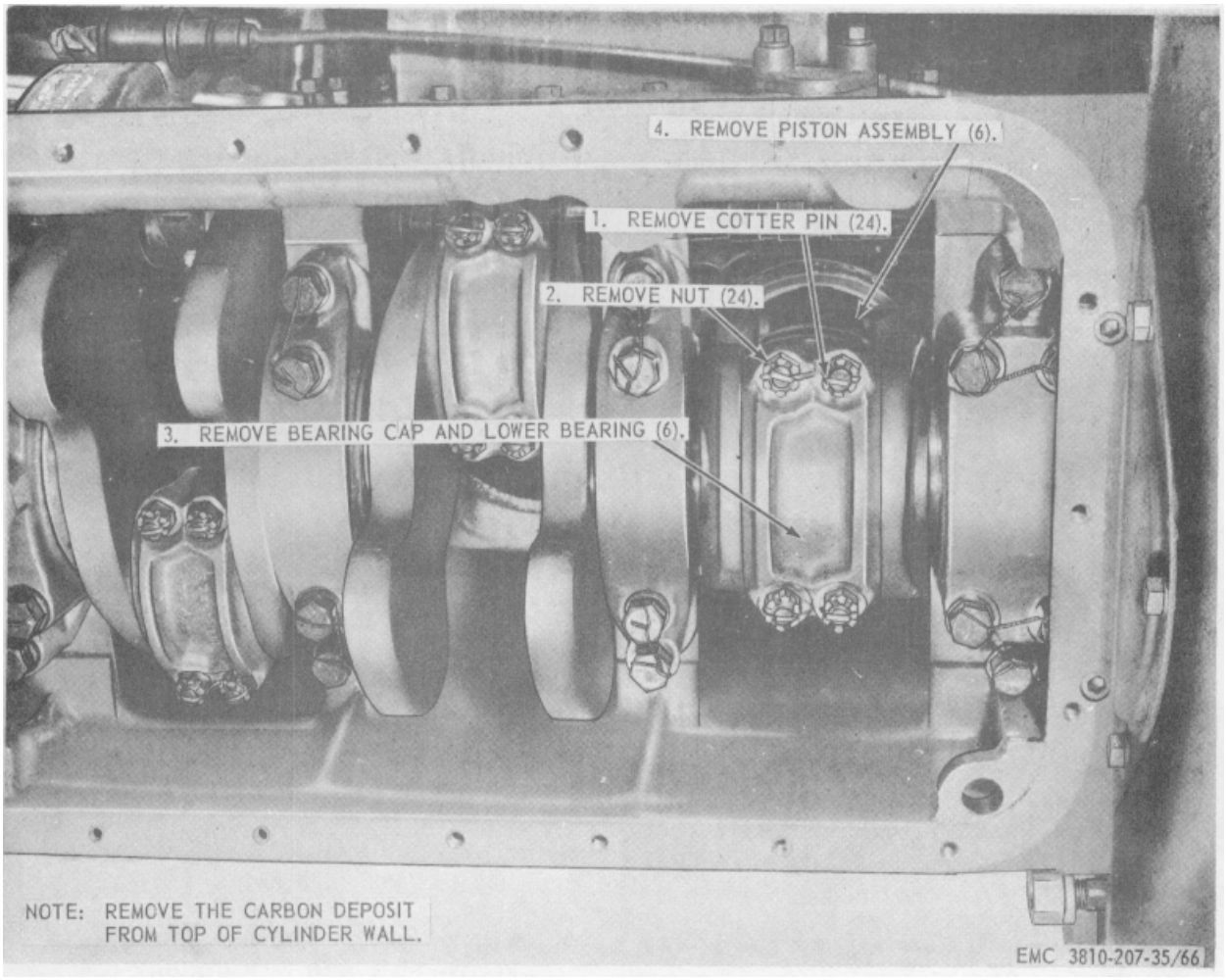


Figure 66. Carrier engine piston and connecting rod assemblies, removal and installation.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts.

261. Carrier Engine Clutch Housing Reassembly and Installation

a. Reassembly. Reassemble the carrier engine clutch housing in the reverse of the numerical sequence illustrated on figure 69.

b. Installation.

(1) Install the carrier engine clutch housing as illustrated on figure 68.
(2) Install the carrier transmission (par. 309).
(3) Connect the transmission controls (TM 5-3810-207-20).
(4) Connect the propeller shaft (TM 53810-207-20).

Section XVI. CARRIER ENGINE CLUTCH ASSEMBLY

262. General

A push-type, dry-disk, multiple-levered clutch of adjustable type construction is used on the carrier engine. The clutch assembly is fastened to the engine flywheel and an independently driven disk revolves the clutch unit

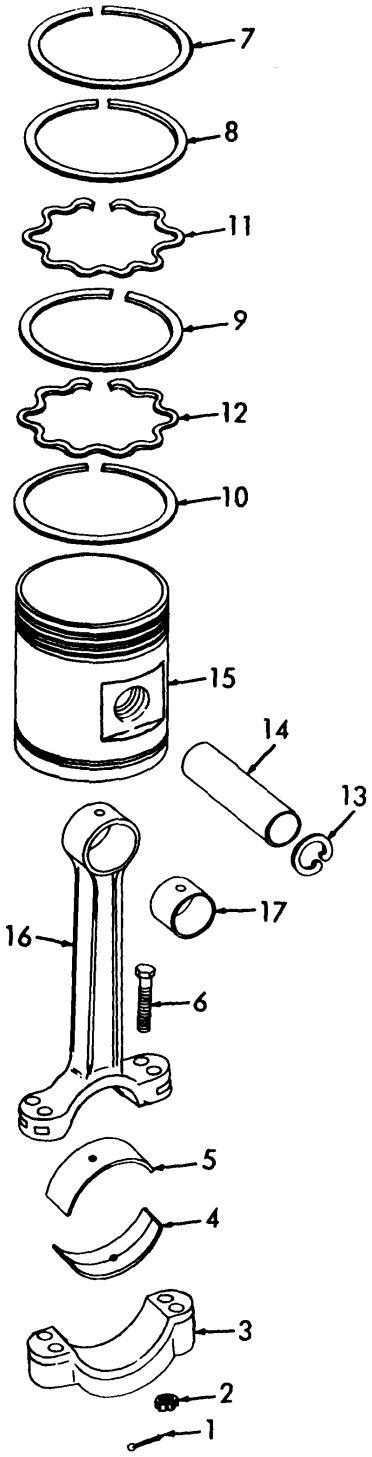


Figure 67. Carrier engine piston and connecting rod, exploded view.

when the clutch is engaged. The facing wear of the driven disks compensated for by shim removal that restores the original spring pressure.

263. Carrier Engine Clutch Assembly Removal and Disassembly

a. Removal.

(1) Disconnect the propeller shaft (TM 5-3810-207-20).
(2) Remove the clutch housing (par. 259).
(3) Remove the carrier engine clutch assembly as instructed on figure 70.

b. Disassembly. Disassemble the carrier engine clutch assembly in numerical sequence as illustrated on figure 71.

264. Carrier Engine Clutch Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean the disk assembly with a dry cloth. Clean remaining parts with an approved cleaning solvent and dry thoroughly.

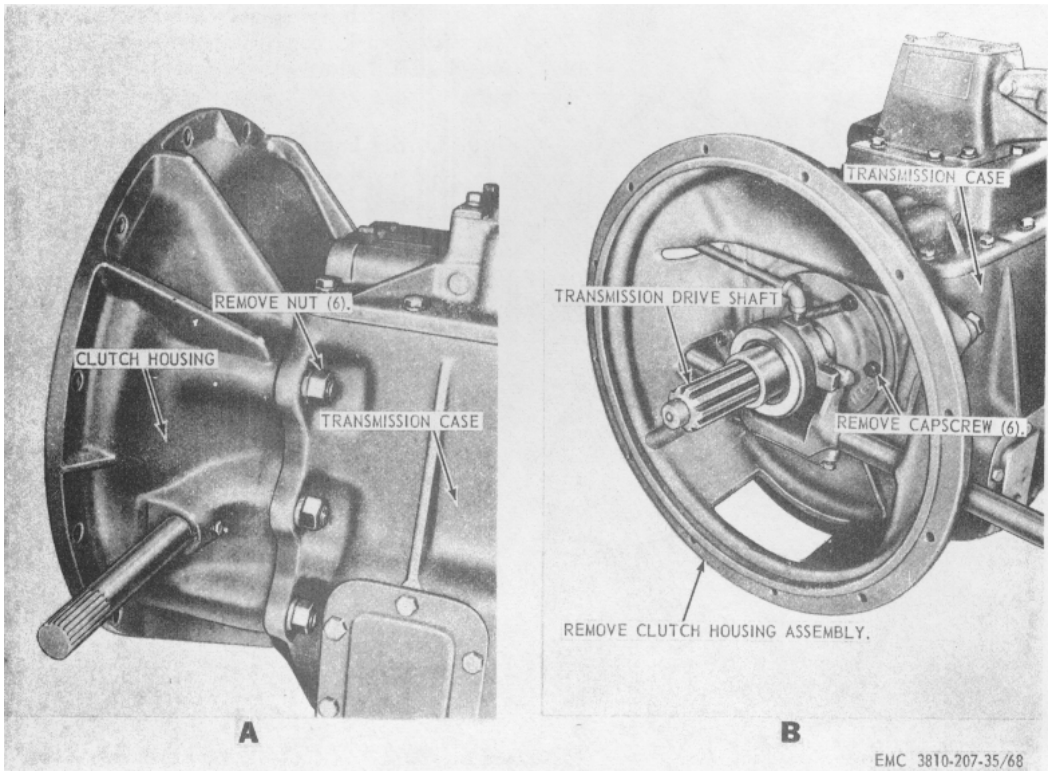
b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective or damaged parts. The proper clearance between the pressure plate driving lugs and slots of the flywheel ring is from 0.44 to 0.006 inches.

265. Carrier Engine Clutch Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier engine clutch assembly in the reverse of the numerical sequence as illustrated on figure 71.

1 Pin, cotter, 3/32 x 3/4 in. (24 rqr)
2 Nut, 7/61-20 (24 rqr)
3 Bearing cap (6 rqr)
4 Lower bearing (6 rqr)
5 Upper bearing (6 rqr)
6 Ball, special, 7/16-20 (24 rqr)
7 Piston ring (compression) (6 rqr)
8 Piston ring (compression) (6 rqr)
9 Oil ring (6 rqr)
10 Oil ring (6 rqr)
11 Expander ring (6 rqr)
12 Expander ring (6 rqr)
13 Retaining ring (12 rqr)
14 Piston pin (6 rqr)
15 Piston (6 rqr)
16 Connecting rod (6 rqr)
17 Bushing (6 rqr)

Figure 67-Continued.



A. Clutch housing outside mounting point

B. Clutch housing inside mounting point

Figure 68. Carrier engine clutch housing, removal and installation.

b. Installation.

(1) Install the carrier engine clutch assembly as illustrated on figure 70.

(2) Install the clutch housing (par. 261).

(3) Connect the propeller shaft (TM 53810-207-20).

Section XVII. CARRIER ENGINE FLYWHEEL AND FLYWHEEL HOUSING

266. General

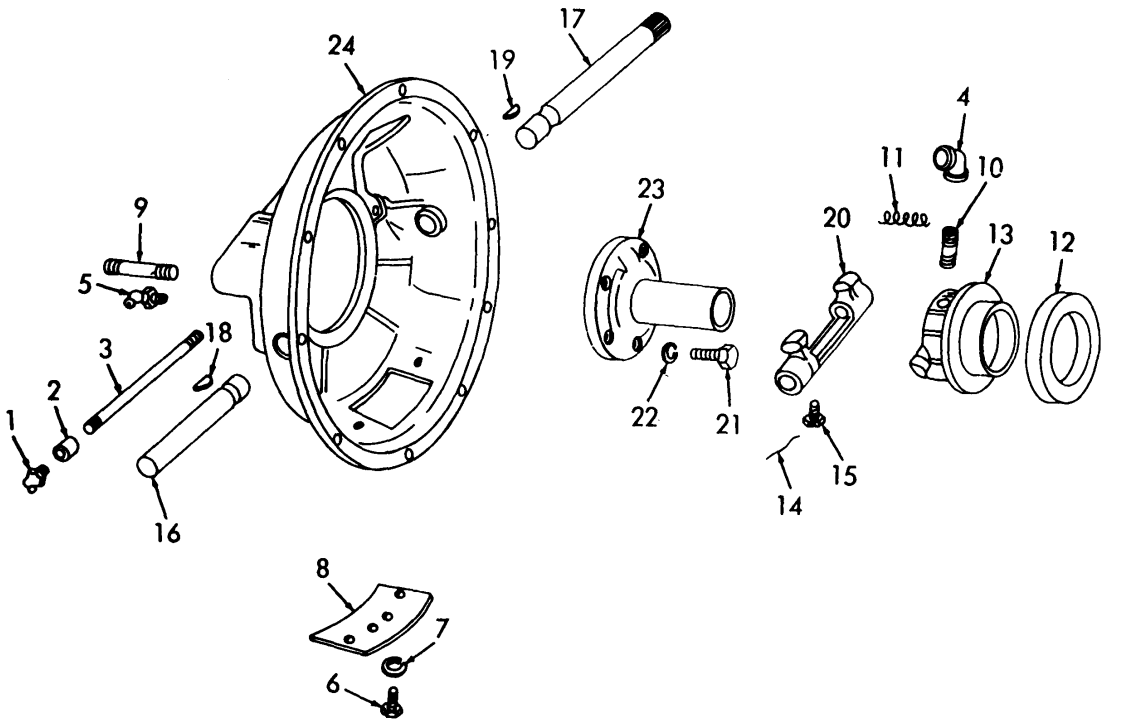
The carrier engine flywheel is attached to the crankshaft flange with six capscrews, lockwashers, and a lockwire. One of the cap screws is offset 1/16 inch. A corresponding hole is located in the crankshaft flange so the flywheel can be assembled in but one position. It is very important to tighten the flywheel capscrews securely. The flywheel housing provides support for mounting the clutch housing and transmission assemblies as well as affording protection to the clutch mechanism and flywheel ring gear.

267. Carrier Engine Flywheel and Flywheel Housing Removal and Disassembly

a. Removal.

(1) Remove the starter assembly (TM 5-3810-207-20).

(2) Remove the clutch assembly (par. 263).



1	Fitting, lubrication	13	Clutch bearing carrier
2	Coupling	14	Lockwire
3	Lubrication tube	15	Screw, cap, 3/8-16 x 1 in. (2 rqr)
4	Elbow	16	Short clutch shaft
5	Fitting, lubrication	17	Long clutch shaft
6	Screw, cap, 5se-18 x 1/2 in. (2 rqr)	18	Woodruff key, No. 607
7	Washer, lock, 5/16 in. (2 rqr)	19	Woodruff key, No. 607
8	Inspection plate	20	Yoke
9	Stud, 5/8 x 2 in. (6 rqr)	21	Screw, cap, 3/8-16 x 11/4 in. (6 rqr)
10	Nipple	22	Washer, lock, 3/8 in. (6 rqr)
11	Spring (2 rqr)	23	Bearing cover
12	Clutch bearing	24	Clutch housing

Figure 69. Carrier engine clutch housing, exploded view.

(3) Remove the flywheel and flywheel housing as instructed on figure 72.

b. Disassembly. Disassemble the flywheel and flywheel housing in numerical sequence as illustrated on figure 73.

268. Carrier Engine Flywheel and Flywheel Housing Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts. Maximum run-out of 124 the flywheel should not exceed 0.002 indicator reading.

269. Carrier Engine Flywheel and Flywheel Housing Reassembly and Installation

a. Reassembly. Reassemble the flywheel and flywheel housing in the reverse of the numerical sequence as illustrated on figure 73.

b. Installation.

(1) Install the flywheel and flywheel housing as illustrated on figure 72.
(2) Install the clutch assembly (par. 265).
(3) Install the starter assembly (TM 53810-207-20).

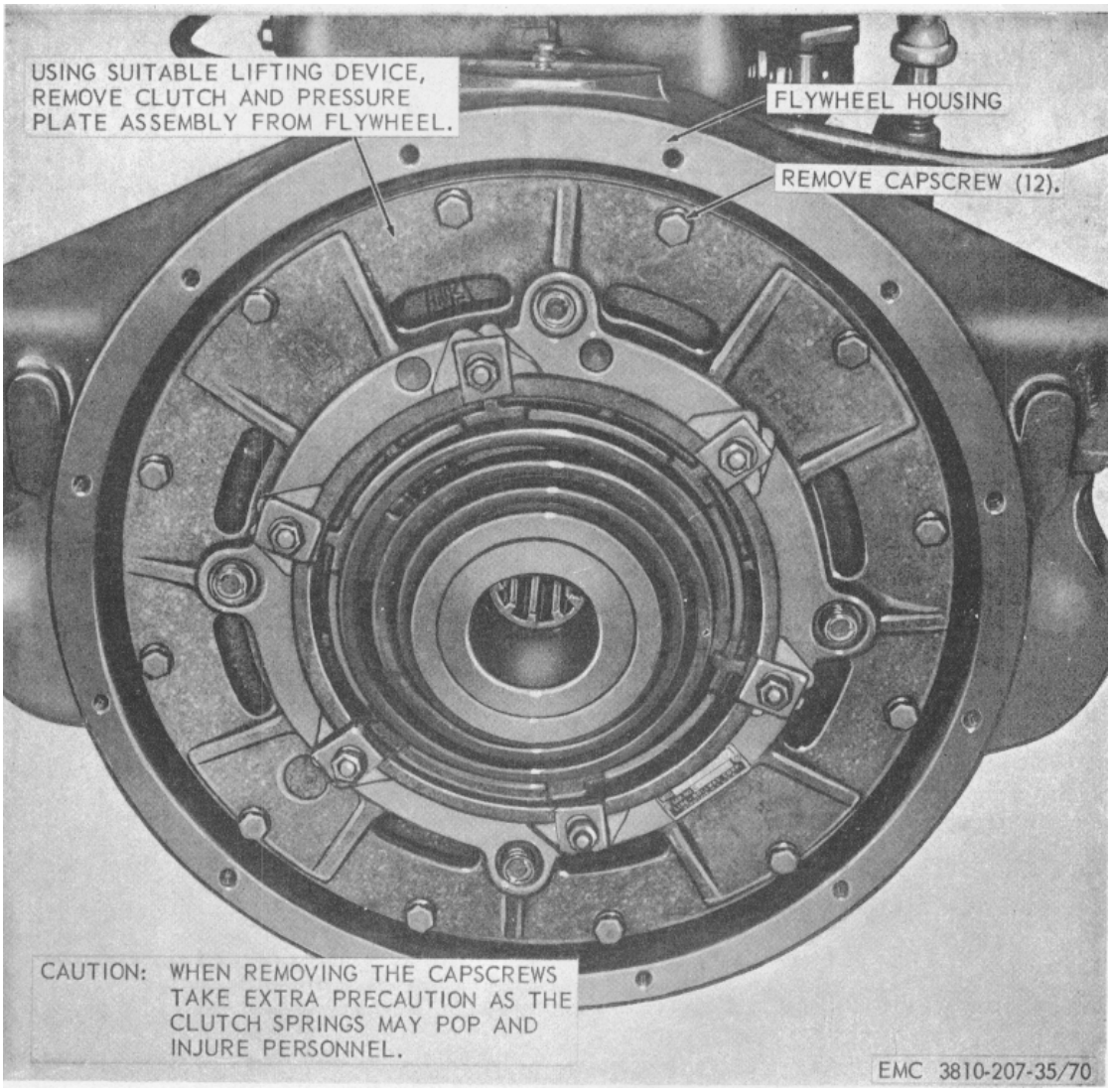


Figure 70. Carrier engine clutch and pressure plate, removal and installation.

Section XVIII. CARRIER ENGINE VIBRATION DAMPER AND PULLEY ASSEMBLY

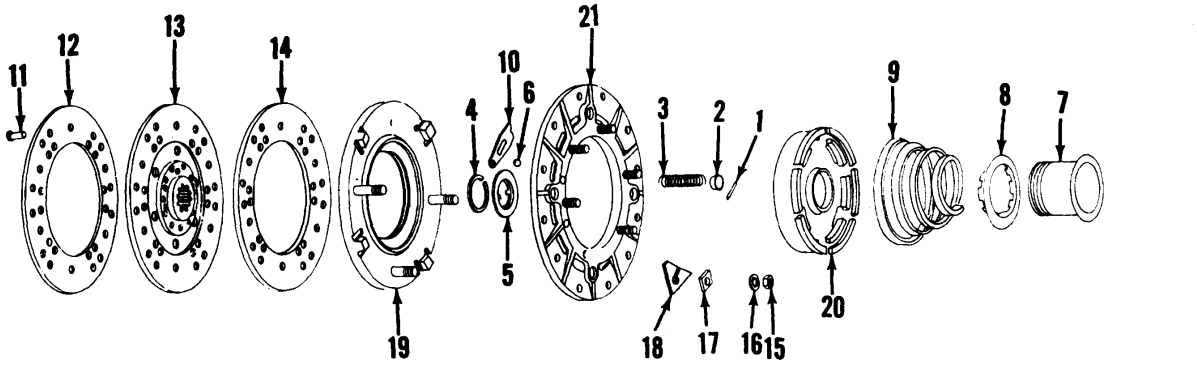
270. General

The carrier engine vibration damper is dynamically balanced and attached to the drive pulley mounted on the front end of the crankshaft. The vibration damper is used to eliminate the vibration of the crankshaft.

271. Carrier Engine Vibration Damper and Pulley Assembly Removal and Disassembly

a. Removal.

(1) Remove the radiator from the carrier engine (par. 227).



1	Spring retaining pin (4 rqr)	8	Equalizer ring	15	Nut, 3/8-16 (6 rqr)
2	Spring retaining washer	9	Pressure spring	16	Washer, 3/8 in. (6 rqr)
3	Retractor spring (4 rqr)	10	Pressure lever (20 rqr)	17	Adjusting strap (6 rqr)
4	Lockring	11	Facing rivet (30 rqr)	18	Adjusting shim (48 rqr)
5	Fulcrum ring (2 rqr)	12	Facing	19	Pressure plate and stud assembly
6	Lever locking ball (20 rqr)	13	Driven disk	20	Adjusting plate
7	Sleeve	14	Facing	21	Flywheel ring

Figure 71. Carrier engine clutch assembly, exploded view.

(2) Remove the carrier engine vibration damper and pulley assembly from the crankshaft in the numerical sequence as instructed on figure 74.

b. Disassembly. Disassemble the carrier engine vibration damper and pulley assembly as illustrated on figure 75.

272. Carrier Engine Vibration Damper and Pulley Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent.

b. Inspection and Repair.

(1) Inspect the damper for breaks, cracks, and other damage. Replace defective vibration damper.

(2) Inspect the pulley for breaks, cracks, and other damage. Replace defective pulley.

(3) Inspect the remaining parts for damaged threads, cracks, bends, breaks, and other damage.

273. Carrier Engine Vibration Damper and Pulley Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier engine vibration damper and pulley assembly on the crankshaft in the reverse of the numerical sequence as instructed on figure 75.

b. Installation.

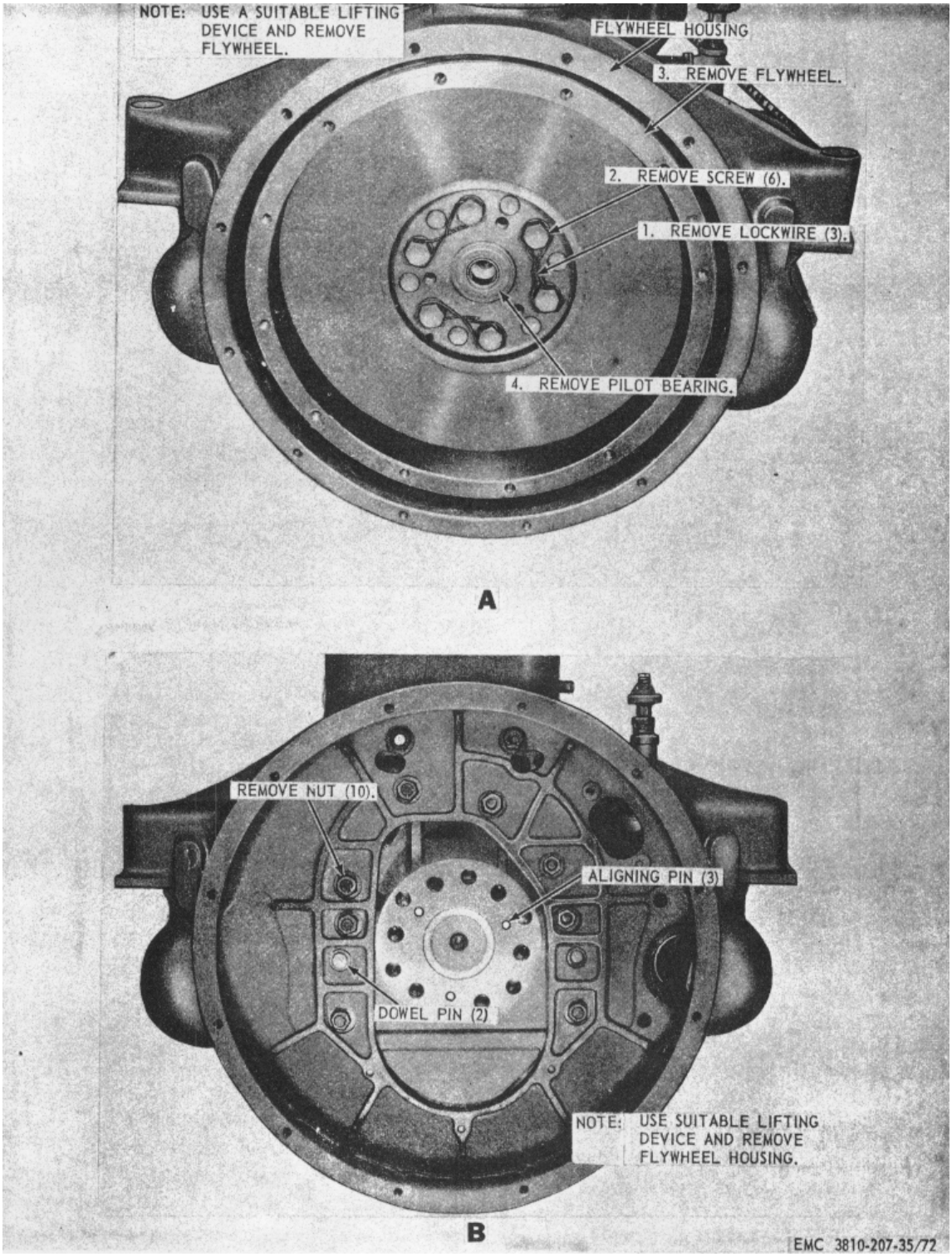
(1) Install the vibration damper and pulley assembly as illustrated on figure 74.

(2) Install the radiator on the carrier engine (par. 229).

Section XIX. CARRIER ENGINE TIMING GEARS

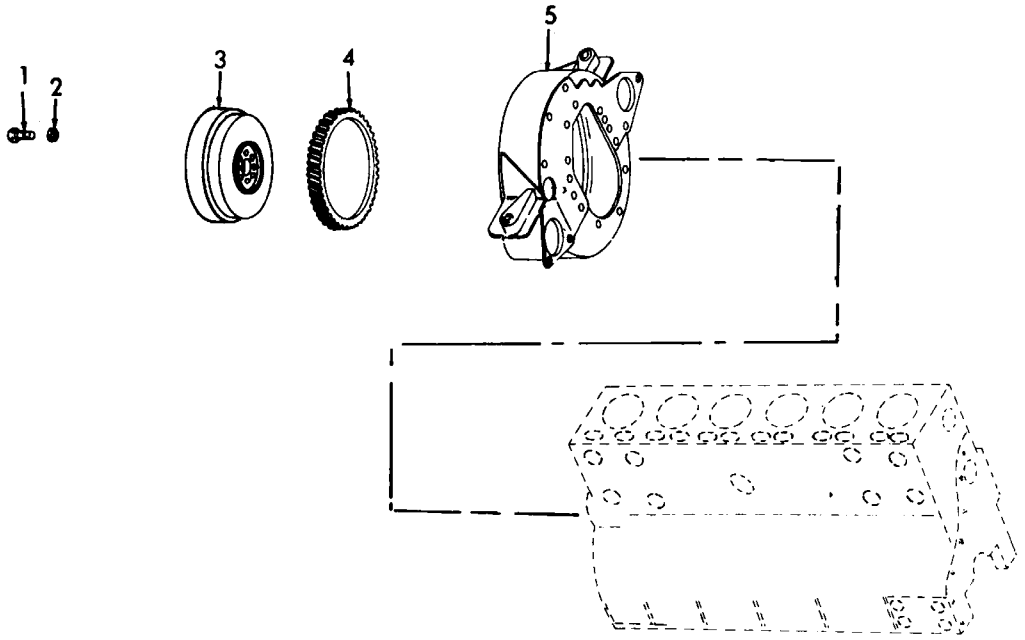
274. General

The carrier engine timing gears consist of the crankshaft and camshaft gears which are helically cut to provide greatest meshing surface. The crankshaft gear drives the camshaft gear at one-half engine speed.



A. Flywheel removal B. Flywheel housing removal

Figure 72. Carrier engine flywheel and flywheel housing, removal and installation.



1	Screw, cap, 5/8-18 x 13/4 in. (6 rqr)	3	Flywheel	5	Flywheel housing
2	Washer, lock, 5/8 in. (6 rqr)	4	Ring gear		

Figure 73. Carrier engine flywheel, ring gear, and flywheel housing, exploded view.

275. Carrier Engine Timing Gears Removal

a. Remove the carrier engine assembly (par. 46).
b. Remove the fan and fan belts (TM 58810-207-20).
c. Remove the fuel pump (TM 5-3810-20720).
d. Remove the accessory drive (par. 223).
e. Remove the oil pump (par. 251).
f. Remove the flywheel housing (par. 267).
g. Remove the cylinder head and valves (par. 243).
h. Remove the vibrator damper and pulley (par. 271).
i. Remove the carrier engine timing gears as instructed on figure 76.

276. Carrier Engine Timing Gears Cleaning and Inspection

a. Clean all parts with an approved cleaning solvent and dry thoroughly.
b. Inspect all parts for excessive wear or damage. Replace all defective parts. Always replace gears in pairs.

277. Carrier Engine Timing Gears Installation

a. Install the carrier engine timing gears as illustrated on figure 76.
b. Install the vibrator damper and pulley (par. 273).
c. Install the cylinder head and valves (par. 245).

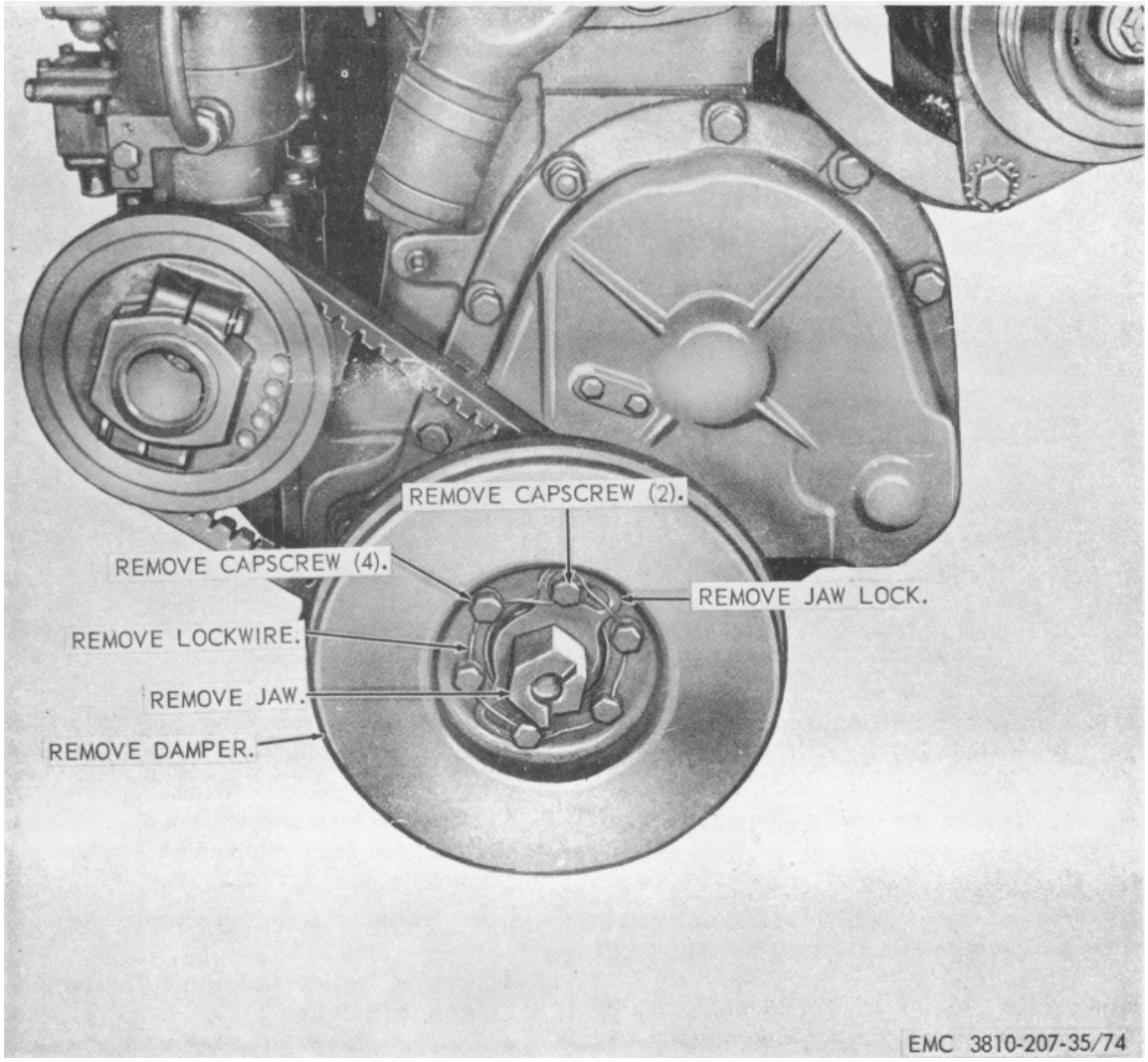


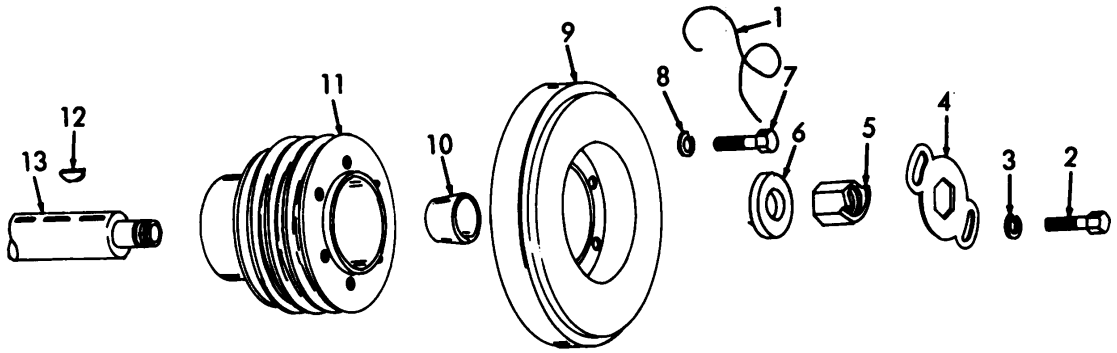
Figure 74. Carrier engine vibration damper and pulley assembly, removal and installation.

d. Install the flywheel housing (par. 269).
e. Install the oil pump (par. 253).
f. Install the accessory drive (par. 225).
g. Install the fuel pump (TM 5-3810-207-20).
h. Install the fan and fan belts (TM 5-3810-207-20).
i. Install the carrier engine assembly (par. 46).

Section XX. CARRIER ENGINE CAMSHAFT

278. General

A one-piece drop-forged camshaft is used in the carrier engine and is supported by replaceable bushings. An integral gear midway between the ends of the camshaft provides the drive for the accessory drive that drives the engine oil pump and other accessories.



EMC 3810-207-35/75

1 Lockwire, 17 in.
2 Screw, cap, 3/8-16 x 17Ae in. (2 rqr)
3 Washer, lock, 3/8 in. (2 rqr)
4 Jaw lock
5 Jaw
6 Jaw washer
7 Screw, cap, 3/8-16 x 17A7 in. (4 rqr)
8 Washer, lock, 3/8 in. (4 rqr)
9 Vibration damper
10 Split collar
11 Pulley
12 Woodruff key (8 rqr)
13 Crankshaft

Figure 75. Carrier engine vibration damper and pulley assembly, exploded view.

279. Carrier Engine Camshaft Removal and Disassembly

a. Removal.
(1) Remove the timing gears (par. 275).
(2) Remove the carrier engine camshaft as instructed on figure 77.

b. Disassembly. Disassemble the camshaft in numerical sequence as instructed on figure 78.

280. Carrier Engine Camshaft Cleaning and Inspection

a. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspect all parts for excessive wear or damage.

c. Inspect the camshaft bearing journal for diameter of 2.2470 inch minimum to 2.2480 inch maximum.

d. Inspect the camshaft end play for a clearance of 0.004 inch minimum to 0.006 inch maximum.

e. Inspect the camshaft bushings for tolerance of 2.2495 inch minimum to 2.2500 inch maximum.

f. Replace all defective parts.

281. Carrier Engine Camshaft Reassembly and Installation

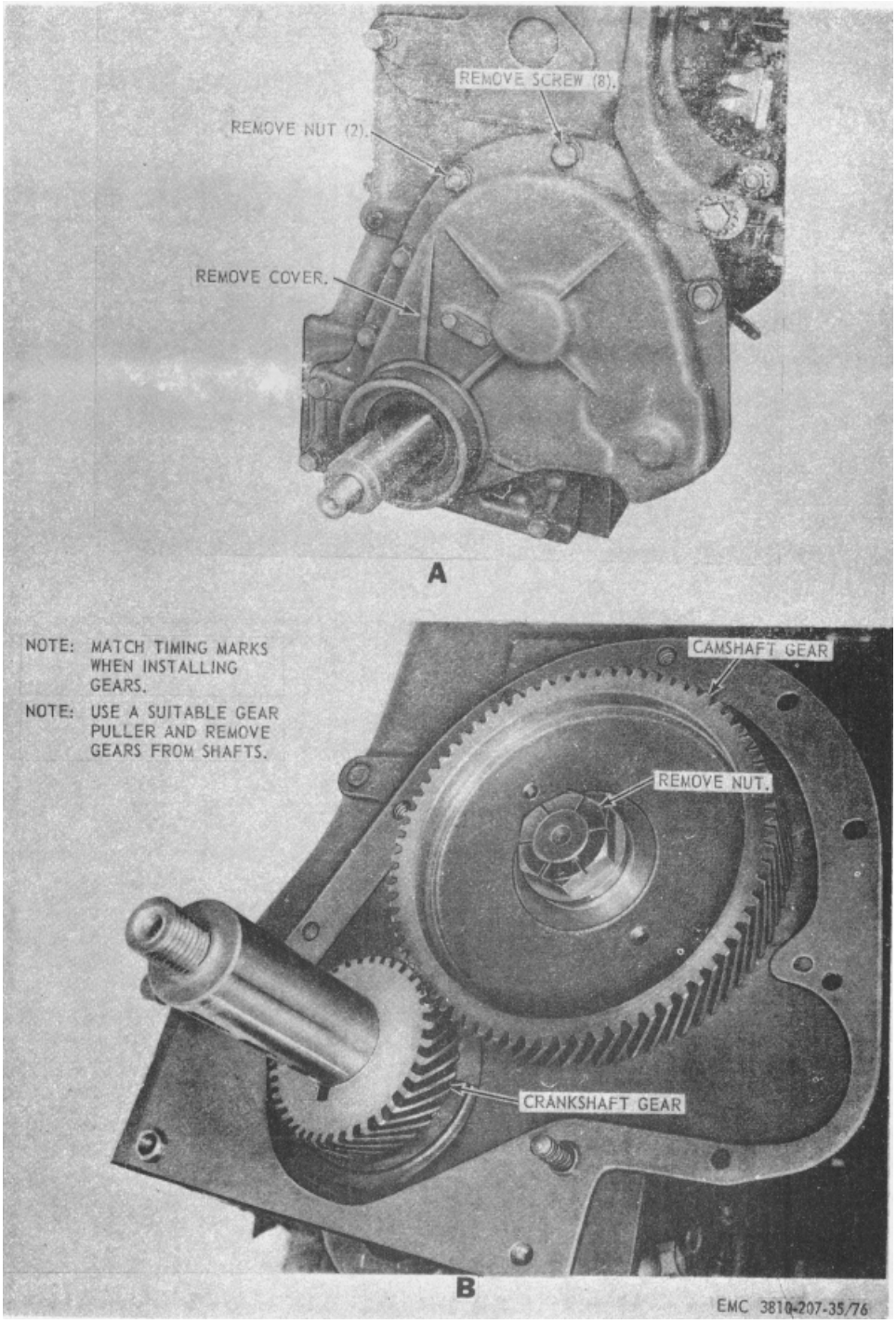
a. Reassembly. Reassemble the camshaft in reverse of the numerical sequence as instructed on figure 78.

b. Installation.
(1) Install the carrier engine camshaft as illustrated on figure 77.
(2) Install the timing gears (par. 277).

Section XXI. CARRIER ENGINE CRANKSHAFT AND MAIN BEARINGS

282. General

The carrier engine crankshaft is a counterbalanced throw-type, drop forging. The crankshaft supports the connecting rods and pistons along its length. At the forward end is located the crankshaft drive gear that drives the camshaft gear. A flywheel is mounted to the rear end of the crankshaft. Bearing caps support



A. Timing gar cover, installed B. Timing gears, installed

Figure 76. Carrier engine timing gears, removal and installation.

the crankshaft within the crankcase. The primary purpose of the crankshaft is to convert the thrust force from the piston and connecting rod assemblies into torque power.

283. Carrier Engine Crankshaft and Main Bearings Removal and Disassembly

a. Removal.

(1) Remove the carrier engine (par. 46).

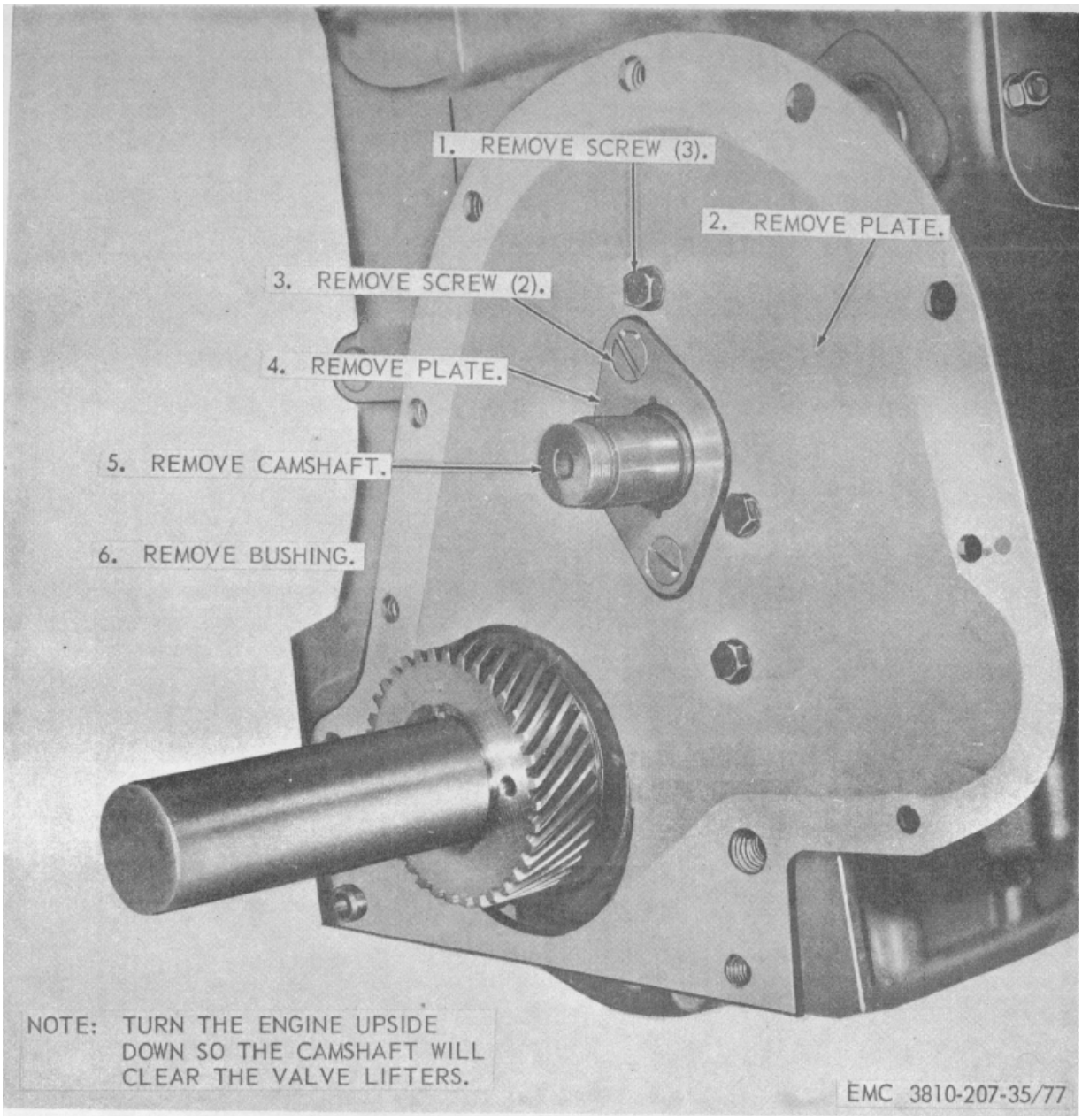


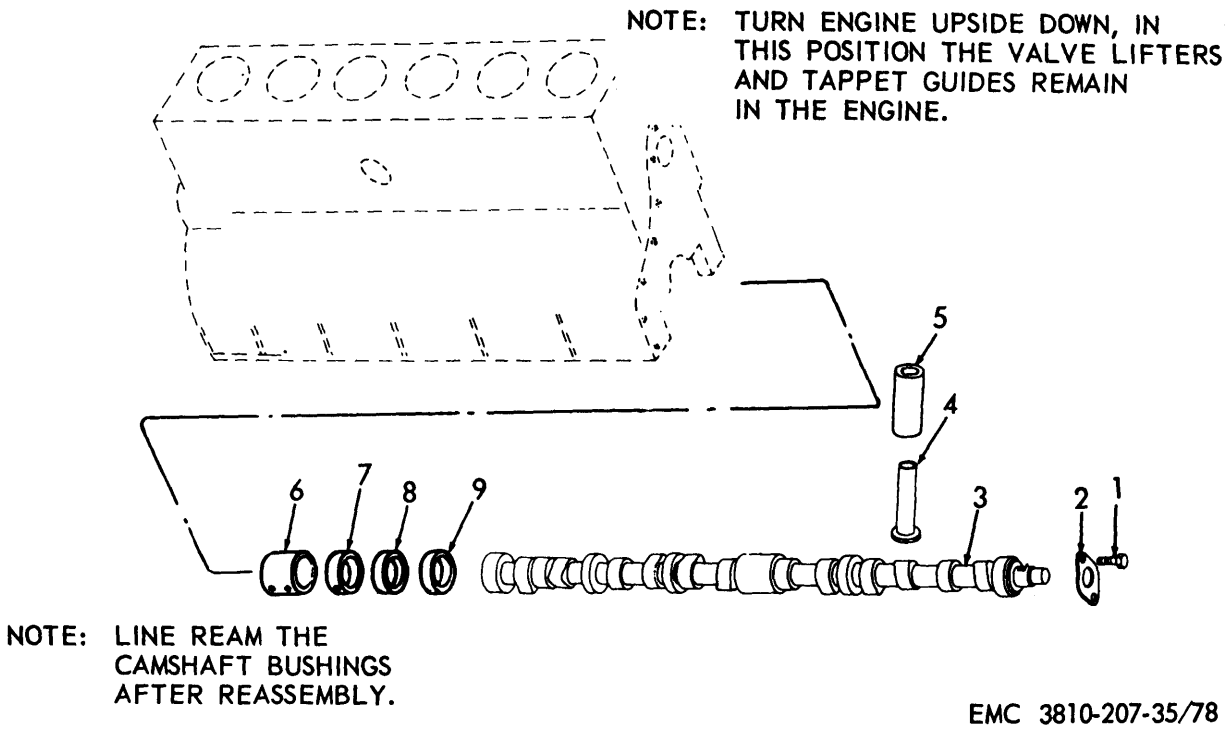
Figure 77. Carrier engine camshaft and bushing, removal and installation.

(2) Remove the flywheel housing (par. 267).
(3) Remove the oil pump (par. 251).
(4) Remove the pistons and connecting rods (par. 255).
(5) Remove the timing gears (par. 275).
(6) Remove the carrier engine crankshaft and main bearings as instructed on figure 79.

b. Disassembly. Disassemble the carrier engine crankshaft and main bearings in numerical sequence as illustrated on figure 80.

284. Carrier Engine Crankshaft and Main Bearings Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.



1 Screw, machine, 3/8-16 x % in. (2 rqr)
2 Thrust plate
3 Camshaft
4 Valve tappet (12 rqr)
5 Valve tappet guide (12 rqr)
6 Center camshaft bushing
7 Rear camshaft bushing
8 Front camshaft bushing
9 Intermediate camshaft bushing (2 rqr)

Figure 78. Carrier engine camshaft, bushings, and valve lifters, exploded view.

b. Inspection and Repair.

(1) Inspect the crankshaft for scored or damaged bearing journals, cracks, breaks, or other damage. Replace a defective crankshaft as necessary.
(2) Inspect the connecting rod bearings and crankshaft main bearings for scores, cracks, breaks, or excessive wear.
(3) Inspect the bearing caps for breaks, cracks, or other damage. Replace a defective bearing cap as necessary.
(4) Inspect the crankshaft main bearing journals for a diameter of 3.749 inch minimum to 3.750 inch maximum. The main journal limits are 0.001 inch minimum to 0.004 inch maximum.
(5) Inspect the crankshaft end play for 0.005 inch minimum to 0.008 inch maximum.
(6) Inspect the crank pin. The diameter should be between 3.499 inch minimum and 3.500 inch maximum.

285. Carrier Engine Crankshaft and Main Bearings Reassembly and Installation

a. Reassembly. Reassemble the carrier engine crankshaft and main bearings in the reverse of the numerical sequence as illustrated on figure 80.

b. Installation.

(1) Install the crankshaft and main bearings as illustrated on figure 79.
(2) Install the timing gears (par. 277).
(3) Install the pistons and connecting rods (par. 257).
(4) Install the oil pump (par. 253).
(5) Install the flywheel housing (par. 269).
(6) Install the carrier engine (par. 46).

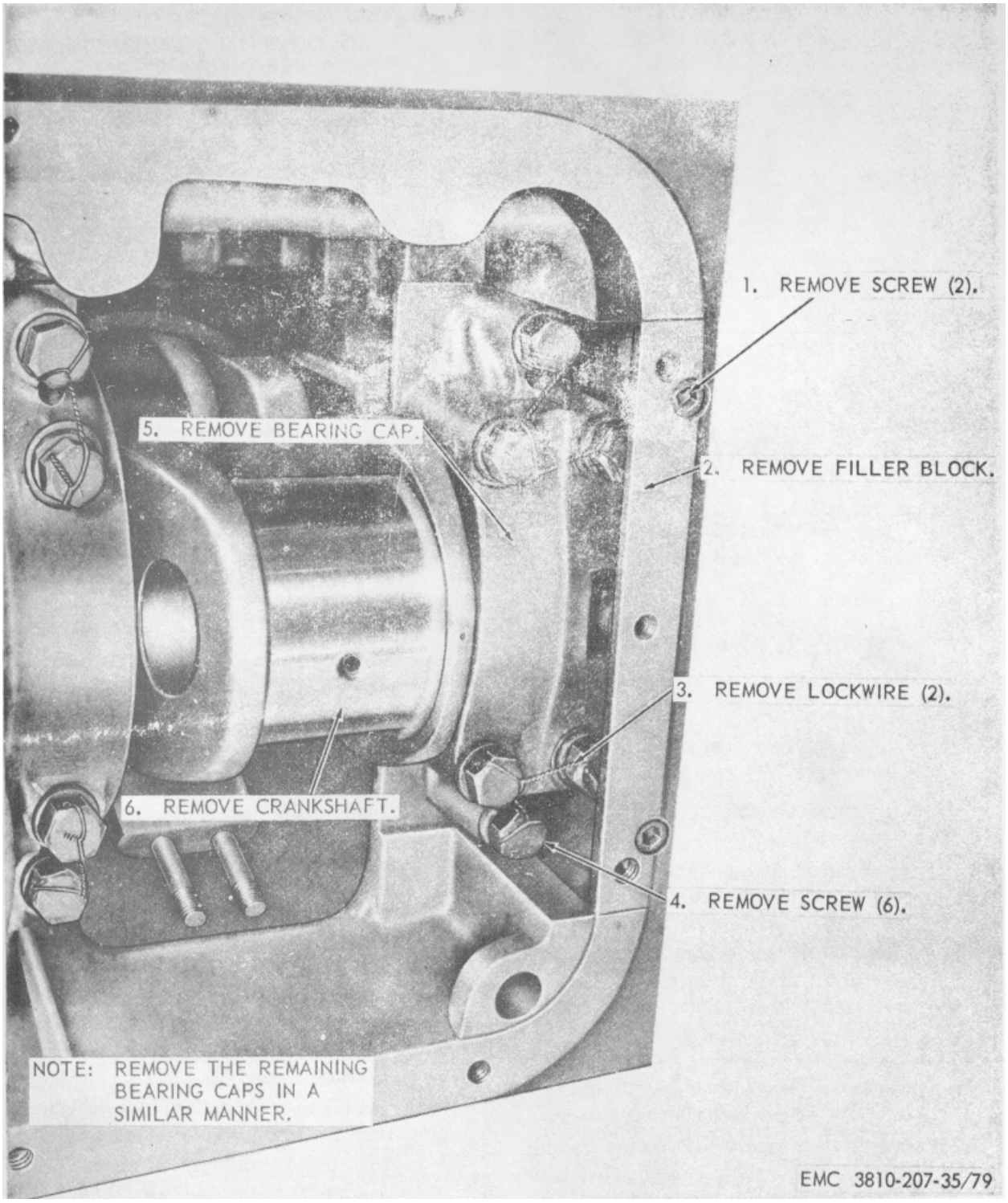
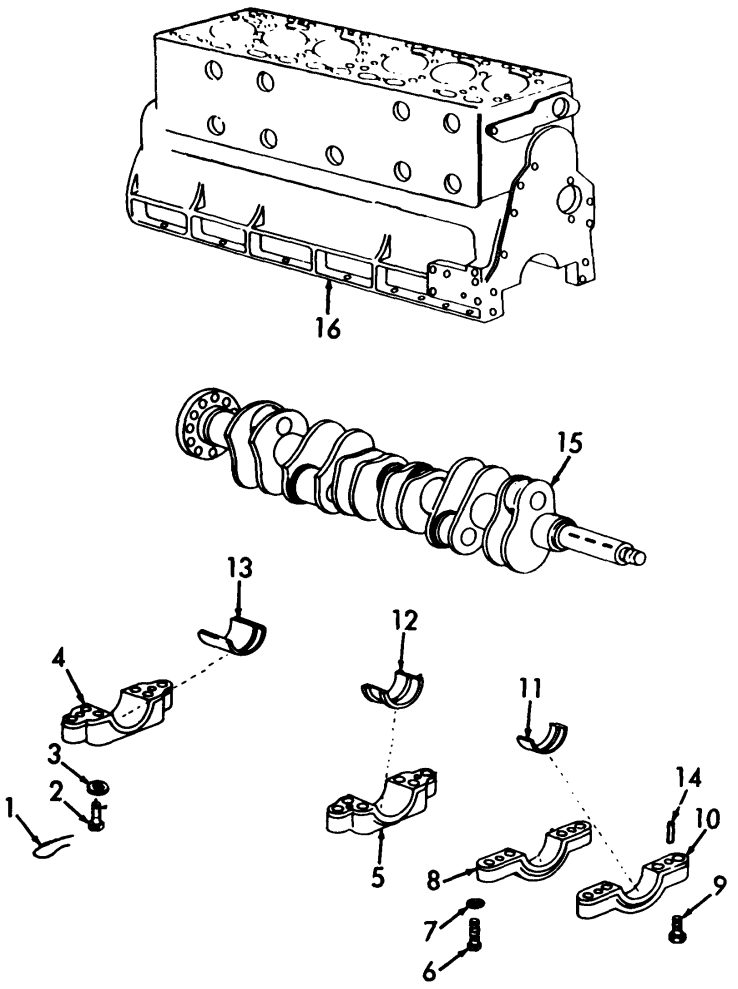


Figure 79. Carrier engine crankshaft and main bearings, removal and installation.



EMC 3810-207-35/80

1	Lockwire, 0.042 in. dia	9	Screw, cap, 1/2-13 x 2 3/4 in. (13 rqr)
2	Screw, cap, 1/2-13 x 3 3/4 in. (16 rqr)	10	Front main bearing cap
8	Washer, flat, 1/2 in. (29 rqr)	11	Front and intermediate bearing (10 rqr)
4	Rear main bearing cap	12	Center bearing (2 rqr)
5	Center main bearing cap	13	Rear bearing (2 rqr)
6	Screw, cap 9/16-12 x 3 5/8 i n. (2 rqr)	14	Dowel pin (14 rqr)
7	Washer, flat, 9/16,a in. (2 rqr)	15	Crankshaft
8	Intermediate main bearing cap (2 rqr)	16	Engine block

Figure 80. Carrier engine crankshaft and main bearings, exploded view.

Section XXII. CARRIER ENGINE BLOCK

286. General

The carrier engine block is a solid, one-piece, iron alloy casting. It houses the crankshaft, camshaft, connecting rods, pistons, and valves. The block has large water jackets which surround the cylinders to provide sufficient cooling.

The intake valve seats are ground on the cylinder block surface. The exhaust valve seats are replaceable. Drilled oil passages carry oil under pressure to all bearings and moving parts requiring lubrication.

287. Carrier Engine Block Removal

a. Remove the carburetor, distributor, governor, generator, starter, fuel pump, generator regulator, water pump, oil filters, and spark plugs (TM 53810-207-20).
b. Remove engine from carrier (par. 46).
c. Remove the radiator (par. 227).
d. Remove cylinder head (par. 243).
e. Remove oil pan (par. 247).
f. Remove oil pump (par. 251).
g. Remove valves (par. 243).
h. Remove pistons (par. 255).
i. Remove flywheel and flywheel housing (par. 267).
j. Remove crankshaft (par. 283).
k. Remove camshaft (par. 279).

288. Carrier Engine Block Cleaning and Inspection

a. Soak the engine block in a strong caustic solvent for two hours; clean with live steam.
b. Clean and blow out all oil and water passages with compressed air.
c. Inspect the engine block for cracks, breaks, scored cylinder walls, and worn machined surfaces of the block. Check with straight edge and feeler gage. If machined surfaces are worn or warped more than 0.010 inch, replace block as necessary.
d. Inspect all threaded holes for damaged or elongated holes. Replace all freeze plugs.
e. Inspect cylinder diameter for 5.375 inch minimum to 5.377 inch maximum.
f. Inspect the block main bearing bore for 4.002 inch minimum to 4.003 inch maximum.

289. Carrier Engine Block Installation

a. Install the camshaft (par. 281).
b. Install the crankshaft (par. 285).
c. Install the flywheel housing and flywheel (par. 269).
d. Install the pistons (par. 257).
e. Install the valves (par. 245).
f. Install the oil pump (par. 253).
g. Install the oil pan (par. 249).
h. Install the cylinder head (par. 245).
i. Install the radiator (par. 229).
j. Install engine in carrier (par. 46).
k. Install the oil filter, water pump, spark plugs, generator regulator, fuel pump, starter, generator, governor, distributor, and carburetor (TM 5-3810-207-20).

CHAPTER 9

CARRIER CAB AND FENDER REPAIR INSTRUCTIONS

Section I. CARRIER INSTRUMENT PANEL

290. General

The carrier instrument panel is mounted on the cab dashboard. Located on the panel are the starter, light, and ignition switches; the temperature and oil pressure warning lights; the high beam indicator and dashboard lights; the choke control, primer, and windshield wiper knobs; the generator indicator, fuel, oil pressure, air pressure, and temperature gages; and the speedometer.

291. Carrier Instrument Panel Removal

a. Removal.

(1) Remove the starter, light, and ignition switches from the instrument panel (TM 5-3810-207-20).

(2) Remove the dashboard, high beam indicator, oil pressure warning and temperature warning lights from the instrument panel (TM 5-3810-207-20).

(3) Remove the choke control, primer, and windshield wiper knobs from the instrument panel (TM 5-3810-207-20).

(4) Remove the generator indicator, fuel, oil pressure, air pressure, and temperature gages from the instrument panel (TM 5-3810-207-20).

(5) Remove the speedometer from the instrument panel (TM 5-3810-207-20).

(6) Remove the instrument panel from the panel mounting as instructed on figure 81.

292. Carrier Instrument Panel Cleaning, Inspection, and Repair

a. Cleaning. Clean the instrument panel with an approved cleaning solvent.

b. Inspection and Repair. Inspect the instrument panel for cracks, bends, breaks, or other damage. Repair or replace a damaged instrument panel as necessary.

293. Carrier Instrument Installation

a. Install the carrier instrument panel on the panel mounting in the reverse of the instructions on figure 81.

b. Install the speedometer on the instrument panel (TM 5-3810-207-20).

c. Install the generator indicator, fuel, oil pressure, air pressure, and temperature gage on the instrument panel (TM 5-3810-207-20).

d. Install the choke control, primer, and windshield wiper knobs on the instrument panel (TM 5-3810-207-20).

e. Install the dashboard, high beam indicator, oil pressure warning, and temperature warning lights on the instrument panel (TM 5-3810-207-20).

f. Install the starter, ignition, and light switches on the instrument panel (TM 5-3810207-20).

Section II. CARRIER CAB VENTILATORS

294. General

The carrier cab ventilators are located on the cab front and left side. They provide a means of fresh air entry to the cab.

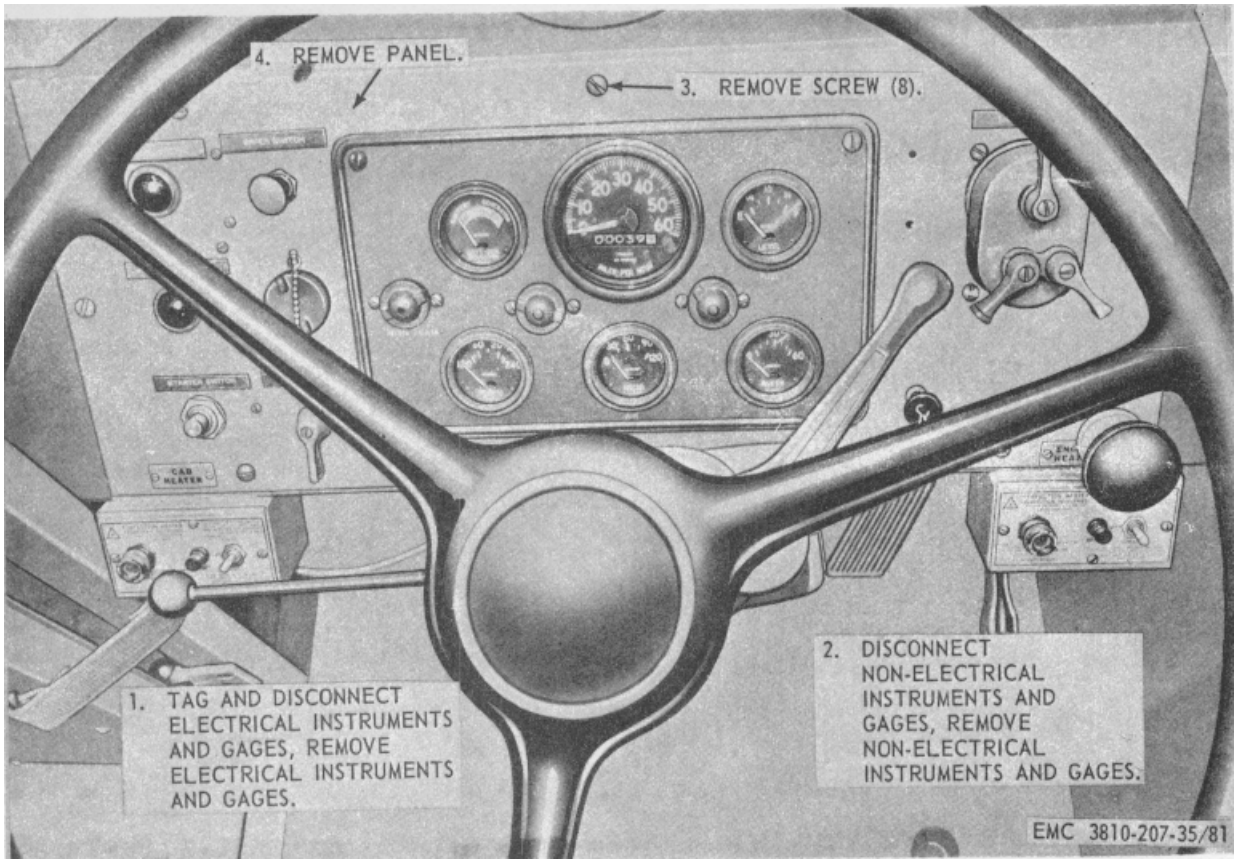


Figure 81. Carrier instrument panel, removal and installation.

295. Carrier Cab Ventilators Removal

Remove the carrier cab ventilators.

296. Carrier Cab Ventilators Cleaning and Inspection

a. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspect all parts for defects and damage. Replace all defective parts.

297. Carrier Cab Ventilators Installation

Install the carrier cab ventilators.

Section III. CARRIER CAB AND WIRING HARNESS

298. General

The carrier has a sectional, welded steel, weatherproof cab. The cab houses the driver's seat, steering wheel and column, engine controls, instrument panel, and wiring harness.

299. Carrier Cab and Wiring Harness Removal

a. Disconnect the battery ground cable (TM 5-3810-207-20).

b. Remove the engine hood, back panel, and cab access panel (TM 5-3810-207-20).

c. Remove the instrument panel and wiring harness (par. 291).

d. Remove the steering wheel (TM 5-3810-207-20).

e. Remove the fuel priming pump (TM 5-3810-207-20).

f. Remove the heater, control boxes, ducts, and cab thermostat (TM 53810-207-20).

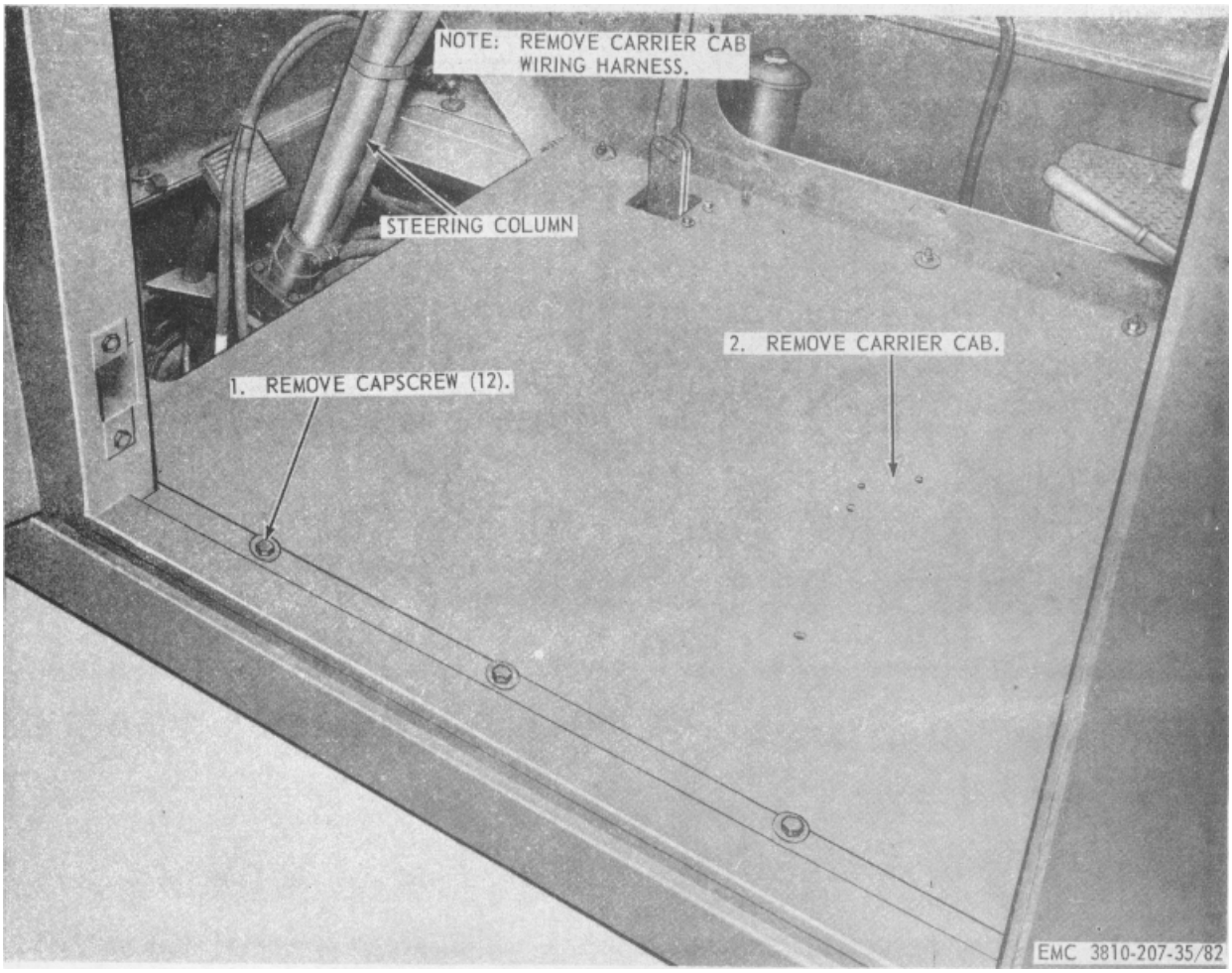


Figure 82. Carrier cab and wiring harness, removal and installation.

g. Remove the windshield wiper motor and low pressure warning valve (TM 5-3810-20720).

h. Remove the cab door and window glass (TM 5-3810-207-20).

i. Remove the cab toe floorboards (TM 53810-207-20).

j. Remove the carrier cab and wiring harness as instructed in figure 82.

300. Carrier Cab and Wiring Harness Cleaning and Inspection

a. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspect all parts for excessive wear and damage. Replace all defective parts.

301. Carrier Cab and Wiring Harness Installation

a. Install the carrier cab and wiring harness as illustrated on figure 82.

b. Install the cab toe floorboards (TM 53810-207-20).

c. Install the cab door and window glass (TM 5-3810-207-20).

d. Install the windshield wiper motor and low pressure warning valve (TM 5-3810-20720).

e. Install the heater, control boxes, ducts, and cab thermostat (TM 5-3810-207-20).

f. Install the fuel priming pump (TM 53810-207-20).

g. Install the steering wheel (TM 5-3810207-20).

h. Install the instrument panel and wiring harness (par. 293).

i. Install the engine hood, back panel, and cab access panel (TM 5-3810-207-20).

j. Connect the battery ground cable (TM 53810-207-20).

Section IV. CARRIER LEFT FRONT FENDER

302. General

The left front fender is located at the left side of the carrier cab. The left front fender also serves as a cab floor.

303. Carrier Left Front Fender Removal

a. Remove the carrier cab (par. 299).

b. Remove the carrier left front fender as instructed on figure 83.

304. Carrier Left Front Fender Cleaning and Inspection

a. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspect all parts for excessive wear and damage. Replace all defective or damaged parts.

305. Carrier Left Front Fender Installation

a. Install the carrier left front fender as illustrated on figure 83.

b. Install the carrier cab (par. 301).

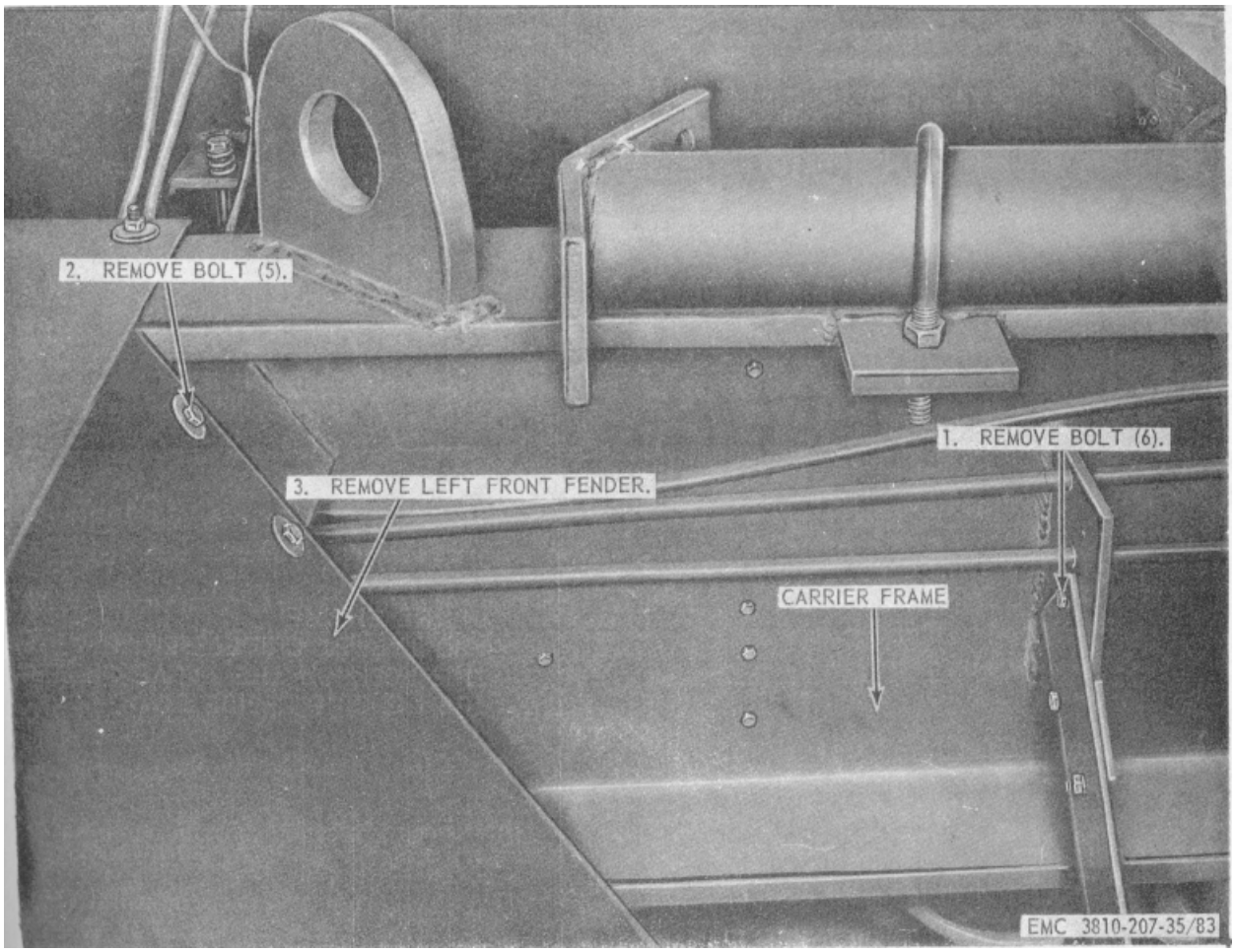


Figure 83. Carrier left front fender, removal and installation.

CHAPTER 10

CARRIER TRANSMISSION AND TRANSFER CASE REPAIR INSTRUCTIONS

Section I. CARRIER TRANSMISSION ASSEMBLY

306. General

The carrier transmission is mounted on the clutch housing of the carrier engine assembly. The transmission is a combination sliding and constant mesh unit. It incorporates five forward speeds and one reverse speed. Engine torque delivered to the transmission through the clutch is changed to the desired rate and

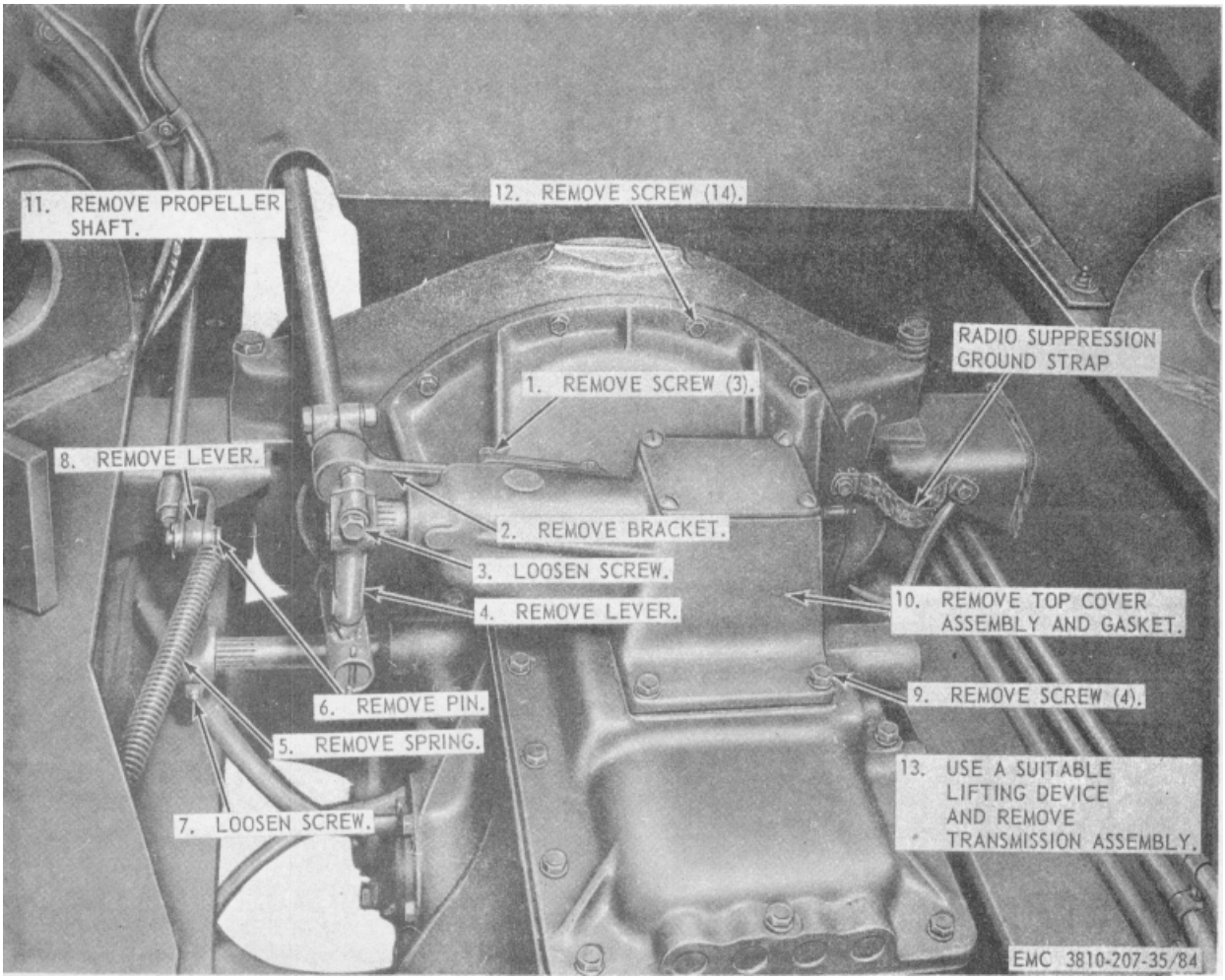


Figure 84. Carrier engine top cover and transmission assembly, removal and installation.

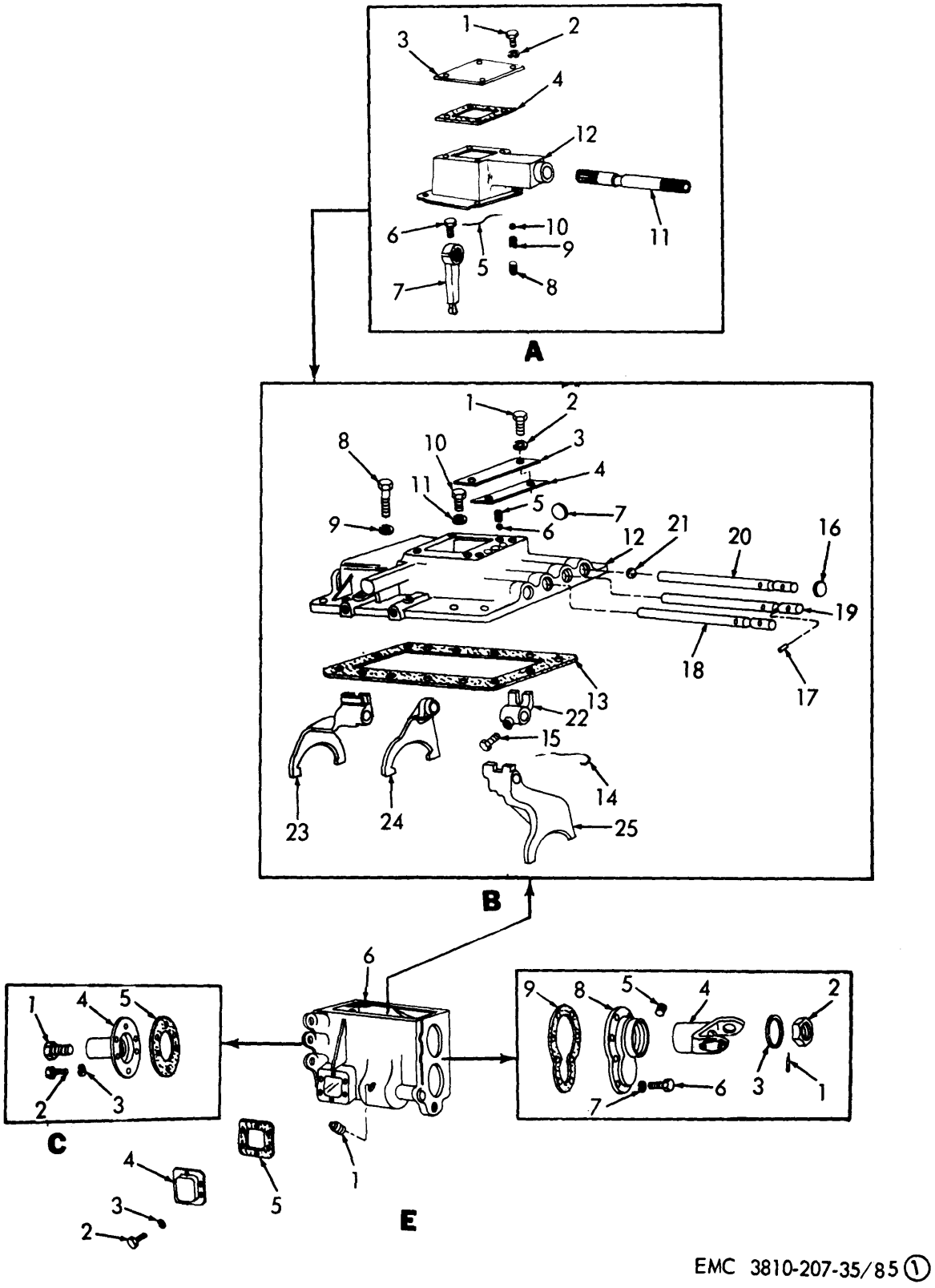


Figure 85. Carrier engine transmission assembly and top cover, exploded view.

1 Screw, machine, 5/16-18 x 1/2 in. (4 rqr)
2 Washer, lock, 5/16 in. (4 rqr)
8 Top plate
4 Gasket
5 Lockwire
6 Screw, cap, 3/8-16 x 1 ¾ in.
7 Inner shift lever
8 Plug, pipe, 3/8 in.
9 Spring
10 Ball, steel, 1/2 in.
11 Shifting shaft
12 Top cover housing

A. Carrier engine transmission top cover

1 Screw, cap, 3/8-16 x 1 1/4 in. (2 rqr)
2 Washer, lock, 3/8 in. (2 rqr)
8 Cover
4 Cover gasket
5 Position finder spring (8 rqr)
6 Ball, steel, 1/2 in. (3 rqr)
7 Expansion plug
8 Screw, cap, 3/8-16 x 2 1/4 in. (2 rqr)
9 Washer, lock, 3/8 in. (2 rqr)
10 Screw, cap, 3/8-16 x 1ik in. (14 rqr)
11 Washer, lock, 3/8 in. (14 rqr)
12 Shifter bar housing
13 Housing gasket (3 rqr)
14 Lockwire (3 rqr)
15 Lockscrew (4 rqr)
16 Expansion plug (8 rqr)
17 Interlock pin
18 Direct and overdrive shifting bar
19 Shifting bar, 2nd and 3rd
20 Shifting bar, 1st and reverse
21 Ball, steel, 3/4 in. (2 rqr)
22 Shifting yoke block, 1st and reverse
28 Shifting yoke, 1st and reverse
24 Shifting yoke, 2nd and 3rd
25 Shifting yoke, direct and overdrive

B. Shifting bars, yokes and housing

1 Screw, cap, special, 3/8-16 x 1 1/2 in. (2 rqr)
2 Screw, cap, 3/8-16 x 1 1/4 in. (4 rqr)
3 Washer, lock, 3/8 in. (6 rqr)
4 Front bearing cover
5 Cover gasket

C. Front bearing cover

1 Pin cotter, 1/8 x 2 1/2 in.
2 Nut, special, 1 1/4l-18
3 Washer, flat, 1 1/4 in.
4 Yoke
5 Plug
6 Screw, cap, 3/8-16 x 5/8 in. (8 rqr)
7 Washer, lock, 3/8 in. (8 rqr)
8 Rear bearing cover
9 Cover gasket

D. Rear bearing cover

1 Plug, pipe, 1 1/4 in.
2 Screw, cap, 3/8-16 x 5/8 in. (12 rqr)
3 Washer, lock, 3/8 in. (12 rqr)
4 Cover (2 rqr)
5 Gasket (2 rqr)
6 Transmission case

E. Transmission case

Figure 85-Continued.

then transmitted to the transfer case by means of a propeller shaft. The transmission gears are machined of a special alloy steel and then heat-treated. The gears, shaft, and bearings operate constantly in an oil bath. The entire transmission is inclosed.

307. Carrier Transmission Assembly Removal and Disassembly

a. Removal.

(1) Drain the transmission assembly (TM 5-3810-207-10).
(2) Disconnect the propeller shaft (TM 5-3810207-20).
(3) Remove the carrier transmission assembly as instructed on figure 84.
(4) Remove the carrier engine clutch' housing as instructed on figure 68.

b. Disassembly. Disassemble the carrier transmission assembly in numerical sequence as illustrated on figure 85.

308. Carrier Transmission Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all damaged or defective parts.

309. Carrier Transmission Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier transmission assembly in the reverse of the numerical sequence as illustrated on figure 85.

b. Installation.

(1) Install the carrier engine clutch housing as instructed on figure 68.
(2) Install the carrier transmission assembly as illustrated on figure 84.
(3) Connect the propeller shaft (TM 53810-207-20).
(4) Fill the transmission case assembly (TM 5-3810-207-10).

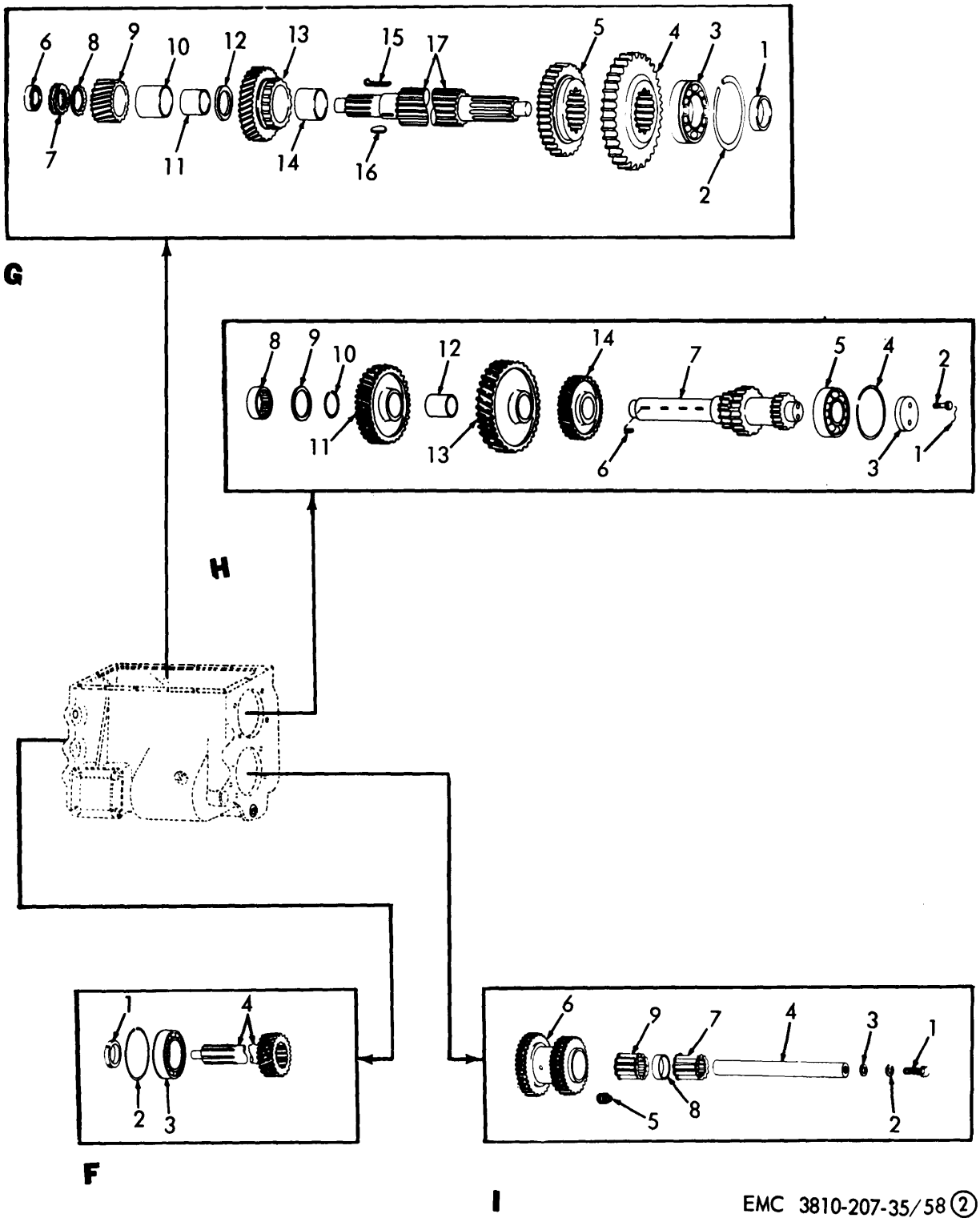


Figure 85.-Continued.

1 Bearing nut special
2 Retaining ring
3 Ball bearing
4 Clutch, shaft and gear

F. Clutch shaft and gear

1 Speedometer gear sleeve
2 Bearing retaining ring
3 Ball bearing
4 First sliding spur gear
5 Second sliding spur gear
6 Roller bearing
7 Main shaft sliding clutch
8 Overdrive gear washer
9 Overdrive gear
10 Overdrive sleeve bearing
11 Overdrive gear sleeve
12 Gear spacer washer
13 Gear assembly, 3rd gear
14 Sleeve bearing, 3rd rear
15 Key
16 Woodruff key No. 404
17 Main shaft

G. Main shaft and gears

1 Lock wire
2 Screw, cap, 1/4-20 x 1 in. (2 rqr)
3 Countershaft retainer
4 Retaining ring
5 Ball bearing
6 Woodruff key, No. 1210 (3 rqr)
7 Countershaft
8 Roller bearing
9 Front bearing spacer
10 Retaining ring
11 Countershaft drive gear
12 Spacer
13 Countershaft overdrive gear
14 Countershaft gear (3rd)

H. Countershaft and gears

1 Screw, cap, 3/8-16 x 1 in.
2 Washer, lock, 3/8 in.
3 Shaft lock
4 Low and reverse idler shaft
5 Plug, pipe, 3/4 in.
6 Low and reverse gear
7 Roller bearing
8 Spacer
9 Roller bearing

I. Low and reverse idler gears

Figure 85.-Continued.

Section II. CARRIER TRANSFER CASE ASSEMBLY

310. General

The carrier transfer case assembly is located to the rear of the transmission and provides a high and low speed range for the rear and front axle. It provides a means of disengaging the front axle entirely. Two levers located to the right of the operator's seat control the transfer case. The speedometer drive and the air actuated emergency hand brake are integral parts of the transfer case.

311. Carrier Transfer Case Assembly Removal and Disassembly

a. Removal.

(1) Drain the transfer case assembly (TM 5-3810-207-10).
(2) Disconnect the speedometer drive assembly from the transfer case (TM 53810-207-20).
(3) Disconnect the handbrake cable from the air actuated brake valve (TM 53810-207-20).
(4) Remove the three propeller shafts from the three universal yokes on the transfer case (TM 5-3810-207-20).
(5) Remove the transfer case assembly as instructed on figure 86.

b. Disassembly. Disassemble the carrier transfer case assembly in the order of numerical sequence as illustrated on figure 87.

312. Carrier Transfer Case Assembly, Cleaning, Inspection, and Repair

a. Cleaning.

(1) Clean all parts with an approved cleaning solvent. Dry thoroughly.

Note. Do not spin a dry bearing with compressed air.

(2) Use an approved cleaning solvent to clean all threads. Remove dirt, sludge, and caked grease from shaft splines and gear teeth.
(3) Remove all dirt, sludge, and grease from the transfer case and bearing cap recesses.

b. Inspection and Repair.

(1) Inspect the transfer case, cover bearing caps, bellcranks, levers, brakedrum, and yokes for cracks, breaks, distortion or other damage. Repair or replace defective parts as necessary.
(2) Inspect all gears for chipped or broken teeth, excessive wear, broken splines,

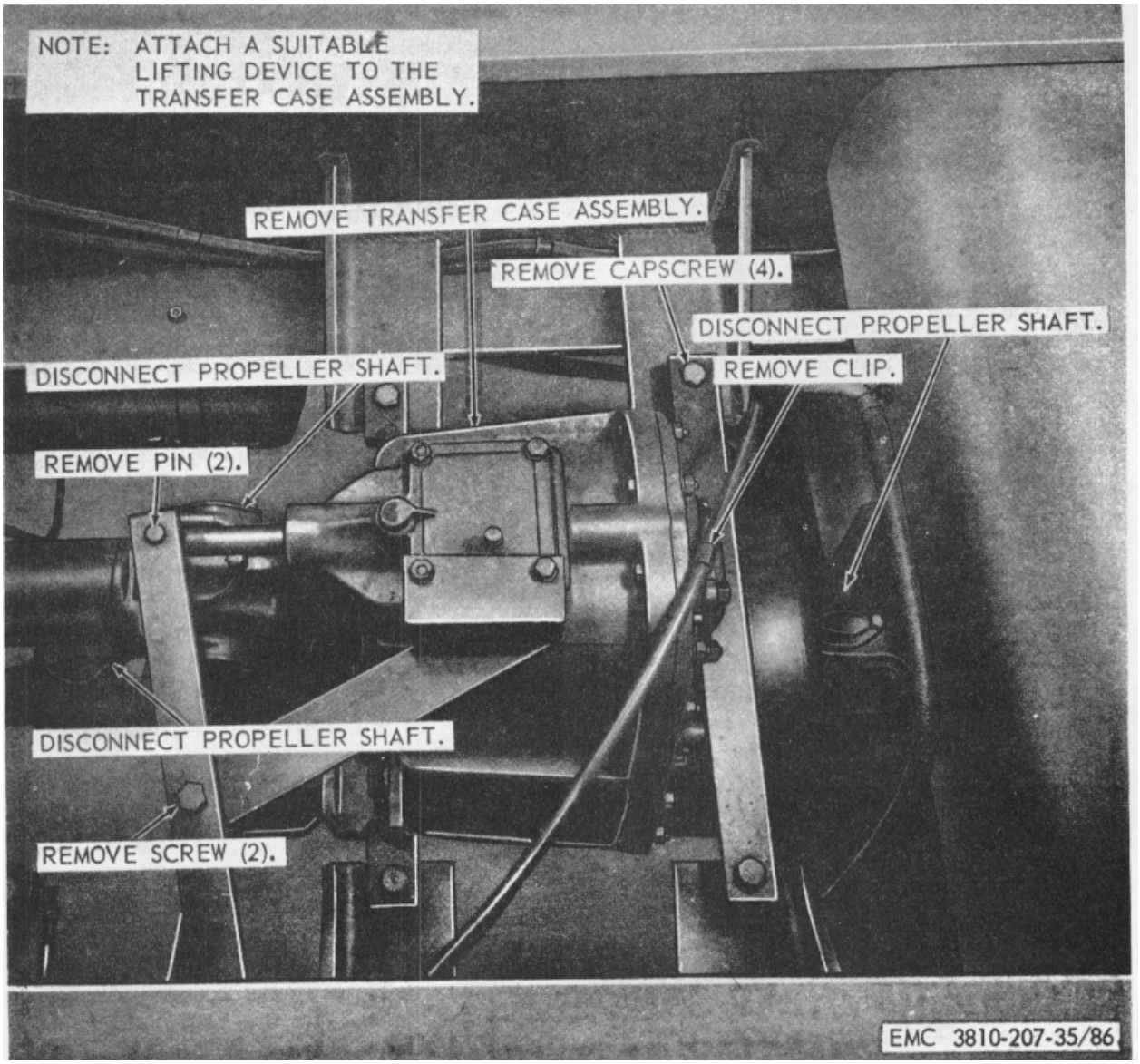


Figure 86. Carrier transfer case assembly, removal and installation

or other damage. Replace all defective gears.

(3) Inspect the bearings for wear, scoring, and binding. Inspect the bearings for free rotation. Replace all defective bearings.

(4) Inspect all shims for cracked or torn edges. Replace all defective shims.

(5) Inspect all shafts for distortion, broken, or chipped splines, scoring, pitting, burrs, stripped threads, or other damage. Repair replace defective shafts as necessary.

(6) Inspect all threaded parts for stripped or damaged threads. Repair or replace parts as necessary.

(7) Inspect all metal mating surfaces for burrs. Remove all burrs.

(8) Inspect the bearing cups for excessive wear, scoring, pitting, or other damage. Replace a defective cup and cone as a set.

(9) Inspect the spacers, washers, and retaining rings for cracks, breaks, twisting, excessive wear, or other damage. Replace defective parts as necessary.

(10) Inspect the brakeshoe lining for wear, breaks, or cracks. Replace defective lining.

(11) Inspect the mounting brackets and the yokes for cracks, breaks, distortion, or other damage. Repair or replace damaged parts as necessary.

(12) Inspect the two shifting yokes and shafts for distortion, wear, breaks, or other damage. Repair or replace defective parts.

(13) Inspect the spring balls, and plungers for distortion, wear, pitting, or other damage. Replace all defective parts as necessary.

(14) Always use new gaskets, oil seals, and shims during reassembly.

313. Carrier Transfer Case Assembly Reassembly and Installation

a. Reassembly. Reassemble the transfer case in the reverse of the numerical sequence as instructed on figure 87.

b. Installation.

(1) Install the carrier transfer case assembly as illustrated on figure 86.

(2) Install the three propeller shafts on the three universal yokes on the transfer case (TM 5-3810-207-20).

(3) Reconnect the handbrake cable on the air actuated brake valve (TM 5-3810-207-20).

(4) Reconnect the speedometer drive assembly on the transfer case (TM 5-3810-207-20).

(5) Fill the transfer case assembly (TM 5-3810-207-10).

(6) Adjust the control levers (TM 5-3810-207-20).

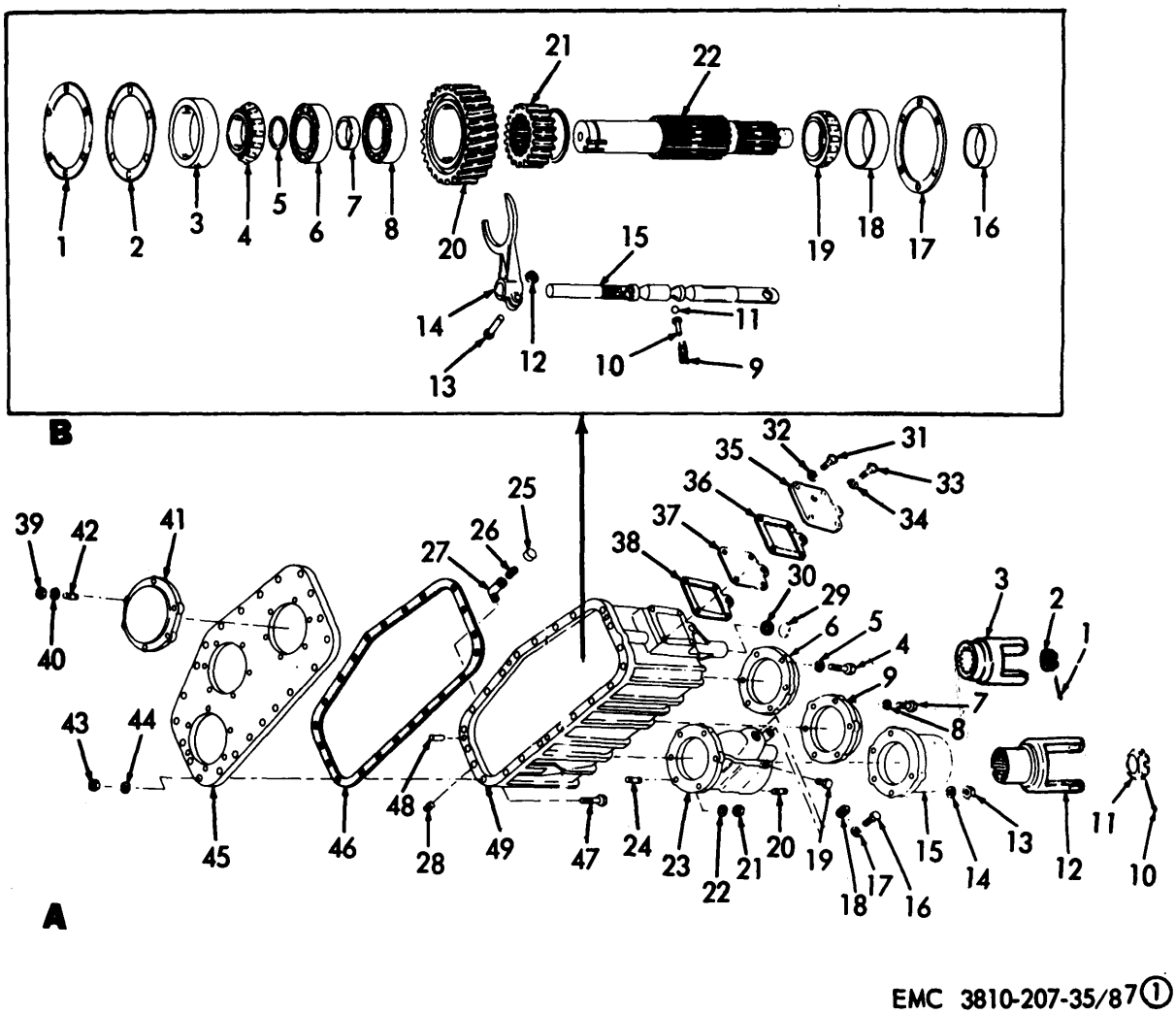


Figure 87. Carrier transfer case assembly, exploded view.

1 Pin, cotter, 1/8 x 2 ¼ in.
2 Nut, castellated, 1 ¼ in.
3 Declutch shaft yoke
4 Screw, cap, 3/8-16 x 1 1/16 in. (6 rqr)
5 Washer lock, 3/8 in. (6 rqr)
6 Input shaft bearing cover
7 Screw, cap, 3/8-16 x 1 1/16 in. (6 rqr)
8 Washer, lock, 3/8 in. (6 rqr)
9 Idler shaft bearing cover
10 Pin, cotter, 1/8 x 2 ¼ in.
11 Nut, castellated, 1 ¼ in.
12 Universal yoke
13 Nut, 3/8-16 (6 rqr)
14 Washer, lock, 3/8 in. (6 rqr)
15 Declutch carrier cap
16 Screw, cap, 7/16-20 x 1/2 in.
17 Washer, lock, IT, 7/16 in.
18 Plug, pipe, ¾ in.
19 Screw, cap, 7/16-14 x 9/16 in.
20 Stud, 3/8-16 x 1¼ in. 16 rqr)
21 Nut, 3/8-16 (6 rqr)
22 Washer, lock, 3/8 in. (6 rqr)
23 Declutch shaft carrier bearing
24 Stud, 3/8-16 x 1 ¼ in. (6 rqr)
25 Pipe cap, 3/4 in.
26 Nipple, pipe, ¾ in. x 1 in.
27 Elbow, street, ¾ in.
28 Plug, pipe, ¾ in.
29 Packing retainer
30 Gear shaft packing
31 Screw, cap, 3/8 -16 x 1¼ in. (2 rqr)
32 Washer, lock, 3/8 in. (2 rqr)
33 Screw, cap, 3/8-16 x 1 in. (2 rqr)
34 Washer, lock, 3/8 in. (2 rqr)
35 Gear shift cover
36 Gasket
37 Breather plate
38 Gasket
39 Nut, 3/8-16 (6 rqr)
40 Washer, lock, 3/8 ins (6 rqr)
41 Rear bearing cover
42 Stud, 3/8-16 x 1lk in. (6 row
43 Nut, 3/8-16 (22 rqr)
44 Washer, lock, 3/8 in. (22 rqr)
45 Transfer case cover
46 Gasket
47 Screw, cap, 3/8-16 x 2 in. (22 rqr)
48 Taper pin, 1½ in. (4 rqr)
49 Transfer case

A. Transfer case and cover

1 Gasket
2 Shim (as rqr)
3 Bearing cup
4 Bearing cone
5 Bearing spacer
6 Ball bearing
7 Gear spacer
8 Ball bearing
9 Spring
10 Shift lock plunger
11 Shift lock ball
12 Nut, 3/8-24
13 Screw, cap, 3/8-24 x 1¾ in.
14 Gearshift fork
15 Transfer gearshift shaft
16 Oil seal
17 Gasket
18 Input shaft bearing cup
19 Input shaft bearing cone
20 Direct drive gear
21 Sliding gear
22 Input shaft

B. Input shaft and gear

Figure 87.-Continued.

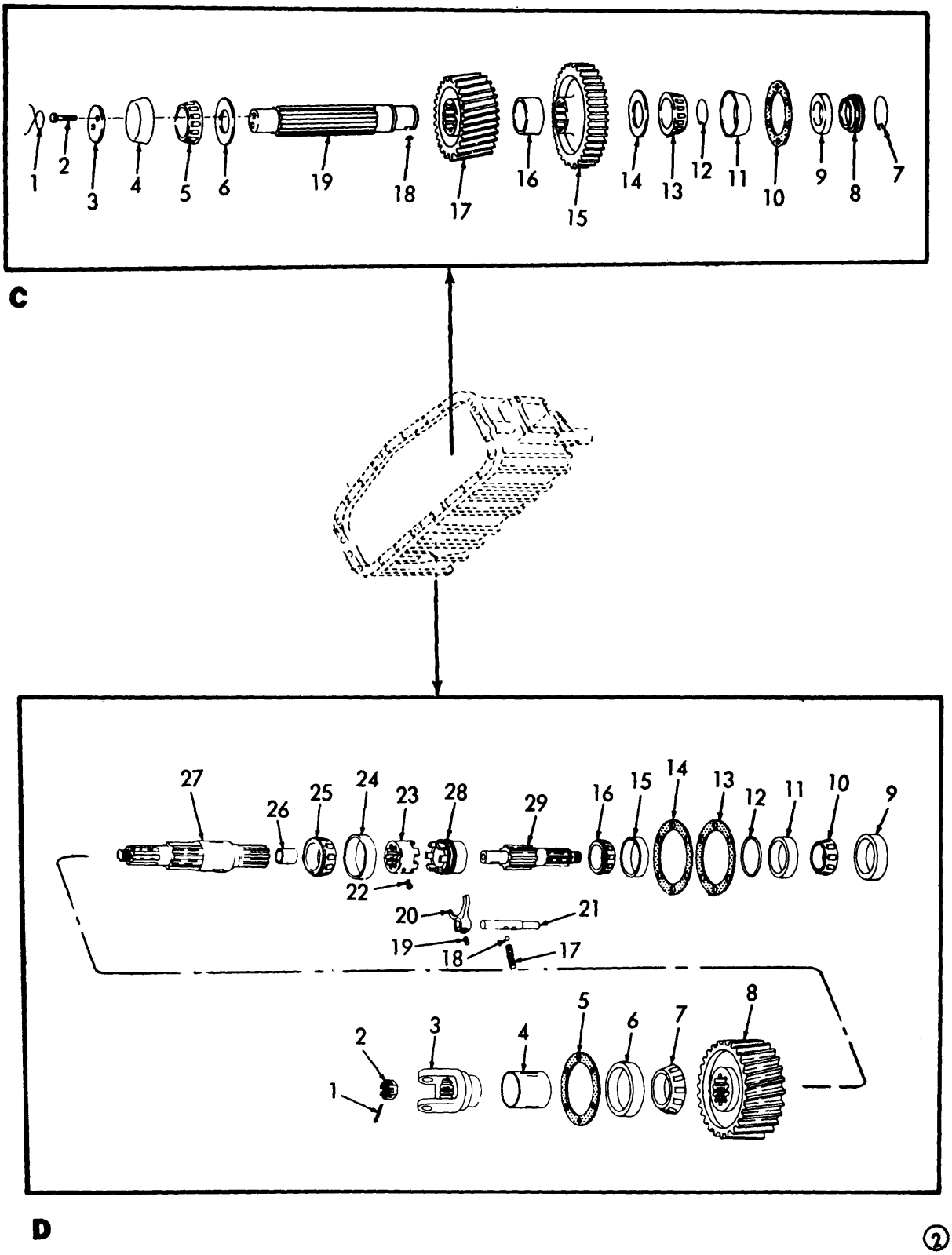


Figure 87. –Continued.

1 Lockwire
2 Screw, cap, 3/8-16 x 7/8 in. (2 rqr)
3 Rear bearing lockwasher
4 Rear bearing cup
5 Bearing cone
6 Rear bearing spacer
7 Retainer ring
8 Speedometer drive gear
9 Drive gear spacer
10 Bearing cover gasket
11 Front bearing cup
12 Retainer ring
13 Bearing cone
14 Front bearing spacer
15 Low speed gear
16 Idler shaft gear spacer
17 Idler gear
18 Woodruff key
19 Idler shaft

C. Idler shaft and gear

1 Pin, cotter, 1/8 x 2¼ in.
2 Nut, castellated, 1¼ in.
3 Brake mounting flange
4 Flange spacer
5 Gasket
6 Rear bearing cup
7 Rear bearing cone
8 Driven gear
9 Oil seal
10 Bearing cone
11 Bearing cup
12 Bearing shim (as rqr)
13 Gasket
14 Gasket
15 Bearing cup
16 Bearing cone
17 Spring
18 Declutch shift lock ball
19 Fork screw, 7/16-14 x 5/8 in.
20 Declutch shaft fork
21 Declutch shift shaft
22 Lock screw, 7/16-20 x 5/8 in.
23 Declutch driving clutch
24 Output shaft bearing cup
25 Rear bearing cone
26 Declutch shaft pilot bushing
28 Declutch siding clutch
29 Declutch shaft

D. Declutch shaft, output haft, and driven gear

Figure 87.-Continued.

CHAPTER 11

CARRIER AIR BRAKE SYSTEM REPAIR INSTRUCTIONS

Section I. CARRIER AIR COMPRESSOR ASSEMBLY

314. General

The carrier air compressor assembly is a single acting, reciprocating two cylinder type. The rated capacity is 71/4 cubic feet per minute at 1,250 rpm. The minimum oil pressure required at engine idling speed is 5 pounds per square inch and at minimum governed engine speed is 15 pounds per square inch. The compressor runs continuously while the engine is running, but the actual compression of air is controlled by the governor, which, acting in conjunction with the unloading mechanism in the compressor cylinder block, starts the compression of air by loading the compressor when the pressure in the air brake system reaches the desired minimum 80-85 pounds. The compressor is lubricated by oil from the engine crankcase and is cooled by coolant from the engine.

315. Carrier Air Compressor Assembly Removal and Disassembly

a. Removal. Remove the carrier air compressor assembly as instructed on figure 88.

b. Disassembly. Disassemble the carrier air compressor assembly in numerical sequence as illustrated on figure 89.

316. Carrier Air Compressor Assembly Cleaning, Inspection, and Repair

a*. Cleaning*. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair.

(1) Inspect all parts for excessive wear and damage.

(2) Plug all holes in the cylinder head except one and insert air hose. Immerse cylinder head in water and apply 15 psi air pressure. Watch for signs of air bubbles. Remove cylinder head from water and disconnect air hose.

(3) Inspect the inlet valves and seats. If inlet valves are grooved deeper than 0.003 inch where they contact the seat, they are defective.

(4) Inspect the cylinder bores. If they are scored or out-of-round more than 0.002 inch, or tapered more than 0.003 inch, the cylinder block is defective. Clearance between pistons and cylinder bores should be between 0.002 and 0.004 inch.

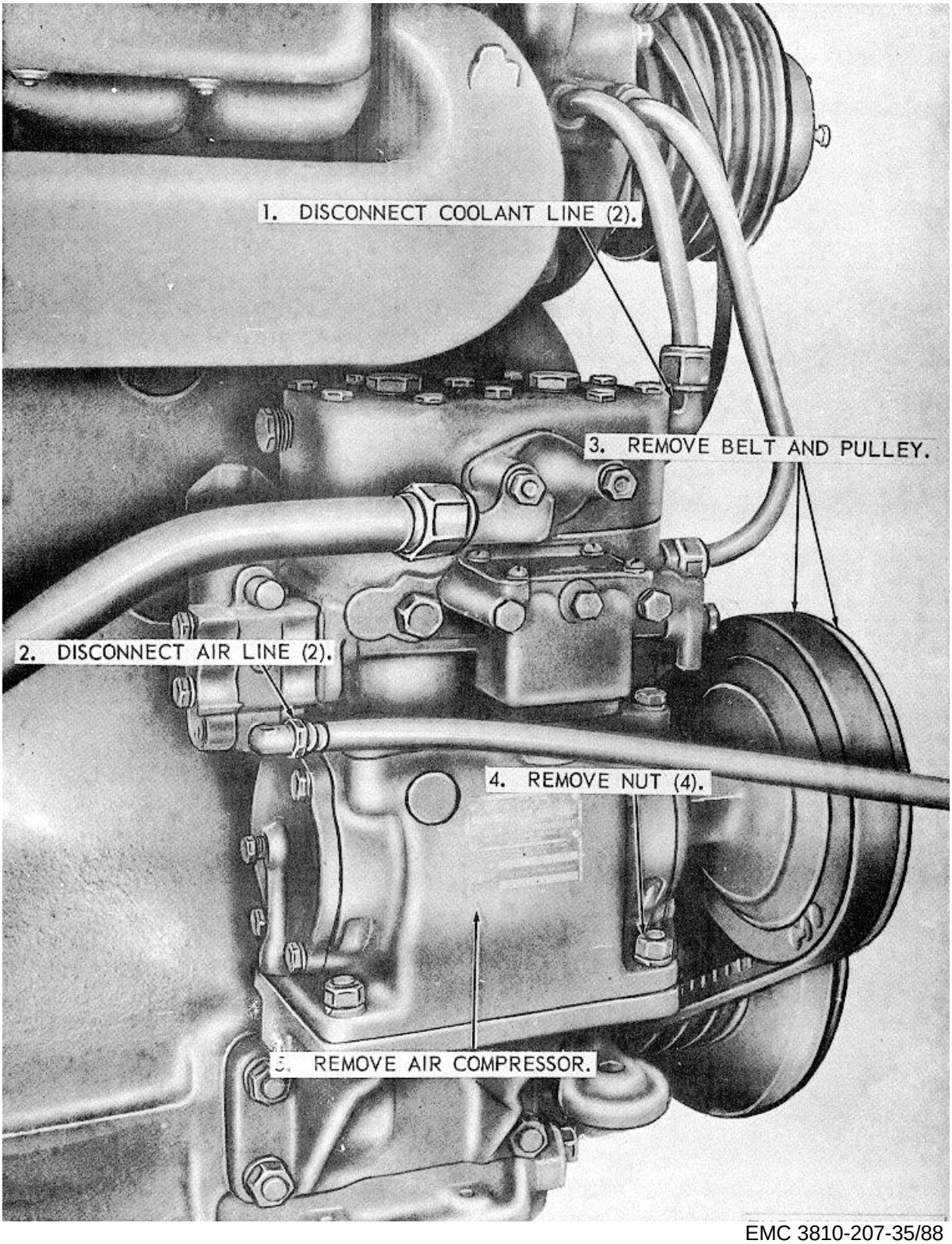
(5) Inspect the fit of the piston ring gap and the fit in the piston grooves. The gap clearance is 0.007 to 0.019 inch and the groove clearance is 0.0015 to 0.0030 inch.

(6) Inspect the clearance of wrist pin. The wrist pin to the connecting rod bushing clearance should not exceed 0.0015 inch.

(7) Clearance between the connecting rod journal and the connecting rod bearings must be less than 0.003 inch or more than 0.021 inch after rebuilding compressor rising insert type rods.

(8) Inspect the crankshaft journals, if they are more than 0.002 inch out-of-round or scored, the crankshaft and bearings are defective.

(9) After installing new discharge valves, springs, and capnuts, the discharge



EMC 3810-207-35/88

Figure 88. Carrier air compressor assembly, removal and installation.

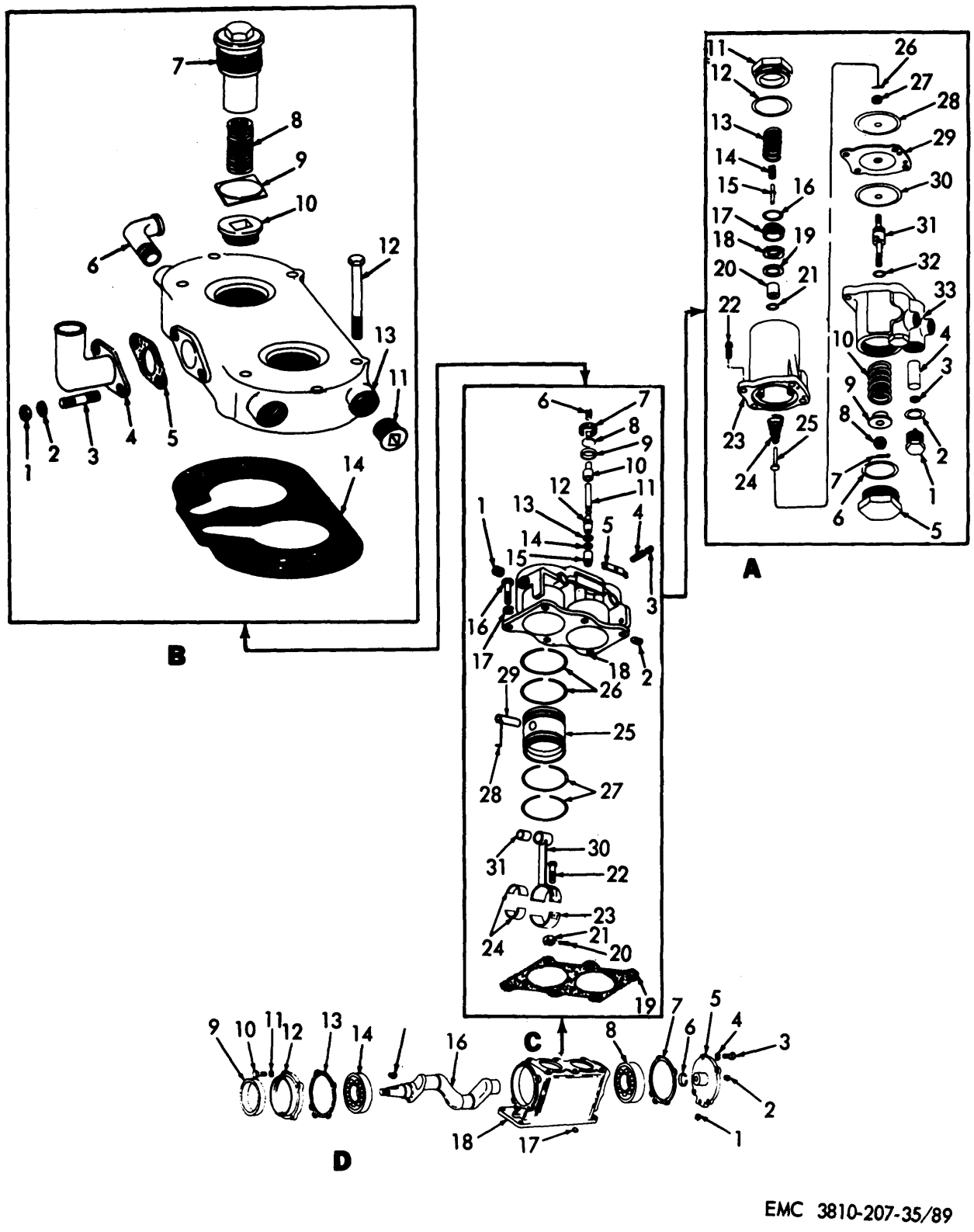


Figure 89. Carrier air compressor assembly, exploded view.

1 Strainer cap (2 rqr)
2 Seal ring (2 rqr)
3 Neoprene washer (2 rqr)
4 Filter (2 rqr)
5 Valve body cap
6 Seal ring
7 Pin, cotter, 1/16 x ½ in.
8 Nut, ¼ -28
9 Spring seat
10 Spring
11 Valve body cap
12 Seal ring
18 Spring
14 Inlet valve spring
15 Inlet exhaust valve
16 Packing
17 Inlet valve seat
18 Shim, 0.10 in. (as rqr)
18 Shim, 0.10 in. (as rqr)
19 Shim, 0.003 in. (as rqr)
20 Guide bushing
21 Packing
22 Screw, machine, 1/4-20 x 11/16 in. (4 rqr)
23 Valve body
24 Exhaust stem spring
25 Exhaust stem
26 Pin, cotter, 1/16 x ½ in.
27 Nut, ¼-20
28 Diaphragm, follower
29 Diaphragm
30 Diaphragm follower
31 Diaphragm stem
32 Packing
33 Spring cage

A. Compressor governor assembly

1 Nut, 5/16-18
2 Washer, lock, 5/16 in. (2 rqr)
3 Stud, 5/16-18 x 2¼ in. (2 rqr)
4 Discharge fitting
5 Gasket
6 Elbow
7 Discharge valve cap nut (2 rqr)
8 Valve spring (2 rqr)
9 Discharge valve (2 rqr)
10 Valve seat (2 rqr)
11 Plug, pipe, 3/8 in. (3 rqr)
12 Screw, cap, 5/16-18 x 2½ in.
13 Cylinder head
14 Head gasket

B. Compressor cylinder head

1 Plug, pipe, 3/8 in. (5 rqr)
2 Plug, pipe, ¼ in. (5 rqr)
3 Unloader seat
4 Unloader spring
5 Unloader saddle
6 Inlet valve spring (2 rqr)
7 Inlet valve guide (2 rqr)
8 Inlet valve (2 rqr)
9 Inlet valve seat (2 rqr)
10 Plunger guide (2 rqr)
11 Unloader plunger (2 rqr)
12 Unloader piston (2 rqr)
13 Back up ring (2 rqr)
14 Packing (2 rqr)
15 Bushing (2 rqr)
16 Screw, cap, 3/8-16 x 1 in. (6 rqr)
17 Washer, lock, 3/8 in. (6 rqr)
18 Cylinder block body
19 Block gasket
20 Pin, cotter, 1/16 x 5/8 in. (4 rqr)
21 Nut, 5/16-24 (4 rqr)
22 Connecting rod bolt (4 rqr)
23 Connecting rod cap (2 rqr)
24 Bearing insert (4 rqr)
25 Piston (2 rqr)
26 Piston rings (4 rqr)
27 Piston rings (4 rqr)
28 Wrist pin lockwire (2 rqr)
29 Wrist pin (2 rqr)
30 Connecting rod (2 rqr)
31 Wrist pin bushing (2 rqr)

C. Connecting rod, piston, and cylinder block

1 Plug, pipe, 1/16 in.
2 Plug, pipe, 1/8 in.
3 Screw, cap, 5/16-18 x ¾ in. (4 rqr)
4 Washer, lock, 5/16 in. (4 rqr)
5 Rear end cover
6 Seal ring
7 Cover gasket
8 Ball bearing
9 Oil seal
10 Screw, cap, 5/16-18 x ¾ in. (4 rqr)
11 Washer, lock, 5/16 in. (4 rqr)
12 Front end cover
13 Cover gasket
14 Ball bearing
15 Woodruff key
16 Crankshaft
17 Oil seal gasket
18 Crankcase

D. Crankshaft and crankcase body

Figure 89.-Continued.

valve travel should be between 0.036 and 0.058 inch.

(10) Test discharge valve for leakage by applying 100 psi air pressure through the discharge port of the cylinder head and apply soap suds to the valve openings in the cylinder head floor. Leakage should not exceed a one inch soap bubble in not less than 5 seconds. Test discharge valve capnuts by this method.

(11) The dimensions from the top of the cylinder block to the inlet valve seat should not exceed 0.145 inch. After installing new seats, the dimension should be 0.101 to 0.113 inch.

(12) Replace or repair all damaged or defective parts.

317. Carrier Air Compressor Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier air compressor assembly in the reverse of the numerical sequence as illustrated on figure 89.

b. Installation. Install the carrier air compressor assembly as illustrated on figure 88.

Section II. CARRIER FRONT AIR BRAKE CHAMBER ASSEMBLY

318. General

The carrier's two front air brake chamber assemblies each consist basically of two circular housings or plates, a push rod assembly, and a diaphragm. The purpose of the brake chambers is to convert the energy of compressed air into mechanical force and motion necessary to operate the front brakes. The push rod assembly is connected to the slack adjusters, located on the front steering knuckle housing, which operates the brakebands through a cam action. The air pressure enters the brake chamber behind the diaphragm, and as the air pressure is increased, the force of the push rod assembly is also increased. When the air pressure is released from the brake chamber, a spring returns the diaphragm and push rod assembly to the released position.

319. Carrier Front Air Brake Chamber Assembly Removal and Disassembly

a. Removal. Remove the carrier front air brake chamber assembly (TM 5-3810-207-20).

b. Disassembly. Disassemble the carrier front air brake chamber assembly in numerical sequence as illustrated on figure 90.

320. Carrier Front Air Brake Chamber Assembly Cleaning, Inspection, and Repair

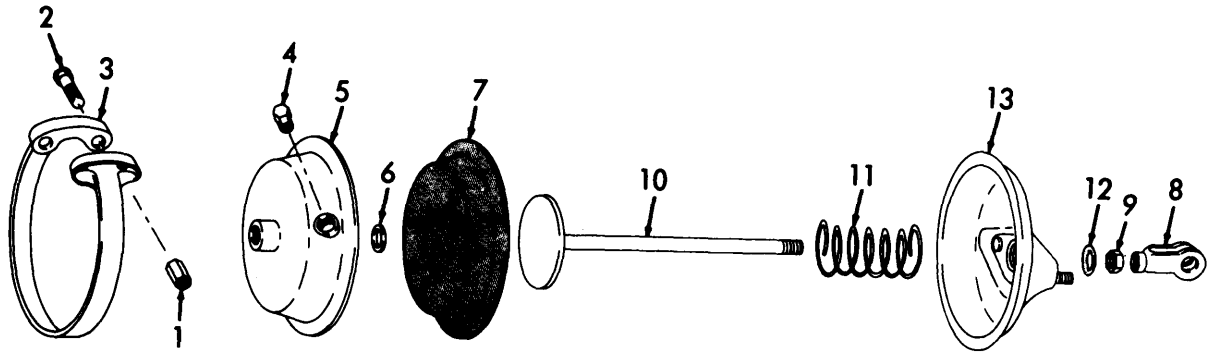
a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective parts.

321. Carrier Front Air Brake Chamber Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier front air brake chamber assembly in the reverse of the numerical sequence as illustrated on figure 90.

b. Installation. Install the carrier front air brake chamber assembly (TM 53810-207-20).



EMC 3810-207-35/90

1 Nut, special, 5/16-24 x ¾ in. (2 rqr)
2 Bolt, special, 5/16-24 x 1 1/8 in. (2 rqr)
3 Clamping ring
4 Plug, pipe, 3/8 in.
5 Pressure plate
6 Ferrule (2 rqr)
7 Diaphragm
8 Yoke
9 Nut, ¼-20
10 Push rod
11 Spring
12 Seal
13 Non-pressure plate

Figure 90. Carrier front air brake chamber assembly, exploded view.

Section III. CARRIER REAR AIR BRAKE CHAMBER ASSEMBLY

322. General

The carrier's four rear air brake chamber assemblies each consist basically of two circular housings called plates, a push rod assembly, and a diaphragm. The purpose of the brake chambers is to convert the energy of compressed air to mechanical force and motion necessary to operate the rear brakes. The push rod assembly is connected to the slack adjusters, located on the rear axle housings, which operate the brake bands through a cam action. The air pressure enters the brake chamber behind the diaphragm, and as the air pressure is increased, the force of the push rod assembly is also increased. When the air pressure is released from the brake chamber, a spring returns the diaphragm and push rod assembly to the released position.

323. Carrier Rear Air Brake Chamber Assembly Removal and Disassembly

a. Removal. Remove the carrier rear air brake chamber assembly (TM 5-8810-207-20).

b. Disassembly. Disassemble the carrier rear air brake chamber assembly in numerical sequence as illustrated on figure 91.

324. Carrier Rear Air Brake Chamber Assembly Cleaning, Inspection, and Repair

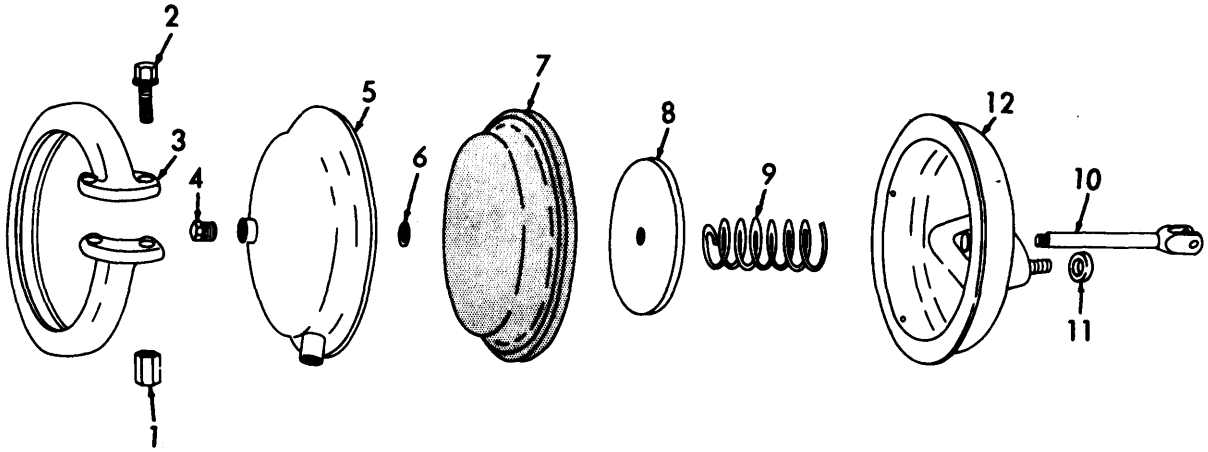
a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective parts.

325. Carrier Rear Air Brake Chamber Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier rear air brake chamber assembly in the reverse of the numerical sequence as illustrated on figure 91.

b. Installation. Install the carrier rear air brake chamber assembly (TM 5-3810-207-20).



EMC 3810-207-35/91

1	Nut, special, 5/16-24 x ¾ in. (2 rqr)	5	Pressure plate	9	Spring
2	Bolt, special, 5/16-24 x ¾ in. (2 rqr)	6	Ferrule (2 rqr)	10	Push rod
3	Clamping ring	7	Diaphragm	11	Seal
4	Plug, pipe, 3/8 in.	8	Push plate	12	Non-pressure plate

Figure 91. Carrier rear air brake chamber assembly, exploded view.

Section IV. CARRIER MOISTURE EJECTOR VALVE ASSEMBLY

326. General

The carrier moisture ejector valve assembly is a small relay valve with no delivery ports. A line from the bottom of the dry tank to the inlet port of the ejector carries a combination of air, moisture, and sludge into the area in the body between the seat, that the movable seat seals against, and the O-ring. With each brake application, air enters the ejector through the application line port. This application air forces the actuator down and pushes the valve away from its seat on the casting, allowing about a spoonful of moisture to be admitted to the area under the O-ring. Upon release of the brake application, the actuator is forced up, allowing the seat to seal off any further flow of moisture or air from the tank and opening the exhaust port through the center of the seat. This permits moisture to flow out.

327. Carrier Moisture Ejector Valve Assembly Removal and Disassembly

a. Removal. Remove the carrier moisture ejector valve assembly (TM 5-3810-207-20).

b. Disassembly. Disassemble the carrier moisture ejector valve assembly in numerical sequence as illustrated on figure 92.

328. Carrier Moisture Ejector Valve Assembly Cleaning, Inspection, and Repair

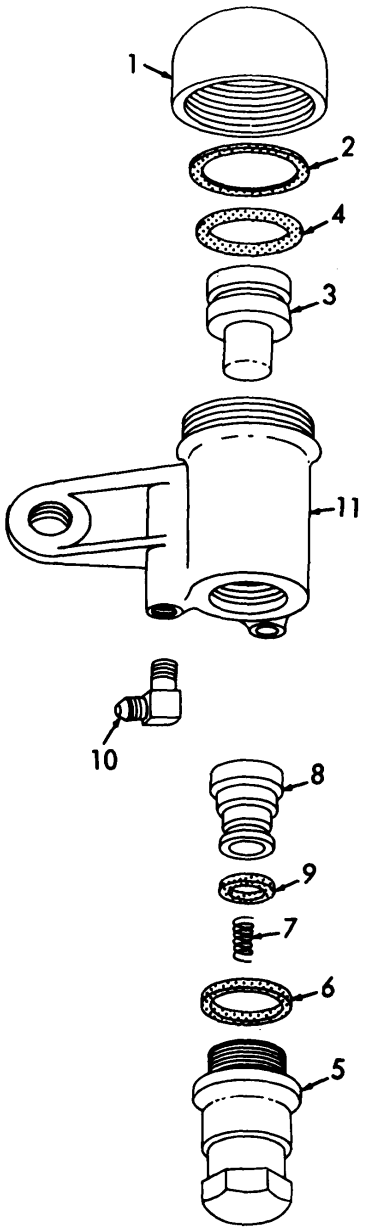
a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace all defective parts.

329. Carrier Moisture Ejector Valve Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier moisture ejector valve assembly in the reverse of the numerical sequence as illustrated on figure 92.

b. Installation. Install the carrier moisture ejector valve assembly (TM 5-3810-207-20).



1	Cap	7	Spring
2	Gasket	8	Valve seat
3	Actuator	9	O-ring
4	O-ring	10	Elbow
5	Lower body	11	Body
6	Gasket		

Figure 92. Carrier moisture ejector valve assembly, exploded view.

Section V. CARRIER AIR BRAKE DOUBLE CHECK VALVE ASSEMBLY

330. General

The carrier's double check valves are used in an air brake system when it is necessary to automatically direct the flow of air pressure into a common line from either of two other lines. Both of the carrier air brake double check valves are used in conjunction with two brake control valves. If the double check valves were not used and either of the brake control valves were moved to the applied position, tank pressure would escape through the exhaust part of the other brake control valve.

331. Carrier Air Brake Double Check Valve Assembly Removal and Disassembly

a. Removal. Remove the carrier air brake double check valve assemblies (TM 53810-207-20).

b. Disassembly. Disassemble the carrier air brake double check valve assembly in numerical sequence as illustrated on figure 93.

332. Carrier Air Brake Double Check Valve Assembly Cleaning, Inspection, and Repair

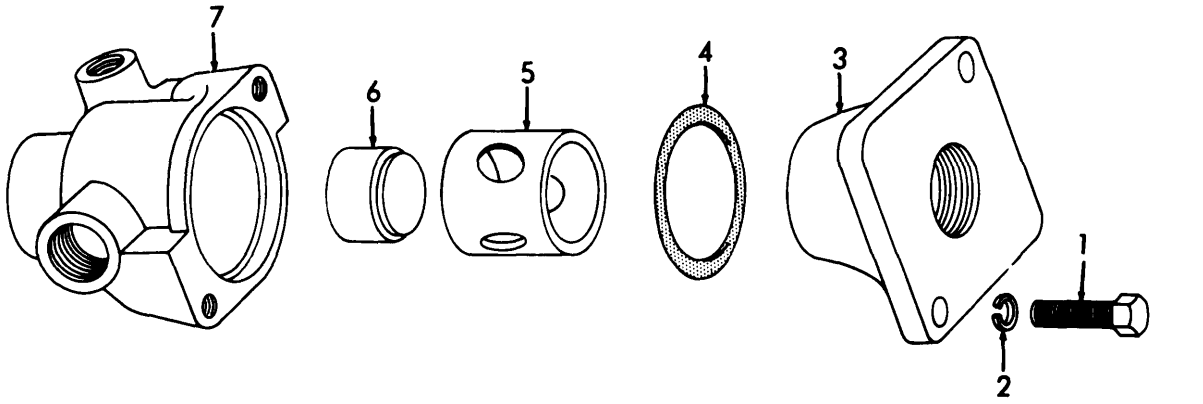
a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts.

333. Carrier Air Brake Double Check Valve Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier air brake double check valve assembly in the reverse of the numerical sequence as illustrated on figure 93.

b. Installation. Install the carrier air brake double check valve assembly (TM 5-3810-207-20).



1 Screw, cap, 5/16-24 x 7/8 in. (2 rqr)
2 Washer, lock, 5/16 in. (2 rqr)
3 Cover
4 Grommet
5 Valve guide
6 Disk valve
7 Body

Figure 93. Carrier air brake (disk type) double check valve assembly, exploded view.

CHAPTER 12

CARRIER BRAKES REPAIR INSTRUCTIONS

Section I. CARRIER HANDBRAKE

334. General

The carrier handbrake is a mechanically operated brake lever. It works through a series of devises and rods.

335. Carrier Handbrake Removal and Disassembly

a. Removal. Remove the carrier handbrake as instructed on figure 94.

b. Disassembly. Disassemble the carrier handbrake in numerical sequence as illustrated on figure 95.

336. Carrier Handbrake Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Inspect brakedrum for scoring. Replace or repair all defective parts.

337. Carrier Handbrake Reassembly and Installation

a. Reassembly. Reassemble the carrier handbrake in reverse of the numerical sequence as illustrated on figure 95.

b. Installation. Install the carrier handbrake as illustrated on figure 94.

Section II. CARRIER FRONT SERVICE BRAKE ASSEMBLY

338. General

The carrier is equipped with brakes controlled by the air brake system. The mechanical portion of the brake system includes the shoes, liners, drums, and cams. The brakes are applied or released by depressing or releasing the brake pedal. The air pressure causes the brake chamber push rods to move the slack adjusters which rotate the brake cam, forcing the brakeshoes against the brakedrums, causing brake action. When the pressure in the brake chambers is exhausted, the force of the brake chamber springs and the brakeshoe springs pull the push rods, slack adjusters, and brakeshoes to their normal positions, releasing the brakes.

339. Carrier Front Service Brake Assembly Removal and Disassembly

a. Removal. Remove the carrier front service brakeshoe assembly (TM 5-3810-207-20).

b. Disassembly. Disassemble the carrier front service brakeshoe assembly in numerical sequence as illustrated on figure 96.

340. Carrier Front Service Brake Assembly Cleaning, Inspection, and Repair

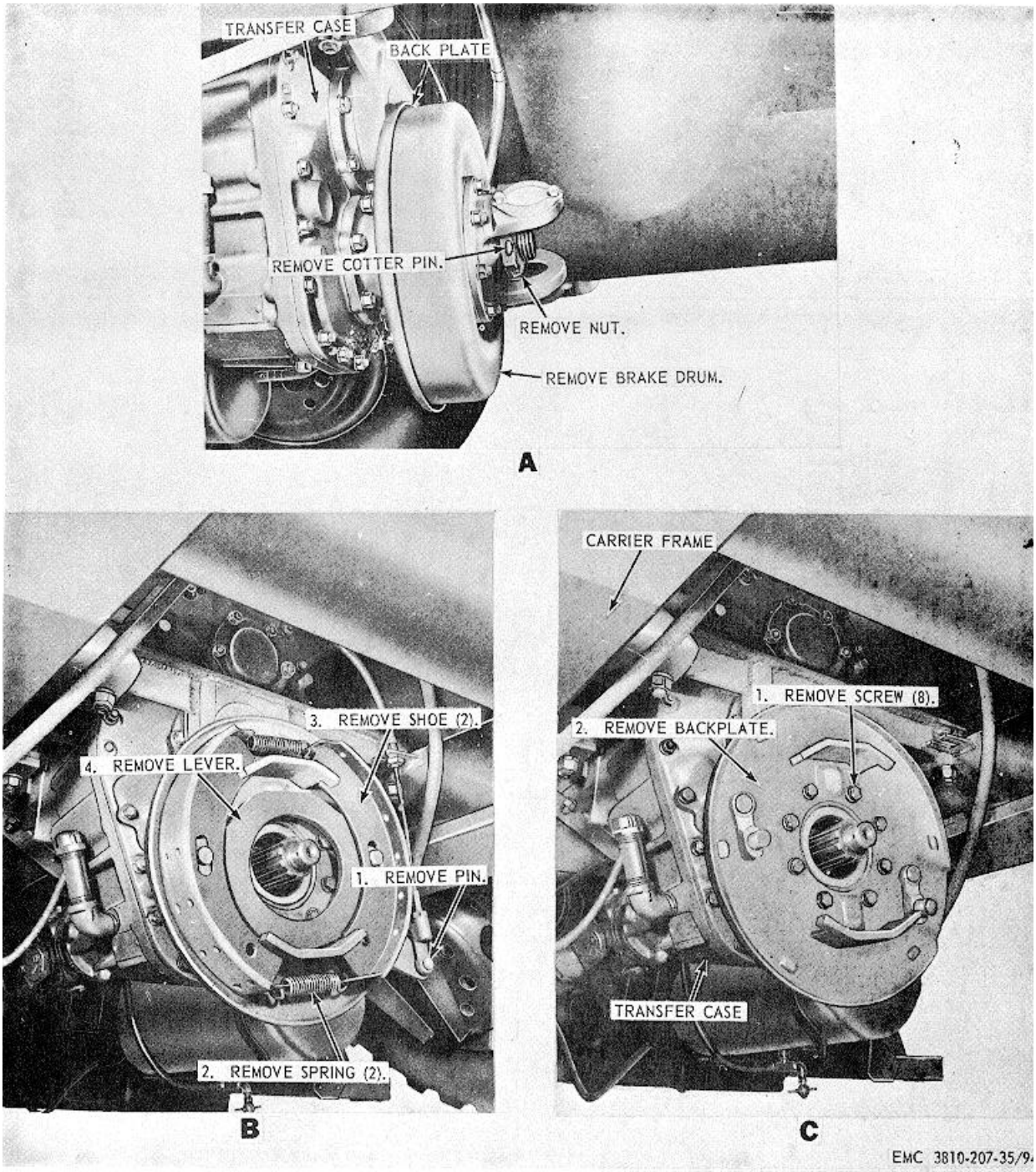
a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts.

341. Carrier Front Service Brake Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier front service brakeshoe assembly in the reverse of the numerical sequence as illustrated on figure 96.

b. Installation. Install the carrier front service brakeshoe assembly (TM 53810-207-20).



A. Carrier handbrake, brakedrum installed B. Carrier handbrake, brakeshoe assembly, installed
C. Carrier handbrake backplate assembly. installed

Figure 94. Carrier handbrake, removal and installation.

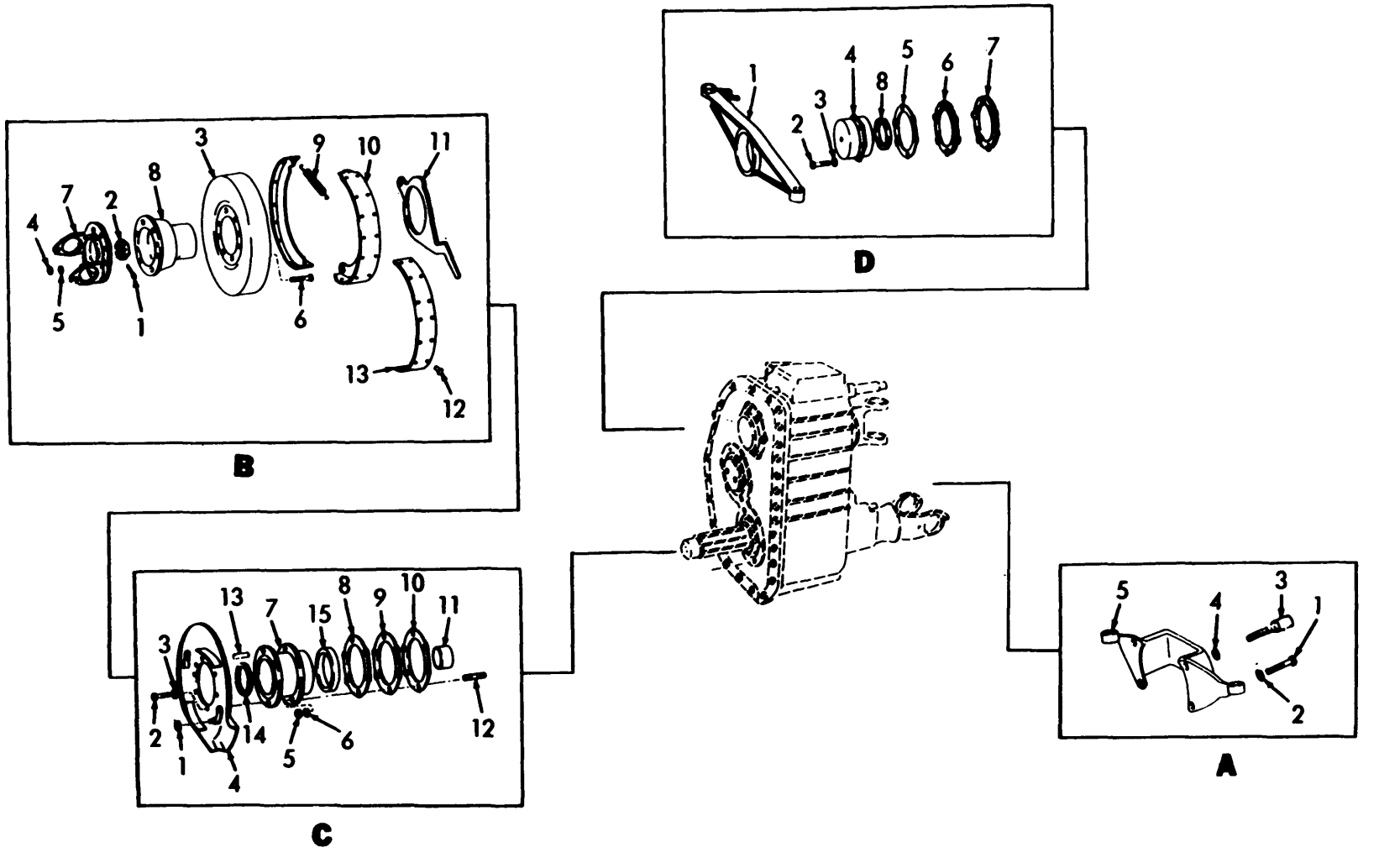


Figure 95. Carrier emergency handbrake assembly, exploded view.

1 Screw, cap, ¾ -10 x 1¾ in. (8 rqr)
2 Washer, lock, ¾ in. (3 rqr)
3 Bolt, socket-head, ¾ 10 x 1¾ in.
4 Washer, lock, ¾ in.
5 Transfer case front mounting

A. Transfer case front mounting

1 Pin, cotter, 1/16 x 1¾ in.
2 Nut, special, ¼ -12
3 Brakedrum
4 Nut, 3/8-16 (8 rqr)
5 Washer, lock, 3/8 in. (8 rqr)
6 Screw, cap, 3/8-16 x 1½ in. (8 rqr)
7 Flange yoke
8 Mounting flange
9 Spring (2 rqr)
10 Brake shoe assembly (2 rqr)
11 Cam operating lever
12 Rivet (28 rqr)
13 Brake lining (2 rqr)

B. Brake shoe assembly

1 Roller
2 Screw, cap, 3/8-16 x 16 x 1 in. (6 rqr)
3 Washer, lock, 3/8 in. (6 rqr)
4 Backplate assembly, w/pawl
5 Nut, 7/16-14 (6 rqr)
6 Washer, lock, 7/16 in. (6 rqr)
7 Rear bearing cage assembly
8 Shim (as rqr)
9 Shim (as rqr)
10 Shim (as rqr)
11 Bearing-to-flange spacer
12 Stud, 7/16-14 x 1 in. (6 rqr)
13 Bearing cage dowel pin
14 Oil seal
15 Bearing cup

C. Backplate assembly

1 Transfer case rear mounting
2 Screw, cap, 7/16-14 x 1 1/6 in. (6 rqr)
3 Washer, lock, 7/16 in. (6 rqr)
4 Rear bearing cover
5 Shim (as rqr)
6 Shim (as rqr)
7 Shim (as rqr)
8 Rear bearing cup

D. Rear mounting and bearing cover

Figure 95.-Continued.

Section III. CARRIER REAR SERVICE BRAKE ASSEMBLY

342. General

The carrier rear service brake assembly is a two shoe, automotive-type, air-actuated brake. The friction set up between the relative motion of the brakeshoe linings and the brakedrum retards the motion of the wheels on the carrier axle.

343. Carrier Rear Service Brake Assembly Removal and Disassembly

a. Removal. Remove the carrier rear service brakeshoe (TM 5-3810-207-20).

b. Disassembly. Disassemble the carrier rear service brake assembly in numerical sequence as illustrated on figure 97.

344. Carrier Rear Service Brake Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace and repair all defective parts.

345. Carrier Rear Service Brake Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier rear service brake assembly in the reverse of the numerical sequence as illustrated on figure 97.

b. Installation. Install the carrier rear service brakeshoe (TM 54810-207-20).

Section IV. CARRIER AIR ASSIST VALVE ASSEMBLY

346. General

The carrier air assist valve assembly is air-actuated and is used to reduce the effort required to apply the handbrake.

347. Carrier Air Assist Valve Assembly Removal and Disassembly

a. Removal. Remove the carrier air assist valve assembly (TM 5-3810-207-20).

b. Disassembly. Disassemble the carrier air assist valve assembly in numerical sequence as illustrated on figure 98.

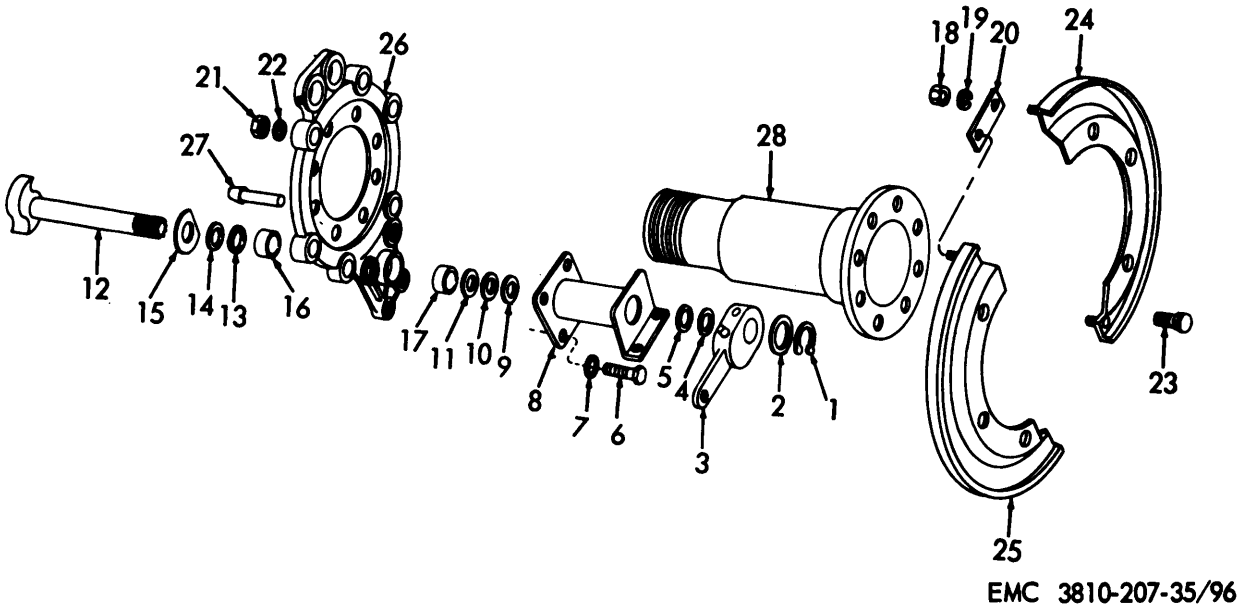
348. Carrier Air Assist Valve Assembly Cleaning, Inspection, and Repair.

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts.

349. Carrier Air Assist Valve Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier air



1	Retaining ring	15	Camshaft washer
2	Retaining washer	16	Bushing
3	Slack adjuster	17	Bushing
4	Spacer, thin	18	Nut, ¼ -20 (4 rqr)
5	Spacer, thick	19	Washer, lock, ¼ in. (4 rqr)
6	Screw, cap, ½ -13 x 1 3/8 in. (4 rqr)	20	Connector plate
7	Washer, flat, ½ in. (4 rqr)	21	Nut, 5/16-18 (6 rqr)
8	Bracket	22	Washer, lock, 5/16 in. (6 rqr)
9	Spacer	23	Screw, cap, 5/16-18 x 1 in. (6 rqr)
10	Retainer	24	Dust shield, upper
11	Felt oil seal	25	Dust shield, lower
12	Camshaft	26	Spider assembly
13	Felt oil seal	27	Rivet ½ x 1 in. (8 rqr)
14	Retainer	28	Spin

Figure 96. Carrier front service brake shoe assembly, exploded view.

assist valve assembly in the reverse of the numerical sequence as illustrated on figure 98.

b. Installation. Install the carrier air assist valve assembly (TM 5-3810-207-20).

Section V. CARRIER TREADLE VALVE ASSEMBLY

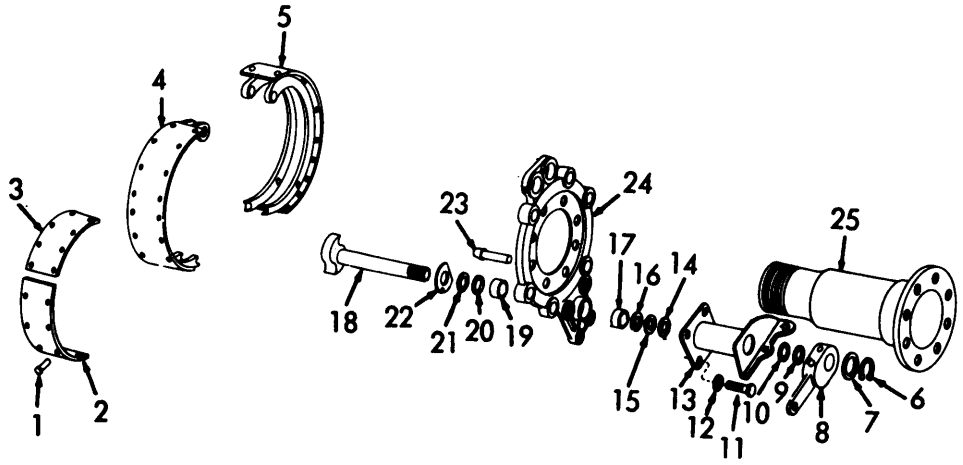
350. General

The treadle brake valve is fitted with a treadle which is a part of the brake valve. Movement of the treadle operates an inlet and exhaust valve within the treadle brake valve which controls the air pressure delivered to the brake actuators. To fully apply the brakes, the treadle or brake pedal must be fully depressed. When the treadle or brake pedal is only partially depressed, correspondingly less braking force is developed.

351. Carrier Treadle Valve Assembly Removal and Disassembly

a. Removal. Remove the carrier treadle valve assembly (TM 5-3810-207-20).

b. Disassembly. Disassemble the carrier treadle valve assembly in numerical sequence as illustrated on figure 99.



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1	Rivet (48 rqr)	10	Spacer, thick	18	Camshaft
2	Lining, anchor end	11	Screw, cap, ½ -13 x 1 3/8 in. (4 rqr)	19	Bushing
3	Lining, cam end	12	Washer, flat, ½ in. (4 rqr)	20	Seal
4	Upper brakeshoe	13	Bracket	21	Retainer
5	Lower brakeshoe	14	Spacer	22	Washer
6	Retaining ring	15	Retainer	23	Rivet (8 rqr)
7	Retaining Washer	16	Seal	24	Spider
8	Slack adjuster	17	Bushing	25	Spindle
9	Spacer, thin				

Figure 97. Carrier rear service brakeshoe assembly, exploded view.

352. Carrier Treadle Valve Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts.

353. Carrier Treadle Valve Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier treadle valve assembly in the reverse of the numerical sequence as illustrated on figure 99.

b. Installation. Install the carrier treadle valve assembly (TM 5-3810-207-20).

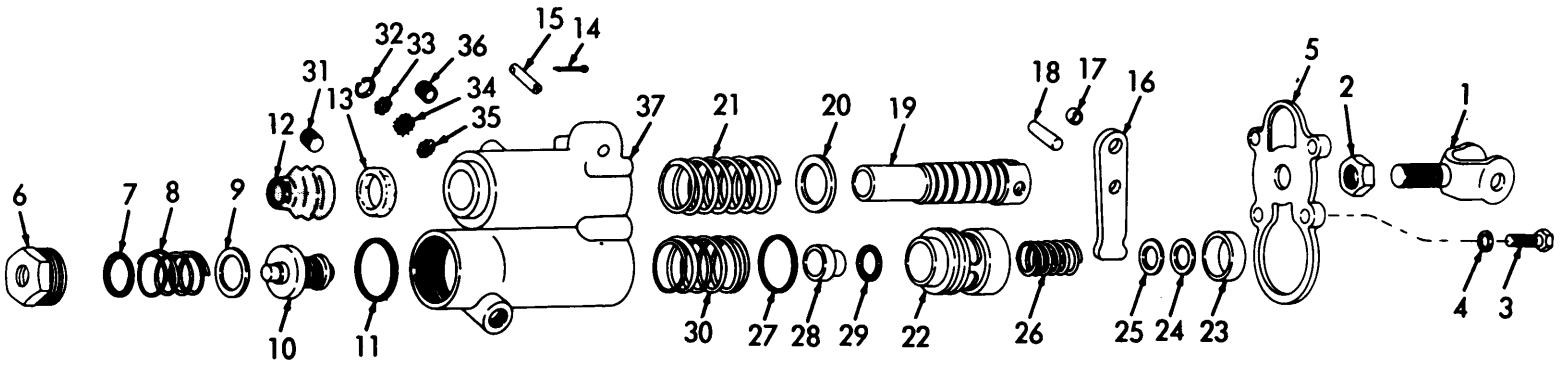
Section VI. CARRIER AIR BRAKE QUICK RELEASE VALVE ASSEMBLY

354. General

The purpose of the carrier quick release valve assembly is to reduce the time required to release the brakes by hastening the exhaust of air pressure from the brake chambers. The valve consists of a body containing a spring-loaded diaphragm so arranged as to permit air pressure to flow through the valve in one direction, but when the supply pressure is reduced, the air which has passed through the valve is permitted to escape through the exhaust port.

355. Carrier Air Brake Quick Release Valve Removal and Disassembly

a. Removal. Remove the carrier air brake quick release valve (TM 5-3810-207-20).



1	Yoke	11	Preformed packing	20	Pull rod washer	29	Preformed packing
2	Nut, ½ -13	12	Boot	21	Spring	30	Spring
3	Screw, cap, 5/16-18 x ¼ in. (4 rqr)	13	Oiler felt	22	Piston	31	Plug, pipe, ¼ in.
4	Washer, lock, 5/16 in. (4 rqr)	14	Pin, cotter, 1/8 x ¾ in.	23	Spring seat	32	Retainer ring (2 rqr)
5	Cover	15	Pin	24	Shim, 0.032 in. (as rqr)	33	Strainer plate
6	Cap	16	Lever	25	Shim, 0.010 in. (as rqr)	34	Hair
7	Preformed packing	17	Bushing	26	Spring	35	Strainer plate
8	Spring	18	Pin	27	Preformed packing	36	Oiler
9	Washer, flat, 7/16 in.	19	Pull rod	28	Valve seat	37	Body
10	Inlet and exhaust valve						

Figure 98. Carrier air assist valve assembly, exploded view.

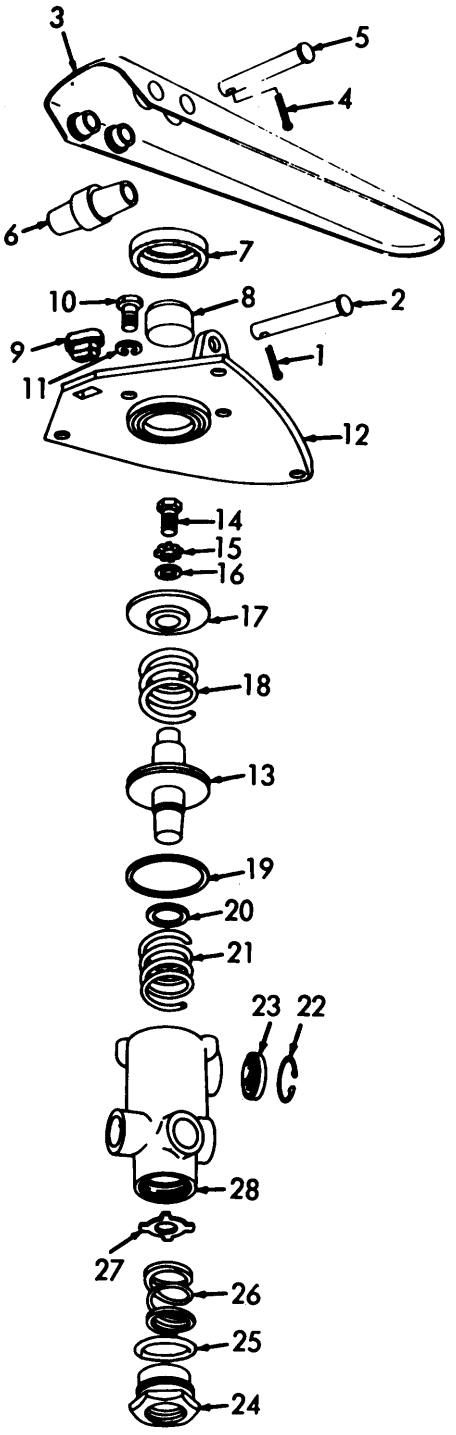


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Figure 99. Carrier treadle brake valve assembly, exploded view.

1 Pin, cotter, 3/32 x 1 in.
2 Pin
3 Treadle body
4 Pin, cotter, 3/32 x 1 in.
6 Pin
6 Roller
7 Boot
8 Plunger
9 Stop button
10 Screw, cap, 5/16-18 x ¾ in. (8 rqr)
11 Washer, lock, 5/16 in. (8 rqr)
12 Mounting plate
13 Piston
14 Screw, cap, 3/8-16 x ¾ in.
15 Washer, lock, ET, 3/8 in.
16 Washer, fiat, 3/8 in.
17 Spring seat
18 Spring
19 Packing
20 Packing
21 Spring
22 Retaining ring
23 Filter screen
24 Inlet nut
25 Packing
26 Spring
27 Inlet valve
28 Body

Figure 99.-Continued.

b. Disassembly. Disassemble the carrier air brake quick release valve in numerical sequence as illustrated on figure 100.

356. Carrier Air Brake Quick Release Valve Cleaning, Inspection, and Repair

a. Cleaning.

(1) Clean all metal parts in an approved cleaning solvent; dry thoroughly.

(2) Wipe the diaphragm with a lint free cloth.

b. Inspection and Repair.

(1) Inspect the diaphragm for cracks, breaks, punctures, and excessive wear.

(2) Inspect the lower face of the diaphragm which contacts the exhaust port seat in the cover for pits and grooves. Replace a defective diaphragm as necessary.

(3) Inspect the body for cracks, breaks, stripped, or damaged threads, and other damage. Replace a defective body.

(4) Inspect the spring and spring seat for cracks, breaks, bends, and other damage.

357. Carrier Air Brake Quick Release Valve Reassembly and Installation

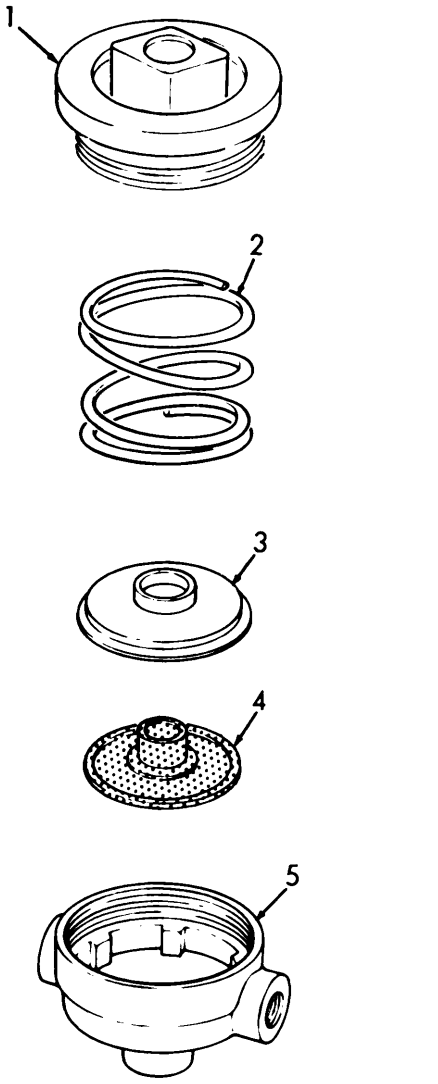
a. Reassembly. Reassemble the carrier air brake quick release valve in the reverse of the numerical sequence as illustrated on figure 100.

b. Installation. Install the carrier air brake quick release valve (TM 5-3810-207-20).

Section VII. CARRIER TRAILER BRAKE VALVE

358. General

The carrier trailer brake valve is a Bendix-Westinghouse type TC brake valve. It consists essentially of a piston which divides the interior of the valve into two separate chambers. The chamber above the piston is always open to the atmospheric pressure, while the lower chamber may or may not be subject to air system pressure. The position of the piston is determined by the position of the operating handle. The nonrigid connection between the piston and handle, through a spring, automatically maintains a selected pressure to the trailer brakes.



1 Cover
2 Spring
3 Seat
4 Diaphragm
5 Body

Figure 100. Carrier air brake quick release valve assembly, exploded view.

359. Carrier Trailer Brake Valve Removal and Disassembly

a. Removal. Remove the carrier trailer brake valve from the crane carrier (TM 5-3810-207-20).

b. Disassembly. Disassemble the carrier trailer brake valve in the numerical sequence as instructed on figure 101.

360. Carrier Trailer Brake Valve Cleaning, Inspection, and Repair

a. Cleaning.

(1) Clean all metal parts with an approved cleaning solvent.

(2) Clean all air passages with compressed air, making certain that they are clean and free of obstructions and foreign matter.

b. Inspection and Repair.

(1) Inspect the bore in the body for scoring and scratches. The bore must be smooth to prevent damage to the piston. Replace a defective body.

(2) Inspect the piston for rough spots and other damage. Check the fit of the piston stem in the cam. The piston stem must be a free sliding fit.

(3) Inspect the inlet and exhaust valve for grooves, pitting, and other damage. Check the fit of the valve in the adjusting ring nut. The valve must slide freely without binding. Replace a defective inlet and exhaust valve.

(4) Inspect the inlet valve seat in the body and the exhaust valve seat in the piston for grooves, pitting, corrosion, wear, and other damage. Replace defective body and piston.
(5) Inspect all parts for cracks, breaks, bends, damaged threads, corrosion, distortion, and other damage. Repair or replace damaged parts as necessary.

361. Carrier Trailer Brake Valve Reassembly and Installation

a. Reassembly. Reassemble the carrier trailer brake in the reverse of the numerical sequence as instructed on figure 101.

b. Installation. Install the carrier trailer brake valve on the crane carrier (TM 53810-207-20).

Section VIII. CARRIER AIR BRAKE PROTECTION VALVE ASSEMBLY

362. General

The carrier air brake protection valve assembly and the carrier air brake protection control valve assembly form the carrier air brake protection system. The trailer service and emergency lines pass through the carrier protection valve. Should a condition arise resulting in air loss from either the carrier or trailer system, with the carrier protection control valve in the "Normal" position, the carrier protection valve will automatically close the air lines leading to the trailer and apply the trailer brakes. During the initial charging of the air brake system, the carrier air brake protection valve remains closed until 24 pounds per square inch air pressure is reached in the air receiver tanks. Until 24 psi air pressure is developed in the air receiver tanks, no air pressure is supplied to the trailer through the trailer emergency brake line. When approximately 24 psi of carrier air tank pressure is reached, the carrier protection valve opens and remains open, allowing air pressure to be delivered through the emergency line charging the trailer air brake system. Normal and emergency braking functions are maintained as long as carrier air receiver tank pressure is above 24 psi.

363. Carrier Air Brake Protection Valve Assembly Removal and Disassembly

a. Removal. Remove the carrier air brake protection valve assembly (TM 5-3810-207-20).

b. Disassembly. Disassemble the carrier air brake protection valve assembly in numerical sequence as illustrated on figure 102.

364. Carrier Air Brake Protection Valve Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts.

365. Carrier Air Brake Protection Valve Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier air brake protection valve assembly in the reverse of the numerical sequence as illustrated on figure 102.

b. Installation. Install the carrier air brake protection valve assembly (TM 5-3810-207-20).

Section IX. CARRIER AIR BRAKE PROTECTION CONTROL VALVE ASSEMBLY

366. General

The carrier air brake protection control valve assembly and the carrier air brake protection valve assembly form the carrier air brake protection system. Manual control of the protection valve is through the two-way protection control valve mounted within easy reach of the carrier operator's position. When the protection control valve is in the "Normal"' position, the service and emergency braking functions of the carrier and the trailer brake systems are normal. When the protection control valve is in the "Emergency" position, the trailer emergency line is vented to the atmosphere

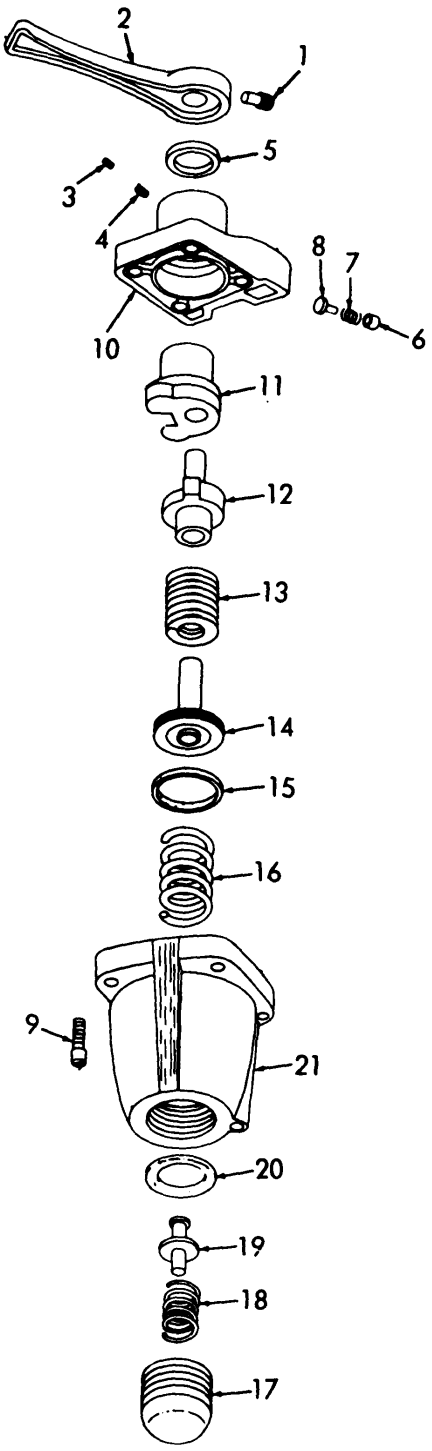


Figure 101. Carrier trailer brake valve, exploded view.

through the exhaust port of the carrier protection valve, and the trailer air brake lines closed off at the carrier protection valve.

367. Carrier Air Brake Protection Control Valve Assembly Removal and Disassembly

a. Removal. Remove the carrier air brake protection control valve assembly (TM 53810-207-20).

b. Disassembly. Disassemble the carrier air brake protection control valve assembly in numerical sequence as illustrated on figure 103.

368. Carrier Air Brake Protection Control Valve Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts.

369. Carrier Air Brake Protection Control Valve Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier air brake protection control valve assembly in the reverse of the numerical sequence as illustrated on figure 103.

b. Installation. Install the carrier air brake protection control valve assembly (TM 53810-207-20).

---

1 Setscrew, ¼ -20 x ½ in.
2 Handle
3 Setscrew, ¼ -28 x 3/8 in.
4 Screw, lock, 4-40 x 3/8 in.
5 Adjusting ring nut
6 Setscrew, socket head, 3/8-24 x 1 ¼ in.
7 Spring
8 Plunger
9 Screw, machine (4 rqr)
10 Cover
11 Cam follower
12 Cam
13 Spring
14 Piston
15 Packing, preformed
16 Spring
17 Nut, ¾ -10
18 Spring
19 Valve inlet and exhaust
20 Packing, preformed
21 Body

Section X. CARRIER SAFETY VALVE ASSEMBLY

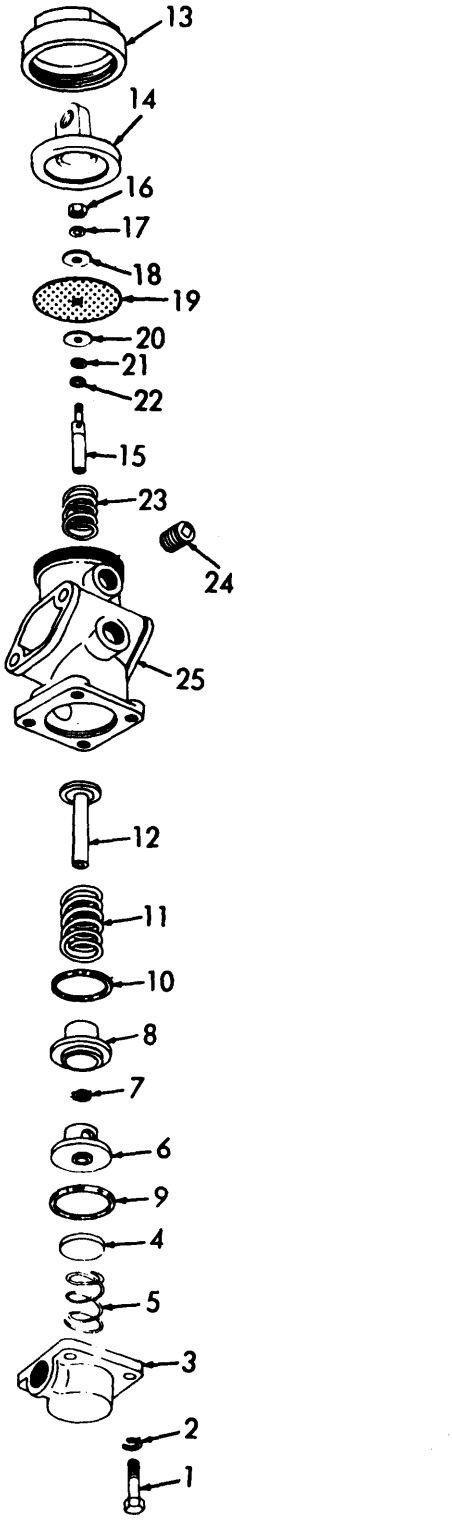


Figure 102. Carrier air brake protection valve assembly, exploded view.

370. General

The carrier safety valve assembly consists of a spring loaded ball check valve and is used to protect the air brake system against excessive pressure. The safety valve is usually set for 150 pounds pressure but can be varied to unit requirements.

371. Carrier Safety Valve Assembly Removal and Disassembly

a. Removal. Remove the carrier safety valve assembly (TM 5-3810-207-20).

b. Disassembly. Disassemble the carrier safety valve assembly in numerical sequence as illustrated on figure 104.

372. Carrier Safety Valve Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts.

373. Carrier Safety Valve Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier safety valve assembly in the reverse of the numerical sequence as illustrated on figure 104.

b. Installation. Install the carrier safety valve assembly (TM 5-3810-207-20).

---

1 Screw, cap, 5/16-18 x ¾ in. (4 rqr)
2 Washer, lock, 5/16 in. (4 rqr)
3 Cover
4 Disk valve
5 Spring
6 Valve seat
7 Packing
8 Valve guide
9 Packing
10 Packing
11 Spring
12 Service and exhaust valve
13 Capnut
14 Caps
15 Plunger
16 Nut, ¼ -28
17 Washer, ¼ in.
18 Follower
19 Diaphragm
20 Follower
21 Washer, ¼ in.
22 Packing
23 Spring
24 Plug, pipe, ¼ in.
25 Body

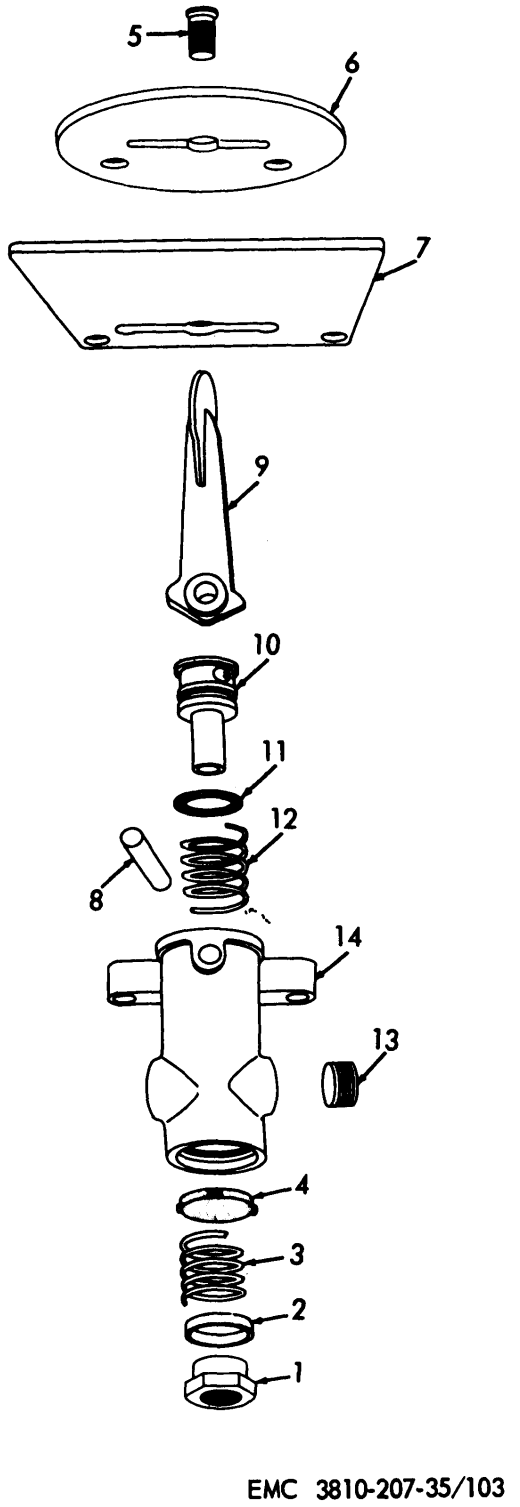


Figure 103. Carrier air brake protection control valve assembly, exploded view.

374. General

The carrier air brake relay valve assembly is located in the carrier air brake system between the air receiver tanks and the rear air brake chambers. The relay valve speeds up the application and release of the rear wheel brakes. It is controlled by the brake control valve and keeps the air pressure in the rear brake chambers the same as the pressure being delivered by the brake control valve. The relay valve reacts to even slight changes in pressure, and raises, lowers, or completely exhausts the air pressure in the rear brake chambers. Air pressure from the brake control valve is delivered to the cavity above the diaphragm. As this cavity is comparatively small and very sensitive to quick changes in air pressure, the action of the relay valve in changing its delivered pressures is also very rapid.

375. Carrier Air Brake Relay Valve Assembly Removal and Disassembly

a. Removal. Remove the carrier air brake relay valve assembly (TM 5-3810-207-20).

b. Disassembly. Disassemble the carrier air brake relay valve assembly in numerical sequence as illustrated on figure 105.

376. Carrier Air Brake Relay Valve Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts.

377. Carrier Air Brake Relay Valve Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier air brake relay valve assembly in the reverse of the numerical sequence as illustrated on figure 105.

b. Installation. Install the carrier air brake relay valve assembly (TM 53810-207-20).

1	End cap	8	Pin
2	Packing	9	Cam lever
3	Spring	10	Plunger
4	Valve	11	Packing
5	Screw, cap, 3/16-24 x 3/8 in (2 rqr)	12	Spring
		13	Plug, pipe, 1/8 in.
6	Name plate	14	Body
7	Mounting plate		

Section XII. CARRIER LOW AIR PRESSURE WARNING SWITCH

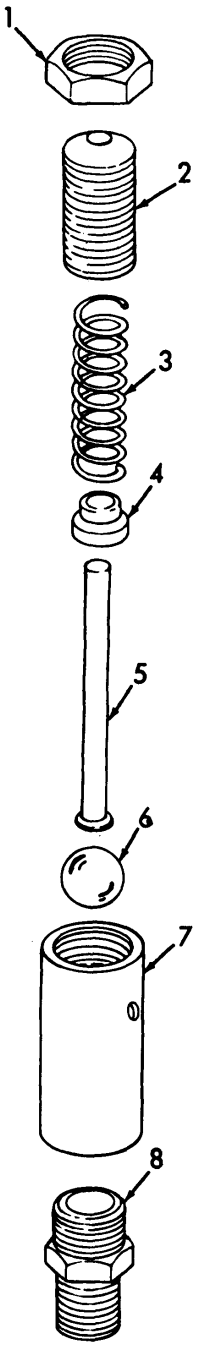


Figure 104. Carrier safety valve assembly, exploded view.

378. General

The carrier low pressure indicator is a safety service designed to give an automatic warning to the operator when the air pressure in the air brake system is below the minimum advisable for normal vehicle operation. It operates an electrical buzzer or warning light. When the reservoir air pressure drops below 60 pounds, the diaphragm spring exerts a force above the diaphragm which is greater than the force exerted by the air pressure below the diaphragm, causing the diaphragm to move down and close the electrical contacts. This completes or closes the electrical circuit to the electrical buzzer or warning light.

379. Carrier Low Air Pressure Warning Switch Removal and Disassembly

a. Removal. Remove the carrier low air pressure warning switch (TM 5-3810-207-20).

b. Disassembly. Disassemble the carrier low air pressure warning switch in numerical sequence as illustrated on figure 106.

380. Carrier Low Air Pressure Warning Switch Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts.

381. Carrier Low Air Pressure Warning Switch Assembly and Installation

a. Reassembly. Reassemble the carrier low air pressure warning switch in the reverse of the numerical sequence as illustrated on figure 106.

b. Installation. Install the carrier low air pressure warning switch (TM 5-3810-207-20).

1	Locknut	5	Release pin
2	Adjusting nut	6	Steel ball
3	Spring	7	Spring cage
4	Spring seat	8	Body

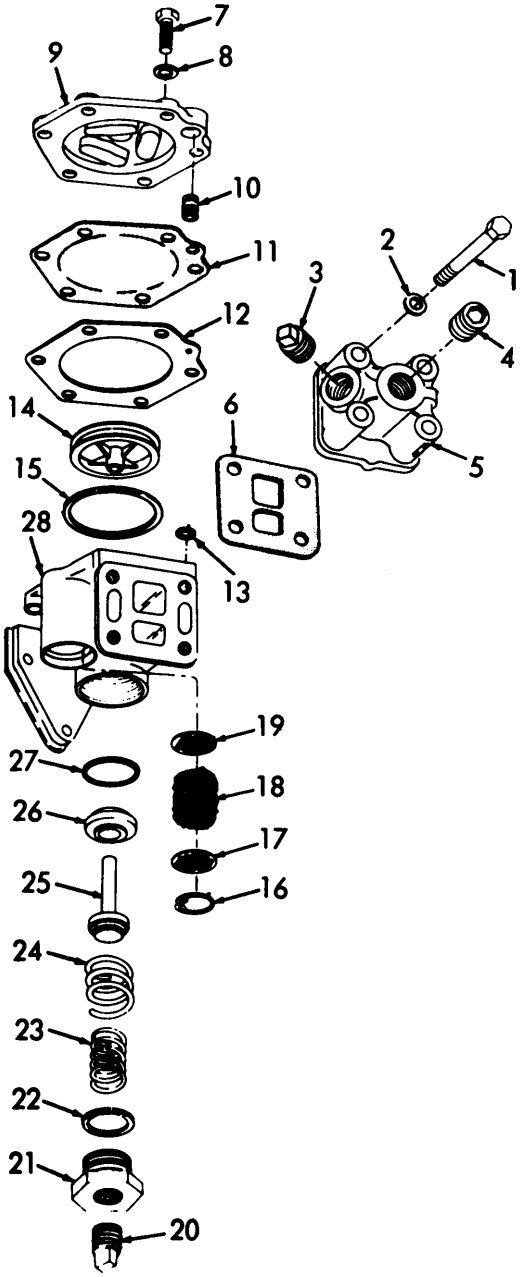


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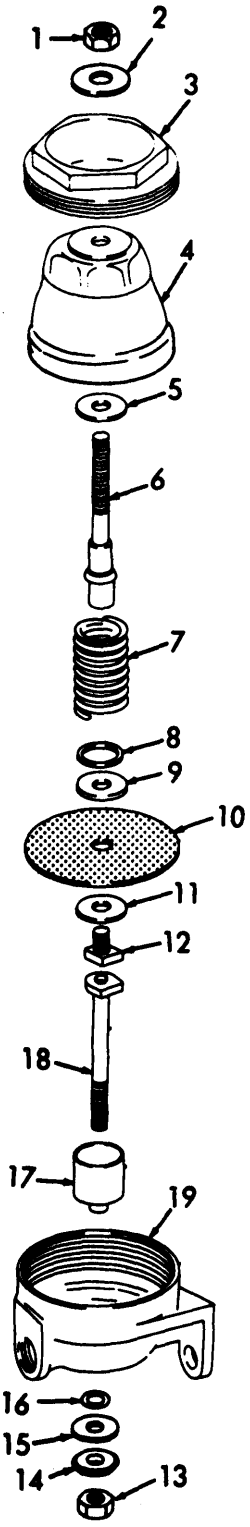
Figure 105. Carrier air brake relay valve assembly, exploded view.

1 Screw, cap, %4-18 x 2 in. (4 rqr)
2 Washer, fiat, 5t in. (4 rqr)
3 Plug, pipe, U in.
4 Plug, pipe, % in.
5 Adapter
6 Gasket
7 Screw, cap, %e-18 x 1 in. (6 rqr)
8 Washer, fiat, %6 in. (6 rqr)
9 Cover
10 Bleeder passage filter
11 Diaphragm
12 Diaphragm ring
13 Packing
14 Diaphragm guide
15 Packing
16 Snap ring
17 Strainer plate
18 Exhaust strainer
19 Strainer, plate
20 Plug, pipe, % in.
21 Capnut
22 Packing
23 Spring
24 Spring
25 Supply valve
26 Valve seat
27 Packing
28 Valve body

Figure 105.-Continued.



EMC 3810-207-35/106

Figure 106. Carrier low air pressure warning switch, exploded view.

1 Nut, 1-24
2 Washer, flat, No. 10
3 Cover retainer
4 Cover
5 Washer, flat, No. 10
6 Terminal screw
7 Spring
8 Shim
9 Diaphragm washer
10 Diaphragm
11 Diaphragm washer
12 Contact
13 Nut, 1-24
14 Washer, flat, No. 10
15 Terminal washer
16 Packing
17 Terminal bushing
18 Terminal screw
19 Body

Figure 106.-Continued.

CHAPTER 13

CARRIER STEERING REPAIR INSTRUCTIONS

Section I. CARRIER STEERING HYDRAULIC PUMP ASSEMBLY

382. General

The carrier steering hydraulic pump assembly is mounted on the front end of the carrier engine cylinder block, just behind the fan assembly. The pump is belt driven from the carrier water pump and fan pulley. The output of the hydraulic pump is delivered to a pressure control valve which in turn supplies the hydraulic cylinder with the necessary power for steer- ing. The pump has a pumping element with a specially designed arrangement in which the inner and outer components are mutually driven. The carrier of the pumping element is keyed to the shaft and revolves inside of the cam insert, which in turn rotates in a bore offset from the center line of the shaft. When the pumping element is revolved, the six rollers, supported by the carrier and retained in position by the cam insert, create a rolling and sliding contact against each other which causes the spaces between parts to open and close. This pumping action is smooth and uniform and occurs through a large number of degrees of rotation. This assures quiet operation and long life for the integral parts because of the absence of shock loads.

383. Carrier Steering Hydraulic Pump Assembly Removal and Disassembly

a. Removal. Remove the carrier steering hydraulic pump assembly (TM 5-3810-207-20).

b. Disassembly. Disassemble the carrier steering hydraulic pump assembly in numerical sequence as illustrated on figure 107.

384. Carrier Steering Hydraulic Pump Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts.

385. Carrier Steering Hydraulic Pump Assembly Reassembly and Installation

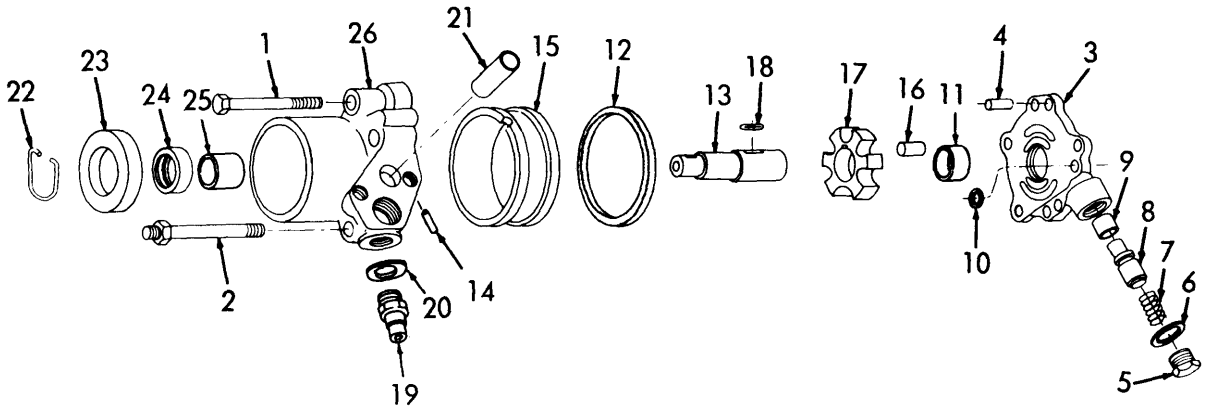
a. Reassembly. Reassemble the carrier steering hydraulic pump assembly in the reverse of the numerical sequence as illustrated on figure 107.

b. Installation. Install the carrier steering hydraulic pump assembly (TM 5-3810-207-20).

Section II. CARRIER STEERING HYDRAULIC CONTROL VALVE ASSEMBLY

386. General

The carrier steering hydraulic control valve assembly is mounted on the rear and underside of the actuating housing and bushing assembly of the carrier steering gear assembly. The valve is the control center of the hydraulic steering gear. When the steering wheel is turned, the actuator in the steering gear assembly moves the actuating lever of the steering control valve so hydraulic oil pressure from the hydraulic steering pump is directed to the steering cylinder giving the desired amount and direction of wheel turn.



EMC 3810-207-35/107

1	Screw, cap, 3/8-16 x 2 in. (2 rqr)	10	Packing	19	Adapter
2	Stud and nut assembly 3/8 -16-24 x 3 1/8 in. (3 rqr)	11	Bushing	20	Gasket
3	Cover body	12	Packing	21	Flow director
4	Dowel pin (8 rqr)	13	Shaft	22	Snap ring
5	Valve cap	14	Dowel pin	23	Bearing
6	Packing	15	Cam ring	24	Seal
7	Spring	16	Roll (6 rqr)	25	Bushing
8	Valve assembly	17	Carrier	26	Base body
9	Tube seat	18	Drive pin		

Figure 107. Carrier steering hydraulic pump assembly, exploded view

387. Carrier Steering Hydraulic Control Valve Assembly Removal and Disassembly

a. Removal. Remove the carrier steering hydraulic control valve assembly (TM 5-3810207-20).

b. Disassembly. Disassemble the carrier steering hydraulic control valve assembly in numerical sequence as illustrated on figure 108.

388. Carrier Steering Hydraulic Control Valve Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts.

389. Carrier Steering Hydraulic Control Valve Assembly Reassembly and Installation

a. *Reassembly.* Reassemble the carrier steering hydraulic control valve assembly in the reverse of the numerical sequence as illustrated on figure 108.

b. Installation. Install the carrier steering hydraulic control valve assembly (TM 5-3810207-20).

Section III. CARRIER STEERING HYDRAULIC CYLINDER ASSEMBLY

390. General

The carrier steering hydraulic cylinder assembly is a steering aid attached to the mechanical steering mechanism. The hydraulic steering cylinder enables the operator to have effortless control of the carrier under all adverse conditions that may be due to excessive loads or road conditions.

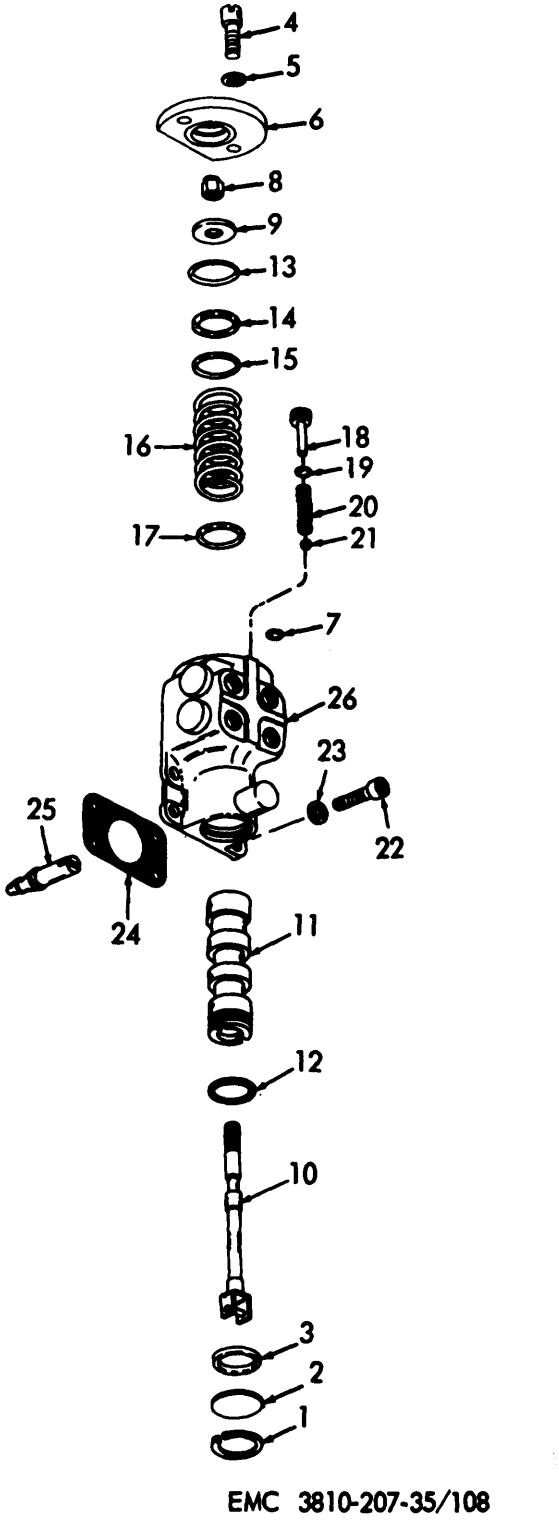


Figure 108. Carrier steering hydraulic control valve assembly, exploded view.

1 Retainer ring
2 Cover plate
8 Packing
4 Screw, cap, 1/4-20 x 5/8 in. (2 rqr)
5 Washer, lock, IT, 1/4 in. (2 rqr)
6 End cover
7 Packing (2 rqr)
8 Nut, stop, 5/16-24
9 Washer, special, 5/16 in.
10 Flexure rod
11 Spool
12 Packing
13 Centering washer
14 Packing
15 Centering washer
16 Spring
17 Centering washer
18 Plug
19 Packing
20 Spring
21 Ball
22 Screw, cap, 5/16 -18 x ¾ in. (4 rqr)
28 Washer, fiat, 5/16, in. (4 rqr)
24 Gasket
25 Actuating lever
26 Valve body

Figure 108.- Continued.

391. Carrier Steering Hydraulic Cylinder Assembly Removal and Disassembly

a. Removal. Remove the carrier steering hydraulic cylinder assembly (TM 5-3810-20720).

b. Disassembly. Disassemble the carrier steering hydraulic cylinder assembly in numerical sequence as illustrated on figure 109.

392. Carrier Steering Hydraulic Cylinder Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts.

393. Carrier Steering Hydraulic Cylinder Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier steering hydraulic cylinder assembly in the reverse of the numerical sequence as illustrated on figure 109.

b. Installation. Install the carrier steering hydraulic cylinder assembly (TM 5-3810-20720).

Section IV. CARRIER STEERING COLUMN AND GEAR ASSEMBLY

394. General

The steering assembly used on the carrier is a cam and lever type assembly. Manual operation of the steering wheel causes the camshaft to rotate in the gear assembly.

395. Carrier Steering Column and Gear Assembly Removal and Disassembly

a. Removal.

(1) Remove the steering wheel and horn (TM 5-3810-207-20).

(2) Remove the steering gear arm and control valve (TM 5-3810-207-20).

(8) Remove the turn signal switch (TM 5-3810-207-20).

(4) Remove two screws and clamp that secures the steering column to the instrument panel. Remove clamp bolt from top cover of the gearbox and remove the steering column.

(5) Remove the carrier steering gear assembly as instructed on figure 110.

b. Disassembly. Disassemble the carrier steering column and gear assembly in numerical sequence as illustrated on figure 111.

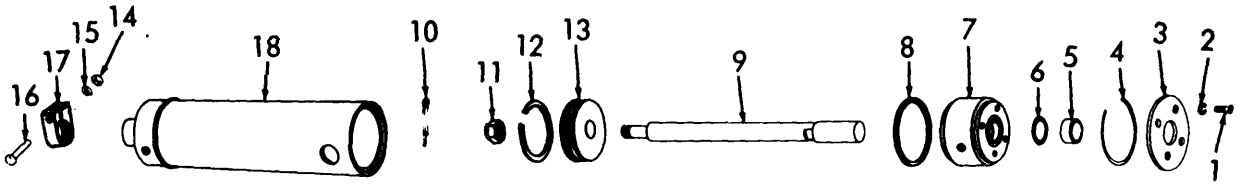
396. Carrier Steering Column and Gear Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear. Replace or repair all defective parts. Inspect shims between lever shaft and housing. Adjust shims pack to proper thickness. Shim pack should not be able to be turned by fingers through side cover.

397. Carrier Steering Column and Gear Assembly and Installation

a. Reassembly. Reassemble the carrier steering column and gear assembly in the reverse of the numerical sequence as illustrated on figure 111.



1	Screw, machine, 1/4 -20 x 5/8 in. (4 rqr)	10	Pin, cotter, 1/8 x 1 1/4 in.
2	Washer, lock, 1/4 in. (4 rqr)	11	Nut, 3/4 -16
3	Cover	12	Piston ring (2 rqr)
4	Retaining ring	13	Piston
5	Seal	14	Nut, 5/8 -18
6	O-Ring	15	Washer, lock 5/8 in.
7	Bearing	16	Screw, cap, 5/8-18 x 2 3/4 in.
8	O-Ring	17	Clamp
9	Piston rod	18	Cylinder

Figure 109. Carrier steering hydraulic cylinder assembly, exploded view.

b. Installation.

(1) Install the carrier steering gear assembly as illustrated on figure 110.

(2) Install the steering column and secure with top cover clamp bolt. Secure to instrument panel with clamp and two screws.

(3) Install the turn signal switch (TM 53810-207-20).

(4) Install the steering gear arm and control valve (TM 5-3810-207-20).

(5) Install the steering wheel and horn (TM 5-3810-207-20).

Section V. CARRIER STEERING KNUCKLE AND SHAFT ASSEMBLY

398. General

The carrier steering knuckles are the trunnion socket-type with universal joints. The power is delivered through the differential to the axle shafts and out through the constant velocity universal joints to the wheels. The front axle can be engaged to operate as a driving unit or disengaged to rotate freely by operating the control lever in the operator's cab. The trunnion sockets are provided for the front axle to allow steering of the carrier while engaged or disengaged.

399. Carrier Steering Knuckle and Shaft Assembly Removal and Disassembly

a. Removal.

(1) Remove the front wheels (TM 53810-207-20).

(2) Remove the brakeshoes (TM 5-3810207-20).

(3) Remove the tie rod drag links (TM 53810-207-20).

(4) Remove the carrier steering knuckle and shaft assembly as instructed on figure 112.

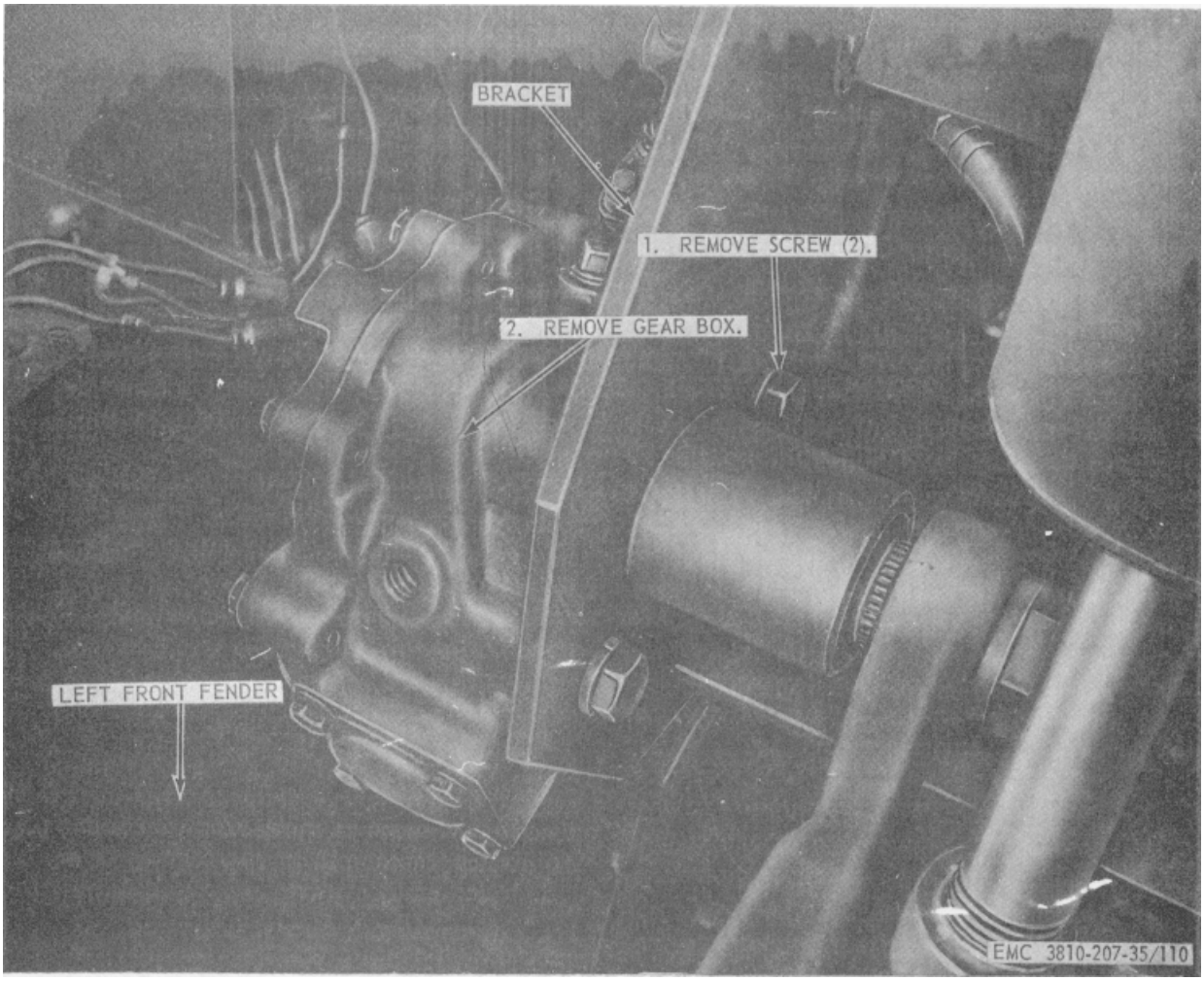


Figure 110. Carrier steering gear assembly, removal and installation.

b. Disassembly. Disassemble the carrier steering knuckle and shaft assembly in numerical sequence as illustrated on figure 113.

400. Carrier Steering Knuckle and Shaft Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. The proper adjustment of the steering knuckle flange bearings is accomplished by the shims located under the flange bearing caps. Remove shims under each cap until there is no end play in the knuckle assembly. After 0.005 inch shims is removed there should be a small amount of drag in rotating the steering knuckle, but it should not bind. Replace or repair all defective parts.

401. Carrier Steering Knuckle and Shaft Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier steering knuckle and shaft assembly in the reverse of the numerical sequence as illustrated on figure 113.

b. Installation.

(1) Install the carrier steering knuckle

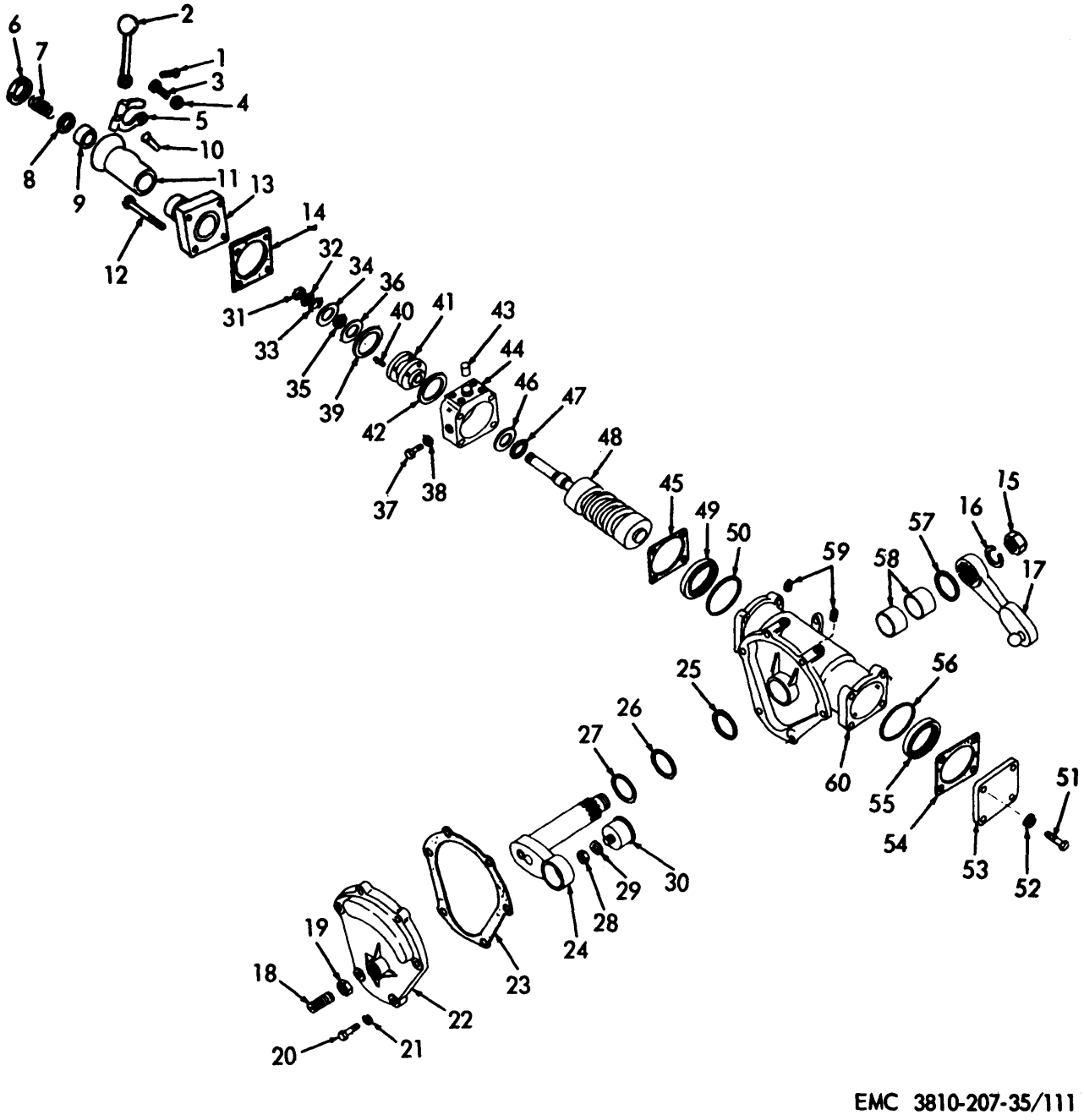


Figure 111. Carrier steering gear assembly, exploded view.

and shaft assembly as illustrated on figure 112.

(2) Install the tie rod drag links (TM 53810-207-20).

(3) Install the brakeshoes (TM 5-3810207-20).

(4) Install the front wheels (TM 53810207-20).

1 Screw No. 10-16 x 5/16 in.
2 Signal lever
8 Clamp bolt
4 Locknut
5 Directional signal switch
6 Steering wheel nut
7 Spring
8 Spring seat washer
9 Bearing
10 Contact roller assembly
11 Jacket tube
12 Upper cover bolt (4 rqr)
13 Upper cover
14 Cover gasket
15 Nut, 1 1/8 -12
16 Washer, lock, 1 1/8 in.
17 Steering gear arm
18 Adjusting screw
19 Nut, 1/2 -20
20 Screw, cap, 3/8 -16 x 1 1/4 in. rqr)
21 Washer, lock, 3/8 in. (6 rqr)
22 Cover
23 Cover gasket
24 Lever shaft assembly
25 Thrust washer
26 Shim (as rqr)
27 Thrust washer
28 Bearing unit nut
29 Retainer washer
30 Bearing unit
31 Adjusting nut
32 Lockwasher, special
33 Tongued washer
34 Thrust washer
35 Thrust bearing
36 Thrust washer
37 Screw, cap, 5/16 -18 x 3/4 in.
38 Washer, flat, 5/16 in.
39 Centering washer
40 Actuator spring (2 rqr)
41 Actuator
42 Centering washer
43 Bushing
44 Actuator; housing
45 Housing gasket
46 Thrust washer
47 Thrust bearing
48 Camshaft assembly
49 Cam bearing
50 Retainer ring
51 Screw, cap, 3/8 -16 x 3/4 in. (4 rqr)
52 Washer, lock, 3/8 in. (4 rqr)
53 Cover
54 Cover gasket
55 Cam bearing
56 Retainer ring
57 Oil seal
58 Bushing (2 rqr)
59 Plug, pipe, 1/8 in. (2 rqr)
60 Steering gear housing

Figure 111. -Continued.

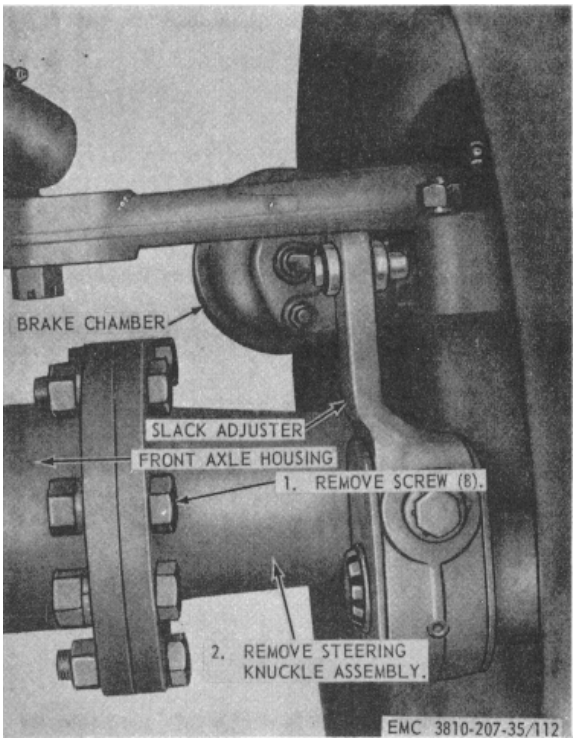
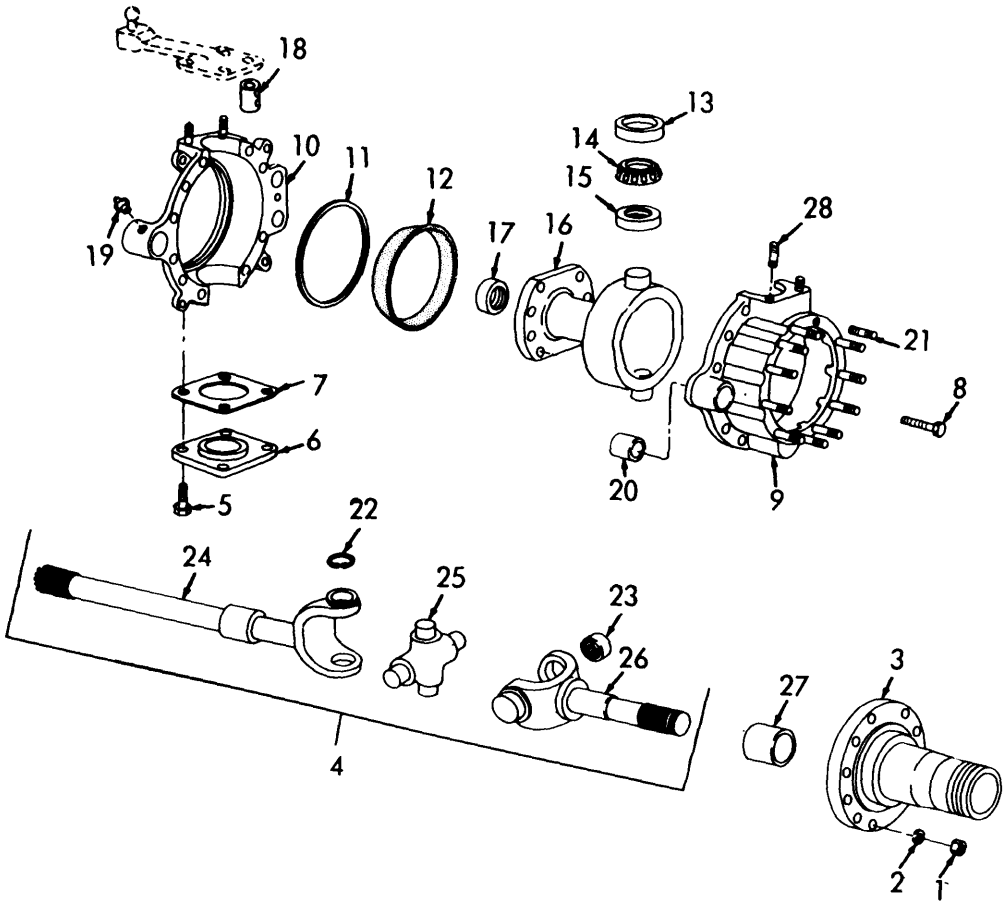


Figure 112. Carrie steering knuckle and shaft assembly, removal and installation.



EMC 3810-207-35/113

1	Nut, 1/2 -20 (23 rqr)	15	Grease retainer (2 rqr)
2	Washer, lock (23 rqr)	16	Trunnion socket
3	Hub	17	Drive shaft oil seal
4	Axle shaft assembly	18	Pin
5	Screw, cap, 5/8 -11 x 2 in. (4 rqr)	19	Fitting, lubrication (2 rqr)
6	Steering bearing lower cap	20	Camshaft bushing
7	Shim (as rqr)	21	Stud, 1/2 -13 and 20 x 1 3/4 in. (12 rqr)
8	Screw, cap, 1/2 -20 x 1 1/2 in. (11 rqr)	22	Lockring
9	Front steering flange	23	Universal bearing
10	Rear steering flange	24	Long axle shaft
11	Socket oil snap ring	25	Universal joint
12	Socket oil seal washer	26	Short axle shaft
13	Steering knuckle cup (2 rqr)	27	Bushing
14	Steering knuckle cone (2 rqr)	28	Stud, 5/8 -11 and 18 x 2 in. (4 rqr)

Figure 113. Carrier steering knuckle and shaft, exploded view.

CHAPTER 14

CARRIER FRONT AXLE ASSEMBLY REPAIR INSTRUCTIONS

Section I. CARRIER FRONT DIFFERENTIAL ASSEMBLY

402. General

The carrier front differential assembly is of the double reduction type. Both gear sets are mounted on tapered roller bearings. The bevel

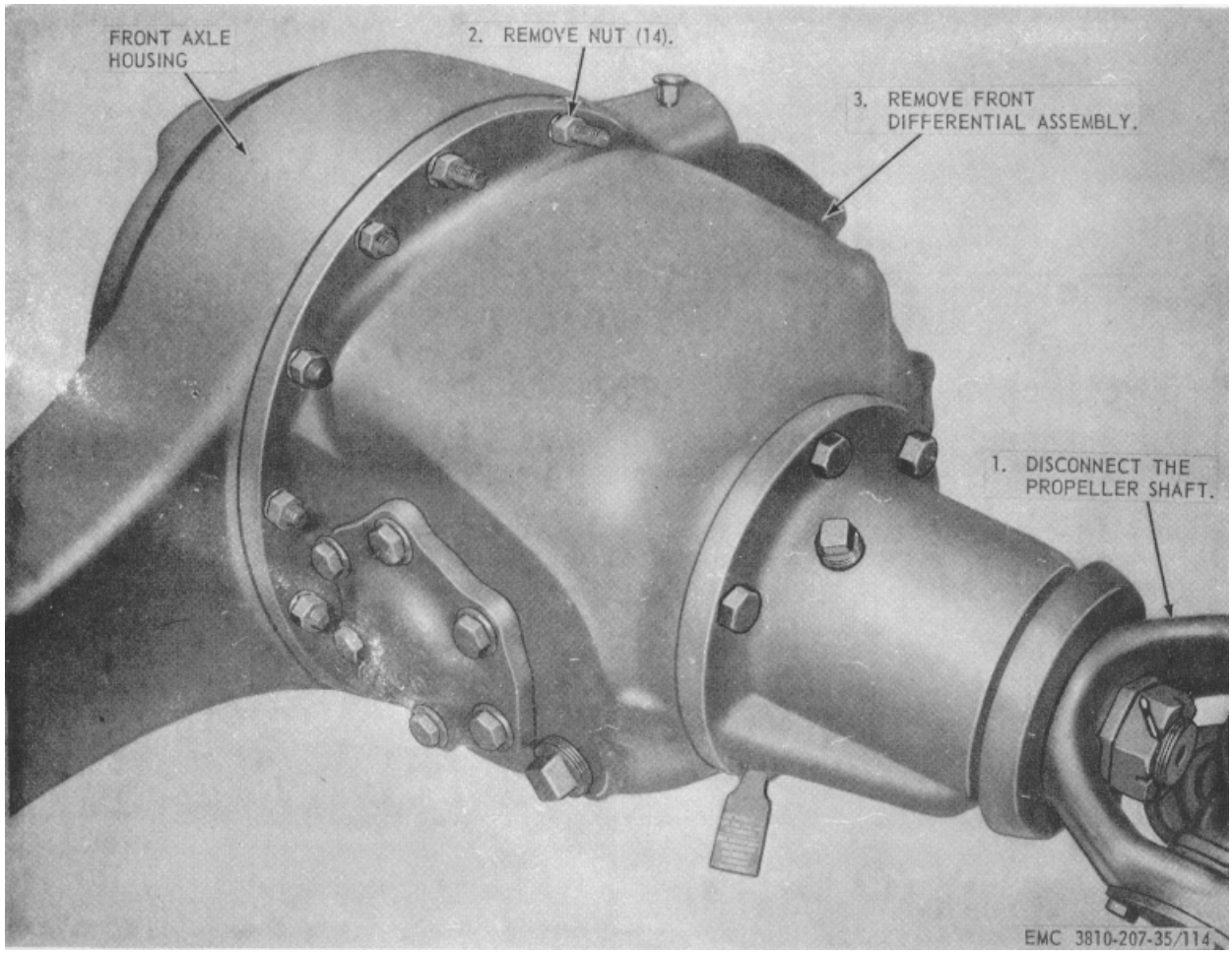


Figure 114. Carrier front differential assembly, removal and installation.

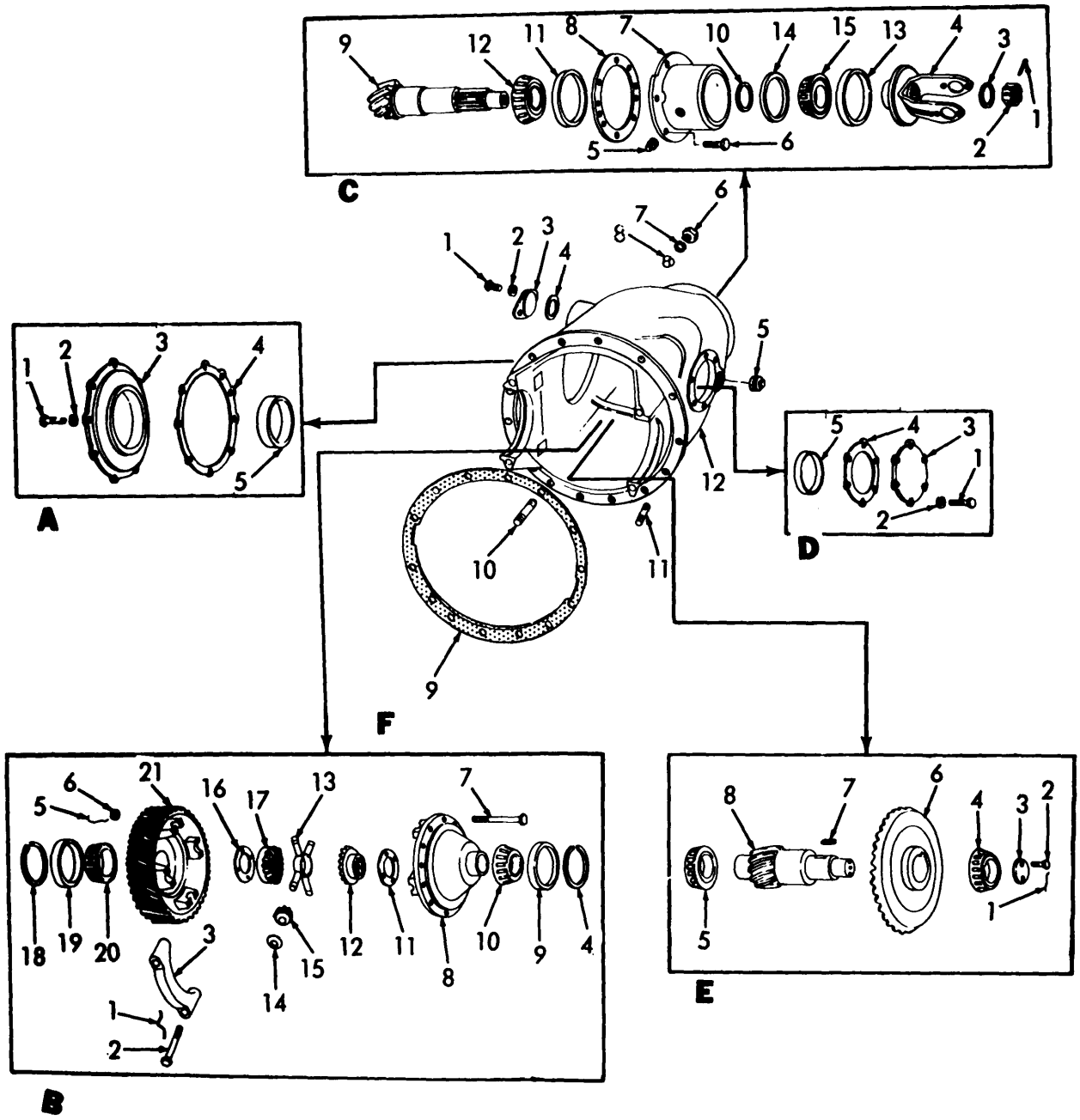


Figure 115. Carrier front axle housing and differential assembly, exploded view.

1 Screw cap, 1/2 -18 x 1 1/2 in. (9 rqr)
2 Washer, flat, 1/2 in. (9 rqr)
3 Bearing cage
4 Shim (as rqr)
5 Bearing cap

A. Left side bring cage and cup

1 Lockwire, 0.0625 in. od (2 rqr)
2 Screw, cap, 5/8-18 x 4% in. (4 rqr)
3 Bearing cap (2 rqr)
4 Adjusting ring
5 Lockwire, 0.0625 in. od
6 Nut, 5/8-18 (8 rqr)
7 Bolt, 5/8-18 x 5 3/4 in. (8 rqr)
8 Differential case
9 Bearing cup
10 Bearing cone
11 Thrust washer
12 Gear
13 Spider
14 Thrust washer (4 rqr)
15 Bevel pinion (4 rqr)
16 Thrust washer
17 Gear
18 Adjusting ring
19 Bearing cup
20 Bearing cone
21 Helical gear and case

B. Helical gear, spider an differential case

1 Pin, cotter, 1/4 x 1 3/4 in.
2 Nut, 1 1/4 in.
3 Washer, flat, 1 1/4 in.
4 Yoke
5 Breather
6 Screw, cap, 7/16-20 x 1 5/8 in. (6 rqr)
7 Bearing cage
8 Shim (as rqr)
9 Pinion gear shaft
10 Spacer
11 Rear bearing cup
12 Rear bearing cone
18 Oil seal
14 Forward bearing cup
15 Forward bearing cone

C. Pinion gear shaft, yoke and bearing ease

1 Screw, cap, 1/2-13 x 1 1/2 in. (6 rqr)
2 Washer, fiat, 1/2 in. (6 rqr)
3 Bearing cage
4 Shim (as rqr)
5 Bearing cup

D. Right side bearing cage and cup

1 Lockwire, 0.0475 in. od
2 Screw, cap, 7/16-14 x 1 ½ in. (2 rqr)
3 Thrust washer
4 Bearing cone
5 Bearing cone
6 Bevel gear
7 Key
8 Gearshaft

E. Gear and gearshaft

1 Screw, cap, 3/8 -16s x 3/4 in.(2 rqr)
2 Washer, lock, 3/8 in. (2 rqr)
3 Cover
4 Gasket
5 Plug, 1 1/2 in.
6 Nut, 1/2-13 (14 rqr)
7 Washer, lock, IET, 1/2 in. (14 rqr)
8 Dowel (4 rqr)
9 Gasket
10 Stud, 1/2 -13 x 3 1/4 in. (4 rqr)
11 Stud, 1/2 -18 x 2 in. (10 rqr)
12 Differential carrier

F. Differential carrier

Figure 115.-Continued.

pinion gear drives the bevel gear which, being on a common shaft with the spur pinion gear, drives the differential spur pinion gear which drives the differential gear.

403. Carrier Front Differential Assembly Removal and Disassembly

a. Removal.

(1) Remove the propeller shaft (TM 53810-207-20).

(2) Drain the axle housing (TM 5-3810207-10).

(3) Remove the steering knuckle and shaft assembly (par. 399).

(4) Remove the carrier front differential assembly as instructed on figure 114.

b. Disassembly. Disassemble the carrier front differential assembly in numerical sequence as illustrated on figure 115.

404. Carrier Front Differential Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace or repair all defective parts. Check the pre-load torque of the cross shaft bearing. The correct pre-load torque of 5 to 15 pound-inches can be obtained by adding or removing shims under the bearing cage on the opposite side of the bevel gear. Check the pinion geaishaft bearing for correct pre-load of 5 to 15 pound-inches. Inspect the contact of the bevel gear and pinion teeth for correct backlash of 0.014 to 0.020 inch. The spur gear runout should not exceed 0.008 inch.

405. Carrier Front Differential Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier front differential assembly in the reverse of the numerical sequence as illustrated on figure 115.

b. Installation.

(1) Install the carrier front differential assembly as illustrated on figure 114.

(2) Install the steering knuckle and shaft assembly (par. 401).

(3) Fill the axle housing (TM 5-3810207-10).

(4) Install the propeller shaft (TM 53810-207-20).

Section II. CARRIER FRONT SPRING ASSEMBLY

406. General

The two front spring assemblies, one on each side, are mounted with the arch down. A hanger is welded to the frame side rail. The rear end of the spring lies in the hanger. An eye on the front end of the spring is pinned to the hanger welded on the frame side rail. The spring leaves are held together by a bolt through the center of each leaf. The leaves are held in alignment with two clips. The front axle is secured to each spring with a pair of U-bolts.

407. Carrier Front Spring Assembly Removal and Disassembly

a. Removal. Remove the carrier front spring assembly as instructed on figure 116.

b. Disassembly. Disassemble the carrier front spring assembly in numerical sequence as illustrated on figure 117.

408. Carrier Front Spring Assembly Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear or damage. Replace or repair all defective parts.

409. Carrier Front Spring Assembly Reassembly and Installation

a. Reassembly. Reassemble the carrier front spring assembly in the reverse of the numerical sequence as illustrated on figure 117.

b. Installation. Install the carrier front spring assembly as illustrated on figure 116.

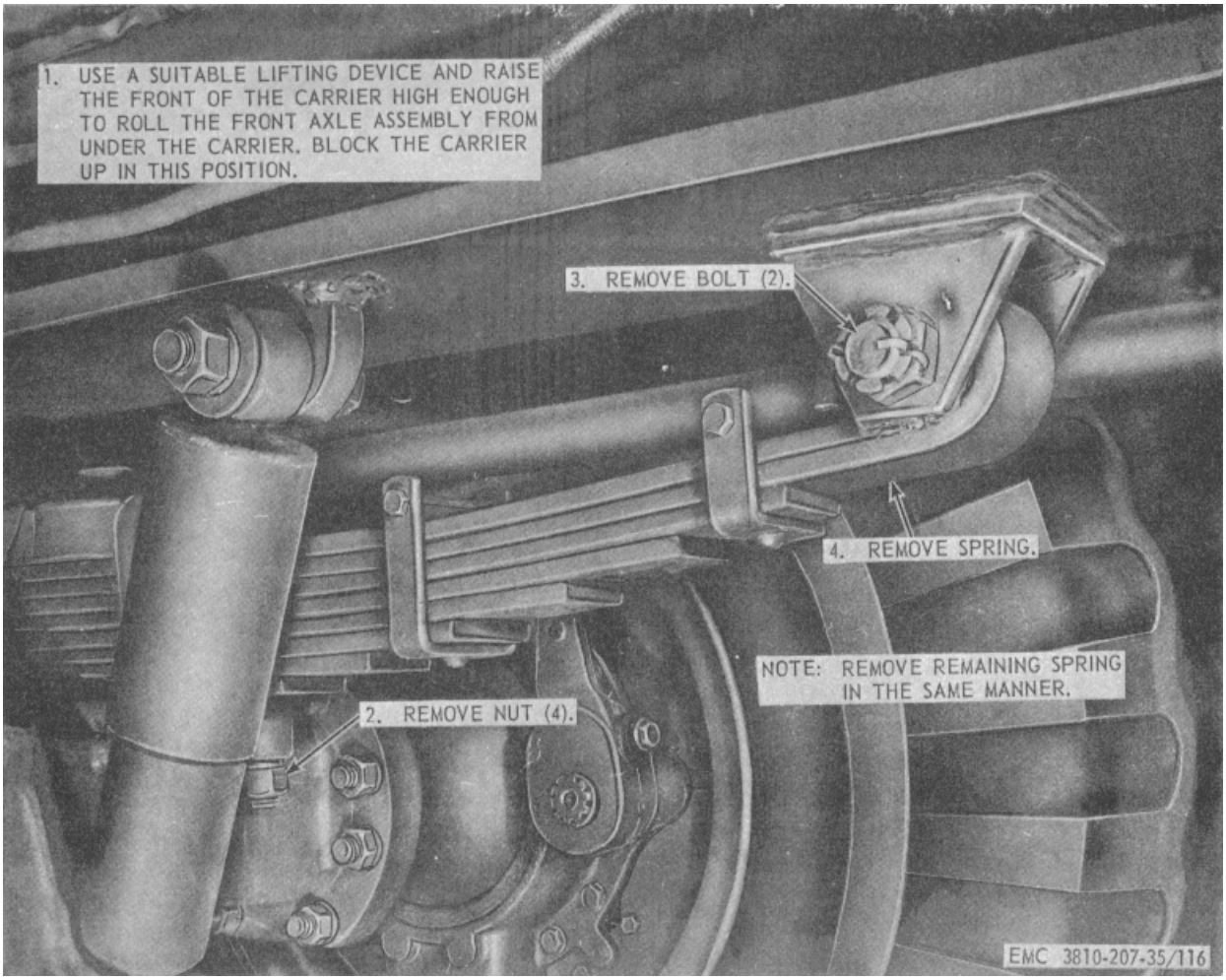
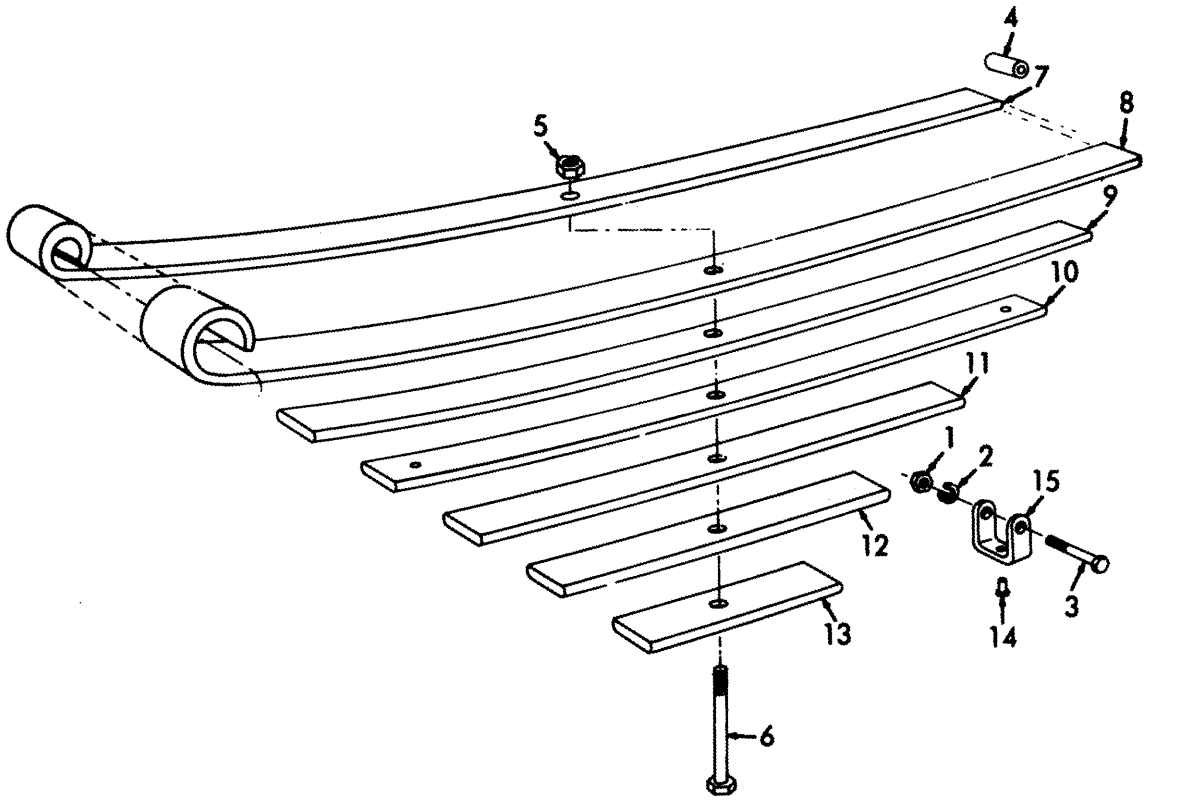


Figure 116. Carrier front spring and axle assembly, removal and installation.



EMC 3810-207-35/117

1	Nut, 3/8 -16 (2 rqr)	9	Leaf No. 8
2	Washer, lock, 3/8 in. (2 rqr)	10	Leaf No. 4
3	Bolt, 3/8-16 x 4 in. (2 rqr)	11	Leaf No. 5
4	Sleeve (2 rqr)	12	Leaf No. 6
5	Nut, 7/16-20	13	Leaf No. 7
7	Leaf No. 1	14	Rivet (2 rqr)
8	Leaf No. 2	15	Clip (2 rqr)

Figure 117. Carrier front spring assembly, exploded view.

CHAPTER 15
CARRIER REAR AXLE AND BOGIE ASSEMBLY REPAIR INSTRUCTIONS

Section I. TORQUE ROD ASSEMBLY

410. General

Each rear axle of the carrier has an automotive-type torque rod; one end attached to the upper axle housings and the other end of the torque rod is attached to the carrier at the rear saddle bracket. The ball stud and socket assembly of the torque rod is so designed that the torque generated at the axle is minimized at the frame.

411. Torque Rod Assembly Removal and Disassembly

a. Removal Remove the torque rod assembly as instructed on figure 118.

b. Disassembly. Disassemble the torque rod assembly in numerical sequence as instructed on figure 119.

412. Torque Rod Assembly Cleaning and Inspection

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. Replace all defective parts as necessary.

413. Torque Rod Assembly Reassembly and Installation

a. Reassembly. Reassemble the torque rod assembly in the reverse of the instructions on figure 119.

b. Installation. Install the torque rod assembly as illustrated on figure 118.

Section II. EQUALIZING BEAM ASSEMBLY

414. General

Two equalizing beams serve as the rear suspension for the carrier frame and rear axles to which each end of the beams are bolted. The ball and socket axle mounted beam ends provide axle movement independent of the carrier frame, since the vertical movement of either wheel or axle is about the center mounting of the beam where it is bolted to the carrier and pivots or turns on its center sleeve and bushing.

415. Equalizing Beam Assembly Removal and Disassembly

a. Removal. Remove the equalizing beam assembly as instructed on figure 120.

b. Disassembly. Disassemble the equalizing beam assembly in numerical sequence as instructed on figure 121.

416. Equalizing Beam Assembly Cleaning and Inspection

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection. Inspect all parts for excessive wear and damage. Replace or repair all defective parts.

417. Equalizing Beam Assembly Reassembly and Installation

a. Reassembly. Reassemble the equalizing

beam assembly in the reverse of the instruction on figure 121.

b. Installation. Install the equalizing beam assembly as illustrated on figure 120.

Section III. CARRIER REAR, REAR AXLE DIFFERENTIAL ASSEMBLIES

418. General

The forward rear and rear axles are top mounted double-reduction drive units. The through shafts of the hypoid gear drive units are supported at the forward end by tapered roller bearings and at the rear end by a straight roller bearing. Pinion bearing preload is adjusted and maintained by a hardened precision spacer between the inner and the outer tapered bearings. The front rear through-shaft is splined on both ends while the rear one is not splined on both ends.

419. Carrier Rear, Rear Axle Differential Assemblies Removal and Disassembly

a. Removal.

(1) Disconnect the propeller shafts (TM 5-3810-207-20).

(2) Remove the rear airbrake lines (TM 5-3810-207-20).

(3) Drain the two axle housing (TM 5-3810-207-20).

(4) Disconnect the torque rods (par. 411).

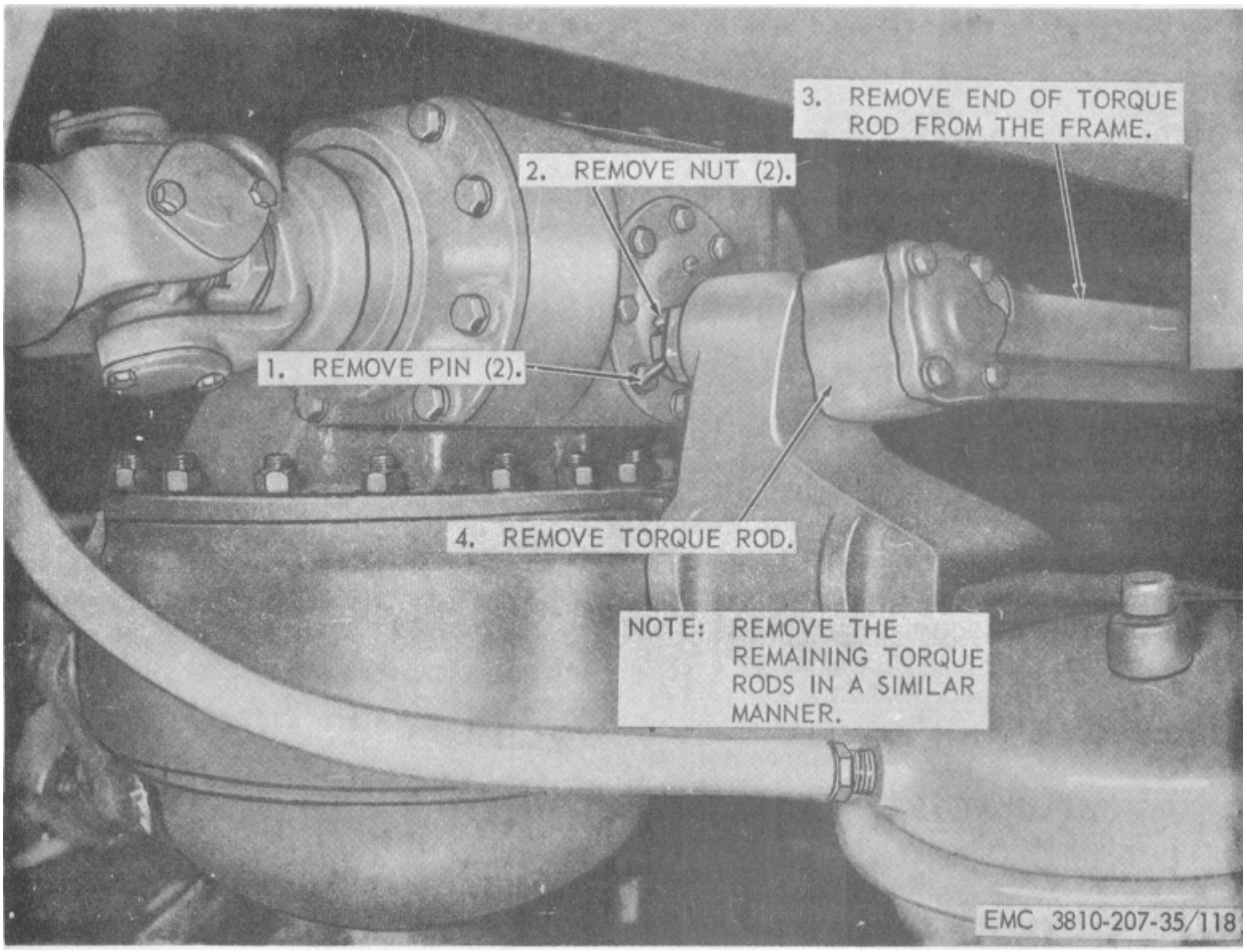
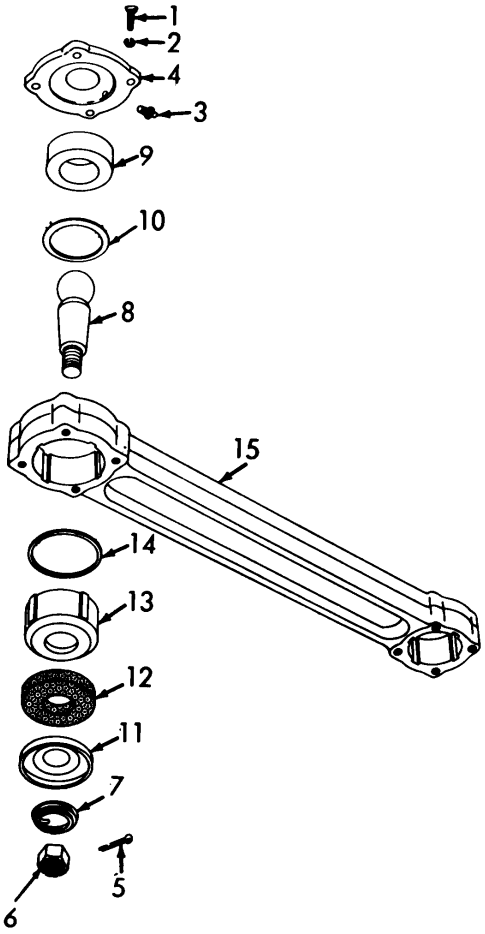


Figure 118. Torque rod assembly, removal and installation.



NOTE: DISASSEMBLE OPPOSITE END OF TORQUE ROD IN THE SAME MANNER.

EMC 3810-207-35/119

1 Screw, cap, 3/8 -24 x 1 1/4 in. (8 rqr)
2 Washer, lock, 3/8 in. (8 rqr)
3 Fitting, lubrication (2 rqr)
4 Torque rod cap (2 rqr)
5 Pin, cotter, 3/16 x 2 1/2 in. (2 rqr)
6 Nut, 1 14-12 (2 rqr)
7 Spring (2 rqr)
8 Ball stud (2 rqr)
9 Plain ball socket (2 rqr)
10 Shim, 0.010 in. (as rqr)
11 Retainer (2 rqr)
12 Socket felt (2 rqr)
13 Grooved ball socket (2 rqr)
14 Shim, 0.005 in. (as rqr)
15 Torque rod

Figure 119. Torque rod assembly, exploded view.

(5) Disconnect the equalizer beams (par. 415).

(6) Use a suitable lifting device to raise the carrier, and roll the rear axle assemblies from under the carrier. Block the carrier up in this position.

(7) Remove the rear axles (TM 5-3810207-20).

(8) Remove the carrier rear axle differential assemblies as instructed on figure 122.

b. Disassembly. Disassemble the carrier rear axle differential assemblies in numerical sequence as illustrated on figure 123.

420. Carrier Rear, Rear Axle Differential Assemblies, Cleaning, Inspection, and Repair

a. Cleaning. Clean all parts with an approved cleaning solvent and dry thoroughly.

b. Inspection and Repair. Inspect all parts for excessive wear and damage. The pre-load torque for bearings mounted in bearing cage is 5 to 15 pounds-inch. Install or remove shims between bearing cage and cover to attain proper bearing pre-load. When gear backlash is not specified on gear, set backlash to 0.006 to 0.012 inch. Replace gears in pairs. Replace or repair all damaged or defective parts.

421. Carrier Rear, Rear Axle Differential Assemblies Reassembly and Installation

a. Reassembly. Reassemble the carrier rear axle differential assemblies in reverse of numerical sequence as illustrated on figure 123.

b. Installation.

(1) Install the carrier rear axle differential assemblies as illustrated on figure 122.

(2) Connect the equalizer beams (par. 417).

(3) Connect the torque rods (par. 413).

(4) Install the rear axle (TM 5-3810207-20).

(5) Fill the two axle housings (LO 53810-207-20).

(6) Install the rear air brake lines (TM 5-3810-207-20).

(7) Connect the propeller shafts (TM 5-3810-207-20).

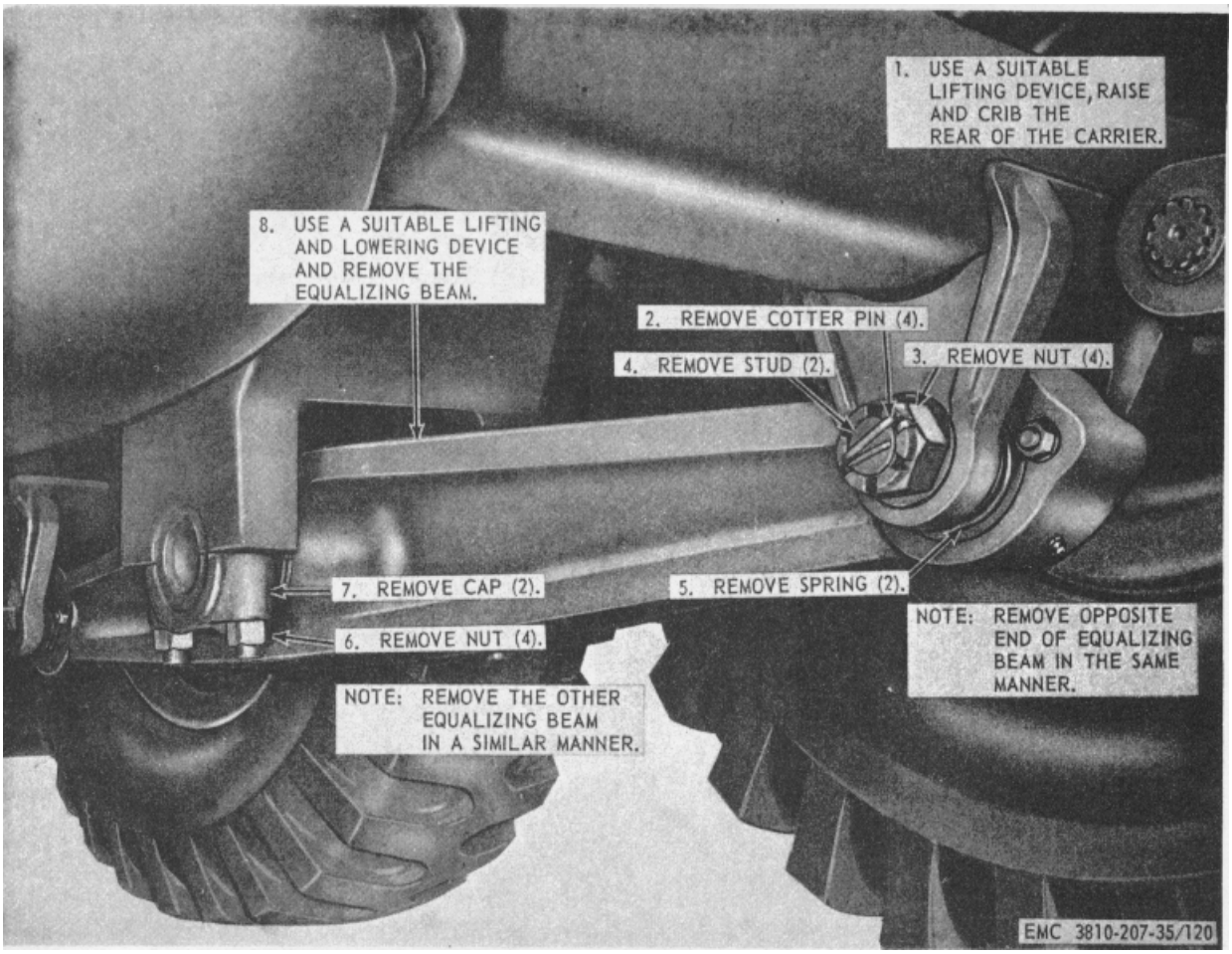


Figure 120. Equalizing beam assembly, removal and installation

1	Nut, 3/4-16 (4 rqr)	12	Beam ball (2 rqr)
2	Saddle cap (2 rqr)	13	Beam socket half (4 rqr)
3	Thrust washer (2 rqr)	14	Nut 1/2 -20 (4 rqr)
4	Beam center sleeve	15	Washer, lock, 1/2 in. (2 rqr)
5	Stud, 3/4-16 x 4 3/4 in. (4 rqr)	16	Locking washer (2 rqr)
6	Pin, cotter, 3/16 x 3 1/2 in. (4 rqr)	17	Locking washer (2 rqr)
7	Nut, castellated, 1 3/8-12	18	Washer, lock, 1/2 in. (2 rqr)
8	Stud, 1 3/8-12 x 9 1/2 in. (2 rqr)	19	Screw, cap, 1/2 -20 x 1/2 in. (4 rqr)
9	Spring (2 rqr)	20	Fitting lubrication (3 rqr)
10	Felt retainer (4 rqr)	21	Center bushing (2 rqr)
11	Ball felt (4 rqr)	22	Equalizing beam

Figure 121. Equalizing beam assembly, exploded view.

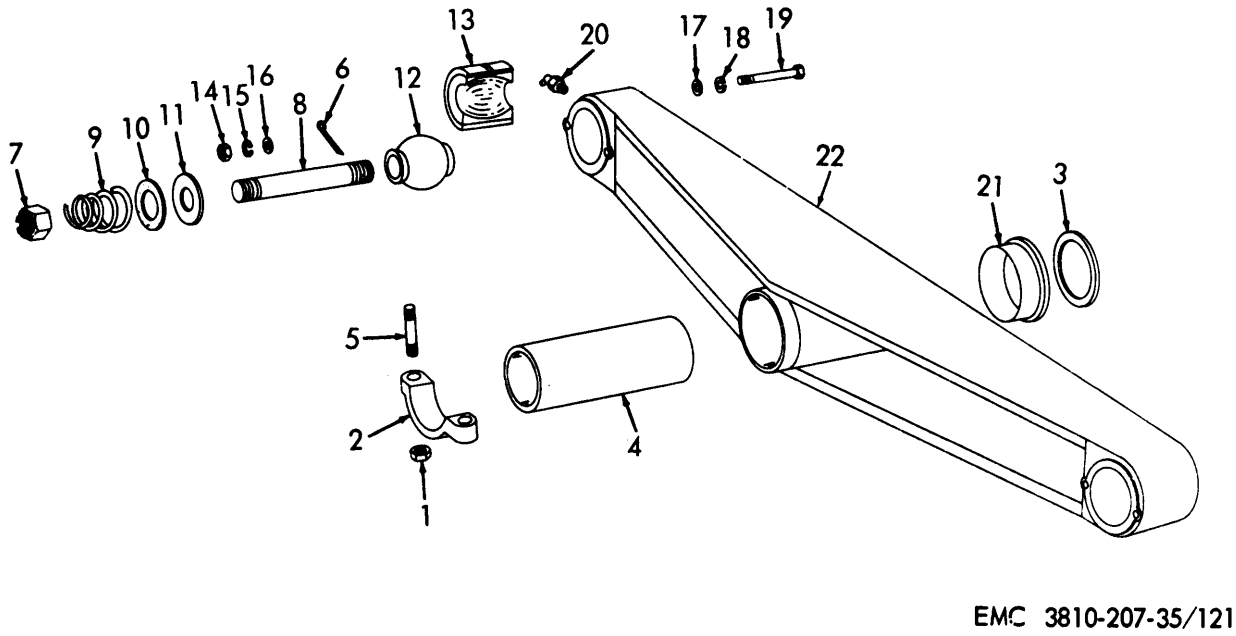


Figure 121.-Continued.

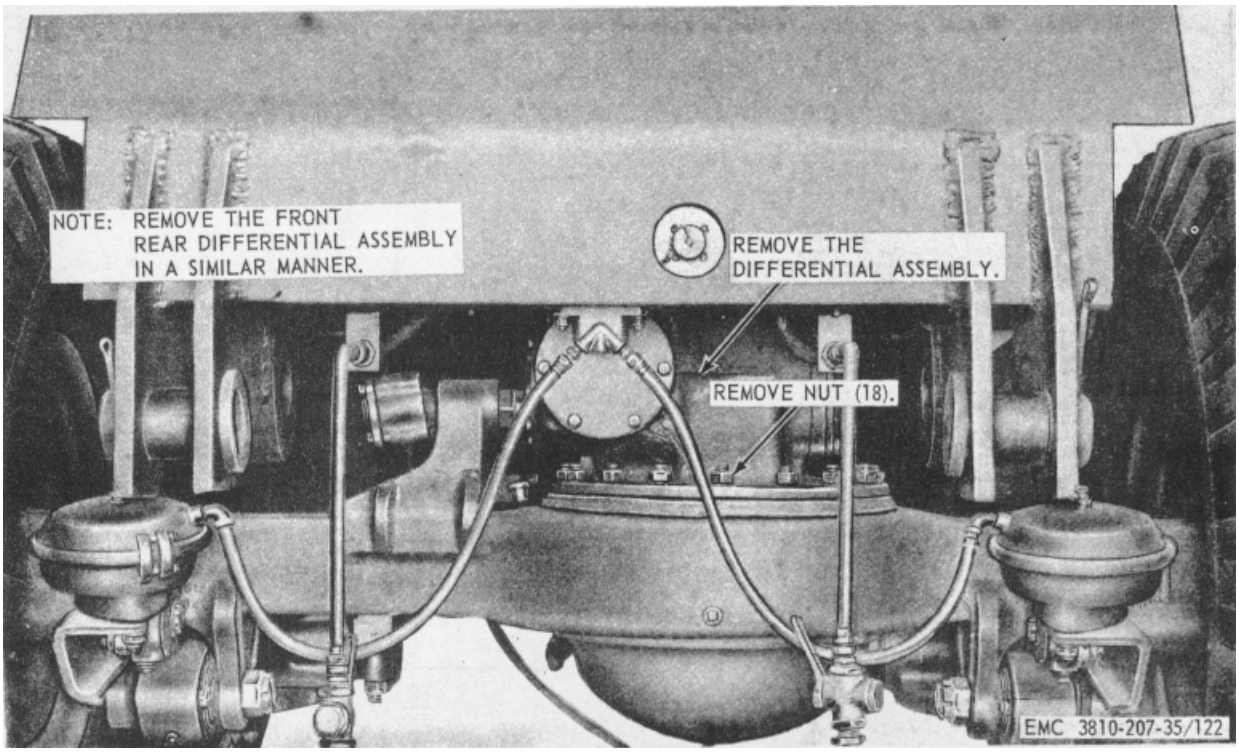


Figure 122. Carrier rear, rear axle differential assembly, removal and installation.

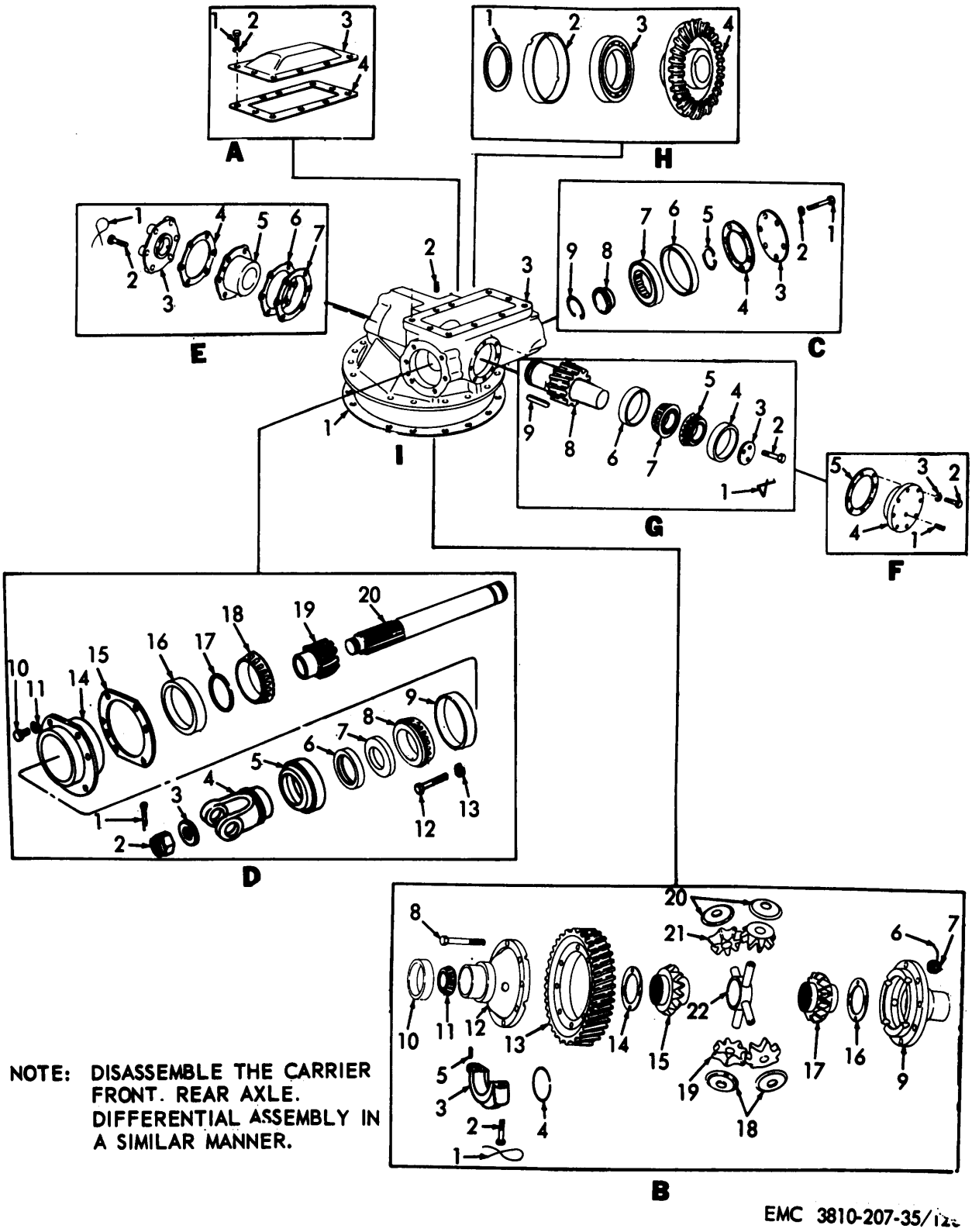


Figure 123. Carrier rear, rear axle differential assembly, exploded view.

1 Screw, cap, 3/8 -16 x 3/4 in. (10 rqr)
2 Washer, lock, 3/8 in. (10 rqr)
3 Differential cover
4 Cover gasket

A. Differential cover

1 Lockwire, 0.625 in.
2 Screw, cap, 3/4 -10 x 4 1/2 in. (4 rqr)
3 Bearing cap (2 rqr)
4 Adjusting ring (2 rqr)
5 Dowel (4 rqr)
6 Lockwire, 0.624 in.
7 Castellated nut, 5/8 -18 (8 rqr)
8 Screw, cap, 5/8-18 x 3 in. (8 rqr)
9 Differential case
10 Bearing cup (2 rqr)
11 Bearing cone (2 rqr)
12 Differential case
13 Drive helical gear
14 Thrust washer
15 Differential bevel gear
16 Thrust washer
17 Differential bevel gear
18 Bevel pinion thrust washer (2 rqr)
19 Spider bevel pinion (2 rqr)
20 Bevel pinion thrust washer (2 rqr)
21 Spider bevel pinion (2 rqr)
22 Differential spider

B. Differential spider, pinions, ears and case

1 Screw, cap, 3/8-16 x 1 in. (6 rqr)
2 Washer, lock, 3/8 in. (6 rqr)
3 Shaft cover
4 Cover gasket
5 Retaining ring
6 Spacer
7 Roller bearing
8 Bearing race
9 Retaining ring

C. Shaft cover and bearings

1 Pin, cotter, 3/8 x 3 in.
2 Castellated nut, 1 3/4-12
3 Washer, flat, 1 3/4 in.
4 Yoke
5 Dirt defector
6 Oil seal
7 Spacer
8 Bearing cone
9 Bearing cup
10 Screw, cap, 1/2 -13 x 1 1/2 in. (6 rqr)
11 Washer, lock, 1/2 in. (6 rqr)
12 Screw, cap, 1/2 -18 x 1 5/8 in. (2 rqr)
13 Washer, lock, 1/2 in. (2 rqr)
14 Bevel pinion bearing cage
15 Shim (25 rqr)
16 Bearing cup
17 Spacer
18 Bearing cone
19 Bevel gear and pinion
20 Rear axle pinion shaft

D. Rear axle pinion shaft, bearing cage and yoke

1 Lockwire, 0.625 in.
2 Screw, cap, 1/2 -18 x 1 3/4 in. (6 rqr)
3 Bearing cover
4 Cover shim (25 rqr)
5 Bearing cage
6 Cage shim (25 rqr)
7 Gasket

E. Bearing cage and cover

1 Plug, pipe, 1/4 in.
2 Screw, cap, 3/8 -16 x 3/4 in. (8 rqr)
3 Washer, lock, 3/8 in. (8 rqr)
4 Cage shim (25 rqr)
5 Cover gasket

F. Cover and gasket

1 Lockwire, .0.625 in.
2 Screw, cap, 7/16 -14 x 1 in. (3 rqr)
3 Retaining washer
4 Bearing cup
4 Bearing cone
6 Bearing cone
6 Bearing cap
7 Bearing cone
8 Helical pinion shaft
9 Machine key

G. Pinion shaft

1 Bearing washer
2 Bearing sleeve
3 Bevel gear bearing
4 Bevel gear

H. Bevel gear and bearing

1 Gasket
2 Screw, set, 7/16 -14 x 1 in.
3 Carrier assembly

I. Carrier assembly and gasket

Figure 123.--Continued.

APPENDIX I

REFERENCES

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1. Dictionaries of Terms and Abbreviations

AR 320-5	Dictionary of United States Army Terms.
AR 320-50	Authorized Abbreviations and Brevity Codes.

2. Fire Protection

TM 5-687	Inspection and Preventive Maintenance Services for Fire Protection Equipment and Appliances.
TM 9-1799	Ordnance Maintenance Fire Extinguishers.

3. Lubrication

LO 5-3810-207-20	Lubrication Order.

4. Operating Instructions

TM 5-3810-207-10	Operator’s Manual.

5. Organizational Maintenance

TM 5-3810-207-20	Organizational Maintenance Manual.

6. Painting

TB ENG 60	Preservation and Painting of Serviceable Corps of Engineers Equipment.
TM 38-230	Preservation, Packing and Packing of Military Supplies and Equipment.

7. Preventive Maintenance

AR 750-5	Maintenance Responsibilities and Shop Operations.
TB ENG 347	Winterization Techniques for Engineer Equipment.
TM 5-505	Maintenance of Engineer Equipment.
TM 9-1870-1	Care and Maintenance of Pneumatic Tires.
TM 38-750	The Army Equipment Records System.
TM 5-764	Electric Motor and Generator Repair.

8. Publication Indexes

DA PAM 108-1	Index of Army Motion Pictures, Film Strips, Slides, and Phono-Recordings.
DA PAM 310-1	Index of Administrative Publications.
DA PAM 310-2	Index of Blank Forms.
DA PAM 310-3	Index of Training Publications.
DA PAM 310-4	Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modified Work Orders.
DA PAM 310-5	Index of Graphic Training Aids and Devices.
DA PAM 310-25	Index of Supply Manuals-Corps of Engineers.

9. Radio Interference Suppression

TM 11-483 Radio Interference Suppression.

10. Supply Publications

TM 5-3810-207-20P	Organizational Repair Parts and Special Tool Lists.
TM 5-3810-207-35P	Field and Depot Maintenance Repair Parts and Special Tool Lists.

11. Training Aids

FM 5-25	Explosives and Demolition.
FM 21-5	Military Training.
FM 21-6	Techniques of Military Instruction.
FM 21-30	Military Symbols.

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