McCULLOCH

5400 Alla Rd.
Los Angeles, California 90066

Model	Bore Inches	Stroke Inches	Displ. Cu. In.
940	2.217	1.635	6.3

MAINTENANCE

SPARK PLUG. Use a Champion J-8J, AC M45 or Autolite A7X spark plug. Set electrode gap to 0.025.

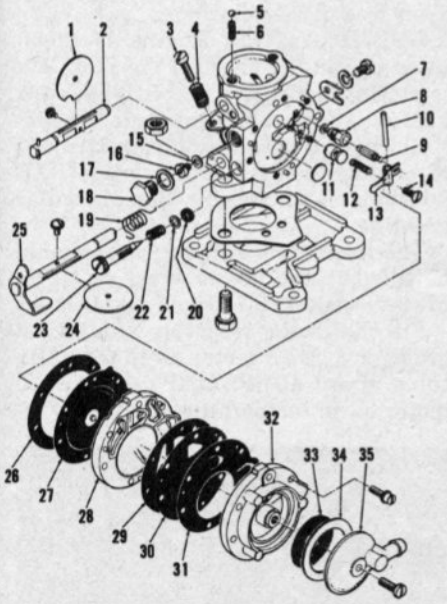


Fig. MC3-1–Exploded view of diaphragm type carburetor used in later model engines. Earlier models of carburetor are similar.

1. Choke plate
2. Choke shaft
3. Idle speed screw
4. Spring
5. Choke friction ball
6. Spring
7. Gasket
8. Inlet valve seat
9. Fuel inlet valve
10. Valve lever pin
11. Check valve nozzle
12. Valve lever spring
13. Inlet valve lever
14. Screw
15. Gasket
16. Main fuel jet
17. Gasket
18. Plug
19. Throttle return spring
20. Packing
21. Washer
22. Spring
23. Idle mixture needle
24. Throttle plate
25. Throttle shaft
26. Gasket
27. Metering diaphragm
28. Diaphragm cover
29. Fuel pump gasket
30. Fuel pump diaphragm
31. Check valve diaphragm
32. Fuel pump body
33. Screen
34. Gasket
35. Cover

CARBURETOR. Refer to Fig. MC3-1 for exploded view of the McCulloch diaphragm type carburetor used on later models.

The air cleaner cover and element must be removed to gain access to the idle speed adjustment screw as shown in Fig. MC3-2. On later models, only the idle mixture is adjustable. Early models have an adjustable main fuel needle in addition to the idle mixture adjusting screw. Location of adjusting screws is the same on all models as shown in Fig. MC3-3. For later models,

Fig. MC3-2–Air cleaner cover and filtering element must be removed to gain access to idle speed adjustment screw on carburetor.

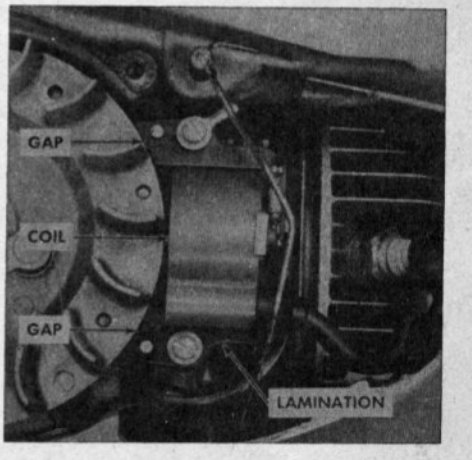


Fig. MC3-4–Gap between flywheel and armature core laminations should be 0.010.

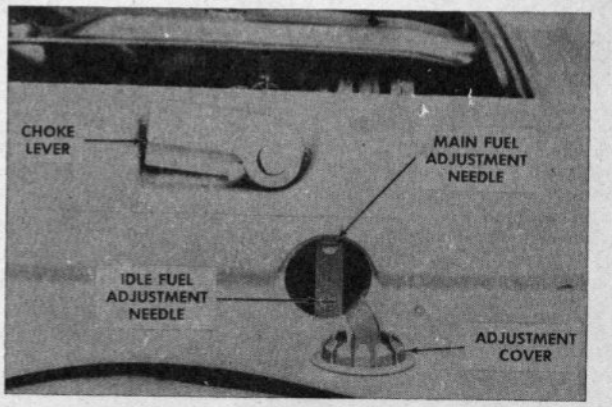


Fig. MC3-3–Fuel adjustment needles on carburetor are accessible after removing adjustment cover located just below choke lever.

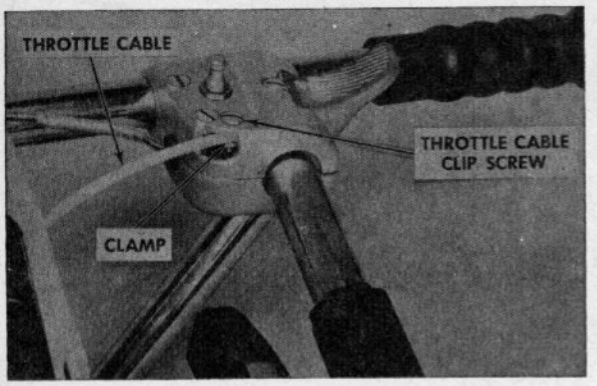


Fig. MC3-5–Engine maximum governed speed is adjustable by loosening throttle cable clip screw and moving cable housing away from or towards throttle trigger.

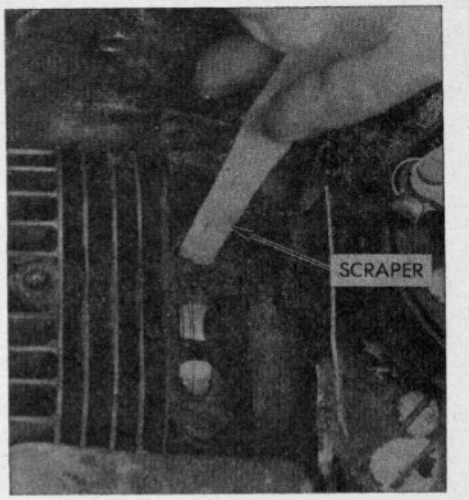


Fig. MC3-8–Cleaning exhaust ports with wood scraper.

follow the procedure for adjusting idle mixture screw in following procedure.

For initial adjustment, open both the idle and main fuel adjustment needles one full turn. Be sure that the idle speed adjustment is not set too fast.

Make final adjustments with engine warm and running. Adjust the idle fuel needle so that the engine will accelerate properly and will not misfire at idle speed. Adjust the idle speed screw so that the engine will idle just under clutch engagement speed. Then, adjust the main fuel needle with engine running under a cutting load so that the engine will run smoothly at cutting speeds. CAUTION: Do not set the main fuel adjustment needle unless the engine is loaded; an adjustment for best engine operation while not under load will result in a too lean fuel mixture and improper engine lubrication.

MAGNETO AND TIMING. Components of the flywheel type magneto are shown in the engine exploded view in Fig. MC3-12.

Ignition timing is fixed and non-adjustable. Adjust breaker point gap to 0.018. Recheck gap after tightening breaker plate mounting screws. Condenser capacity should be 0.18-0.22 mfd.

Armature air gap (See Fig. MC3-4) should be 0.010 and should be checked whenever servicing magneto.

GOVERNOR. Model 940 is equipped with an air vane type governor. To check governor adjustment, remove blower housing and starter assembly and depress the throttle trigger. The governor spring (2—Fig. MC3-6) should move the air vane to ¼-inch away from the flywheel vanes. If not, governor should be adjusted as follows: Remove air cleaner cover and filter element. Loosen set screw (4) on governor arm (6), hold carburetor throttle shaft in wide open position, and re-tighten set screw (4) while holding governor air vane ¼-inch away from flywheel vanes. Governor air vane shaft should have only enough end play after adjustment to allow free movement. Check to be sure that when throttle trigger is released, carburetor throttle shaft arm contacts idle speed stop screw; and when throttle trigger is fully depressed, governor spring moves carburetor throttle to wide open position and governor air vane to ¼-inch away from flywheel vanes.

LUBRICATION. Engine is lubricated by mixing oil with the fuel. Mix ½-pint of McCulloch oil with each 1¼ gallons of regular gasoline; if McCulloch oil is not available, mix ½-pint of non-detergent medium grade SAE 30 motor oil with each gallon of regular gasoline.

The transmission (gear case) should be filled to the proper level (See Fig. MC3-7) with SAE 140 gear oil.

Fill chain oiler reservoir with a good grade of SAE 30 motor oil in temperatures above 40° F., and use SAE 10 motor oil in temperatures below 40° F.

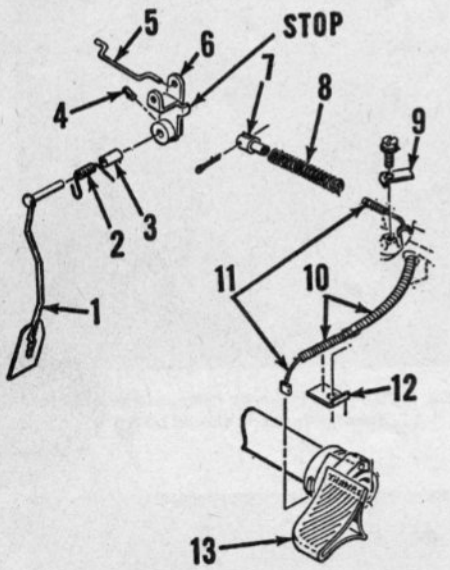


Fig. MC3-6–Exploded view of air vane governor and throttle linkage. Refer to text for adjustment procedure. Pushing throttle trigger (13) down moves stop away from governor arm (6) allowing tension of governor spring (2) and opposing air blast against air vane (1) to control engine speed. Clevis (7) attaches to end of throttle wire (11).

1. Air vane
2. Governor spring
3. Bushing
4. Set screw
5. Carburetor throttle link
6. Governor arm
7. Clevis
8. Throttle return spring
9. Cable clamp
10. Cable housing
11. Throttle wire
12. Cable clamp
13. Throttle trigger

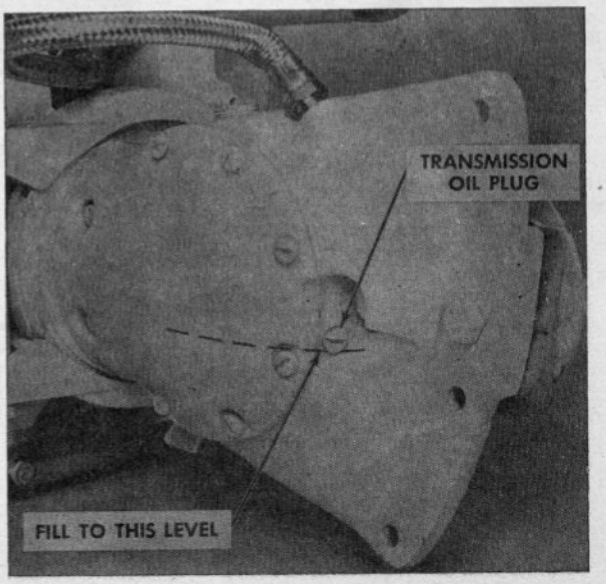


Fig. MC3-7–Oil level in gear case should be maintained as shown by dotted line with SAE 140 gear oil.

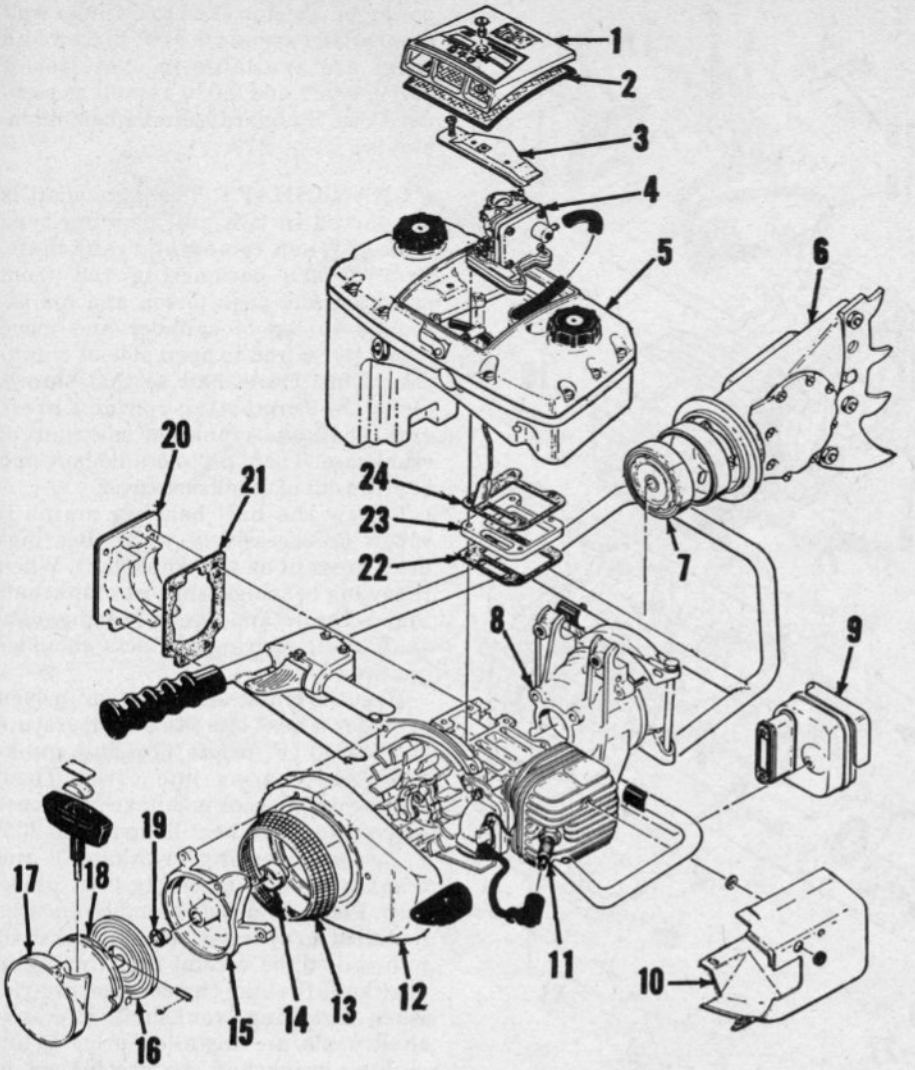


Fig. MC3-9–Exploded view of Model 940 chain saw components.

1. Air cleaner cover
2. Filter element
3. Cover anchor
4. Carburetor
5. Fuel tank assembly
6. Transmission
7. Clutch assembly
8. Clutch housing
9. Muffler
10. Shroud
11. Engine assembly
12. Blower housing
13. Air screen
14. Starter ratchet
15. Starter base
16. Rewind spring
17. Starter cover
18. Starter pulley
19. Bushing
20. Crankcase cover
21. Gasket
22. Gasket
23. Insulator
24. Gasket

When cutting wood with high sap or pitch content, the chain oil can be diluted with kerosene. Never use kerosene in excess of 50% of the chain oil-kerosene mixture.

CARBON. Clogged exhaust ports or muffler openings will cause loss of power. The muffler should be removed, disassembled and scraped free of carbon at regular intervals. If the cylinder exhaust ports need cleaning, turn the engine so that piston is at top dead center and clean the exhaust ports with a wood scraper as shown in Fig. MC3-8.

REPAIRS

CONNECTING ROD. Connecting rod and piston assembly is removed from bottom of crankcase after removing the crankshaft. Crankpin bearing consists of 24 loose needle roller bearings. Piston pin is a press fit in connecting rod.

Inspect the connecting rod for scoring of the crankpin bearing surface or twisting or bending of rod. Discard connecting rod if any of these defects are found. The 24 crankpin needle rollers should be renewed as a set if any roller is damaged, worn or burned.

When reinstalling connecting rod to crankpin, coat the rod bearing surface with a light film of grease such as Lubriplate and stick 12 of the needle rollers to the rod. Coat the rod cap with a light film of grease and stick the remaining 12 rollers to the cap. Be sure the "pips" on rod and cap are aligned as shown in Fig. MC3-11. Parting line of rod and cap is fractured to provide a dowel effect to the meshing of the rod

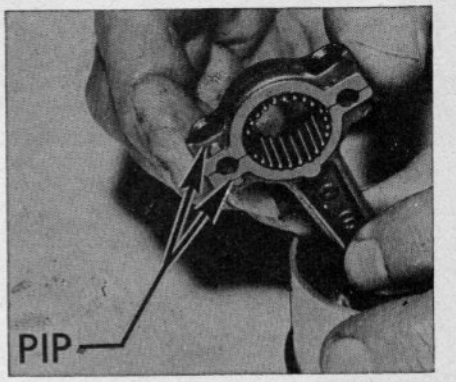


Fig. MC3-10–When installing connecting rod cap, be sure that "pips" are aligned as shown.

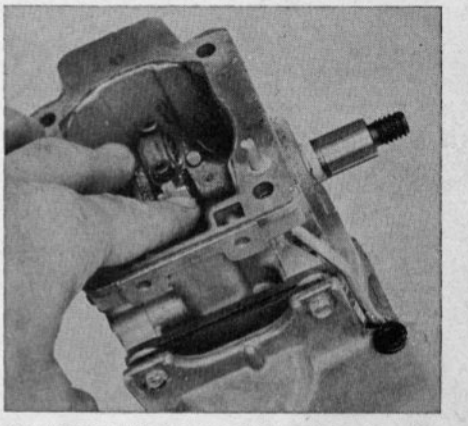


Fig. MC3-11–When connecting rod cap is properly installed, no "catch points" can be felt when rubbing finger nail across rod and cap parting line.

and cap surfaces. When cap is correctly installed, the parting line is practically invisible and no "catch points" can be felt by rubbing finger nail across parting line as shown in Fig. MC3-11. Wiggle the cap while tightening retaining screws to properly mesh the uneven surfaces. Tighten cap retaining screws to a torque of 65-70 inch-pounds.

PISTON, PIN AND RINGS. Piston and piston rings are available for service in standard size and oversizes of 0.010, 0.020 and 0.030. Desired piston skirt to cylinder wall clearance, measured at right angle to piston pin, should be 0.0025-0.005; maximum allowable clearance is 0.010. Ring end gap should be 0.004-0.012, and ring side clearance in groove should be 0.0015-0.004.

Piston is equipped with one open end and one closed end caged needle roller bearing. Piston pin is removed by pressing pin and closed end bearing out of connecting rod and piston. Usually, either the pin or bearing, or both, are damaged beyond further use during removal.

When reassembling, heat piston in oven or with heat lamp to a temperature of about 200° F. and press needle

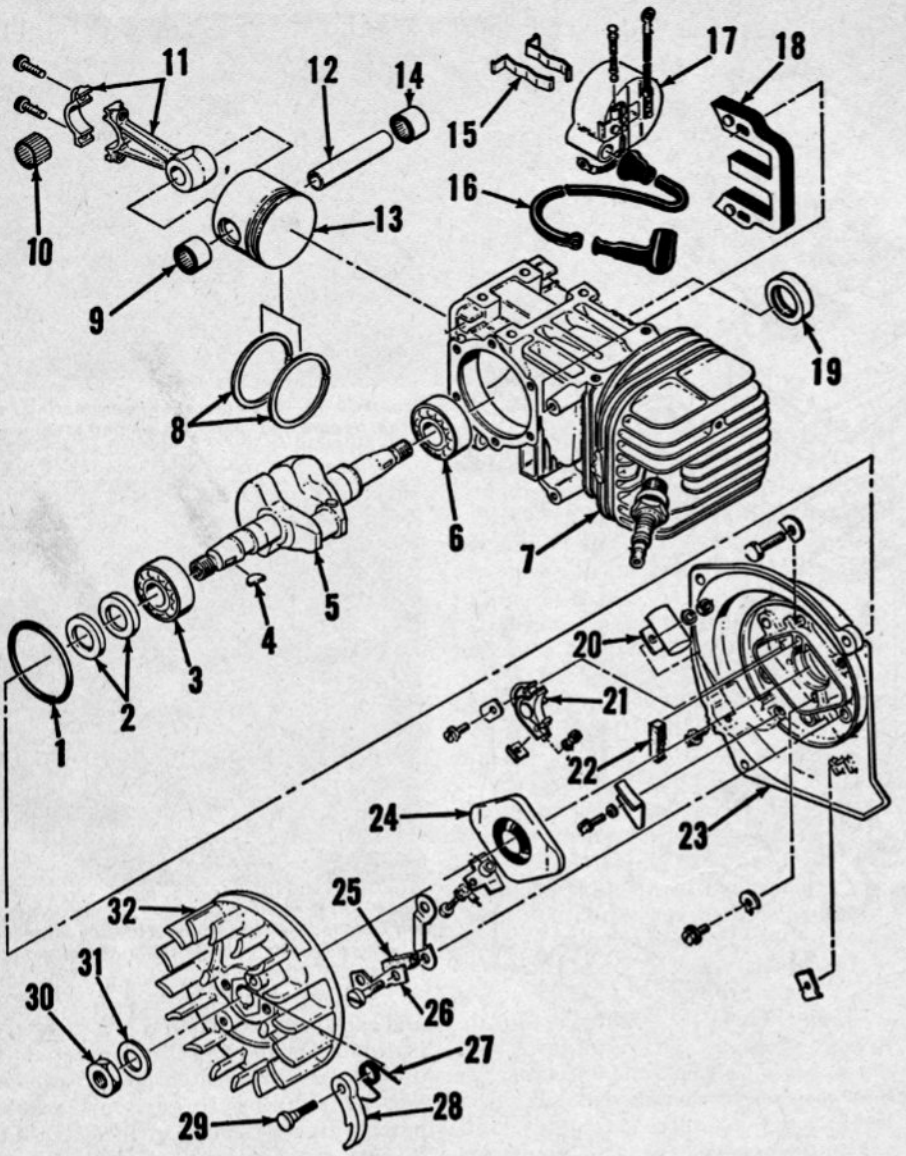


Fig. MC3-12–Exploded view of Model 940 power head assembly.

1. "O" ring
2. Seals
3. Ball bearing
4. Woodruff key
5. Crankshaft
6. Ball bearing
7. Cylinder
8. Piston rings
9. Needle bearing (open end)
10. Needle rollers (24)
11. Connecting rod
12. Piston pin
13. Piston
14. Needle bearing (closed end)
15. Coil clips
16. High tension wire
17. Ignition coil
18. Armature (laminations)
19. Seal
20. Condenser
21. Breaker points
22. Cam wiper felt
23. Crankcase cover plate
24. Breaker cover
25. Breaker box seal
26. Seal strap
27. Pawl spring
28. Starter pawl
29. Pawl pin
30. Flywheel nut
31. Washer
32. Flywheel

bearings into piston so that inner ends of bearing cages are flush with piston bosses. Press on lettered end of bearing cages only. Heat connecting rod in oven or under heat lamp to a temperature of approximately 300° F. Lightly oil the piston pin and press piston pin in until flush with outer end of open needle bearing cage. CAUTION: If pin is beyond flush with outer end of bearing cage, it will be necessary to disassemble the unit, renew piston pin and closed end bearing if damaged, and properly reassemble the unit. If piston pin contacts closed end of bearing cage, failure of the closed end needle bearing will occur. The piston must be supported in a holding block of the correct size when pressing pin in or out of piston and connecting rod assembly.

Install piston and rod assembly into cylinder with closed end piston pin bearing towards the exhaust port side of cylinder bore. Lubricate the piston and rings prior to installation. The bevel in bottom end of cylinder bore will act as a ring compressor.

CYLINDER. The cylinder should be renewed or rebored to next larger oversize if taper or out-of-round condition exceeds 0.005; if cylinder is scored, scratched, pitted or scuffed; if exhaust or intake ports are pounded; if new rings will not seal and engine lacks power; or if piston skirt to cylinder wall clearance exceeds 0.010. Piston and rings are available in oversizes of 0.010, 0.020 and 0.030 as well as standard size. Standard cylinder bore diameter is 2.218-2.219.

CRANKSHAFT. The crankshaft is supported in two ball bearing type mains. When removing crankshaft, first detach connecting rod from crankpin and push piston and rod assembly to top of cylinder and move lower end of rod to open side of crankcase. Turn crankshaft so that throws clear the connecting rod and press crankshaft and crankcase cover out of crankcase. Then, press crankshaft and bearing out of crankcase cover.

Renew the ball bearing mains if rough or excessively worn. Bearings are a press fit on the crankshaft. When renewing bearings, support crankshaft under throw and press bearing onto shaft until bearing contacts shoulder on throw.

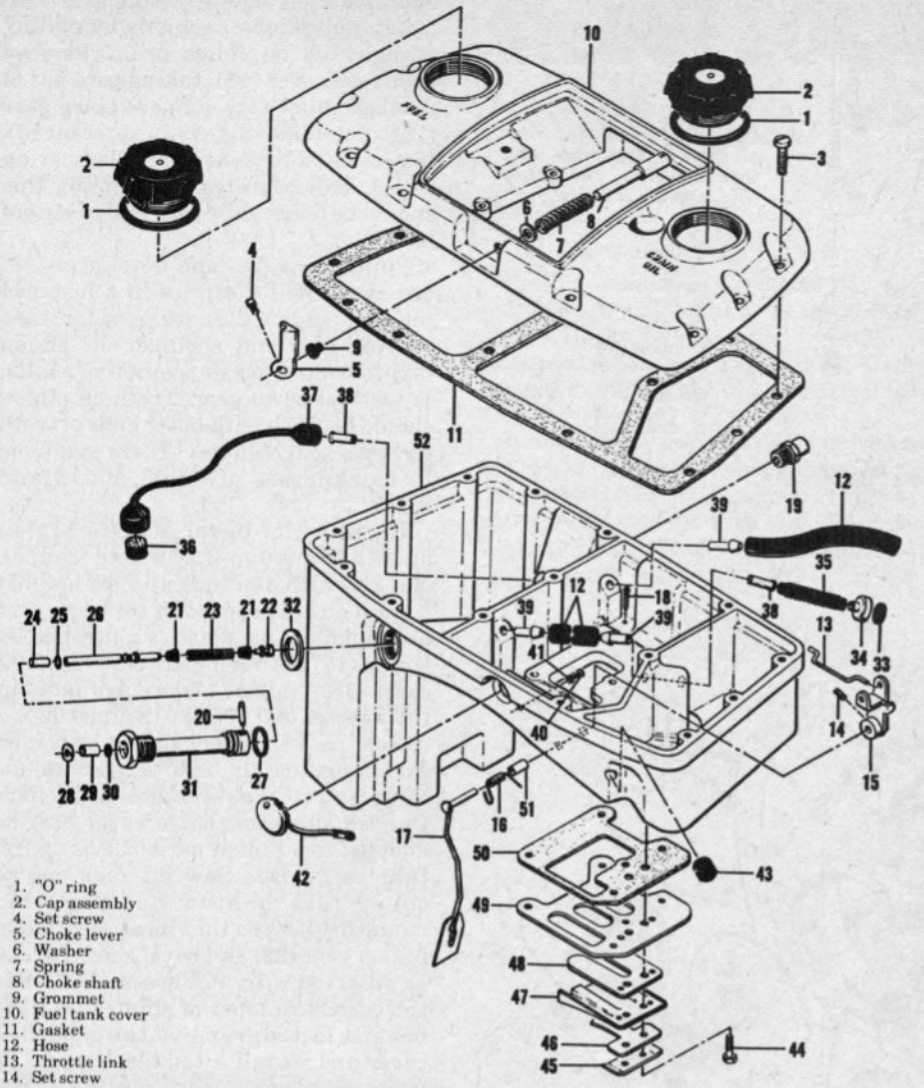
Heat the crankcase end cover in oven or under a heat lamp to a temperature of 180-200° F. before pressing crankshaft and bearing into cover. Then, allow cover to cool and heat crankcase in oven or under heat lamp to 180-200° F. before pressing crankshaft and crankcase cover assembly into crankcase. Piston and rod assembly must be installed in cylinder before crankshaft is installed; be careful that throws on crankshaft clear the connecting rod when installing crankshaft. If crankshaft seals are installed prior to installing crankshaft, be careful not to overheat crankcase or crankcase cover. It is recommended that seals be installed after installing crankshaft and crankcase cover.

REED VALVES. The reed valve plate (49—Fig. MC3-13) is attached to the bottom of the fuel tank and oil reservoir casting as shown.

Renew the valve reed (48) if rusted, pitted or cracked. Be sure that smooth side of reed is installed towards the reed plate (49).

CLUTCH. The clutch unit is accessible after removing the transmission as shown in Fig. MC3-14. Refer to Fig. MC3-16 for exploded view of clutch assembly. Renew the clutch shoes in sets of four only. To remove the clutch retaining nut, lock the engine flywheel as shown in Fig. MC3-15; turn nut in direction indicated by arrow stamped into clutch rotor. Refer to Figs. MC3-16 and MC3-17 for suggested method of installing shoes and retaining spring on clutch rotor.

TRANSMISSION. Refer to exploded view of transmission (gear case assembly) in Fig. MC3-19.



1. "O" ring
2. Cap assembly
4. Set screw
5. Choke lever
6. Washer
7. Spring
8. Choke shaft
9. Grommet
10. Fuel tank cover
11. Gasket
12. Hose
13. Throttle link
14. Set screw
15. Governor arm
16. Spring
17. Governor vane
18. Cotter pin
19. Oil fitting
20. Pin
21. Packing cup
22. Plug
23. Spring
24. Sleeve
25. "O" ring
26. Oil pump plunger
27. "O" ring
28. Washer
29. Seal
30. "O" ring
31. Oil pump body
32. Gasket
33. Screen
34. Oil pick-up
35. Hose
36. Felt filter
37. Hose
38. Tube nipple
39. Tube nipple
42. Adjustment hole cover
43. Grommet
45. Lockplate
46. Reed valve clamp
47. Fuel deflector
48. Reed valve
49. Reed valve plate
50. Gasket
51. Bushing
52. Fuel and oil tank

Fig. MC3-13–Exploded view of Model 940 fuel tank assembly and related parts.

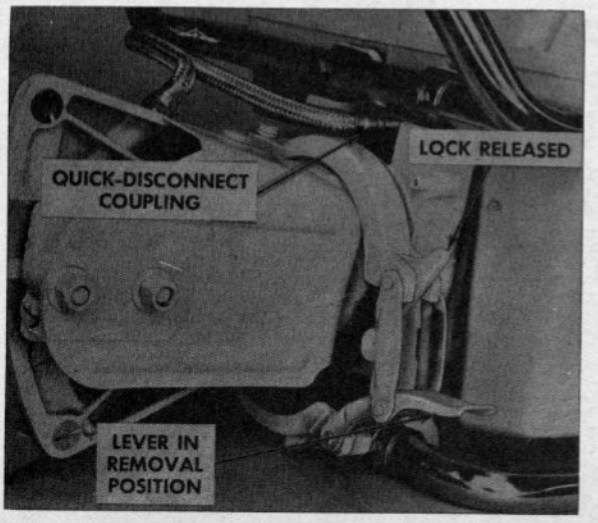


Fig. MC3-14–Removing transmission from power head.

Fig. MC3-15–Flywheel can be locked to remove flywheel or clutch retaining nut by inserting pin through hole in crankcase cover into cutout in flywheel.

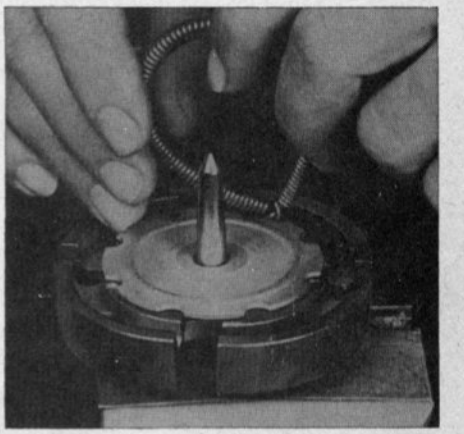


Fig. MC3-16—To assemble clutch, clamp a punch or rod in vise, set rotor down over punch or rod and set clutch shoes in place. The clutch spring can then easily be installed as shown in Fig. MC3-17.

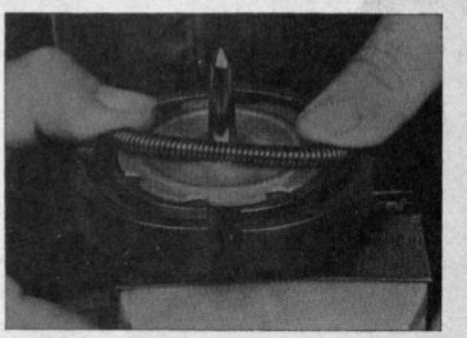


Fig. MC3-17–Installing clutch spring.

To disassemble transmission unit, remove from engine as shown in Fig. MC3-14, refer to exploded view in Fig. MC3-19 and proceed as follows: Remove oil filler plug (12) and drain all oil from gear case. Remove the three pinion retaining screws (2) by turning clutch drum (1) to gain access to screws through hole in drum. Remove the cover (18) retaining screws. Place gear case in oven, cover side up, and heat to

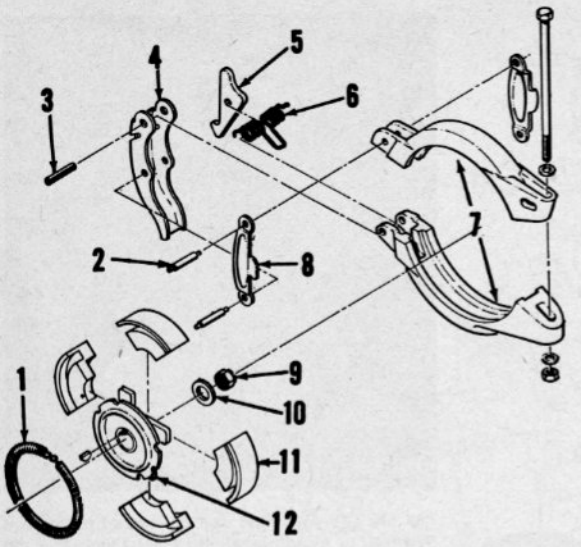


Fig. MC3-18–Exploded view of clutch assembly and transmission retaining clamp assembly.

1. Clutch spring
2. Pins (2)
3. Groove pin
4. Lever
5. Latch
6. Latch spring
7. Clamp ring
8. Clamp links (2)
9. Clutch nut
10. Washer
11. Clutch shoes (4)
12. Clutch rotor

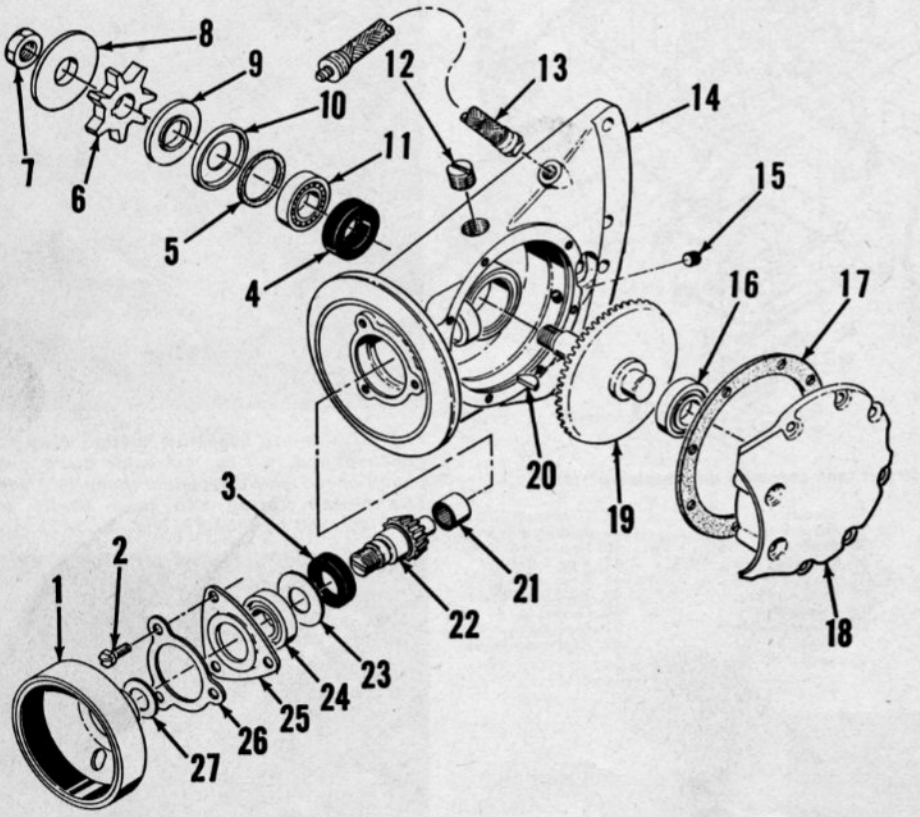


Fig. MC3-19–Exploded view of transmission unit.

1. Clutch drum
2. Cap screw
3. Seal
4. Seal
5. Felt dust seal
6. Chain sprocket
7. Nut
8. Washer (large)
9. Washer (small)
10. Dust shield
11. Ball bearing
12. Plug
13. Chain oiler hose
14. Gear case
15. Oil level plug
16. Ball bearing
17. Shims
18. Cover
19. Bevel gear
20. Woodruff key
21. Needle bearing
22. Pinion gear
23. Shims
24. Ball bearing
25. Retainer
26. Lock plate
27. Spacer

approximately 200° F. While gear case is hot, pull pinion assembly by pulling straight out on clutch drum. Remove gear case cover (18), taking care not to damage shims (17). Remove bevel gear (19) after removing chain sprocket (6). If necessary to remove needle bearing (21) or ball bearings (11 and 16), this should be done while case and cover are hot.

Pinion gear (22) and bevel gear (19) are available for service in a matched set only. Shims (23) are used between bearing (24) and shoulder on pinion (22) to control mesh position of pinion in teeth of bevel gear. Teeth on pinion should be flush with outer ends of teeth on bevel gear. Shims (17) are available in thicknesses of 0.003, 0.010 and 0.015.

Backlash of bevel gear to pinion should be 0.005-0.008 and can be checked with dial indicator set against a tooth on chain sprocket (6) when unit is assembled. Backlash is controlled by shims (17) between gear case (14) and cover (18). Shims (17) are available in thicknesses of 0.005, 0.012 and 0.020.

Gear case and cover should be heated to approximately 200° F. before attempting to reassemble unit. McCulloch suggests that a cover (18) be adapted to a pinion mesh checking fixture as follows: Saw off rear end of cover just behind bearing (16) mounting boss so that mesh position of pinion gear (22) and bevel gear (19) can be observed with unit assembled. After the correct number of shims (23) have been selected, remove the modified cover and install a complete cover. Be sure the transmission turns freely after reassembly. Fill to proper level with SAE 140 gear oil as shown in Fig. MC3-7.