McCULLOCH

Model	Bore	Stroke	Displ.	Drive Type
10-10 Auto	1.75 in. (44.4 mm)	1.375 in. (34.92 mm)	3.3 cu. in. (54.0 cc)	Direct
7-10 Auto	2.0 in. (50.8 mm)	1.375 in. (34.92 mm)	4.3 cu. in. (70.5 cc)	Direct
PM700	2.0 in. (50.8 mm)	1.375 in. (34.92 mm)	4.3 cu. in. (70.5 cc)	Direct
PM10-10S, PM55, PM555	1.812 in. (46.02 mm)	1.375 in. (34.92 mm)	3.5 cu. in. (57.4 cc)	Direct
PM60, SP60	1.875 in. (47.62 mm)	1.375 in. (34.92 mm)	3.8 cu. in. (62.3 cc)	Direct
PM800, PM805, PM850, SP80, SP81, Double Eagle 80	2.06 in. (52.3 mm)	1.5 in. (38.1 mm)	5.0 cu. in. (81.9 cc)	Direct

MAINTENANCE

SPARK PLUG. Recommended spark plug is AC CS45T for Models 10-10 Auto, PM10-10S, PM55 and PM555. Recommended spark plug is AC CS42T on all other models. Recommended spark plug electrode gap is 0.025 inch (0.63 mm). Note spark plug has a conical seat which does not require a gasket. Tighten spark plug to 144-180 in.-lbs. (16.3-20.3 N·m) torque.

CARBURETOR. A McCulloch "W" series, Tillotson HS, Walbro SDC or Zama carburetor may be used. Refer to Tillotson, Walbro or Zama carburetor section in CARBURETOR SERVICE section for service on those carburetors.

Initial adjustment of mixture needles on Tillotson, Walbro and Zama carburetors is one turn open for both low and high speed mixture needles. Make final adjustment on Tillotson, Walbro and Zama carburetors with engine warm and running. Adjust idle speed screw so engine idles just below clutch engagement speed. Adjust low speed mixture screw so engine will accelerate cleanly without hesitation. Adjust high speed mixture screw to obtain optimum performance under cutting load. Some chain saws with Tillotson or Walbro carburetors are equipped with a throttle latch to advance the throttle opening to a fast idle position for starting. Throttle opening is adjusted by turning adjusting screw (S – Fig. MC6-3) on bottom of trigger.

McCulloch series "W" carburetor was manufactured as two different models. Early model is shown in Fig. MC6-4 and later model is shown in Fig. MC6-5. On early models, fuel is metered by an adjustable needle valve attached to the throttle shaft. On later models, this only adjusts idle mixture. High speed operation on early models is controlled by an adjusting screw which determines throttle plate opening. Later models utilize a fuel needle for high speed adjustment. Both models use a primer plunger for choking operation. Choking on early models is accomplished by forcing fuel past needle valve into the carburetor bore. Later models force fuel from a chamber into the carburetor bore.

Be sure primer operates correctly as fuel leaking into bore will change fuel mixture. Primer "O" rings must be installed correctly to prevent leakage. Some plungers shown in Fig. MC6-4

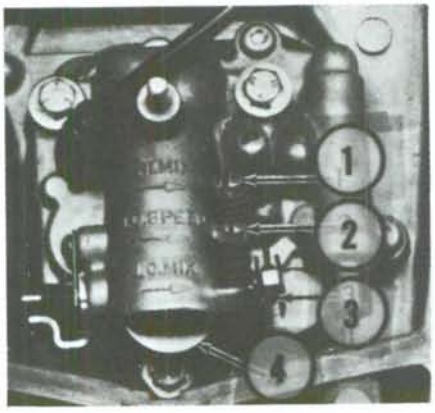


Fig. MC6-1 – Air cleaner cover and filter element removed to show carburetor adjustment points of early McCulloch Models "W" series carburetor. Later models are similar except for high speed mixture screw.

1. High speed mixture screw
2. Idle speed screw
3. Idle speed mixture screw
4. Throttle butterfly

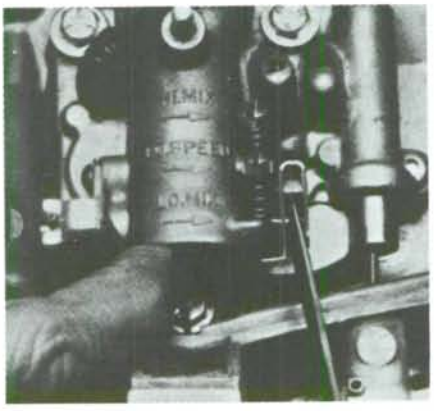


Fig. MC6-2 – Keep finger on throttle butterfly as shown when adjusting carburetor. Refer to text for procedure.

Fig. MC6-3 – Fast idle adjustment on some models is performed by turning adjusting screw (S) on bottom of trigger.

Illustrations courtesy McCulloch Corp.

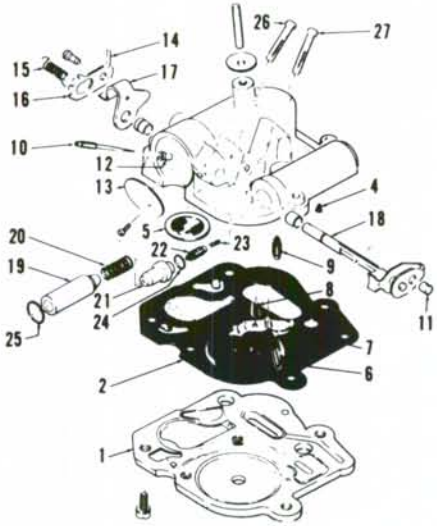


Fig. MC6-4—Exploded view of early McCulloch Model "W" series carburetor. Refer to Fig. MC6-1 for view of carburetor installed.

1. Base plate
2. Diaphragm
4. Check valve
5. Capillary seal
6. Inlet valve pin
7. Inlet lever
8. Spring
9. Inlet valve needle
10. Metering (low idle) mixture needle
11. Swivel
12. Air orifice
13. Throttle butterfly
14. Roll pin
15. Idle governor spring
16. Clip
17. Throttle lever
18. Throttle shaft
19. Primer plunger
20. Plunger spring
21. Seat
22. Primer needle
23. Needle spring
24. "O" ring
25. "O" ring
26. Idle speed screw
27. High speed mixture screw

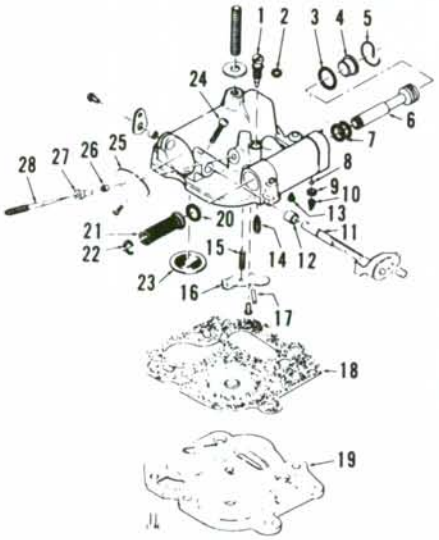


Fig. MC6-5—Exploded view of later McCulloch Model "W" series carburetor. Refer to Fig. MC6-4 for view of early model.

1. High speed mixture needle
2. "O" ring
3. "O" ring
4. Plug
5. Retainer
6. Primer plunger
7. "O" ring or "V" packing
8. Ball
9. Ball seat
10. Valve
11. Throttle shaft
12. Bushing
13. Valve
14. Fuel inlet valve
15. Spring
16. Inlet lever
17. Pin
18. Diaphragm
19. Base plate
20. "O" ring
21. Spring
22. Retaining ring
23. Seal
24. Idle speed screw
25. Throttle plate
26. Fuel orifice
27. Air orifice
28. Idle metering needle

have a cup to retain "O" ring (25). Install cup 5/64 inch (1.98 mm) from end of primer housing bore as shown in Fig. MC6-6. Two types of primer plungers have been used on the carburetor shown in Fig. MC6-5. The rear groove of the plunger is 0.090 inch (2.29 mm) or 0.120 inch (3.05 mm) wide as shown in Fig. MC6-7. An "O" ring is used in the narrow groove while "V" packing is used in the wide groove as a service replacement.

If carburetor has been disassembled, make a preliminary adjustment prior to starting engine and make final adjustment after engine has been started and brought to operating temperature.

To make the preliminary adjustment on "W" series carburetors, refer to Fig. MC6-1 and proceed as follows: Turn the idle speed screw (2) counterclockwise until throttle butterfly (4) is completely closed. Hold a finger against the closed butterfly as shown in Fig. MC6-2 and turn the idle mixture screw (3–Fig. MC6-1) clockwise until the butterfly starts to open, then turn the idle mixture needle three turns counterclockwise. Return to the idle speed screw (2) and while holding finger against butterfly (4), turn idle air screw clockwise until butterfly begins to open, then continue to turn the screw clockwise an additional ½ turn. Hold the throttle trigger in the wide open position, turn the high speed mixture screw (1) as required until throttle butterfly is in horizontal position. Now turn screw (1) clockwise until throttle butterfly (4) starts to close, then turn the high speed mixture screw two turns counterclockwise. On later models, initial adjustment of main fuel needle (1–Fig. MC6-5) is one turn. Do not attempt to adjust throttle plate opening.

With preliminary adjustment made as outlined, start engine and bring to operating temperature. Let engine run at idle rpm and if necessary, adjust idle speed screw until engine is operating just below chain creep speed. Now accelerate engine rapidly several times and check engine operation. If engine falters during acceleration, the mixture is too lean and idle mixture needle should be turned counterclockwise as necessary. If engine runs rough and smokes excessively during acceleration, the mixture is too rich and the idle mixture needle should be turned clockwise as necessary. Make this adjustment in small increments and check engine operation after each adjustment. If the idle mixture is changed it may also be necessary to readjust the idle speed screw to keep engine idle rpm below chain creep speed. Refer to Fig. MC6-8 and set the tension governor spring so engine idles smoothly in all positions. Reduce tension on spring if chain creeps.

With engine idle rpm and mixture adjusted, load engine (make a cut) and turn the high speed adjustment screw (1–Fig. MC6-1) on early models counter-

Fig. MC6-6—Some early McCulloch "W" series carburetors have a seal cup which must be installed 5/64 inch (1.98 mm) inside primer bore as shown above.

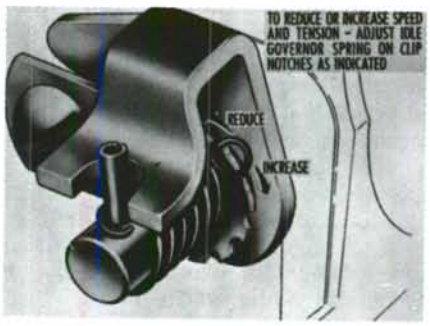


Fig. MC6-8—View showing installation of idle governor spring. Later McCulloch "W" series carburetors do not have governor spring. Adjust spring as shown so engine will idle smoothly in any position.

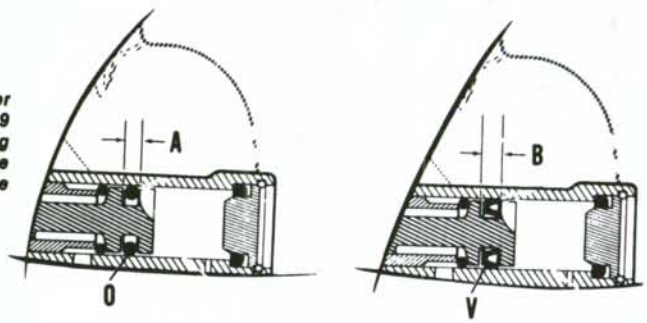


Fig. MC6-7—Primer plunger with narrow 0.090 inch (2.29 mm) groove (A) uses "O" ring (O). Primer plunger with wide 0.120 inch (3.05 mm) groove (B) uses "V" packing (V).

Illustrations courtesy McCulloch Corp.

clockwise in small increments until engine operation begins to roughen, then turn the screw clockwise just enough to eliminate the engine roughness. On later models of "W" carburetor, the high speed mixture screw is turned clockwise to lean fuel mixture.

IGNITION. Early models are equipped with a breaker-point type flywheel magneto ignition system while later models use an electronic ignition system.

On models equipped with breaker-points, breaker-point gap should be 0.019 inch (0.48 mm). Clearance between ignition coil legs and flywheel magnets should be 0.010-0.012 inch (0.25-0.30 mm) and can be adjusted after loosening coil mounting screws. Ignition timing is 26 degrees BTDC and is not adjustable, however, incorrect breaker-point gap will affect ignition timing.

Clearance between ignition coil module legs and flywheel magnets should be 0.011-0.015 inch (0.28-0.38 mm) on models equipped with electronic ignition. Ignition timing is 26 degrees BTDC but is not adjustable.

Note that two different electronic systems have been used on later models. Individual components should not be interchanged. The different systems may be identified by noting color of components which are all black on one of the ignition systems.

LUBRICATION. Engine is lubricated by a mixture of regular gasoline and oil. The gasoline and oil should be mixed in a separate container before being put in the engine fuel tank. If using McCulloch engine oil, use 3 ounces (88.7 mL) of oil for each gallon (3.7853 L) of gasoline (approx. 1:40). If McCulloch oil is not available, use 6 ounces (177.4 mL) of SAE 40 two-stroke oil for each gallon (3.7853 L) of gasoline (approx. 1:20).

Fill chain oiler tank each time fuel tank is filled. Use SAE 30 motor oil for temperatures above 40°F (4°C). When cutting wood with a high sap or pitch content the chain oil may be diluted up to 50 percent with kerosene, if necessary. Adjust oil pump output on models with automatic chain oiler as shown in Fig. MC6-9.

On gear drive models, use SAE 140 all-purpose gear oil in transmission. With bar pointed down and filler plug removed, oil should be level with bottom of filler hole.

CARBON. If a noticeable lack of power or a decrease in the exhaust noise level is evident it is possible that the muffler and exhaust ports need cleaning. Use a wood scraper when cleaning exhaust ports to avoid damage to cylinder or piston.

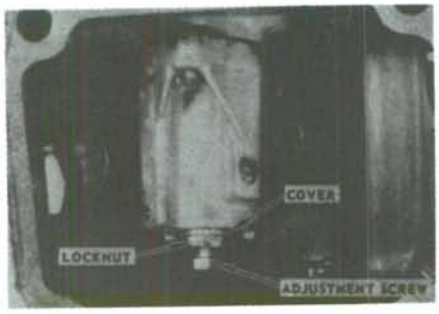


Fig. MC6-9—Automatic oil pump output is adjusted by loosening locknut and turning adjustment screw. Locknut may be absent on later models. Adjustment should be made in small increments.

REPAIRS

CONNECTING ROD. Removal of connecting rod requires separating cylinder and crankcase. To gain access to the cylinder and crankcase, remove clutch guard and starter assembly, clutch, fan housing, flywheel, ignition components, air cleaner cover and air cleaner screen, carburetor, spark arrester, cylinder shroud and fuel tank assembly.

With the above assemblies removed, drain chain oiler tank, if necessary, then remove the crankcase cover. Remove the four interior and four exterior cylinder retaining cap screws and separate crankcase from cylinder. Remove the rod cap screws and remove rod and piston from crankshaft. Do not lose any of the 22 loose rollers used in PM800, PM805, PM850, SP80, SP81 and Double Eagle 80 or 20 loose rollers used in all other models. Heat piston evenly to about 200°F (93.4°C), support piston boss on a 9/16 inch deep socket and using a driver smaller than piston pin, press piston pin from rod.

NOTE: Piston support tool is P/N63093 and driver is P/N63094.

Inspect connecting rod for worn or scored bearing surfaces, bends or twists. If any of these defects are found, renew rod.

To reassemble, heat piston pin end of rod to about 300°F (149°C) and reinstall by reversing removal procedure. Install rod in piston with pips on rod and cap aligned. Use grease to hold rollers in crankshaft end of rod. Tighten rod cap screws to 65-70 in.-lbs. (7.3-7.9 N·m) with oiled threads.

PISTON, PIN, RINGS AND CYLINDER. Later models are equipped with a chrome cylinder bore. On these models, except Double Eagle 80, standard size pistons and rings only are available. Cylinder bore and piston on Models PM800, PM850 and Double Eagle 80 are graded. "A," "B" or "C" according to size. Letter size should be the same on piston and cylinder to obtain desired clearance. If cylinder is unmarked, use a

Fig. MC6-10—Exploded view of typical engine assembly, and early type manual and automatic oil pumps. Later type manual and automatic oil pumps are shown in Fig. MC6-12A. Note that early models used insert (28) and snap ring (29) while late models use insert (25) and pin (12).

1. Roll pin
2. Manual oil pump housing
3. Spring
4. "O" ring
5. Roll pin
6. Boot
7. Gasket
8. Valve
9. Oil hose
10. Cylinder
11. Compression valve
12. Dowel pin
13. Oil seal
14. Snap ring
15. Ball bearing
16. Crankshaft
17. Needle bearing
18. Piston pin
19. Piston ring
20. Piston
21. Connecting rod
22. Roller bearing
23. Rod cap
24. Rod screws
25. Bearing insert
26. Roller bearing
27. Oil seal
28. Bearing insert
29. Snap ring
30. Oil tank cover
31. Gasket
32. Piston
33. Teflon washer
34. Piston ring
35. "O" ring
36. Spring
37. Adjustment sleeve
38. Automatic oil pump housing
39. Outlet ball valve
40. Spring
41. "O" ring
42. Valve cover
43. Locknut
44. Adjusting screw

Illustrations courtesy McCulloch Corp.

piston marked "B." Piston letter size is marked on crown while cylinder is marked adjacent to compression release valve. Oversize pistons and rings are available on models with a cast iron liner in the cylinder.

Models with cast iron liner should conform to the following specifications: Piston-to-wall clearance should be 0.003-0.005 inch (0.08-0.13 mm) measured at piston skirt. Cylinder taper or out-of-round should not exceed 0.005 inch (0.13 mm). Piston ring end gap should be 0.006-0.017 inch (0.16-0.43 mm) on unpinned rings and 0.051-0.066 inch (1.30-1.67 mm) on models with pinned piston rings. Maximum piston ring end gap should be 0.0055 inch (0.14 mm) on Model 10-10 Auto and 0.006 inch (0.15 mm) on Models 7-10 Auto and PM700. Minimum ring side gap is 0.003 inch (0.08 mm) for Models 10-10 Auto, 7-10 Auto and PM700. If cylinder is bored to an oversize, the tip of the compression release valve (DSP) must be cut one-half the amount of the oversize. For example, the compression release valve would be cut 0.010 inch (0.25 mm) if the cylinder is bored 0.020 inch (0.51 mm) oversize. Be sure valve does not protrude into cylinder and contact piston or piston rings.

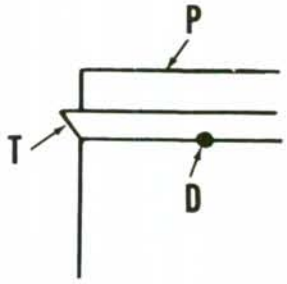


Fig. MC6-11—Tapered piston rings on some models must be installed so taper (T) is toward top of piston (P). Locating dot (D) on ring will be toward bottom when installed correctly.

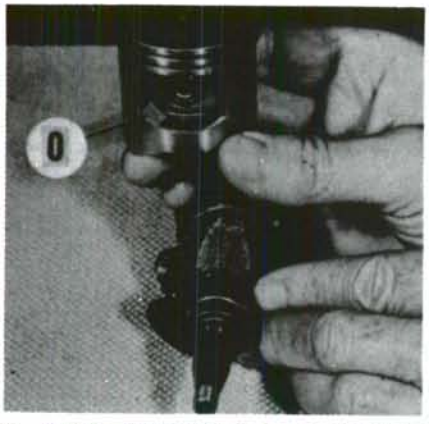


Fig. MC6-12—Install piston so large offset (O) at piston pin boss is toward clutch.

Recommended piston-to-cylinder clearance is measured 3/8 inch (9.5 mm) from bottom of piston skirt. On models with chrome cylinder bore clearance should be 0.002-0.004 inch (0.06-0.10 mm) except for Models PM800 and PM850 which is 0.0024-0.0038 inch (0.061-0.096 mm) and Model Double Eagle 80 which is 0.009 inch (0.23 mm). Cylinder should be inspected and renewed if chrome has cracked, flaked or worn away and exposed soft base metal underneath. Pistons and rings are available in standard sizes only. Piston ring end gap should be 0.055-0.091 inch (1.40-2.31 mm) for Models PM555, PM700, PM800 and PM850. On Model Double Eagle 80, ring end gap should be 0.070 inch (1.78 mm). Piston rings used with chrome cylinder are tapered on some models and must be installed with taper pointing up as shown in Fig. MC6-11.

If needle bearings in piston require renewal, support piston on outer end of pin boss, place insert support or McCulloch special tool between piston bosses (in place of rod) and press top bearing out toward inside. Turn piston over and repeat operation on opposite bearing.

NOTE: Bearing enters hole in insert support as it is pressed out. Do not reuse any bearings that have been removed.

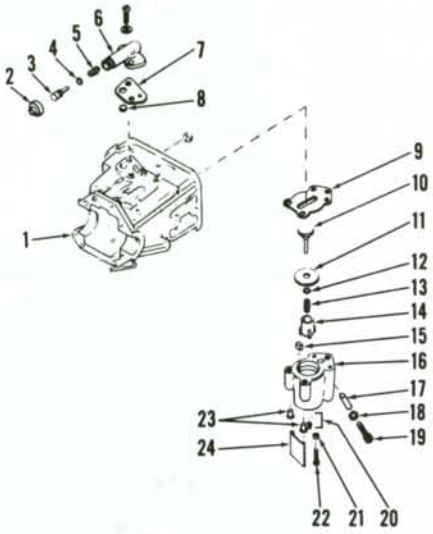


Fig. MC6-12A—Exploded view of later type manual and automatic chain oil pump. Locknut (21) may be absent on some models.

1. Crankcase
2. Boot
3. Plunger
4. "O" ring
5. Spring
6. Manual oil pump housing
7. Gasket
8. Valve
9. Gasket
10. Piston
11. Piston ring
12. "O" ring
13. Spring
14. Adjustment sleeve
15. Pad
16. Automatic oil pump housing
17. Sleeve
18. Washer
19. Cap screw
20. Ball valve & spring
21. Locknut
22. Adjusting screw
23. Eyelet
24. Spring clip

To install new bearings in piston, heat piston to about 200°F (93.4°C) and reverse procedure but use solid end of insert support and press bearing into piston until bearing butts against the insert support. This positions bearing inner end flush with inner ends of piston pin boss.

Pistons on all engines have piston pin offset in piston. Piston must be installed on connecting rod with large offset (O—Fig. MC6-12) toward clutch. The piston on most engines is also marked with "EX" and must be installed with "EX" side adjacent to exhaust port. Heat connecting rod eye to approximately 300°F (149°C) before installing piston and pressing in piston pin.

CRANKSHAFT. The crankshaft is supported by a ball bearing at flywheel end and a needle bearing at clutch end. Crankshaft should be discarded if it shows uneven or excessive wear, or any other signs of damage. When installing bearing on crankshaft, place shielded side of ball bearing next to counterweight of crankshaft and press bearing on shaft until it bottoms. When crankshaft and piston assembly is positioned in cylinder, be sure inner end of needle bearing is positioned 1/8 inch (3.17 mm) away from counterweight of crankshaft and that shaft seals are installed with lips facing inward. Tighten the four interior crankcase bolts to 55-60 in.-lbs. (6.3-6.8 N·m) and the four exterior crankcase bolts to 35-40 in.-lbs. (4.0-4.5 N·m) torque.

AUTOMATIC OILER. All models have an automatic chain oiler in addition to the manual chain oiler. The oil pump is operated by crankcase pulsations.

The oil pump is adjusted as shown in Fig. MC6-9. Chain oil is routed first through the manual oiler then through the automatic oiler before it exits at the bar pad. This allows the manual oiler to be used independently as well as providing priming for the automatic oiler. The oil pump is contained within the oil tank and may be removed after draining

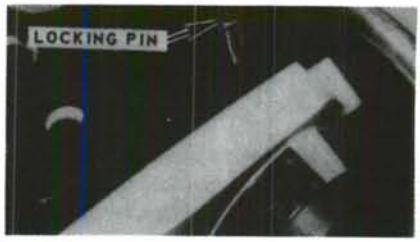


Fig. MC6-13—Flywheel may be locked in place on SP60, SP80, SP81, PM700 and PM850 Models by inserting 1/4 inch locking pin through base plate into notch in flywheel.

Illustrations courtesy McCulloch Corp.

oil tank and removing tank cover. Oil pump should be cleaned and inspected for damage or excessive wear. Be sure all oil passages are open and clean and renew piston disc if warped or cracked. Before starting chain saw, prime automatic oil pump by operating manual oiler several times.

CLUTCH. To remove clutch, remove clutch guard and starter assembly, bar, chain and fan (flywheel) housing. Lock flywheel by inserting a screwdriver between bossed portion of flywheel and leg of coil lamination (DO NOT use flywheel fin). Flywheel on SP60, SP80, SP81 and PM850 models is secured by inserting a ¼ inch (6.35 mm) locking pin through the base plate as shown in Fig. MC6-13 and rotating flywheel until pin engages notch in flywheel. Remove clutch retaining nut and pull clutch from crankshaft. Remove clutch drum and bearing, and shims. Refer to Figs. MC6-14 and MC6-15.

Inspect all parts for signs of excessive wear or other damage. Clutch shoes must be renewed as a unit. Clutch spring(s) should also be renewed. Renew clutch rotor if it allows excessive play of clutch shoes. Renew shims if grooved or damaged. Inspect sprocket and renew if excessively worn. Inspect starter pawls on models equipped with recoil starter on clutch side of saw. Pawls can be renewed by removing rivets and installing new pawls and rivets.

Note that one retaining plate of clutch assembly used on Model SP80 has a pin which prevents the clutch spring from rotating. The clutch spring must be installed so that the ends of the spring will be underneath retaining pin when the plate is installed on clutch shoe. Refer to Fig. MC6-16. The clutch drum on gear drive models is equipped with a seal which must be installed with lips of seal toward clutch bearing. Tighten clutch nut to 400-420 in.-lbs. (45.2-47.4 N·m) on Model SP80 and to 160-170 in.-lbs. (18.1-19.2 N·m) torque on all other models.

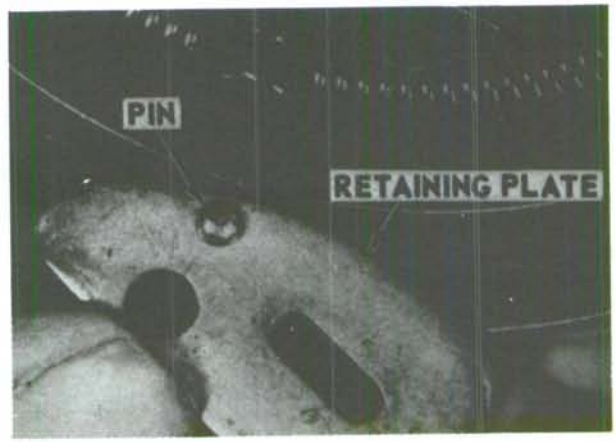


Fig. MC6-16—Install clutch spring (4—Fig. MC6-15) so spring ends will contact locating pin in clutch spring retaining plate.

REWIND STARTER. Chain saw may be equipped with a rewind starter mounted on right or left side. Refer to Fig. MC6-18 for exploded view of recoil starter mounted on right side of chain saw. Rewind spring is wound in counterclockwise direction in housing and rope is wound in counterclockwise direction around rope pulley as viewed installed in housing. New rope length is 50 inches (127 cm). Early models have a hole in the rope pulley and a nail or other device can be inserted through the hole to hold the rewind spring on the rope pulley as shown in Fig. MC6-19. Note that the spring is wound clockwise if this method is used to install rewind spring.

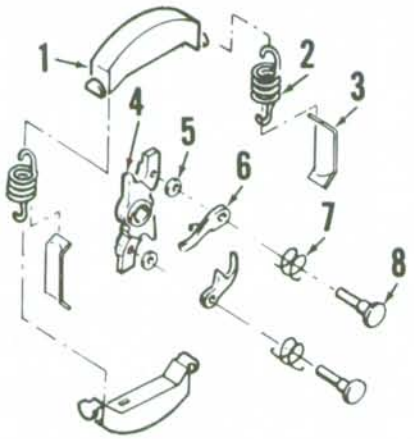


Fig. MC6-14—Exploded view of clutch used on all models except SP80.

1. Shoe
2. Spring
3. Retainer
4. Rotor
5. Washer
6. Pawl
7. Spring
8. Rivet

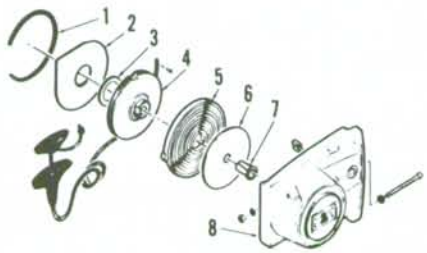


Fig. MC6-18—Exploded view of typical right hand rewind starter.

1. Snap ring
2. Dust shield
3. Thrust washer
4. Rope pulley
5. Rewind spring
6. Spring shield
7. Nylon bushing
8. Fan housing

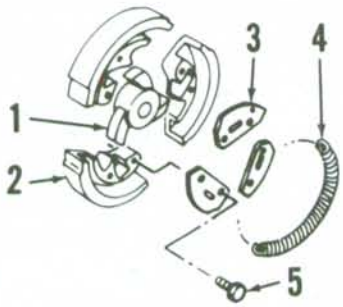


Fig. MC6-15—Exploded view of clutch shoe assembly used on Model SP80.

1. Rotor
2. Clutch shoes
3. Retainer plates
4. Clutch spring
5. Cap screw

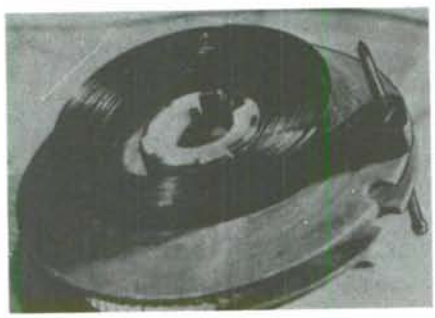


Fig. MC6-19—Some rope pulleys have a hole which allows the rewind spring to be held in position by inserting a nail or other device as shown.

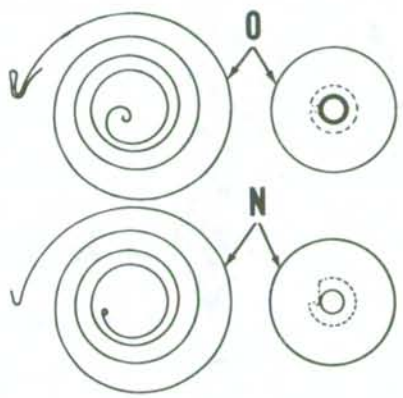


Fig. MC6-20—Note difference between old (O) and new (N) style rewind springs and rope pulleys. Refer to text.

Illustrations courtesy McCulloch Corp.

An early and late type of rewind spring and rope pulley have been used. Refer to Fig. MC6-20. Early and late spring and pulley should not be interchanged. Early type spring and pulley must be used in early starter housing. Later type spring and pulley can be used in early or later starter housing.

Place tension on rope by pulling rope handle then hold rope pulley so notch on outer edge of pulley aligns with rope outlet. Pull loose rope into housing and rotate rope pulley one or two turns in counterclockwise direction. Release rope and check starter operation.

Refer to Fig. MC6-21 for view of left hand starter found on saws manufactured in United States and some export models. Install rewind spring on fan housing in counterclockwise direction. Wind rope on rope pulley so it is wound in counterclockwise direction when viewed with pulley installed on housing. New rope length should be 42 inches (106.7 cm). Check operation of starter to be sure there is sufficient rewind spring tension to rewind rope, but rewind spring is bottomed when rope is pulled to its full length. Spring tension is altered by turning rope pulley while housing cover is removed.

Left-hand starter used on some saw models manufactured for export is shown in Fig. MC6-22. Rewind spring is wound in clockwise direction as viewed with pulley installed in housing. Place tension on rope by pulling rope handle and then hold rope pulley so notch on outer edge of pulley aligns with rope outlet. Pull loose rope into housing and rotate rope pulley one or two turns in clockwise direction. Release rope and check starter operation.

CHAIN BRAKE. Some later models are equipped with the chain brake mechanism shown in Fig. MC6-25. The chain brake stops chain motion when the operator's hand contacts brake lever (11) and steel strap (3) tightens around the clutch drum thereby stopping chain motion. Chain brake components must operate freely for the chain brake mechanism to be effective.

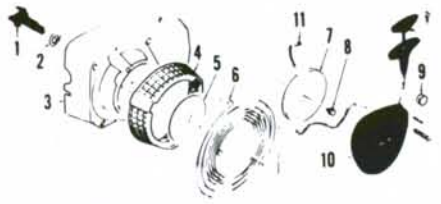


Fig. MC6-21 – Exploded view of left-hand rewind starter used on U.S. models and some export models.

1. Starter shaft
2. Wave washer
3. Fan housing
4. Sawdust guard
5. Spring shield
6. Rewind spring
7. Rope pulley
8. Cap screw
9. Rope roller
10. Cover
11. Rivet

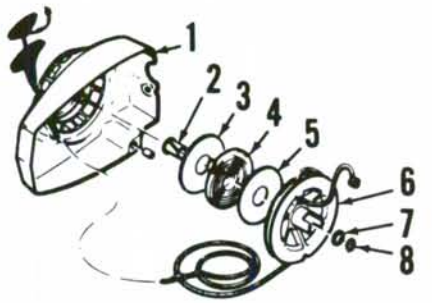
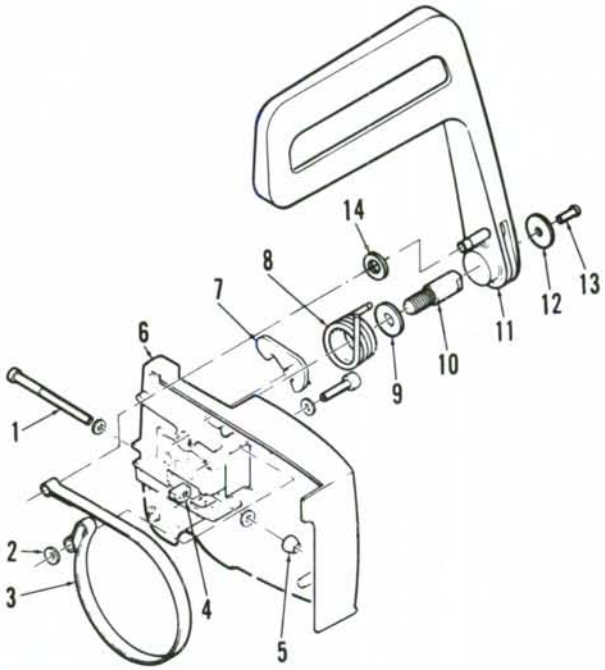


Fig. MC6-22 – Exploded view of left-hand rewind starter used on some export models.

1. Fan housing
2. Nylon bushing
3. Spring shield
4. Rewind spring
5. Dust shield
6. Rope pulley
7. Washer
8. Snap ring

Fig. MC6-25 – Typical view of chain brake used on some later models.

1. Chain adjusting screw
2. Washer
3. Brake strap
4. Adjusting block
5. Nut
6. Housing
7. Latch
8. Spring
9. Washer
10. Shaft
11. Brake lever
12. Washer
13. Screw
14. Washer



Illustrations courtesy McCulloch Corp.