PIONEER

PIONEER SAWS
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MODEL COVERAGE

Model	Bore Inches	Stroke Inches	Displ. Cu. In.	Drive Type
400, 400A, 410, NU17, 450, 550	2¼	1⅜	5.47	Direct

MAINTENANCE

SPARK PLUG. Spark plug electrode gap should be 0.025 inch. The recommended spark plug is Champion J8J. Autolite AN7X, A7 or AT8 and AC type 45M or 44-S spark plugs may also be used. Spark plug should be tightened to 7-8 ft.-lbs. torque.

CARBURETOR. A Brown 1-PA carburetor (Fig. PR1—1) was originally used on 400, 400A and 410 models. The carburetor used on the earliest of these models was equipped with a choke as shown (28 thru 31); however, later models use a fuel primer pump (Fig. PR1—4) and the choke operating parts are removed. A Tillotson HL-108A carburetor (Fig. PR1—2) and a fuel primer pump (Fig. PR1—4) are used on all NU17, 450 and 550 models.

On Brown carburetors, normal setting for the high speed needle (22—Fig. PR1—1) is ¾ to 1 turn open and 1 to 1⅛ turns open for the idle mixture needle (23). On Tillotson carburetors, normal setting is ¾ turn open for both the high speed needle (22—Fig. PR1—2) and the idle mixture needle (23). On all models, clockwise rotation of the adjusting needles will lean the mixture.

The main fuel system on all models is equipped with three fuel filters. The first filter (1—Fig. PR1—3) is located in the fuel tank, the second filter (2) is located under a small cover in the air box and the third filter (17—Fig. PR1—1 or PR1—2) is located on the carburetor. Air leakage under covers (19—Fig. PR1—1 or PR1—2) and (C—Fig. PR1—3) can prevent fuel from reaching the carburetor.

The fuel primer pump (Fig. PR1—4) is located on the control panel of models so equipped. Depressing primer button (1) should squirt a small amount of fuel into the carburetor inlet for starting. Inspect the check valves (12 & 18), diaphragm (6) and filter (26) if fuel primer pump does not operate.

MAGNETO AND TIMING. A Pioneer magneto is used on all models. The flywheel retaining nut is left hand thread. The breaker point gap should be 0.022 inch and armature air gap (Fig. PR1—5) should be 0.008-0.012

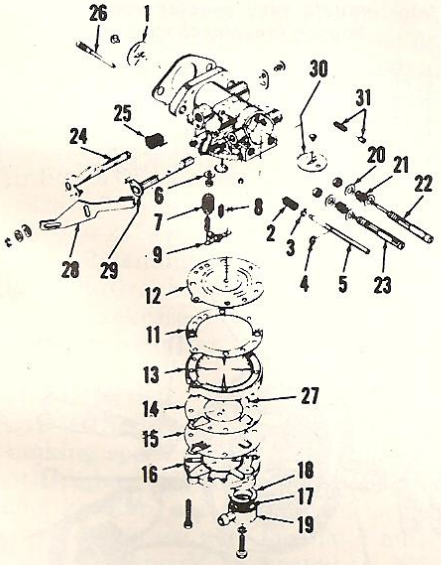


Fig. PR1-1–Exploded view of the Brown diaphragm carburetor used on early models. Springs (27) are located above both check valves. Choke parts (28 & 31) are sometimes removed when fuel primer pump (Fig. PR1-4) is installed. Refer to Fig. PR1-2 for legend except the following.

27. Spring
28. Choke arm
29. Choke shaft
30. Choke plate
31. Choke detent and spring

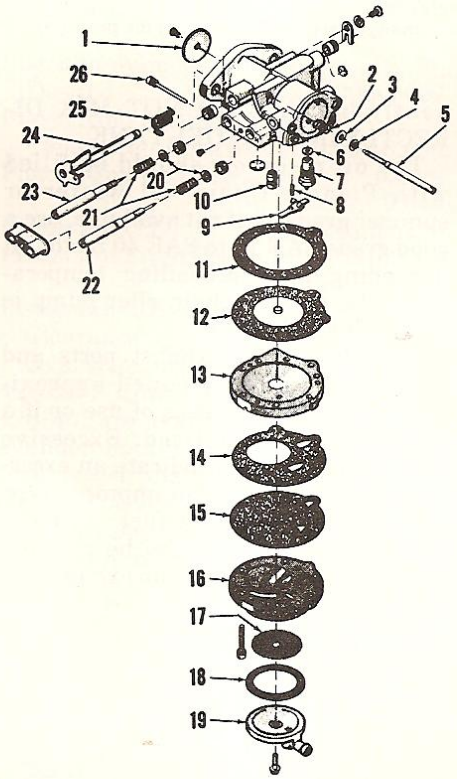


Fig. PR1-2–Exploded view of Tillotson HL model carburetor used on 450, 550 and NU17 models.

1. Throttle plate
2. Spring
3. Washer
4. Clip
5. Idle speed screw
6. Gasket
7. Inlet needle seat and valve
8. Spring
9. Inlet lever
10. Nozzle check valve
11. Gasket
12. Fuel control diaphragm
13. Cover
14. Gasket
15. Fuel pump diaphragm
16. Fuel pump body
17. Filter screen
18. Gasket
19. Cover
20. Washer
21. Spring
22. High speed adjusting screw
23. Low speed adjusting screw
24. Throttle shaft
25. Spring
26. Inlet lever pinion screw

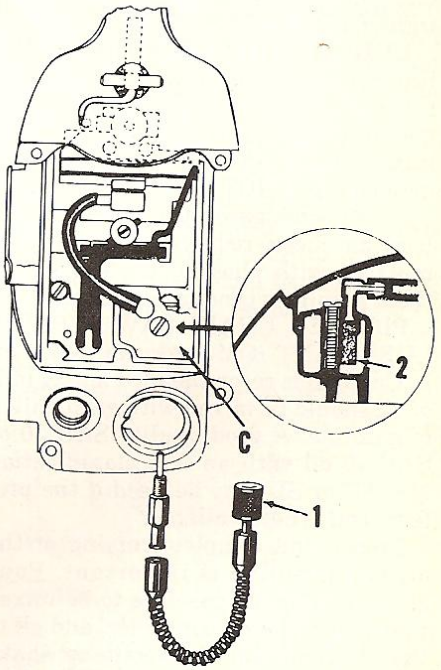


Fig. PR1-3–The first fuel filter (1) is located in the tank. Be sure that gasket located under cover (C) doesn't leak, when servicing the second filter (2).

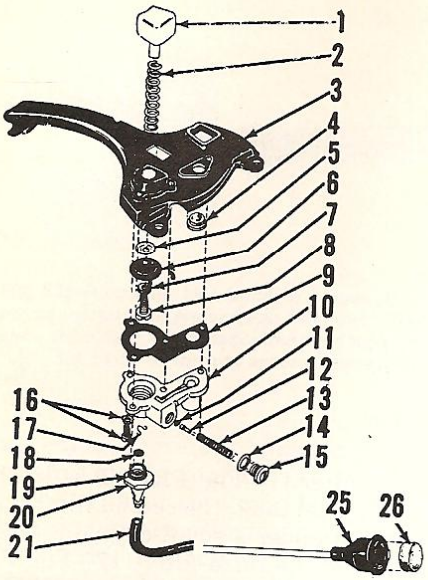
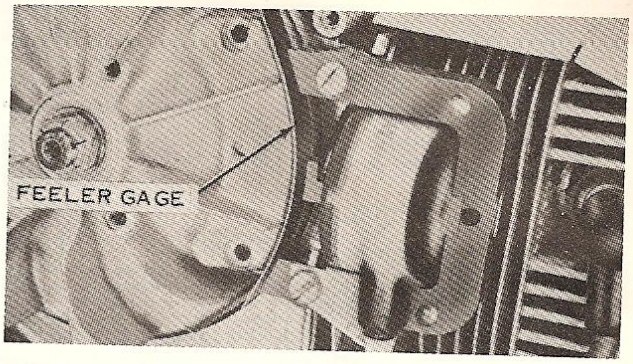


Fig. PR1-4–Exploded view of fuel primer pump and associated parts used on most models.

1. Primer pump button
2. Primer button spring
3. Control panel
4. Sight glass
5. Diaphragm cup
6. Diaphragm
7. Washer
8. Screw
9. Gasket
10. Primer pump body
11. "O" ring
12. Pump outlet valve
13. Valve spring
14. Washer
15. End cap
16. Screw & lockwasher
17. Retaining clip
18. Disc inlet valve
19. "O" ring
20. Valve housing
21. Fuel line
25. Filter body
26. Filter

Fig. PR1-5–A feeler gage of correct thickness can be located between flywheel magneto and the three legs of coil core as shown to set the armature air gap.



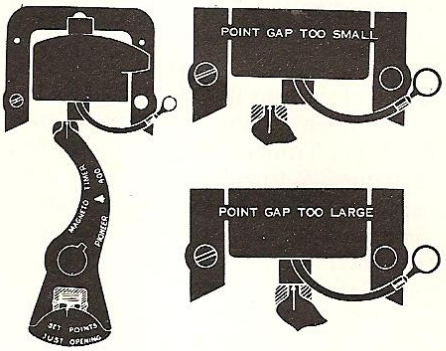


Fig. PR1-6–Edge gap can be checked using special tool number 426847. Edge gap can be changed slightly by changing the point gap.

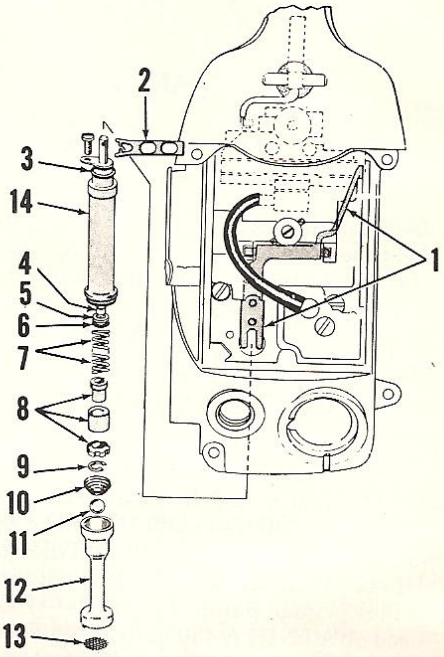


Fig. PR1-8–Exploded view of the manual chain oiler pump. Early models use spring (10) and later models have special webbing in the housing to center check ball (11).

1. Operating lever
2. Clip
3. "O" ring
4. Pump rod
5. "O" ring
6. Washer
7. Spring
8. Piston and valve
9. Snap ring
10. Centering spring
11. Check ball (9/32 inch)
12. Pick up housing
13. Screen
14. Pump body

inch. Condenser capacity should be 0.16-0.20 Microfarads. Ignition should occur (breaker points just open) at 30 degrees BTDC. Magneto edge gap should be 0 to 0.250 inch and can be checked using the special tool number 426847. Edge gap and timing can be adjusted only by changing the breaker point gap within the limits of 0.021-0.024 inch. The flywheel nut should be tightened to 25-30 ft.-lbs. torque.

LUBRICATION. The engine is lubricated by mixing oil with the fuel at a ratio of 16:1 (½ pint of oil with each gallon of gasoline). Regular or premium grade gasolines are recommended. DO NOT use low lead gasolines. In some gasolines the amount of lead has been reduced and has been replaced with phosphorus. The use of these gasolines is not recommended.

PIONEER CHAIN SAW SPECIAL LUBRICANT (OMC 2 cycle motor oil in Canada) is recommended and ½ pint of oil should be mixed with each gallon of gasoline. A good quality SAE 30 or SAE 40 oil with an API classification MS, SC or SD may be used if the preferred oil is not available.

Proper and complete mixing of the oil and gasoline is important. Pour about half of the gasoline to be mixed into a clean metal container, add all of the oil required; then, stir or shake until thoroughly mixed. Add the balance of the gasoline to make the correctly proportioned mixture; then, stir or shake until it is properly and permanently blended. DO NOT MIX DIRECTLY IN THE FUEL TANK.

The oil reservoir should be filled with Pioneer Chain Oil winter or summer grade, or if not available, use a good grade SAE 10 to SAE 40 motor oil depending upon prevailing temperature. The manual chain oiler pump is shown in Fig. PR1—8.

CARBON. The exhaust ports and muffler should be cleaned approximately every two weeks of use or if a loss of power is noticed. Excessive carbon buildup may indicate an excessive amount of oil or an improper type of oil mixed with the fuel. Cylinder cooling fins should also be cleaned when cleaning carbon from exhaust.

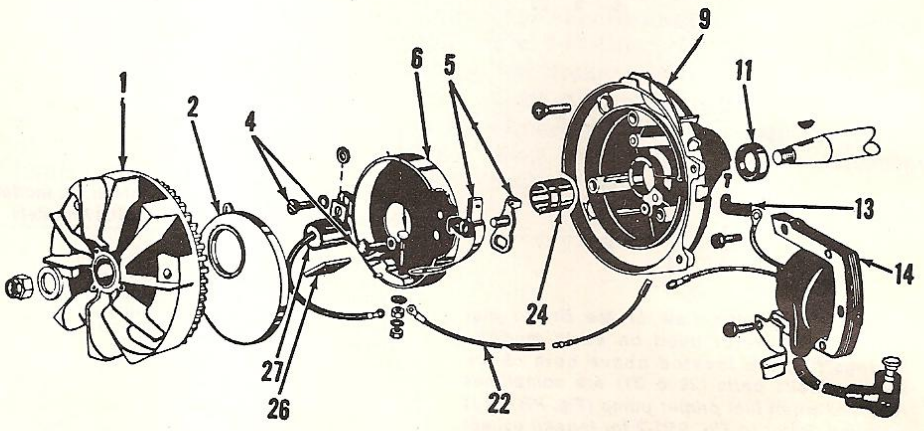


Fig. PR1-7–Exploded view of magneto used on all models.

1. Flywheel
2. Cover
5. Breaker points
6. Housing
9. Bearing housing
11. Crankcase seal
14. Coil and laminations
22. Kill wire
24. Cam
26. Felt
27. Condenser

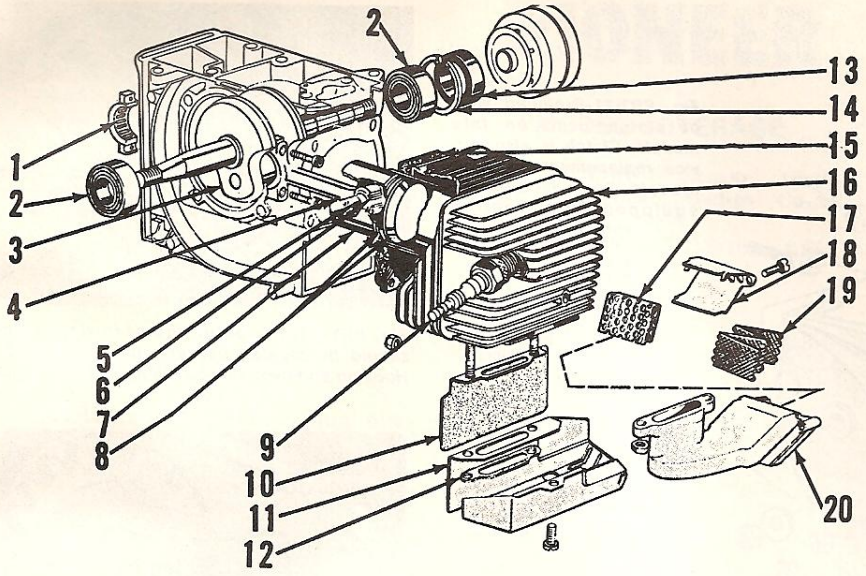


Fig. PR1-9–View of engine crankshaft, connecting rod and associated parts. Magneto end crankcase seal and bearing housing is shown in Fig. PR1-7.

1. Rod cap & bearings
2. Main bearings
3. Crankshaft
4. Connecting rod
5. Piston pin & retaining rings
6. Pin bearing
7. Piston
8. Piston rings
9. Spark plug
10. Gasket shield
11. Muffler shroud
12. Muffler gasket
13. Oil seal
14. Retaining ring
15. Cylinder gasket
16. Cylinder
17. Screen plate
18. Exhaust deflector
19. Muffler screen
20. Muffler body

REPAIRS

TIGHTENING TORQUES. Recommended tightening torques for all models are listed in the following table. All values are in inch-pounds unless otherwise noted.

Main Bearing Housing to Crankcase	70-80
Flywheel Nut	25-30 Ft.-Lbs.
Connecting Rod Screws	60-65
Cylinder Base Nuts	60-80
Muffler to Cylinder	70-80
Clutch Nut	25-30 Ft.-Lbs.
Rear Handle to Air Box	70-80
Air Box to Crankcase—	
Size ¼-28 Screws	70-80
Size 10-24 Screws	35-40
Shroud Retaining Screws	60-80
Handle to Crankcase	60-80
Bar to Crankcase	80-110
Oil Pump to Air Box	25-35

CYLINDER, PISTON, RINGS AND PIN. Compression pressure at cranking speed should be 90-105 PSI with engine cold. The cylinder and cylinder head are one piece and attached to the crankcase with four stud nuts. The piston should be heated to 200-250° F. before removing the piston pin. Mark the piston on exhaust port side if old piston is to be reinstalled. New pistons may be installed either way, but used piston should be installed in same position as original. The following repair specifications are in inches.

Cylinder Bore I.D. (Std.)	2.2500-2.2505
Piston Skirt O.D. (Std.)	2.2435-2.2440
Piston to Cylinder Clearance—Desired	0.006-0.007
Piston Ring to Groove Side Clearance—Desired	0.002-0.004
Piston Ring End Gap—Desired	0.008-0.014
Piston Pin O.D.	0.6248-0.6250
Piston Pin Fit in Piston Bore	0-0.0005 interference
Piston Pin to Bearing Clearance	0.0005-0.0017

Oversize pistons (part number 426137) and rings (part number 426140) are available for service. The cylinder bore must be resized 0.020 inch larger than standard before installing the oversize piston and rings.

When assembling, the opening in piston pin retaining rings should be centered toward closed end of piston.

CONNECTING ROD. Connecting rod can be separated and removed after removing the cylinder and piston. CAUTION: Make certain that all of the 12 rollers at crankpin end are removed. New crankpin bearing rollers should be used each time connecting rod is removed. The following specifications are in inches.

Crankpin Bearing Bore I.D. in Connecting Rod	0.9100-0.9104
Crankshaft Crankpin O.D.	0.7199-0.7202
Crankpin Roller Bearing Clearance	0.0006-0.0017

The mating surfaces of connecting rod and cap are fractured to provide correct alignment when reassembling. One side of connecting rod and cap is machined flat for identification when assembling. The crankpin bearing cage halves are also matched halves and can be correctly assembled only one way. One side of each half is machined so that when correctly assembled a "V" notch will be located at the parting surface of the two halves.

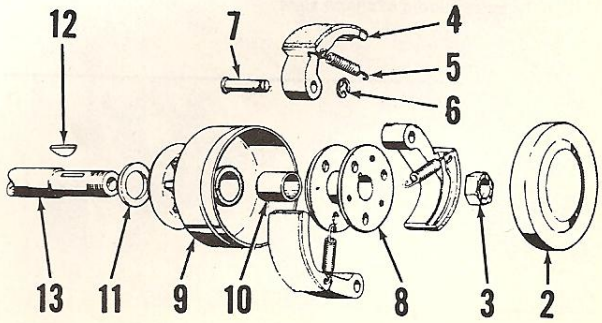
To assemble, coat the machined bearing surface of connecting rod and cap with a light grease. CAUTION: Be sure that grease is not on fractured surfaces. Install bearing cage in cap and install five of the bearing rollers in the cage. Position the connecting rod cap with cage half and rollers under the crankpin, then install upper half of bearing cage and the remaining seven rollers. Install connecting rod and tighten the two attaching screws.

NOTE: Assembly of the connecting rod is much easier using Pioneer connecting rod spoon (Part No. 426014) and special screw installing tool (Part No. 426024).

CRANKCASE AND CRANKSHAFT. Crankshaft can be removed after removing the cylinder, connecting rod, flywheel, magneto and clutch. Remove the four attaching screws, then pull the magneto side main bearing housing away from crankcase. Crankshaft ball type main bearings should be a tight (interference) fit in crankcase and bearing housing bores. Area around bearings should be heated to 200-250° F. when installing bearings. Metal sides of crankshaft seals should be toward outside, with lip toward inside.

CLUTCH. Two different clutches have been used. Early series 400 saws

Fig. PR1-10–Exploded view of clutch used on early models. The later type clutch (Fig. PR1-11) may be installed on early models.



2. Clutch cover
3. Nut
4. Shoe
5. Spring
6. Snap ring
7. Pin
8. Clutch driver
9. Sprocket & drum
10. Bearing
11. Washer
12. Woodruff key
13. Crankshaft

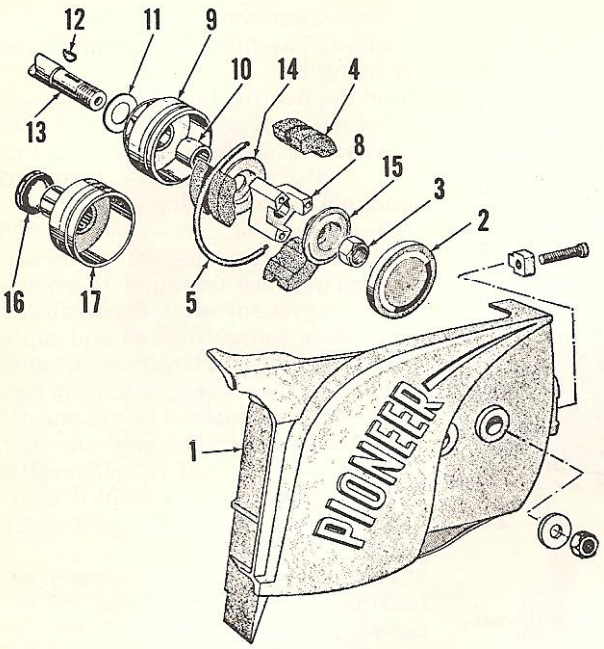


Fig. PR1-11–Exploded view of clutch used on late models. Clutch is also service replacement for early models. Some models are equipped with floating sprocket (16).

1. Cover
2. Clutch cover
3. Nut
4. Shoe
5. Spring
8. Clutch driver
9. Sprocket & drum
10. Bearing
11. Washer
12. Woodruff key
13. Crankshaft
14. Inner plate
15. Outer plate
16. Sprocket segment
17. Drum & spline

were originally equipped with the clutch shown in Fig. PR1—10. Clutch shown in Fig. PR1—11 was originally installed on NU17, 450 and 550 models and is installed as service replacement for early type. Bearing (10—Fig. PR1—10 or PR1—11) should be lubricated with a small amount of Mobil Sovarex No. 1W or Shell Alvania No. 2 lubricant before installing clutch drum. A clutch assembling tool (Part No. 429923) is available to facilitate installation of clutch shoes (4—Fig. PR1—12) and spring (5) on driver (8). Connection (C) at ends of garter spring (5) should be at the middle of a clutch shoe. Do not have connection between clutch shoes.

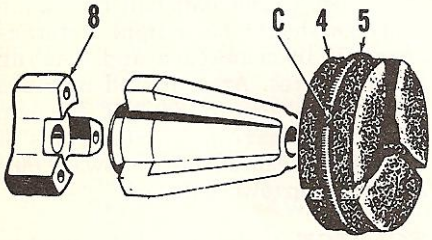


Fig. PR1-12–Special tool is available for sliding clutch shoes (4) and garter spring (5) onto driver (8). Connection of garter spring ends (C) should be at middle of clutch shoe.

REWIND STARTER. The rewind starter can be disassembled for service after removing fan housing cover and pulley cover. Remove pin (12—Fig. PR1—13) and withdraw parts from air box. Refer to Fig. PR1—14 for installation of rewind spring. Rewind spring should be liberally oiled before installing. Install friction yoke as described in Fig. PR1—15. The 5/32 inch diameter nylon starter cord (3—Fig. PR1—13) should be approximately 45 inches long. Preload the rewind spring approximately three turns before installing pulley cover.

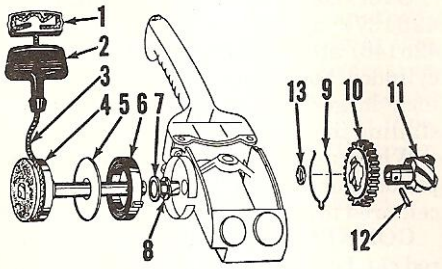


Fig. PR1-13–Exploded view of rewind starter. Cord (3) should be 45 inches long.

1. Cord anchor
2. Starter handle
3. Starter cord
4. Starter pulley
5. Backing plate
6. Rewind spring
7. Washer
8. Bushing
9. Friction yoke
10. Starter pinion
11. Starter spline
12. Roll pin
13. Washer

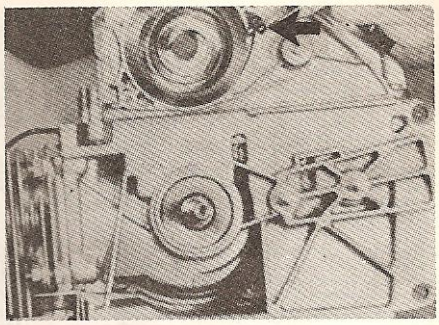


Fig. PR1-14–The outer end of rewind spring should be located between lugs on air box. Hooking end over outside lug may break the lug off.

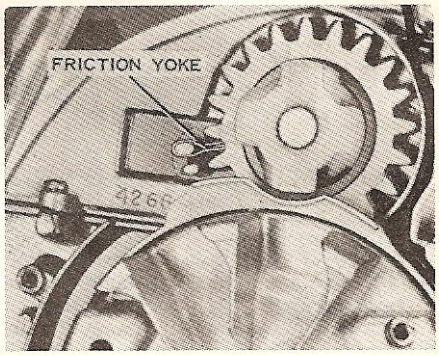


Fig. PR1-15–Friction yoke should be around upper projection as shown. Offset portion at outer end of yoke should be away from pinion.

GASKET AND "O" RING PART NUMBERS

	400, 410	NU-17	450 550
Exhaust Gasket	426444	426444	426444
Cylinder Base Gasket	426453	426453	426204
Muffler Gasket Shield	426740	426740	426740
Oil Pump Rod "O" Ring	425028	425028	425028
Oil Pump Body "O" Ring	303059	303059	303059
Oil Cap Gasket	425074	425074	425074
Gas Cap Gasket	425087	425087	425087
Filter Cap Gasket	426464	426464	426464
Insulating Block Gasket	426705	426704	....
Carburetor Base Gasket	....	....	426705
Airbox Gasket	426651	426651	426651
Carburetor Mounting Gasket	425046	425046	425046
Carburetor Metering Gasket	426596	260719	260719
Carburetor Fuel Pump Gasket	426598	425506	425506
Fuel Inlet Connecting Gasket	426601	....	....
Inlet Needle Seat Gasket	....	425486	425486
Primer Pump Base Gasket	426820	426820	426820
Check Valve "O" Ring	308528	308528	308528
Disc Valve Housing "O" Ring	202893	202893	202893
Carburetor Fuel Filter Gasket	....	260663	260663