

PIONEER

MODEL COVERAGE

Model	Bore In.	Stroke In.	Displ. Cu. In.	Drive
600, 600A, 610, 620, Super 6-20, 650	2 1/4	1 9/16	6.21	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. Tillotson HL-22A carburetor was originally used on 600, 600A, 610 and 620 models; Tillotson HL-129A is used on Super 6-20 and 650 models. Normal setting for the high speed mixture needle (22—Fig. PR2—1) is 1 1/4 turns open for HL-22A carburetors; 1 turn open for HL-129A carburetors. Normal setting for idle mixture needle (23) on all carburetors is 3/4 turn open. The fuel is filtered by the pick-up screen (1—Fig. PR2—2) in tank, the felt filter (2) in filter bowl and by screen (17—Fig. PR2—1) at carburetor. An air leak, especially at filter bowl (Fig. PR2—2) may prevent fuel from reaching carburetor.

MAGNETO AND TIMING. The breaker points, cam, condenser and coil are located under the flywheel. Flywheel retaining nut is left hand thread. Breaker point gap should be 0.020 inch. Condenser capacity should be 0.16-0.20 Microfarads. Ignition should occur (breaker points just open) at 30 degrees BTDC. Ignition timing will usually be correct if marks on stator and bearing housing (Fig. PR2—3) are aligned. The flywheel retaining 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 (1/2 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.

OMC (Johnson or Evinrude) 2 CYCLE ENGINE OIL is recommended and 1/2 pint of oil should be mixed with each gallon of gasoline. A good quality

Fig. PR2-1—Exploded view of Tillotson HL carburetor.

1. Throttle plate
2. Spring
3. Bushing
4. Seal ring
5. Idle speed screw
6. Gasket
7. Inlet needle valve
8. Spring
9. Inlet lever
11. Gasket
12. Diaphragm
13. Cover
14. Gasket
15. Fuel pump diaphragm
16. Fuel pump body
17. Filter screen
18. Gasket
19. Cover
20. Seal ring
21. Spring
22. High speed mixture needle
23. Low speed mixture needle
24. Throttle shaft
25. Spring
26. Inlet lever pivot
27. Choke plate
28. Choke shaft
29. Gaskets
30. Insulator
31. Adapter

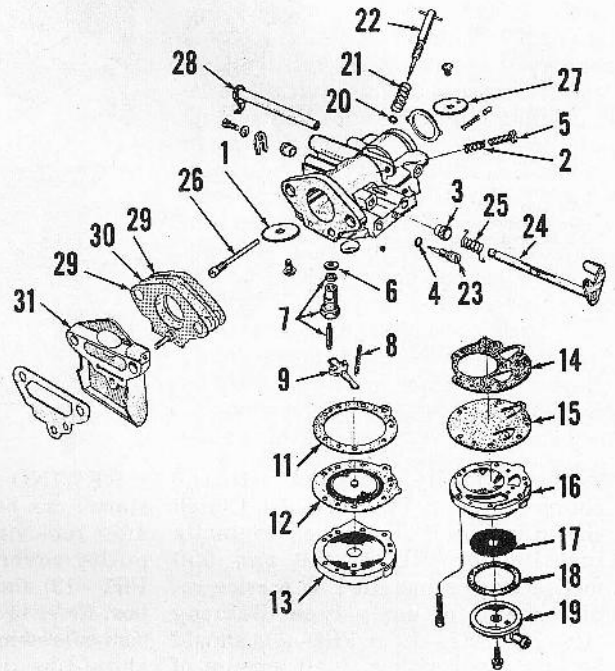


Fig. PR2-2—The first fuel filter (1) is located in the tank and the second fuel filter (2) is located in the fuel bowl which is mounted on top of tank. Air filter is shown at (3). Two types of vacuum valves (4) used in the fuel filler caps are shown.

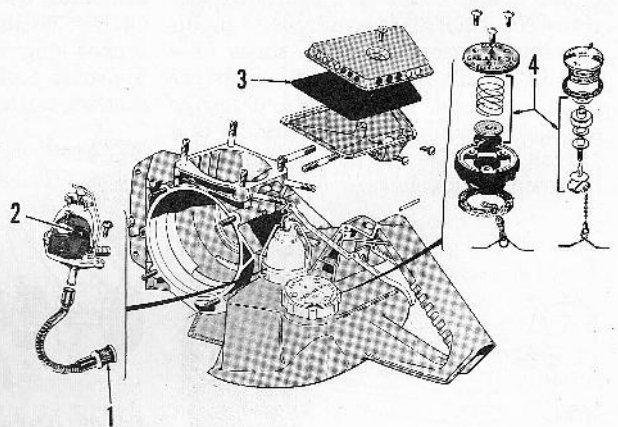


Fig. PR2-3—Align marks on stator and main bearing housing as shown when installing magneto stator.

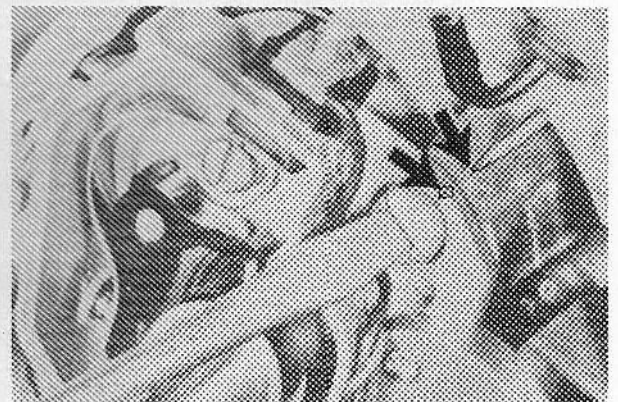
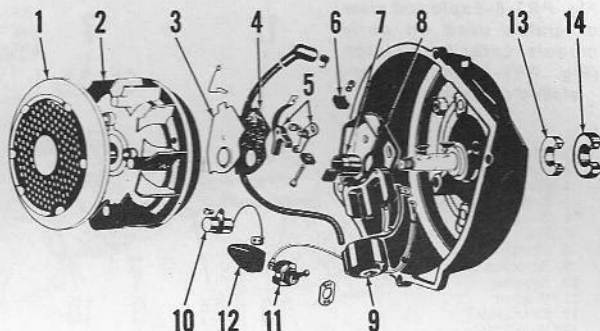


Fig. PR2-4—Exploded view of main bearing housing and magneto assembly.

1. Screen
2. Flywheel
3. Cover
4. Gasket
5. Breaker points
6. Insulator
7. Breaker cam
8. Stator
9. Coil
10. Condenser
11. Kill switch
12. Switch cover
13. Crankshaft seal
14. Main bearing



SAE 30 or SAE 40 oil with an API classification MS, SB 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 amount of 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 oiler 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. PR2-5.

CARBON. The exhaust ports and muffler should be cleaned approxi-

mately every two weeks of use or if a loss of power is noticed. Excessive carbon build up may indicate an excessive amount of oil, an improper type of oil mixed with the fuel or an excessively rich fuel-air mixture. Cylinder cooling fins should be cleaned at the same time carbon is cleaned from exhaust.

REPAIRS

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

Main Bearing Housing to	
Crankcase	60-70
Flywheel Nut	25-30 Ft.-Lbs.
Connecting Rod Screws	60-65
Cylinder Base Nuts	60-80
Cylinder Head to Cylinder—	
650 Model	60-80
Other Models	90-100

Clutch Nut	25-30 Ft.-Lbs.
Cooling Shroud Retaining Screws	60-80
Handle to Crankcase	60-80
Bar to Crankcase	80-110
Starter to Fan Housing	25-35
Chain Oiler to Crankcase	25-35
Fuel Filter to Crankcase	25-35

CYLINDER, PISTON, RINGS

AND PIN. Compression pressure at cranking speed should be 125-145 PSI with engine cold. The cylinder head is attached to top of cylinder with six stud nuts. The four cylinder base retaining nuts must be loosened, then the cylinder must be raised slightly before retaining nuts can be removed. The piston should be heated before removing the piston pin. Mark the piston on exhaust port side if old piston is to be reinstalled. New pistons can 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.	0.6245-0.6248
Piston Pin Fit in	
Piston Bore ...	0-0.0005 interference
Piston Pin to Bearing	
Clearance	0.0005-0.0017

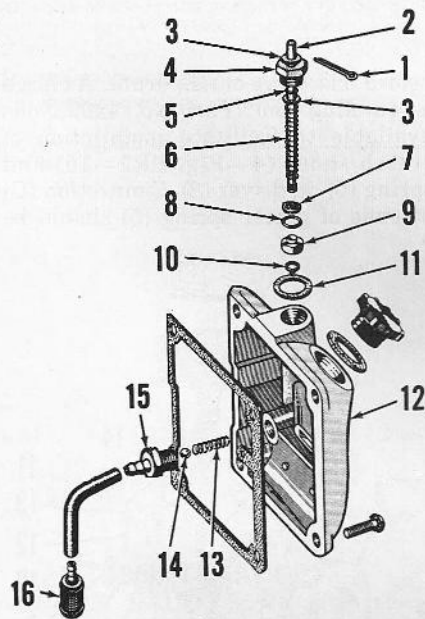


Fig. PR2-5—Exploded view of chain oiler pump.

- | | |
|---------------|----------------------------|
| 1. Cotter pin | 10. Snap ring |
| 2. Rod | 11. Gasket |
| 3. Washers | 12. Cover and pump body |
| 4. Gland nut | 13. Spring |
| 5. "O" ring | 14. Check valve ball |
| 6. Spring | 15. Valve seat and fitting |
| 7. Washer | 16. Pick-up filter |
| 8. "O" ring | |
| 9. Piston | |

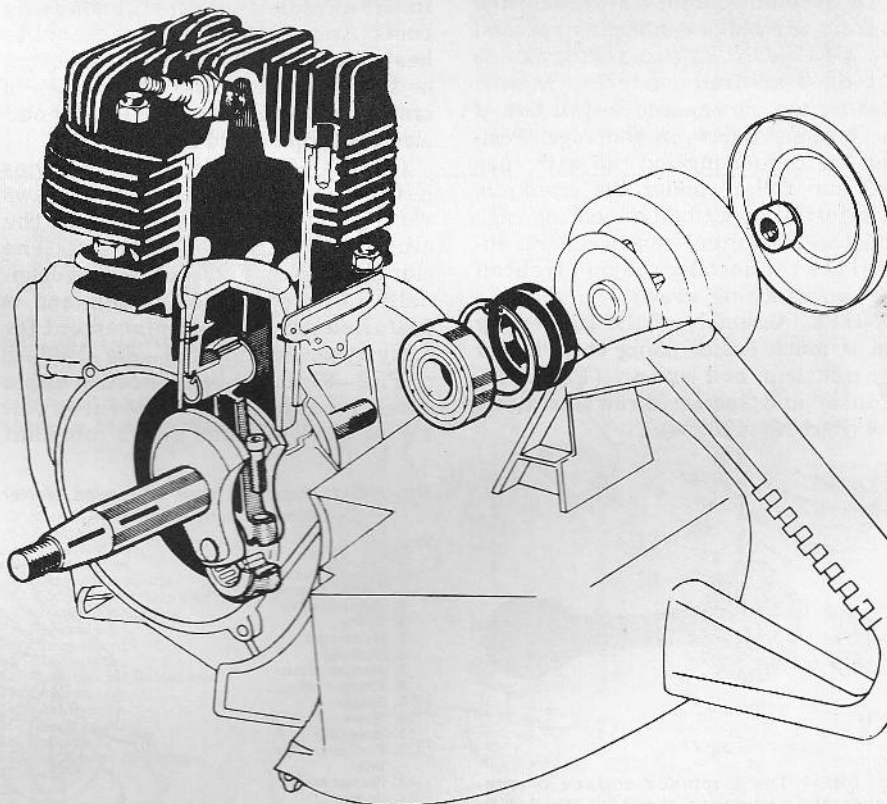


Fig. PR2-6—Cross section of engine showing crankshaft, connecting rod and piston. Main bearing and housing for magneto end are shown in Fig. PR2-4.

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. The connecting rod can be separated and removed after removing the cylinder and piston. CAUTION: Make certain that all 12 rollers at crankpin end are removed. New crankpin rollers should be installed each time the 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 (F—Fig. PR2—7) 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 (V) will be located at parting surface of the two halves.

To assemble, coat the machined bearing surface of connecting rod and cap. 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 the connecting rod and tighten the two attaching screws.

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

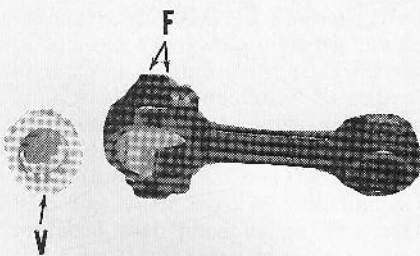


Fig. PR2-7—The machined surface of connecting rod and cap is shown at (F). Parting surface (V) on bearing cage should form a "V" at one point when correctly assembled.

Fig. PR2-8—Exploded view of clutch used on early models. Later type clutch (Fig. PR2-9) 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. Crankshaft
- 13. Woodruff key

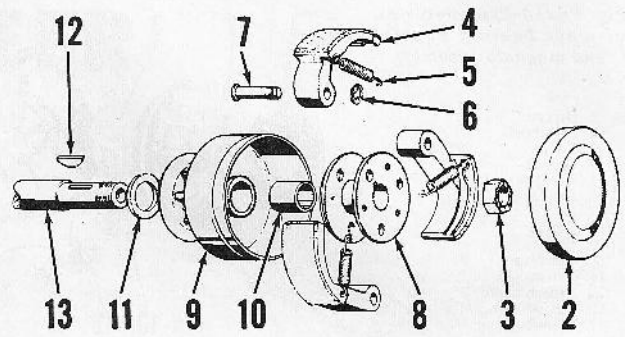
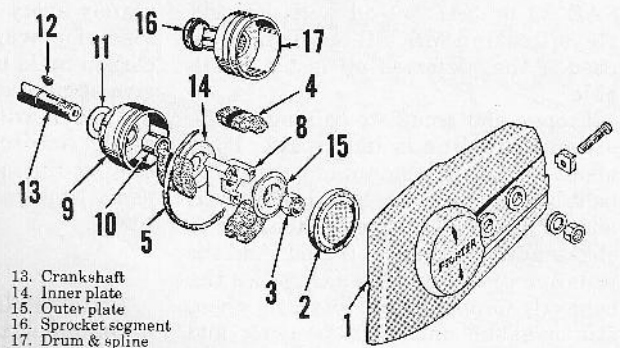


Fig. PR2-9—Exploded view of clutch used on late models. Clutch is also service replacement for early models. Some saws may be equipped with floating sprocket (16).

- 1. Cover
- 2. Clutch cover
- 3. Nut
- 4. Shoe
- 5. Spring
- 8. Clutch driver
- 9. Sprocket & drum
- 10. Bearing
- 11. Washer
- 12. Woodruff key



CRANKCASE AND CRANKSHAFT.

The crankshaft can be removed after removing the cylinder, connecting rod, flywheel, magneto and clutch. Remove the four attaching stud nuts, then pull the magneto side main bearing housing away from the 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 removing or installing bearings. Metal sides of crankshaft seals should be toward outside, with lip toward inside.

CLUTCH. Two different clutches have been used. Early series 600 saws were originally equipped with the clutch shown in Fig. PR2—8. The clutch shown in Fig. PR2—9 was originally installed on 650 models and is installed as service replacement for early type. Bearing (10—Fig. PR2—8 or PR2—9) should be lubricated with a small amount of Mobil Sovarex No. 1W or Shell Alvania No. 2 lubricant

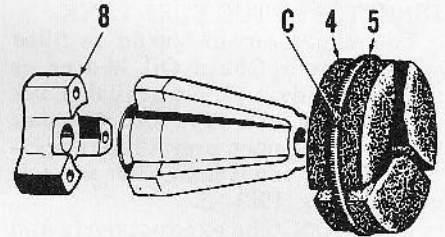
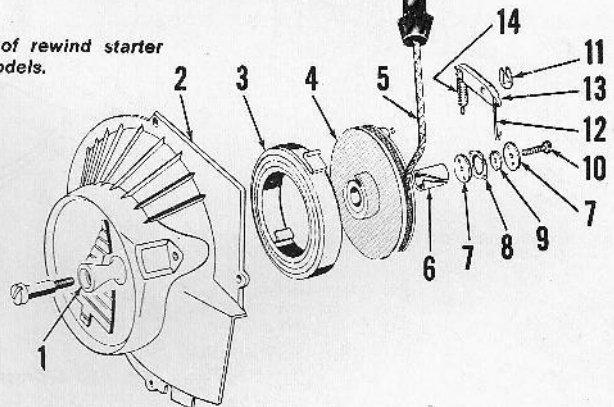


Fig. PR2-10—Special tool is available for sliding clutch shoes (4) and garter spring (5) onto driver (8). Connection of garter spring ends (C) should be at middle of shoe.

before installing clutch drum. A clutch assembling tool (Part No. 429923) is available to facilitate installation of clutch shoes (4—Fig. PR2—10) and spring (5) on driver (8). Connection (C) at ends of garter spring (5) should be

Fig. PR2-11—Exploded view of rewind starter used on early models.

- 1. Rope guide roller
- 2. Starter housing
- 3. Rewind pulley
- 4. Pulley
- 5. Nylon cord
- 6. Bushing
- 7. Friction plates
- 8. Friction yoke
- 9. Spacer
- 10. Screw
- 11. Snap ring
- 12. Pawl operating link
- 13. Starter pawl
- 14. Spring



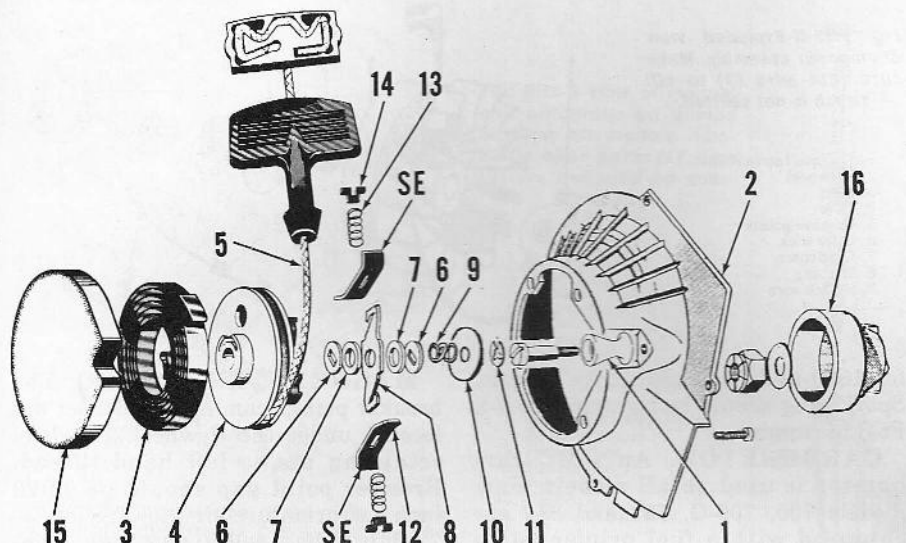


Fig. PR2-12—Exploded view of rewind starter used on later models.

- | | | | |
|----------------------|------------------|-------------------|---------------------|
| 1. Rope guide roller | 5. Nylon cord | 9. Spring | 13. Spring |
| 2. Starter adapter | 6. Brake washers | 10. Washer | 14. Spring retainer |
| 3. Rewind spring | 7. Fiber washers | 11. Snap ring | 15. Starter housing |
| 4. Pulley | 8. Brake lever | 12. Starter pawls | 16. Starter cup |

at the middle of a clutch shoe. Do not have connection between clutch shoes.

REWIND STARTER. Two types of rewind starters have been used. Early models may be equipped with the rewind starter shown in Fig. PR2-11. Later models are equipped with the starter shown in Fig. PR2-12.

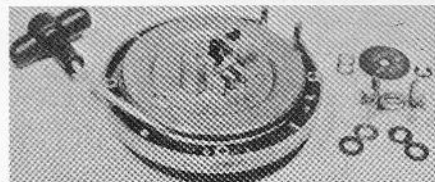


Fig. PR2-13—View of rewind starter with starter pawls and friction washers removed.

On late type, the sharp edges of pawls should be on side marked (SE).

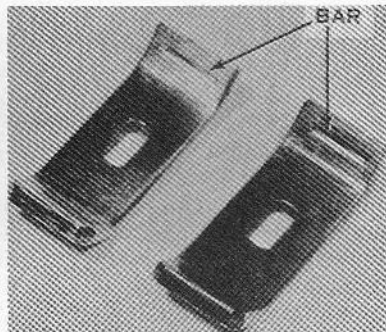


Fig. PR2-14—Bar is stamped across end of starter pawls which should be sharp.

The sharp edge should be filed to 27 degrees. The pawls may catch in the cup (13) if edge is too sharp or if cup surface is rough. Starter may slip if starter pawls are dull or if fiber washers (7) are oil soaked. Sharp edge of starter pawls are stamped with a bar (Fig. PR2-14). The 5/32-inch diameter nylon starter cord should be approximately 38 inches long.

GASKET AND "O" RING PART NUMBERS

	MODELS	
	600, 620	650
Exhaust Gasket	426205	426205
Cylinder Head Gasket	425643	425643
Cylinder Base Gasket	426204	426204
Oiler Gland Nut Gasket	425093	
Oil Cap Gasket	425074	425074
Oil Pump Piston "O" Ring	425095	425095
Oiler Gland Nut "O" Ring	425028	425028
Oil Pump Base Gasket	426199	
Fuel Pickup Head "O" Ring	304614	304614
Fuel Filter Base Gasket	425669	425669
Carburetor Air Cleaner Gasket	425689	425689
Fuel Filter Bowl Gasket	425748	425748
Gas Cap Gasket	425087	425087
Carburetor Fuel Strainer Gasket	260663	260663
Carburetor Fuel Pump Gasket	425506	425506
Carburetor Metering Gasket	260719	260719
Carburetor Inlet Seat Gasket	425486	425486
Carburetor Adapter to Crankcase Gasket	426123	426123
Carburetor Adapter and Mounting Gasket	425046	425046
Carburetor Insulating Block Gasket	425328	425328
Fan Housing Gasket	427193	427193
Breaker Box Gasket	425690	425690
Check Valve Gasket	427273	427273
Check Valve "O" Ring	427281	427281

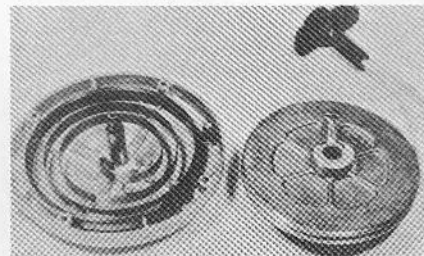


Fig. PR2-15—View of starter housing showing correct installation of rewind spring.