

PIONEER

MODEL COVERAGE

Model	Bore In.	Stroke In.	Displ. Cu. In.	Design Features
1410, 1420	1.875	1.450	4.0	A, C
1450	1.875	1.450	4.0	A, D
1520	1.875	1.450	4.0	B, C
1560	2.0	1.5	4.7	B, D
2400, 3200	2.0	1.5	4.7	A, C
2460, 3270	2.0	1.5	4.7	A, D

DESIGN FEATURE CODE

- A—Direct drive to saw chain
- B—Gear transmission is used to reduce saw chain speed
Reduction ratio: 2.5:1
- C—Manual chain oiler
- D—Automatic and manual chain oilers

MAINTENANCE

SPARK PLUG. Spark plug electrode gap should be 0.030 inch for all models. Recommended Champion spark plug is CJ6 for 1560 models, CJ8 for all other models. Spark plug should be tightened to 7-8 Ft.-Lbs. torque.

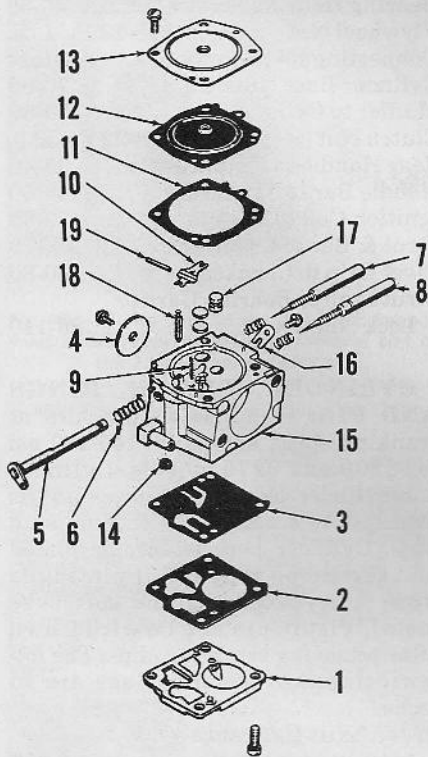


Fig. PR5-1—Exploded view of Tillotson HS carburetor.

- | | |
|------------------------------|-----------------------------|
| 1. Fuel pump cover | 10. Inlet control lever |
| 2. Gasket | 11. Gasket |
| 3. Fuel pump diaphragm | 12. Fuel control diaphragm |
| 4. Throttle disc | 13. Cover |
| 5. Throttle shaft | 14. Fuel inlet screen |
| 6. Throttle return spring | 15. Carburetor body |
| 7. Idle mixture needle | 16. Throttle shaft retainer |
| 8. High speed mixture needle | 17. Check valve |
| 9. Spring | 18. Inlet needle |
| | 19. Pivot pin |

CARBURETOR. Tillotson HS carburetors are used on all models. Saw model 1410 was originally equipped with HS-16B carburetor. The initial setting for both high speed and idle mixture adjusting needles (7 & 8—Fig. PR5-1) is 1¼ turn open from lightly seated. Adjust both mixture adjustment needles to provide smoothest running when operating under normal conditions.

Later saw models may be equipped with either Tillotson HS-39A or HS-39B carburetor. The difference between these two carburetors is the type of check valve (17). Early carburetors should be changed by installing the later type check valve. A fixed jet (calibrated orifice) is located in top of late type check valve assembly (17) and the high speed mixture needle (8) must be adjusted differently. Initial setting of idle mixture needle (7) should be 1¼ turns open for all carburetors. Initial setting of the high speed mixture needle (8) should be turned in until lightly seated on carburetors with late type check valve; ½ turn open on carburetors with early type check valves. Turn mixture adjustment needles to provide best running when operating under normal conditions. High speed mixture needle (8) should not be opened more than ¼ turn for high speed cutting and limbing, if late check valve is used. High speed mixture needle should not be opened more than ¾ turn for heavy cutting if late check valve is installed.

Idle speed on most models is adjusted by a stop screw which prevents the carburetor throttle from closing completely. Throttle stop screw is located on carburetor of 1410 models and on air box wall (S—Fig. PR5-3) of other models. Engine idle speed should be slow enough to keep drive clutch from engaging.

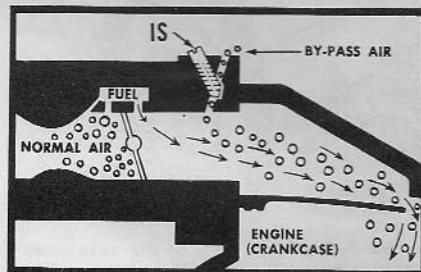


Fig. PR5-2—The idling speed of the engine is adjusted by metering the amount of by-pass air entering the engine. The throttle valve is closed at idle speed as shown.

Some saws are equipped with "Inject-Aire" and the carburetor throttle is completely closed at idle. Air is permitted to enter the engine at idle speed through a separate passage as shown in Fig. PR5-2. Position of the adjustment screw changes idle speed by varying the amount of by-pass air that is allowed to enter engine. Normal setting of idle speed adjustment needle (IS—Fig. PR5-3) is two turns out from lightly seated. Engine speed should be slow enough that clutch does not engage.

Refer to Fig. PR5-4 for exploded views of the fuel filter, primer, pump and reed valve assemblies.

MAGNETO. A Wico magneto is used on all models. Breaker points are located under the flywheel, flywheel retaining nut is left hand thread and breaker point gap should be 0.015 inch. Ignition timing should occur (breaker points just open) at 30 degrees BTDC. Armature air gap should be 0.013 inch. Condenser capacity should be 0.16-0.20 Microfarads. Flywheel retaining nut should be tightened to 18-22 Ft.-Lbs. torque. Refer to Fig. PR5-18 for installation of starter pawls and springs.

LUBRICATION. 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

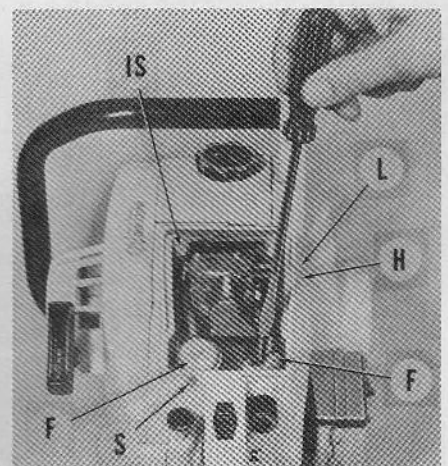


Fig. PR5-3—View of typical saw showing location of "Inject-Aire" idle speed screw (IS), fuel filter (F), fuel primer pump (P), low speed mixture adjustment needle (L) and high speed mixture needle (H).

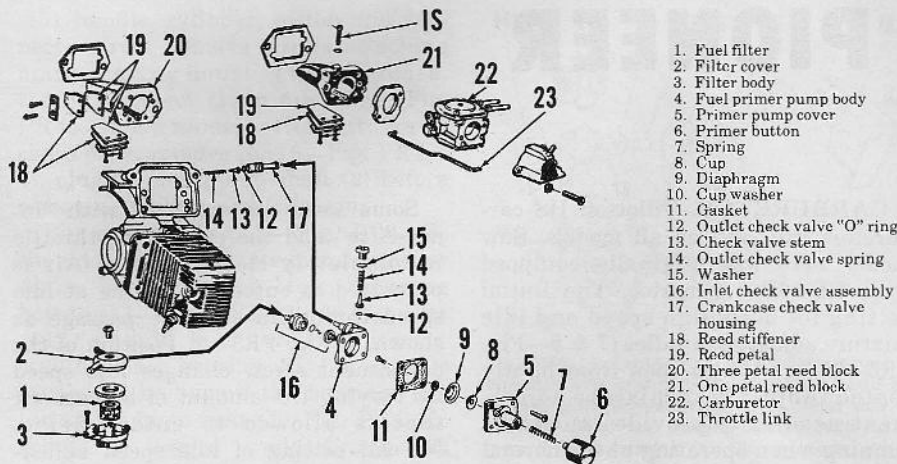


Fig. PR5-4—Partially exploded view showing the early (three petal) reed valve assembly on the left and the later (one petal) reed valve assembly on the right. Other fuel system components are also shown.

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 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 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 properly and permanently blended. **DO NOT MIX DIRECTLY IN THE FUEL TANK.**

Oil reservoir should be filled with Pioneer Chain Oil winter or summer grade, or if not available, a good grade SAE 10 to SAE 40 motor oil depending upon prevailing temperature. All models are equipped with a manual chain oiler pump (Fig. PR5-5). Some early pumps were equipped with inlet check valve as shown at (5). Most pumps use special inlet check valve fitting (3). Both early and late pumps are shown in Fig. PR5-6. The automatic chain oiler pump used on some models is shown in Fig. PR5-7. Remove automatic oiler parts in sequence shown.

Worm gear (W) on crankshaft turns pump shaft and gear (6). Guide pin (3)

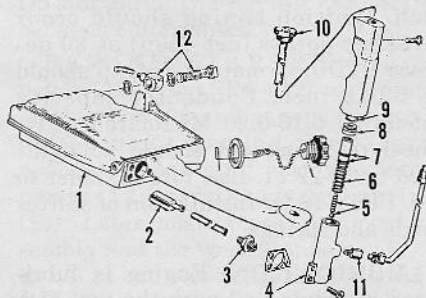


Fig. PR5-5—Exploded view of the chain oiler reservoir, manual pump and associated parts. Outlet screen and fitting (12) are for automatic chain oiler on models so equipped.

- 1. Oil reservoir (tank)
- 2. Pick-up assembly
- 3. Fitting (inlet check valve late models)
- 4. Pump body
- 5. Inlet check valve (early models)
- 6. Spring
- 7. Pump plunger and "O" ring
- 8. Washer
- 9. Snap ring
- 10. Button and push rod
- 11. Outlet check valve

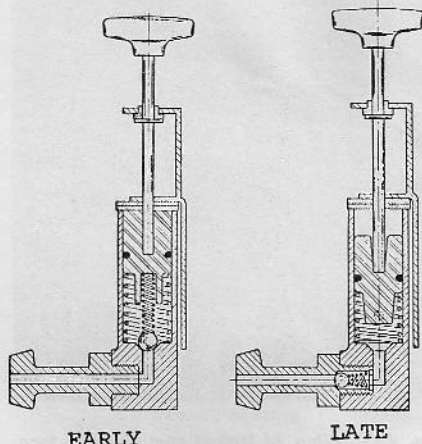


Fig. PR5-6—Cross section of early and late type manual oiler pumps. Most saws are equipped with late type.

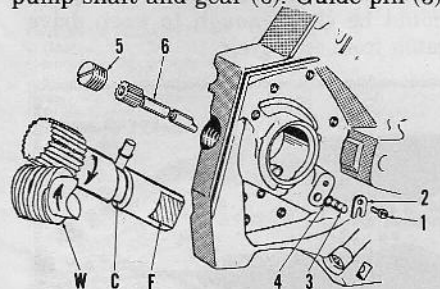


Fig. PR5-7—Exploded view of the automatic chain oiler pump. Pump shaft and gear (6) is turned by a worm gear on crankshaft.

- 1. Screw
- 2. Locating plate
- 3. Guide pin
- 4. "O" ring
- 5. Plug
- 6. Pump shaft and gear

rides in a cam slot (C) of pump shaft and causes pump shaft to move back and forth as it rotates. The back and forth movement pumps oil to the chain. Flat (F) on shaft acts as a valve to open intake port on outward stroke and outlet port on the inward stroke.

CARBON. Muffler and cylinder exhaust ports should be cleaned periodically before any loss of power is noticed because of carbon build up. Remove muffler and clean carbon from all parts of muffler. Turn engine crankshaft until piston is covering the exhaust port, then carefully clean carbon from exhaust using a soft scraper. Be especially careful not to damage piston. Do not attempt to clean exhaust with piston not covering the port. Hard carbon deposits can cause extensive damage if permitted to fall into the engine. Engine cooling fins should be cleaned at the same time that carbon is cleaned from exhaust.

REPAIRS

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

Bearing Housing Screws	45-50
Flywheel Nut	18-22 Ft.-Lbs.
Connecting Rod Screws	See text
Cylinder Base Nuts	70-80
Muffler to Cylinder	50-60
Clutch Nut	18-22 Ft.-Lbs.
Rear Handle to Crankcase	35-40
Handle Bar to Crankcase	45-50
Ignition Coil to Engine	25-35
Strut & Bar to Crankcase	80-110
Pivot Grip to Crankcase	60-80
Strut Stud to Bearing Carrier	
Lock Nut	80-110

CYLINDER, PISTON, RINGS AND PIN.

Compression pressure at cranking speed should be 140-150 psi for 3200 and 3270 models. Cylinder and cylinder head is one piece and is attached to crankcase with four stud nuts. Cylinder bore is chrome plated and should be renewed if plating is worn away exposing the soft base metal. Piston pin can be withdrawn after removing retaining clips. The following repair specifications are in inches.

Piston Skirt Clearance—	
1410	0.007
Ring End Gap—	
1410	0.008-0.014
All Other Models	0.092—0.098

A special assembly tool (part number 472213) should be used when assembling the piston to connecting rod on 1560, 2400, 2460, 3200 and 3270 models. Piston pin (1—Fig. PR4-11) is installed on loader and

Fig. PR5-10—Exploded view of crankcase, crankshaft and associated parts. Several differences may exist between parts for early engines and late type shown.

1. Crankcase
2. Cylinder
3. Shroud
4. Pin retaining clip
5. Piston
6. Connecting rod
- 6C. Rod cap
7. Crankpin bearing
8. Piston pin
9. Thrust washer
10. Piston pin bearings
11. Crankshaft seal
12. Main bearing
13. Crankshaft

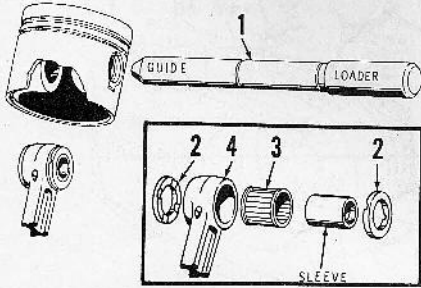
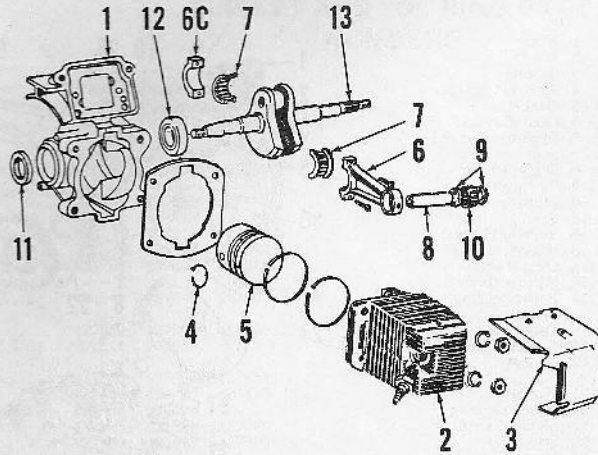


Fig. PR5-11—The three piece special Pioneer tool will facilitate installation of the piston pin. Refer to text.

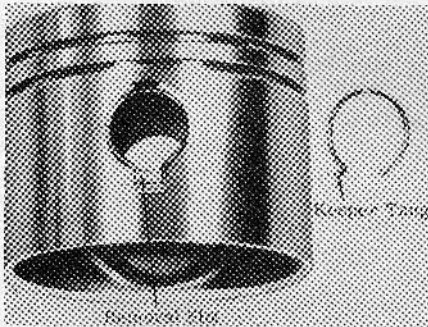


Fig. PR5-12—The tang on the piston pin keeper must be correctly installed in removal slot of the 2 inch diameter pistons.

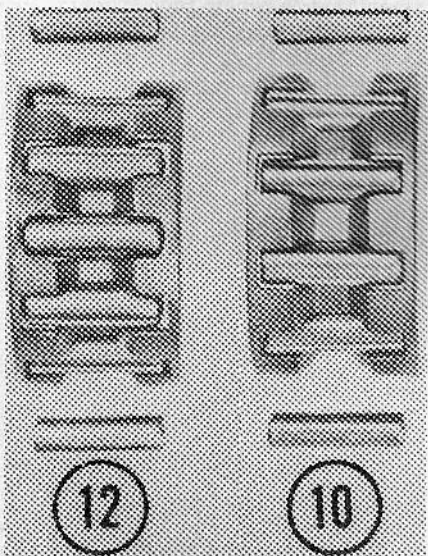


Fig. PR5-13—View of the 12 and 10 roller crankpin bearings used on 4.7 cubic inch engines. The bearing with eight captive rollers and two loose rollers should be installed.

the guide is located over end of loader. Assemble thrust washers (2) and bearing (3) into rod (4), then use the sleeve to hold these parts in position. Heat piston, then press guide and piston pin (1) through one piston boss, bearing (3) and other piston boss. Make sure that the piston ring locating pin is positioned on magneto side of piston, away from the exhaust port.

On all models, piston rings are pinned to prevent rotation in grooves. Make sure that ring locating pin is on magneto side of engine, away from exhaust port.

CONNECTING ROD. Connecting rod can be separated and removed after removing cylinder and piston. Be sure that all of the bearing rollers are removed. New bearing rollers should be used each time that the connecting rod is removed. The Pioneer special tool (No. 427975) can be used to hold the rod cap in place while installing the retaining screws.

The crankpin bearing on 1410, 1420, 1450 and 1520 models uses a separating cage and 12 loose rollers. Piston pin bearing is the cartridge type and is pressed into bore in connecting rod. Press only on lettered end of piston pin bearing.

Several types of connecting rods and crankpin bearings have been used in the larger (4.7 cubic inch) engines. The latest connecting rods are pre-

ferred and can be identified by the solid rod cap (not slotted). The early crankpin bearing contained 12 rollers (Fig. PR5-13) and the latest bearing has 10 rollers. The late bearing has eight rollers retained in the bearing cage halves and two loose rollers between the ends of the cage halves. The late type bearing should be used when servicing all 1560, 2400, 2460, 3200, 3270 and 3270S models. Tighten the retaining screws to 75 inch-pounds torque

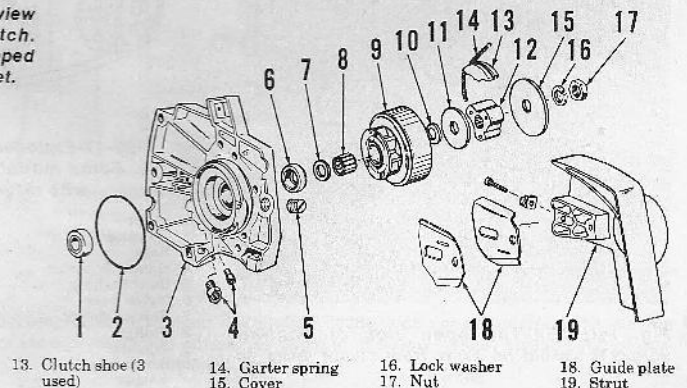
Mating surfaces of connecting rod and cap are fractured to provide correct alignment when assembling all models. One side of rod and cap are machined flat for identification.

On 1410, 1420, 1450 and 1520 models, the crankpin bearing cage halves are machined 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. Coat the machined bearing surface of connecting rod and cap with suitable grease to hold bearing rollers when assembling. **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 to 80 inch-pounds torque.

CRANKCASE AND CRANKSHAFT. The crankshaft can be removed from all models after removing the cylinder, piston, rod, flywheel, magneto, fuel tank, chain drive clutch and the main bearing carrier assembly. Automatic chain oiler pump (Fig. PR5-7) must be removed from models so equipped before removing the main bearing carrier.

Crankshaft ball type main bearings should be a tight (interference) fit in bores of crankcase and bearing carrier.

Fig. PR5-15—Exploded view of the chain drive clutch. Some models are equipped with a floating sprocket.



1. Main bearing
2. Seal ring
3. Bearing carrier
4. Oil fittings
5. Chain automatic oiler plug
6. Crankshaft seal
7. Washer
8. Bearing
9. Clutch drum
10. Thrust washer
11. Plate
12. Clutch driver

13. Clutch shoe (3 used)

14. Garter spring
15. Cover

16. Lock washer
17. Nut

18. Guide plate
19. Strut

Area around bearings should be heated when installing the bearings. Closed side of crankshaft seals should be toward outside with lip toward inside (connecting rod journal).

DIRECT DRIVE CLUTCH. The direct drive clutch typical of all models is shown in Fig. PR5-15. Bearing (8) should be lubricated with a small amount of Mobil Sovarex No. 1W or Shell Alavania No. 2 lubricant before installing the clutch drum. A clutch assembling tool (Part No. 429923) is available to facilitate installation of clutch shoes (13), spring (14) and driver (12). Connection at ends of garter spring should be at the middle of a clutch shoe, not between two of the shoes.

On models with floating sprocket, open side of sprocket should be away from the clutch drum as shown in Fig. PR5-15A.

CLUTCH AND GEARBOX. The clutch used on gear drive models is contained in the gearcase. It is necessary to remove the gearcase cover (18—Fig. PR5-16) in order to service the clutch, gears, shafts or bearings. Remove the handlebar, saw chain, guide bar, fuel tank (17), then remove screws and cover (18). A puller should be used to remove clutch driver (32) from the crankshaft. Idler spindle (26) should be tight fit in gearcase bore. The gearcase should be heated before removing or installing idler spindle.

The automatic chain oiler pump shaft (10) should be removed from models so equipped before attempting to pull the gearcase from the engine crankcase. Guide pin (9) operates in groove of pump shaft and must be removed before pump shaft can be pulled from pump bore.

Lip of crankshaft seal should be toward inside of engine and lip of output shaft seal (11) should be toward inside of gearcase. Inside diameter of washer (13) is larger than inside diam-

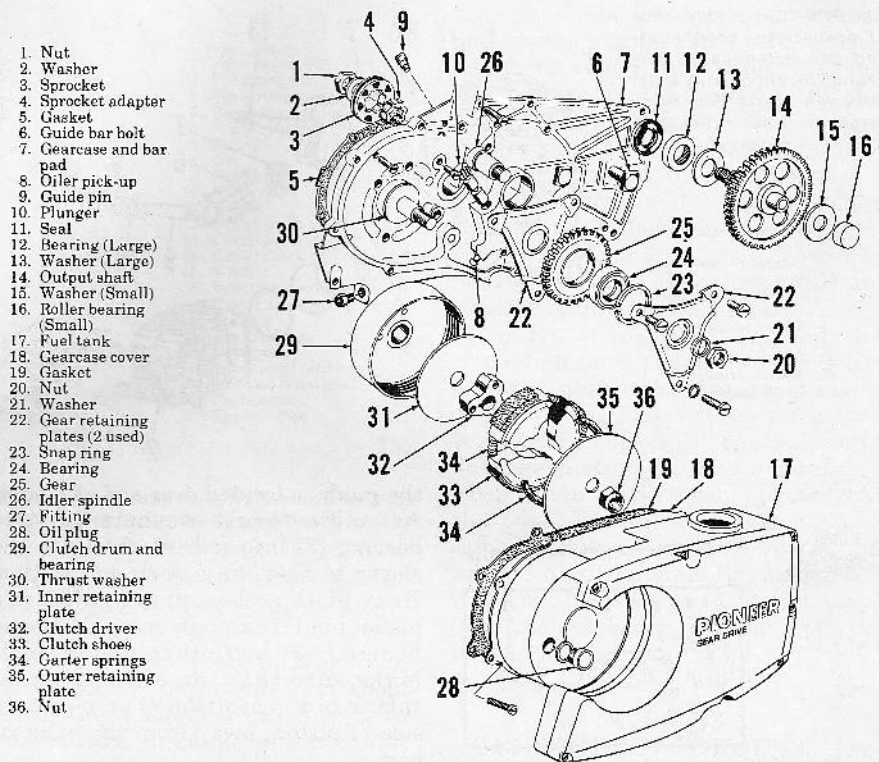


Fig. PR5-16—Exploded view of gearcase and clutch assembly typical of 1520 and 1560 models. Automatic chain oiler (parts 8, 9 & 10) is not used on all models.

eter of washer (15). Outside diameter of retaining plate (31) is smaller than outside diameter of retaining plate (35). Oil in gearcase should be main-

tained at level of filler plug (28). NOTE: The fuel tank and fuel tank cover are bonded together and available only as an assembly. Do not remove screws from fuel tank cover.

REWIND STARTER. Starter pawls (12—Fig. PR5-17) are located on the flywheel and engage a notch in pulley (8) for starting. All models are equipped with two sets of pawls (12), pivots (11) and springs (13). Pawls and springs should be installed as shown in Fig. PR5-18. Starter must be disassembled to renew rope (3—Fig. PR5-17), or rewind spring (7). The 5/32-inch diameter nylon cord should be 45 inches long. The rewind spring should be preloaded 3 turns when assembling.

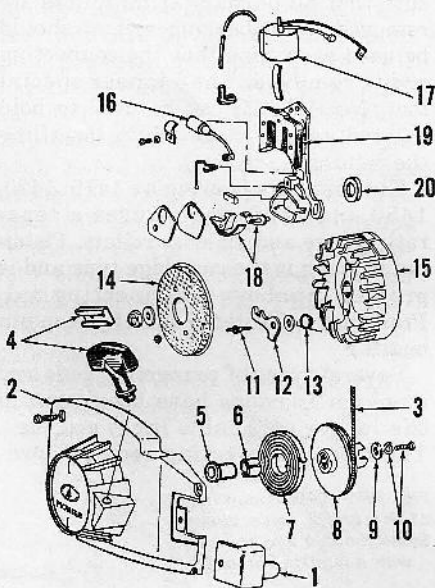


Fig. PR5-17—Exploded view of the rewind starter. Some models may not be equipped with steel bushing (5).

- 1. Cover
- 2. Housing
- 3. Rope
- 4. Handle & anchor
- 5. Steel bushing
- 6. Nylon liner
- 7. Rewind spring
- 8. Pulley
- 9. Washer
- 10. Screw & lock washer
- 11. Post (2 used)
- 12. Pawl (2 used)
- 13. Spring (2 used)
- 14. Screen
- 15. Flywheel
- 16. Condenser
- 17. Coil
- 18. Breaker points
- 19. Stator plate & coil core
- 20. Felt washer

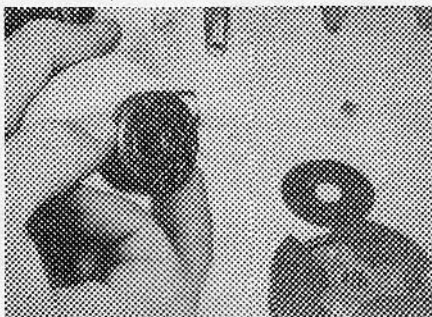


Fig. PR5-15A—The open side of floating sprocket should be away from clutch drum as shown.



Fig. PR5-18—The starter pawls and springs should be installed as shown.

CHAIN SAWS

Pioneer

GASKET AND "O" RING PART NUMBERS

	1410A, 1450, 1420	2400, 2460	3200, 3270
Gas Cap Gasket	425087	425087	425087
Filter Disc Gasket	427273	.....	.....
Filter Disc "O" Ring	427281	.....	.....
Fuel Filter Base Gasket	427369	427369	427369
Carburetor Mounting Gasket	427888	427888	427888
Exit Valve "O" Ring	308528	308528	.....
Primer Pump Cover Gasket ..	427715	427715	427715
Breaker Box Gasket	427757	429076	429849
Bearing Carrier "O" Ring ..	427889	427889	427889
Carburetor Fuel Pump Gasket	427940	427940	427940
Carburetor Metering Gasket	427950	427950	427950
Fuel Pickup Line "O" Ring .	202612	202612	.....
Connector "O" Ring (Washer)	427855	427855	427855
Cylinder Base Gasket	429429	429429	429429
Reed—Idle Speed "O" Ring .	304598	304598	.....
Reed Valve Body Gasket	427885	427885	427885
Oil Cap Gasket	427689	427689	427689
Oil Pump Plunger "O" Ring	427360	427360	428906
Oil Pump Body Gasket	427861	427861	427861
Exhaust Gasket	428189	428189	428189
Check Valve "O" Ring	308528	308528	308528
Automatic Oil Pump "O" Ring .....	.....	.....	308528
Oil Pickup Head Gasket ....	.....	.....	307554

	1520	1560
Gas Cap Gasket	425087	425087
Primer Pump "O" Ring (Fuel Pickup Head "O" Ring)	202612	202612
Primer Fitting Gasket (Washer) ..	.....	427855
Air Filter Knob "O" Ring .....	.....	304614
Fuel Filter Bowl Gasket	427369	427369
Carburetor to Crankcase Gasket ..	427888	427888
Primer Pump Cover Gasket	427715	427715
Exit Valve "O" Ring	308528	308528
Oil Pump Body Gasket	427861	427861
Oil Pump Plunger "O" Ring	427360	428906
Oil Cap Gasket	427689	427689
Oil Pickup Head Gasket .....	.....	307554
Breaker Box Gasket	427757	429076
Reed Valve to Crankcase Gasket ..	427885	427885
Idle Speed Needle "O" Ring	304598	304598
Check Valve "O" Ring	308528	308528
Exhaust Gasket	428189	428189
Cylinder Base Gasket	428371	429429
Valve Body Gasket	427273	.....
Valve Body "O" Ring	427281	.....
Carburetor Fuel Pump Gasket	427940	.....
Carburetor Metering Gasket	427950	.....
Crankcase Gasket	428319	.....
Gearcase Cover Gasket	428913	.....
Oil Plug Gasket	428314	.....