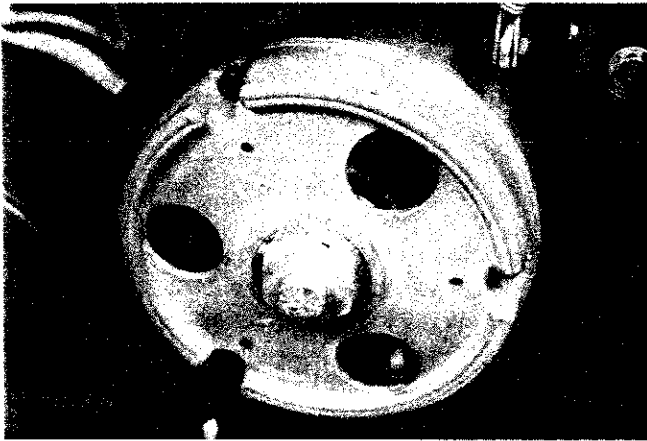


# ENGINE REMOVAL

8. Remove the 4 screws and lockwashers that secure the recoil starter assembly to the fan housing, using a short screwdriver. Remove the recoil starter assembly and carefully allow to retract against the console-mounted recoil cable bracket.
9. Remove the belt and pull the drive clutch off the mainshaft of the engine, Fig. II-16, (see Section V — Drive System, Drive Clutch Removal).

Fig. II-16



10. Remove outside 2 capscrews, flat washers and locknuts that secure the front of the engine plate to front end, using two 9/16-inch wrenches.
11. Grasp engine on both sides, pivot engine rearward until muffler tailpipe pulls through the hole in the belly pan and pull engine out of the snowmobile.
12. Set engine on a clean work bench.
13. Account for the 2 solid aluminum motor mounts that may fall into the belly pan when the engine is pulled.
14. Before disassembling the engine, clean the exterior surfaces of all foreign matter.

## ENGINE SERVICING (DISASSEMBLY)

### Remove External Components

**Equipment Necessary:** 13 mm Open End Wrench and Socket, 7/16-Inch Socket and Wrench, Screwdriver, 11/16-Inch Socket and 11/16-Inch Wrench

1. Remove the 2 nuts that secure the carburetor elbow to the engine, using a 13 mm open end wrench. Slide carburetor with elbow, gaskets and insulator block from the engine and set aside in a clean dry area.
2. Loosen the capscrew and locknut that secures the muffler strap and asbestos strip, using a 7/16-inch socket and wrench. When strap is sufficiently released, slide strap and asbestos strip off the backing bracket.
3. Remove the 2 nuts that secure the tailpipe clamp, using a 13 mm socket. Remove clamp assembly from around the tailpipe.
4. Drive the muffler off the exhaust pipe, using a rubber hammer.

5. When muffler is removed, use a 13 mm wrench and remove the nuts and flat washers that secure the exhaust pipe to the engine. Slide the exhaust pipe and exhaust gasket off the mounting studs.

**Note:** Examine the 2 muffler backing brackets that are secured to the engine plate. If damage is not evident, removal of brackets is not necessary.

6. Pull the high tension wire off the spark plug, Fig. II-17. Pull blue wire connector off the external ignition coil.
7. Remove the 3 screws and lockwashers that secure the external ignition coil to the fan housing, using a screwdriver, Fig. II-17. Pull external coil from fan housing.

**Note:** The high tension wire and the brown ground wire are to remain connected to the external ignition coil.

# ENGINE REMOVAL

## General

For photography purposes and to improve clarity, the engine is shown removed from the snowmobile, even though many of the service procedures may be performed with the engine mounted in the snowmobile. More often than not, a major service procedure can be accomplished more efficiently if the engine is removed from the snowmobile.

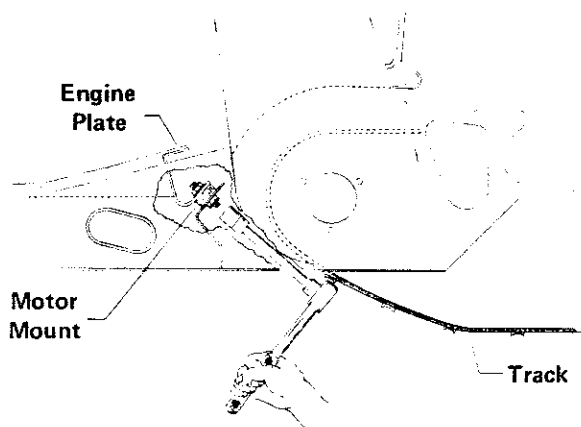
**Note:** When the engine is being removed from the snowmobile, all mounting hardware is to be kept with respective components.

## Remove Engine from Snowmobile

**Equipment Necessary:** Pliers, Cardboard, 9/16-Inch Socket, 8-Inch Extension, Short Screwdriver, 13 mm Socket, 13 mm Wrench, and Two 9/16-Inch Wrenches

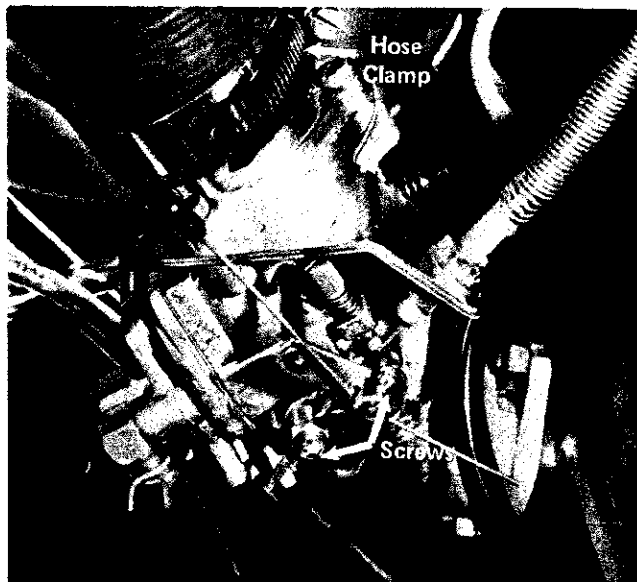
1. Remove the hood cable, using a phillips screwdriver and 1/2-inch wrench. Remove the push nuts and pins that secure the hood to the hinge support, using a pliers. Remove the hood from the hinge support.
2. Tip the snowmobile on its side and use a piece of cardboard or similar material to prevent scratching.
3. Remove the 2 locknuts that secure the motor mounts to the belly pan, using a 9/16-inch socket and an 8-inch extension, Fig. II-13. Tip the snowmobile right side up.

Fig. II-13



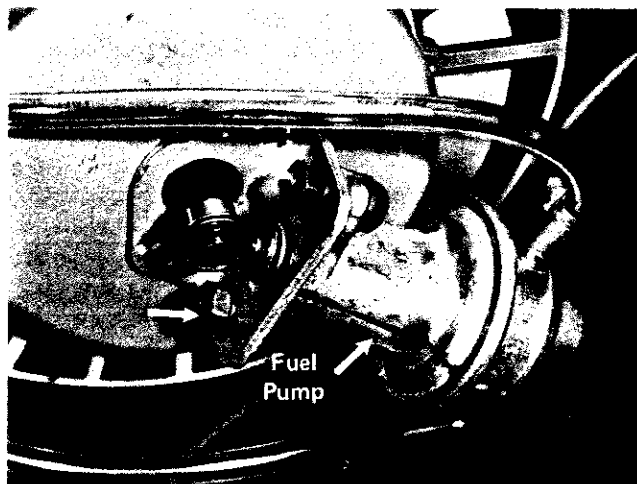
4. Loosen the 2 screws that secure the throttle wire and the choke wire to carburetor mounted throttle and choke arms, Fig. II-14. Pull wires from the throttle and choke arms.

Fig. II-14



5. Loosen the carburetor intake hose clamp, using a screwdriver, Fig. II-14. Pull intake hose off carburetor intake adaptor.
6. Remove the 2 bolts, lockwashers, flat washers and nuts that secure the fuel pump to the recoil housing, using a 13 mm socket and wrench, Fig. II-15. Lay fuel pump in the belly pan.

Fig. II-15



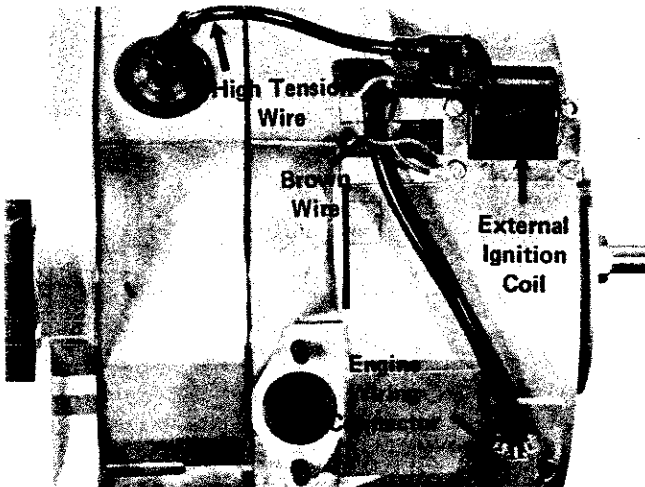
7. Pull the fuel line off the carburetor inlet fuel fitting and the return line off the carburetor return line fitting, Fig. II-15. Position the fuel line and return line higher than the fuel level in the fuel tank to prevent fuel flow from the fuel tank.

# ENGINE SERVICING (DISASSEMBLY)

8. Remove the engine wiring connector from the fan housing by removing the 2 screws, using a screwdriver, Fig. II-17.

**Note:** Allow the engine wiring connector to hang loose.

Fig. II-17



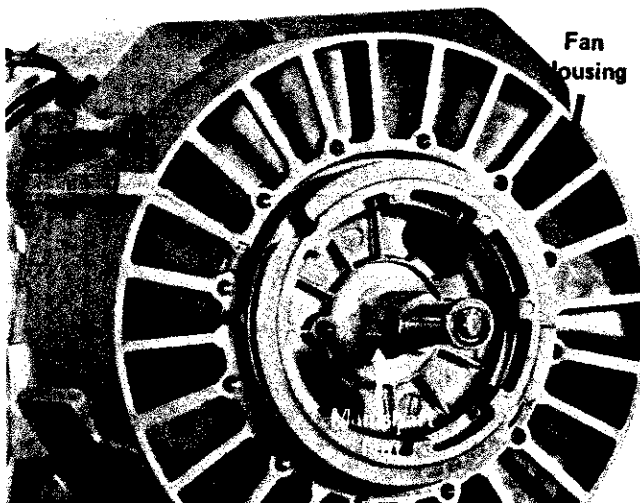
9. Remove the 4 bolts and lockwashers that secure the engine plate to the engine, using a 11/16-inch wrench and socket. Set engine plate aside.

## Remove Starter Drum and Fan

**Equipment Necessary:** 5 mm Allen Wrench, 15/16-Inch Wrench, Vise, Puller and Small Side Cutter

1. Remove the 3 Allen head bolts that secure the fan housing to the end cover, Fig. II-18. Slide fan housing off the mainshaft.

Fig. II-18



2. Place the PTO end counterweight of the engine in a vise and tighten securely to hold in place.
3. Remove the mainshaft nut, using a 15/16-inch wrench, Fig. II-18.
4. Slide a protective cap on the mainshaft and install the fan puller, using two M8 x 60 bolts, Fig. II-19. The holding tool shown is not necessary if the counterweight is in a rise. Arctic does not sell the holding tool.

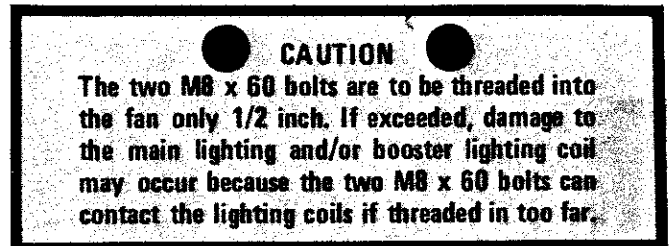
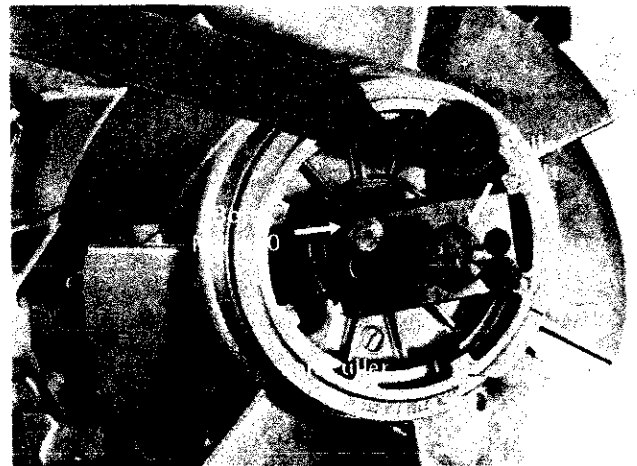
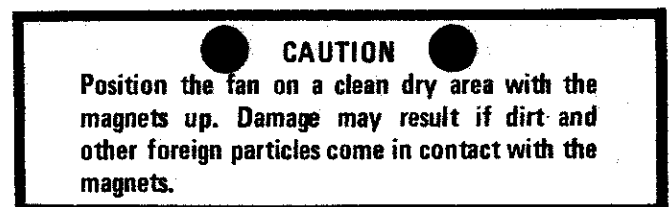


Fig. II-19



5. Pull the fan from the mainshaft by rotating the center puller bolt clockwise until the fan releases from the mainshaft taper, using a 15/16-inch wrench, Fig. II-19. Separate the puller from the fan.

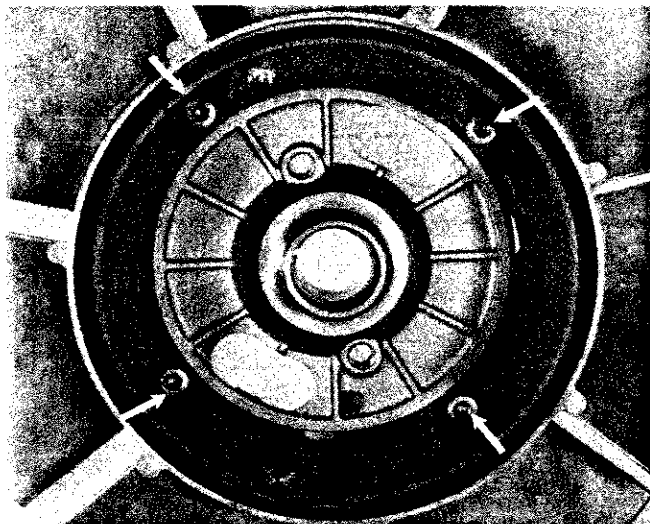


6. Remove the key from the mainshaft, using a side cutter. Keep key with fan. Remove PTO end counterweight from the rise.

# ENGINE SERVICING (DISASSEMBLY)

7. If the starter drum, fan or flywheel is not to be serviced, remove the magneto assembly (see Remove Magneto Assembly and Counterweights, page II-14). If the starter drum, fan or flywheel is to be serviced, proceed to step 8.
8. Using a 5 mm Allen wrench, remove the 4 Allen head bolts and lockwashers that secure the starter drum, fan and flywheel, Fig. II-20. Separate components and replace as conditions dictate.

Fig. II-20



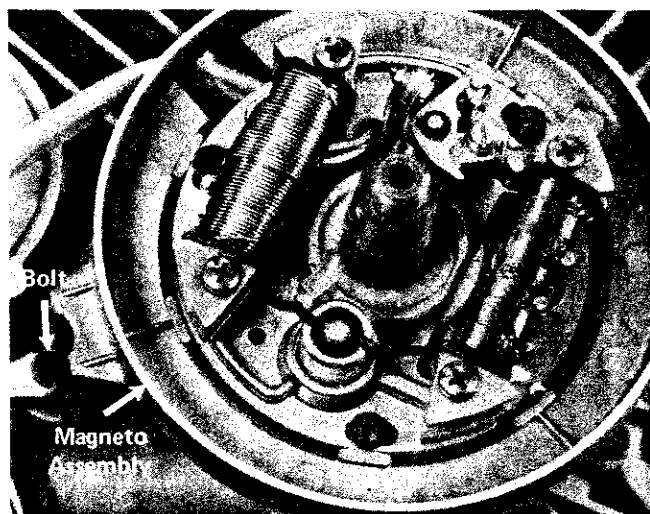
**Note:** The 4 Allen head bolts are sealed with locktite. It is recommended that an impact driver be used to break the bolts loose. If an impact driver is not used, there is a possibility that the bolt head may deform when removed with a conventional Allen wrench, making removal extremely difficult.

## Remove Magneto Assembly and Counterweights

**Equipment Necessary:** 10 mm Wrench, 5 mm Allen Wrench, 13 mm Socket and Rubber Hammer

1. Remove the 4 bolts, flat washers and nuts that secure the magneto mounting plate to the end cover, using a 5 mm Allen wrench, Fig. II-21. Remove magneto mounting plate and ensure that the 2 dowel pins are accounted for. Set magneto mounting plate on a clean area where it will not be subjected to dirt or accidental damage.
2. Loosen the counterweight retaining bolt, using a 13 mm wrench, Fig. II-22. Use a

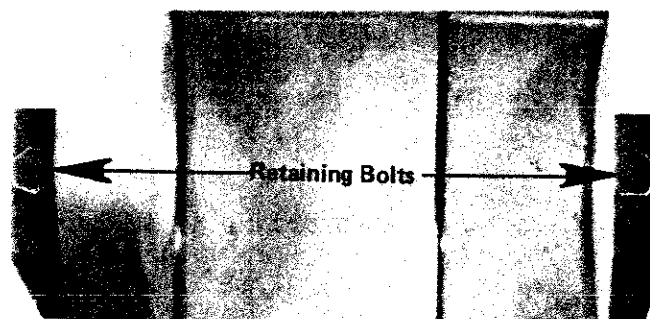
Fig. II-21



rubber hammer to drive counterweight free of the mainshaft. Perform this step on both the Magneto end and PTO end counterweights.

**Note:** It is recommended that the area around the counterweight bolt be heated before attempting to remove. Heating makes bolt removal easier.

Fig. II-22



3. If the coils, breaker points or condenser will not be serviced, remove the PTO end cover (see Remove PTO End Cover, page II-14). If the coils, breaker points or condenser are to be serviced, proceed to Section IV, Electrical System.

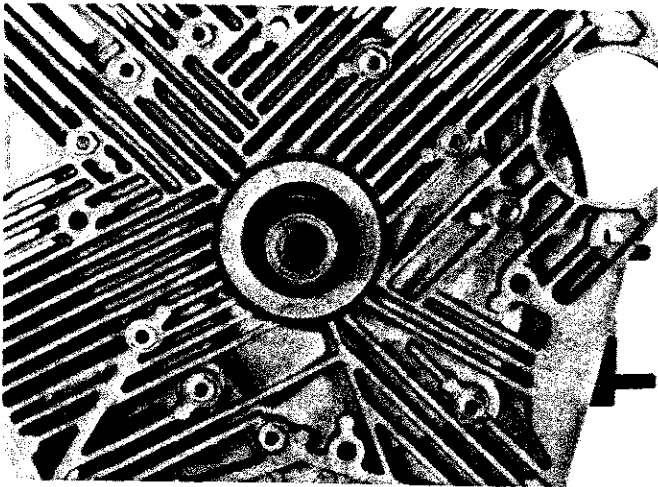
## Remove PTO End Cover

**Equipment Necessary:** 10 mm Socket and Wrench

1. Remove the 10 bolts, washers and nuts that secure the PTO end cover, rotor housing and Magneto end cover, Fig. II-23. Each bolt is fitted with 2 washers, one with the bolt head, the other with the nut.

# ENGINE SERVICING (DISASSEMBLY)

Fig. II-23



2. Carefully lift the PTO end cover off the rotor housing and mainshaft.

**Note:** As the end cover is removed, the dowel sleeves, rotor sealing pins, sealing pin springs, side seals and side seal springs, Fig. II-24, may stick to the end cover. Exercise care so that these components do not accidentally fall, and as a result, become lost.

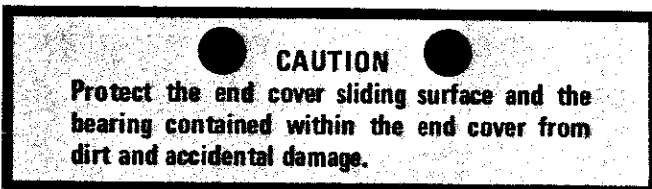
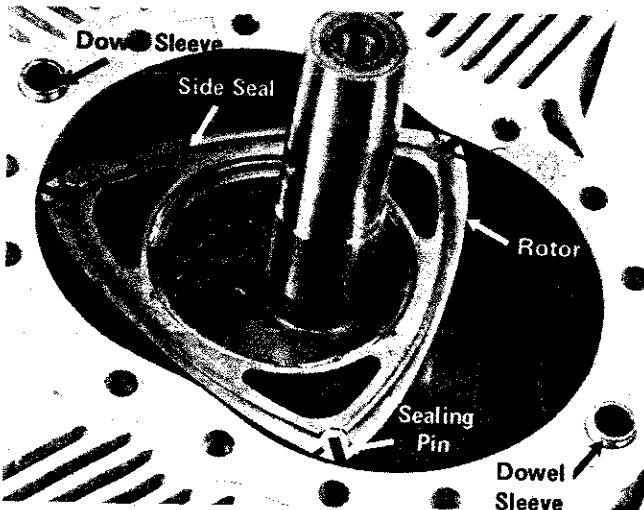


Fig. II-24



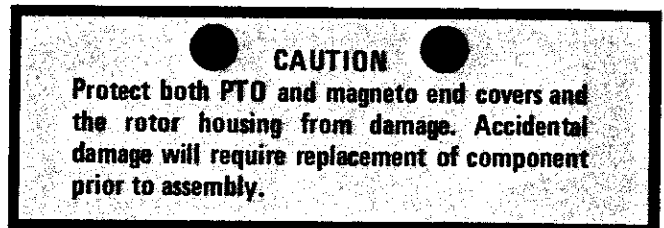
**Remove Rotor and Rotor Housing**

**Equipment Necessary: No Special Tools Required**

1. Remove the rotor from the rotor housing and mainshaft, exercising care so that the rotor is not accidentally dropped and damaged, Fig. II-24. The apex seals, apex seal springs, side seals, side seal springs, sealing pins and sealing pin springs may stick to the PTO end cover when the rotor is removed. Parts to be accounted for are 3 apex seals and springs, 6 side seals and springs, 6 sealing pins and 12 sealing pin springs.

**Note:** Place rotor and sealing components on a clean area where accidental damage will not occur.

2. Lift the rotor housing off the magneto end cover. Account for the 2 dowel pins.



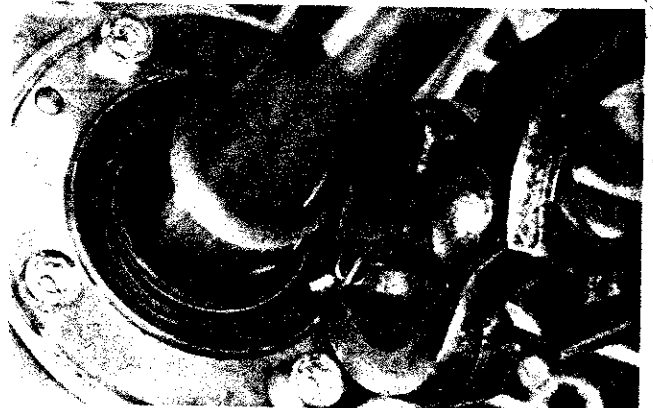
## Remove Mainshaft

**Equipment Necessary: Center Punch, Conventional Hammer, Self-Tapping Screw, Wire Pinchers, Snap Ring Pliers and Rubber Hammer**

The mainshaft is not to be removed from the magneto end cover unless repair of the mainshaft, pinion gear, end cover, bearing or rotor is necessary.

1. Punch a hole into the magneto end cover seal and thread a self-tapping screw into the hole. Pull out oil seal by grasping the screw, using a pinchers, Fig. II-25.

Fig. II-25

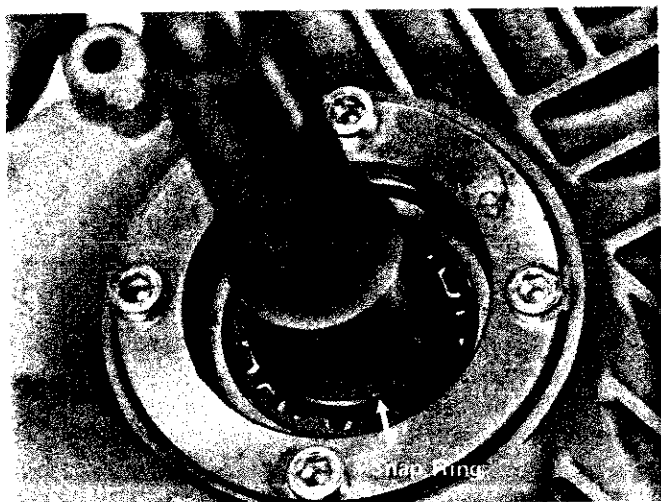


# ENGINE SERVICING (DISASSEMBLY)

**Note:** The oil seal WILL be damaged when removed; this is an accepted practice. Replacement of the seal is necessary when seal is pulled.

2. Remove the snap ring, Fig. II-26, that retains the mainshaft in the end cover, using a snap ring pliers.

Fig. II-26



3. Place protective cap over the magneto end of the mainshaft and drive out of the end cover, using a rubber hammer.

**Note:** There are 2 spacer thrust rings on every mainshaft. Ensure they are accounted for. Some mainshafts may have a shim(s) — make sure shim(s) is also accounted for. Spacer thrust rings and shim(s) are used to obtain proper crankshaft end play.

## CAUTION

Make sure that damage to the sealing surface or rotor sliding surface of the end cover is not sustained. If damaged, replacement is necessary.

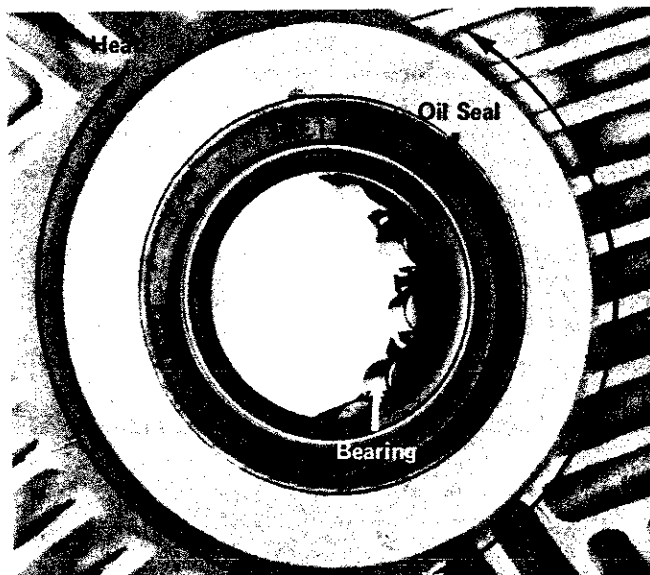
### Remove Bearing from PTO End Cover

**Equipment Necessary:** Flat End Punch, Hammer, Two 2 x 4 Wooden Blocks, Clean Soft Rags and Lacquer Thinner

The only time the bearing is to be removed is when it is damaged or if the magneto end cover bearing is replaced. Always replace both bearings even if only one is defective.

1. Set the PTO end cover on rag-covered wooden blocks with the rotor sliding surface facing upward.
2. Using a flat end punch and hammer, drive the oil seal out of the end cover.
3. Turn the end cover over so that the rotor sliding surface is positioned on the rag-covered wooden blocks.
4. Heat the end cover bearing area on the exterior casting surface to  $+392^{\circ}\text{F}$ . When temperature is obtained, use a flat end punch and hammer and drive the bearing out of the end cover, Fig. II-27. Make sure that the end of the punch is positioned on the bearing race when driving bearing out.

Fig. II-27



5. Remove the loctite deposits from the bearing and oil seal area of the end cover, using lacquer thinner.

### Remove Bearing from Magneto End Cover

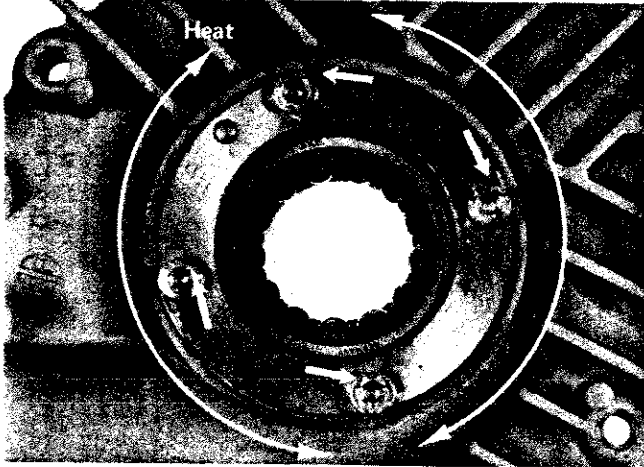
**Equipment Necessary:** Flat End Punch, Hammer, Two 2 x 4 Wooden Blocks and Clean Soft Rags

1. Heat the end cover bearing area on the exterior casting surface to  $+300^{\circ}\text{F}$ ., Fig. II-28.
2. When temperature is obtained, set the magneto end cover on rag-covered wooden blocks with the gear facing upward.

# ENGINE SERVICING (DISASSEMBLY)

3. Use a flat end punch and hammer and drive the bearing out of the pinion gear. Make sure that end of the punch is positioned against the bearing race when driving the bearing out.

Fig. II-28



## I Remove Pinion Gear

**Equipment Necessary:** 5 mm Allen Wrench and Impact Driver

1. Remove the 4 Allen head bolts, Fig. II-28, using an impact driver and 5 mm Allen wrench . . . reason — bolts are sealed with locktite.
2. Heat the end cover pinion area on the exterior casting surface to  $+300^{\circ}\text{F.}$ , Fig. II-28. When temperature is obtained, press the pinion gear out of the end cover. Also remove the paper gasket that fits between the pinion collar and end cover.

## Remove Apex and Side Seal Components

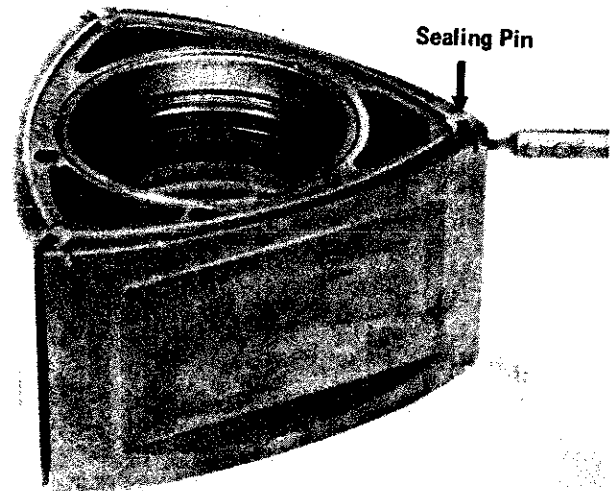
**Equipment Necessary:** Decarbonizing Tool

Fig. II-29



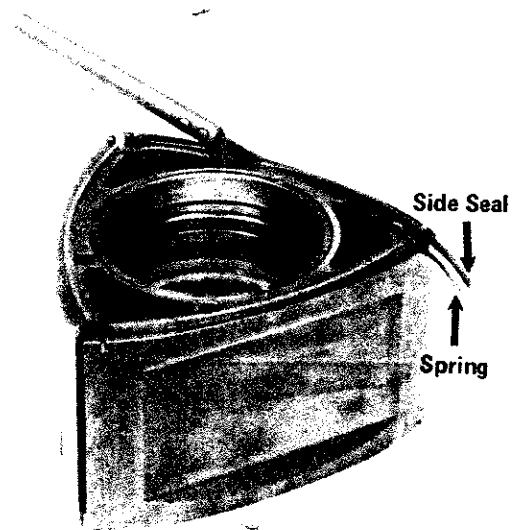
1. Position the tipped end of the decarbonizing tool against the end of the apex seal, Fig. II-29. Push or tap lightly against the tool until the apex seal and spring can be removed.
2. Loosen the sealing pin by turning with the tipped end of the decarbonizing tool, Fig. II-30. Lift the sealing pin and the 2 horseshoe-shaped springs out of the sealing pin bore.

Fig. II-30



3. Position the tipped end of the decarbonizing tool against the end of the side seal. Push or tap lightly against the tool until the side seal and spring can be removed, Fig. II-31.

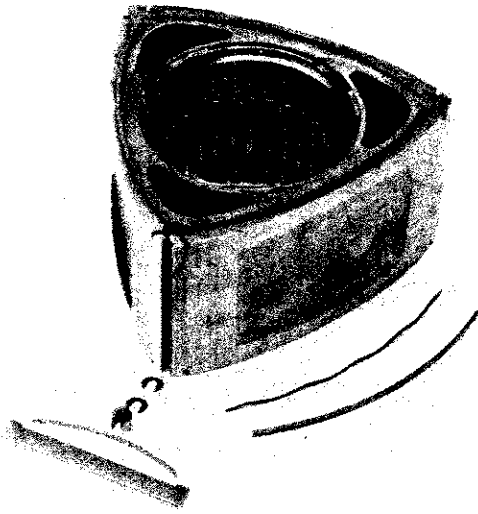
Fig. II-31



4. Perform steps 1 - 3 on all seal areas until all sealing components are removed, Fig. II-32.

# ENGINE SERVICING (DISASSEMBLY)

Fig. II-32



## CAUTION

Before the needle bearing is removed from the rotor, make sure that all sealing components are removed from both sides of the rotor, Fig. II-32. If seals are not removed, damage may occur when the bearing is being removed from the rotor.

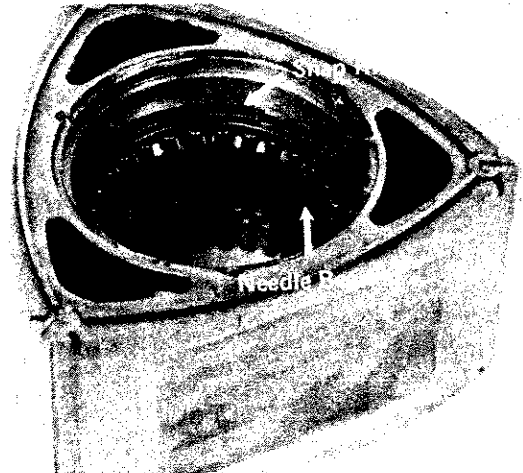
1. Remove the snap ring, Fig. II-33, that secures the needle bearing, using a snap ring pliers. There is also a snap ring on the gear side of the needle bearing that is to be removed.
2. Slide the needle bearing from within the rotor.

Fig. II-33

## Remove Rotor Needle Bearing

Equipment Necessary: Snap Ring Pliers

**Note:** If the rotor needle bearing is to be reused, mark the bearing and the rotor so that the bearing will be installed in exactly the same position when reassembling. A definite wear pattern develops between the bearing and the eccentric on the mainshaft. For this reason the bearing must be installed in the same position. The bearing will deteriorate rapidly if not installed in this manner.





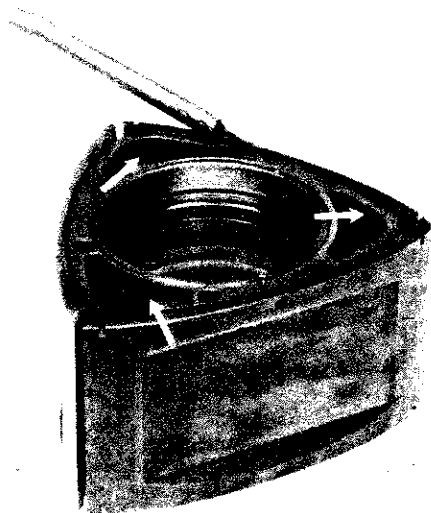
# ENGINE SERVICING (DECARBONIZING)

## Decarbonize Rotor and Sealing Components

### Equipment Necessary: Decarbonizing Tool

1. Remove major carbon buildup from the rotor sealing components and the respective seal grooves and sealing pin bores in the rotor, using the decarbonizing tool, Fig. II-34. DO NOT scrape down to the bare metal.

Fig. II-34



2. Remove major carbon buildup from the rotor faces (3 sides), using the decarbonizing tool. It is not necessary to scrape so clean as to expose bare metal.
3. If the top or bottom (end cover sealing sides) of the rotor have **EXCESSIVE** carbon buildup, scrape off only the carbon flakes, using the decarbonizing tool.
4. Observe the condition of the 3 fuel flow passages near the rotor apexes, Fig. II-34. The fuel flow passages must be unobstructed. Decarbonize the passages if necessary.

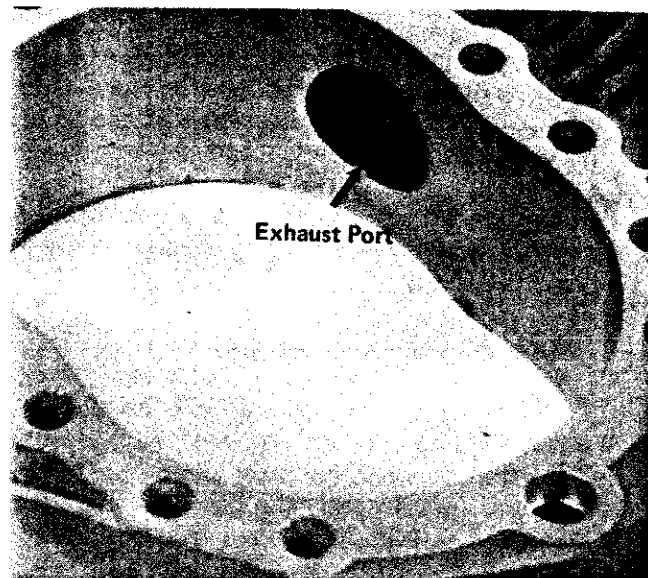
## Decarbonize Rotor Housing

### Equipment Necessary: Decarbonizing Tool, Cleaning Solvent and 13/16-Inch Spark Plug Socket

1. Remove the spark plug from the rotor housing, using a 13/16-inch spark plug socket.

2. Carefully remove major carbon buildup from the exhaust port and spark plug bore, using the decarbonizing tool or triangular scraper, Fig. II-35. DO NOT SCRAPE OFF ANY METAL.

Fig. II-35



3. Clean the inside of the rotor housing very well, using cleaning solvent. Dry the rotor housing thoroughly.

## Decarbonize End Covers

### Equipment Necessary: Cleaning Solvent

1. Remove major carbon buildup from the rotor sliding surface of both end covers, using cleaning solvent. Dry the end covers thoroughly.

**Note:** If only minor carbon deposits are present on the rotor sliding surface of the end covers, DO NOT attempt to remove such deposits.

**CAUTION**

DO NOT scrape or accidentally damage the rotor sliding surface of the end covers. Most any damage may contribute to leakage, power loss or engine seizure.

# ENGINE SERVICING (INSPECTING)

## Inspect End Covers

### Equipment Necessary: Surface Plate

**Note:** End covers cannot be remachined; total replacement of the affected end cover is to be made if damage is incurred.

1. Inspect the end covers for scratches, scoring, cracks (other than hairline), breakage and any other noticeable imperfection that may affect operation. If any of these conditions exist, replacement is necessary.
2. Inspect end cover bearings for rough rotation and the absence of a bearing element. If these conditions exist, replace the bearing.
3. Inspect port areas for damage.
4. Carefully place the end covers on a clean surface plate. There is not to be any distortion between the rotor sliding surface of the end cover and the surface plate. If distortion is evident, replace the end covers.

### CAUTION

Be extremely careful when the end cover is placed on the surface plate to check distortion. If the end cover is scraped across the surface plate, the possibility of end cover sliding surface damage does exist. If accidentally damaged, end cover must be replaced. Remachining cannot be performed on the end covers.

## Inspect Rotor Housing

### Equipment Necessary: No Special Tools Required

**Note:** The sliding surface of the rotor housing is not to be remachined; total replacement of the rotor housing must be made if damage is incurred.

If a new rotor housing is to be installed, new apex seals must be used in conjunction with the new rotor housing. DO NOT USE APEX SEALS THAT WERE REMOVED, EVEN IF THE SEAL IS NOT WORN. Whenever a rotor housing is replaced, the hole for the spark plug should be checked for length so that a spark plug with the appropriate reach is used.

1. Inspect the rotor housing sliding surface for deep scratches, scoring, cracks (other than hairline), breakage and any noticeable imperfection that may affect engine operation. If any of these conditions exist, replace the rotor housing.
2. Inspect the exhaust port and spark plug hole for damage and raised surfaces. Replace the rotor housing if these conditions exist.
3. Check both sides of the rotor housing sealing surface by placing the rotor housing on a surface plate. There is not to be any distortion between the rotor housing and the surface plate. No coarse or raised edges are to be evident on the sealing surfaces. If any of these conditions exist, replace the rotor housing.

## Inspect Fan and Starter Drum

### Equipment Necessary: Metal File (If Necessary)

1. Inspect the fan for cracks, nicks, or broken blades. If fan blades are cracked or broken, replace the fan.  
**Note:** If the fan blade is nicked, use a metal file and carefully smooth out the affected area.
2. Inspect the keyway on the inside diameter of the fan for damage. If damage is evident, replace the fan.
3. Inspect the starter drum for damage, cracks, nicks, and imperfections in the casting. Smooth out nicked areas with a metal file. If damaged or cracked, the starter drum is to be replaced.

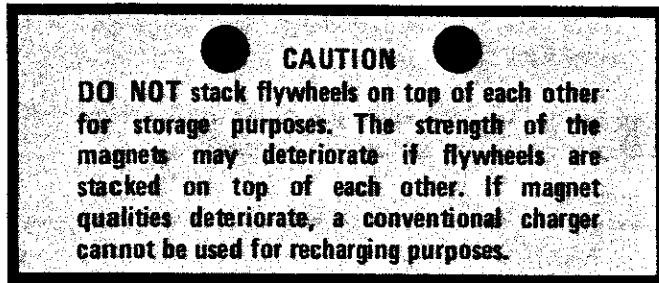
## Check Magnet Strength (Flywheel)

### Equipment Necessary: Screwdriver

1. Set the fan with flywheel on a wooden surface so that the magnets face upward.
2. Hold a screwdriver on the extreme end of the handle with the blade end pointing down toward the center of the flywheel.

# ENGINE SERVICING (INSPECTING)

3. Slowly lower the blade end of the screwdriver toward the center of the flywheel. When blade gets close to the magnet force, the blade is to attract against a magnet with considerable force. If attraction is not evident or very weak, the flywheel is to be replaced.



## Inspect Mainshaft

### Equipment Necessary: No Special Tools Required

1. Inspect the keyway and examine the external and internal threads for wear, scoring, or damaged threads. Replace as conditions dictate.
2. Inspect the graduated tapers for scratches, wear, or scoring. Replace as conditions dictate.
3. Inspect the mainshaft eccentric for scratches, wear, or scoring. Replace as conditions dictate.

## Inspect Rotor

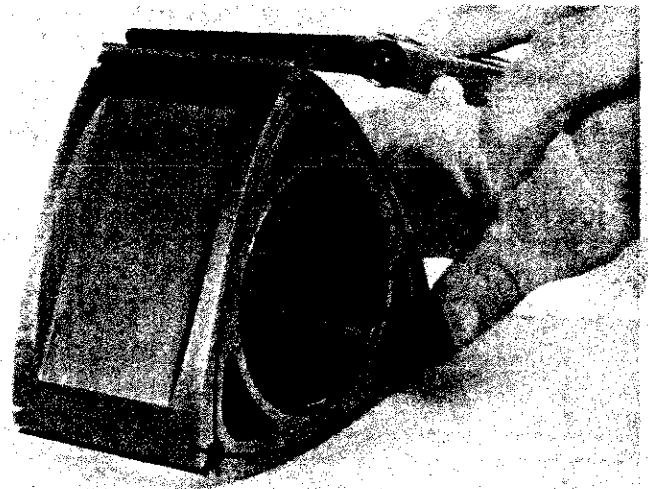
### Equipment Necessary: Feeler Gauge

1. Inspect the rotor for cracks, chips and deep scratches. If these conditions exist, replace the rotor.
2. Check the rotor ring gear for cracks and damaged teeth. If damaged teeth or cracks are evident, the rotor is to be replaced. Ring gears cannot be replaced individually. If the rotor is replaced, the pinion gear (PTO end cover) must also be replaced. If one component is replaced and not the other, accelerated gear wearing of the new component will occur. This in itself will negate the replacement of the component.
3. Check the apex seal grooves for pitted edges and raised metal surfaces. If excessively damaged, replace the rotor.

4. Insert apex seals into the rotor and check the apex seal side play, using a feeler gauge. Maximum permissible apex seal side play is 0.0098 inch.

**Note:** As the engine is used, the apex seal grooves in the rotor become increasingly conical shaped. Because this condition exists, the feeler gauge is not to be inserted more than 0.078 inch into the apex seal groove when measuring side play.

Fig. II-36

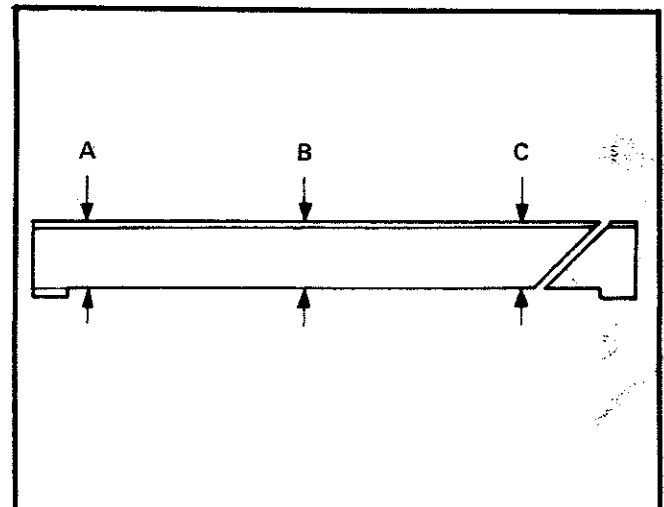


## Inspect Apex Seals, Sealing Pins and Side Seals

### Equipment Necessary: 1-Inch Micrometer

1. Using new or decarbonized apex seals, measure the seals at positions A, B and C, using a micrometer, Fig. II-37. Measurement is to range from 0.2793 - 0.2953 inch. If measure-

Fig. II-37



# ENGINE SERVICING (INSPECTING)

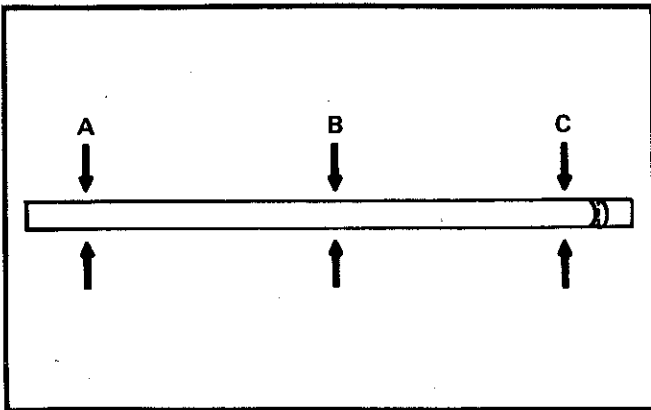
ment is not within tolerance, replace the apex seal. If there is more than 0.0079 inch deviance between positions A, B and C, replace the apex seal.

**Note:** All apex seals are to be replaced even if only one seal is not within tolerance.

2. Measure the thickness of the apex seal at positions A, B and C, Fig. II-38. Measurement is to range from 0.1173 - 0.1181 inch. If measurement is not within tolerance, replace the apex seal. If there is more than 0.00079 inch deviance between positions A, B and C, replace the apex seal.

**Note:** All apex seals are to be replaced even if only 1 seal is not within tolerance.

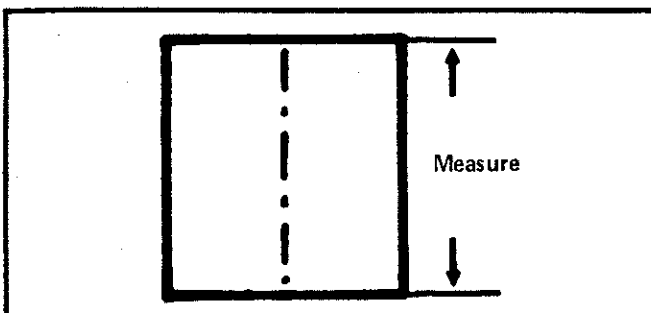
Fig. II-38



3. Measure the length of the sealing pins, using a micrometer, Fig. II-39. Measurement is to range from 0.2086 - 0.2204 inch. Replace the sealing pin if not within tolerance. If the measurement between any 2 seals deviates by more than 0.00196 inch, the sealing pin is to be replaced.

**Note:** All sealing pins are to be replaced even if only 1 seal is not within tolerance.

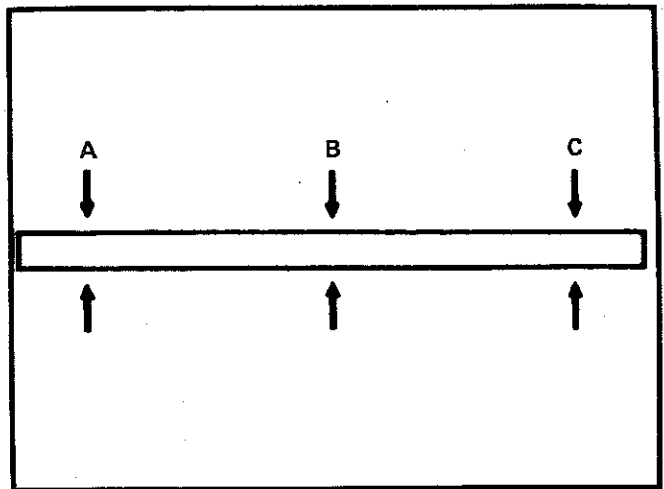
Fig. II-39



4. Measure the depth of the side seals at positions A, B and C, using a micrometer, Fig. II-40. Measurement is to range from 0.0865 - 0.0945 inch. Replace side seal if not within tolerance. The extreme ends of the side seals (A and C) cannot be worn more than 0.0039 inch as compared with the center (B) of the side seal. If this condition exists, replace the side seal.

**Note:** All side seals are to be replaced even if only 1 seal is not within tolerance.

Fig. II-40



## Inspect Rotor Sealing Component Springs

**Equipment Necessary:** No Special Tools Required

1. Check the apex seal springs, side seal springs and the sealing pin springs for compression characteristics. If condition of a spring is doubtful, replacement is necessary.

**Note:** All related component springs are to be replaced even if only 1 spring is not within tolerance. For example — if 1 apex seal spring is to be replaced, replace all apex seal springs. The same holds true for side seal springs and sealing pin springs.

# ENGINE SERVICING (ASSEMBLY)

## Install Bearing and Pinion (Magnet End Cover)

**Equipment Necessary:** Two 2 x 4 Wooden Blocks, Clean Rags, Four M6 x 70 Bolts, 5 mm Allen Wrench, Locktite 40 and Torque Wrench

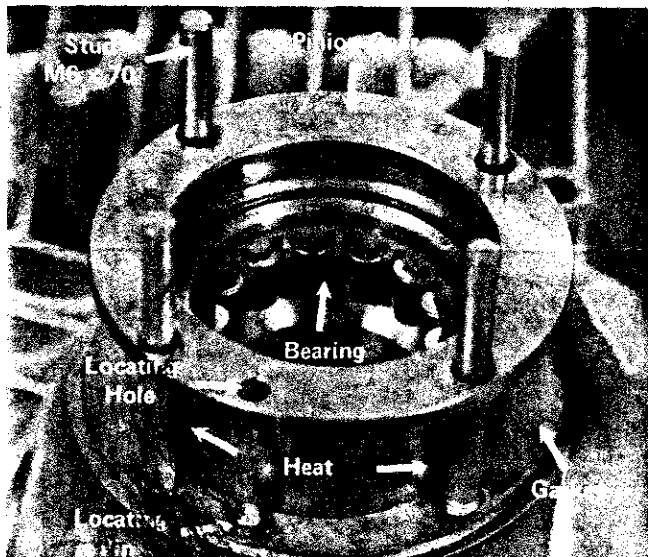
**Note:** If the gear teeth inside the rotor are damaged, which constitutes replacement, the pinion gear must also be replaced. Likewise, if the pinion gear is damaged, which constitutes replacement, the rotor must also be replaced.

1. Position the pinion gear with the gear resting on the working surface. Heat the bearing race contact area of the pinion gear to +266°F, and press the bearing into the pinion gear, Fig. II-41. Allow the pinion gear with bearing to cool.

**Note:** Ensure that the bearing race is fully seated against the bearing seat stop in the pinion gear.

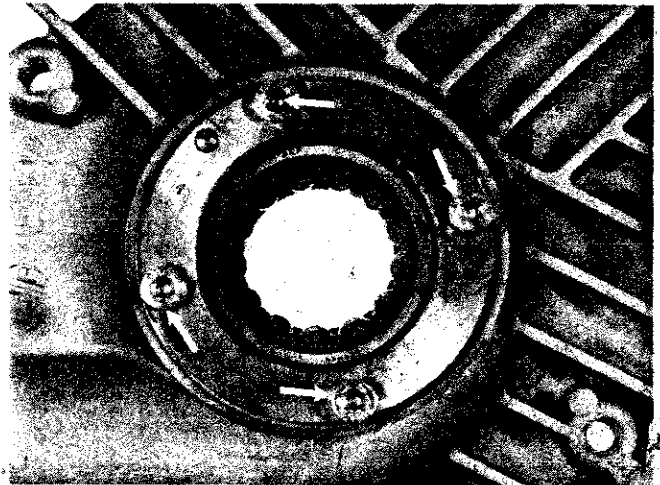
2. Set the Magneto end cover on rag-covered wooden blocks with the rotor sliding surface against the rags. Place paper gasket on the end cover, making sure that the gasket holes line up with those in the end cover, Fig. II-41.
3. Position the pinion gear in the end cover, making sure that the pinion gear locating hole and the end cover locating pin line up, Fig. II-42.
4. Center the pinion gear in relation to the mounting holes, using four M6 x 70 bolts or studs, Fig. II-41.

Fig. II-41



5. Press the pinion gear into the end cover and remove the four M6 x 70 bolts or studs that were used for centering purposes.
6. Secure the pinion gear to the end cover with 4 Allen head bolts, Fig. II-42, using a 5 mm Allen wrench. Tighten bolts to 6 ft. lbs. torque, using a torque wrench. Locktite 40 can be used on the bolt threads.

Fig. II-42



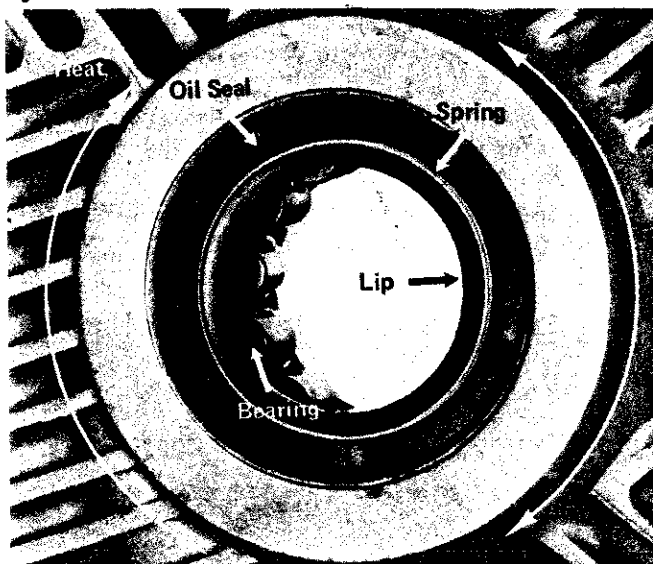
## Install Bearing and Seal (PTO End Cover)

**Equipment Necessary:** Locktite 40, High-Temperature Grease (Bosch Ft1v4 or Ft1v8)

1. Heat the end cover bearing area (opposite side of rotor sliding surface) to +300°F, Fig. II-43.
  2. Lightly coat the outside surface of the bearing race with Locktite 40 and press the bearing into the end cover from the rotor sliding surface side, Fig. II-43.
- Note:** Ensure the bearing race seats against the bearing stop in the end cover.
3. Lightly coat the outer diameter surface of the oil seal with Locktite 40 and press the seal into the end cover from the outside. Oil spring to face outward, Fig. II-43.
  4. Apply high-temperature grease (Bosch Ft1v4 or Ft1v8) on the sealing lip of the oil seal, Fig. II-43.
  5. Set the end cover aside where it will not be damaged.

# ENGINE SERVICING (ASSEMBLY)

Fig. II-43



## Install Mainshaft and Check End Play

**Equipment Necessary:** Oil, Snap Ring Pliers and Feeler Gauge

1. Lubricate the Magneto end cover bearing with oil.
2. Slide the mainshaft threaded end through the end cover starting from the inside (rotor sliding surface).
3. Heat the spacer thrust ring(s) in hot oil. Slide spacer thrust ring(s), Fig. II-44, on the mainshaft and press into position. Ensure the spacer thrust ring(s) fully seat against the stop seat on the mainshaft, Fig. II-44.

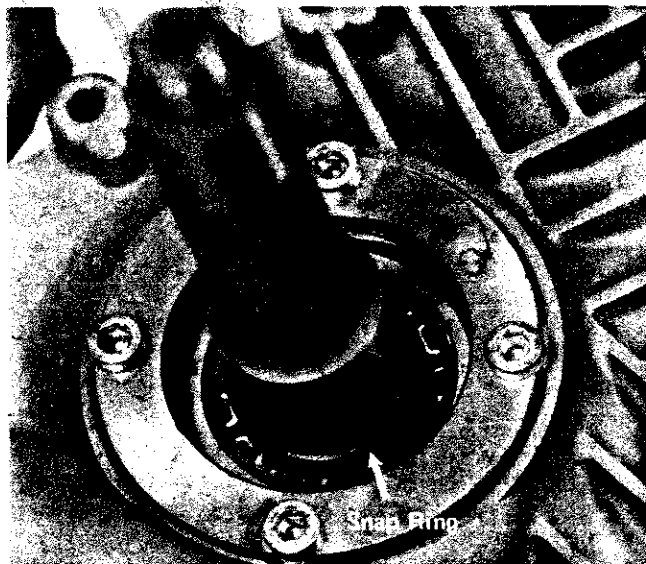
Fig. II-44



**Note:** If shims were removed during disassembly, same quantity must always be installed during assembly. These shims are necessary to maintain correct mainshaft end play.

4. Secure mainshaft in the end cover with the snap ring, using a snap ring pliers, Fig. II-45.

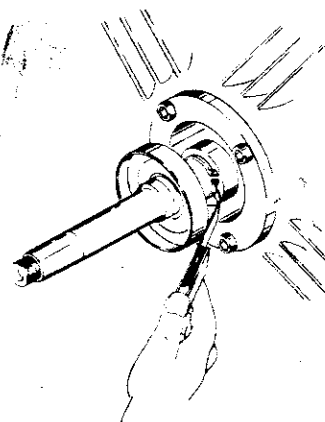
Fig. II-45



5. Insert a feeler gauge or wire gauge to the inside of the snap ring, Fig. II-46. Measurement is to be from 0.000 - 0.001 inch. Shim as required to obtain the correct measurement.

**Note:** It may be necessary to bend the feeler gauge or wire gauge at the end to gain access between the snap ring and shim(s) for checking end play.

Fig. II-46

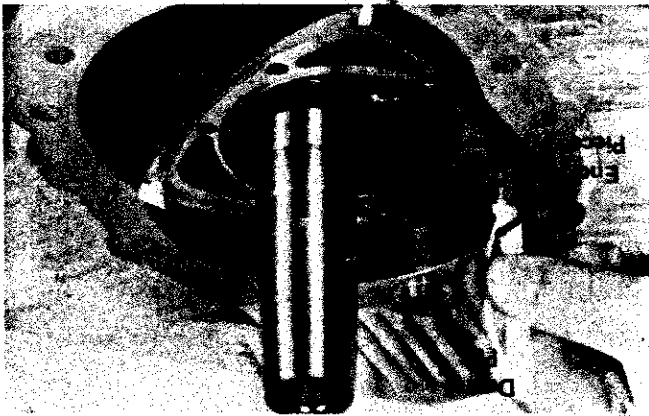


6. Apply high-temperature grease (Bosch Ft1v4 or Ft1v8) on the sealing lip of the oil seal.

# ENGINE SERVICING (ASSEMBLY)

7. Place the apex seal with spring on the apex seal end piece and slowly push all components down the groove, Fig. 11-50. Install remaining apex seal end pieces, apex seal springs and apex seals in the same manner.

Fig. 11-50



Install PTO End Cover and Counterweights

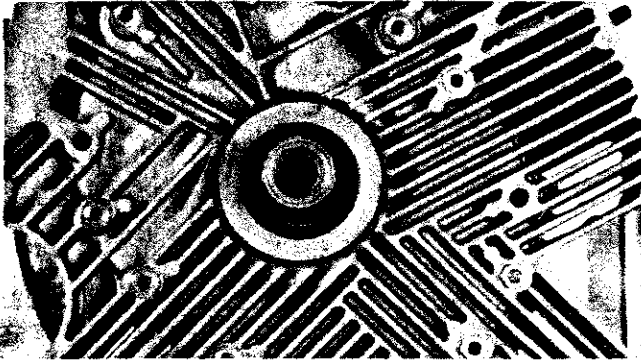
Equipment Necessary: Oil, Mounting Sleeve, 10 mm Socket, 11 mm Wrench and Torque Wrench

1. Lubricate the PTO end cover sliding surface and bearing with oil.

2. Place the mounting sleeve on the mainshaft and slide the PTO end cover over the mainshaft. Ensure the PTO end cover slides onto the rotor housing dowel pins, Fig. 11-50, and is firmly sealed around the rotor housing sealing surface.

3. Secure the PTO end cover, rotor housing and Magneto end cover together with 10 bolts, flat washers and nuts, using a 10 mm socket and wrench, Fig. 11-51. Tighten the nuts to 5.8 - 8.0 ft. lbs. torque, using a torque wrench.

Fig. 11-51



Install Rotor in Rotor Housing  
Equipment Necessary: High-Temperature Grease (Bosch Ft1v4 or Ft1v8)  
1. Carefully slide the rotor (gear side down) onto the mainshaft and pinion gear.

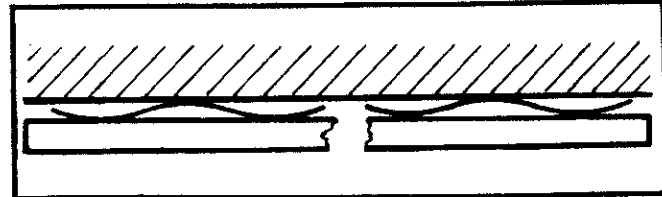


Fig. 11-49

Make sure that sealing components do not accidentally fall out of the rotor when installing rotor in rotor housing. Damage to the end covers) and/or rotor housing will occur if components were allowed to fall out of the rotor and complete engine assembly performed.

CAUTION

2. Insert high-temperature grease (Bosch Ft1v4 or Ft1v8) into the sealing pin bores and side seal grooves.

3. Insert 2 sealing pin springs into each sealing pin bore. Perform this step on all sealing components.

Note: Sealing pin springs must have the convex sides touching to ensure maximum spring compression. Open end of the sealing pin springs must line up with the apex seal groove.

4. Insert the sealing pin into the sealing pin bore. Line up sealing pin by running an apex seal through the groove. Perform this step on all sealing components.

5. Install the side seal springs into the grooves; spring ends are to point toward the rotor. Install side seals in grooves, Fig. 11-49. Perform this step on sealing components.

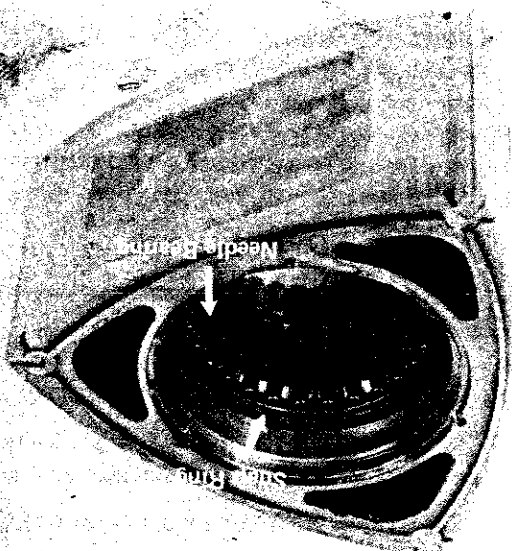
6. Lubricate the apex seal end piece with high-temperature grease (Bosch Ft1v4 or Ft1v8) and slide the end piece into the apex seal groove.

# ENGINE SERVICING (ASSEMBLY)

8. Secure the needle bearing in the rotor with a snap ring, using a snap ring pliers, Fig. 11-48. Lubricate the needle bearing with oil.

**Note:** Snap rings must be seated in the rotor grooves to properly retain the needle bearing in place.

Fig. 11-48



9. Place the rotor on a clean rag with the gear side facing up.

10. Insert high-temperature grease (Bosch Ft1v4 or Ft1v8) in the sealing pin bores and the side seal grooves.

11. Insert the 2 sealing pin springs into each sealing pin bore. Perform this step on remaining sealing components on gear side of rotor.

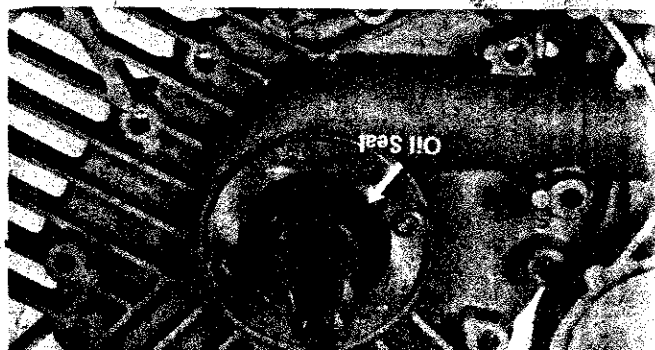
**Note:** Sealing pin springs must have the convex sides touch each other to ensure maximum spring compression. Open end of the sealing pin springs must line up with apex seal groove.

12. Insert the sealing pin into the sealing pin bore. Line up sealing pin by running an apex seal through the groove. Perform this step on remaining sealing components on gear side of rotor.

13. Install the side seal springs into the groove. Spring ends are to point toward the rotor. Install side seal in grooves, Fig. 11-49.

7. Lightly coat the outer diameter surface of the oil seal with Locktite 40 and press the seal into the end cover from the outside, Fig. 11-47. The oil seal spring is to face outward.

Fig. 11-47



1. Place 2 dowel pins in the Magneto end cover. Lubricate the Magneto end cover sliding surface with oil.

2. Lubricate the rotor housing sliding surface with oil and place on the Magneto end cover. Ensure that the dowel pins in the Magneto end cover fully seat in the locating holes of the rotor housing.

3. Place 2 dowel pins in the rotor housing locating holes.

4. Slide the unassembled rotor onto the mainshaft and pinion gear. Observe the position of the rotor so that when seals are installed on the gear side of the rotor, the rotor can be placed into the rotor housing without unnecessary movement. This prevents the sealing components from accidentally falling out of the rotor.

5. Remove the rotor from the rotor housing.
6. Install a snap ring in the groove nearest the rotor gear, using a snap ring pliers.

7. Slide the needle bearing into the rotor. The marks made on the needle bearing (if reused) and rotor are to be lined up so that the needle bearing is installed in the same place as prior to disassembly.

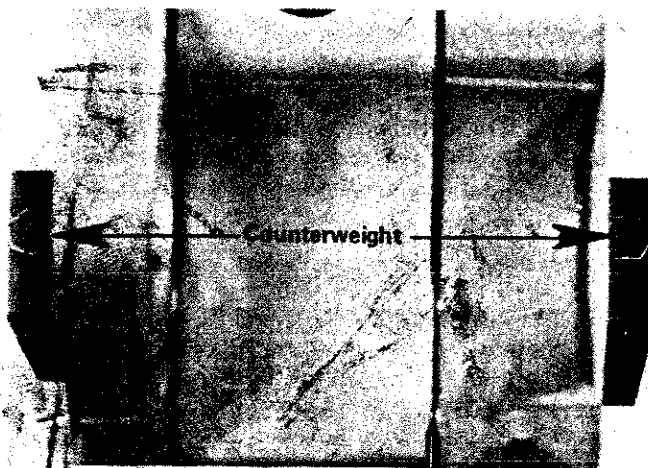


# ENGINE SERVICING (ASSEMBLY)

**Note:** Each bolt is to be equipped with 2 flat washers; one under the bolt head and the other between the PTO end cover and nut. When tightening the nuts, use a crisscross pattern and tighten the nuts in three graduated torque increments.

4. Remove the mounting sleeve from the mainshaft.
5. Clean Locktite deposits from counterweight bolts and inner threads of the counterweights with lacquer thinner. Apply Locktite TL 270 on the bolt threads.
6. Thread bolts into counterweights. Slide a counterweight, Fig. II-52, onto each end of the mainshaft and align bolt with the balancing detent in the mainshaft. Tighten the counterweight bolt to 21.7 ft. lbs. torque, using a 13 mm socket and torque wrench.

Fig. II-52



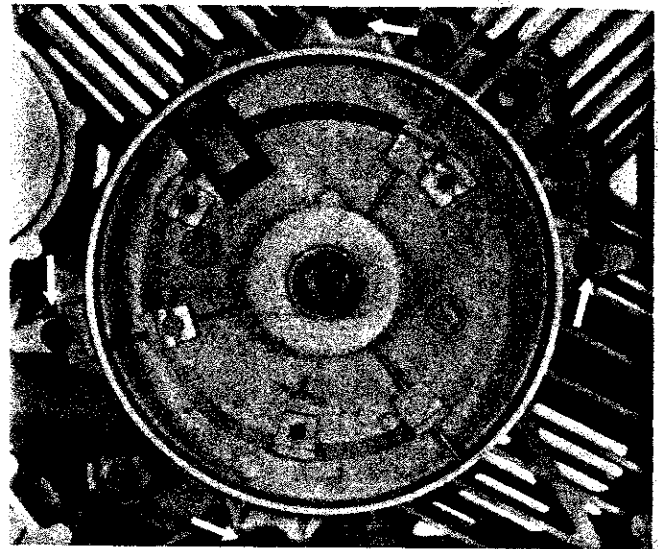
## Install Magneto and Fan Assembly

**Equipment Necessary:** 5 mm Allen Wrench, 10 mm Socket, Torque Wrench, 15/16-Inch Wrench and Locktite TL 270

1. Position the magneto plate in place on the Magneto end cover mounting studs. Secure magneto plate, Fig. II-53, in place with 4 bolts, flat washers and nuts, using a 5 mm Allen wrench, 10 mm socket and torque wrench, Fig. II-53. Tighten the nuts to 5.8 - 8.0 ft. lbs. torque.

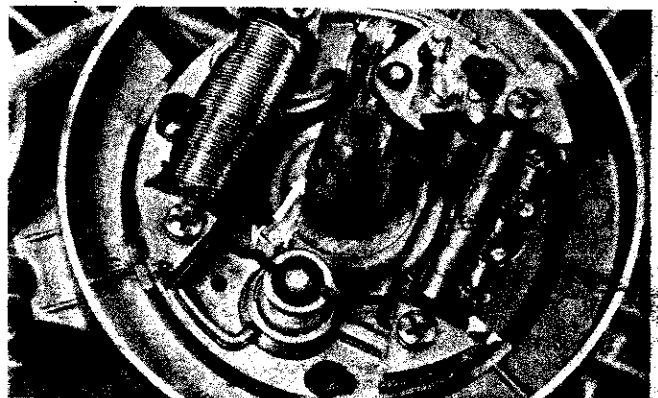
**Note:** If electrical components were not removed from the magneto plate, install the complete magneto assembly.

Fig. II-53



2. Insert the woodruff key into the keyway in the mainshaft, Fig. II-54.

Fig. II-54

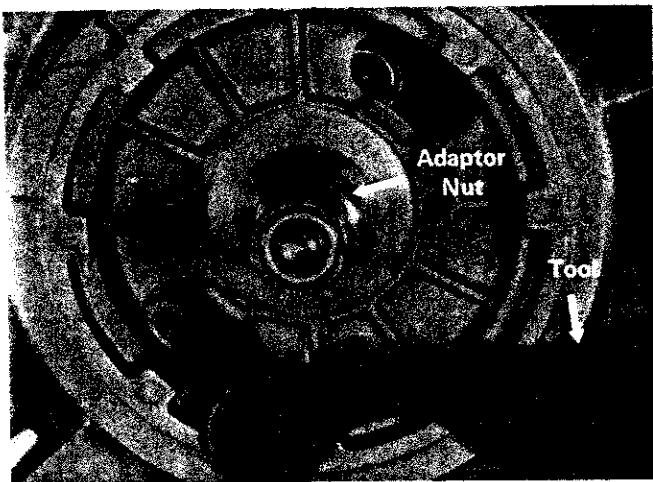


3. Slide the fan assembly onto the mainshaft, making sure that the woodruff key seats into the keyway in the fan.
4. Place the PTO end counterweight into a vise and tighten securely to hold engine in place and to prevent the mainshaft from rotating. Secure the fan assembly to the mainshaft with the mainshaft adaptor nut, using a 15/16-inch wrench, Fig. II-55. Tighten the adaptor nut to approximately 57.8 ft. lbs. torque, using an end wrench. Torque wrench cannot be used for tightening due to the adaptor nut configuration. Holding tool in Fig. II-55 is not necessary.

**Note:** Internal threads of the adaptor nut can be lightly coated with Locktite TL 270.

# ENGINE SERVICING (ASSEMBLY)

Fig. II-55

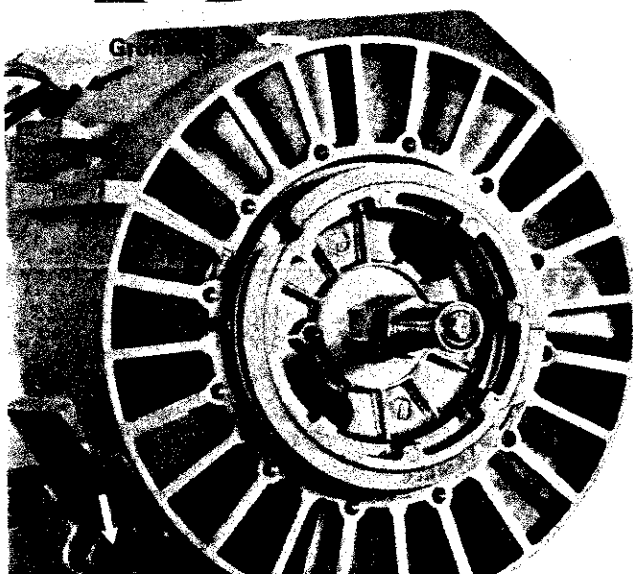


## Install Fan Housing

**Equipment Necessary:** 5 mm Allen Wrench and Torque Wrench

1. Insert and seat 2 dowel pins in the top and exhaust side mounting holes of the magneto end cover.
2. Slide the fan housing into position and insert the rubber grommet into the cut-out in the fan housing. Curved end of grommet to be inserted into the fan housing, Fig. II-56.
3. Secure the fan housing to the end cover with 3 Allen head screws, using a 5 mm Allen wrench, Fig. II-55. Tighten the screws to 5.5 ft. lbs. torque, using a torque wrench.

Fig. II-56



**Note:** Use the shortest allen head screw to secure the fan housing nearest the intake of the engine.

## Install External Components

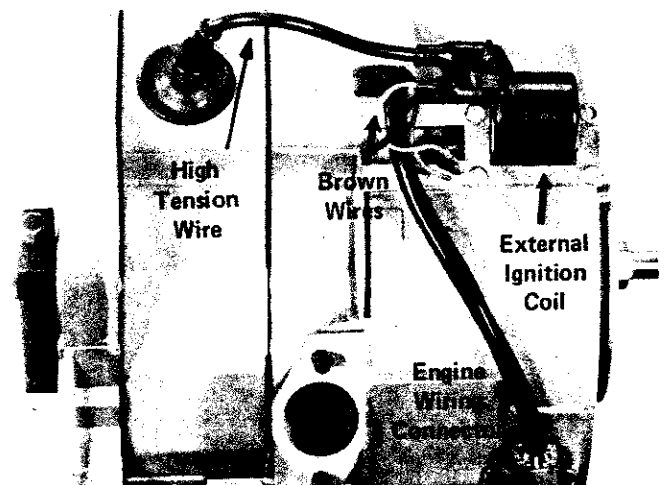
**Equipment Necessary:** 11/16-Inch Socket, 11/16-Inch Wrench, Torque Wrench, Screwdriver, 13/16-Inch Spark Plug Socket, 13 mm Wrench, 7/16-Inch Socket and 7/16-Inch Wrench

1. Install the engine plate to the engine with 4 bolts and lockwashers, using a 11/16-inch socket and wrench. Tighten the bolts to 30 ft. lbs. torque, using a torque wrench.
2. Secure the engine wiring connector to the fan housing with 2 screws, using a screwdriver. The short ground wire extending from the wiring connector is to be grounded to the outside screw, Fig. II-57.
3. Install the external ignition coil to the fan housing with 3 screws and lockwashers, using a screwdriver, Fig. II-57.

**Note:** The 2 brown wires (one from external coil and one from engine wiring harness) are to be grounded to the bottom left screw that secures the external coil to the fan housing, Fig. II-57.

4. Install the spark plug, using a 13/16-inch spark plug socket, and tighten to 16 - 18 ft. lbs. torque. Connect the high tension wire to the spark plug. Connect the 2 blue wires to the secondary terminal on the external ignition coil, Fig. II-57.

Fig. II-57



# ENGINE SERVICING (ASSEMBLY)

5. Secure the exhaust pipe and gasket to the exhaust manifold with the 2 nuts and flat washers, using a 13 mm wrench. Tighten nuts to 9.4 - 11.5 ft. lbs. torque, using a torque wrench.
6. Slide the muffler partially onto the exhaust pipe, position the tailpipe clamp around the tailpipe and secure to the muffler backing bracket with 2 bolts, using a 1/2-inch wrench.
7. Slide the asbestos muffler strip between the muffler and backing bracket. When asbestos strip is in position, slide the muffler strap over the muffler backing bracket and tighten the capscrew and locknut, using a 7/16-inch socket and wrench.
8. Secure the carburetor with elbow, gaskets and insulator block to the intake manifold, using 1/2-inch open end wrench. Tighten to 9.4 - 11.5 ft. lbs. torque, using a torque wrench.

## CAUTION

Nuts that secure carburetor to the intake manifold must be tight to ensure a good seal between the components. If not tight, sucking of air will occur, resulting in hard starting characteristics and a lean condition while operating; severe engine damage may occur.

# ENGINE INSTALLATION

## Install Engine in Snowmobile

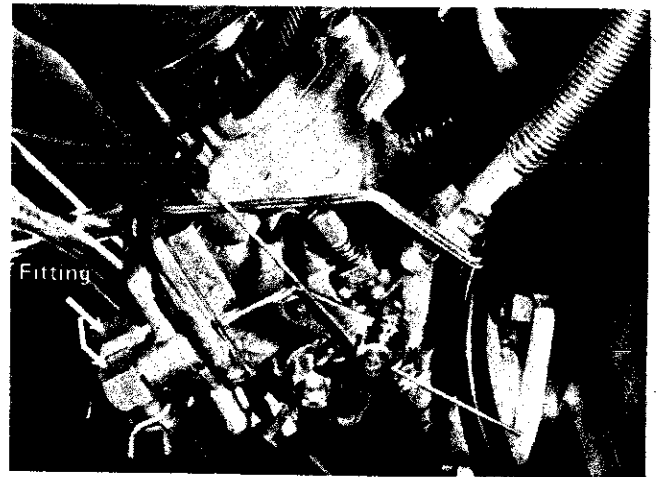
**Equipment Necessary:** Two 9/16-Inch Wrenches, Pliers, Cardboard, 9/16-Inch Socket, 8-Inch Extension, Torque Wrench, Phillips Screwdriver and 1/2-Inch Wrench

1. Set the 2 solid aluminum front mounts on the front end assembly.
2. Carefully place the engine on the front end assembly and aluminum mounts. Slowly move the engine rearward to allow the rear motor mounts to push through the holes in the curved section of the belly pan.
3. Secure the engine plate and solid aluminum mounts to the front end assembly with 2 capscrews, flat washers and locknuts, using two 9/16-inch wrenches.

**Note:** The locknut and flat washer are to be positioned on top of the engine plate for proper installation.

4. Push the vapor return line onto the carburetor vapor return fitting (inside fitting), Fig. 11-58.
5. Push the fuel line onto the carburetor fuel inlet fitting (outside fitting), Fig. 11-58, and secure in place with the clamp, using a pliers.

Fig. 11-58



6. Install the recoil starter and fuel pump (see Install Recoil Starter, steps 1 and 2, page 11-35).
7. Plug the ignition connector into the engine connector block.
8. Install the drive clutch (see Section V — Drive System, Install Drive Clutch).
9. Install the intake hose, throttle and choke wires (see Section III — Fuel System, Install Carburetor, steps 2 - 5).