SECTION 5 - ENGINE MECHANICAL

MERCURY
SNOWMOBILES

PART B - 200 HIRTH

MERCURY
MARINE

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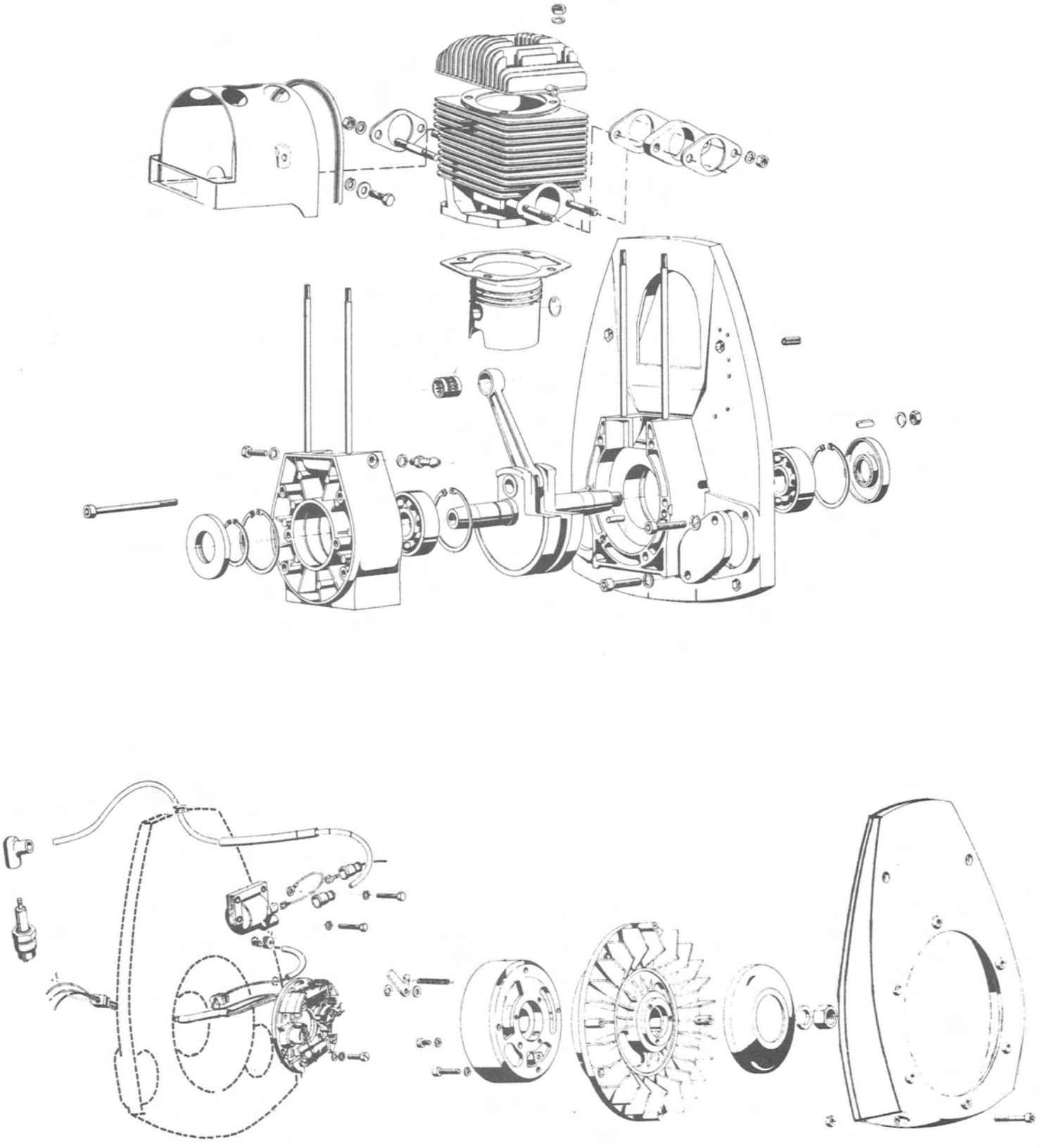

Figure 1. Model 200 Hirth Engine - Exploded View

GENERAL

If major engine repairs are to be completed with engine removed from vehicle, an engine mounting bracket can be made from angle iron with holes and dimensions as shown in Figure 2. (Figure 3)

Some Kiekhaefer Mercury tools, as listed, require modification; however, the tool still will perform its original function.

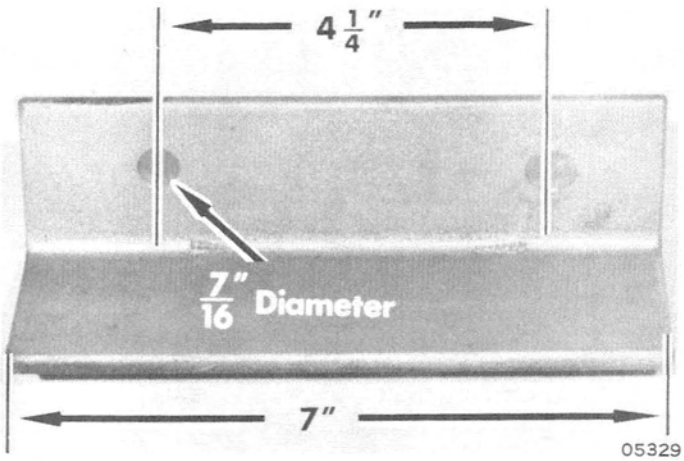

Figure 2. Engine Mounting Bracket

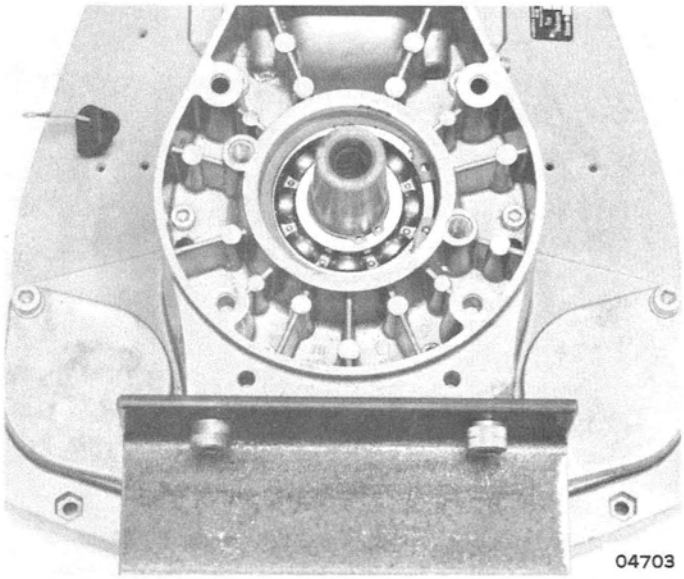

Figure 3. Engine Mounting Bracket Installed

All nuts, bolts and allen screws are metric calibrated, hence, some metric tools are needed.

ENGINE REMOVAL and INSTALLATION - COMPLETE REMOVAL

1. Remove top cowl and dash assembly.
2. Remove clutch shroud and drive belt.
3. Remove exhaust pipe at cylinder and move aside.
4. Remove throttle cable and fuel line at carburetor.
5. Disconnect 3 magneto leads from terminal block. Remove terminal block and move aside with wires connected.
6. Disconnect ground lead and harness clamp from blower housing.
7. Remove 4 engine mount nuts, which secure engine mount plate to engine mount rails, and lift out engine.

INSTALLATION

1. Position engine on mounting rails and secure with 4 attaching nuts.
2. Install terminal block and connect wires.
3. Connect ground lead and harness clamp to blower housing.
4. Connect throttle cable and fuel line.
5. Install exhaust pipe.
6. Install drive belt and clutch shroud.
7. Install dash assembly and top cowl.

CYLINDER HEAD and SLEEVE

1. Disconnect spark plug wire.
2. Remove 2 screws and pull up to remove engine shroud.
3. Remove 4 nuts and lift cylinder head off.
4. Remove head gasket.
5. Disconnect exhaust pipe at cylinder.
6. Remove carburetor.
7. Pull cylinder off studs and remove cylinder gasket.

INSTALLATION

1. Clean gasket surfaces, cylinder head and sleeve fin area.
2. Support piston with 2 pieces of wood. (Figure 1) Slide cylinder onto studs with new base gasket.
3. Compress piston rings with a suitable compressor or guide them carefully into cylinder bore.
4. Slide piston into cylinder and remove ring compressor (if used).
5. Remove pieces of wood and push cylinder into piston.
6. Place cylinder head and gasket into position and secure with attaching nuts. Torque to specifications.
7. Connect spark plug wire.

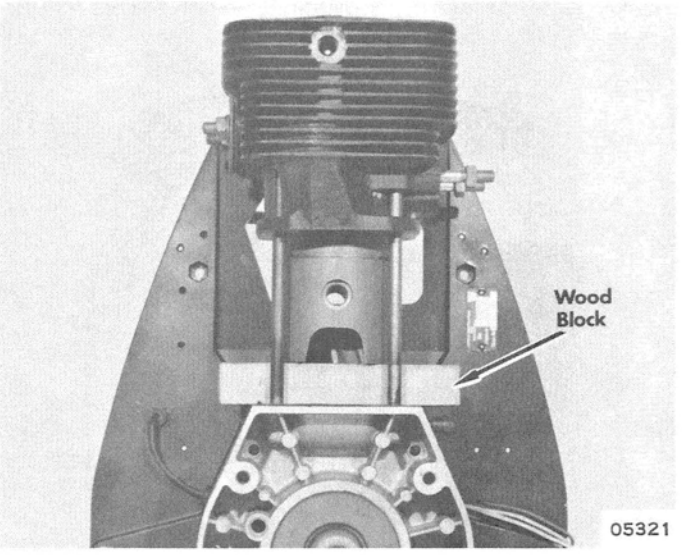

Figure 1. Cylinder Installation

CYLINDER SLEEVE REPAIRS

Repairs to cylinder sleeve depend upon amount of wear present. If inspection revealed that cylinder was slightly worn, honing may clean up the cylinder. If not, cylinder should be bored to next smallest oversize diameter that will resurface the cylinder.

HONING

1. Follow the hone manufacturer's recommendations for use of hone, cleaning and lubrication during honing.
2. Occasionally, during honing operation, cylinder bore should be thoroughly cleaned and piston selected for individual cylinder, then checked for correct fit.
3. When finish-honing a cylinder bore, move up-and-down at sufficient speed to obtain very fine uniform surface finish marks in a cross-hatch pattern of approximately 45° to 65° included angle. Finish marks should be clean but not sharp, free from imbedded particles and torn or folded metal. (Figure 2)
4. Thoroughly clean cylinder bores with hot water and detergent. Scrub well with stiff bristle brush and rinse thoroughly with hot water. A good cleaning operation must be performed. If any abrasive material is allowed to remain in cylinder bores, it will rapidly wear new rings and cylinders. Also, bearings will wear if lubricated by contaminated oil. Bore should be swabbed several times with light engine oil and clean cloth, then wiped with a clean, dry cloth. Cylinders should not be cleaned with kerosene or gasoline.

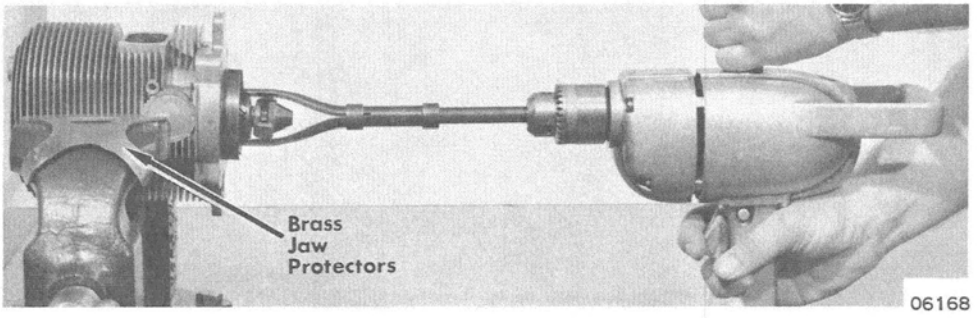

Figure 2. Honing Cylinder

INSPECTION

1. Hone cylinder to clean up any score marks or scuffs in cylinder bore.
2. Measure piston diameter with a micrometer at center of piston skirt. (Figure 3)
3. Measure cylinder sleeve diameter with an inside micrometer at approximate center of sleeve. (Figure 3)
4. Subtract piston diameter from cylinder bore diameter to determine "piston-to-bore clearance".
5. If clearance exceeds .010" after honing, replace piston with next oversize.

CYLINDER BORING

1. Instructions furnished by manufacturer of boring equipment should be followed carefully.

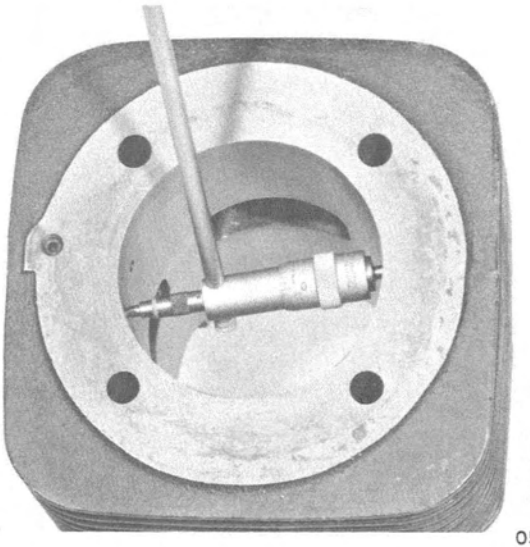

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Figure 3. Measuring Cylinder Sleeve

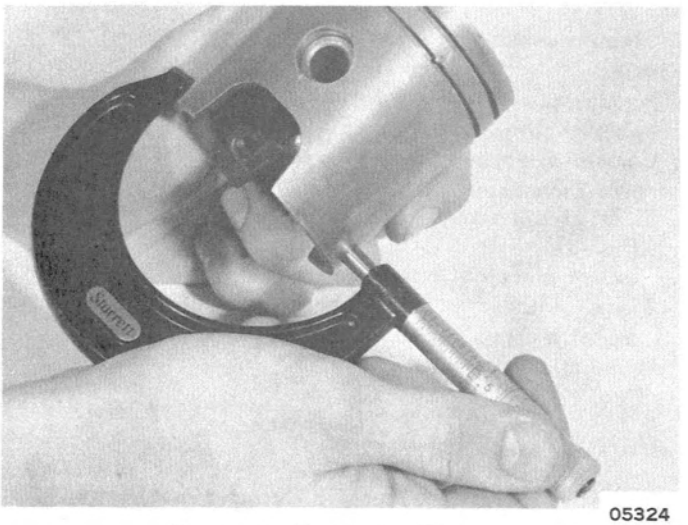

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Figure 4. Measuring Piston

2. Pistons are available in .020" and .040" oversizes. Bore and finish hone cylinder to dimension shown in Figure 4 for particular oversize desired.

Oversize Piston	Cylinder Max. Finish Hone	Oversize Piston Diameter	Skirt Clearance
.020" .040"	2.9327" (74.5mm) 2.9527" (75mm)	2.926" (74.33mm) 2.946" (74.83mm)	.0067"-.010" .0067"-.010"

PISTON ASSEMBLY

1. Remove cylinder head and sleeve.

CAUTION: Place a clean rag in crankcase to prevent foreign objects from entering during repair.

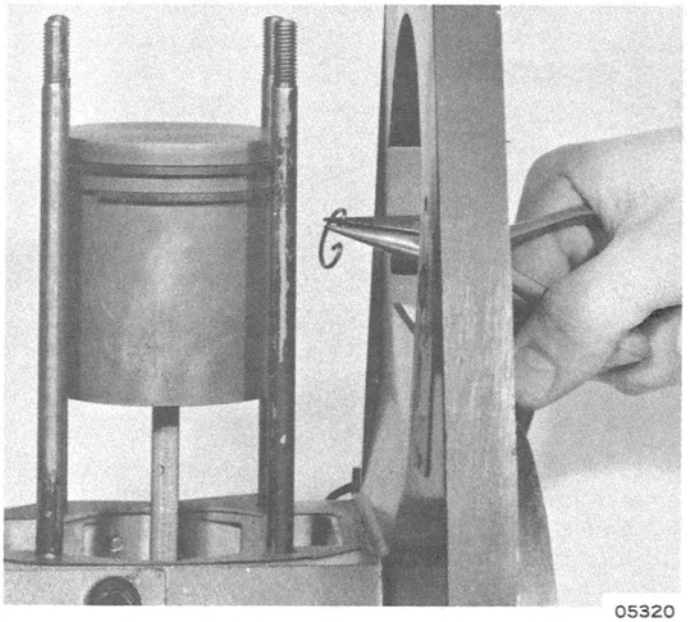

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Figure 5. Piston Pin Keeper Removal

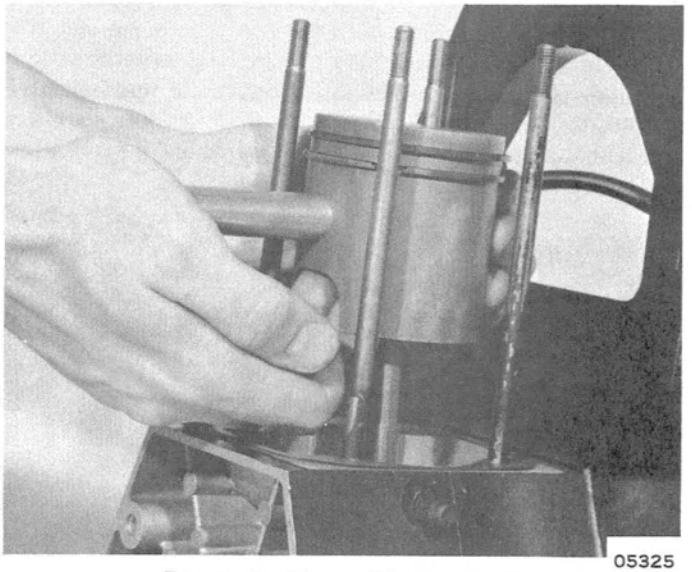

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Figure 6. Piston Pin Removal

2. Remove blower housing to permit removal of piston pin keeper lock ring on the flywheel side. (Figure 5) Remove opposite pin keeper lock ring.
3. Push out piston pin with hand pressure and Piston Pin Tool (C-91-52395). (Figure 6)
4. Remove piston pin bearing from connecting rod.

CLEANING and INSPECTION

1. If pistons have been scored or metal has been damaged, replace pistons.
2. Check piston pin bosses for cracks. Replace, if cracked or piston pins are loose (with noticeable up-and-down movement).
3. Inspect piston ring grooves for wear, burn or distortion. Piston rings are inexpensive and replacement will ensure a good repair and future operation. Pins (located in ring grooves) prevent rings from rotating.

NOTE: Before replacing piston rings, clean carbon out of ring grooves, using the recessed end of a broken piston ring. Also clean carbon from top of piston with a wire brush or wheel. Do not burr or round off machined surfaces or edges. Use 320 grit paper to clean piston skirt.

INSTALLATION

1. Install piston pin bearing in connecting rod.
2. Position piston with arrow to front of engine. (Figure 7) Push piston pin into piston and connecting rod with Piston Pin Tool (C-91-52395).

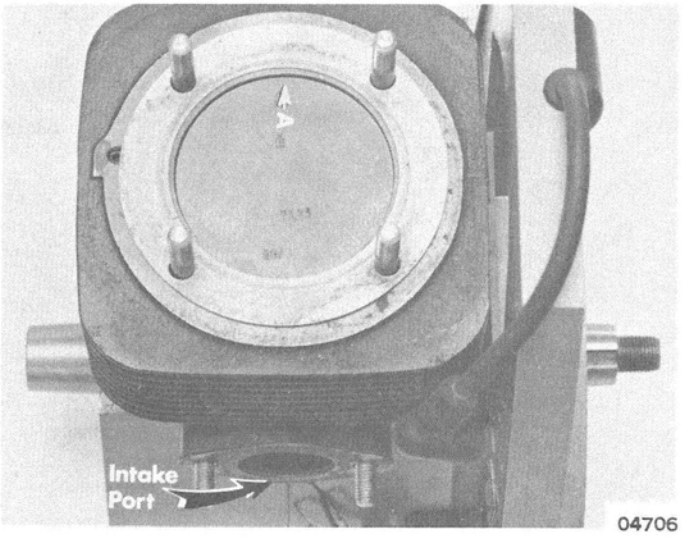

Figure 7. Piston Installation

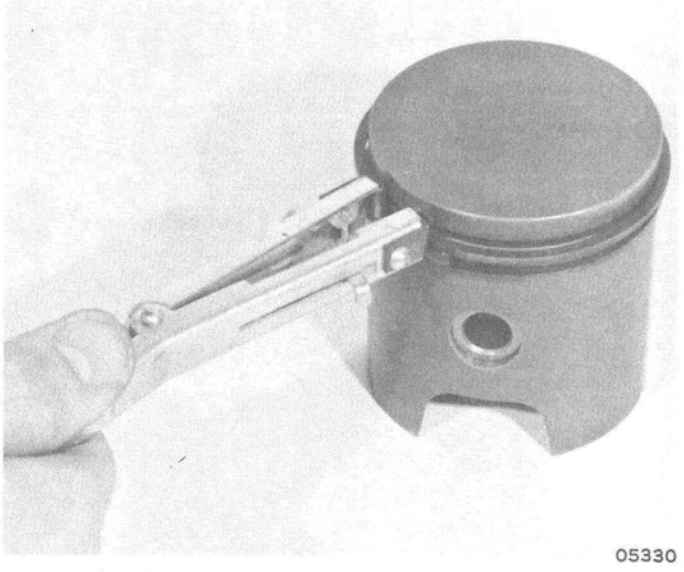

Figure 8. Piston Ring Replacement

3. Install new piston pin keeper lock rings and piston rings.
4. Install new piston rings with Tool C-91-24697. (Figure 8)
5. Install blower housing, cylinder sleeve and head.

FLYWHEEL/FAN ASSEMBLY

1. Remove starter and blower cover as an assembly by removing 4 allen screws.
2. Remove 3 allen screws from flywheel nut lockwasher and remove lockwasher, dust cover and starter cup.
3. Hold flywheel with C-91-24937 Belt Wrench. Remove flywheel retaining nut and washer.
4. To remove flywheel/fan assembly, modify Flywheel Puller (C-91-24695A2), using template in tool section. Install puller, using 3 screws (2½ x 6mm) and thread protector cap.
5. Hold flywheel/fan with belt wrench, tighten puller and remove flywheel. (Figure 1)

NOTE: Apply heat to flywheel hub while tightening pulley, if flywheel does not remove easily during above operation. Do not heat over 210° to 280°.

INSTALLATION

1. Place fan assembly on crankshaft with keyways aligned and install key in keyway.
2. Adjust point-gap and timing as outlined in "Ignition Section 3B".
3. Place flat washer and retaining nut on crankshaft and torque to specifications. Hold flywheel/fan with belt wrench.
4. Place dust cover, starter cup and flywheel nut lock-washer in position and secure with 3 allen screws.
5. Install starter rewind and blower cover assembly.

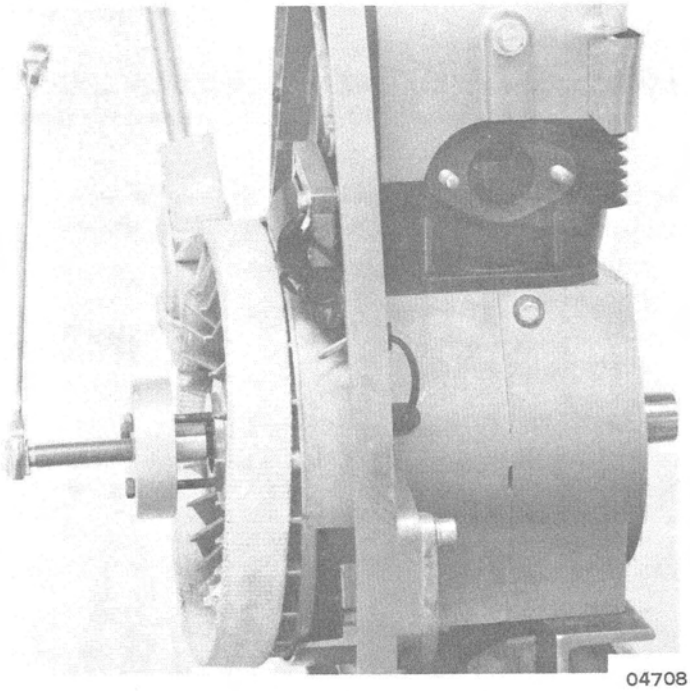

Figure 1. Flywheel Removal

CRANKSHAFT

NOTE: The crankshaft is sold as a complete assembly with connecting rod.

REMOVAL

1. Remove engine from vehicle.
2. Remove cylinder head and sleeve.
3. Remove flywheel/fan assembly.
4. Remove blue wire from breaker assembly. Push rubber grommet for blue wire thru backing plate and remove wire. Push light and shorting wire grommet thru housing.
5. Mark stator and housing to aid in assembly. Remove 3 screws from outer diameter of stator. Pull stator away from backing plate, being careful of attached wires.
6. Remove drive clutch from crankshaft.
7. Remove clutch side crankshaft seal. Do not damage bearing behind seal.

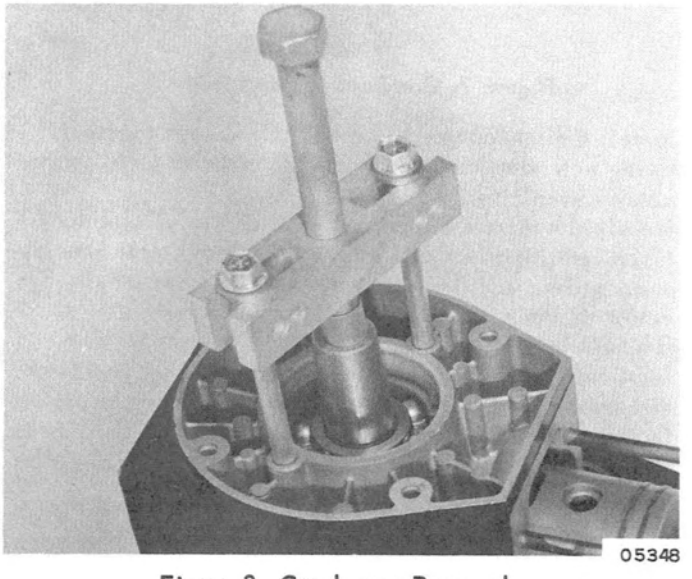

Figure 3. Crankcase Removal

8. Remove snap ring with C-91-24283 Expanding Pliers.
9. Remove 6 allen screws which hold crankcase together.
10. Install Puller C-91-45660A1 as shown in Figure 3. Operate puller and remove crankcase half.
11. To remove crank shaft from fan side of crank case, heat bearing boss with propane to 210° to 280° F. Position assembly, as shown in Figure 5, and tap lightly with soft hammer. Drive crankshaft from crankcase. Use care not to drop crankshaft.
12. Remove fan side seal with a drift pin.

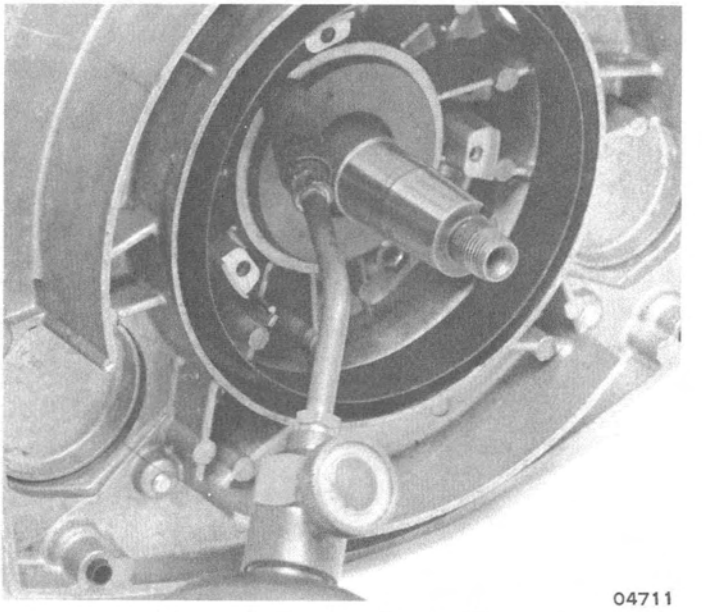

Figure 4. Heating Bearing Boss

NOTE: Crankshaft and connecting rod are sold as an assembly. Crankshaft should not be disassembled.

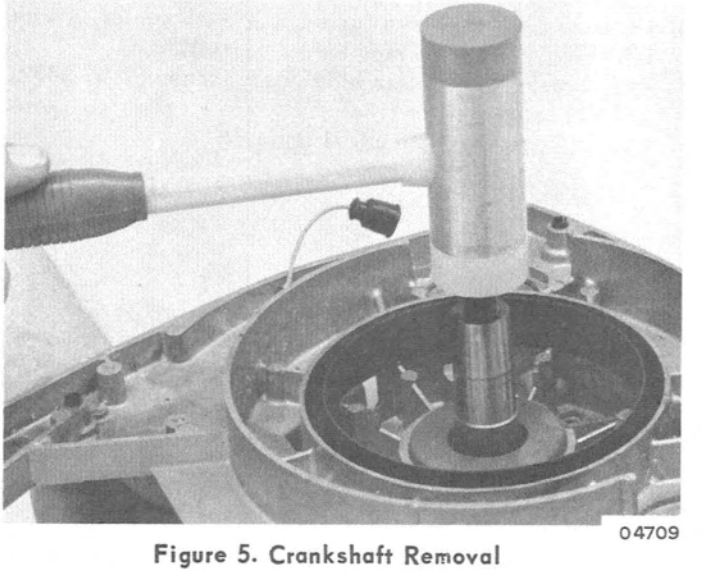

Figure 5. Crankshaft Removal

INSTALLATION

1. Check crankshaft ball bearings for wear. If replacement is necessary, see procedure, following.
2. Place clutch side of crankcase on arbor press, being sure of a good support surface.
3. Oil crankshaft, then press it into bearing until snap ring groove is exposed. (Figure 6)

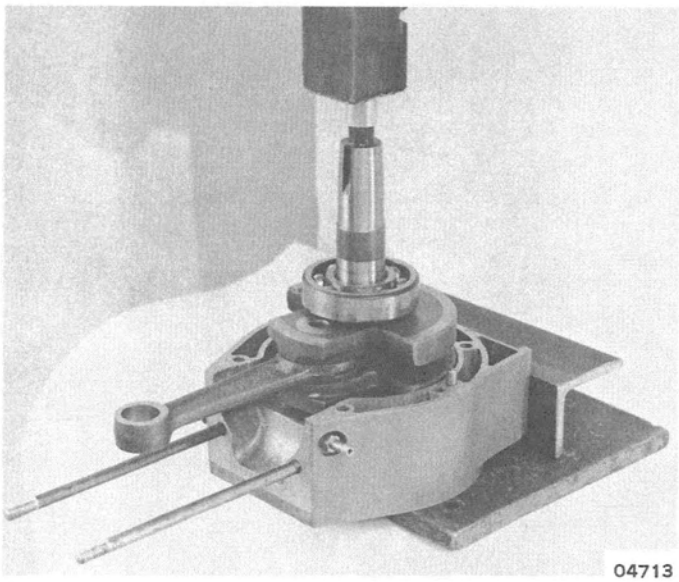

Figure 6. Crankshaft Installation

4. Install snap ring in groove.
5. Use Tool C-91-30330 to press crankshaft oil seal in crankcase. Lip of seal faces in.
6. Coat one crankcase sealing surface with sealer. Always lubricate oil seal surface before installing.
7. Heat bearing boss in fan side of crankcase (210°-280°). Quickly press onto crankshaft while aligning dowel pins in crankcase halves. (Figure 7)

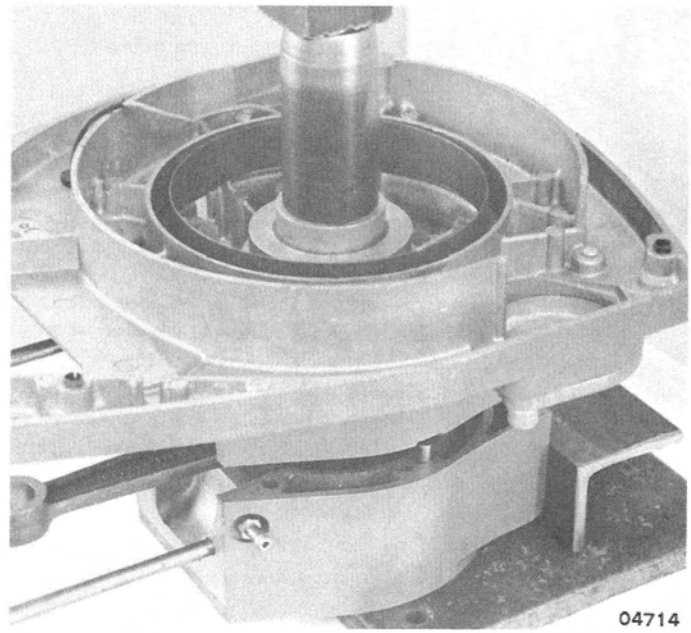

Figure 7. Crankcase Reassembly

8. Install 6 allen screws which hold crankcase together.
9. Using new aluminum sealing washer under nuts, torque screws evenly to 7 ft. lbs.
10. Install clutch side crankshaft seal and drive clutch.
11. Insert ignition wires and light wires thru blower housing and, pulling lightly, slide stator over crankshaft. Set stator in place, align marks and tighten screws.
12. Connect leads.
13. Lubricate rubber wiring grommets and install into blower housing. Be careful not to damage wire insulation.
14. Install flywheel/fan assembly.
15. Install cylinder sleeve and head.
16. Install engine in vehicle.

CRANKSHAFT BALL BEARING REPLACEMENT

CLUTCH SIDE BEARING

1. With crankshaft removed, remove snap ring from inside with Tool C-91-25081.
2. Heat housing with torch 210° to 280° and press bearing out with Tool C-91-24100.
3. Install new bearing and press in until outer bearing race touches outer snap ring. Install inner snap ring. (Figure 8)

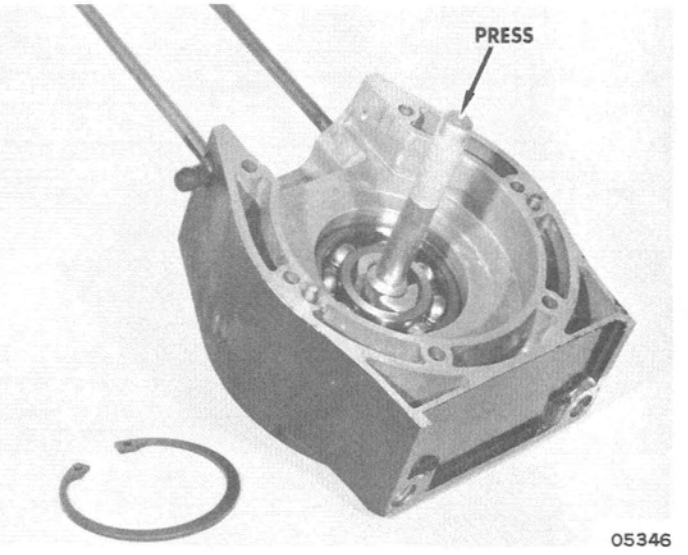

Figure 8. Clutch Side Bearing Replacement

FAN SIDE BEARING

1. To remove bearing, use puller plate (such as C-91-37241 and as shown in Figure 9).
2. Press crankshaft out of bearing.
3. When installing new bearing, use a fixture that will contact only inner bearing race but will be free on the crankshaft.

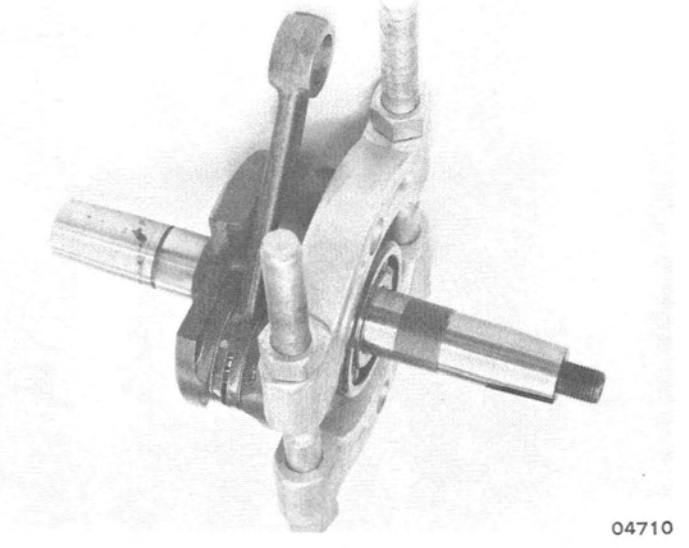

Figure 9. Fan Side Bearing Replacement