

# SACHS WANKEL

## MODELS

SACHS MOTORS CORPORATION, LTD.  
9615 Cote De Liesse  
Dorval, Quebec, Canada

## CONDENSED SERVICE DATA

Model	RC 1-18.5*	KM914B	KM24
Displacement .....	303 cc	303 cc	294 cc
	18.5 cu. in.	18.5 cu. in.	17.9 cu. in.
Horsepower @ RPM ....	19 @ 5500	19 @ 5500	23 @ 6000
Carburetor Model .....	HL	HL	HR
Spark Plug			
Bosch .....	W150M11S	W150M11S	W260T1
Champion .....	L86	L85	K7
Spark Plug Gap .....	0.019-0.020	0.018-0.020	0.020
Point Gap .....	0.014-0.018	0.014-0.018	0.014-0.018
Ignition Timing .....	10°-14°	10°-12°	20°
	BTDC	BTDC	BTDC
Fuel/Oil Mixture .....	40:1	50:1	50:1

\*Previous Curtiss Wright Model

### MAINTENANCE

#### Models RC 1-18.5 & KM914B

**SPARK PLUG.** A Bosch W 150 M 11 S spark plug is used. The Champion equivalent is L86 or L90. Recommended spark plug gap is 0.019-0.020 in.

**CARBURETOR.** Tillotson Diaphragm Type carburetors are used. Model HL 242A used on some engines is equipped with a fixed main jet. Model HL 252A which is alternately used has a main adjustment needle. Refer to TILLOTSON Carburetor Section in SERVICE FUNDAMENTALS for operation and overhaul.

On Model H 242A, initial setting for idle mixture adjusting screw is 1½ turns open. On Model HL 252A, set idle mixture adjusting screw at ¾ turn and main adjusting needle at 1½ turns open. Adjustments must be checked under operating conditions of temperature and load. On Model HL 252A adjust main needle so engine will accelerate over full operating range without hesitation and run smoothly without excessive smoking. Readjustment of idle mixture needle and idle speed needle may also be necessary.

On Model HL 242A, a 0.041 main jet is recommended for altitudes up to 4000 ft. and a 0.039 main jet for higher altitudes.

**FUEL PUMP.** The fuel pump is

operated by a pulse passage (P—Fig. 19) which enters the rotor housing midway between intake and compression areas. An external line connects the diaphragm type fuel pump to engine pulse passage. The line must be kept open and must not leak.

**LUBRICATION.** The engine is lubricated by oil mixed with the fuel. Recommended fuel/oil ratio is given in CONDENSED SERVICE DATA Tables. Fuel should be good quality regular gasoline.

**IGNITION TIMING.** A Bosch flywheel magneto is used. Magneto contains an auxiliary lighting coil which utilizes the permanent magnets as the power source. Power output is 40 watts at 12 volts.

Recommended ignition point gap is 0.014-0.018 in. Ignition timing is 12 degrees BTDC and magneto edge gap is 0.590-0.748 in.

When the "O" timing mark on flywheel aligns with reference mark on fan housing, rotor is at Top Dead Center (TDC). See Fig. 1. The "M" mark designates 12 degrees BTDC when aligned with reference mark. Points should begin to open and magneto edge gap should be 0.590-0.748 in. when "M" mark is aligned.

Magneto cam can be installed for either clockwise or counter-clockwise

rotation when viewed from Power Take-Off End of crankshaft. On the Wankel engine, cam MUST be installed with "L" mark aligned with reference mark on flywheel as shown in Fig. 2.

Assembly marks are generally used with all components for correct timing. Fig. 3 shows alignment marks for ar-

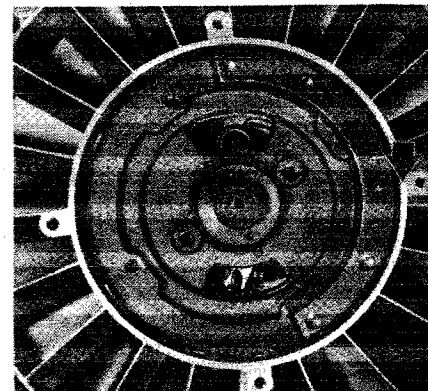


Fig. 1—View of Wankel engine with recoil starter removed, showing timing scribe line (Arrow) on blower housing. "M" mark on magneto housing indicates firing point, "O" mark TDC.

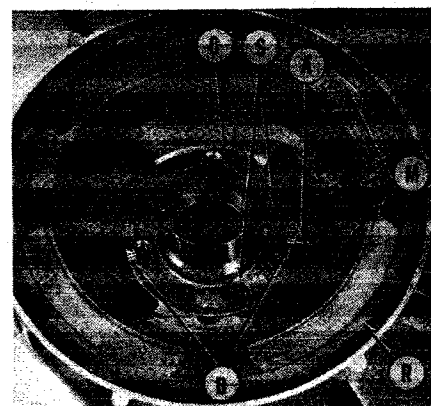


Fig. 2—Inside view of flywheel showing magnets and breaker cam. Refer to text for details.

A. Assembly mark  
C. Breaker cam  
D. Direction marks  
M. Magnets  
R. Magneto housing  
S. Retaining Screws

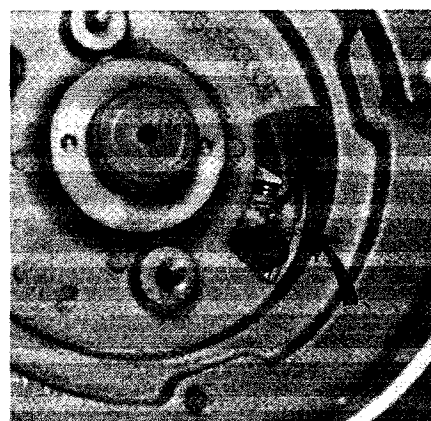


Fig. 3—Chisel marks (Arrow) indicating proper location for armature plate installation can be viewed through flywheel as shown. Refer to text.

mature plate positioning. Replacement parts may not be marked, however, and the complete procedure for correct timing is as follows:

Temporarily position the flywheel and turn crankshaft until "M" timing mark on magneto housing aligns with scribe mark on crankcase as shown in Fig. 1. Measure the edge gap (A—Fig. 4) working through opening in magneto housing. Edge gap should be 0.590-0.748 in.; if it is not, lift off the flywheel and loosen the three screws (Fig. 5) securing armature plate to crankcase. Reposition the plate and recheck by installing flywheel. When edge gap is correctly adjusted, set breaker point gap to recommended opening (0.4 mm or 0.016 in.) and turn crankshaft until "M" timing mark on flywheel is again aligned. Breaker points should be just starting to open; if they are not, remove flywheel and loosen the four screws (S—Fig. 2) securing breaker cam (C) to flywheel. Reposition the cam and recheck, then tighten screws securely when cam is properly positioned.

Refer to Fig. 6 for an exploded view of armature plate showing component parts. Refer also to MAGNETO SER-

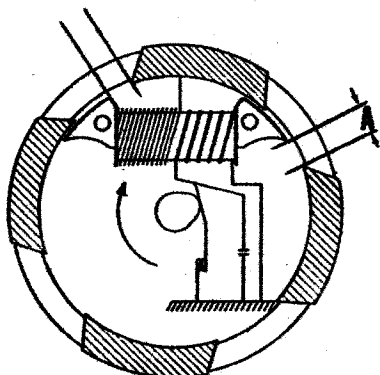


Fig. 4—With "M" timing mark aligned, edge gap (A) should measure 15-19 mm (0.590-0.748 inch).

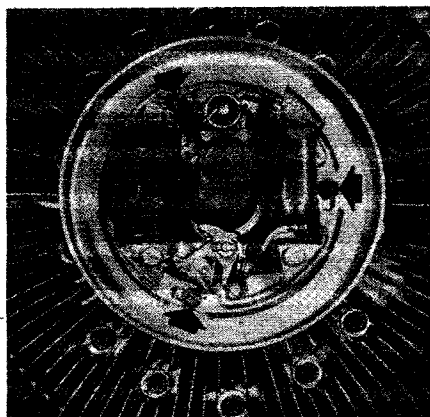


Fig. 5—View of engine with flywheel removed, showing armature plate attaching screws (Arrows).

## VICE Section in ENGINE SERVICE FUNDAMENTALS.

### REPAIRS

#### Models RC 1-18.5 & KM914B

**TIGHTENING TORQUES.** Recommended tightening torques are as follows:

Flywheel Nut .....	55 ft.-lbs.
Rotor Housing End	
Plate Screws .....	55-70 in.-lbs.
Counterweight Screw ....	15 ft.-lbs.
Retaining Flange Screws—	
PTO End .....	55-70 in.-lbs.
Fan Housing Nuts .....	15 ft.-lbs.

**DISASSEMBLY.** Screws and nuts are metric. Metric wrenches should be used, however, 1 7/16-inch and 7/16-inch sockets will fit the nuts. Metric Allen wrenches **MUST** be used on socket head screws.

Disassembly should begin at starter end. Remove starter and cooling fan housing (Fig. 7). Remove mainshaft

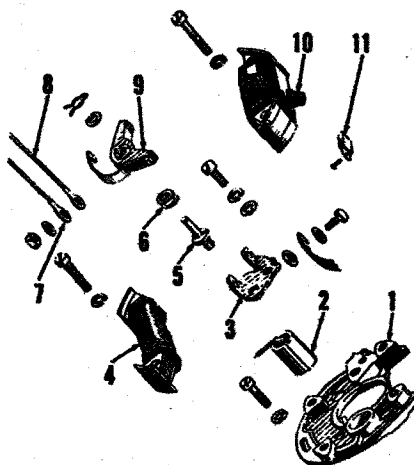


Fig. 6—Exploded view of magneto armature plate showing component parts.

- |                     |                   |
|---------------------|-------------------|
| 1. Plate            | 7. Kill wire      |
| 2. Condenser        | 8. Condenser wire |
| 3. Stationary point | 9. Breaker arm    |
| 4. Lighting coil    | 10. Ignition coil |
| 5. Pivot shaft      | 11. Oilier wick   |
| 6. Shims            |                   |

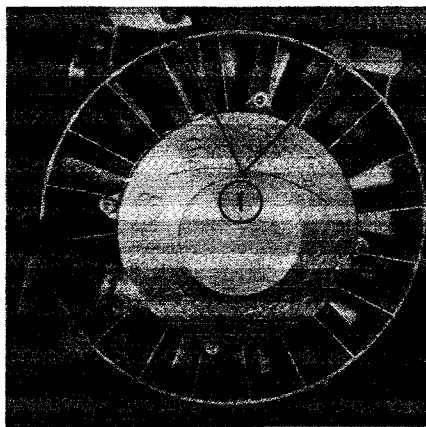


Fig. 7—Remove the six stud nuts (1) and lift off blower housing. Starter may first be removed if desired.

nuts, washer and starter cup, being careful not to lose the dowel pins (5—Fig. 11). Remove flywheel assembly using a suitable puller attached to

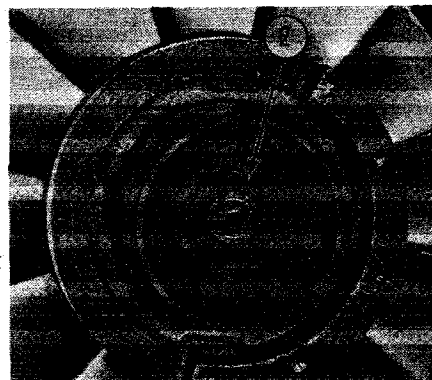


Fig. 8—Remove flywheel nut (2) using a 36 mm socket. A 1-7/16-inch socket will work.



Fig. 9—Remove washer (3).

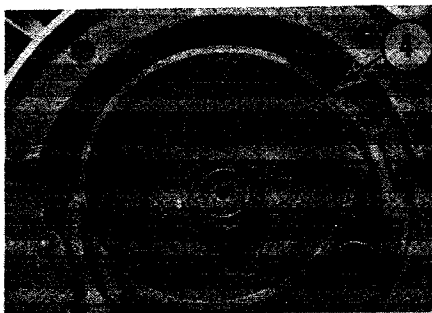


Fig. 10—Lift off starter cup (4).



Fig. 11—Be careful not to lose the two small (loose) dowels (5). Lift out the dowels and remove flywheel by attaching a puller to threaded holes (P). Holes are M8 (metric) threads.

## ENGINES

threaded holes (P). Remove ignition plate assembly and magneto mounting plate as shown in Figs. 12 & 13; remove the circle of socket head cap screws (8) and lift off ignition side end plate.

Rotor removal should be done carefully to prevent damage to rotor, housing or seals. Seals may stick to end plates when engine is disassembled. Protect inside and end surfaces of rotor housing against damage and be careful not to dislodge or damage the hollow locating dowels (Fig. 14).

Remove counterweight (A—Fig. 15), Woodruff key and retaining flange (B) from drive end of mainshaft. O-ring seal around retaining flange hub should be renewed. Remove snap ring (1—Fig. 16), shims (2) and thrust washer (3); then withdraw mainshaft from drive end plate.

**INSPECTION.** Note condition of rotor seals (Fig. 17). Side seal (wave) springs (1) are installed with tips of spring pointing down in groove. Apex seal pin springs (5) should be mated as shown in Fig. 18. Carbon should be carefully removed from seal grooves. Seal side clearance should not exceed 0.004 in. Renew rotor and bearing assembly if clearance is excessive.

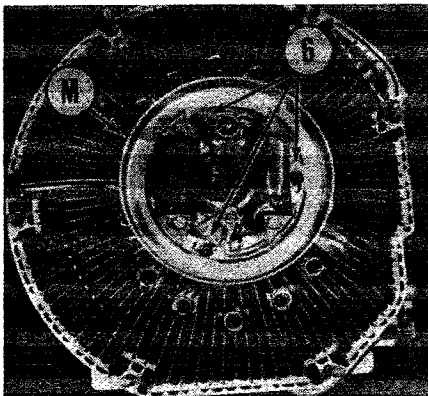


Fig. 12—Remove the three screws (6) and lift armature out of mounting plate (M).

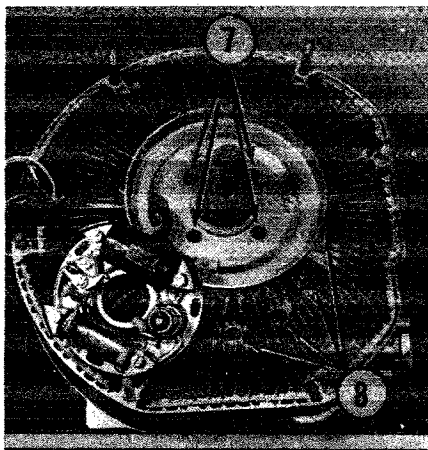


Fig. 13—Remove the four screws (7) and lift off armature and mounting plate as a unit.

Inspect rotor roller needle bearing. Bearing is retained in rotor bore by snap rings. Rotor and bearing are only available in an assembly which also includes the complete rotor seal kit.

Inspect mainshaft surfaces and end plate bearings for wear. Drive side roller bearing and inner race must be renewed as an assembly. Inner race must be pressed from mainshaft. Heat the new inner race to approximately 300° F. and press into position on shaft until it seats on shaft shoulder. Either end plate must be heated to approximately 300° F. to remove and install the shaft bearings. Mainshaft eccentric, bearing and seal surfaces should be checked for wear or damage and shaft renewed if its condition is questionable.

Check rotor gear teeth and pinion gear in magneto end plate. If stationary (pinion) gear is damaged, it can be renewed by first heating magneto

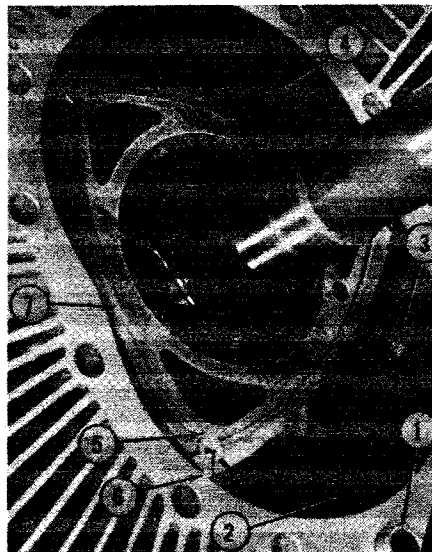


Fig. 14—View of rotor and rotor housing with ignition end plate removed. Be careful not to lose ring dowels (1) when engine is disassembled.

- |                  |              |
|------------------|--------------|
| 1. Ring dowel    | 5. Seal pin  |
| 2. Pulse passage | 6. Apex seal |
| 3. Intake port   | 7. Side seal |
| 4. Exhaust port  |              |

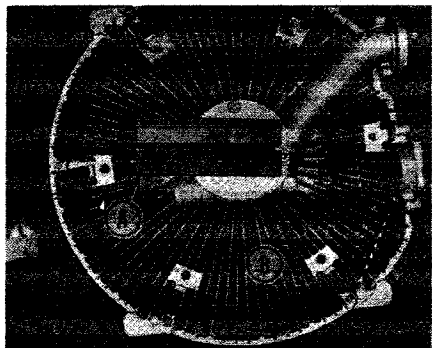


Fig. 15—Working from pto side of engine, remove counterweight (A) and retaining flange (B). Metric size Allen wrenches are required.

## Sachs Wankel

end plate to 300° F., then pressing out the pinion and bearing. The stationary gear flange must be carefully installed with the four magneto mounting bolt holes aligned. Install as follows:

Heat new stationary gear to 300° F. and install the old or new bearing, then allow gear to cool. Two metric (M6) alignment studs are required. Studs can be made by removing the heads from M6 cap screws at least 2 inches long. Heat end plate to 300° F. and install the studs in holes 180 degrees apart; then press pinion and bearing into plate until squarely seated on machined surface of plate.

End plates (side plates) may be re-

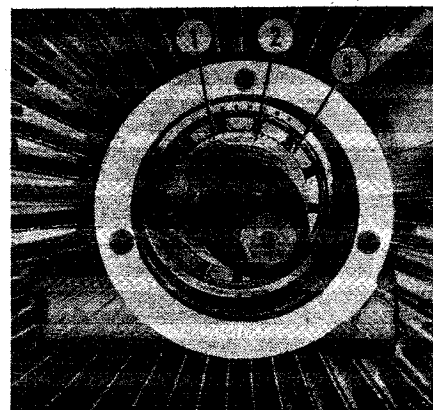


Fig. 16—Mainshaft can be removed after removing snap ring (1), spacer shims (2) and thrust washer (3).

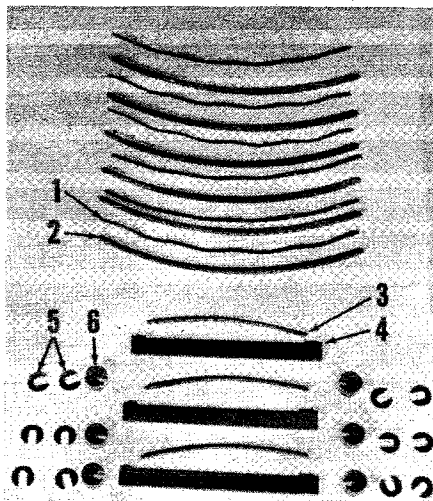


Fig. 17—Exploded view of rotor seals which take the place of piston rings in piston engine.

- |                      |                   |
|----------------------|-------------------|
| 1. Wave springs      | 4. Apex seals     |
| 2. Side seals        | 5. Pin springs    |
| 3. Apex seal springs | 6. Apex seal pins |



Fig. 18—Apex seal pin springs must be installed with convex sides together as shown.

machined approximately 0.035 inch provided minimum plate thicknesses shown in Fig. 20A are not exceeded. Magneto end plate is measured adjacent to center hole after removing stationary gear. Drive end plate is meas-

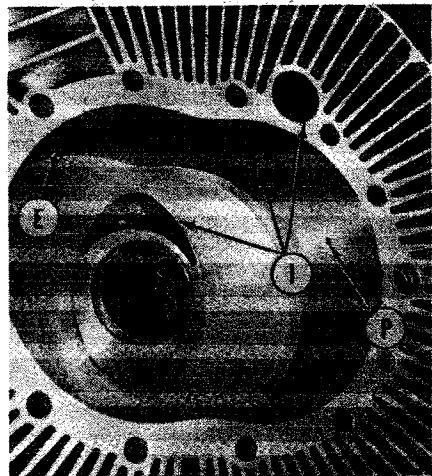


Fig. 19-Rotor housing and drive end plate with rotor and shaft removed. Inlet fuel charge passes through both end plates, rotor and rotor housing to provide lubricant to the moving parts.

E. Exhaust port  
I. Intake ports  
P. Pulse passage port

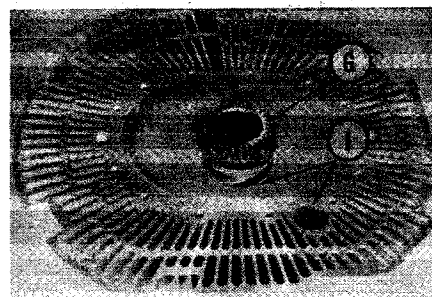


Fig. 20-Inside view of ignition side end plate showing stationary gear (G) and intake ports (1). Refer also to Fig. 19.

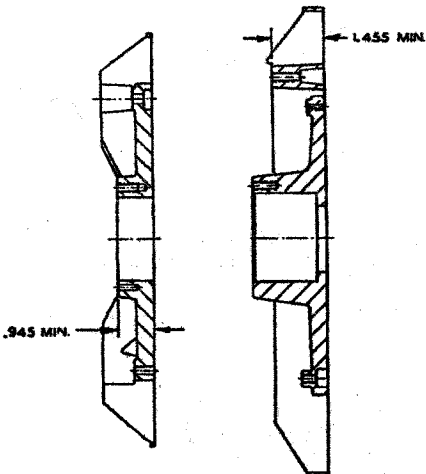


Fig. 20A-Rotor side plates may be re-machined (about 0.035 inch) provided the minimum thicknesses shown are maintained. Magneto

ured through mounting pad hole as shown.

Positioning arbors are required when refinishing end plates. Arbors must be locally made, using the dimensions and materials shown in Fig. 28 for magneto end plate arbor and Fig. 29 for drive end plate tool. Fig. 30 shows set-up procedure for using the tools.

The manufacturer recommends using a sharp carbide bit positioned to permit a shave cut. Use a machine feed of not more than 0.0025 inch per spindle revolution and machine from center outward. Start at center with a spindle speed of approximately 330 rpm, decrease speed to approximately 200 rpm at a 3½ inch radius and to 100 rpm at 5 inch radius.

Hand lap using 320 grit emery paper and finish lap with crocus cloth.

**ASSEMBLY.** All bearings, seals and moving surfaces should be lubricated as engine is assembled. Install mainshaft in drive side end plate being careful not to damage bearing. Install thrust washer (3—Fig. 16) on drive end of mainshaft and install as many shims (2) as possible and still permit installation of snap ring (1). Shims (2) are 0.1 mm (0.004 in.) thick. Install snap ring

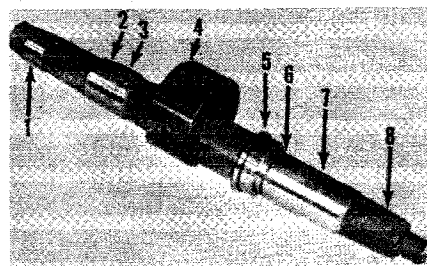


Fig. 21-Engine mainshaft showing points of inspection.

- |                  |                     |
|------------------|---------------------|
| 1. Flywheel end  | 5. Bearing race     |
| 2. Seal seat     | 6. Snap ring groove |
| 3. Bearing race  | 7. Seal surface     |
| 4. Actuating cam | 8. Drive end        |



Fig. 22-Inspect roller bearing and seal surfaces of rotor. Carbon should be carefully

(1), then check main shaft for ease of rotation. Lubricate O-ring and place in groove on hub of retaining flange. Also lubricate oil seal in bore of flange. Use a protecting sleeve to prevent damage to oil seal lip and install the flange, tightening retaining screws to 55-70 in.-lbs. torque. Install Woodruff key and counterweight and torque retaining cap screw to 15 ft.-lbs.

Install two locating ring dowels in drive side end plate and install rotor housing. Install apex seal pin, spring pins, side seal wave spring and side seals in drive side of rotor (opposite side from gear). Place rotor housing and drive end plate on its side with spark plug hole up as shown in Fig. 24. Counterweight and mainshaft eccentric should point downward. Install the three apex springs and seals in slots and, holding seals firmly in place install the rotor as shown. One point of rotor must point up toward spark plug port. Care should be taken not to damage edge of apex seals as rotor is

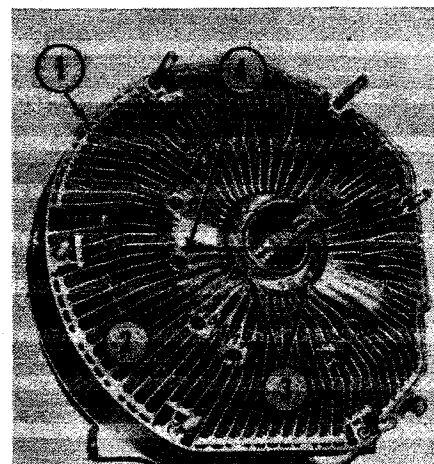


Fig. 23-Magneto end of partially assembled engine.

- |                            |                     |
|----------------------------|---------------------|
| 1. Ignition side end plate | 3. Threaded holes   |
| 2. Stationary gear flange  | 4. End plate screws |



Fig. 24-Reinstalling rotor assembly. Refer to

installed. Also use extreme care not to lose side seals. Rotor should not be permitted to move from contact with drive end plate once it is installed, or side seals may adhere to plate and be withdrawn from their grooves.

Oil and install the remaining side seals, springs and pins on ignition side of rotor. Install ring dowels and ignition side end plate. It may be necessary to rock the crankshaft back and forth until gears mesh. Install end plate screws and torque to 55-70 in.-lbs. Rotate mainshaft and check for freedom of movement.

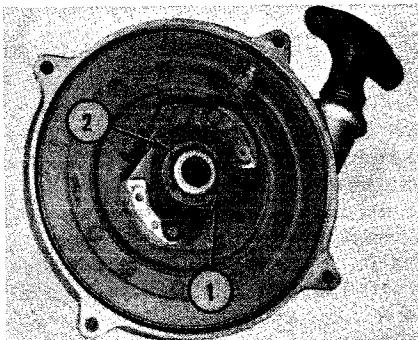


Fig. 25-Removed view of recoil starter assembly.

1. Snap ring
2. Spacer shims

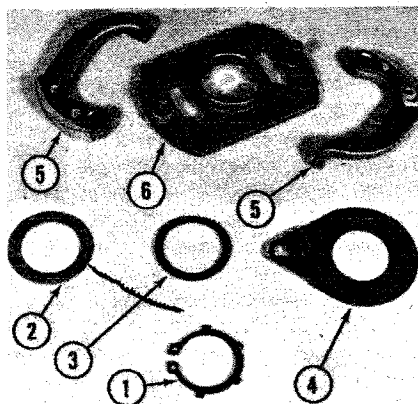


Fig. 26-Disassembled view of starter actuating mechanism.

1. Snap ring
2. Spacer shims
3. Wave washer
4. Brake disc
5. Actuating levers
6. Lever plate

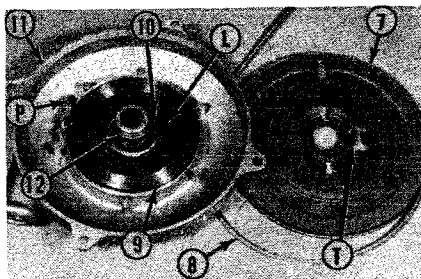


Fig. 27-Cable pulley removed showing return spring correctly installed.

7. Cable pulley
8. Cable
9. Recoil spring
10. Guide ring
11. Housing
12. Sleeve
- L. Loop
- T. Tab

Place lubricated O-ring seal around stationary pinion flange and install magneto/generator mounting plate and armature plate. Plate must be installed with large hole for wires pointing toward spark plug port. Install Woodruff key, flywheel, starter cup, dowels and washer. Install and tighten flywheel nut to a torque of 55 ft.-lbs. Reinstall cooling fan housing and starter and tighten retaining stud nuts to 13-16 ft.-lbs.

**RECOIL STARTER.** To disassemble starter, cut cable as close as possible to grip and allow pulley to turn slowly until spring is completely unwound. Remove snap ring (1—Fig. 25) and washers (2), then lift off the actuating assembly. Remove pulley (7—Fig. 27), leaving spring (9) in

housing. Protect hands if spring is to be removed, and lift out carefully to prevent personal injury.

When assembling the starter, use Fig. 27 as a guide. With inner side of housing facing upward as shown, install spring so it coils counter-clockwise beginning with outside anchor, securing loop over pin (P). Spring guide ring (10) has a section removed to provide clearance for inner spring loop (L) and a relieved outer end to provide clearance for spring rivets. Be sure guide is installed right side up as shown. Wind cable completely around pulley in the direction shown and install pulley with tab (T) engaging inner spring loop (L). Wind pulley three turns counter-clockwise before passing cable through housing hole. Reinstall handle grip to prevent re-entry of

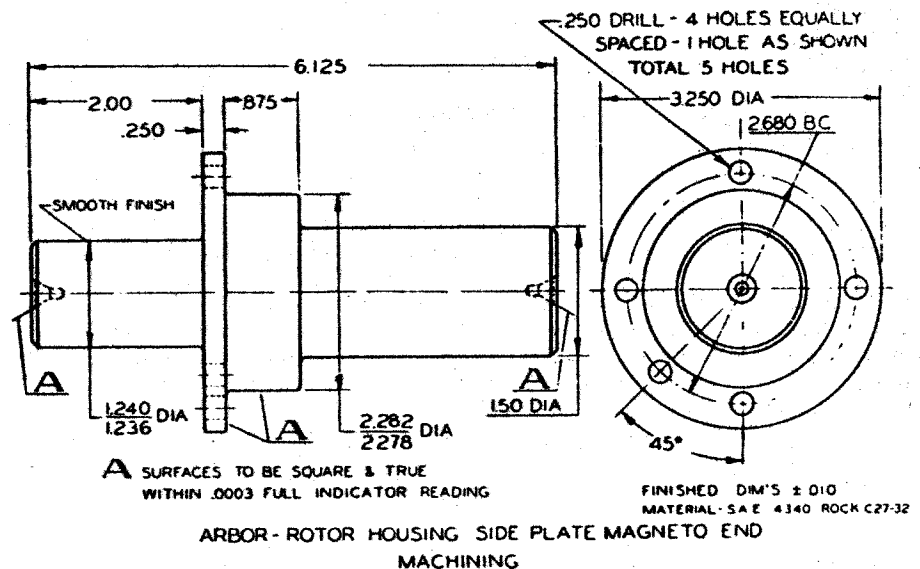


Fig. 28-Machining diagram for local fabrication of magneto end plate arbor.

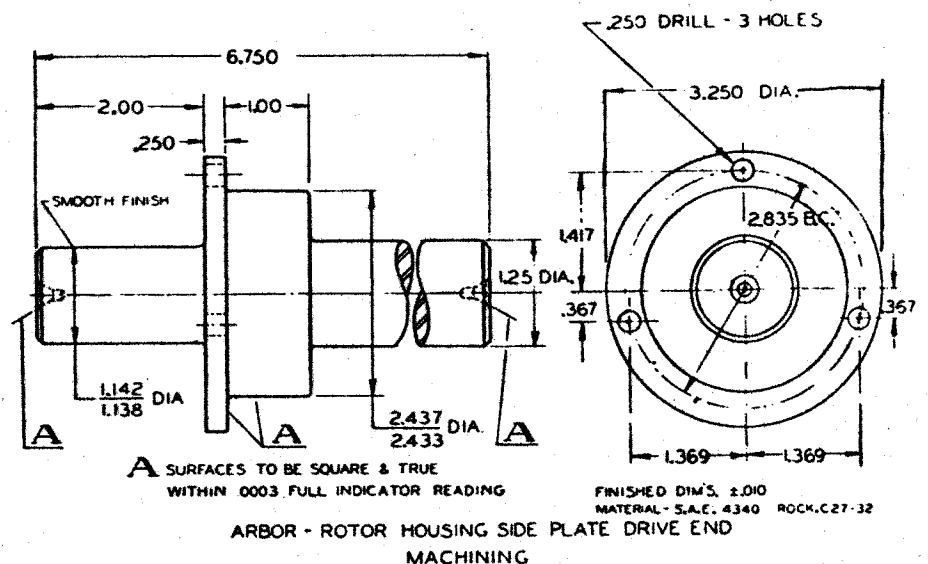


Fig. 29-Machining diagram for local fabrication of drive end plate arbor.



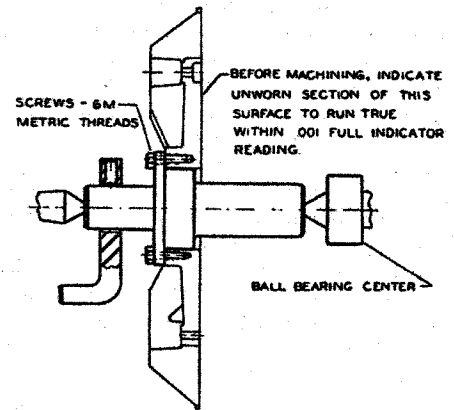
cable. A new retaining ferrule will be needed.

Shims (2—Fig. 26) are in two sizes, the larger (1-inch ID) being placed on top of pulley (7—Fig. 27) and underneath lever plate (6—Fig. 26). These shims are available in thicknesses of 0.15, 0.3, 0.5 and 0.8 mm (0.006, 0.012, 0.020 and 0.032 inch), and shim pack should be of correct thickness to permit top hub flange of carrier (6) to ride 0.1-0.2 mm (0.004-0.008 inch) below shoulder of sleeve (12—Fig. 27). Install lever plate (6—Fig. 26), levers (5) and brake disc (4). Install wave washer (3)

and smaller shims (2). These shims are  $\frac{1}{8}$ -inch ID and 0.3 or 0.5 mm (0.012 or 0.020 inch) in thickness. Enough shims should be used to permit wave washer to compress but not to flatten when snap ring (1) is installed.

**NOTE:** The purpose of the wave washer and adjustment is to create a light drag on brake disc (4) and cause levers to swing out (engage) when cable is pulled. If too many shims are used, starter may not properly re-wind.

Fig. 30—Set up procedure for re-machining rotor housing side plates. Refer to Figs. 20A, 28 and 29, and to text.



## MAINTENANCE

### Model KM24

**SPARK PLUG.** A BOSCH W240T1 or Champion K7 plug having a half-inch reach is used on engines before Serial Number 7565102. Later engines use a  $\frac{3}{4}$  inch reach plug (BOSCH W240T2). **PLUGS CANNOT BE INTER-CHANGED.**

Adjust air gap to 0.5 mm (0.020 inch) and tighten plug to a torque of 2.2-2.5 kg-m (16-18 ft.-lbs.).

**CARBURETOR.** A Walbro WR or Tillotson HR carburetor is used. A separate, plunger type, diaphragm fuel pump is used and carburetor is not equipped with pulse pump. Fuel pump pressure should be about 3.5 psi at all engine speeds and service consists of renewing the pump.

**LUBRICATION.** Engine is lubricated by oil mixed with the fuel. Use Regular gasoline and a good two stroke or rotary engine motor oil mixed at the rate of 25:1. Approved oils are Arctic Cat Rotolube; Shell Rotella SAE 30HD, Mobilmix TT, Essolube HD30 or Fina Poly 8.

**IGNITION TIMING.** Ignition points should just begin to open when scribe mark on rope pulley inner sheave aligns with "M" mark on fan housing. Timing is adjusted by regapping ignition points or loosening the three screws retaining magneto base plate to mounting plate and repositioning base plate in the slotted holes. Specified point gap is 0.014-0.018 inch (0.35-0.45 mm).

## REPAIRS

### Model KM24

**TIGHTENING TORQUES.** Recommended tightening torques are as follows:

	ft.-lbs.	kg-m
Counterweight clamp bolt	20-22	3
End covers	5-8	0.6-1.1

Engine plate	30	4
Fan housing	5.5	0.75
Fuel pump drive (adapter nut)	55-60	8
Manifolds	10	1.4
Stationary gear	6	0.8

**DISASSEMBLY.** Remove carburetor and inlet manifold elbow as a unit. Remove muffler. Disconnect wires and remove ignition coil. Remove recoil starter assembly and fan housing. Clamp PTO end counterweight in a vise to hold shaft, then remove fuel pump drive adapter nut.

Remove fan and flywheel using a suitable puller, protecting threaded end of mainshaft from forcing screw. Remove magneto and mounting plate as a unit by removing the retaining throughbolts.

Heat counterweights in area of retaining set screws to break the LOCTITE seal, then remove set screws and counterweights. Remove throughbolts, noting that a flat washer is positioned under bolt head and nut.

Carefully work PTO end cover from its doweled position on rotor housing and lift off the cover, checking to see that side seals, sealing pins, springs and ring dowels do not adhere to cover and become lost as cover is removed.

Remove rotor and rotor housing, making sure none of the sealing components are accidentally lost or damaged. Rotor seals to be accounted for are as follows:

Side seals	6
Side seal springs	6
Sealing pins	6
Sealing pin springs	12
Long apex seals	3
Short apex seals	3
Apex seal springs	3

There are also two ring dowels between each end cover and rotor housing, four in all. These ring dowels may remain with cover or housing, or may fall out as parts are handled.

Punch a hole in magneto end cover

seal. Thread a self-tapping screw into the hole and pull the seal by prying on the screw. With seal removed, unseat the exposed snap ring and withdraw mainshaft from magneto end cover.

**NOTE:** Spacer shims may be located beneath the snap ring. Also two spacer thrust rings are used on every mainshaft. These parts provide the correct mainshaft end play and must be saved for reinstallation.

**INSPECTION.** Inspect end covers for scratches, scoring or cracks. Visible wear pattern is normal. End covers cannot be re-machined, renew covers if damaged.

Examine stationary gear teeth and mating gear in rotor. If either is damaged, both must be renewed.

Inspect running surface of rotor housing for scoring or other damage. Rotor housing cannot be re-machined. If rotor housing is renewed, new apex seals must also be installed.

Examine apex seal grooves in rotor for pitting or pounding. Insert apex seal in groove and attempt to slide a 0.010 inch feeler gage into groove beside the seal. If feeler gage will start, renew rotor.

Measure depth of cleaned apex seal at middle and near each end. If measurement is less than 0.280 inch (7.0 mm) or varies more than 0.008 inch (0.2 mm) at either end, all three seals must be renewed. Measure thickness of apex seal, which should not be less than 0.1173 inch (2.97 mm).

Measure length of sealing pins, which should not be less than 0.2086 inch (5.3 mm). If measurement is less or if pins vary in length more than 0.002 inch (0.05 mm), renew all three pins on that side.

Measure depth of side seals, which should not be less than 0.0865 inch (2.2 mm). If thickness is less, or if end of any seal measures 0.004 inch (0.1 mm) less than at center, all side seals must be renewed.

## ENGINES

**ASSEMBLY.** Thoroughly clean and decarbonize all parts. Lubricate magneto end cover bearing with engine oil and slide mainshaft through bearing. Heat the two thrust rings in hot oil and press into position until they bottom on shaft shoulder. Install any removed shims and the retaining snap ring. Grease sealing lip of oil seal with high temperature grease. Lightly coat outside edge of seal with LOCTITE and install seal with lip to outside.

Invert magneto end cover, rotor contact side up on a bench. Install ring dowels and rotor housing. Lubricate working surfaces of rotor housing and end cover. Turn mainshaft until high

portion of cam points directly toward narrow part of rotor housing. Place rotor gear-side up on a clean rag and install sealing pins, side seals and their springs in gear side of rotor, using high temperature grease to hold them in place. Turn rotor until one point is aligned with high point of cam, then carefully upend rotor over shaft with flat of rotor aligned with high point of cam. Gently slide gears into mesh. DO NOT lift rotor again at this point or side seals will fall out. Carefully push down on rotor. If it cannot be pushed flush with top of rotor housing it is likely seals have fallen out; remove rotor and try again.

## Sachs Wankel/Scorplon

Install remaining seal pins and springs. Position short apex seal in one seal pin. Place end of apex seal spring against step of short seal, put long apex seal in place and push the entire assembly in its groove until it bottoms. Install the remaining apex and side seals, then install PTO end cover and ring dowels using a suitable seal protector. Install through-bolts and tighten alternately and evenly to recommended torque. Complete the assembly by reversing the disassembly procedure using LOCTITE on counterweight set screws and fuel pump drive adapter nut.