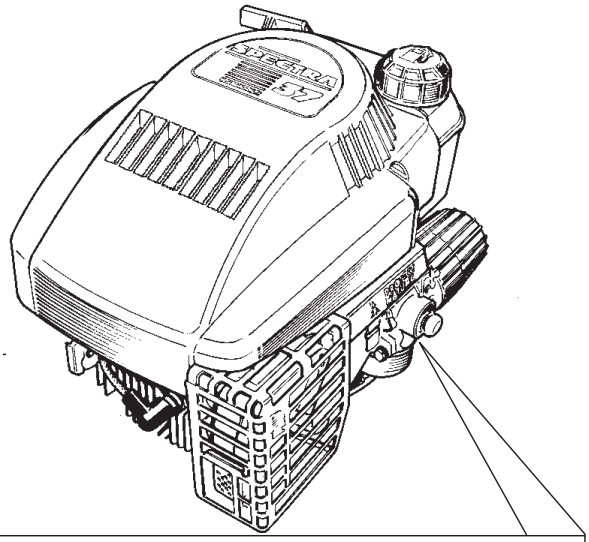
TECUMSEH EUROPA

A. FOREWORD

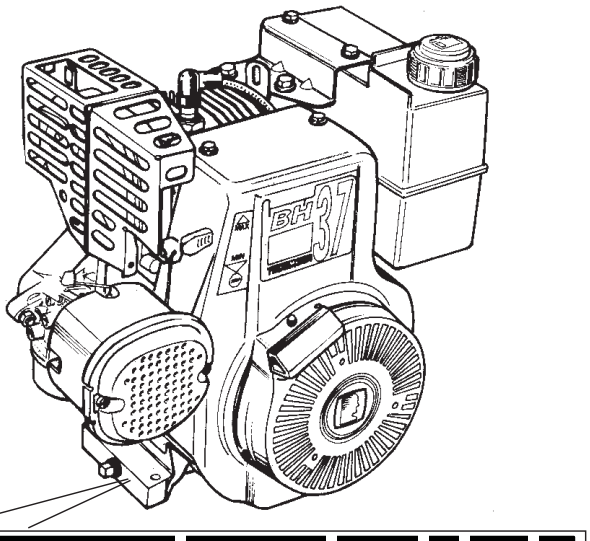
This manual contains information required to service or repair all Tecumseh Italian built engines.
For exploded views of particular engines or component part numbers, refer to the Tecnamotor and Tecumseh Europa Spare Parts Catalogue.
When ordering spares from your authorized Tecumseh Dealer, please quote the entire model and specification number. These numbers are stamped on the engine as shown below.
Always insist on genuine Tecumseh replacement parts.

ENGINE CODE



SPECTRA 37	E-38000	S	5	174	A
MODELLO	SPECIFICA	NUMERO DI SERIE	ANNO DI COSTR.	GIORNO DI COSTR.	TURNO

SPECTRA 37 E-38000 S 5 174 A



BH 37	E-45040E	S	5	174	C
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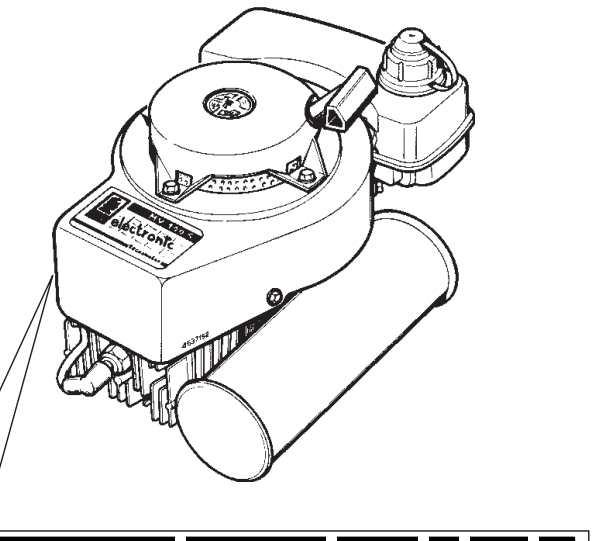


MV 100 S	E-16000C	S	5	174	C
MODELLO	SPECIFICA	NUMERO DI SERIE	ANNO DI COSTR.	GIORNO DI COSTR.	TURNO

MV 100 S E-16000C S 5 174 C

SERVICE BULLETIN

Subject: 2-stroke engines - running in and oil requirements

Tecumseh now requires that all 2-stroke engines with a recommended fuel/oil mix greater than 25 : 1 should be run with the first tank of fuel mixed at double the recommended ratio. This gives increased protection during the piston ring seating process.

We also highly recommend the use of Tecumseh smokeless oil (part number 26980003), which is an extremely high quality and environmentally friendly product.

The use of alternative oils which may be of a lower quality will invalidate the warranty.

B. CHECK-UP BEFORE REPAIR

1. GENERAL

If a customer complains of an engine “non-starting”, it is a good rule to make an accurate check by first pulling the starter to ensure that there are no internal breakages. Ascertain that the correct fuel/oil mixture is being used. (2-stroke engines).
Check the carburettor and governor controls, remote control, air cleaner, spark plug, oil level (4-stroke engines). Drain and refill fuel tank with fresh, clean fuel.
For 2-stroke engines, AV and MV, use a 4% (25:1) or 2% (50:1) petrol/oil mixture. Refer to the operator's manual for correct mix for each engine.

USE CLEAN FRESH FUEL FOR TESTING

NOTE *- If engine is fitted with remote control and choke, check that:*

- *With the lever in the choke or start position, the choke is fully closed and the throttle open. This is important for starting from cold.*
- *With the lever in the max position, make sure that the throttle is fully open. If full throttle is not being attained, maximum power will not be obtained from the engine.*

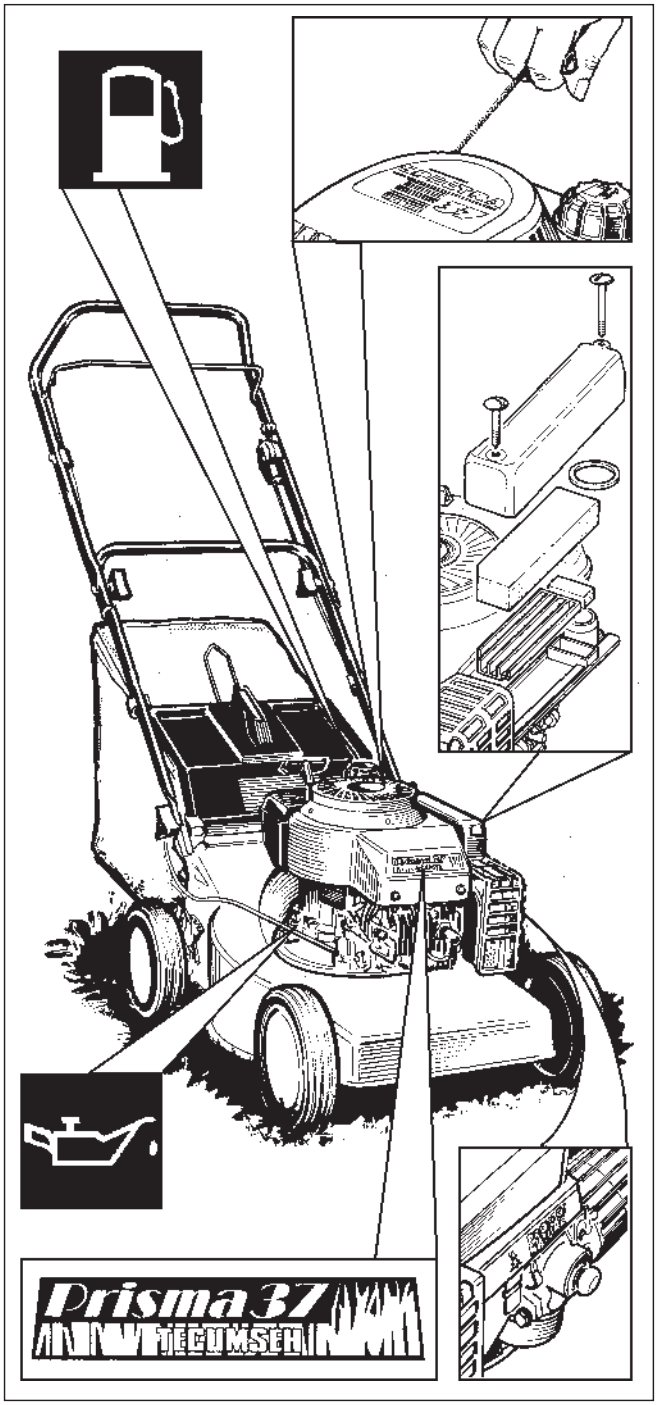


Fig. 1

2. RECOIL STARTER (CHOKE)

a - Move control lever (Fig 2) on engine or remote control (Fig 2) on equipment to choke or start.
b - Operate mower control to release engine brake (if any).
c - Pull starter handle (Fig 2-2) with a quick firm action. Allow the rope to recoil back into its housing whilst retaining grip on handle.
d - Repeat preceding instructions B and C until engine starts. Then gradually move control lever on engine or remote control on equipment away from choke or start to max position.

***NOTE** - If engine fires, but fails to start, move control lever on engine or remote control on equipment to MAX position and repeat preceding instructions B and C until engine starts.*

***NOTE** - Warm engine normally starts without choking. Move control lever (Fig 2) on engine or remote control (Fig 2) on equipment to MAX position; then follow 'b' 'c' and 'd' instructions.*

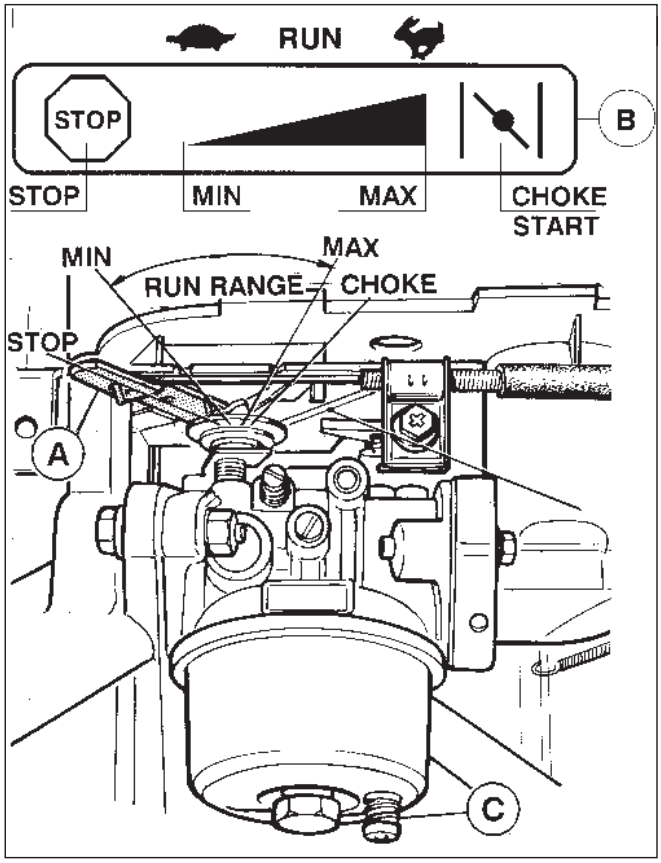


Fig. 2

RECOIL STARTER (PRIMER)

a - Move control lever (Fig 2-1) to "FAST" or "START" (see equipment manufacturer's instructions).
b - Push primer (Fig 2-1) three (**3**) times. Wait about two (**2**) seconds between each push. In cold weather (55F/ 13°C or below) push five (**5**) times.

***NOTE** - Do not use primer to restart a warm engine*

c - Operate mower control to release engine brake (if any).
d - Grasp starter handle (Fig 2-2) and slowly pull rope out until a slight resistance is felt. Let rope rewind slowly. Then pull rope with a rapid full arm stroke.

***NOTA** - If engine fails to start after three (3) pulls, repeat instructions 'b', 'c' and 'd'.*

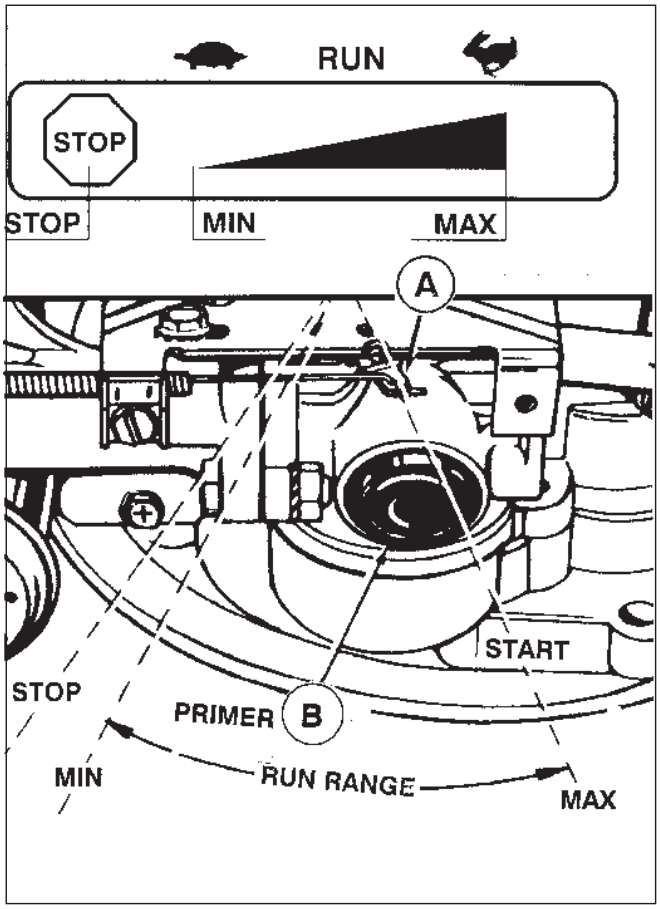


Fig. 2-1

RECOIL STARTER (PRIMER FIXED SPEED)

a - Push primer (Fig 2.1) three (**3**) times. Wait about two (**2**) seconds between each push. In cold weather (55°F/13°C or below) push five (**5**) times.

NOTE *- Do not use primer to restart a warm engine.*

b - Operate mower control to release engine brake.

c - Grasp starter handle (Fig 3) and slowly pull rope out until a slight resistance is felt. Let rope rewind slowly. Then pull rope with a rapid full arm stroke.

NOTE *- If engine fails to start after three (**3**) pulls, repeat instructions 'a','b' and 'c'.*
If the engine starts and runs satisfactorily, the customer should be instructed on starting and maintenance procedure, otherwise continue engine fault check.

ELECTRIC STARTER (Fig 2-2)

To start engine with electric start option, follow the above procedure except use the key to activate the starter motor.

NOTE *- Ensure engine has stopped rotating before re-engaging the starter motor.*

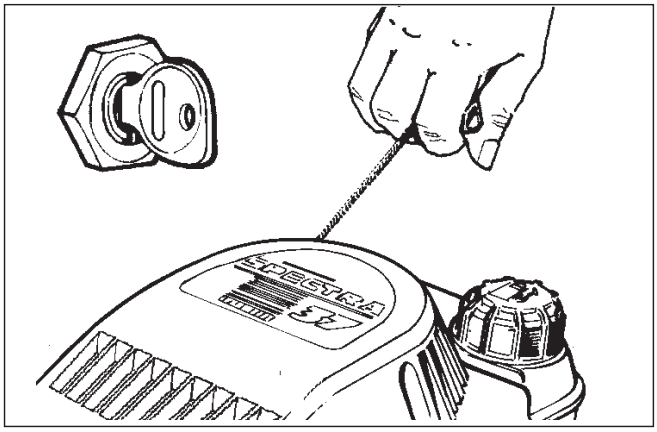


Fig. 2-2

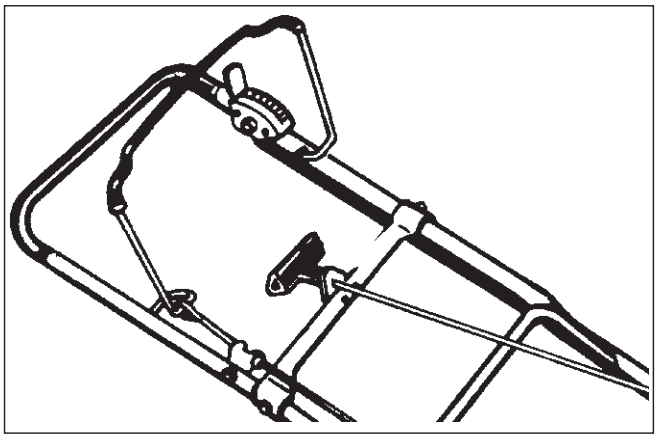


Fig. 3

3. CHECK-UP

A general systematic check can usually locate the fault in a matter of minutes. The following five points cover this operation:

- Starter
- Compression
- Ignition
- Carburetion
- Equipment

a) STARTER

Pull starter and ensure that the starter dog engages and turns the engine. If not, see chapter **C**, Starter Repair Methods, ensure that the rope has not been shortened, thus reducing the number of starting revolutions. The compression may also be checked by this operation.

b) COMPRESSION

If compression is poor, check for:
- Flywheel slipping on crankshaft.
- Loose spark plug.
- Loose cylinder head bolts.
- Damaged cylinder head.
- Warped cylinder head.
- Insufficient tappet clearance (4-stroke engines).
- Broken connecting rod.
- Loose or worn crankshaft seals (2-stroke).

If engine is fitted with compression release, it is necessary to remove cylinder head and check components visually if a leak tester is not available.

***NOTE** - With the compression leak tester faults can be found easily within minutes (Fig 4).*

c) IGNITION

Remove spark plug and connect a new one to the HT lead, earth plug body to cylinder head, turn the engine and check that a strong spark occurs between the plug electrodes. If no spark occurs see chapter **E** for service and repair instructions.

If spark occurs, fit new spark plug and attempt to start engine. Remember that spark failure can also be due to such faults as:
- Broken flywheel key.
- Crankshaft bearing worn, thus preventing cam from opening (breaker point ignition).
- Incorrect air gap setting (electronic ignition).

***NOTE** - When using the compression leak tester (Fig 4) and the ignition tester (Fig 5), faults may quickly be located. If no fault can be found, the defect must be within the carburation system or the equipment.*

Fig. 4

Compression Leak Tester. Tests for leakage of valves, rings and cylinder head in situ.

Fig. 5

Tests standard ignition system in situ. Solid state units must be removed for test.

d) CARBURATION

After having drained and cleaned fuel tank, refill with fresh fuel and check (float carburettors) that fuel flows from the bowl when the drain valve is pressed.

On diaphragm carburettors without primer, remove high speed jet and operate diaphragm. Fuel should then flow from jet seat.

If fuel does not flow, check fuel line and filters, re-set carburettor as in chapter **G** and carry out starting procedure.

If engine still fails to start, remove sparking plug and pour a small quantity of fuel into the cylinder, replace sparking plug and attempt to start. If engine fires a few times it may be assumed that the carburettor is at fault. Check completely the carburettor as in chapter **G**.

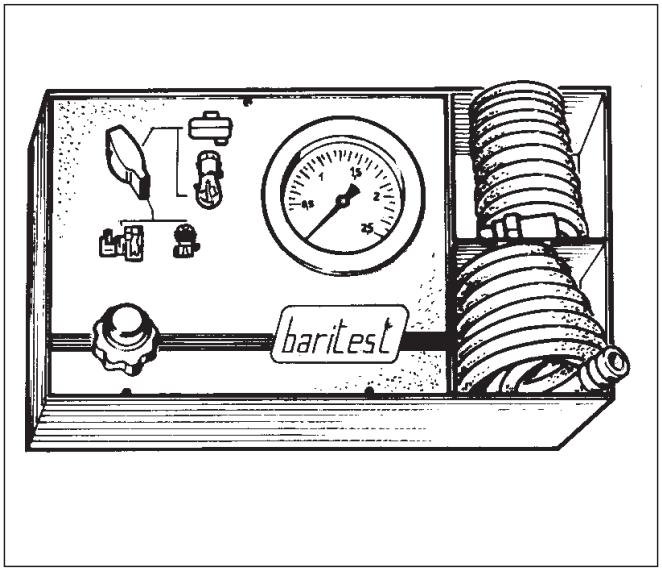


Fig. 4

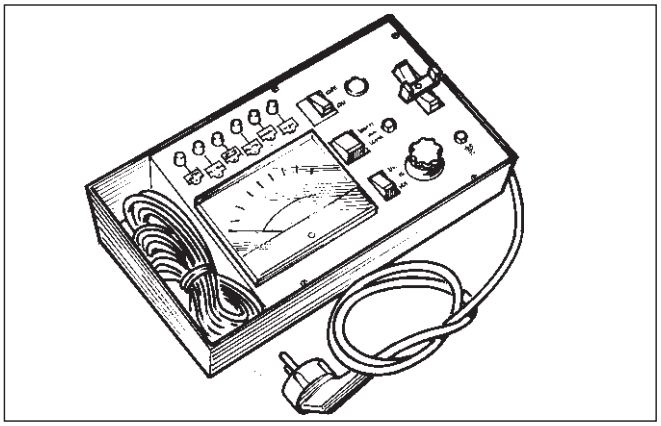


Fig. 5

***NOTE** - On 2-stroke engines a broken or damaged reed plate will prevent starting.*

e) EQUIPMENT

What may initially appear to be an engine fault, such as a starting difficulty or engine vibration, may possibly be the fault of the equipment rather than the engine.
Owing to the great number of machines in use, it is not possible to list these separately. The following is a list of the more common problems:

Hard Starting, Kickback, Failure to Start

- Loose blade. The blade must be tight on shaft or adaptor.
- Loose belt. A loose belt, as with a loose blade, can cause a backlash effect which will counteract the engine cranking effort.
- Starting under load; ascertain that the equipment is disengaged if the unit has a heavy starting load.
- Check remote control assy for proper adjustment with the lever **A** in choke or start position. The carburettor choke should be fully closed (Fig 6).
- Grass cuttings building up under deck may cause difficulties. Clean deck.
- Check that grass collectors are empty. An overfilled collector could cause engine malfunction.

Vibration

- Damaged or out of balance blade
- Damaged or out of balance impellor
- Loose mounting bolts, engine to deck
- Worn blade mounting; replace if mounting allows blade to move causing unbalance.

Noise

- Cutter blade coupling or pulley, an oversize or worn coupling can result in knocking, particularly under acceleration. Check for fit and tightness.

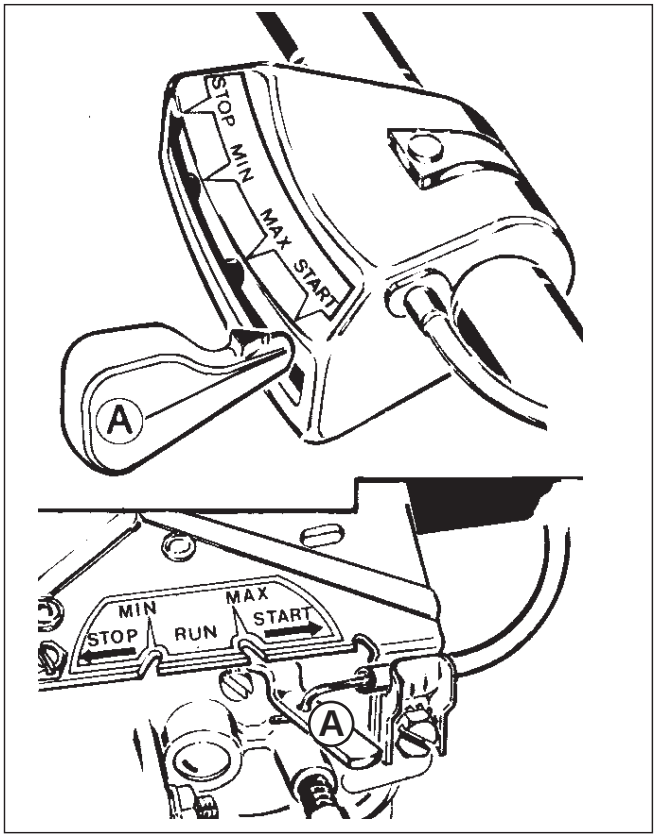


Fig. 6

C. STARTER

NON-STYLIZED STARTERS LAV - BV - BVS - VANTAGE - HBL - BH - AV - MV

1. RECOIL STARTER

In the event of starter failure, remove the unit from the engine and check the following items:

- That dog **A** (Fig 1) protrudes when the rope is slowly pulled. If the rope cannot be pulled, check the retainer hub locking screw **B** for correct tightening torque, which should be kgm 0.5 - 0.6 (45/55 inch lbs).
- If, after correct tensioning of screw **B** (Fig 1), the dog does not function, disassemble the starter as follows, referring to exploded view shown in Fig 2.

Fig 2 - Exploded View Standard Top Starter

1. Retaining Screw
2. Retainer
3. Brake Spring
4. Dog
5. Dog Return Spring
6. Rope Pulley
7. Rewind Spring
8. Starter Housing
9. Rope
10. Handle

To disassemble starter

Release spring tension. Slightly extend rope and lock pulley . Untie knot or remove staple securing handle and release pulley (Fig 3).

- Remove centre locking screw.
- Remove retainer hub, brake spring and dog.
- Remove dog return spring **B**, bearing in mind its position for correct replacement. (Fig 6).
- Remove pulley and spring container assembly.
- Once the damaged parts have been replaced, lubricate spring container with soft grease (Fig 4) and proceed with reassembly.

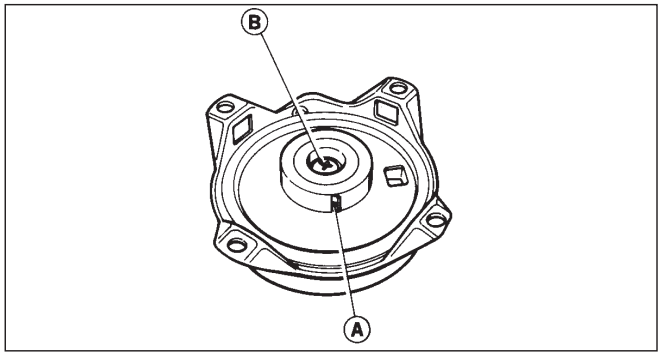


Fig. 1

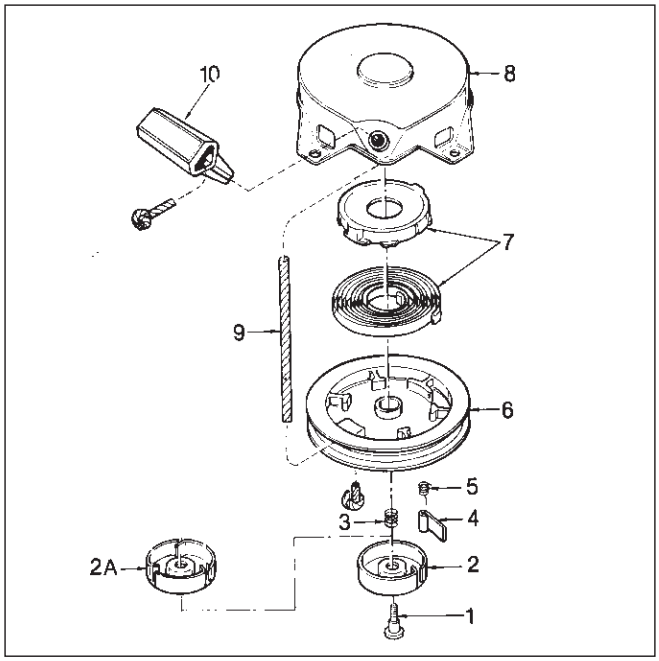


Fig. 2

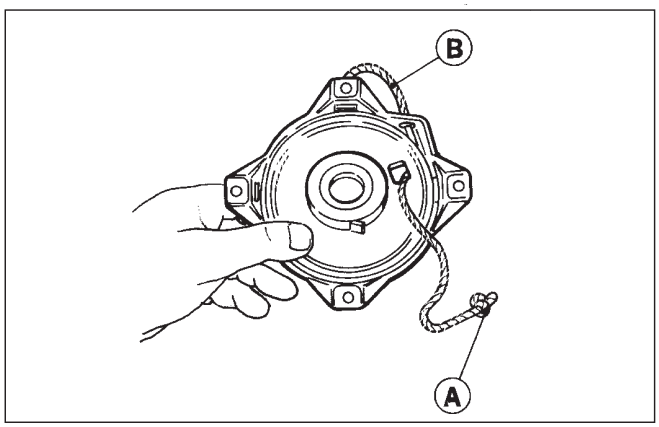


Fig. 3

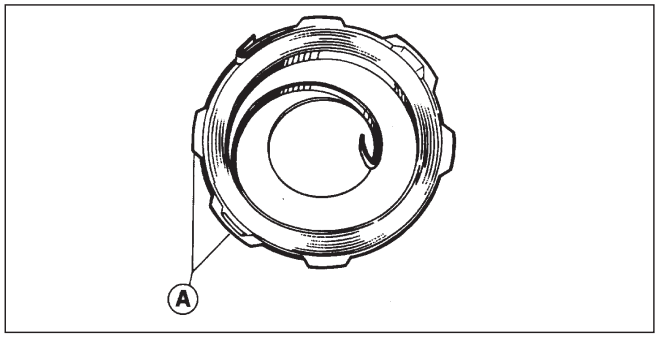


Fig. 4

To reassemble starter

- Accurately position spring container on pulley (Fig 5).
- Reposition the pulley assembly into container lubricating shaft and bushing of plastic pulley.

Fig. 5

A. Spring Engagement
B. Spring Disengagement

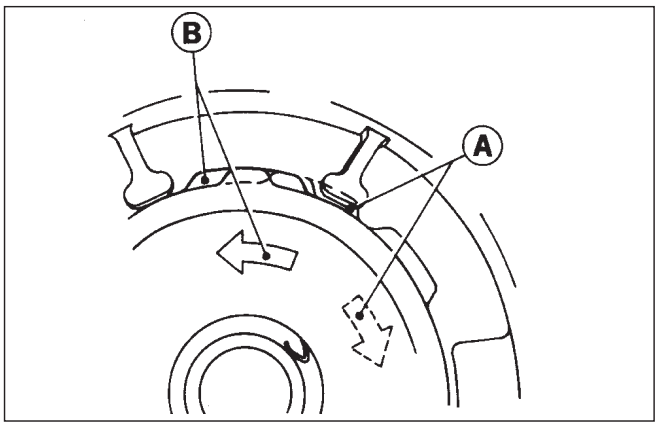


Fig. 5

- Refit retainer spring, place dog and brake spring in position (Fig 6).
- Accurately position retainer hub and secure with the screw.
- Re-tension recoil spring.
- Wind pulley clockwise until tight, then allow to unwind until the hole in the pulley lines up with the eyelet in the housing. Lock pulley. Install rope and handle. Tie knot in rope to secure to pulley. Release pulley. (Fig 3).
- After reassembling starter, always make sure that by pulling the rope slightly the starter dog operates, and that the rope can be fully extended. When released, the handle should be held firmly against the starter housing.
- The correct tension of the spring is obtained after approximately 5 turns of the pulley.

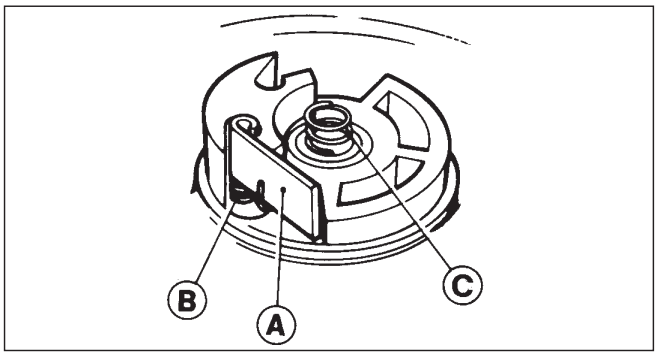


Fig. 6

2. SIDE MOUNTED STARTER HORIZONTAL ENGAGEMENT TYPE (LAV, BV)

The side mounted starter was developed for use on machines in which engines are mounted in a low position. (Fig 7).

Fig 8 - System of Engagement

A. Flywheel gear
B. Pulley gear

The starter operates the engine by engaging a gear into teeth on the underside of flywheel. (Fig 8). When the engine starts, the flywheel speed disengages the starter gear.

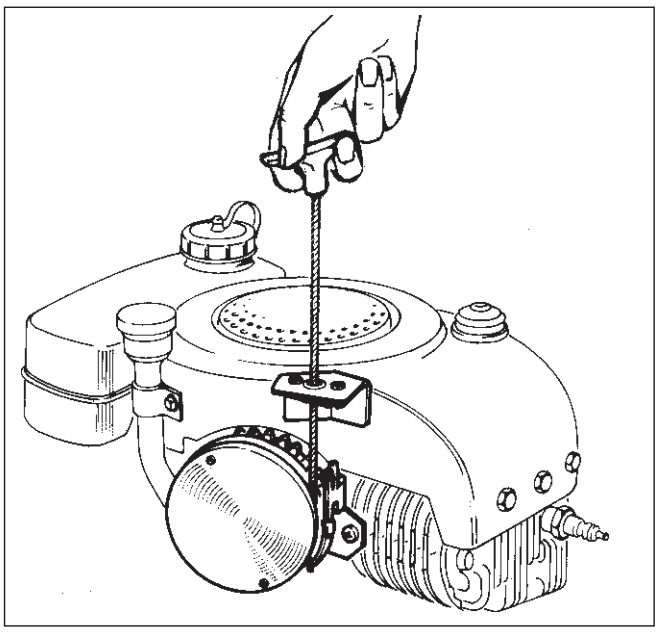


Fig. 7

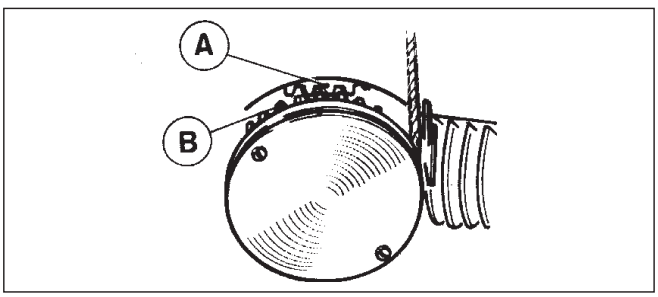


Fig. 8

Disassembly

Disassemble starter as follows. Refer to Fig 9.

- Release main spring tension (**5**) by removing the handle and sliding the rope (**12**) out of the rope clip (**16**). (Fig 10).
- Remove rope clip and replace if necessary.
- Remove the two screws (**1**) and spring cover (**2**). The spring (**5**) may be replaced at this point without further disassembly.
- Carefully remove old spring and place new spring complete with keeper in position and push spring into place in the container. (Fig 11).
- For further disassembly remove central fixing screw (**3**) and remove pulley assy. (Fig 12).
- Remove brake spring (**10**) and washer (**8**) - only early type starters, and separate gear (**7**) from pulley (**6**). If necessary, replace rope (**12**) referring to Fig 13.
- Untie knots **A** and remove rope from handle (**14**) and pulley (**6**).
- Fit a new rope of the same dimensions and retie knots.
- Check all parts before reassembly.

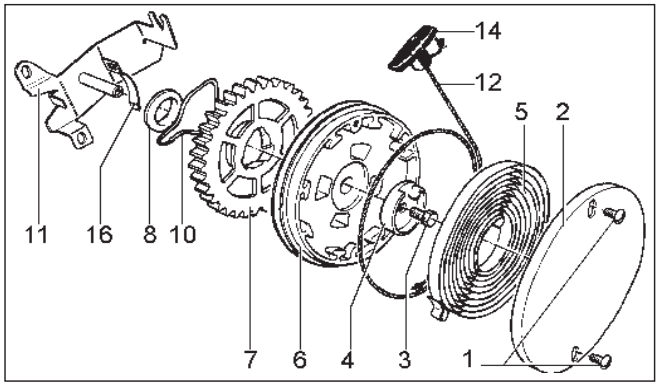


Fig. 9

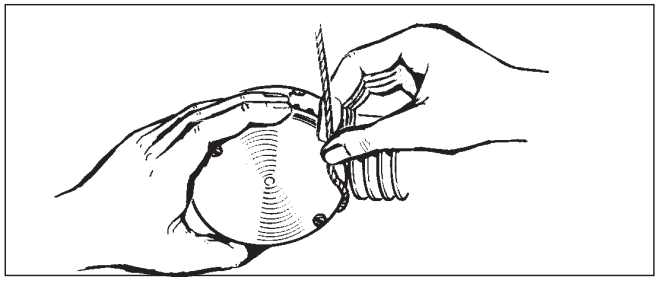


Fig. 10

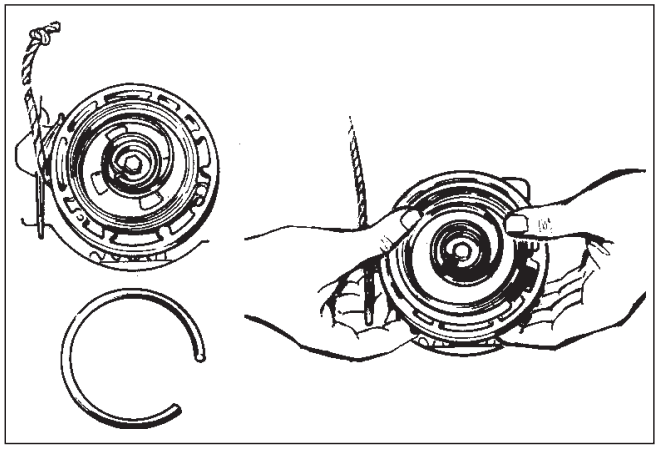


Fig. 11

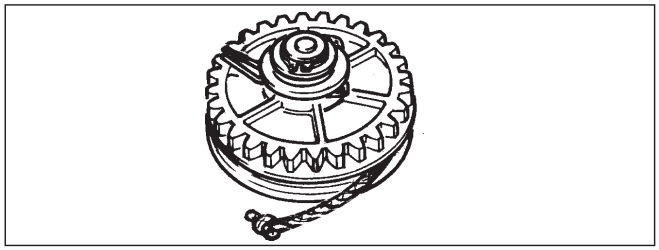


Fig. 12

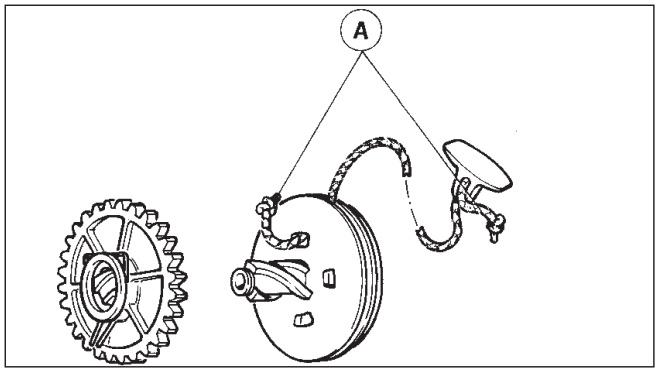


Fig. 13

Reassembling

- Refit gear (**7**) on pulley (**6**).
- Wind the rope onto the pulley and fit the gear and pulley assy onto the bracket pin (**11**).
- Secure the assy with spring hub (**4**) and screw (**3**) (Fig 14).
- Fit re-wind spring.
- Fit new brake spring (**10**) in its seat (Fig 15) being careful to fit the side extension of the spring on its seat.
- Refit the spring cover and secure with its two screws.

NOTE *- Originally the screw (3) (Fig 14,3) had a right hand thread. Late type left hand thread which is indicated by 'S' stamped on head.*

- Pre-tension the spring by completely winding the rope onto the pulley in the direction of the arrow. (Fig 16).
- When the rope is fully wound give the pulley one more complete turn to obtain correct spring tension. (Fig 17).
- The correct tension of the spring is obtained by approximately 2 turns of the pulley.

NOTE - *Only the main spring and spindle must be greased. Do not grease the brake spring etc, in order to prevent the accumulation of dust.*

Fault checking.

- When the rope does not recoil check:
  The spring hub (4), if this rotates, tighten the centre screw (**3**). If the centre pin is loose, replace the bracket (**11**).
- When the gear does not engage, check:
  The distance between the gear and flywheel teeth should not be greater than 1.5 mm (1/16") (Fig 18). To adjust, slacken clamp screws and adjust to correct distance, retighten screw; if the brake spring is a loose fit, replace and check the breaking action on the gear.
- Pull the starter rope and check that the rope clip is not loose and that the rope is of the correct length and diameter.

Refitting to engine

The distance between the gear teeth and the flywheel teeth must be 1.5 mm (1/16"), the bracket mounting holes are elongated to provide this adjustment (Fig 18).

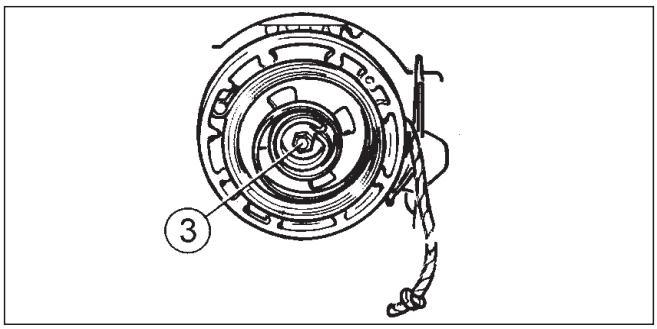


Fig. 14

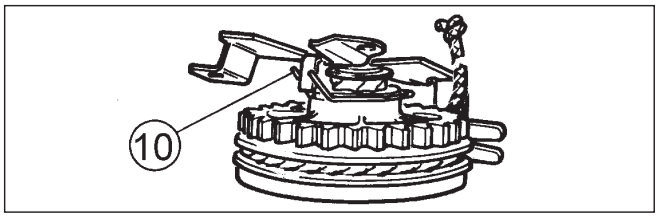


Fig. 15

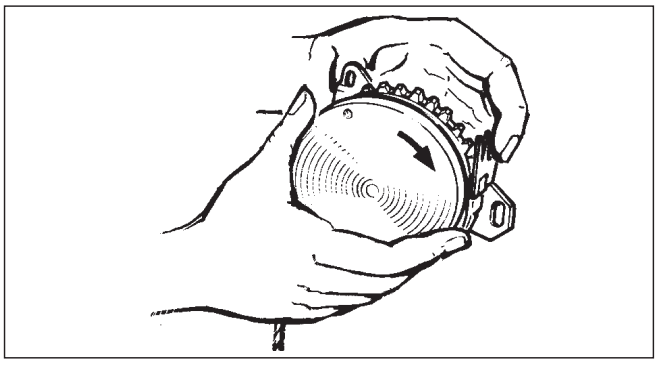


Fig. 16

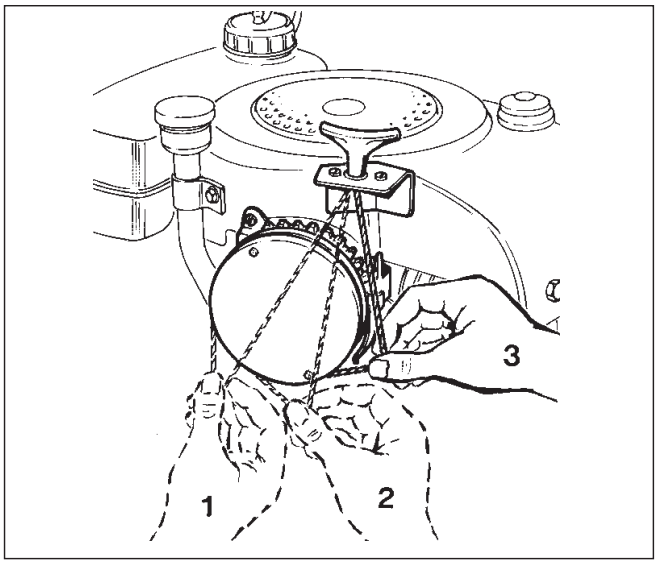


Fig. 17

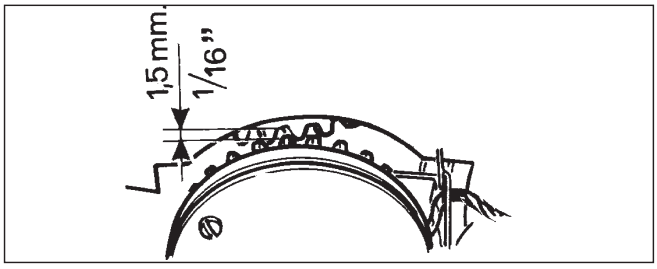


Fig. 18

3. SIDE MOUNTED STARTER VERTICAL ENGAGEMENT USA TYPE

***NOTA** - Alternative type starter above may also be fitted.*

Disassembly:

- Before dismantling, the recoil spring must be locked by inserting pin **C.** (Fig 20).
- Next remove taper pin as per Fig 21.
- Remove centre pin by means of a drift and hammer.
- The spring/gear assy may now be removed. (Fig 2). Remove locking pin (Fig 20-**C**) and slowly release spring.

To replace:

- **Spring:** The new spring is supplied complete with container and new taper pin, the old pin should never be re-used.
- To detach rope, remove clip **A** (not to be used again). (Fig 23).

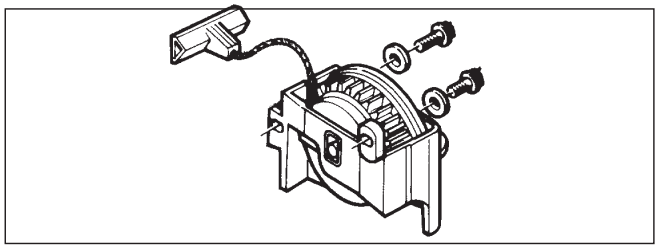


Fig. 19

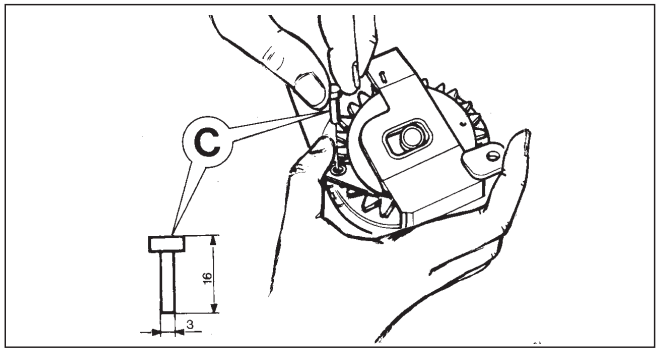


Fig. 20

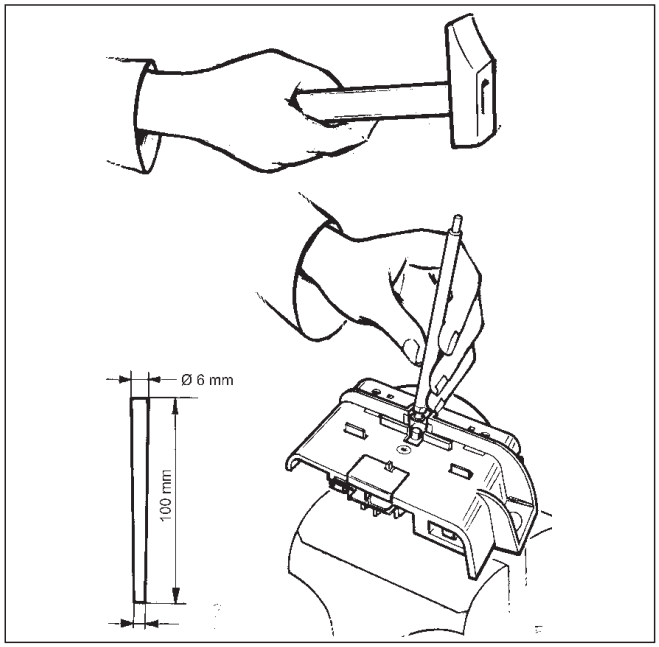


Fig. 21

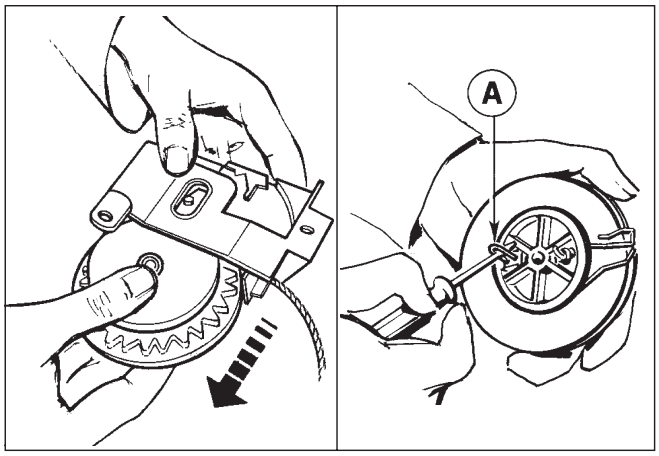


Fig. 22 Fig. 23

Assembly

- To fit new rope, thread end through hole in gear and knot.
- Rewind rope as per Fig 24.
- Place spring on gear and preload two turns. Lock by inserting locking pin. (Fig 25).
- The assembly can now be fitted into the body paying particular attention to position of the rope **C** and the brake spring **M.** (Fig 26).

Fig 26. Correct assembly of rope

C. Rope passage
M. Spring brake

- Replace taper pin and remove locking pin. Checking operation of starter.
- The gear should now move up and down the slot when the rope is pulled and released. (Fig 27).

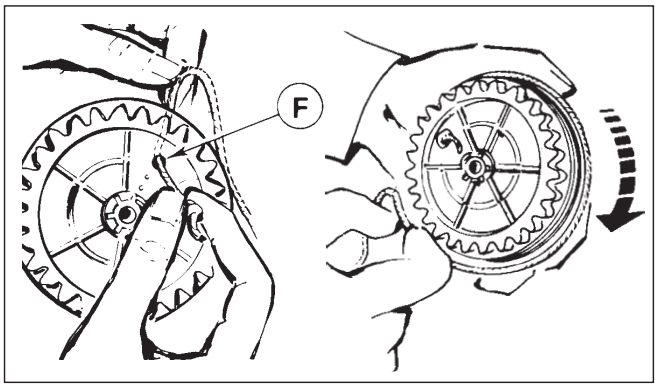


Fig. 24

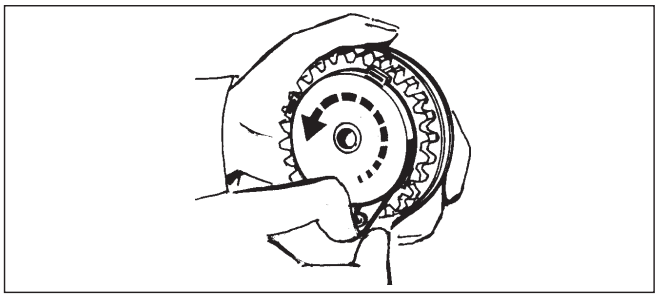


Fig. 25

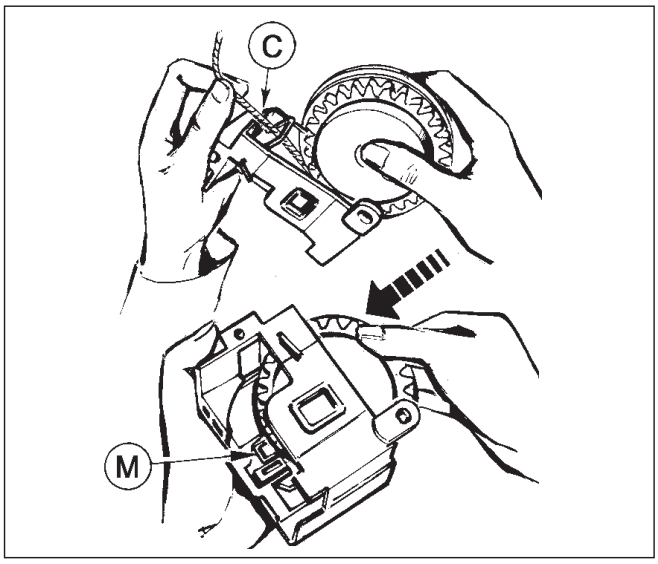


Fig. 26

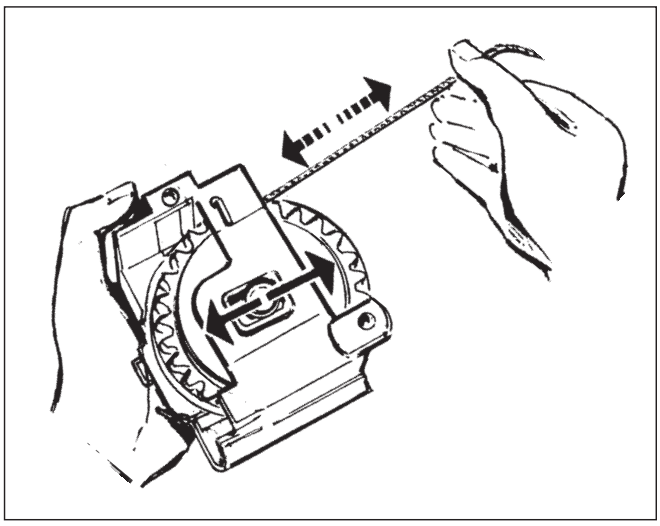


Fig. 27

4. A - STYLIZED RECOIL STARTER (Fig 28-A) VANTAGE, PRISMA, SYNERGY, BH, SPECTRA & FUTURA

B - INTEGRAL RECOIL STARTER (Fig 28-B) VANTAGE & PRISMA Index Figs 28A & 28B.

1. Retaining Pin
2. Washer
3. Pawl Retainer
4. Washer
5. Brake Spring
6. Starter Dog
7. Dog Spring
8. Rope Pulley
9. Rewind Spring
10. Cover
11. Housing (28A) Shroud Assy (28B)
12. Rope
13. Handle

Disassembly procedure

1. After removing the starter assembly from the air conveyor, release the tension on the rewind spring by removing handle and allowing rope to feed back into starter housing.
2. Place a ¾" (19 mm) deep reach socket inside the retainer pawl. Set the rewind on a bench supported on the socket.
3. Using a 5/16" (8 mm) roll pin punch, drive out the centre pin.
4. All components that are in need of service should be replaced.

CAUTION ! *REWIND SPRING IS NOT IN A CANISTER. Care must be used when handling the pulley containing spring because the rewind spring and cover is held by the bosses in the cover.*

Assembly procedure

1. Reverse the above listed procedure keeping in mind that the starter dogs with the dog springs must snap back to the centre of the pulley.
2. Always replace the centre pin with a new pin upon reassembly. Also place the two new plastic washers between the centre leg and retainer pawl.
   Discard old plastic washer. The new plastic washers will be provided along with the new centre pin.
3. Check retainer pawl. If it is worn, bent or damaged in any manner, replace upon reassembly.
   Tap the new centre pin in until it is within 1/8" (3 mm) of the top of the starter.

CAUTION ! *Driving the centre pin in too far will cause the retainer pawl to bend and the starter dogs will not engage the starter cup.*

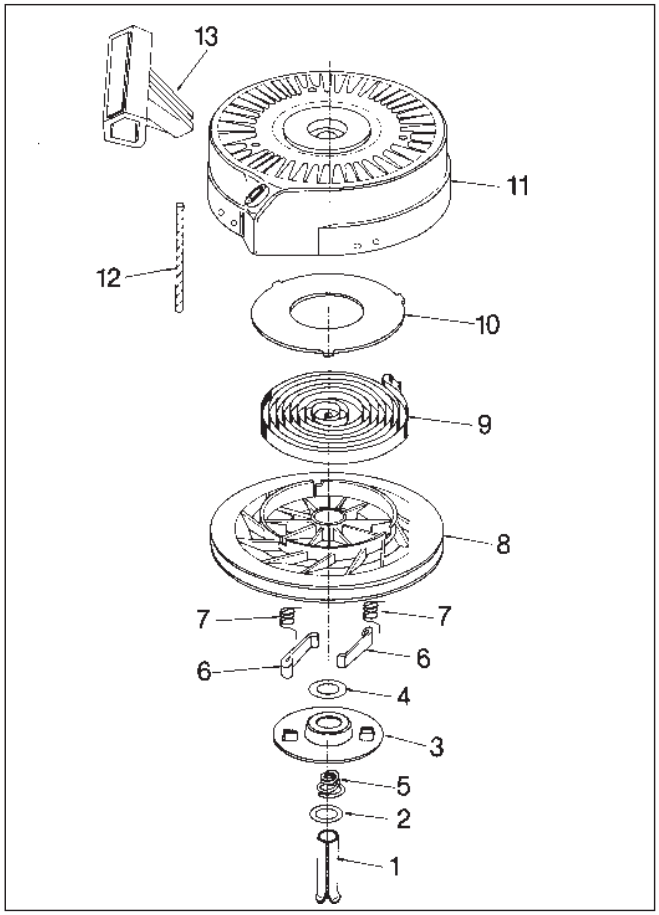


Fig. 28 - A

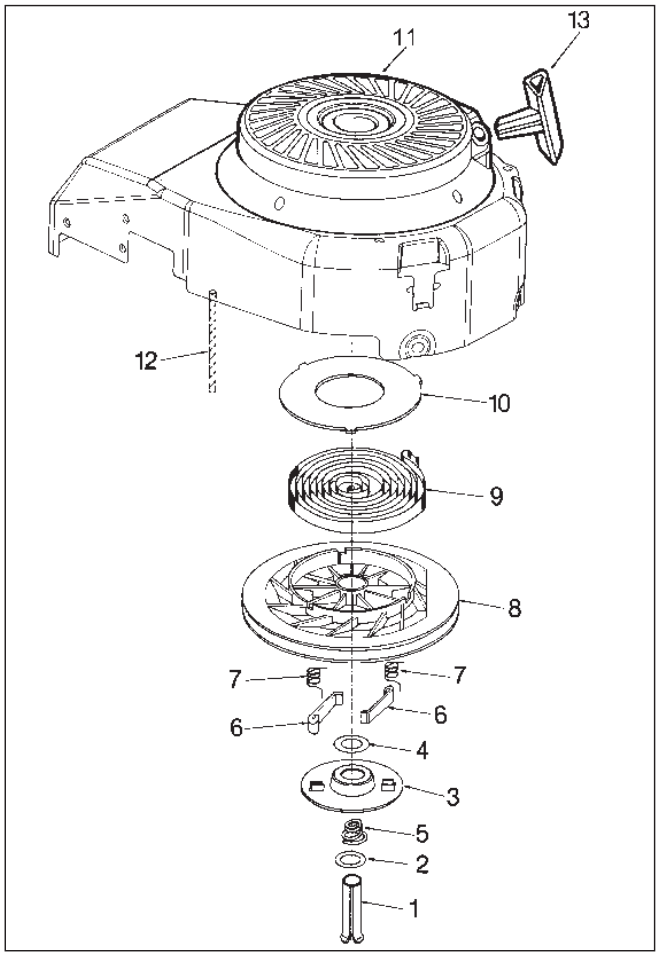


Fig. 28 - B

C - STYLISED STARTER WITH PLASTIC WEDGE (Fig. 28-C)

This starter is similar to previous 'Stylised' starters except that the Pawl Retainer (**2**) is now plastic, and has extended lugs which pass through the starter and hold the assembly together.
These lugs are locked in position by a plastic wedge (**1**) which is inserted between the lugs from the top of the starter.

***NOTE** - The plastic wedge may be covered by a decal, which has to be carefully removed to gain access to the wedge.*

Fig. 28 - C

1. Plastic Wedge
2. Pawl Retainer
3. Pawls
4. Pawl Springs
5. Pulley
6. Spring
7. Cover
8. Housing
9. Rope
10. Handle

***NOTE** - Pulley (**5**), Spring (**6**), and Cover (**7**), are supplied as an assembly when purchased for spare parts purposes.*

DISASSEMBLY/REASSEMBLY

- Release spring tension by unwinding rope.
- Remove decal (if fitted) and pry out the plastic wedge.
- Holding starter assembly together in hand, squeeze lugs together.
- Carefully remove pawl retainer.
- Inspect as for previous stylised starter.
- Re-assembly is the reverse of the above procedure taking care to correctly locate the Pawl Retainer in the Pawls.

***NOTE** - Parts for this starter are not interchangeable with other starters.*

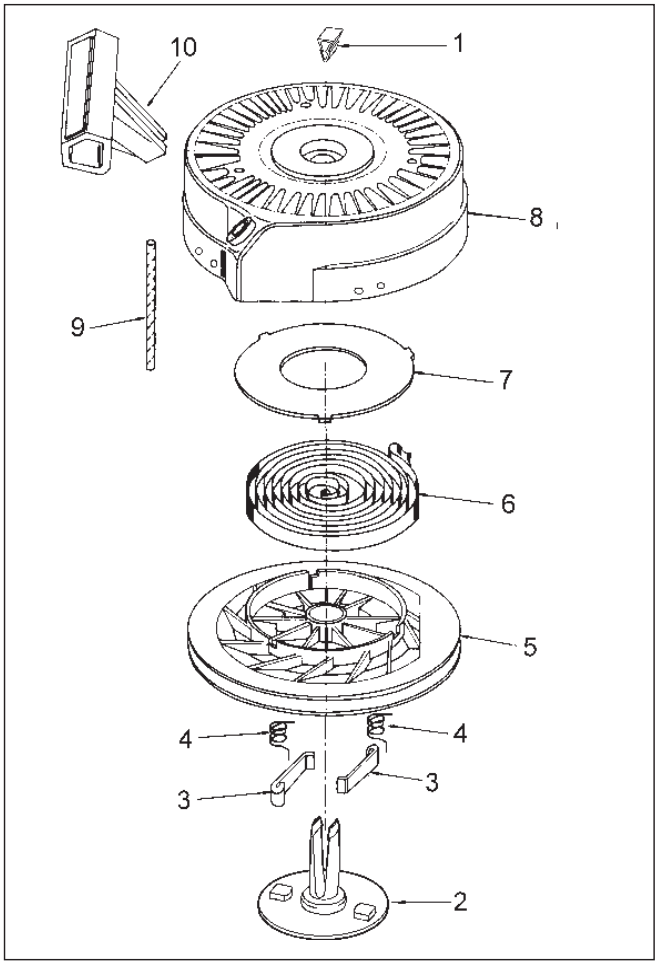


Fig. 28 - C

5. 12 VOLT ELECTRIC START SYSTEM

ELECTRICAL CIRCUIT (Fig 29)

1. Charging Alternator
2. Alternator Lead
3. Ignition Cut-out Lead
4. Battery Earth Cable
5. Alternator Lead, Red, 18AWG
6. Alternator Lead (see 2)
7. Connector Body
8. Electric Starter Lead
9. Starter Motor (internally earthed)
10. Starter Motor Lead (see 8)
11. Battery Earth Lead
12. View **A-A** of Female Connector Body
13/14. Battery
15. Connector
16. Cable, Black, 12 AWG
17. Heavy Duty Switch

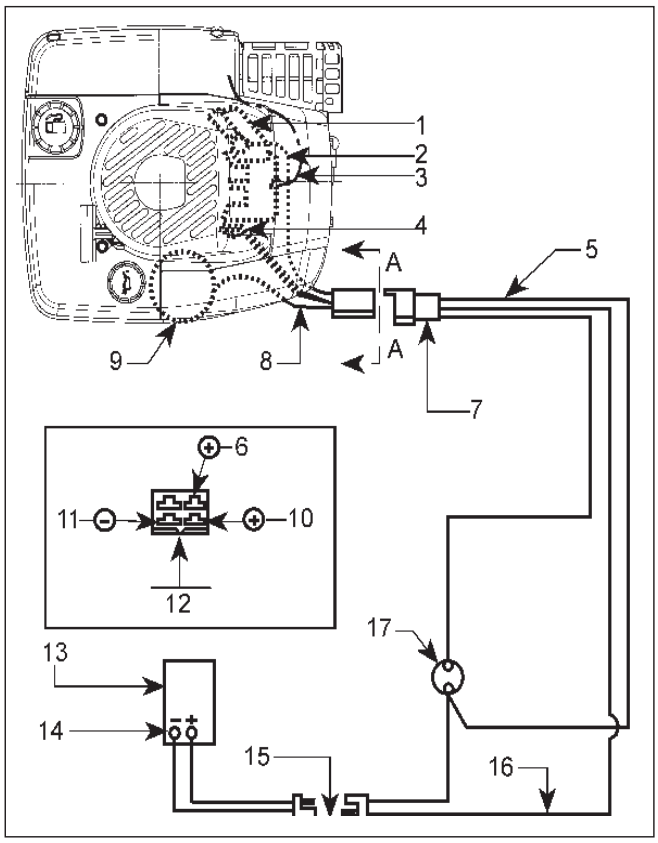


Fig. 29

a) BATTERY

The battery is a part of two circuits, starting and charging. Therefore before going into any extensive alternator or starter checks, the battery itself should be checked first. Ensure that it is fully charged by recharging for 24 hours with charger supplied. In low temperatures battery power reduces whilst power required to crank engine increases.

NOTE *- Loss of charge is normal and temporary during off season storage.*

Sealed Lead Acid Type Batteries

When not in use, store in a cool dry place. After storage, charge with charger unit supplied for 24 hours. Automotive type chargers must not be used as these can overcharge the battery causing extensive damage. The operation of the charger supplied can be checked by feel, it should be warm to the touch whilst in use. The charger has an output of approximately 100-150 mA, i.e. 1/10 of an Amp at 12V DC.

Maintenance instructions for sealed batteries

- Store battery in dry and ventilated area, disconnecting the battery from the wiring harnesses.
- Avoid storing discharged batteries. It is extremely important that it is fully charged before storing.
- If battery has discharged, it should be put immediately on recharge.
- Use only the charger supplied with the battery, or one with the following features:
- maximum current output 100-200 mA at 15 Volts DC.
- Before prolonged lawnmower storage, disconnect battery from engine wiring harnesses and ensure battery is fully charged.
- Avoid shorting battery terminals. The high current delivered by batteries can overheat and destroy the insulation and internal connections.

b) ALTERNATOR

A single coil alternator is fitted alongside the ignition coil (Fig 30) and utilises the same flywheel magnets as the ignition coil. The air gap is 0.30 mm and is set in conjunction with the HT coil assembly. The alternator has an output of 325-350 mA at 3000 rpm which is sufficient to keep the battery charged under normal working conditions.

Air gap setting

Loosen all lamination screws, turn flywheel so magnet is centred across from solid state module using air gap gauge, part no. 26990003 (gauge for 0.30 mm air gap). Tighten ignition coil screw (right side). Rotate flywheel and repeat procedure setting 0.30 mm air gap between alternator coil laminations and magnet. Tighten all alternator screws

To check the system, remove the plastic connector housing by inserting a small bladed screwdriver or similar device to release the spade connector. (Fig 31).

Connect one probe of a continuity meter to the lead of the alternator, the other probe to an unpainted surface on the engine for ground. Reverse the meter probes. If continuity exists in both probe positions, the alternator assembly must be replaced. (Continuity should exist in one of two probe positions only). If there is no continuity in both probe positions, the assembly must be replaced.

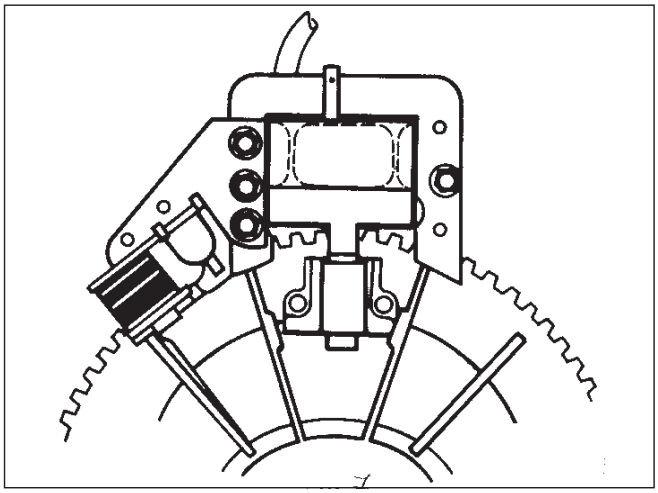


Fig. 30

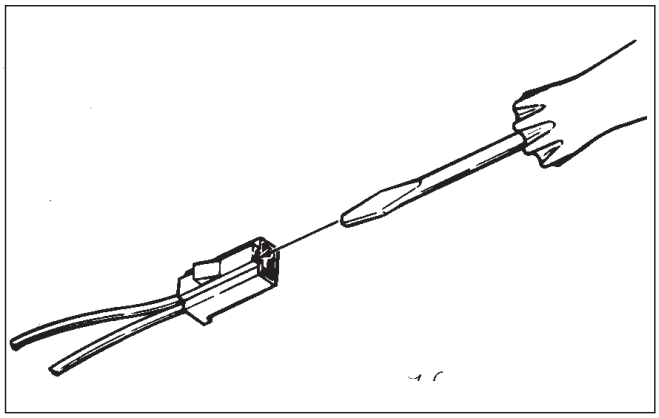


Fig. 31

c) STARTER MOTOR TROUBLESHOOTING STARTERS

STARTER DOES NOT FUNCTION

Check for:
- No current to the starter caused by faulty connections or dead battery.
- Faulty safety switches, ignition or starter switch or solenoid.
- Engine locked up or parasitic load on engine.
- Shorted open or grounded field coil.
- Open, shorted or bent armature.
- Brushes sticking or damaged.
- Dirty or oily brushes or commutator.

STARTER CRANKS ENGINE SLOWLY

Check for:
- Battery discharged or weak.
- Parasitic load or "tight" engine.
- Worn brushes or weak brush springs.
- Dirty, oily or worn commutator.
- Worn bearings in cap assemblies.
- Defective armature.

STARTER SPINS, ENGINE DOES NOT CRANK.

Check for:
- Pinion gear sticking on shaft.
- Damaged pinion or flywheel ring gear.

DRIVE ASSEMBLY SERVICE

Pinion gear parts should be checked for damage or wear. If the gear sticks on the shaft it should be washed in solvent to remove dirt and grease and dried thoroughly. If damaged, replace parts.
The unit is disassembled by removal of the two end cap screws, the bendix gear is secured by a snap ring at the shaft end.
If starter is sluggish in operation, remove end cap and check condition of armature and brushes; if brushes require replacing the complete end cap must be replaced. (Fig 32).

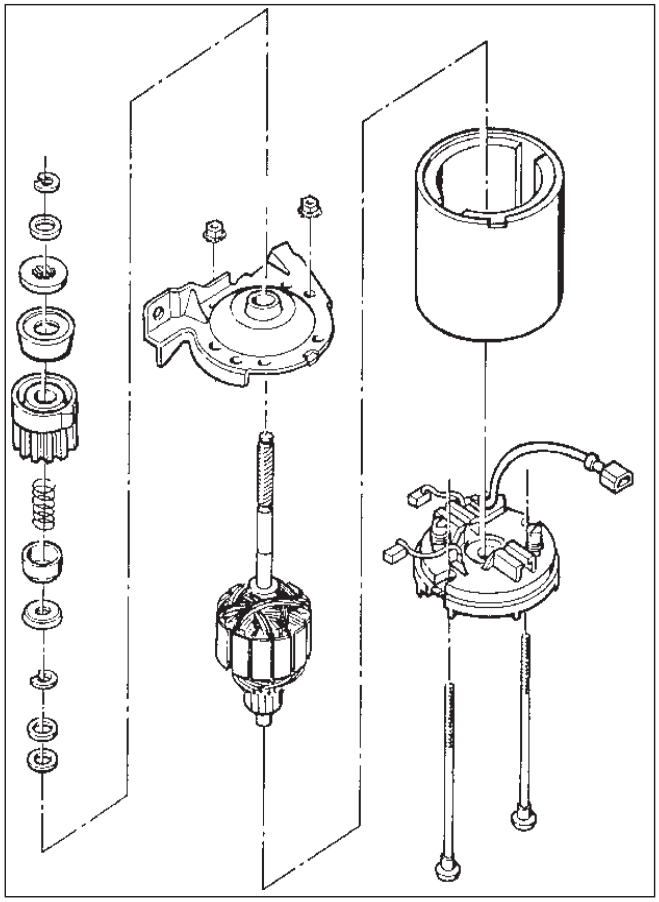


Fig. 32

ARMATURE CHECK

If commutator bars are glazed or dirty, they can be turned down in a lathe. While rotating hold a strip of “00” grade abrasive paper lightly on the commutator, moving it back and forth. **Do not use emery cloth.** (Fig 33).
Recut grooves between commutator bars to a depth equal to the width of the insulators.

Using a continuity tester to make certain no continuity exists between the commutator (copper) and the iron of the armature. Rotate armature and check all commutator bars (Fig 34).

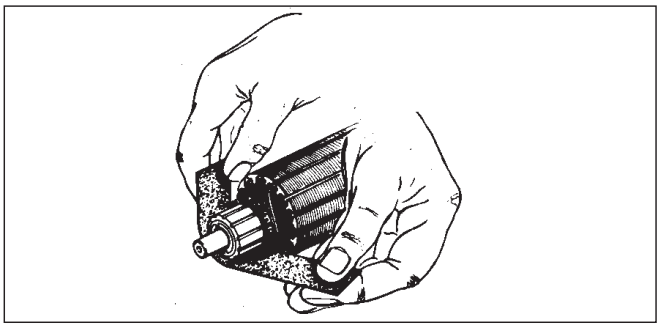


Fig. 33

Re-torque starter mounting bolts to 80÷90 inch lbs (9.0÷10 Nm).

***NOTE** - If it is necessary to replace either the starter pinion and/or the flywheel due to damaged teeth, it is essential that the starter pinion to flywheel ring gear mesh is checked on re-assembly. The correct mesh is 1.5 mm (1/16") between the head of the pinion gear tooth and the base of the flywheel gear tooth. Correct adjustment can be accomplished by de-forming the starter mounting bracket accordingly.*

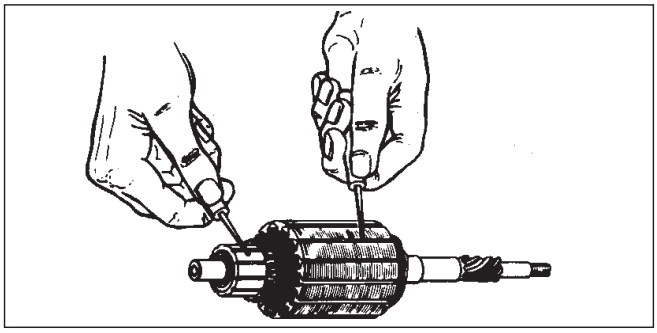


Fig. 34

D. FLYWHEEL BRAKE SYSTEM

Tecumseh's Flywheel Brake System provides consumer safety by shutting down the engine and lawnmower blade within seconds after the operator releases the engine/ blade control at the handle of the lawnmower.
The Brake Starter Mechanism may be used with either of two options for starting:

1. Manual Rope Start
2. 12 Volt Starter System

Each system requires the operator to start unit behind mower handle in operator zone area. The electric start system also provides a charging system for battery recharge when engine is running.

- TO STOP ENGINE (Fig 1). In the stop position the brake pad (**A**) is applied to the inside edge of the flywheel; at the same time the ignition system is grounded out (**B**).
- TO START THE ENGINE (Fig 2). In order to restart the engine, the brake control must be applied. This action pulls the brake pad (**A**) away from the inside edge of the flywheel and opens the ignition ground switch (**B**). On electric start systems the starter is energized to start the engine.
  On non-electric start systems, recoil starter rope must be pulled to start engine.

WIRING DIAGRAMS (Electric Start Systems) (Fig 3).
All wiring beyond the connectors on the engine are supplied by the equipment manufacturer. Check all terminals and connectors for corrosion and adequate contact, and all wiring for damage and proper size.

BATTERY
Check battery following the manufacturer's recommendations. The charging system on the engine maintains the battery during normal use.

***CAUTION**:*
- *Disconnect battery from engine before servicing.*
- *Before removing flywheel, remove brake pressure from flywheel to make removal of flywheel easier.*
- *Compress spring by moving lever toward spark plug and when hole in lever (**A**) aligns with hole in bracket (**B**), secure lever in this position with alignment tool 670298 (Fig 4). Remove flywheel per normal service procedure as outlined under IGNITION section of this manual.*
  Do not damage brake pad or brake mechanism.

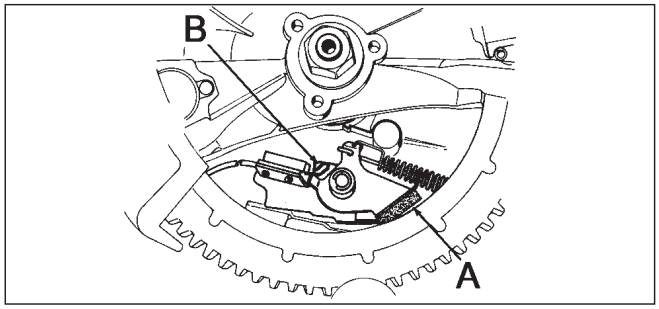


Fig. 1

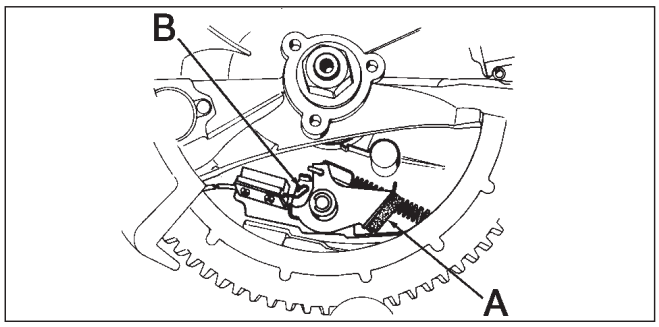


Fig. 2

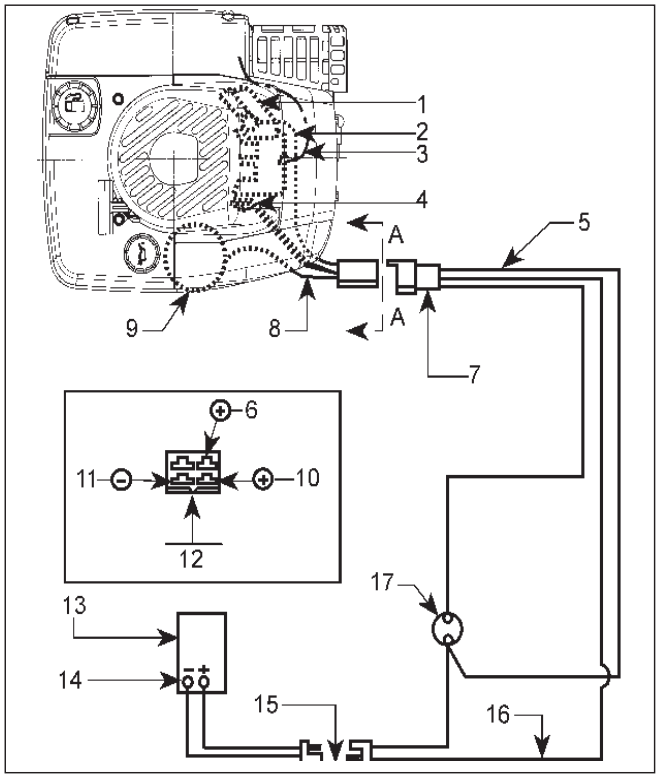


Fig. 3

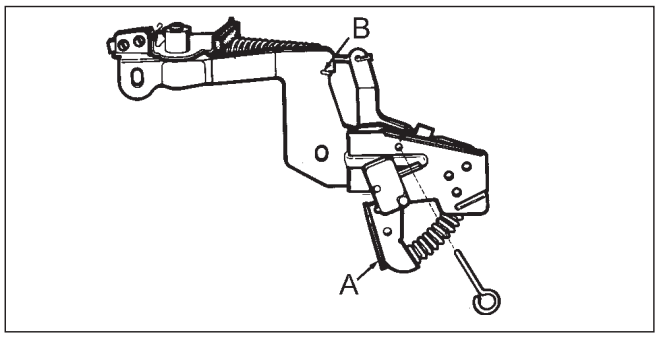


Fig. 4

FLYWHEEL REASSEMBLY (Fig 5)

1. Brake lever compressed with alignment pin in place. Inspect brake pad (**A**) to be free of dirt, oil or grease. If pad is contaminated, or less than 1.5 mm (.060") at narrowest point, replace.
2. Determine if grounding clip is in correct position (**B**).
3. Install flywheel. Be certain that ground wire to grounding clip does not touch flywheel.
4. Torque flywheel nut to 50Nm (35 foot pounds).

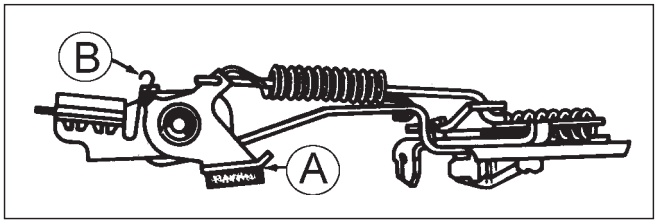


Fig. 5

BRAKE MECHANISM INSTALLATION (Fig 6)

If the brake assembly is removed during service to the engine, reassemble the brake mechanism in the lowest position on the mounting holes (**A**). Re-torque screws to 10Nm (90 inch pounds).

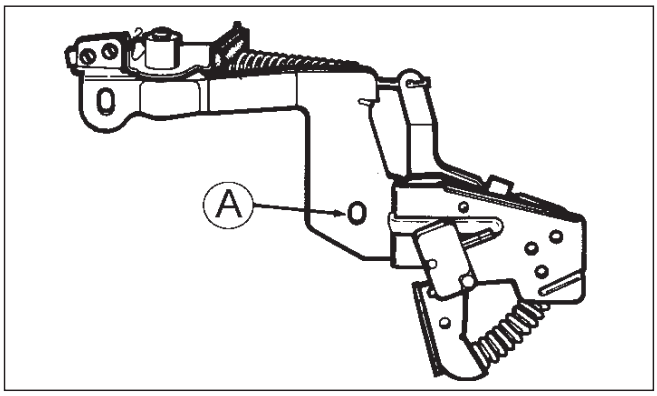


Fig. 6

CONTROL CABLE CONDUIT CLAMP SCREW (Fig 8,A).

If not using a service part screw, be certain the screw length does not extend to prevent free travel of lever.

CONTROL SWITCH (Fig 7,A)

The brake lever must close the switch before the starter can be engaged.

THIS SYMBOL POINTS OUT IMPORTANT SAFETY INSTRUCTIONS WHICH IF NOT FOLLOWED, COULD ENDANGER THE PERSONAL SAFETY AND/OR PROPERTY OF YOURSELF AND OTHERS. READ AND FOLLOW ALL INSTRUCTIONS.

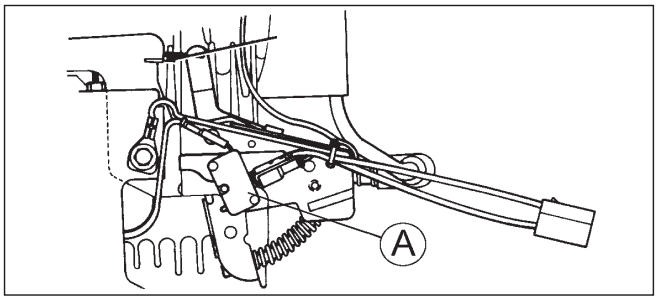


Fig. 7

- DISCONNECT BATTERY FROM CIRCUIT BEFORE MAKING CHECK.
- To perform a continuity check of the switch, use a continuity light or meter. Remove starter wire from starter terminal of switch. With one of the continuity unit's probes inserted in the brake start mechanism's terminal red wire connector and the other lead to the starter terminal (on switch), press the switch button; the light or meter should indicate continuity. If not, replace switch. If continuity exists without pressing switch button, replace switch.

To replace switch (Fig 9).

Carefully grind off the heads of rivets, remove the rivets from the backside of brake bracket. Use the self-tapping screw to make threads in the bracket, install the switch to the brake bracket in the proper position and secure the switch to the bracket with the machine screws.

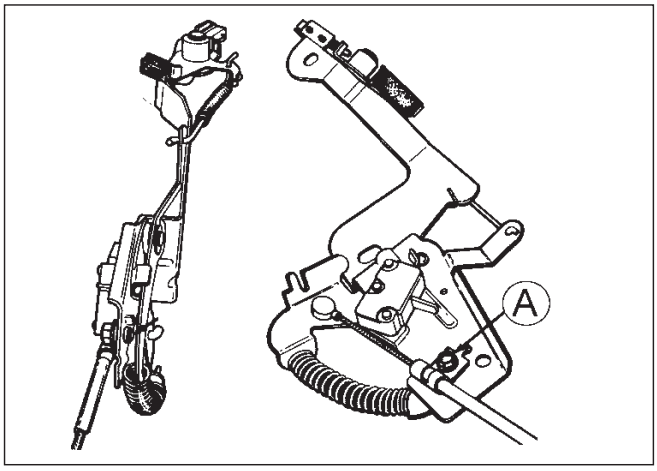


Fig. 8

- Be careful, over-tightening of the screws could break the switch.

- For electric starter maintenance see Starter Section, Chapter C.

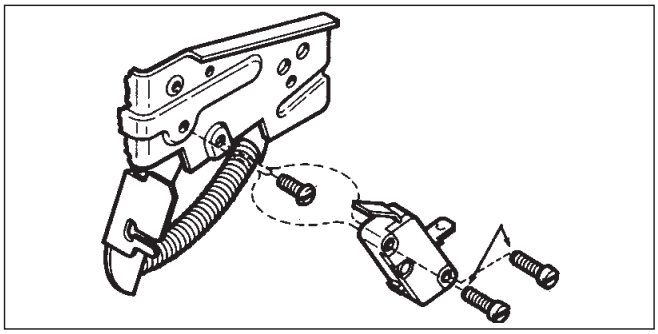


Fig. 9

E. IGNITION SYSTEM

GENERAL

Two types of ignition systems have been used:

- CONVENTIONAL IGNITION SYSTEM consisting of flywheel with built in magnets, ignition coil, condenser and breaker points. Depending on the model and year of production, the configuration will vary but service on these systems is identical.

- SOLID STATE SYSTEM (CDI) consisting of flywheel with built in magnets and a solid state electronic module.

Fig. 1. CONVENTIONAL IGNITION SYSTEM (Internal coil) LAV - HBL - AV - MV

REMOVAL OF FLYWHEEL (NOT MV OR BH TYPE)

- Remove air shroud complete with starter (Fig 2).
- Remove flywheel nut and starter hub using strap wrench part number 670305 or '**C**' spanner 670217 to prevent flywheel from turning (Fig 3).
- Using special tool 670103 for 7/16 UNF crankshaft or 670169 for 1/2 UNF crankshaft screw fully on and back off one turn.
- Supporting the flywheel underneath, strike the tool squarely with a sharp blow from a hammer to break the flywheel loose. (Fig 4).

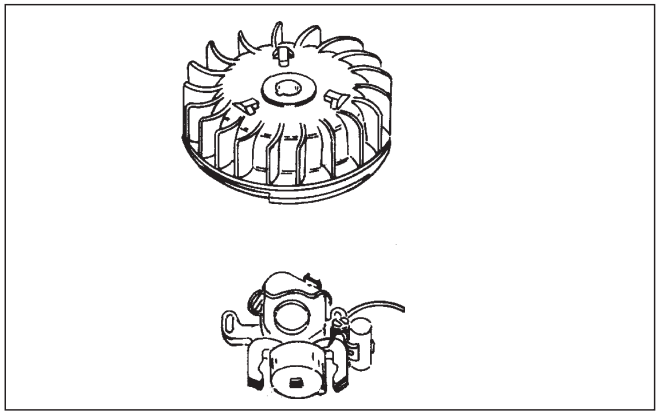


Fig. 1

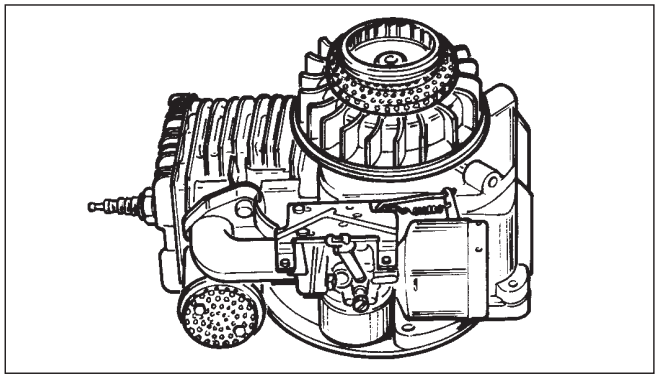


Fig. 2

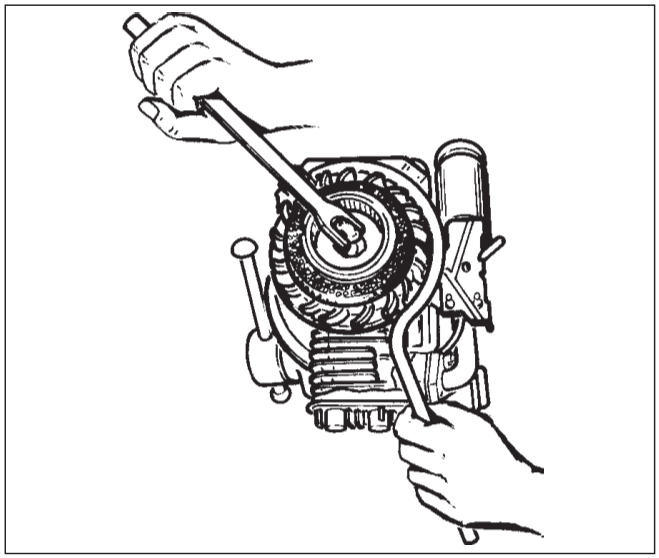


Fig. 3

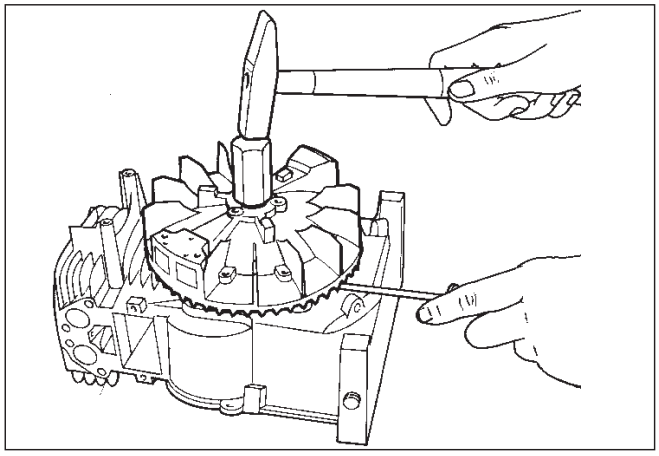


Fig. 4

The standard method of flywheel removal used on other engines can damage the main bearing ball races.
In order to remove the flywheel in the correct way, proceed as follows:

- Remove the other parts in the standard way (air shroud, flywheel nut, starter cup etc.)
- Place tool 670306 as per Fig 5 locating the centre bolt on to the crankshaft.
- Place the 3 self threading screws of the tool in the 3 holes of the flywheel and tighten to at least 2 turns.

***NOTE** - The screws should be tightened an equal number of turns.*
By using a 11/16 wrench, the centre bolt can now be tightened. In this way the flywheel can be removed (see Fig 5). For remounting the flywheel, proceed as usual.

***NOTE** - SUBSEQUENT REMOVAL*
In this case, the flywheel holes will already be threaded. To ensure sufficient grip on the flywheel, the self threading screws should be inserted at least one turn more than the existing threads.

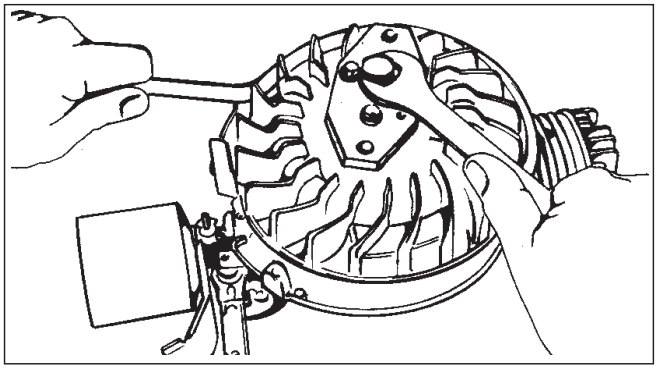


Fig. 5

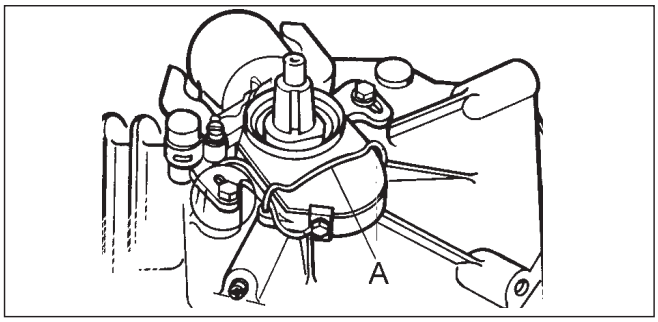


Fig. 6

CHECKING INTERNAL PARTS

- Remove retaining clip **A**, and breaker box cover, and make visual check. (Fig 6).
- Points gap - see table, if adjustment is necessary loosen screw securing static point and reset using feeler gauge.
- Clean contacts with fine emery or contact file.
- Remove all traces of oil, if oil is present in the breaker box it will be necessary to renew the crankshaft oil seal.
- Check all wires and connections.
- With an ignition tester check the efficiency of the coil and condenser (if a tester is not available it may be necessary to test with new units).
- Reassemble and carry out spark test. If engine does not run correctly, the condenser may be suspect; this is usually indicated by burning of the contacts. (Always replace a condenser if points are burned).

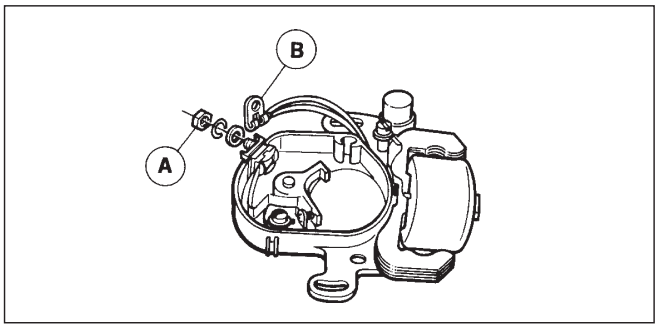


Fig. 7

To replace breaker points

- Remove nut '**A**' securing terminal to breaker points. (Fig 7).
- Remove breaker by lifting out and simultaneously easing insulator block '**A**' from box. (Fig 8).
- Detach static point by removing securing screw **A**. (Fig 9).
- Inspect points and replace as necessary.
- Position static point in box and locate with securing screw leaving screw loose for adjustment.
- Fit moving point, secure with nut and reconnect wires.

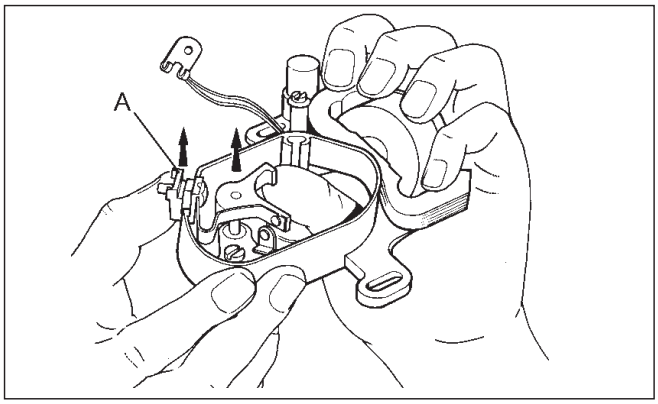


Fig. 8

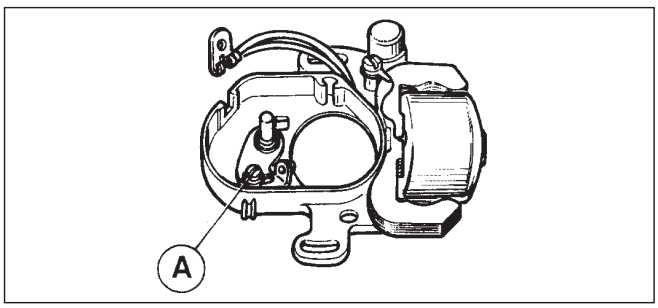


Fig. 9

Cleaning points

To clean the points in position:

- Rotate engine until points are open. Insert a piece of smooth emery.
- Close points in order to grip emery and clean.
- Open points and remove all traces of dust. (Fig 10).

To adjust points

- Adjust points gap to 0.45 ÷ 0.50mm (.020") as follows (see Breaker point setting table).
- Turn engine to bring cam heel to widest opening point.
- Insert feeler gauge and with the aid of a screwdriver fitted in slot '**A**' (Fig 11), gently close points until a «drag» is felt on the feeler.
- Tighten points securing screw.

COIL INSPECTION

- Inspect coil for damage, cracks, bad insulation or signs of overheating. Check all leads, particularly at point of entry to coil.
- Check coil efficiency on a tester with coil mounted on stator (Fig 12).
- Check coil outer insulation for leaks with tester (Fig 12). If a tester is not available, the engine may be tested with a new coil.

COIL REPLACEMENT

- Remove coil by releasing retainer spring '**A**' or by straightening the lamination of the core '**B**' (Fig 13).
- Disconnect all leads and unsolder terminal '**A**' (Fig 14).
- Completely detach coil (Fig 15).
- Reverse the procedure for refitting.

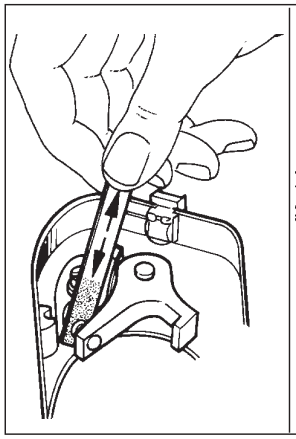


Fig. 10

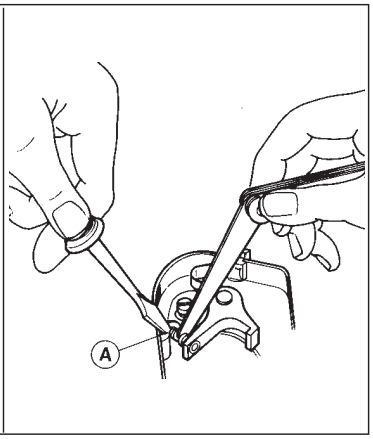


Fig. 11

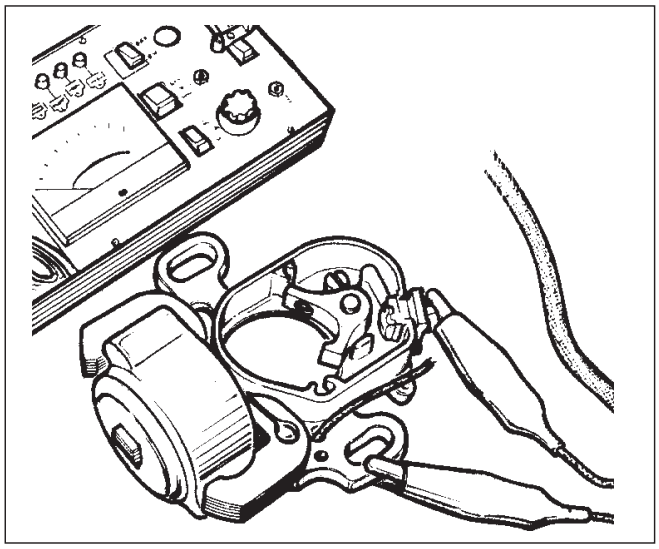


Fig. 12

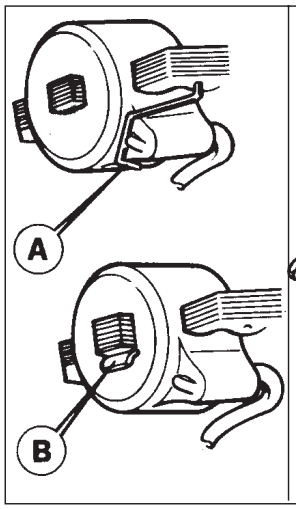


Fig. 13

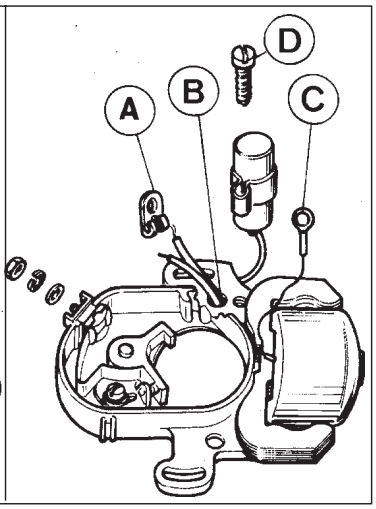


Fig. 14

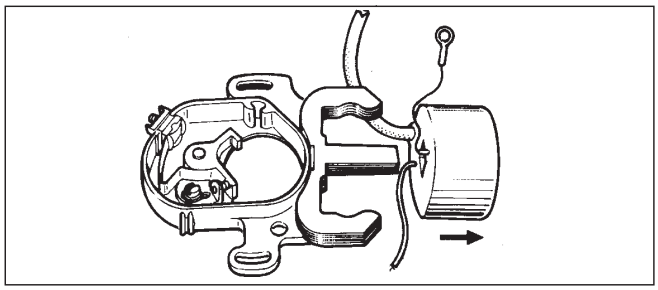


Fig. 15

CONDENSER CHECKING:

- Check for external damage
- Check condenser efficiency with tester.

CONDENSER REPLACEMENT (Fig 14).

- Unsolder wire from terminal '**A**'
- Remove wire from hole '**B**'.
- Remove condenser securing screw '**D**'.
- Reverse procedure for refitting.

***NOTE** - During soldering operations, remove terminal '**A**' from screw in order to prevent damage to insulator.*

2. CONVENTIONAL IGNITION SYSTEM EXTERNAL COIL BV SERIES

On BV engines an external coil ignition system is fitted. On this model the coil assembly is mounted on two pillars cast on the cylinder (Fig 16).

***NOTE** - Attention should be paid to the routing of wires and of HT lead.*

The flywheel fitted to this system has the magnetic mass located on the outside of the flywheel (Fig 17-B).

The technical advantages of this system are:

- More consistent spark at low rpm
- Fixed timing
- Adjustable air gap (set to 0.38 mm) - .015"

BREAKER POINTS

The points are accessible by removal of the flywheel and adjustment is the same as the internal coil system (0.5 mm .020")

LAMINATION/FLYWHEEL AIR GAPS

To set air gap, proceed as follows:

- Set coil at maximum gap
- Position flywheel magnets **B** as per Fig 16
- Place a 0.30 mm gauge or metal strip of at least 100 mm in length across the magnets. (Fig 18).
- Rotate the flywheel to position the magnets opposite the coil, slacken the coil securing bolts, following which the coil should be attracted to the gauge; tighten the securing bolts and remove gauge.

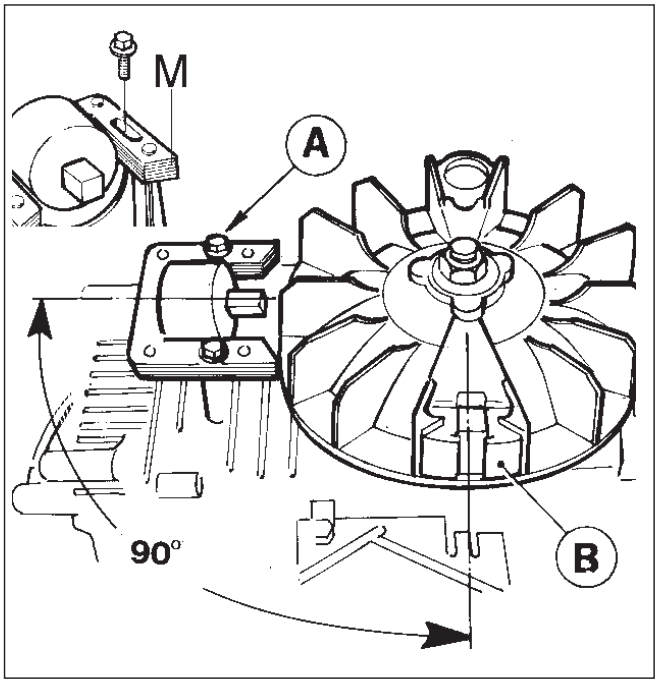


Fig. 16

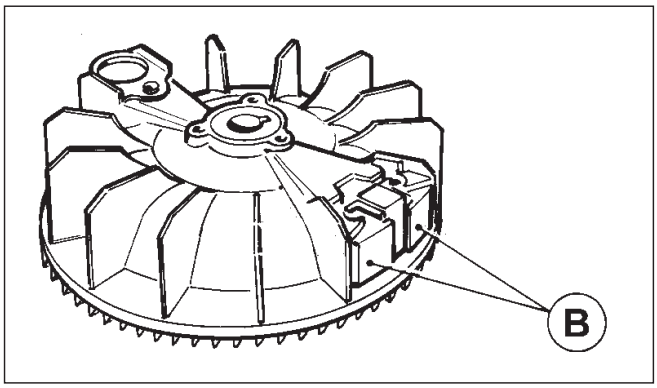


Fig. 17

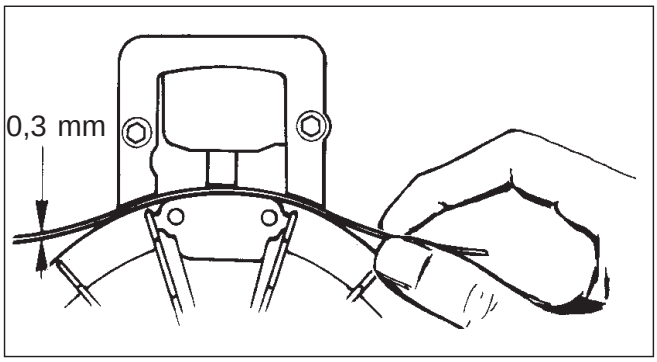


Fig. 18

3. IGNITION TIMING

GENERAL

All engines are correctly timed before delivery and the timing marked as in Fig 19 (Points Ignition).
On engines with outside coil and solid state, ignition timing is fixed.

TWO STROKE TIMING (Points Ignition)

- Set breaker points to 0.45 ÷ 0.50 mm (.20”).
- Remove sparking plug, insert a narrow rule on to piston top, place a straight edge across top of cylinder. (A special tool is available for this operation), (Fig 20).
- Turn crankshaft in direction of rotation and bring piston to top dead centre indicated by position of rule against edge or on scale of special tool.
- Refer to table for correct amount of advance. Turn engine in reverse direction until this is obtained, denoted by rule position against straight edge or scale on special tool.
- Slacken stator securing bolts and turn until points are just about to open. If a test light is not available for this operation, insert a piece of cigarette paper between the points and turn until paper just becomes free; at this point lock stator.

FOUR STROKE TIMING (Points Ignition)

- Set points to 0.45 - 0.50 mm (.020”).
- Accurate timing is best achieved by removing the cylinder head and gasket, turn engine to top dead centre and using gauge (Fig 22) set timing following the procedure for two stroke engines; special tools are available for this operation (Figs 21 and 22).
- Dial gauge timing tool - part no. 670241 (Fig 21) may be used without removal of the cylinder head.

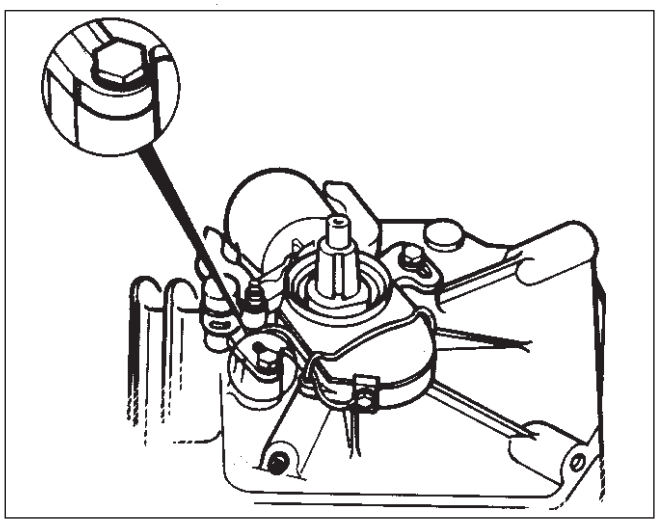


Fig. 19

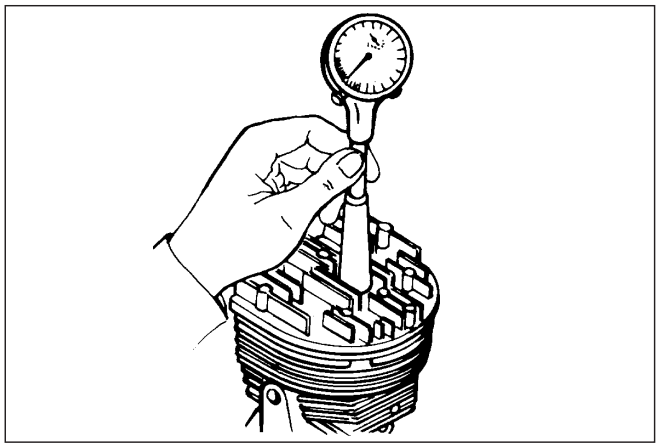


Fig. 20

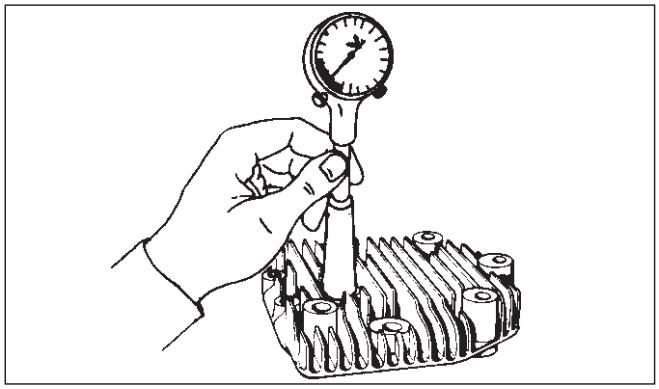


Fig. 21

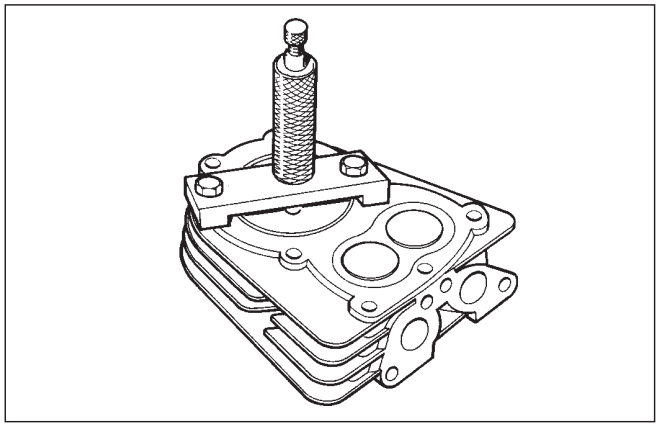


Fig. 22

4. SOLID STATE IGNITION SYSTEM (CDI) BVS - VANTAGE - PRISMA - SYNERGY - HTL - SPECTRA - FUTURA - BH - MV

This is an all electronic ignition system with all the components sealed in a module and is located outside the flywheel. There are no components under the flywheel, except a collar to hold the flywheel key in position.
It can be identified by the square configuration of the module and a stamping “Gold Key” to identify the proper flywheel key on early units. (Fig 23).

- The correct air gap setting between the flywheel magnets and the laminations of the solid state module is 0.30 - 0.40mm (Fig 24).
- Place gauge between the magnets and laminations, and tighten mounting screws to a torque of 30 ÷ 40 inch lbs (3.3 ÷ 4.5 N m).
- Recheck gap setting to make certain there is proper clearance between the magnets and laminations.

The solid state (CDI) module is protected by epoxy filler from exposure to dirt and moisture. This system requires no maintenance other than checks of the high tension lead and sparking plug.

SOLID STATE IGNITION OPERATION

As the magnets in the flywheel rotate past the charge coil, electrical energy is produced in the module. This energy is transferred to a capacitor where it is stored until it is needed to fire the spark plug.
The magnet continues rotating past a trigger coil where a low voltage signal is produced and closes an electronic switch (SCR).
The energy which was stored in the capacitor is now transferred through the switch (SCR) to a transformer where the voltage is increased from 200 volts to 25,000 volts. This voltage is transferred by means of the high tension lead to the spark plug, where it arcs across the electrode of the spark plug and ignites the fuel air mixture. (Fig 25).

Index Fig. 25

1. Flywheel Magnet
2. Loaded Coil
3. Silicone Controlled Rectifier (SCR)
4. Diodes
5. Secondary Coil
6. Spark Plug
7. Earth Connection
8. Condensor

Air gap settings

RPM	GAUGE TYPE Tolerance (mm)	Part No.	Size mm.
3000/3150	.20÷.30	670297	.30
3350/3850	.30÷.40	88841550	.40

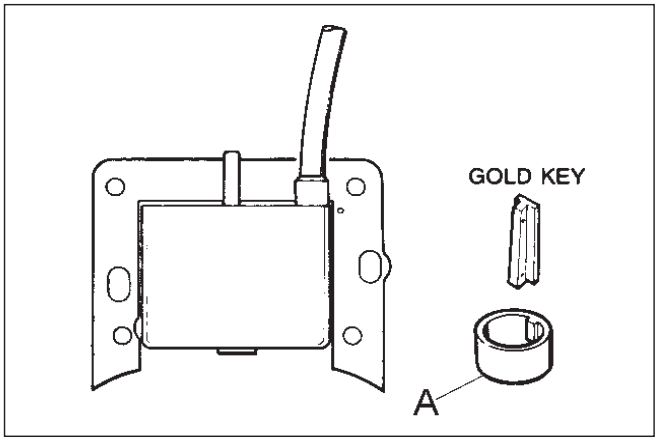


Fig. 23

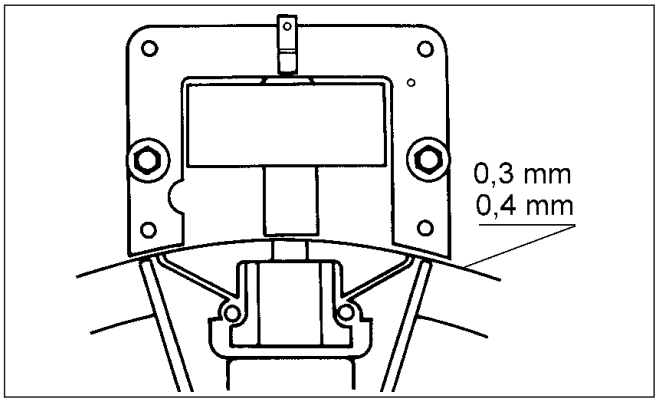


Fig. 24

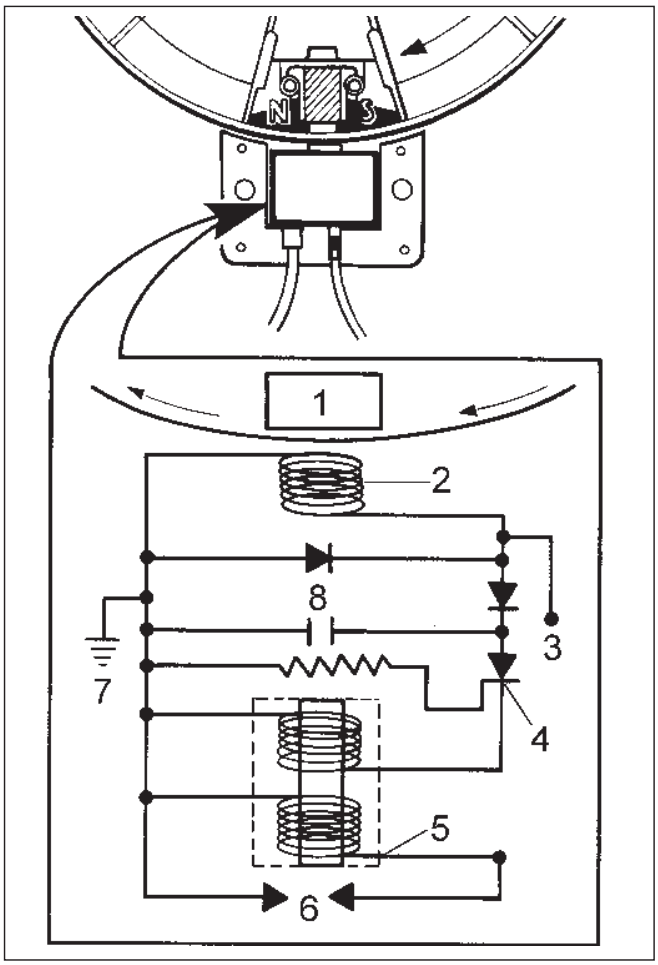


Fig. 25

4A. GROUND TO GO IGNITION UNIT (FLYMO MV100S)

Some Flymo Pilot machines (L47) have been built with an electronic ignition unit which operates the opposite way to conventional units.
This unit has to be earthed to start the engine and can be identified by a green collar at the base of the High Tension lead.

***NOTE** - This unit must not be used on any other application unless specified, or accidental starting when control is in "off" position could occur. always refer to the master spare parts list when ordering parts.*

5. SPARK PLUG (Fig. 26)

Check spark plug every year, or every 100 hours of operation.

- Clean area around spark plug.
- Remove and inspect spark plug.
- Replace spark plug if electrodes are pitted or burned, or if the porcelain is damaged.

For replacement use :

Champion RJ17LM or RJ19 LM for Side Valve & MV engines
Champion RN4C for OHV engines

***NOTE** - Side valve engines are fitted with a spark plug of 8mm reach (OHV 19 mm). The use of a spark plug with a longer thread will result in damage that is not covered by warranty.*

- If reusing the spark plug, clean it by carefully scraping the electrodes. (Do not wire brush or sand blast). Ensure entire spark plug is clean.

- Check electrode gap with feeler guage and set gap at 0.6 mm (.024") if necessary.

- Install spark plug in engine and torque to 2.1 kgm (15 ft lbs). If lacking torque wrench tighten securely.

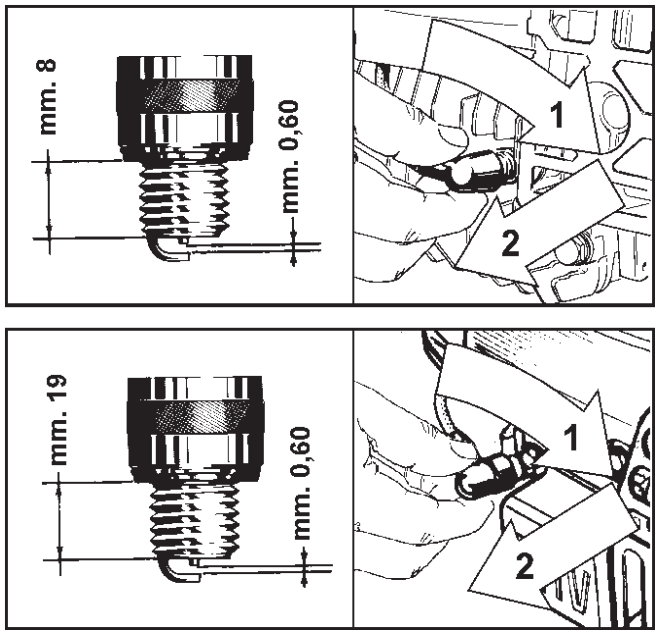
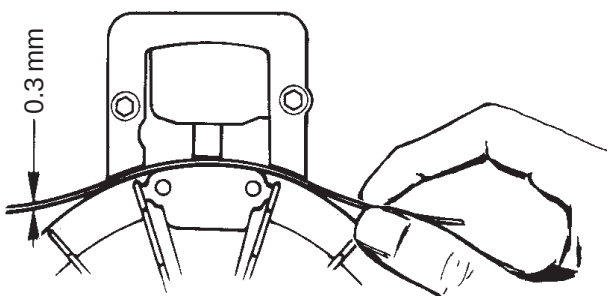


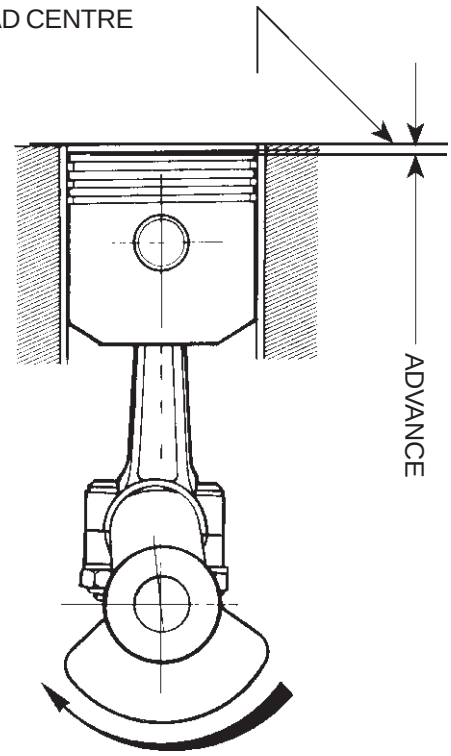
Fig. 26

4-STROKE ENGINE SPARK ADVANCE WITH SPARK IGNITION

ENGINE	SPARK ADVANCE	
	P.M.S. mm	P.M.S. inch
LAV-LAVR 30-35	1.070 - 1.770	3/64 - 1/16
LAV-LAVR 40-172	0.635 - 1.143	1/32 - 3/64
H 22 - 25 - 30	1.070 - 1.770	3/64 - 1/16
H 35	0.755 - 1.003	1/32 - 3/64
HS - HSB 40	0.635 - 1.143	1/32 - 3/64
HS - HBL 30	1.070 - 1.770	3/64 - 1/16
HS - HBL 35	0.755 - 1.003	1/32 - 3/64
HBL - HBP 40	0.635 - 1.143	1/32 - 3/64
BV 150 - BV 153 BVR 150	FIXED 0.635 - 1.143	FIXED 1/32 - 3/64
BV 172 - BVR 172 - BV 173	FIXED 0.635 - 1.143	FIXED 1/32 - 3/64

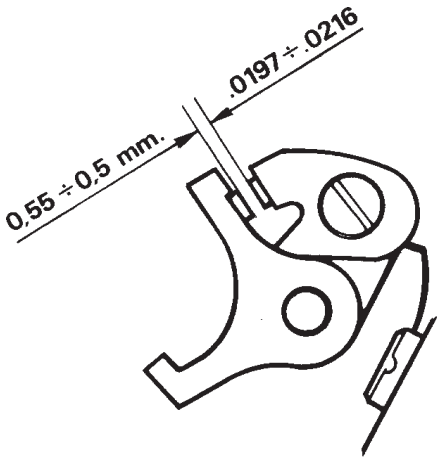


TOP DEAD CENTRE



DIRECTION OF ROTATION VIEWED FROM FLYWHEEL

DISTANCE BETWEEN POINTS



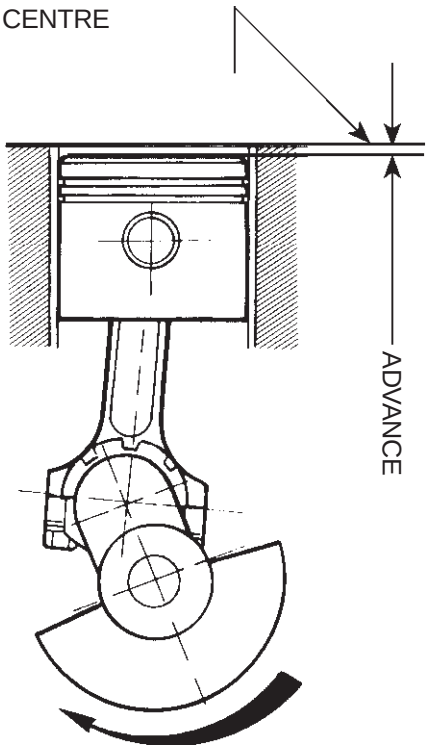
FIXED SPARK ADVANCE ON IGNITION SYSTEM WITH EXTERNAL COIL

The engines produced since 1984 are equipped with electronic ignition.

2-STROKE ENGINE SPARK ADVANCE

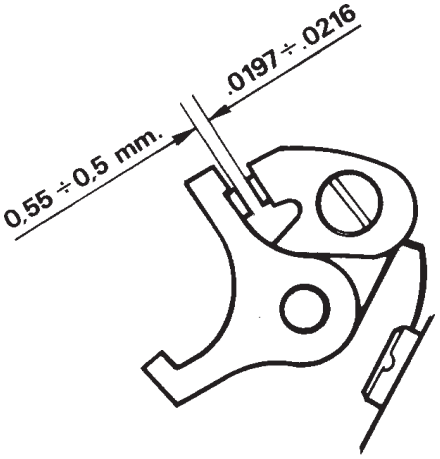
ENGINE	ADVANCE	
	P.M.S. mm	P.M.S. inch
TA	3.09 - 3.75	1/8 - 9/64
TA MARINO	3.99 - 4.48	5/32 - 11/64
VA	3.02 - 3.70	1/8 - 9/64
VA MARINO	4.05 - 4.55	5/32 - 11/64
AH 81 MARINO	3.78 - 4.75	5/32 - 3/16
AV 47	4.42 - 5.03	11/64 - 3/16
ZH	FISSO	FISSO
AV520 - 521 - 525 AV600 - 601 - 605	2.25 - 2.75	3/32 - 7/64
MV100 S	2.25 - 2.75	3/32 - 7/64
AV750 - 755 AV125	2.00 - 2.50	5/64 - 7/64
MV100 - MV100 S PRODUCED SINCE 1986	ELECTRONIC IGNITION	ELECTRONIC IGNITION

TOP DEAD CENTRE



DIRECTION OF ROTATION VIEWED FROM FLYWHEEL SIDE

DISTANCE BETWEEN POINTS



Engine models MV100-MV 100 S, produced since 1986, are equipped with electronic ignition.

F. AIR FILTERS

GENERAL

Owing to the nature of the work for which an air cleaner is designed, it follows that it must have a direct effect on the carburation. It is, therefore, essential that it is kept perfectly clean and correctly maintained at all times. Its function is to protect the inner parts of the engine from dust particles present in the air, a condition which is generally aggravated by the operation of the machine.
Should the air cleaner maintenance instructions not be strictly adhered to, dirt and dust collected in the cleaner could enter the engine or cause overchoking, resulting in too rich a fuel mixture. Both the above conditions reduce engine life.
These impurities in a 4 stroke engine or admitted in the mixture of a 2 stroke engine, form an abrasive which promotes excessive wear to moving parts.
When a 4 stroke engine becomes overchoked due to a dirty air cleaner, an excessive amount of petrol is drawn into the cylinder, flushing the cylinder wall, resulting in insufficient lubrication. It is therefore important that operators observe the instructions on air cleaner maintenance.
Engine operation is impaired by an air cleaner in bad condition and no warranty is granted to users who do not carefully follow the air cleaner servicing instructions.
Tecumseh engines are fitted with the following types of air cleaners:

1. POLYURETHANE TYPE AIR CLEANER

This consists of a polyurethane foam element retained in its housing by a cover (Fig 1). A metal grill is fitted in the base of the container to prevent the element being drawn into the engine.
Maintenance of this type is carried out by washing the polyurethane foam element in a mixture of water and household detergent, providing that the element is thoroughly dried before re-oiling.
(Should the foam element be excessively impregnated with dirt after prolonged use, replace it).
After this cleaning operation, wet the polyurethane foam with a spoonful of mineral oil and squeeze it lightly to obtain a uniform distribution of the lubricant through the element. Clean the container and re-fit the element.

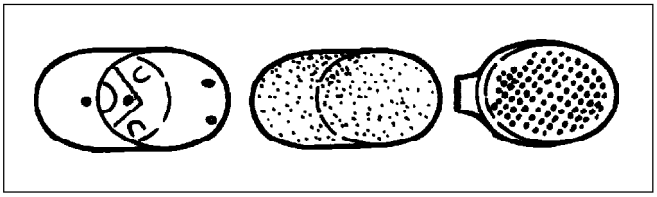


Fig. 1

2. MUFFLER ON POLYURETHANE AIR CLEANER

The intake muffler is fitted on the standard polyurethane air cleaner.
The cover has been modified by adding 3 holes (Fig 2) in order to secure the muffler by means of 3 self-threading screws.
The muffler consists of a plastic cover with 3 air vent tubes. These tubes are drilled and placed in such a way as to reduce intake noise (Fig 3).

DISASSEMBLY AND MAINTENANCE

- For disassembly, first remove the muffler cover group (Fig 4).
- Unscrew the 3 self-tapping screws and detach the 2 parts.
- Clean the inside of the muffler with petrol thoroughly.
- Clean the other elements of the air cleaner (foam, metal grill etc) as described before.
- Re-assemble the air cleaner and fit the muffler to the filter cover before the latter is secured to the filter body.

***NOTE** - The internal holes of the muffler (Fig 4) must be always perfectly clean and should not show any moulding defects (burrs) otherwise carburation may be affected.*

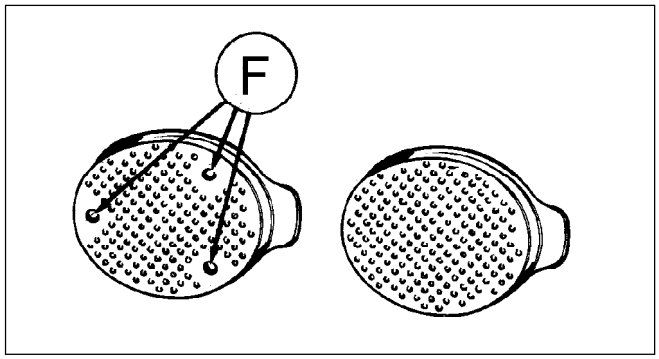


Fig. 2

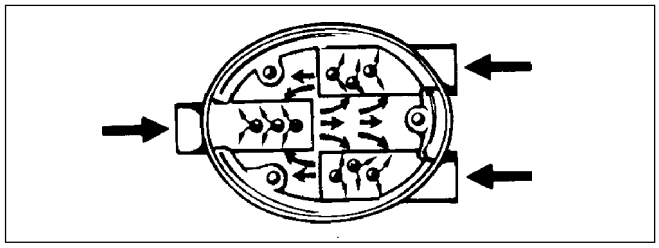


Fig. 3

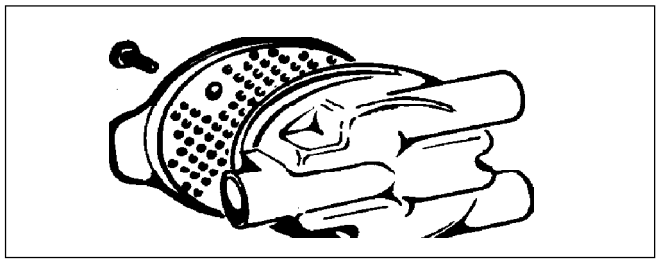


Fig. 4

3. POLYURETHANE AIR CLEANER WITH SNORKEL

A snorkel type pre-cleaner is available to meet the requirements of manufacturers of equipment operating in extremely dusty conditions. This consists (Fig 5) of a standard polyurethane filter with a specially shaped cover to which is attached a plastic hose, carrying at the intake end, a paper cartridge filter. The advantage of this type of filter is to take in air from a point where dust is at a minimum.
Servicing of this assembly is carried out in three stages:

- **Paper air cleaner.** Clean paper filter by compressed air or by tapping on a hard surface. Replace if excessively clogged.

- **Hose.** Wash hose from inside with a flow of water and detergent to remove any dust deposits, check hose for damage and loose connections.

- **Polyurethane element.** Service as for other types.

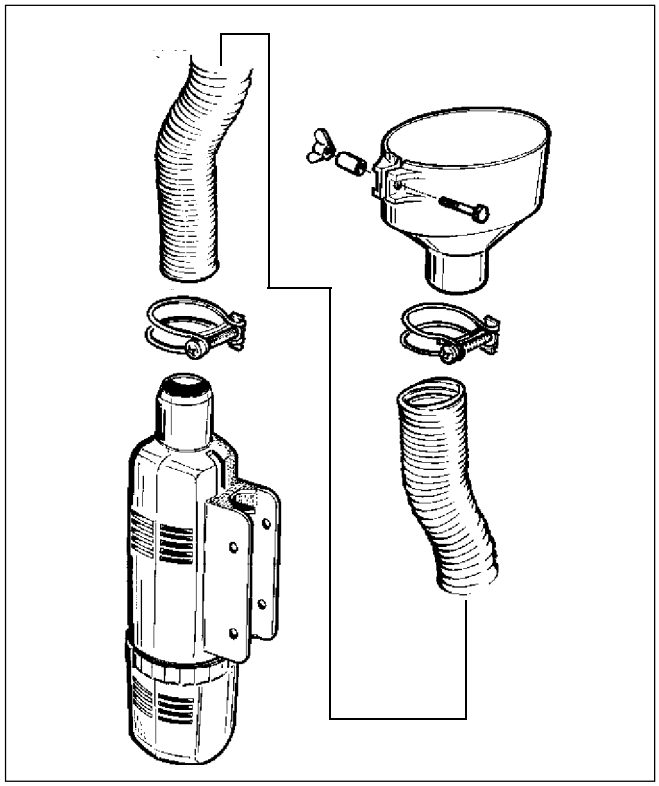


Fig. 5

4. CLEAN.ASP.AIR

LAV ENGINES

As illustrated in Fig 6, reverse flow air is taken from the flywheel fan so that by centrifugal effect, all dirt and dust and particles are removed from the intake pipe area.
The clean air enters tube **A** (Fig 7) and flows into a pre-cleaning chamber **B** before passing through a large dimension polyurethane air filter **C**.

Fig. 7

A Air enter tube
B Chamber
C Polyurethane filter

The maintenance of the polyurethane element must be carried out following the same instructions as for the previous type.
Essential points:
- Wash in petrol
- Dry out
- Impregnate element with a spoonful of SAE 30 oil
- Knead uniformly to distribute the oil

BV ENGINES STANDARD

The Clean-Asp-Air fitted on earliest BV engines has the same working and element maintenance of the Clean-Asp-Air filter on LAV range, but different design. (Fig 8).

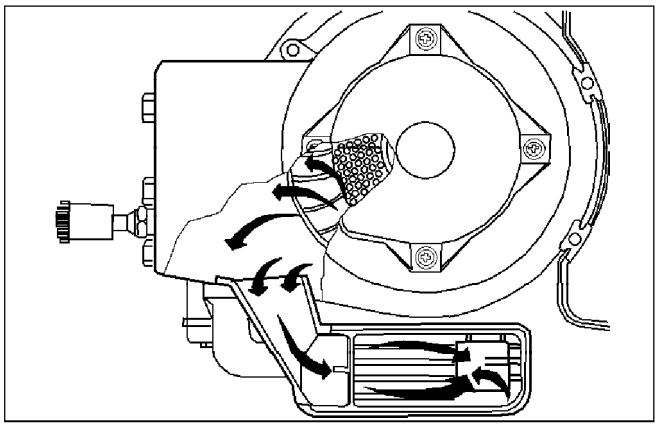


Fig. 6

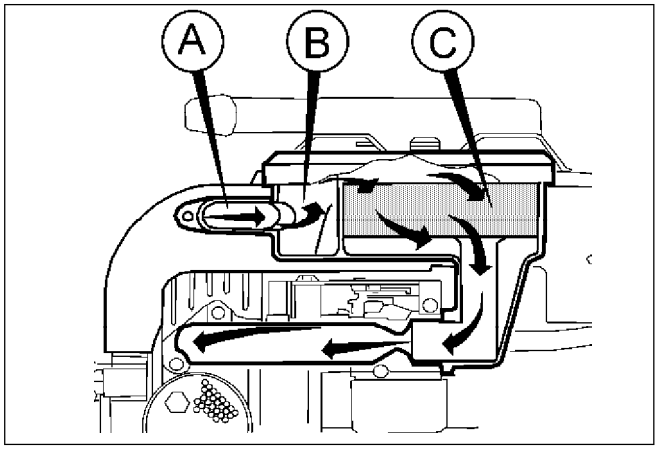


Fig. 7

5. OIL BATH FILTER (Fig. 9)

TO SERVICE FILTER:

The oil bath filter is only efficient when the oil is at the level indicated on the bottom of the container (Fig 9-D). Check oil level every five (5) hours. If not to correct level, refill container using a similar oil to that used in the engine. Change oil once a year or more often when operating in extremely dusty conditions.
Clean and re-oil foam every 10 operating hours and change it every 50 hours or more often if used in extremely dusty conditions.

FILTER MAINTENANCE

a. Remove the cover **A** from the filter body (twist counterclockwise).
b. Remove the foam filter (**B**) from the cover.
c. Wash in water and detergent solution and squeeze (don't twist) until all dirt is removed.
d. Rinse thoroughly in clear water.
e. Wrap in a clean cloth and squeeze (don't twist) until completely dry.
f. Saturate with engine oil and squeeze (don't twist) to distribute oil and remove excess oil.
g. Clean the filter body (**C**) and refill with clean oil up to level indicated (**D**).
h. Replace filter foam and refit cover ensuring this is correctly secured.

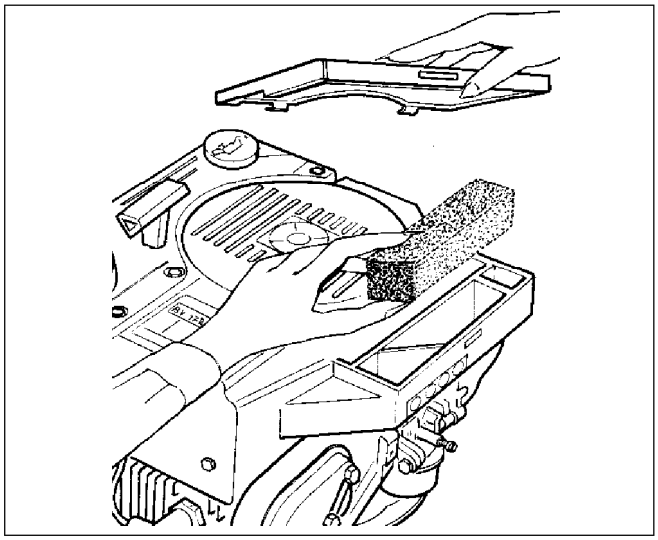


Fig. 8

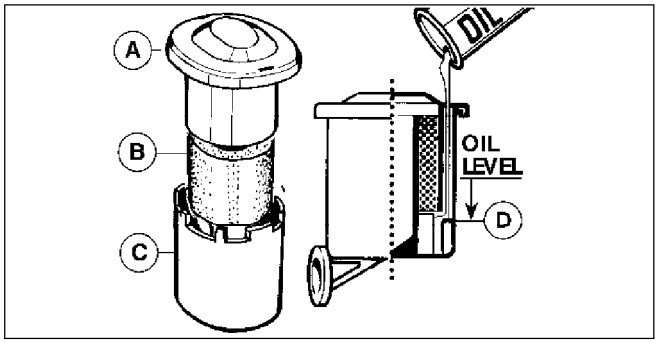


Fig. 9

6. AIR CLEANER FOR FLYMO

Two stroke engines fitted to Flymo Airborne Rotary lawnmowers (Hover mowers) are equipped with a “Turbo” air filter of Flymo design and origin. Parts for these filters should be obtained from your usual Flymo stockist.

Maintenance Instructions (Fig 10):

- Remove the two screws (**D**) which retain the filter cover. Take off the cover (**A**) and remove the two filters (**E**) and (**F**).
- Clean inside the filter cover (**A**) thoroughly
- Shake or tap the thick black filter (**E**) to remove any dirt or dust. If the thin white filter (**F**) is oil soaked and/ or covered with dust, replace it.
  DO NOT OIL THE FILTERS
- Replace the thicker filter (**E**) in the recess of the filter cover and the thinner one (F) on top, taking care not to crease them.
- Clean the plastic filter body (**G**) with a small brush.
- Replace the filter cover (**A**) and the two retaining screws.
- It will only be necessary to remove cap (**B**) by taking out the two screws (**C**) if there is visual evidence of grass or excess dust.

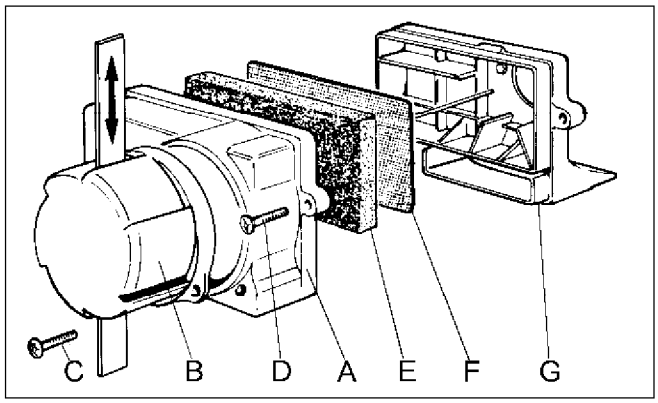


Fig. 10

7. DUAL POLYURETHANE AIR CLEANER WITH SNORKEL (Fig. 11)

OPERATION

Similar to polyurethane air cleaner with paper element and snorkel except in this instance there are two polyurethane filters.
One filter element is located in a housing before the carburettor and the other element is situated at the end of the snorkel flexible pipe usually fitted at the top of the machine handlebars. Again this system is used when equipment is used in extremely dusty conditions.

Fig. 11

1. Filter element
2. Filter body
3. Snorkel tube
4. Pre-filter body
5. Pre-filter element
6. Pre-filter cap

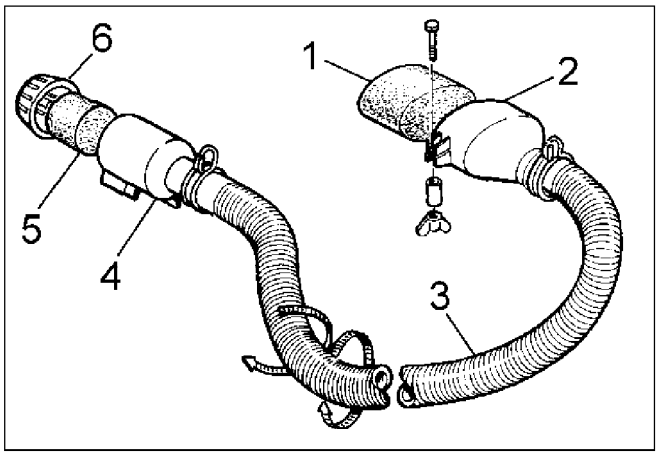


Fig. 11

Service filter elements every 25 operating hours, or more often if conditions are extremely dusty.
Wash the polyurethane foam element in a mixture of water and household detergent ensuring that the element is thoroughly dried before re-oiling.
(Should the foam element be excessively impregnated with dirt after prolonged use, replace it).
After this cleaning operation, wet the polyurethane foam with a spoonful of mineral oil and squeeze it lightly to obtain a uniform distribution of the lubricant throughout the element.
Clean inside of element housing before refitting filters.
Wash snorkel pipe from inside with a flow of water and detergent to remove any dust deposits, check pipe for damage and loose connections.

***NOTE** - Snorkel pipe to be completely disconnected and cleaning to be carried out well away from engine.*

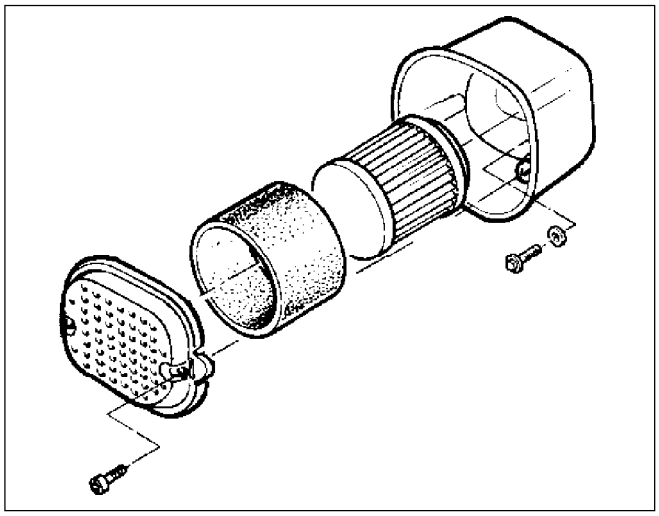


Fig. 12

8. DUAL DRY TYPE PAPER ELEMENT

This air cleaner consists of a paper type element with felt pad pre-cleaner around it. Fitting of air cleaner for horizontal crankshaft engines shown in Fig 12, for vertical crankshaft it is shown in Fig 13A and 13B.

Fig. 13

1. Locating tab
2. Cover
3. Pre-filter (round filters only)
4. Filter element
5. Filter base
6. Press here to release cover (tab)

- Every 25 hours replace felt pad (precleaner)
- Every 75 hours, or yearly, replace felt pad filter (paper cartridge)

If machine is used in a dusty environment, renew felt pad or filter more often. Do not attempt to clean or oil paper cartridge or felt pad.
Never run engine without complete air cleaner (felt pad and paper cartridge).

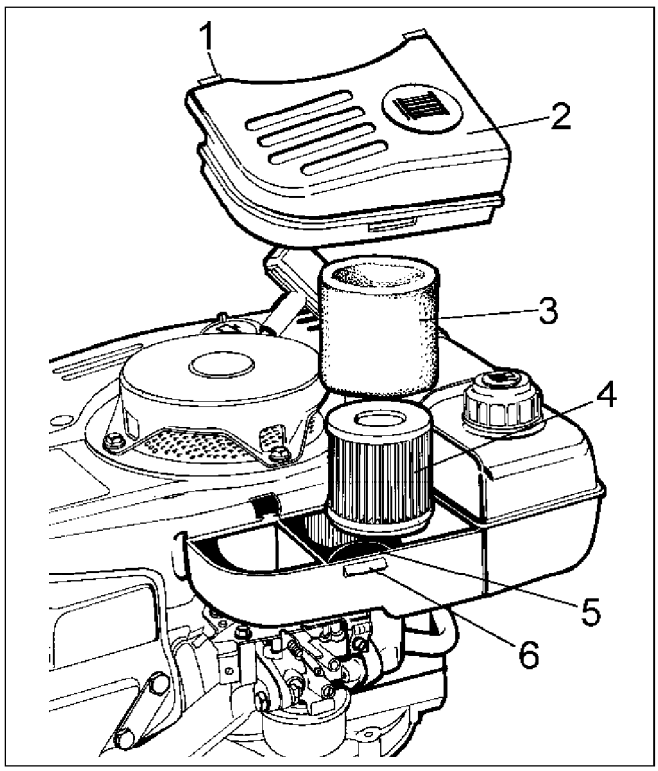


Fig. 13A

HORIZONTAL CRANKSHAFT ENGINES

- Loosen the two cover screws completely and remove cover from base (Fig 12)
- Remove complete air cleaning lifting and softly rotating the cartridge, being careful to prevent dirt from entering air intake.
- If the paper cartridge is still in good servicing conditions, proceed to replace the felt pad, otherwise proceed to replace the complete air filter.
- Clean carefully inside of filter base with a clean, soft cloth.
- Install the filter with new felt pad, or the complete air filter into base by pushing and rotating it. Make sure that filter is correctly seated in the base.
- Replace the cover and tighten the two screws securely. (Fig 12).

VERTICAL CRANKSHAFT ENGINES DUAL ROUND SHAPED AIR CLEANER (Fig 13A)

To install new felt pad or element proceed as follows:

1. Remove the cover by pressing the tab (6).
2. Remove the complete air cleaner taking care not to allow dirt and grass cuttings to enter air intake.
3. Remove the felt pad by sliding it off the paper cartridge.
4. Check the paper cartridge condition and replace if dirty. Clean carefully inside of filter base.
5. Install the new felt pad over the paper cartridge.
6. Install the complete air cleaner into base. Be sure it is correctly seated in the base. Refit the cover.

To install new complete air cleaner refer to preceding instructions.

Type 2 (Fig 13B) OVAL SHAPED AIR CLEANER REPLACEMENT

1. Remove the cover by pressing the tab.
2. Unscrew the wing nut and remove the metallic cover of the air cleaner.
3. Remove the old air cleaner taking care not to allow dirt and grass clippings to enter air intake.
4. Clean carefully inside of filter base.
5. Install the new air cleaner into base. Be sure it is correctly seated in the base.
6. Refit the metallic cover, the wing nut and the cover.

***NOTE** - carefully tighten the wing nut without forcing it. never wash the paper cartridge or attempt to brush dirt from it as this destroys its filtering ability.*

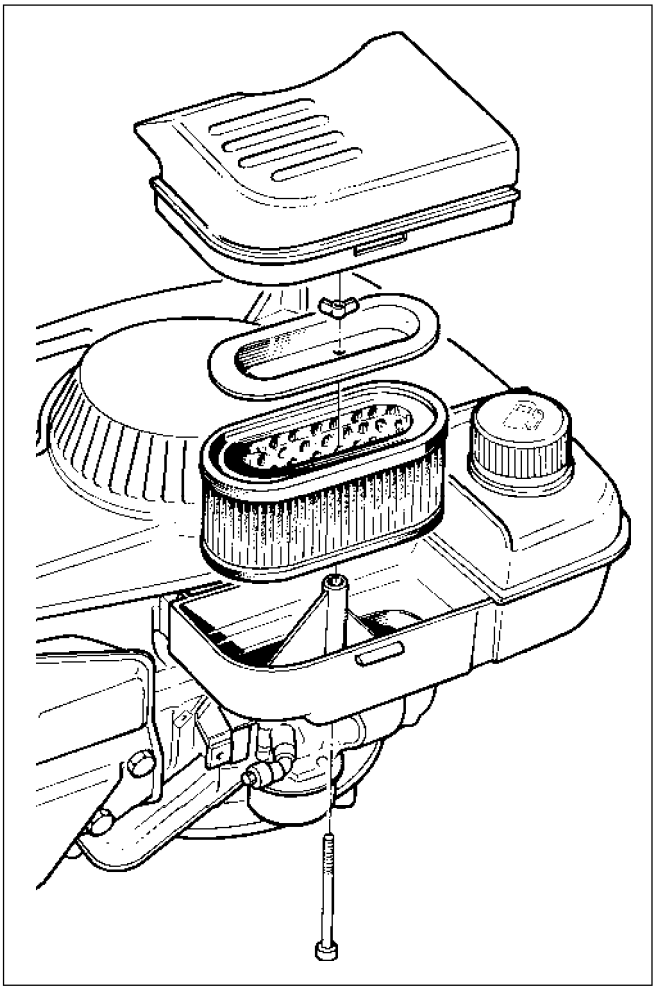


Fig. 13B

9. AIR CLEANER WITH AIR INTAKE FROM THE BLOWER HOUSING

Fig. 14

A. Filter Cover
B. Screws
C. Filter Element
D. Foam Gasket
E. Foam Support
F. Base
G. Breather Gas Recirculation Filter

Proceed as follows:

1. Remove filter body by unscrewing the two screws. Do not remove screws from the filter body.
2. Inspect the following areas for dirt accumulation: **a**, **e**, **f**.
   Remove the foam air filter and the breather gas recirculation foam. If the foams are dirty or clogged they must be replaced. Refer to “Filter Replacement”.
3. Check the gasket inside the filter body. Replace if it is damaged or deformed.

FILTER REPLACEMENT

To remove the foams from the body and from the base, follow instruction 1 in the preceding section; Then proceed as follows:

1. Clean inside the body, the foam support and the filter base.
2. Saturate the new foam with two table spoons (approx. 20 ml) of clean engine oil. Squeeze (do not twist) to evenly distribute the oil and remove excess oil. Do not oil the new breather gas recirculation foam.
3. Fit the new foam into the body making sure it is correctly seated into the body. Ensure the foam gasket (d) is fitted correctly in the body. Install the new breather gas recirculation foam into its proper seat on the base.
4. Position the foam support on the filter base. The bevelled part of the support must point towards the air intake. The fins of the support must face up.
5. Position the body and tighten the two screws securely. DO NOT OVERTIGHTEN.

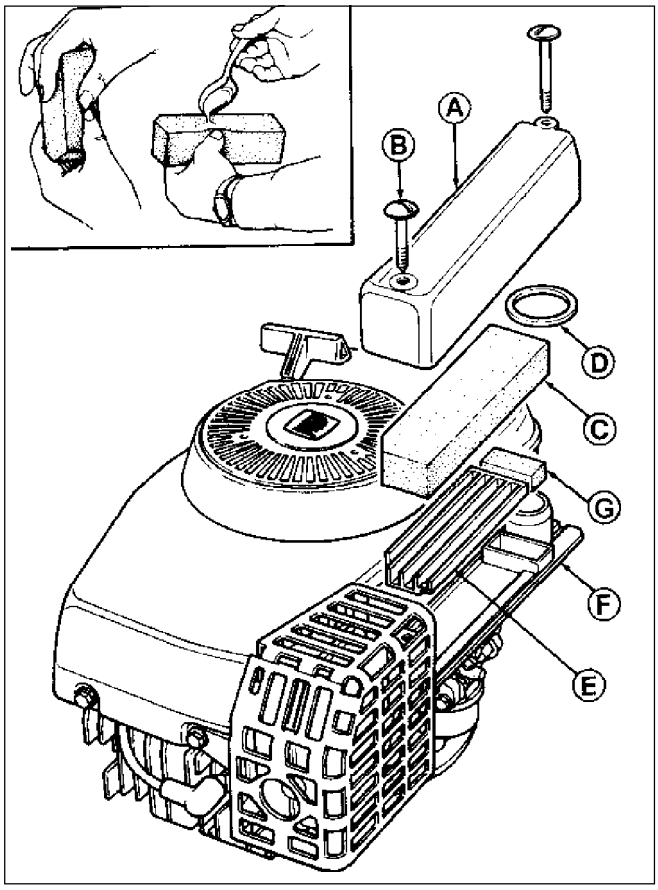


Fig. 14

10. AIR CLEANER INVERTED FLUX FOAM TYPE

Fig. 15

A. Filter Cover
B. Retaining Lugs
C. Filter Element
D. Foam Gasket
E. Base

CHECK PROCEDURE

Check the filter annually, or every 25 hours of use. More frequently if used in dusty environments.

1. Release filter body (**A**) by pressing the two lugs (**B**).
2. Inspect filter base (**E**) for dirt accumulation. Remove the foam from the body. If the foam is dirty or clogged, it must be replaced. Refer to “FOAM REPLACEMENT” instructions.
3. Check the gasket. Replace if it is damaged or deformed.

FOAM REPLACEMENT

To remove the foam from the body please follow instructions 1 and 2 in the preceding section. Then proceed as follows:

1. Clean inside the body and the filter base.
2. Saturate the new foam with two table spoons (approx. 20 ml) of clean engine oil. Squeeze (do not twist) to evenly distribute the oil and remove excess oil.
3. Fit the new foam into the body making sure it is correctly seated into the body.
4. Position the body so that the lugs on the base corresponds to the body openings.
5. Secure body to filter base by downward pressure.

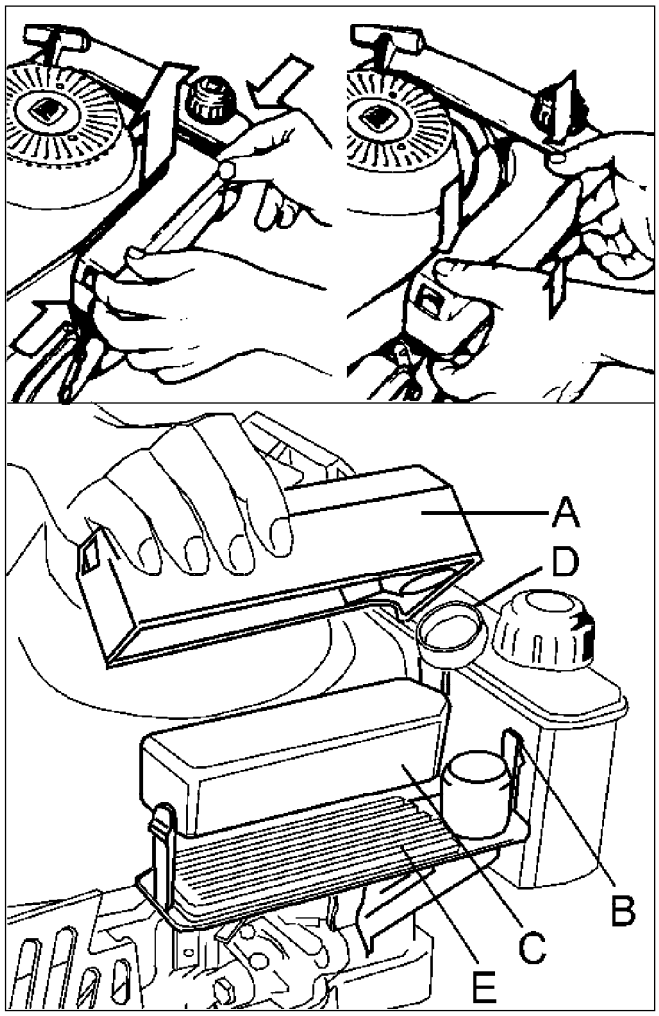


Fig. 15

11. CONICAL AIR CLEANER

Fig. 16

A . Cover
B. Filter Element
C. Flange
D. Location Tab
E. Location Slot
F. Retainer

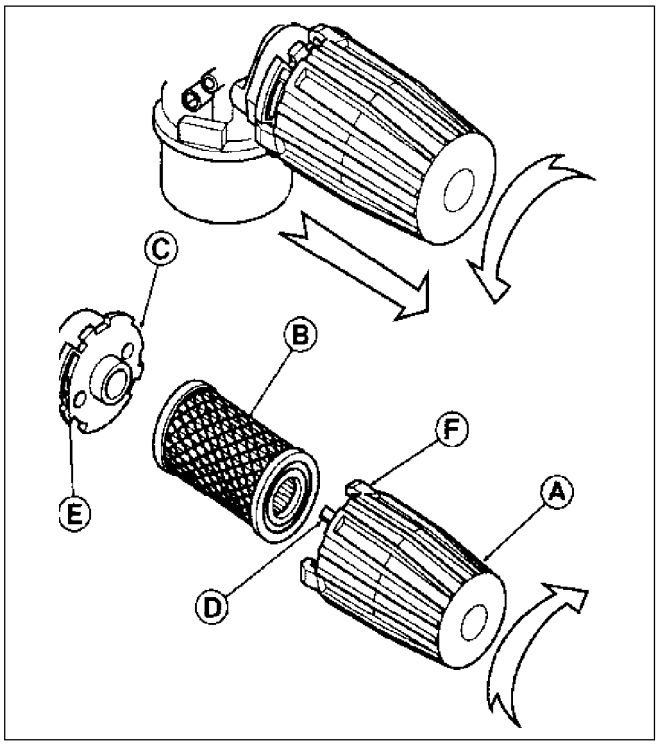


Fig. 16

PAPER CARTRIDGE REPLACEMENT

1. Turn cover to the left (counter-clockwise) and remove it and filter from flange. Discard filter.
2. Clean cover and flange thoroughly.
3. Insert new filter into cover.
4. Position cover and filter against flange with tab on cover inserted into lower left corner of slot in flange.
5. Push cover firmly against flange and turn it to the right (clockwise) as far as it will go. Be sure retainers are locked around flange.

12. PAPER AIR CLEANER WITH INTAKE FROM THE BLOWER HOUSING

Fig. 17

A. Cover
B. Screws
C. Optional Foam Pre-filter
D. Filter Element
E. Body

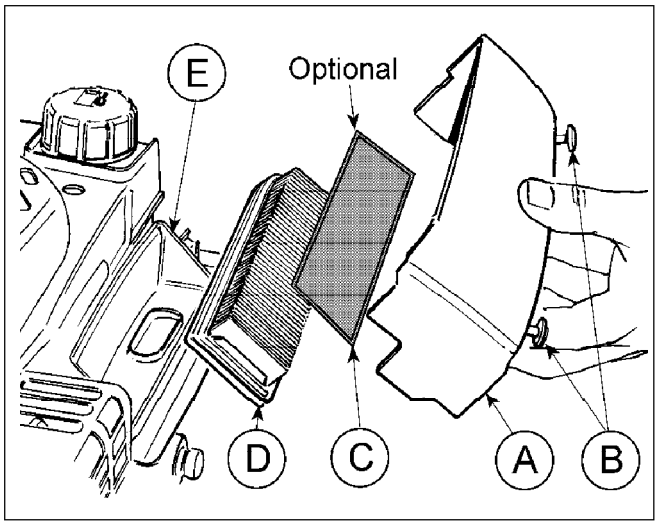


Fig. 17

PAPER FILTER

Check filter every 10 hours or more frequently if used in dry, dusty conditions.
Do not attempt to clean or oil filter.

FOAM PRE-FILTER (if any)

Do not attempt to oil filter.
Clean every three (3) months or every 25 operating hours.
Clean more often if used in extremely dusty conditions.

A. Wash in water and detergent solution.
B. Rinse thoroughly in clean water. Air dry.

TO REMOVE AND INSTALL FILTER

1. Remove cover from body by loosening cover screws. (Do not remove screws from cover).
2. Remove paper filter and foam filter (if any) from the cover.
3. Inspect filter for discolouration or dirt accumulation, if either is present, replace filter.
4. Clean inside of body and cover thoroughly.
5. Install paper filter and foam filter (if any) in cover.
6. Install cover on body. Tighten cover screws securely.

G. CARBURETTORS

1. GENERAL

Two basic types of carburettor are fitted to Tecumseh engines built in Italy.

- Diaphragm carburettor
- Float carburettor

The operating and constructional differences of these types of carburettor are as follows:

DIAPHRAGM CARBURETTOR (Fig. 1)

A - Choke
B - Idle
C - Intermediate speed
D - Full load

Inlet of petrol to carburettor is controlled by needle **P**. During operation of the engine, this needle is lifted by diaphragm **L**, when the fuel drawn from the jet nozzles cause a depression on the upper part of the diaphragm.

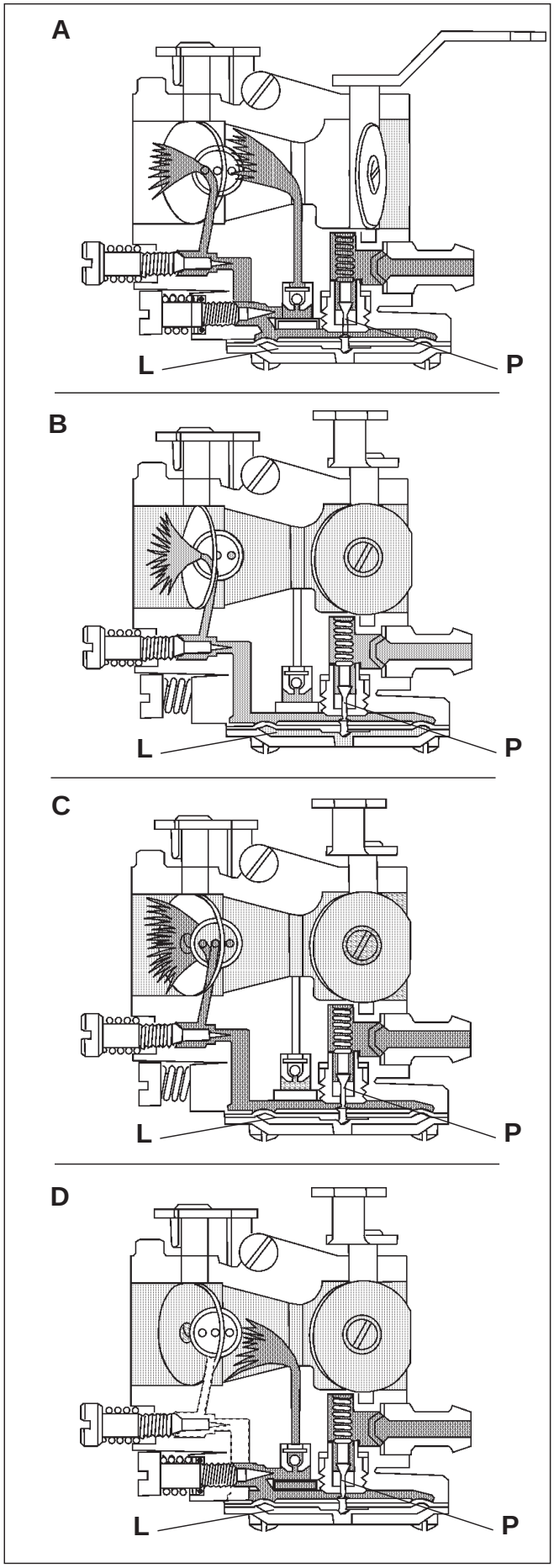


Fig. 1

FLOAT TYPE CARBURETTOR (FIG. 2)

E - Choke
F - Idle
G - Intermediate speed
H - Full load

Inlet of petrol to the carburettor is controlled by needle **P**. When the petrol level decreases, the float **G** falls and consequently the needle allows petrol to flow in and restore the level.

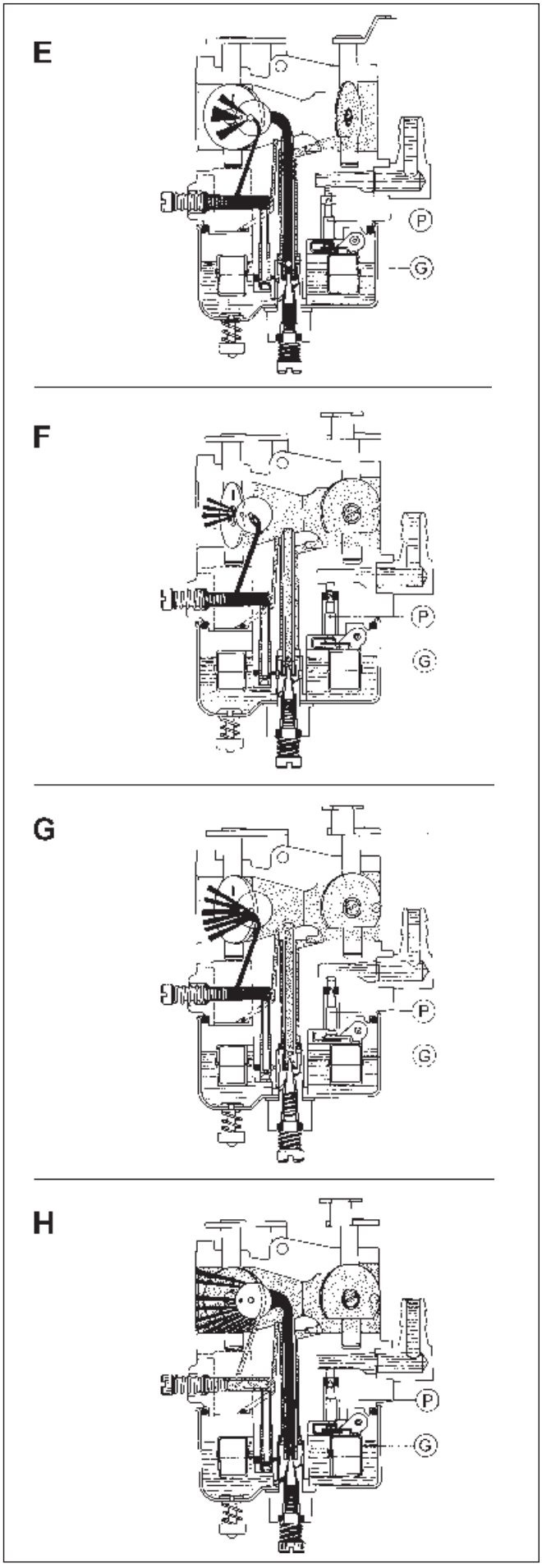


Fig. 2

2. DIAPHRAGM CARBURETTOR

There are 2 types of diaphragm carburettor :
- Standard carburettor
- Carburettor with primer

a) ADJUSTMENT OF DIAPHRAGM CARBURETTOR

For carburettors with variable main and idle jets, proceed as follows (see Fig 3).

A. High speed adjusting screw (See E & Text)
B. Low speed adjusting screw
C. Idle speed regulating screw
D. Choke lever
E. Fixed main jet (high speed)

- Tighten the main adjustment needle **A** and idle adjustment needle **B**. (Do not use force or the needle seats may be damaged).
- Turn main adjustment needle A (hex head) 1.1/4 turns anticlockwise. Turn idle adjustment needle **B** (knurled head) 1 turn anticlockwise. Back off idle speed regulating screw **C** so that it is out of contact with the throttle stop lever (fully closed throttle), then screw in one full turn to hold throttle slightly open.
- Move control lever to full choke, or actuate primer. Start engine and allow to warm up. Make sure choke, when provided, is fully open after warm up.
- Run engine at full operating speed and, by final careful adjustment, set main adjustment needle **A** to position that will give smoothest performance. Final adjustment should range between one and one and a half turns open.
- Run engine at idle speed and adjust idle screw **B** to position that will give the smoothest idle operation.
- Adjust idle speed regulating screw **C** to give an idling speed of 1.800 rpm. Use a tachometer to check speed. Carburettors fitted with a fixed main jet **E** are now standard, and the only adjustments possible are to the idle jet and slow running screws.

NOTE *- The final setting should give a slightly richer mixture.*

b) DIAPHRAGM CARBURETTOR WITH THE MAIN JET INSIDE THE FUEL CHAMBER

From Fig 4 it can be observed that the main jet, instead of being located in its normal position, i.e. at the side of the idle jet, is fitted inside the fuel chamber. This is a fixed main jet and thus does not require any adjustment. In the case of engine running at a fixed speed (for example Flymo) the jet will not have or require other parts. On the contrary, for engines running with variable rpm, a nylon ball valve will be located under the main jet.

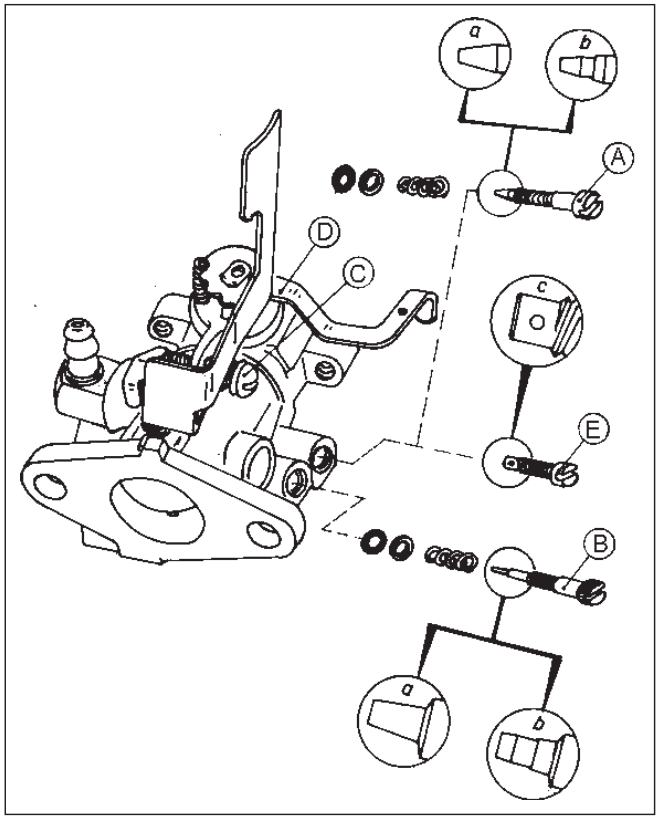


Fig. 3

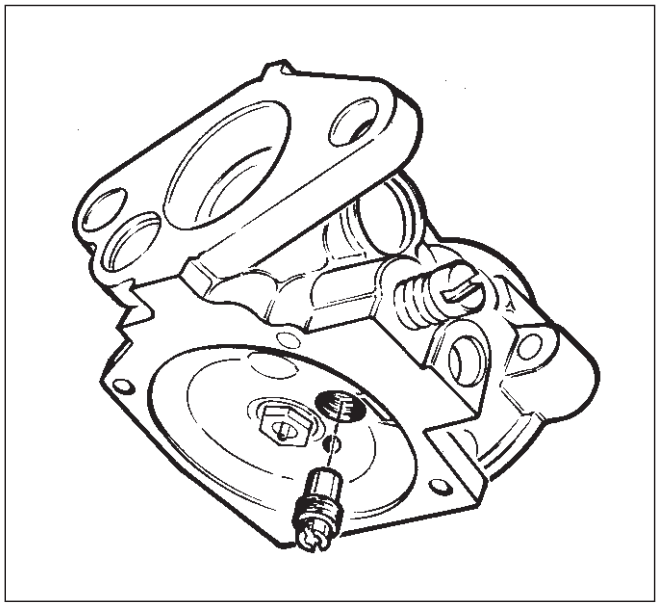


Fig. 4

c) SERVICING DIAPHRAGM CARBURETTOR

Standard diaphragm carburettor

To clean carburettor (Fig 5), proceed as follows:

- Remove main jet (nos. **14, 15, 16, 17**) and idle jet (nos. **10, 11, 12, 13**). Check these for serviceability, replace worn or damaged jets. On current carburettors, a fixed main jet is now fitted (8). This is fitted without seals etc, whereas the idle jet is adjustable and consists of a needle (**10**), spring (**11**), O-ring (**12**) and washer (**13**).
- Check that butterflys (**3** and **9**) and spindles (**1** and **7**) operate freely. If any sticking occurs, clean, and if necessary, replace defective parts.
- Replace the carburettor if the body is found damaged or broken.
- Remove the 4 screws (**26**) of cover (**25**), remove the gasket (**23**) and diaphragm (**24**). At this point, check visually the gasket and diaphragm. The latter should be in good condition and not cracked or hardened.
- Remove the valve assembly (**18, 19, 20, 21**) with a hexagonal 5/32 spanner (or with a slotted head screwdriver for valves of the old type), taking care to extract washer, spring etc. (Fig 6).

Compressed air may now be blown through the valve seat hole and through the two jet holes to remove any dirt or blockage.

- Reassemble, referring to Fig 5, making sure that valve (**21**) and needle (**19**) are not damaged or bent. The needle (**19**) should protrude approximately level with the carburettor face, (Fig 7). If needle is sunk, this denotes that gasket (**20**) has not been fitted or that the needle is worn. If needle projects, it is possible that two washers have been fitted.

Reassemble, install and adjust carburettor.

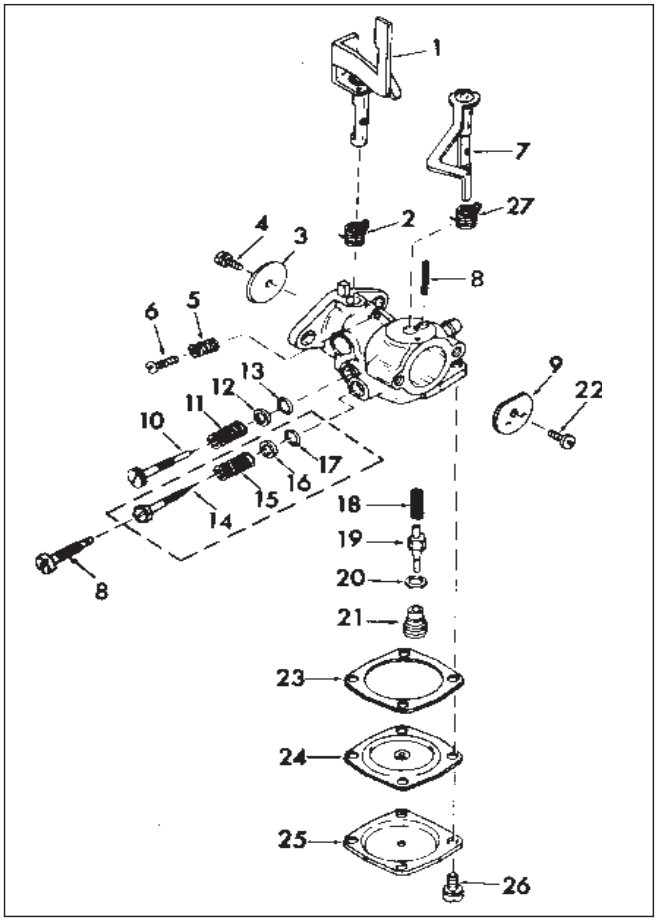


Fig. 5

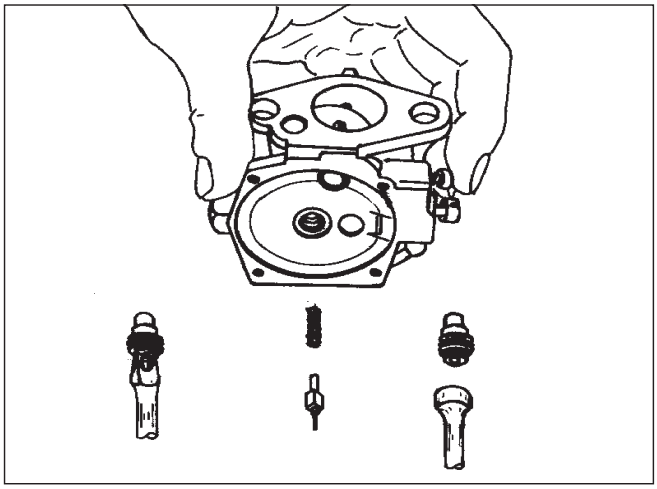


Fig. 6

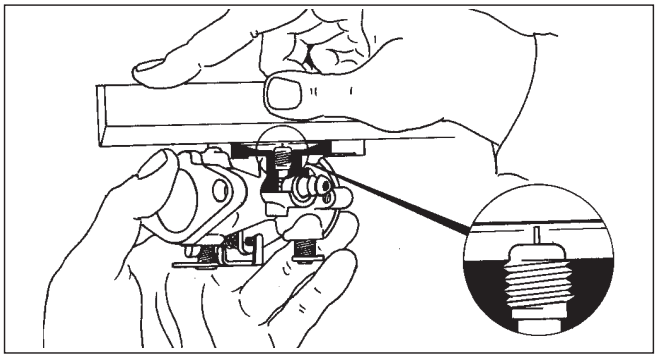


Fig. 7

d) DIAPHRAGM CARBURETTOR WITH PRIMER

The carburettor with primer is characterised by the absence of a choke and by the presence of a special rubber pump, connected to the carburettor base cover by means of a rubber tube (Fig 8).
The cover has a small hole (Fig 8, item A) to allow return movement of the diaphragm after the lifting action of the primer. Fitted immediately behind the inlet elbow is a non-return valve which prevents petrol from flowing back to the tank when the primer is used, thus ensuring that all the fuel is injected into the venturi.

NOTE - *(1) The use of compressed air may damage this valve.*

(2) The inlet needle should be held off its seat for this operation.

If the inlet elbow is obstructed and prevents the passage of air, remove the elbow by pulling and twisting motion, bearing in mind the initial position for reassembly. By blowing the reverse way to the petrol flow, it is possible to clean the fine filter located in the elbow.
Refit elbow. After tapping it in by about one third, use some Loctite or other adhesive, to ensure a petrol tight fit when the elbow is completely inserted. (Fig 9).

Non-return valve fails to operate (brass type pressed in valve).
After removal of the elbow, remove valve for replacement. For this operation proceed as follows: (Fig 10).
- Tap centre hole **A** of valve with a 5/32 tap.
- Remove tap and, with a 5/32 screw nut and washer (Fig 10), extract the valve by tightening screw in tapped hole, retain the screw with a screwdriver, turn the nut with a spanner. The valve will then be withdrawn by the screw.
- Refit the new valve, seating it with the aid of a punch which taps the valve squarely onto its seat. At this point, check operation of valve.
- Refit the needle valve seat (Fig 11). Supply petrol by means of a plastic pipe and check that petrol does not escape from the valve (**A** of Fig 11), but readily flows past the valve when the inner disc is held off its seat.

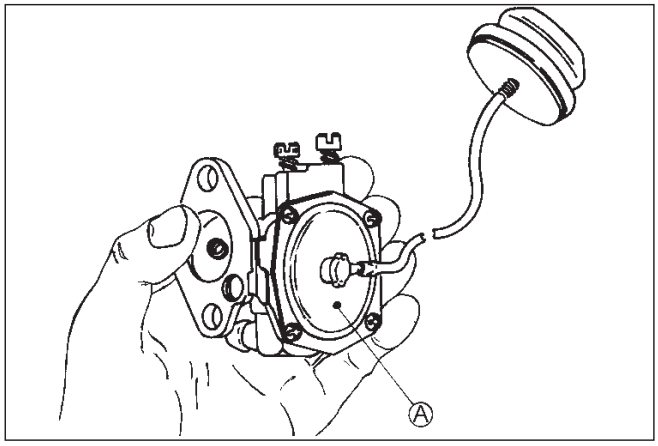


Fig. 8

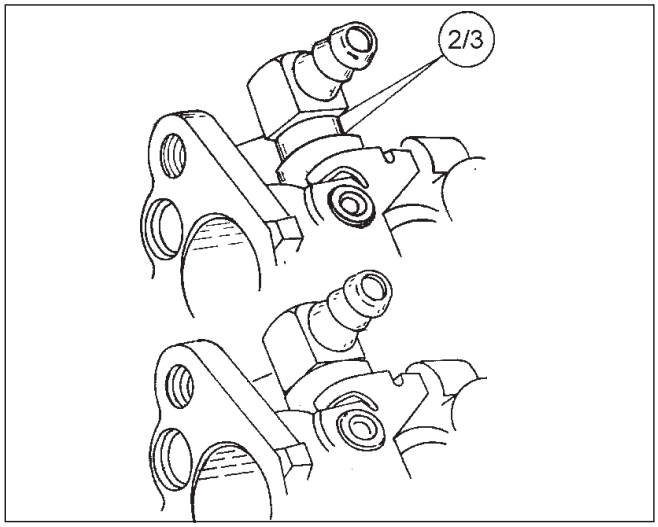


Fig. 9

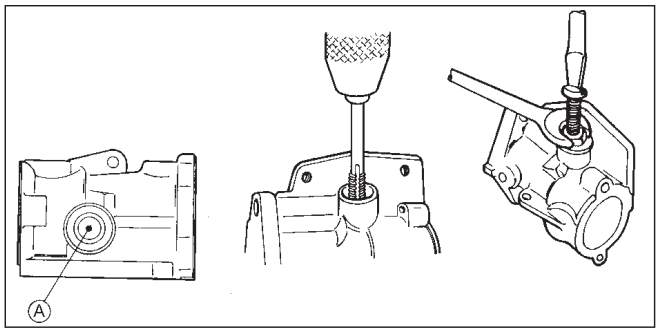


Fig. 10

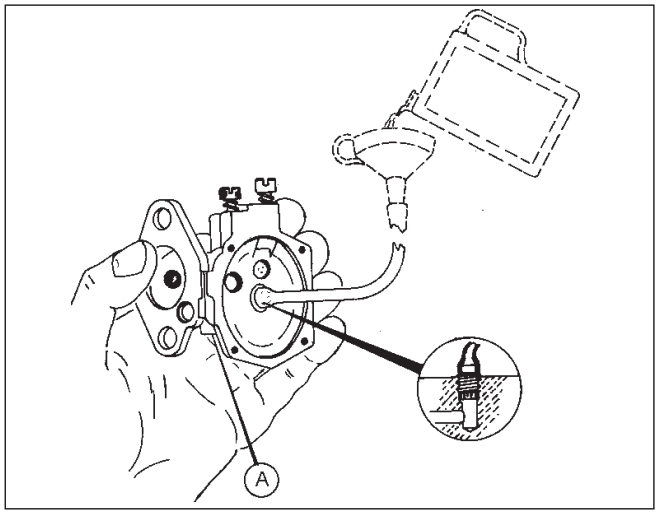


Fig. 11

e) BALL TYPE NON RETURN VALVE (FIG 12)

The brass valve, pressed into the carburettor body has been discontinued. The current non return valve consists of a steel ball which seats in a taper situated in the fuel inlet elbow.
This valve is not inter-changeable with the earlier brass type.
To change or clean the ball and seat, proceed as follows:

a. Remove the fuel inlet elbow (noting position of nozzle). CAUTION : do not lose the steel ball.
b. Check and clean the seat within the elbow, strip and inspect remainder of carburettor as normal.
c. Rebuild carburettor, reposition ball in inlet elbow and push into carb body. When the elbow is inserted approximately 2/3 distance, apply a Loctite or similar adhesive to obtain a good seal, and press elbow fully into place.

***NOTE** - Ensure elbow is positioned in the same manner as originally set.*

Fig 12, A - Steel ball, B - Inlet elbow

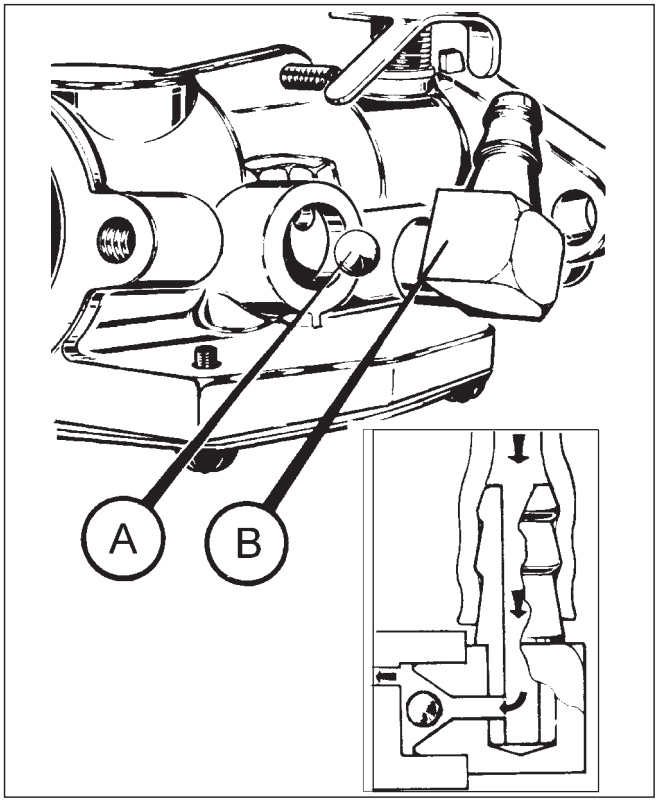


Fig. 12

3. FLOAT STYLE CARBURETTORS

These carburettors may be found in the following variants:
- Adjustable main jet
- Fixed jet choke start
- Fixed jet primer start

The carburettors may be found with fixed (Fig 13) or adjustable (Fig 14) jet.
Fixed jets do not only differ by their size (.68 or .82 etc), but also by the number of emulsion holes and by their length. The correct jet depends on engine type, carburettor and air cleaner type. Use your spare part catalogue to identify the correct jet for a given engine type and air cleaner execution, or consult the tables at the end of this chapter.

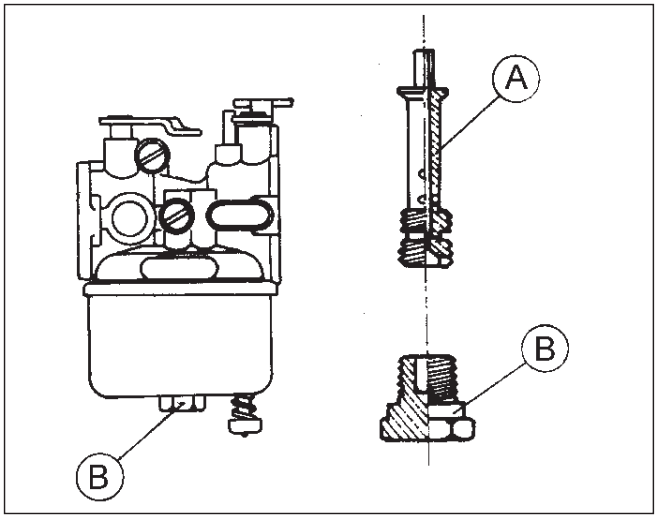


Fig. 13

a) ADJUSTMENT (ADJUSTABLE JET) (FIG 14)

- Tighten the main adjustment screw (**e**) and idle adjustment screw (**d**) finger tight (adjustable jet type only).
- Turn adjustment screw (e) 1.1/2 anticlockwise and idle adjustment screw (**d**) one turn anticlockwise. Slacken idle speed regulating screw (**b**) so that it is just out of contact with the throttle lever (**a**) (throttle completely closed) then screw in one turn to hold throttle slightly open.
- Run engine at idle speed and adjust idle screw (**d**) until smooth running is obtained.
- Adjust position of idle speed regulating screw (**b**) so that engine idles to about 1,800 rpm. Use a tachometer to check speed.

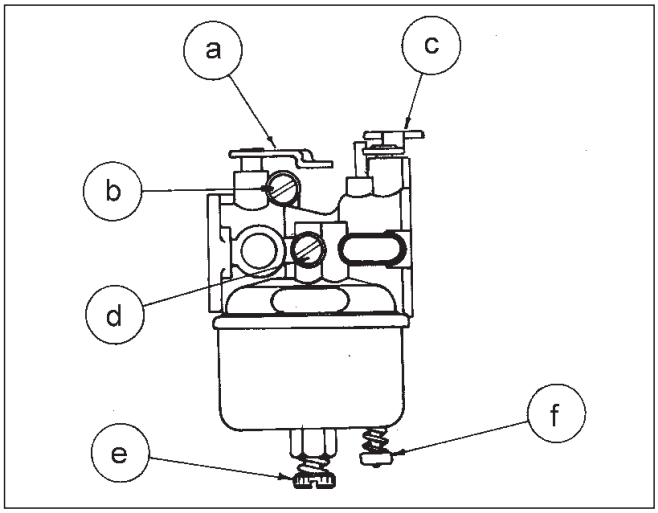


Fig. 14

b) OPERATIONS ON FLOAT CARBURETTORS

Removal and disassembly of the carburettor

- Remove air cleaner.
- Disconnect fuel pipe. Empty fuel bowl by means of the push button (f - Fig 14).
- Remove cover or control panel to allow access to the carburettor.
- Disconnect choke and throttle linkage.
- Remove carburettor from engine.

Checking carburettor parts.

After disassembly clean all metal parts of carburettor with solvent. Dry thoroughly with clean compressed air. Then check parts as follows:

- Check main and idle adjustment screws for wear. Should the tapers show excessive wear, replace. Check that gasket is free from defects - replace if any damage is apparent. To remove and replace main jet use special tool supplied by Tecumseh (Fig 15-**A**).
- Check that screwdriver cut in main nozzle (part **B**, Fig 15) is not damaged and that the main adjustment screw seat is not deeply stepped or otherwise damaged. Check that the fuel orifice in main jet (Fig 15, **e**) is not obstructed or the hole distorted. Replace if damaged.
- Check the carburettor body for damage, obstructed passages, or worn spindle bushes. Clean out obstructed passages with clean compressed air. Replace body if damaged.
- Check that petrol has not entered the float through damage caused by mishandling, dents etc, and that the float shaft is not worn. Replace float if damaged and shaft if worn.
- Check that petrol inlet needle works freely in its seat and its tapered portion is not stepped due to excessive wear. In case of any damage or wear, both on the needle or its seat, replace both parts.
- Check throttle and choke spindles for wear or the bearing surfaces for possible distortion or other damage. Replace if necesssary.

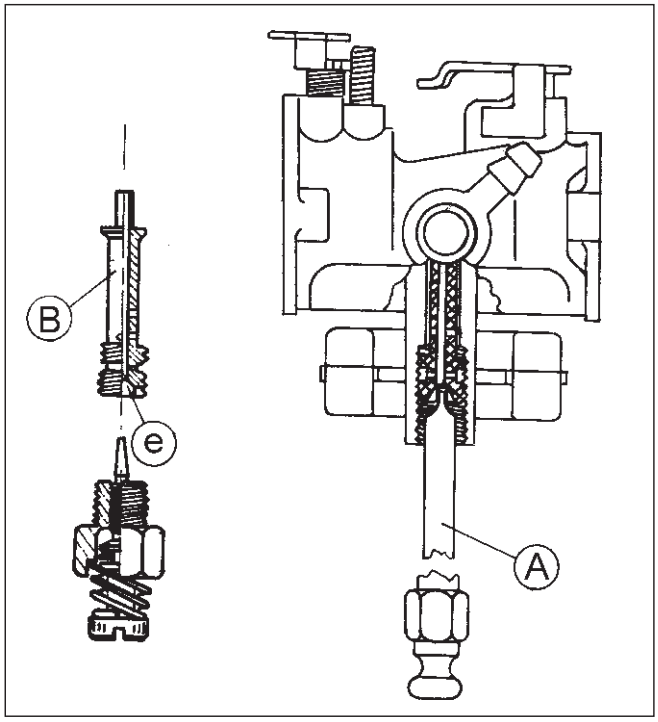


Fig. 15

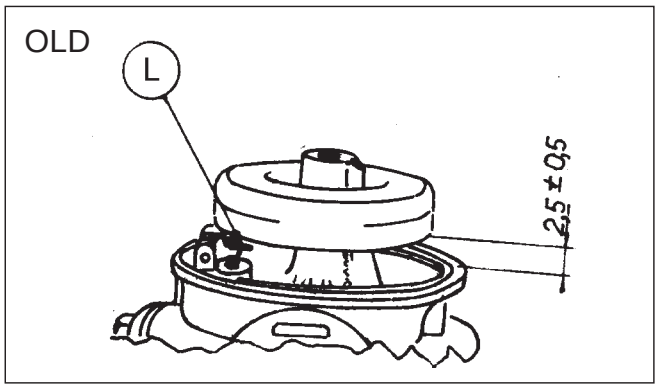


Fig. 16

Brass type float

- Check float level as follows:
  Invert assembled float and carburettor body and check clearance between body and float at portion of float opposite hinge. Clearance should be 3/32" (2,5 mm +/ - 0,5) (Fig 16). If adjustment is necessary, remove the float shaft and bend the tang (L) on float lever, raising or lowering it until correct clearance with the float mounted, is obtained.

Plastic (white) floats

If the carburettor is fitted with a white plastic float, the distance '**L**' (Fig 16) is pre-set and non adjustable. If this setting is not correct, or float is damaged, a new float must be fitted.

c) PRIMER CARBURETTORS

In the pre-start position, fuel fills the prime well in the bowl nut to the level maintained by the float. This will provide the rich mixture required to start a cold engine. It takes about 5 seconds for the prime well to refill after each starting attempt or when engine is stopped.
Push Pre-starting Primer 2 or 3 times. Pause about 2 seconds between each push.

***NOTE** - In cold weather (10C or below), push Pre-starting Primer 5 times. Do NOT use pre-starting Primer to re-start a warm engine which has stopped for a short period.*

If the engine is used in cool weather conditions, the primer can be used to force fuel through the main nozzle to provide a richer mixture.

When the engine starts and runs, the fuel level in the bowl and prime well stabilizes and air from the air bleed and fuel from the main jet are pulled up the main nozzle for engine operation.

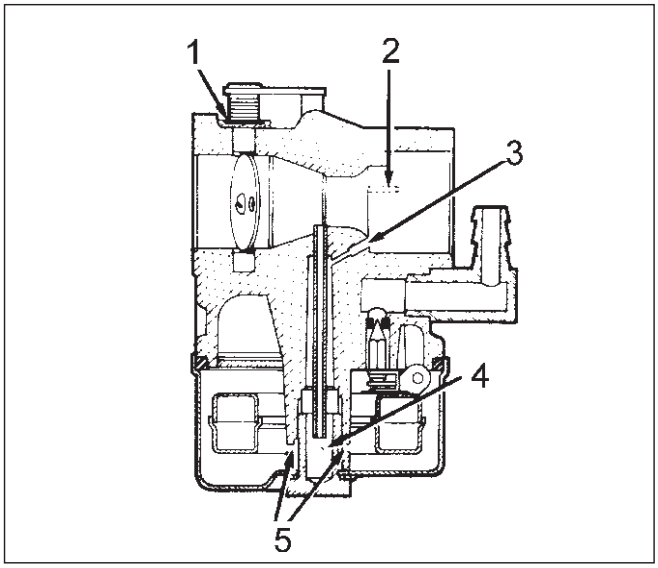


Fig. 17

Index Fig. 17 - Before start

1. Felt seal
2. Internal vent
3. Air bleed
4. Prime charge
5. Fuel inlets

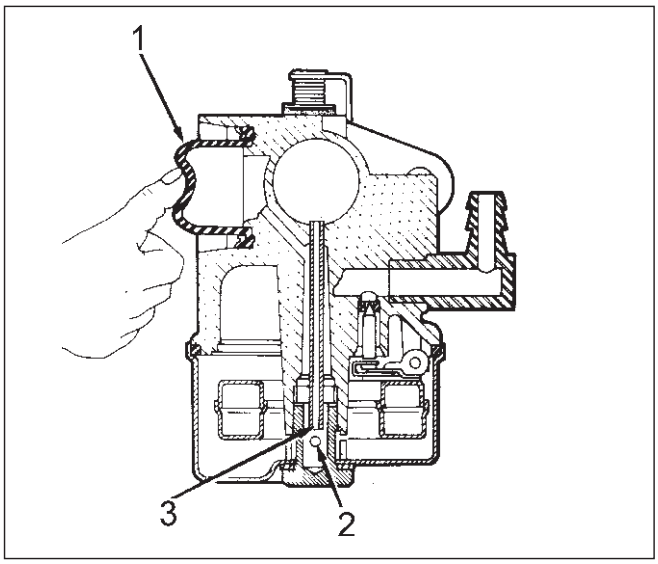


Fig. 18

Index Fig. 18 - Prime

1. Primer bulb
2. Main jet
3. Main nozzle

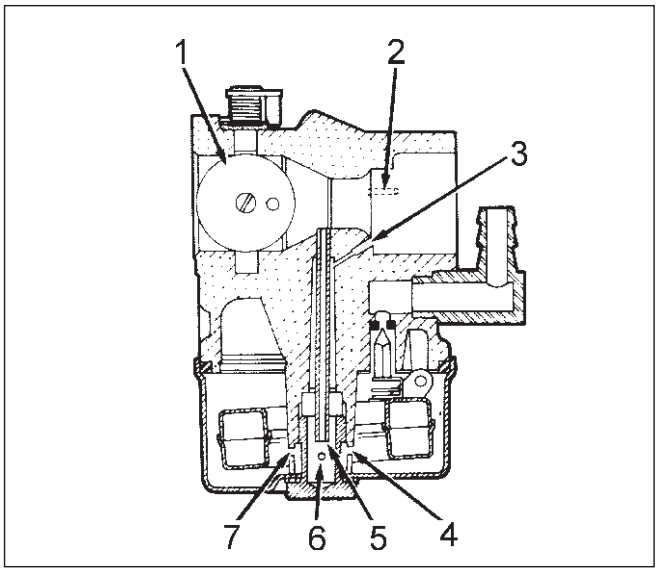


Fig. 19

Index Fig. 19 - Run

1. Throttle shutter
2. Internal vent
3. Air bleed
4. Fuel inlet
5. Main nozzle
6. Main jet
7. Fuel inlets

These carburettors are float feed non-adjustable. Adjusting screws for final setting of rpm can be found on the control plate, if fitted. Screw **A** for high speed, screw **B** for low speed (Fig 21). Screw C on the governor lever is left hand thread, if cross head screw is fitted. (Fig 22).

If engine is fixed speed there will be no control plate, but a deformable tag will be attached to the inlet manifold screw. This tag can be adjusted for final setting of high speed only.

Clean, fresh fuel is vital to the operation of any engine. The device that meters the fuel to the engine is the carburettor. If the fuel is stale, sour or contains water, that creates a metering problem for the carburettor.

Good valves are essential for dependable starting. Burned valves, poor seats or improper valve stem clearance result in poor starting which is then incorrectly diagnosed as a carburettor problem.

The proper float height is very important to all Tecumseh carburettors and must be set by using the Tecumseh float setting tool part number 670253A. (Fig 23) - Brass floats only.

PRIMER BULBS (Figs 24 & 25)

These bulbs can be removed by grasping with pliers and pulling and twisting out of the body. Remove the retainer by prying and lifting out with a screwdriver.

Do not re-use old bulb or retainer. New primer bulb and retainer come in a kit.

Insert new bulb in to primer well, fit new retainer over bulb, press in with an appropriate sized socket.

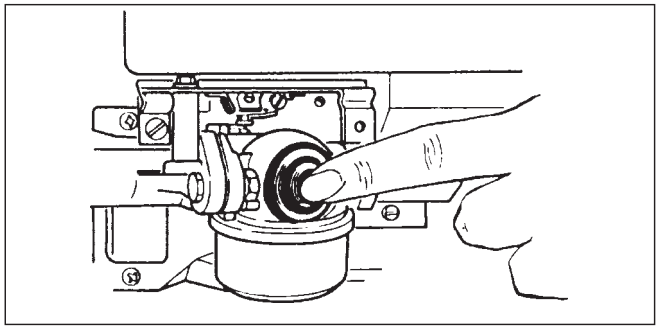


Fig. 20

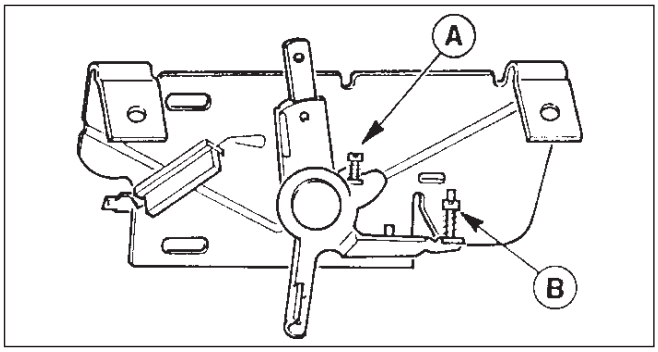


Fig. 21

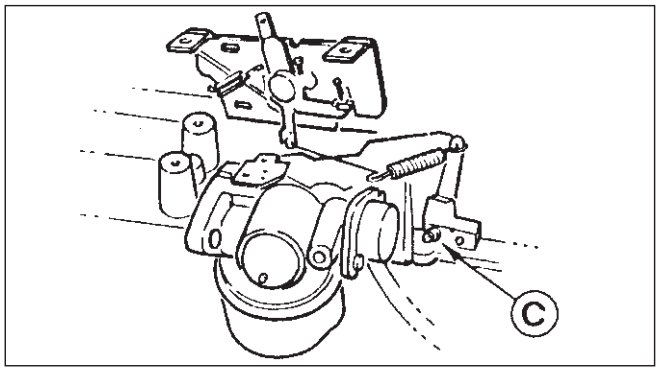


Fig. 22

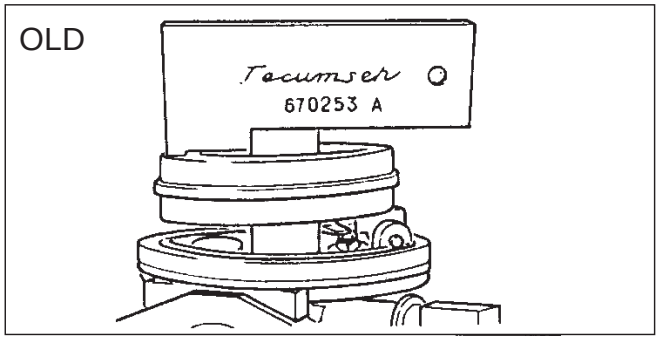


Fig. 23

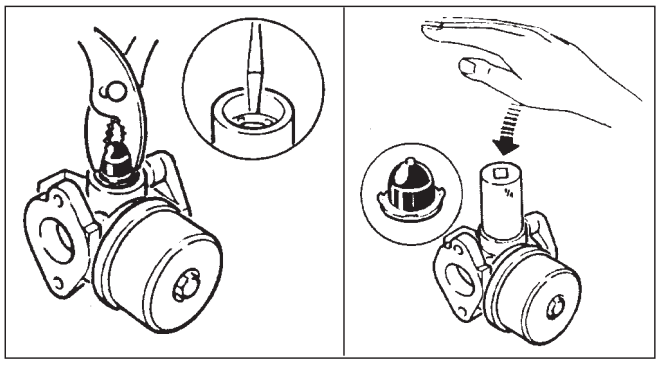


Fig. 24 Fig. 25

d) ALTERNATIVE STYLE PRIMER START FLOAT CARBURETTORS (Fig. 26)

With the advent of more stringent emission controls, carburettor technology is continually improving. Be aware that there are now many different types of Primer Carburettors, which at first glance may seem similar.

Always refer to the master spare parts listing, using the correct engine model, spec and serial number when ordering spare parts.

PRIMER BULBS

There are different types of primer bulb fitted to float style, primer start carburettors.

Stepped bulb with vent
Stepped bulb without vent
Smooth bulb with vent
Smooth bulb without vent, etc.

Using the wrong primer bulb during repair will cause poor engine running and bad starting.

MAIN JET / BOWL NUT

Due to the different styles of primer carburettor, there are different types of Bowl Nut / Main Jet used. These jet types are not interchangeable.

***NOTE** - Always refer to the master spare parts list, using the correct engine model and specification numbers when ordering spare parts.*

e) NEW FLOAT (Height Adjustment)

The float height adjustment dimension indicated in Fig. 16 and in Fig. 23 was used on earlier carburettor models. Float height adjustment for new carburettor models requires use of a 11/16" (4.5 mm) insert.
Proceed as follows: Invert the carburettor with the float upwards. Position the insert on the carburettor body parallel to the fastening plug.
Adjust float height by letting it rest against the insert and bending the rear tab (See Fig. 27).

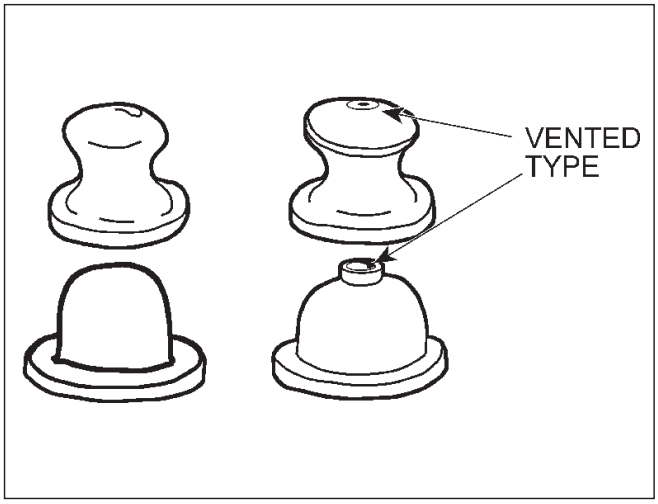


Fig. 26

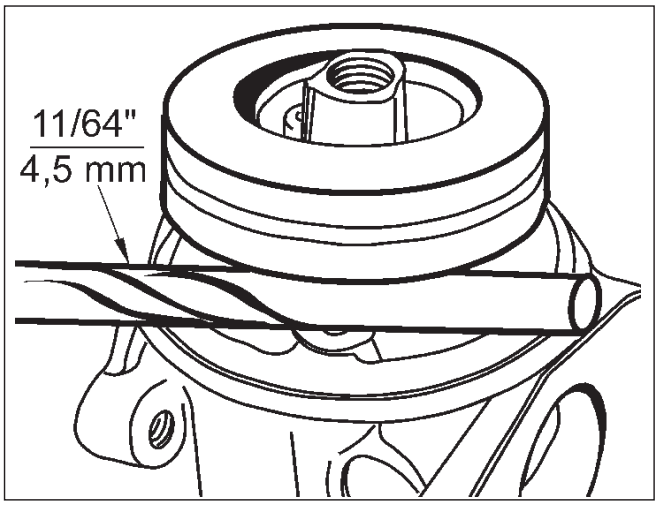


Fig. 27

H. GOVERNORS

GENERAL

Engines currently fitted to lawnmowers, pumps etc, are generally fitted with a speed governor which controls the engine revolutions at a predetermined speed under varying load conditions.

TWO STROKE ENGINES

Two stroke engines are usually fitted with pneumatic governors.

FOUR STROKE ENGINES

Four stroke engines, horizontal and vertical crankshaft, are fitted with mechanical governors.

***NOTE** - When engines are fitted with a remote control lever, make sure that this allows the control to attain the full movement Max - idle - Choke and Stop.*
These positions marked on the handle of the machine should correspond to the same positions on the governor control. If full choke and full throttle are not attained, starting difficulties will be experienced.

1. PNEUMATIC GOVERNOR FOR 2 STROKES

The above engines are fitted with a pneumatic governor of the type shown in Fig 1. Air vane «**B**» attached to the throttle spindle draws air from the flywheel «**V**». This vane so under the air pressure from the flywheel tends to close the throttle until the spring «**M**» fastened between the control lever «**L**» and the vane opposes this movement. The balance between the two forces giving the desired throttle opening.

a) Variable control type (Fig. 2)

The control lever «**L**» secured to the bracket (Fig 1) may be moved between the choke position and the stop contact position. Between the max position (lever against but not operating the choke) and the min position (lever near but not touching stop contact), the speed range is obtained.
To increase or decrease the max speed, the spring «**M**» is moved to another hole in the lever «**L**» (Fig 2) by moving the spring to a hole further away from throttle the speed is increased and vice versa.
The maximum speed is checked with the lever in the position at which it contacts the choke control.

***NOTE** - Always check that the lever will fully close the choke.*

b) FIXED SPEED EXECUTION

A fixed speed type is available (Fig 3). This being fitted with a fixed bracket «**S**» on which is mounted the governor spring «**M**».
The speed adjustment is carried out loosening clamp screw «**P**» and moving the lever to increase or decrease the spring tension according to the speed desired.
On this type of governor the choke lever «**C**» may be a separate control and there may be a separate stop switch. Otherwise the lever «**L**» only operates the choke and the stop switch. (Fig 4).

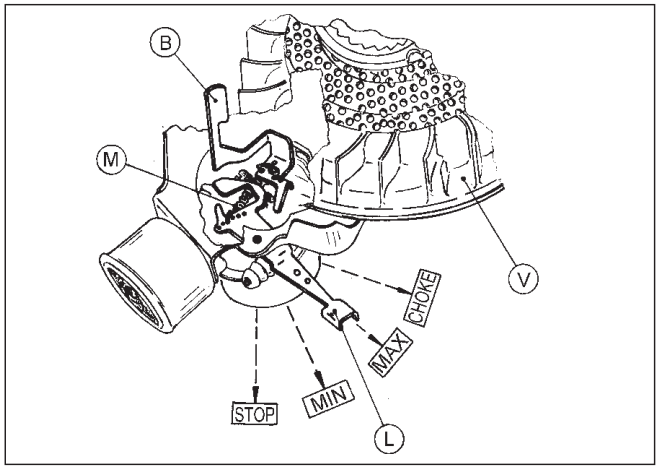


Fig. 1

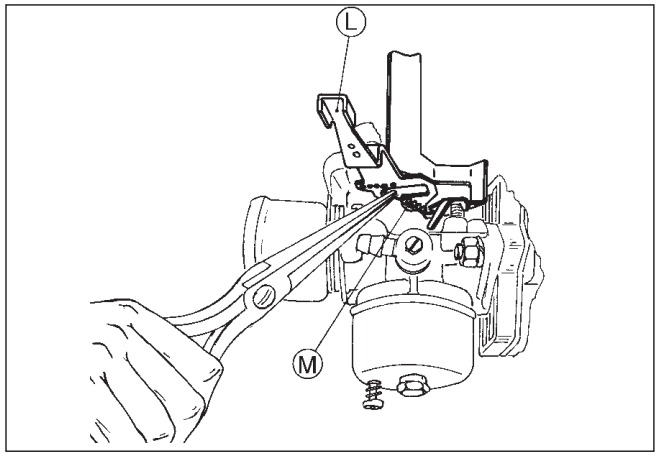


Fig. 2

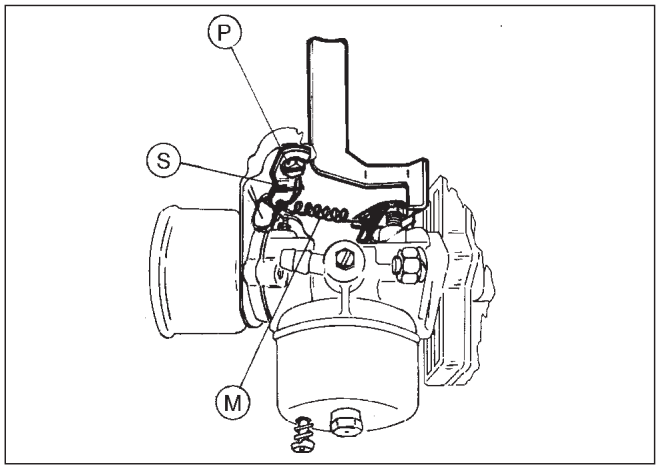


Fig. 3

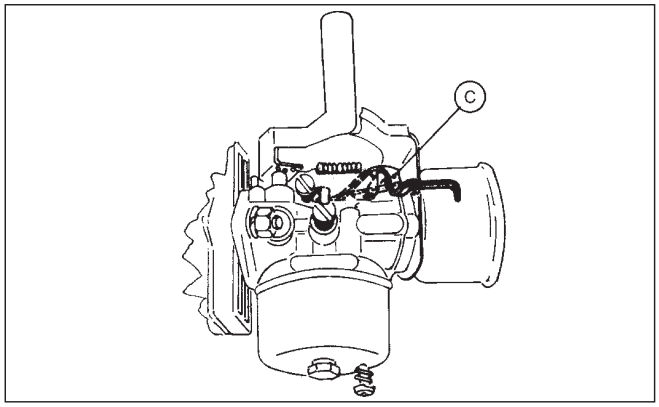


Fig. 4

c) GOVERNORS FOR AV AND MV MODELS

AV and MV engines are fitted with a pneumatic governor similar to the one already used on the previous TA and VA engines.
For the speed control on the governor for AV and MV engines, there is an adjusting screw for use on variable speed engines.
To adjust the speed operate as follows:
- Turn the screw in a clockwise position to increase the speed.
- Turn the screw in an anti-clockwise position to decrease the speed. (Fig 5).

On AV and MV engines the governor spring must be fitted (Fig 6) with the hooks inserted from the top.

The spring must be located in the second hole of the carburettor throttle lever (Fig 7) to allow the opening of the throttle in order to obtain maximum power.

MV engines with electronic ignition have only one hole in the governor vane to connect the spring to.

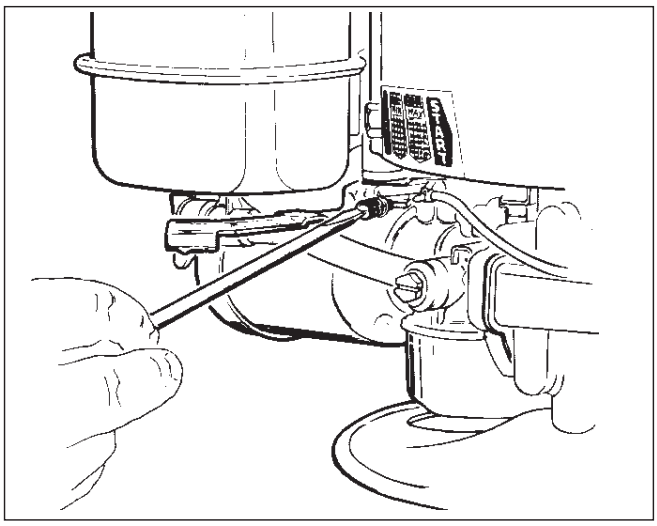


Fig. 5

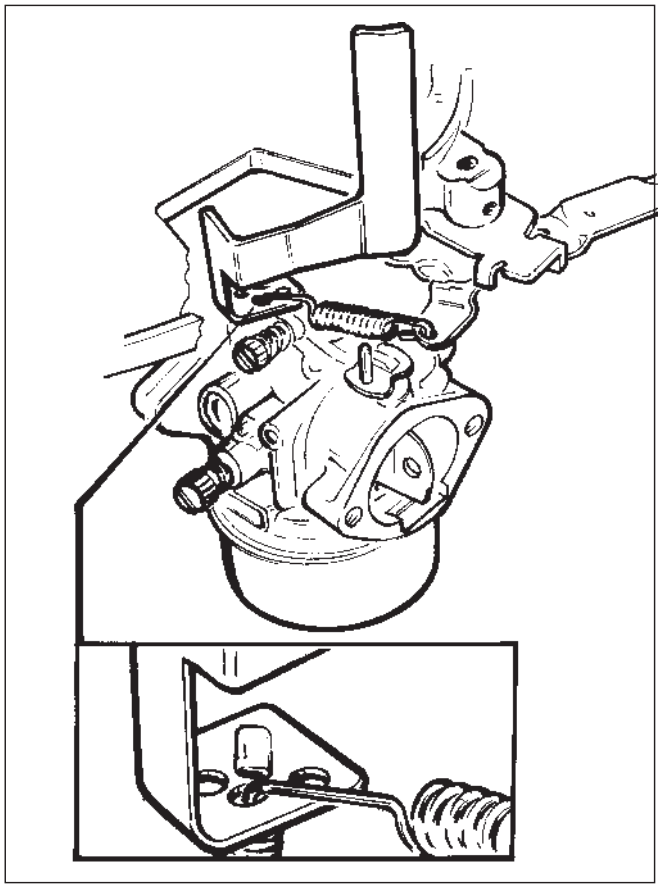


Fig. 6

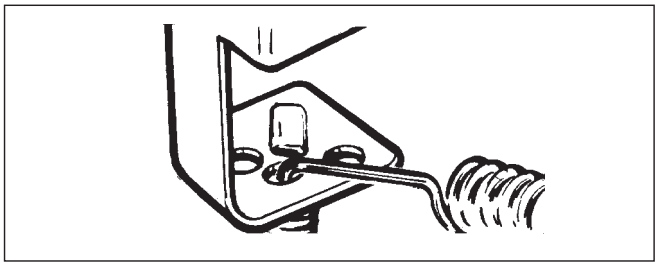


Fig. 7

2. MECHANICAL GOVERNORS FOR FOUR STROKE ENGINES

a) GENERAL

All four stroke engines are fitted with centrifugal type governor (Fig 8). This consists of a plastic gear «**A**» which is caused to rotate by the camshaft gear.

b) STANDARD GOVERNOR (FIG 8)

The gear carries links «**B**» which open under the action of a centrifugal force and move spool «**C**» away from the gear. The crank of governor rod «R» is in contact with the spool «**C**».
The other end of the rod projects through the crankcase and to this is connected a lever and spring which automatically adjusts the engine speed.

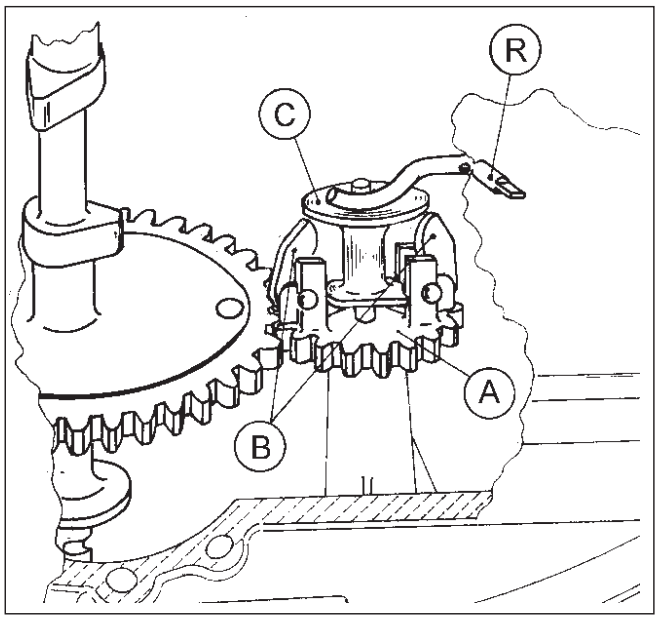


Fig. 8

c) OLEOMATIC GOVERNOR FOR HORIZONTAL ENGINES (FIG 9)

The governor spool (**A** - Fig. 9) is pushed by the centrifugal masses (**D**) and slides along the spindle (**B**) which has holes and allows oil to be drawn inside the spool. This gives a low pressure oil dampening effect which eliminates any slight governor fluctuation. This type of governor is used mainly in generator applications.
Besided the system shown in fig. 9, there is a simpler version with perforated spool.

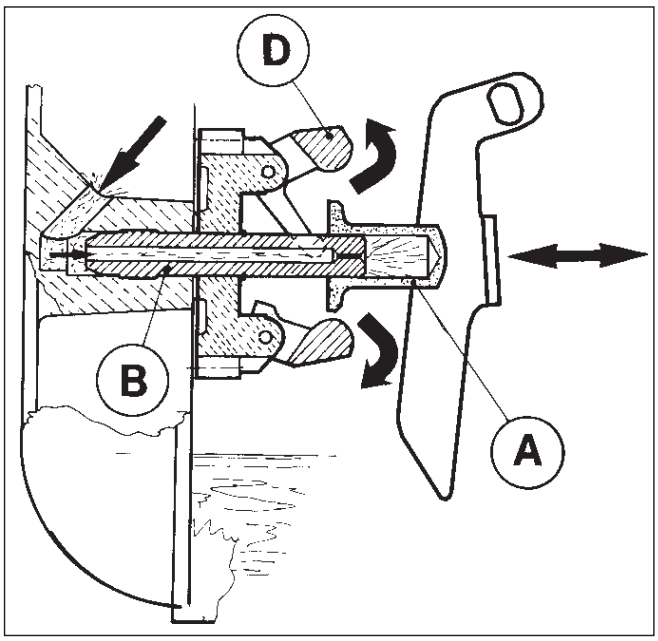


Fig. 9

3. GOVERNOR LINKAGE HORIZONTAL CRANKSHAFT ENGINES (HBL-BHK-BHT & P VERSIONS)

a) DESCRIPTION AND ADJUSTMENT (Fig. 10)

The link (**B**) positively connects the lever (**E**) with the governor lever (**A**). The link (**C**) connects the lever (**E**) with the main throttle lever (**D**). With engine running, governor rod (**P**) rotates CCW. The spring (**L**) is tensioned according to the position of lever (**G**) thus controlling the load applied to the throttle and the engine's speed. By bringing lever (**G**) completely upwards, the max speed is obtained.
Check for maximum speed in this position and adust the speed with the screw (**H**. Major speed adjustments are made by moving the hook of spring (**L**) to a different hole in lever. Moving the spring upwards increases the speed and vice versa.
Moving the lever (**G**) down obtains the idle speed. The idle speed is adjustable with the idle speed screw located on the carburettor in contact with the main throttle (**D**). Moving the lever (**G**) down further obtains the earth contact and the engine stop position.

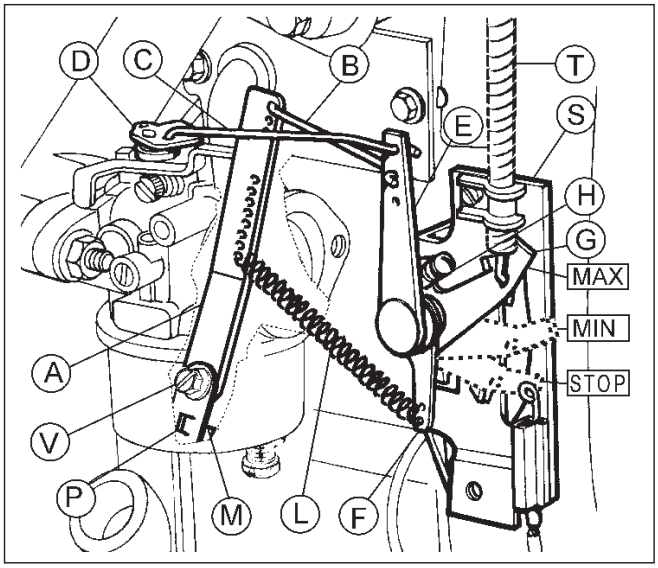


Fig. 10

b) ASSEMBLY

If a governor has been completely stripped proceed as follows:
Fix the clamp (**M**) on rod (**P**) and the lever (**A**) on the clamp (**M**) with the screw (**V**).
Mount the governor plate (**S**). Take care the link (**B**) is mounted on the lever (**E**) at the second hole from the internal side and the lever (**V**) at the first hole from the external side.
Before mounting the carburettor insert the link (**C**) in the first hole of lever (**E**) from the external side, and on the first hole close to the throttle rod of the main throttle.
The governor spring (**L**) has to be mounted at the first external hole on lever (**F**) of governor plate and on the governor lever (**A**) at the hole selected in accordance with the speed categories. (See engine specification).

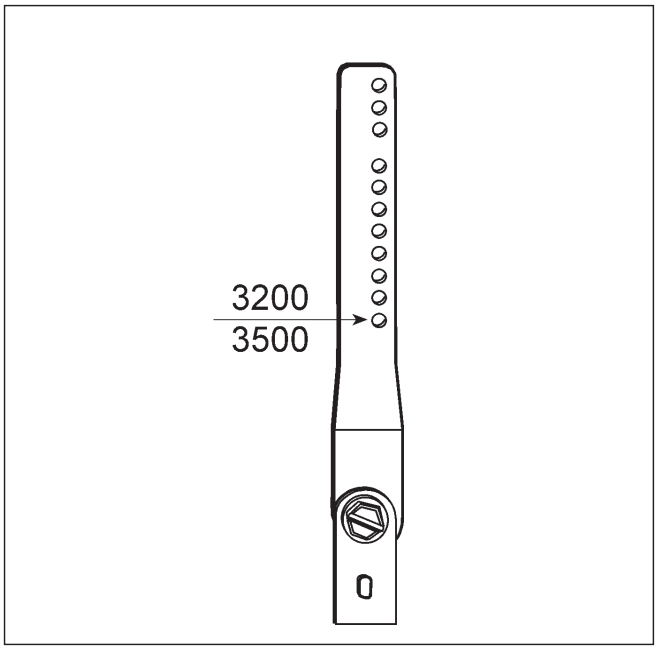


Fig. 11

c) SPEED ADJUSTMENT (Fig 10 & 11)

Ensure the spring (**L**) is mounted in the right hole on lever (**A**) for the required engine speed and lever (**G**) is in "max" speed position.
Adjust the screw (**H**) on the governor plate (**S**) for fine adjustment of the max speed.
For the idle speed (2000-2250 rpm) adjust the carburettor idle screw.

d) APPLICATION VARIANTS

Two different controls are available: Remote control and Manual control.
Remote control has governor plate (**S**) and a Bowden cable is fixed by clamp. (Fig 10)
For Manual control there is additional lever (**N**) and link (**Z**) which are mounted on governor plate (**S**). (Fig 11-1)

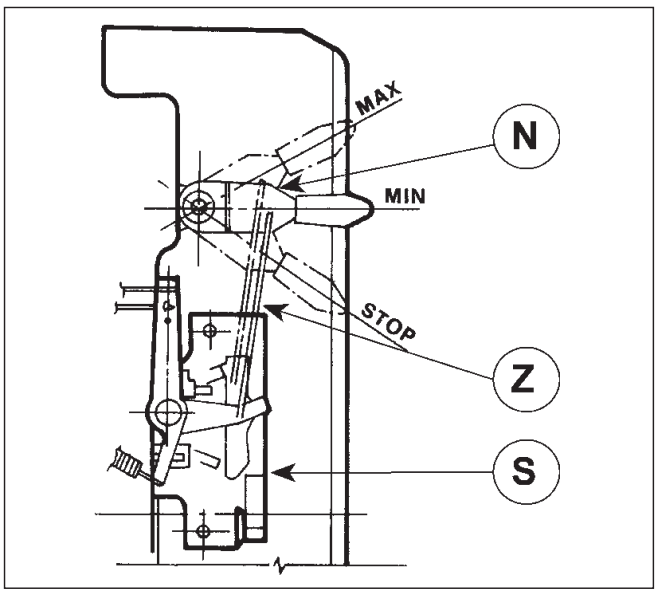


Fig. 11-1

e) GOVERNOR ADJUSTMENT (Fig. 10)

Having screw (**V**) loose, move throttle control lever (**G**) into max position. Turn lever (**A**) and clamp (**M**) clockwise and tighten screw (**V**).

4. GOVERNOR LINKAGE FOR HBP/G AND BHG ENGINES

a) DESCRIPTION

On above engines the position of the carburettor is different and therefore small changes on the governor linkage are necessary.
BHG & HBP/G engines are mainly used on generators and therefore usually run with fixed speed at 3.000 rpm. Fig 12 shows external assembly.

b) ASSEMBLY AND ADJUSTMENT

The particular difference for removal or reassembly between the standard governor linkage and the linkage on HBP/G and BHG engines are the following:

- The governor arm **A** has three holes at the top. The throttle control rod (**T**) being fitted to the lower of the three. (Fig 12).
- There are nine alternative holes at the bottom of the arm. The long control spring being fitted to the second hole (3.000 rpm). The opposite end of the spring is hooked to the third hole of the control lever in Fig 12. The shortest spring for carburettor butterfly is hooked to the (**S**) bracket as in Fig 13. The return spring differs also from the normal spring on other horizontal shaft engines. (Fig 14).

The generator engines have been fitted with plastic gears with heavy mass governor weights

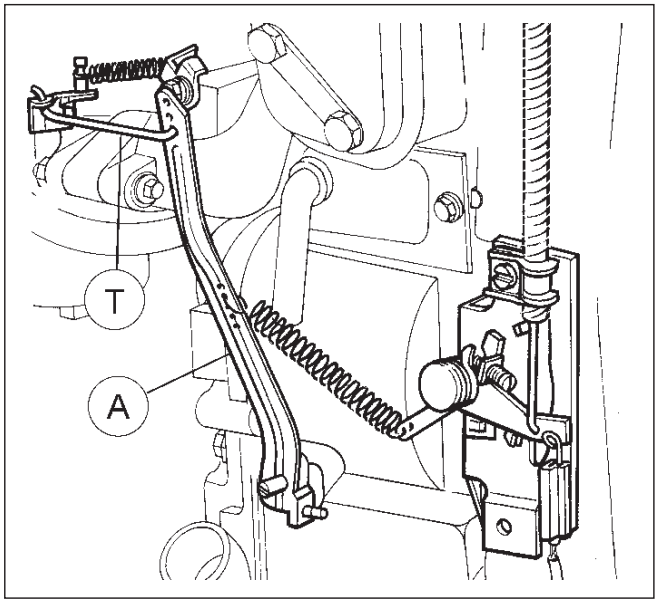


Fig. 12

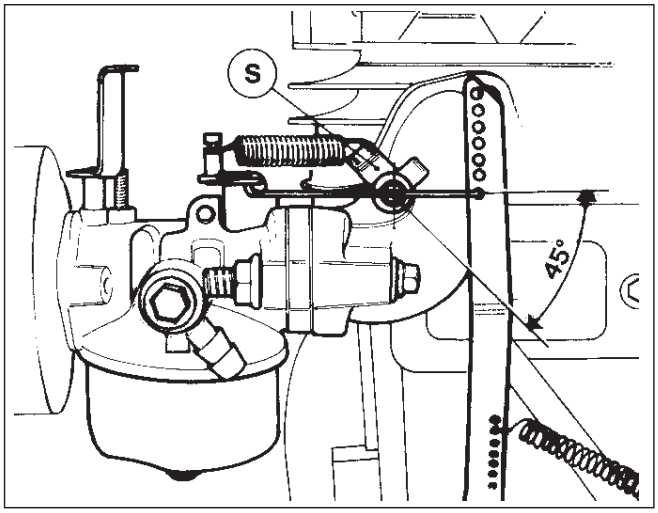


Fig. 13

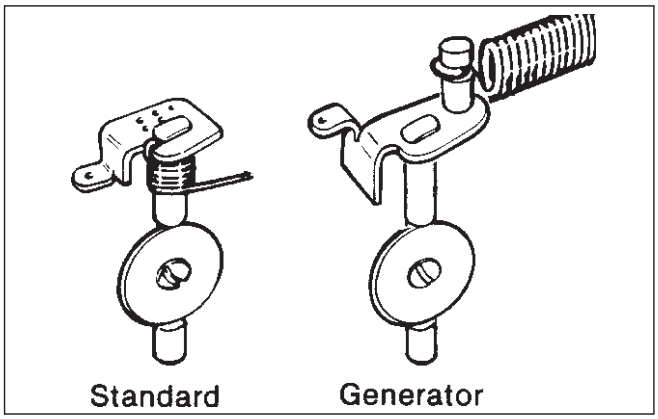


Fig. 14

5. GOVERNOR LINKAGE FOR FOUR STROKE ENGINES WITH VERTICAL CRANKSHAFT

a) DESCRIPTION

Link (T) positively connects lever (**A**) with main throttle lever (**F**). (Fig 15).
With the engine running the governor rod (**R**) rotates clockwise, spring (**W**) which may be tensioned by various amounts according to the position of lever (**L**) thus controls the load applied to the throttle and so determines the engine speed.
Having the hole (**a**) in lever (**L**) matched with the notch (**b**) in the control plate (Fig 16) maximum speed position is achieved and setting the lever (**L**) with the hole (**a**) matched to the notch (**O**) in the control plate idle speed position is achieved.

NOTE *- TThe style of the carburettor control has changed. (Fig 16). The new carburettor control plate is completely inter-changeable. Should however the control plate touch the carburettor linkages, fit two washers under the fixing screws. (Fig 17).*

b) ASSEMBLY AND PRIMARY ADJUSTMENT

To install this type of governor linkage (Fig 15) proceed as follows:
- With the carburettor mounted on the manifold insert link (**T**) in the respective holes connecting throttle to arm (**A**).
- Fit rod and spring assy (**W**) onto the arm (**A**) and control lever (**L**).
- Fit assembly plate with screws (**G**) and fit complete assy to engine.
- Fit arm (**A**) to clamp (**S**) with screw (**P**) leave screw slack and turn arm (**A**) anticlockwise and with throttle (**F**) fully open tighten screw (**P**).
- Locate the plate leaving the securing screws slack.
- Align inner hole (**A**) of control lever (**L**) with respective notch (**B**) on edge of plate. In this position choke control lever should be in contact with throttle lever without actually operating choke. In this position the three holes (**c-d-e**) in the control panel, secondary choke lever and throttle spindle should be aligned. The exact point can be obtained by inserting a pin through the three holes (**Z**). In this position lock plate with screw (**G**).

NOTE *- On engines fitted with diaphragm carburettor and primer, Automagic or Start-O-Matic carburettors the controls were slightly different. It is recommended to change carburettor and control plate when replacements are required.*

c) SPEED ADJUSTMENT (Fig. 15)

Hook spring (**W**) in the hole of lever (**A**) which corresponds to the required high speed. Final adjustment may then be made by screw (**M**). On the carburettor the idle speed is 2000 rpm adjusted by screw (**m**).

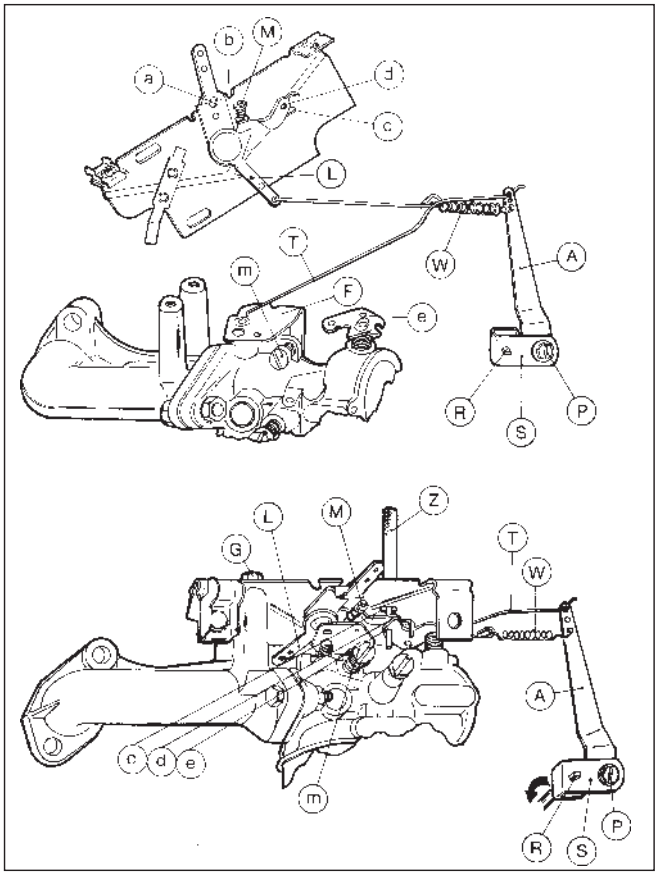


Fig. 15

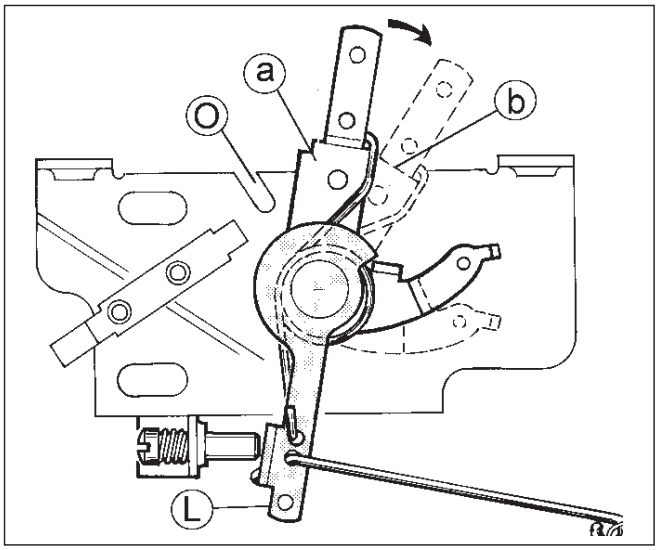


Fig. 16

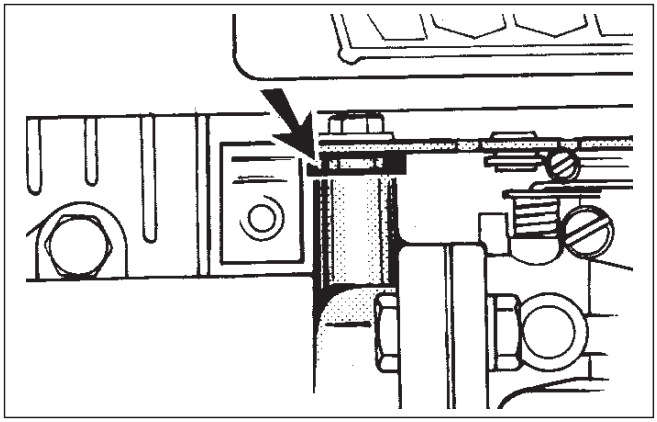


Fig. 17

d) NEW GOVERNOR LEVER AND CLAMP WITH PHILLIPS HEAD. LEFT HAND THREAD ON 4-STROKE VERTICAL SHAFT ENGINES

Starting from serial No. 3-307 D a new clamp No. 27410096 and a new left hand thread screw No. 2919157 have been introduced.
The engines with left hand thread clamp and screw can be easily recognised by Phillips cross head (Fig 19).
Old models have clamp and screw with straight cut head. (Fig 18). Furthermore, new governor lever "A" has 6 holes instead of 5 as in previous lever. (Fig 19).

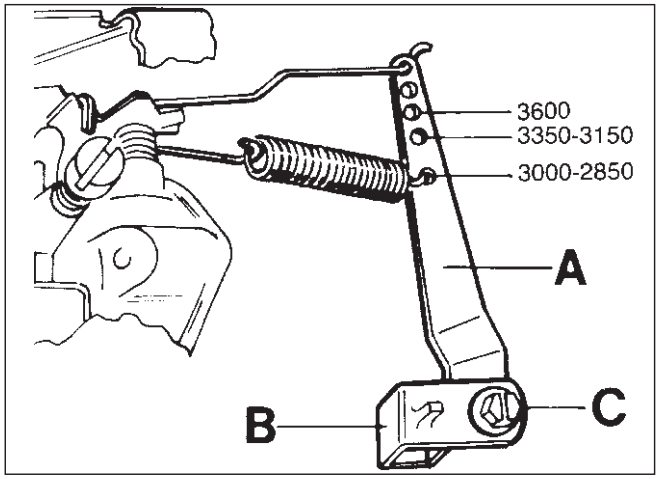


Fig. 18

Fig 18 - (early type)

A. Lever (5 holes)
B. Clamp
C. R-H thread with straight cut head

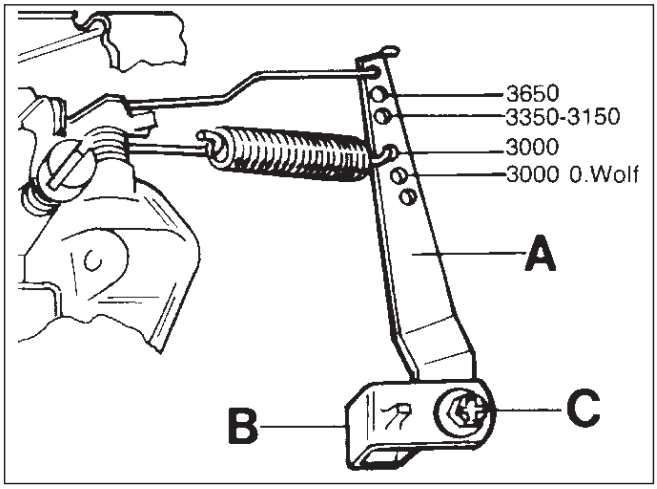


Fig. 19

Fig 19 - (new type)

A. Lever (6 holes)
B. Clamp
C. L-H thread with Phillips head

e) GOVERNOR/PLATE FOR PRIMER CARBURETTOR

Because of the different configuration on the primer carburettor, the speed adjustments are made with the screws on the governor plate. Both speeds (high speed and idle speed) are under governor plate. (Fig 20).
The screw (**A**) is for high speed adjustment, the screw (**B**) is for idle speed adjustment. Usually the engines are set at 3000 rpm max speed, and idle at 2000.

***NOTE** - The screw (**C**) for the governor lever is a left hand thread screw. (Fig 21).*

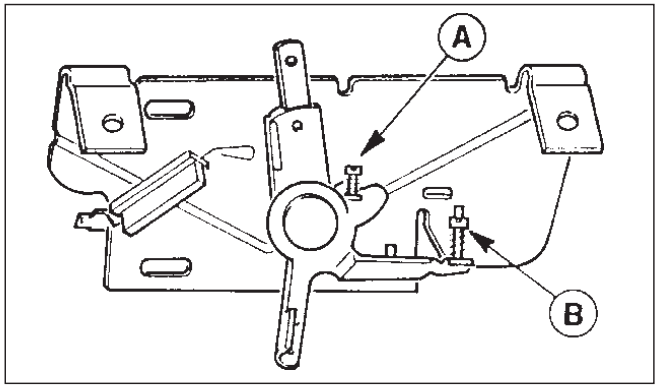


Fig. 20

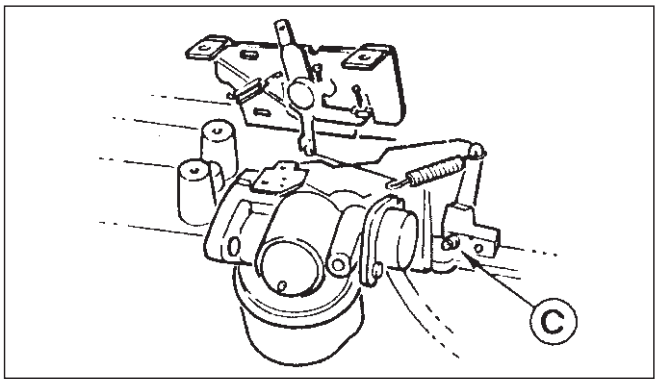


Fig. 21

f) HIGH SPEED CATEGORIES

Figs 22 and 23 show the position of the governor spring for different speeds.
The choke carburettor (Fig 22) is using the spring 27920010. For tiller version the spring is mounted on the 3rd hole. For lawnmower version the spring is mounted on the 5th hole.
The primer carburettor is using the spring 27920123 or 27920161. (Fig 23) in the 2nd hole.

g) GOVERNOR LEVER MOUNTING SYSTEM

There are two different governor lever mounting systems, type **A** and type **B.** (Fig 24).
In type A the linkage is longer, in type **B** the linkage shorter, but both are interchangeable.

h) GOVERNOR PLATE MOUNTING

For the governor plate mounting proceed as follows:
- Install the plate on the intake pipe.
- Insert the two fixing screws.
- Push the plate to the end of the slots towards the filter side.
- Tighten the screws

***NOTE** - If it is not possible to obtain the correct high speed setting using the adjustment screws, move the governor plate towards the spark plug and readjust screws to correct rpm settings.*

i) FIXED SPEED CARBURETTORS. (Fig 24-1)

Adjustment of maximum rpm is achieved by moving tab (**A**) using special tool part number 670326.
Moving the tab towards the spark plug increases the rpm, the opposite decreases rpm.
There is no adjustment of low speed as the engine always runs in high speed mode.

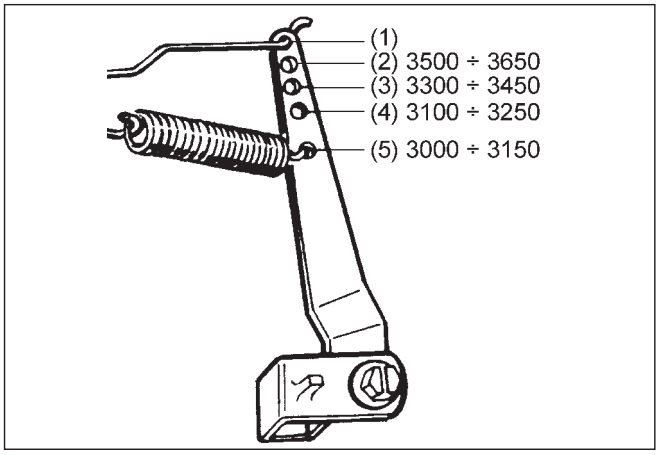


Fig. 22

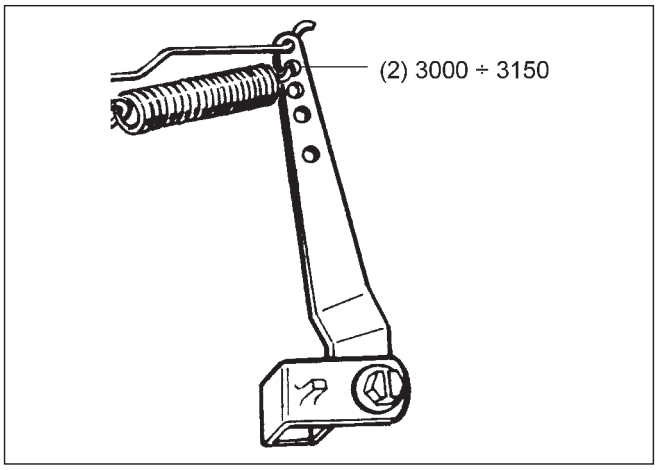


Fig. 23

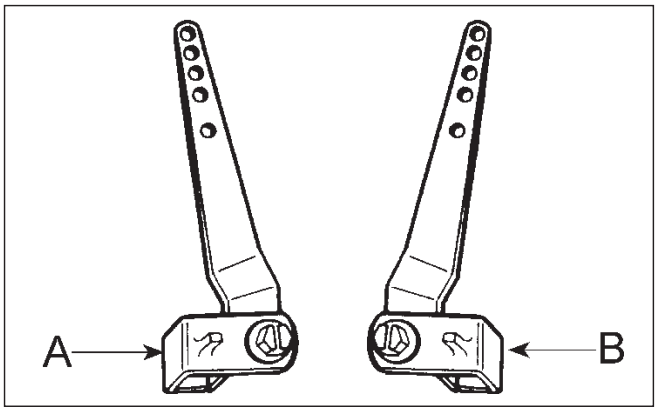


Fig. 24

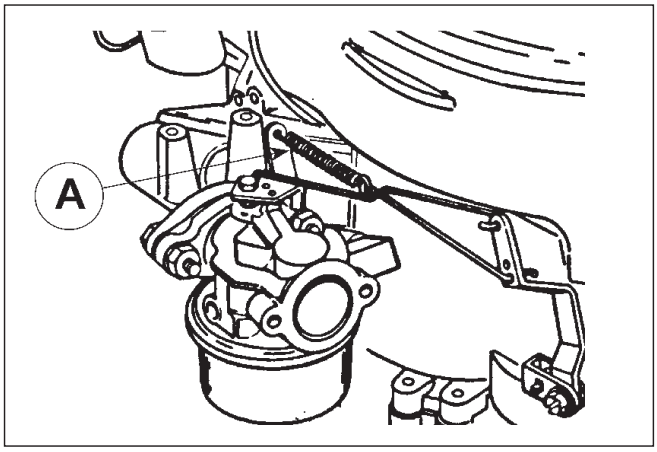


Fig. 24-1

I. TWO-STROKE MECHANICAL ENGINE PARTS

1. UNIBLOCK ENGINES (AV520-600-750-125)

a) INTRODUCTION

Fig. 1 shows the short block.
Fig. 2 shows an exploded view of the engine.
As may be seen the momoblock is compact (combined crankcase and cylinder) and it is sealed in the upper part by the shroud mounting base.

b) EXTERNAL INSPECTION REED PLATE

Fig 3 shows the reed plate. In case of a broken or damaged reed it is necessary to change the two reeds (**A**) by removing the two screws (**B**).

***NOTE** - Use Loctite or similar for sealing when fitting the two screws (**B**).*

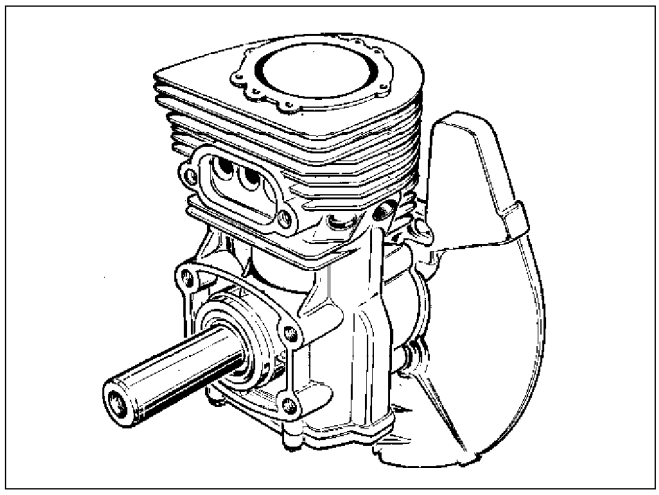


Fig. 1

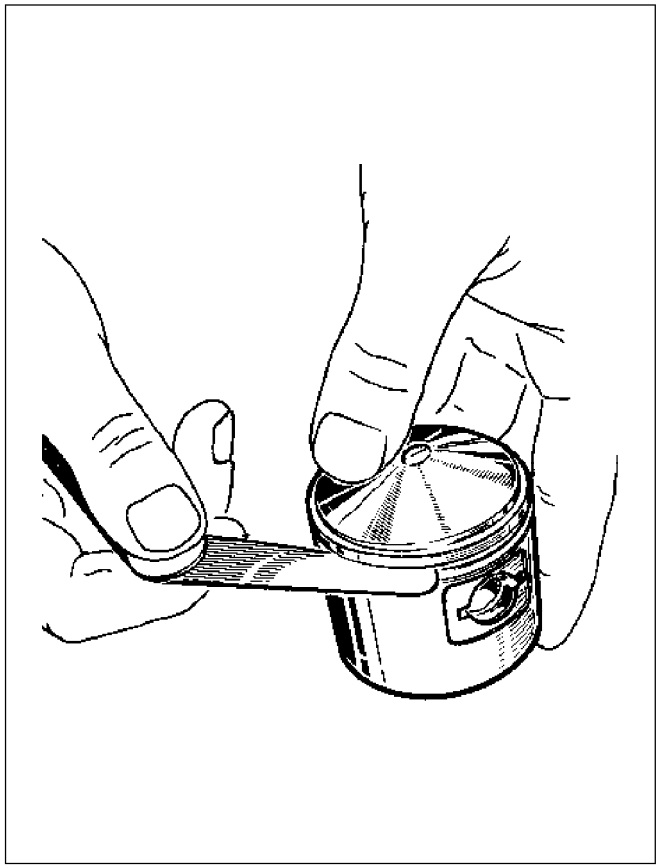


Fig. 2

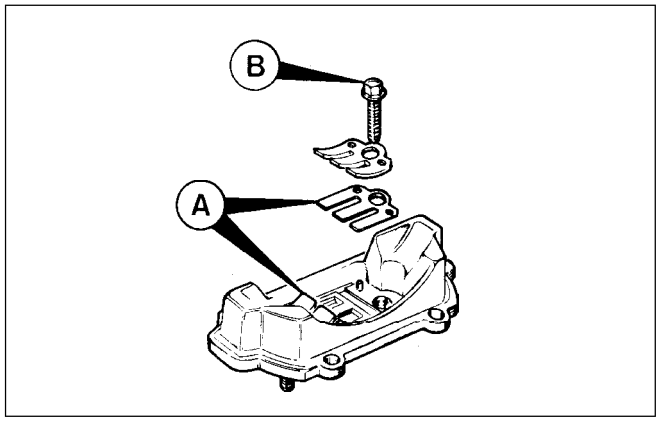


Fig. 3

Inspection of seals

Fig 4 shows the points to which are fitted the gaskets and oil seals that must always be checked to ensure good running of the engine. On a 2 stroke engine all the seals are very important for correct operation.

***NOTE** - On the short block it is important to ensure that the 4 transfer port plugs are perfectly sealed (Fig 4 **A**). When replacing the plugs, seal with Loctite or similar.*

Gaskets

Gaskets fitted to points **B** - **C** - **D** (Fig 4) must be fitted without the aid of any adhesive.
Grease may be used every time the engine is stripped.
Replace the above gaskets when servicing.

Crankshaft seals

Visually check both crankshaft seals (Fig 4 **E** and **F**) and replace if oil is apparent on the outside of the seal.
The crankshaft seals may be removed with the crankshaft in position with the aid of special tool Part No. 670286.

c) INTERNAL INSPECTION

If compression loss occurs after inspection of the seals and gaskets, dismantle the short block as follows:

- Remove cylinder head
- With the cylinder head removed a first visual check on the cylinder condition can be made by turning piston to BDC.
- Remove shroud base (Fig 5)

***NOTE** - During disassembling take care the 27 needles of the top main bearing do not get lost as they are not caged.*

- *Remove the reed plate assy*

At this point the conrod may be removed as follows:

- Turn the piston to BDC
- Remove the two conrod screws with a 3-16" hexagonal head key
- Remove big end cap taking care not to lose the 37 needles
- After having removed the big end cap rotate the crankshaft until the piston is turned to TDC.

***NOTE** - Before carrying out this operation clean carbon from the upper part of the cylinder. Then remove the piston and the conrod.*

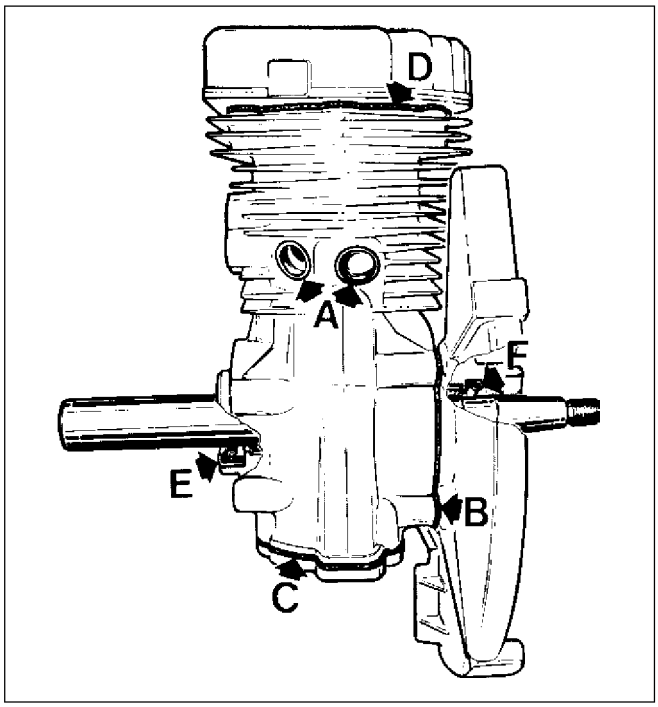


Fig. 4

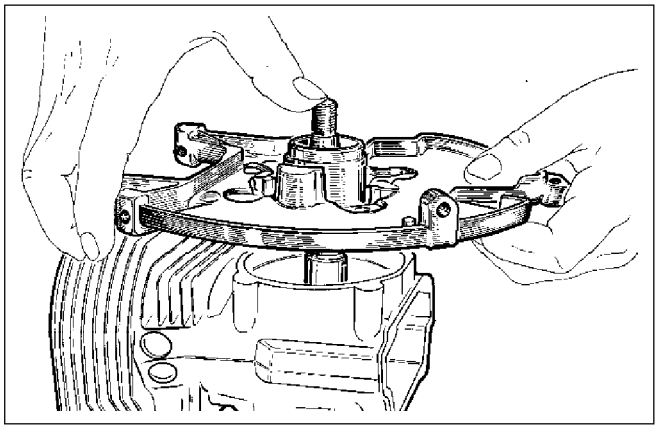


Fig. 5

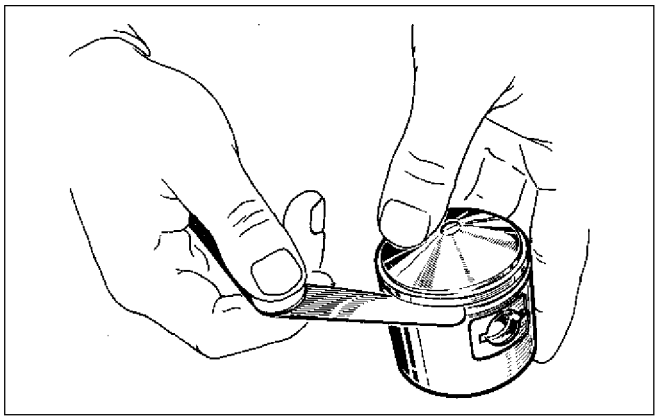


Fig. 6

- Remove the crankshaft taking care not to lose the 29 needles of the bottom main bearing.

The engine is now completely disassembled. Check bore for cylinder wear and ovality. This should not exceed 0.10 mm or 0.0039" over the size given in table. Cylinders with wear outside these limits should be replaced. Measure piston for wear or ovality. This should not exceed 0.05 mm or 0.0020" over the size given in table.

Check the piston ring groove clearance does not exceed 0.12 mm or 0.0047" (Fig 6).

Renew the piston if the wear is outside these limits.

Insert rings into bore about 15 mm from the top and check ring gap (Fig 7)

See table for wear limits. Replace ring if the distance exceeds the table limits.

To replace the piston take off the two retaining rings (Fig 8).

NOTE *- The piston has a hole on the piston pin boss (Fig 9).*

Ensure that this hole is fitted to flywheel side (opposite to the exhaust).

With the use of a micrometer, check also the different diameters of the crank pin and of the main bearings for wear or ovality.

This should not exceed 0.013 mm (0.0005") main bearing journals and 0.025 mm (0.001") big end bearing journal.

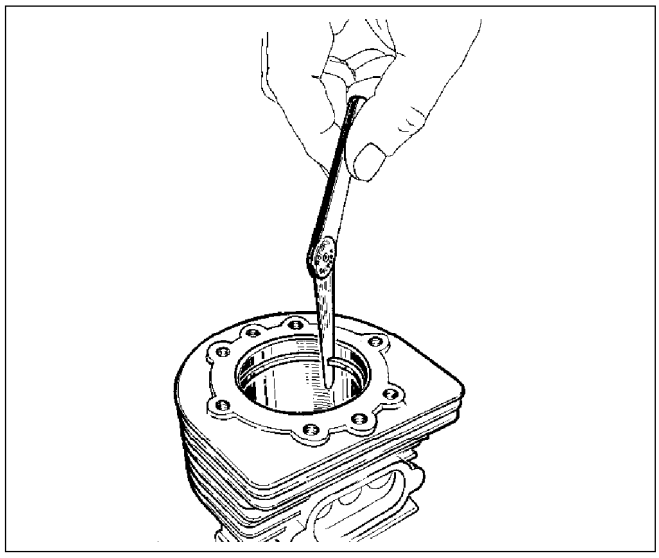


Fig. 7

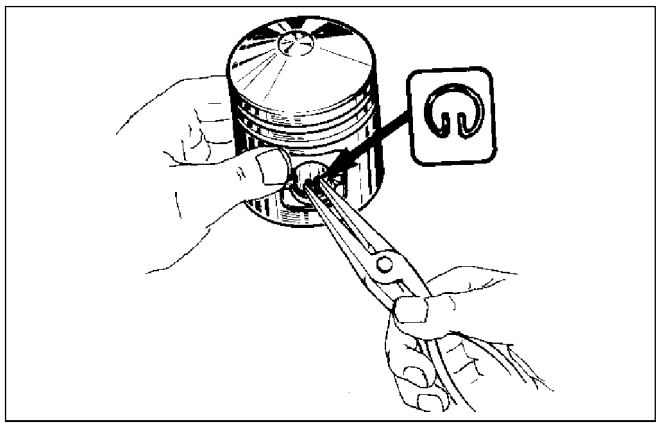


Fig. 8

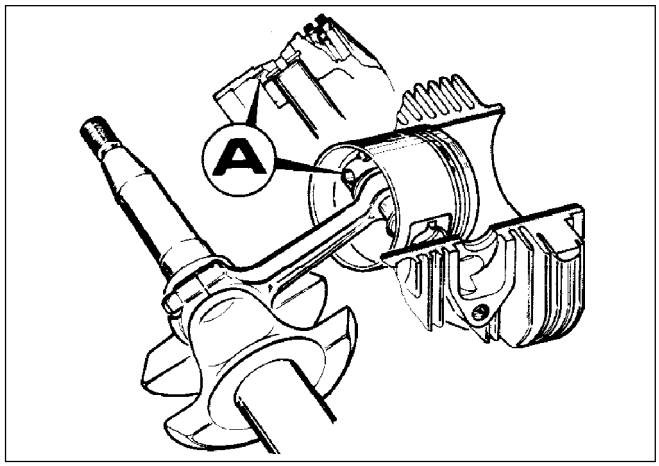


Fig. 9

d) MAIN BEARING

The needle bearings can be replaced using Tecumseh tools (Fig 10).
Use tool 88841026 for flywheel side and tool 88841027 for PTO side to remove bearings.
To refit bearings use tool 88841530 for flywheel side and tool 88841529 for PTO side.

NOTE *- To remove or refit bearings, heat cylinder or shroud base.*

Reassembly of engine

- After having assembled the piston on the conrod, ensure that the steel bearing halves match and insert on the conrod and cap, ensuring that the two bearing shells are correctly located.
  Ensure that the alignment marks on the conrod cap and conrod are matched. (Fig 12).
- Fit the crankshaft protecting the oil seal
- Fit the piston conrod assembly ensuring that hole in the piston pin boss is on the flywheel side (opposite to the exhaust).
- Place the cylinder-piston-conrod-crankshaft block on a flat surface (Fig 13) and turn piston to BDC.
- Fit the 37 needles around crank pin leaving some tolerance between conrod and crankshaft.
- Fit the conrod cap ensuring that the needles are retained in their correct position.
- Progressively tighten the screws turning a few times to ensure that the needles are located in place.
- Tighten conrod according to torque limits.
- Fit the shroud base ensuring that the gasket is fitted correctly.

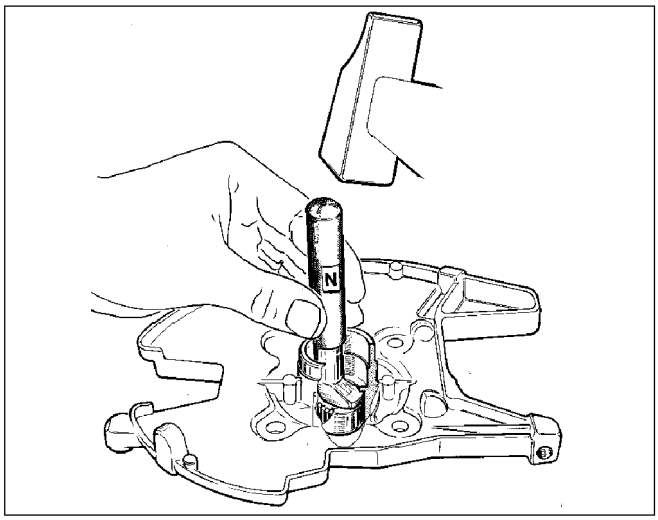


Fig. 10

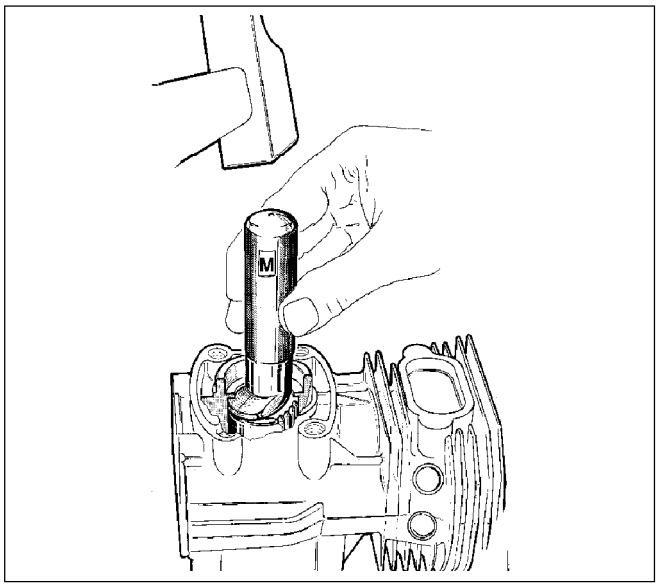


Fig. 11

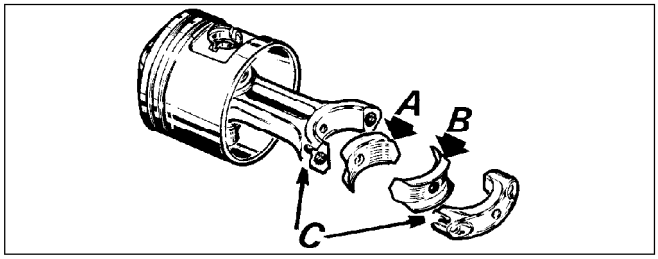


Fig. 12

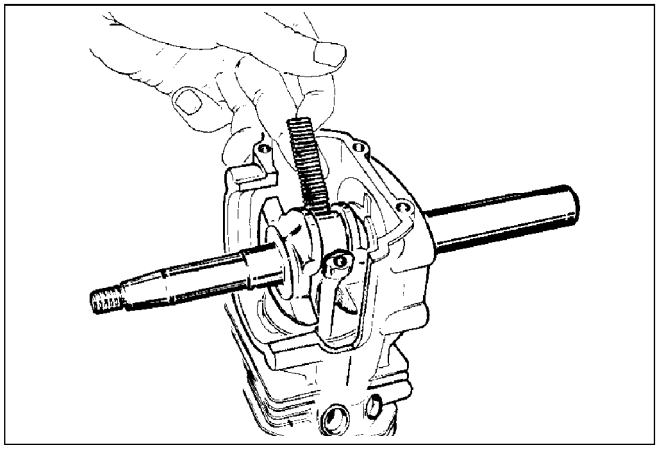


Fig. 13

e) OVERSIZED PISTONS FOR 2 STROKE ENGINES

As in all engine production, Tecumseh occasionally produce cylinders bored above maximum allowable tolerance. In this case .010" oversize pistons and rings will be fitted. These components may be identified by the figure 1 stamped on both cylinder and piston. (Fig 14 shows location of these marks.

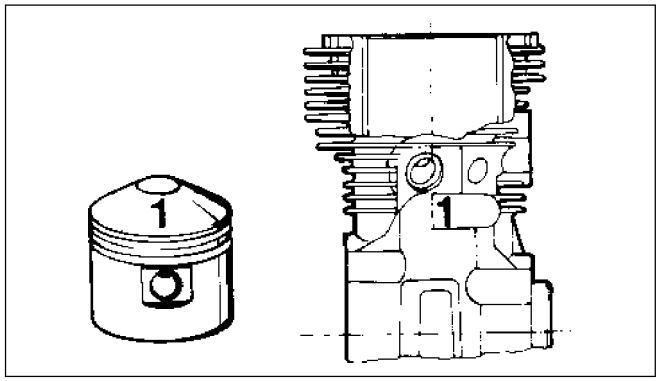


Fig. 14

2. MONO BLOCK ENGINES - MV100S

a) GENERAL

The MV100S is fitted with a ball bearing on both top and bottom main bearings (Fig 15, **A**) and retains the 37 needle bearings in the conrod as per earlier models.
The cylinder has two posts cast onto it, for mounting the electronic ignition module. (Not shown)

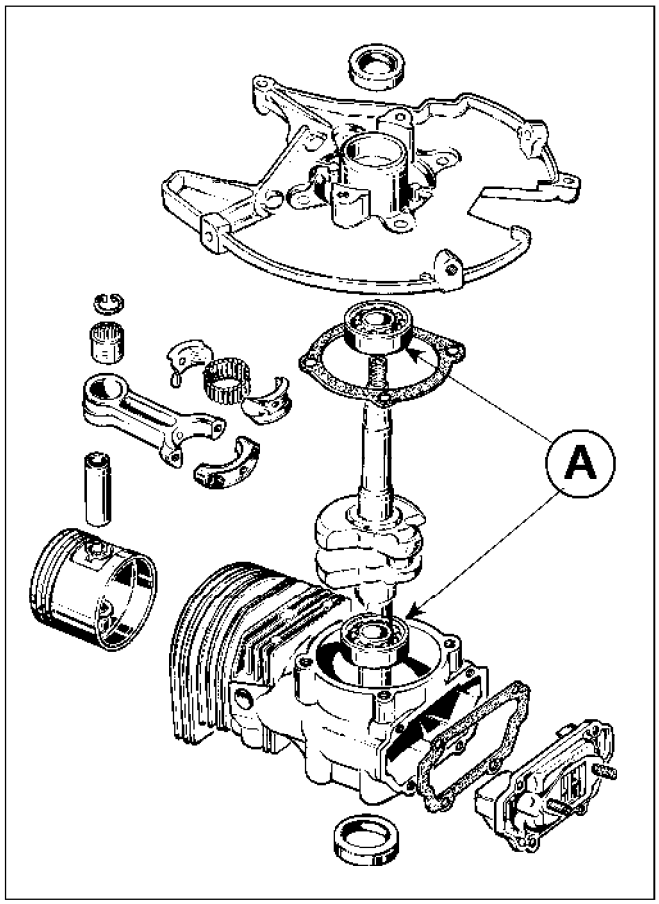


Fig. 15

b) REMOVAL OF FLYWHEEL

The standard method of flywheel removal used on other engines can damage the balls and bearing tracks (Fig 16). In order to remove the flywheel in the correct way, proceed as follows:

- Remove the other parts in the standard way (air shroud, fixing bolt, screen).
- Place the tool **670306** as per Fig 17 locating the screw '**A**' on to the crankshaft.
- Place the 3 self-threading screws of the tool in the 3 holes of the flywheel and tighten to at least 2 turns.

***NOTE** - The bolts should be placed in the correct way and each tightened the same number of turns.*

- The centre bolt (**A**) should not yet be tightened on the crankshaft.
- By using the tool 670306 and an 11/16 wrench the centre bolt can now be tightened (A). In this way the flywheel can be removed (Fig 17).
- For reassembling the flywheel, proceed as usual.

***NOTE** - Subsequent removal is made easier as the flywheel holes are already threaded. It is now necessary to screw the self-threading screws up to at least one thread more than those already tapped.*

c) ENGINE BLOCK DISASSEMBLY

The engine block consists of 3 main groups of parts fitted into the cylinder (Fig 18).

1 Reed valve/carburettor
2 Conrod/Piston
3 Crankshaft/Bearing/Shroud base

In order to disassemble these groups proceed as follows:

Shroud Base Disassembly

Remove external parts (air shroud, flywheel, ignition system), then unscrew the 4 screws fixing the base (Fig 19, **A**).
The air shroud base cannot be easily removed as it is fixed by the ball bearing. For removal use the tool 88841044 with the relevant bolts (Fig 19, **B**)

***NOTE** - These are the same bolts used for fixing some types of muffler to 4 stroke engines.*

Screw fixing bolts '**B**' in an equal number of turns (Fig 19). With an 11/16 wrench tighten centre bolt and pull off base.

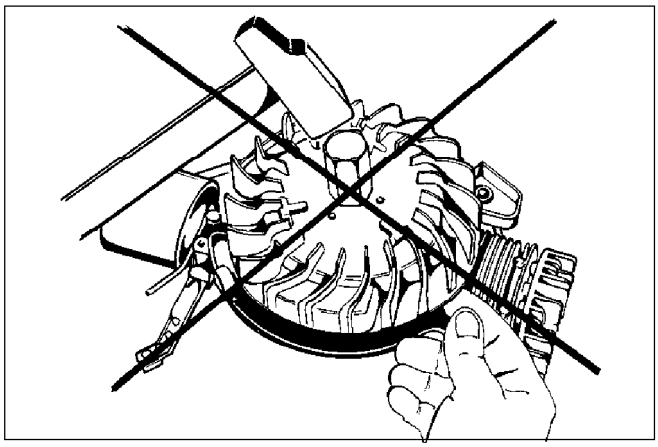


Fig. 16

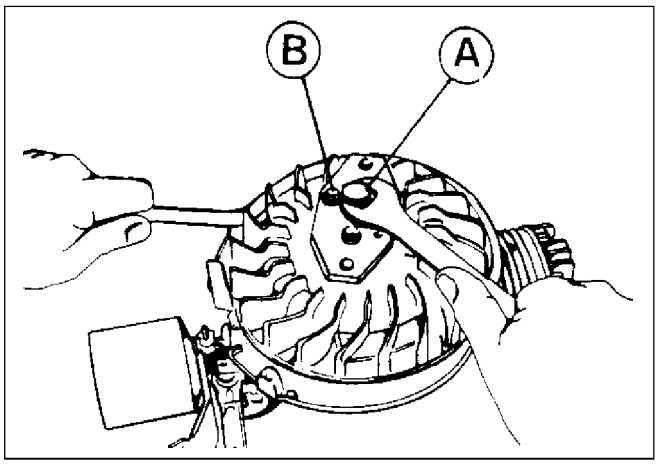


Fig. 17

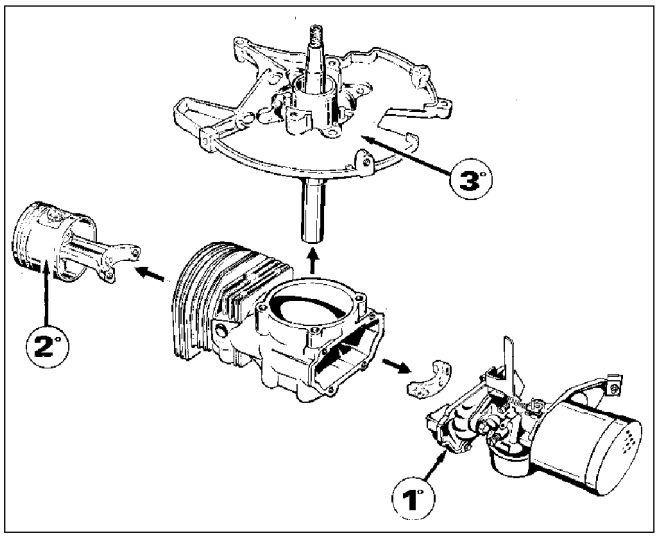


Fig. 18

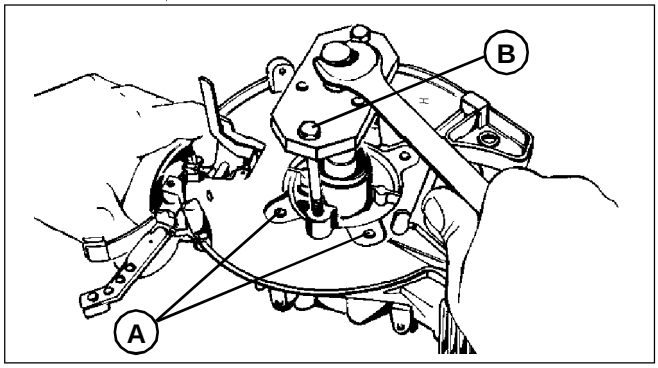


Fig. 19

d) REMOVAL AND REFITTING OF CONNECTING ROD & PISTON ASSEMBLY

This procedure is the same as for earlier engines.

e) REMOVAL AND REFITTING OF CRANKSHAFT (INCLUDING BALL BEARING)

- In order to remove or replace the bearing, the shroud base must be pre-heated to 80/100 deg C. (Fig. 20)
- The shaft and bottom bearing may also be removed by heating the cylinder as above.
- The bottom bearing may be removed from the shaft with the aid of a standard puller.

***NOTE** - This operation renders the ball race unserviceable and a new bearing should always be fitted. hen fitting a new bearing ensure that both shaft and bearing faces are clean.*

***NOTE** - Support the crankshaft webbs when driving on new PTO bearing (FIG 21, **A**)*

- Heat block as per above and refit the crankshaft

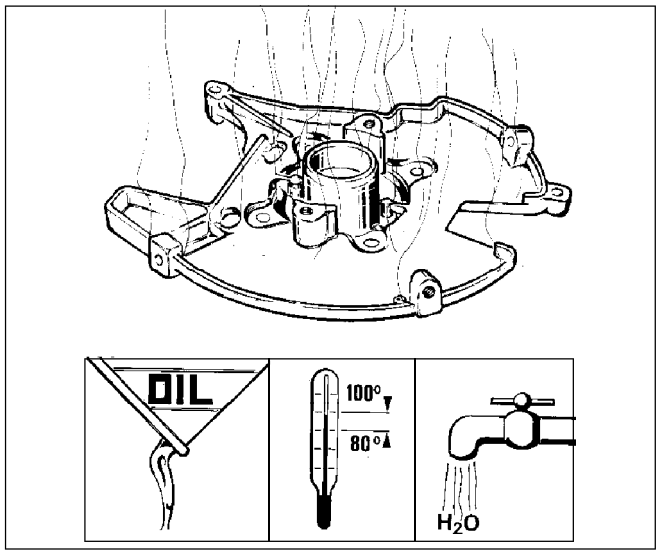


Fig. 20

f) SHROUD BASE REASSEMBLY

Assembly should be made only after expanding the base.

- Place the gasket on the cylinder.
- Heat the shroud base by immersing in oil or water at a temperature of about 80/100 deg **C** (Fig 20).
- Support the base and press in new bearing.
- Press bearing and base assy on to crank (Fig 22)
- Replace the 4 screws
- If the crankshaft does not turn easily, strike p.t.o. end with a copper hammer in order to fully seat bearing.
- Assemble the oil seal as per instructions for earlier engines.

***NOTE** - Should the base be heated in water, after assembly start the engine and let it run for a few minutes in order to dry and so avoid internal oxidation.*

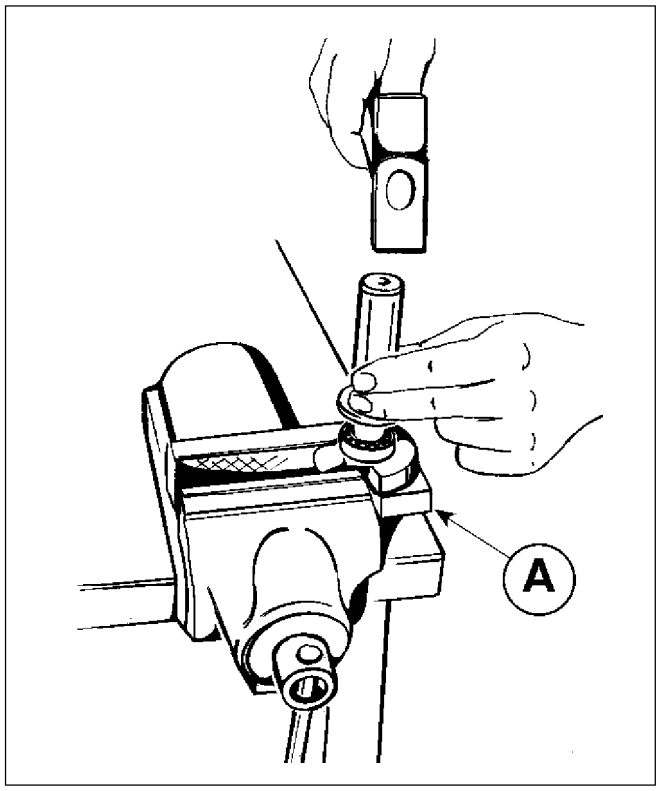


Fig. 21

3. ALTERNATIVE VERSIONS (AV85S, EARLIER MV100S).

For a short period, alternative versions to the two previously mentioned were built. Some versions had a top main ball bearing, bottom bush bearing and bushed connecting rod bearing. Other versions had ball bearings for top and bottom main, and a bushed bearing on the conrod. Refer to previous instructions for disassembly and reassembly except the bushed conrod big end cap is fitted with two retaining screws and one piece lock tab. On assy ensure that lock tabs are securely located on screw heads.
Ensure that screws are torqued to correct specification as follows:

- Torque setting Big end screws (bushed bearing)
  Nm 6,8 - 7,4 (60 - 67 inch/lbs)

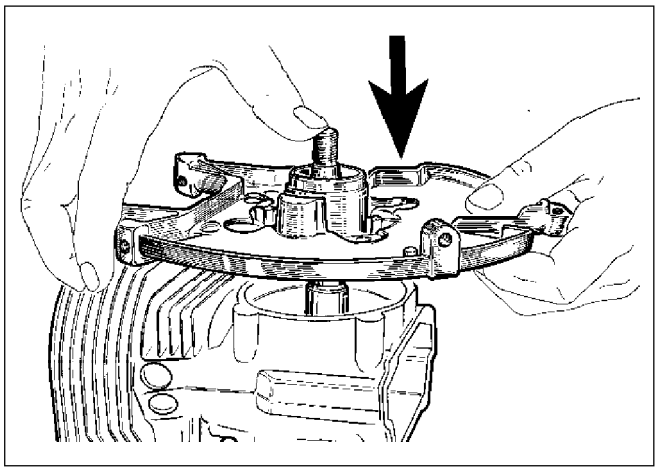


Fig. 22

TECUMSEH EUROPA

2 - STROKE ENGINE - SPECIFICATIONS						
DESCRIPTION	**AV 125**		**MV 100 S**		**MV 100 SB** HIGH RPM	
	mm	**Inch**	**mm**	**Inch**	**mm**	**Inch**
Engine displacement	cm^3 123.19	cu.Inch 7.5	cm^3 98.49	cu.Inch 6.01	cm^3 98.49	cu.Inch 6.01
Stroke	50.15	1.974	44.5	1.752	44.5	1.752
Boring	sel. 56.000 A 56.012	2.2047 2.2052	53.061 53.086	2.089 2.090	53.061 53.086	2.089 2.090
	sel. 56.012 B 56.024	2.2052 2.2056				
Profiled piston skirt diam.	sel. 55.91 A 55.92	2.2011 2.2015				
	sel. 55.92 B 55.93	2.2015 2.2019				
Piston skirt diam.			53.070 53.079	2.0893 2.0897	53.070 53.079	2.0893 2.0897
Width of snap ring groove	2.09 2.11	.0822 .0830	1.638 1.664	.0644 .0656	1.638 1.664	.0644 .0656
Axial clearance of snap ring in groove	0.100 0.132	.00394 .00520	0.051 0.082	.00201 .00323	0.051	.00201
Distance between ring points	0.20 0.35	.0078 .0137	0.152 0.279	.0059 .0109	0.152 0.279	.0059 .0109
Diam. of piston pin seats on piston	12.698 12.703	.499 .500	12.698 12.703	.499 .500	12.698 12.703	.499 .500
Piston pin diam.	12.697 12.692	.4998 .4996	12.697 12.692	.4998 .4996	12.697 12.692	.4998 .4996
Diam. of conrod at end of engine shaft	24.097 24.114	.9480 .9493	21.457 21.464	.8447 .8450	21.457 21.464	.8447 .8450
Diam. of conrod roller track on engine shaft side	25.387 25.400	.986 1.000	25.385 25.406	.9994 1.0002		

2-STROKE ENGINE -SPECIFICATIONS

DESCRIPTION	AV 125		MV 100 S		MV 100 SB High RPM	
	mm	Inch	mm	Inch	mm	Inch
Conrod bearing diam. - piston pin side	17.450 17.475	.6870 .6879	– –	– –	– –	– –
Internal diam. of conrod roller bearing - piston pin side	12.712 12.746	.500 .501	– –	– –	– –	– –
Conrod bearing diam. piston pin side	– –	– –	12.720 12.711	.5007 .5004	12.720 12.711	.5007 .5004
Crankshaft journal diam.	19.269 19.277	.7580 .7589	21.400 21.408	.842 .842	21.400 21.408	.8425 .8428
Conrod roller diam. - engine shaft side	2.400 2.395	.0945 .0943	– –	– –	– –	– –
No. of rollers	28		–	–	37	
Crankshaft bearing seat diam. - power intake side	25.387 25.400	.999 1.000	25.385 25.395	.9994 .9998	25.008 25.017	.9845 .9849
Crankshaft bearing seat diam. - flywheel side	17.009 17.001	.6694 .6693	17.009 17.001	.6694 .6693	17.009 17.001	.6694 .6693
Bearing seat diam. - flywheel side	Ball bearings 39.955 39.971	 1.5730 1.5736	Ball bearings 39.955 39.971	 1.5730 1.5736	Ball bearings 39.955 39.971	 1.5730 1.5736
Bearing seat diam. - power intake side	33.299 33.317	1.3109 1.3116	– –	– –	Ball bearings 46.951 46.935	 1.8484 1.8478
Internal bearing diam. - power intake side	25.4	– 1.000	–	25.000	.9842 24.990	 .9838
No. of rollers			29	–	–	—
Diam. of bearing installed on cylinder - power intake side	– –	– –	25.456 25.466	1.0022 1.0025		
Shaft-engine threading - flywheel side	**7/16 - 20 UNF - 2A**		**7/16 - 20 UNF - 2A**		**7/16 - 20 UNF - 2A**	

TECUMSEH EUROPA

2-STROKE ENGINES PRODUCED FROM 1985/86 TO PRESENT

2-STROKE ENGINE SPECIFICATIONS							
DESCRIPTION		**mm**	**Inch**				
		MV 100 MV 100-S	**MV 100 MV 100.S**				
Boring		53.061 53.086	2.089 2.090				
Stroke		44.5	1.752				
Engine displacement		cm^3 98.49	cu. inch. 6.01				
Air gap between	N/1						
elect. ignition coil	3000/3150	0.20 ÷ 0.30	.008 ÷ .012				
and flywheel	3350/3650/3850	0.30 ÷ 0.40	.012 ÷ .016				
Spark advance		Electronic	Electronic				
Distance between spark plug electrodes		0.55 0.60	.022 .024				
Distance between ring points		0.20 0.35	.008 .014				
Piston skirt diam.		52.781 52.857	2.078 2.081				
Width of snap ring groove		1.638 1.664	.0644 .0655				
Width of snap rings		1.562 1.587	.0614 .0624				
Piston pin diam.		12.692 12.697	.4996 .4998				
Crank journal diam.		21.399 21.412	.8424 .8429				

2-STROKE ENGINES PRODUCED FROM 1985/86 TO PRESENT

2-STROKE ENGINE SPECIFICATIONS						
DESCRIPTION	**mm**	**Inch**				
	MV 100 MV 100-S	**MV 100 MV 100.S**				
Crankshaft bearing seat diam. - power intake side	25.400 25.387	1.0000 .9994				
Crankshaft bearing seat diam. - flywheel side	17.009 16.989	.6692 .6688				
Crankshaft bearing - flywheel side	Ball bearings	Ball bearings				
Cuscinetto di banco lato presa di potenza	Ball bearings	Ball bearings				
Piston pin diam.	No	No				
Engine-shaft axial clearance	12.692 12.697	.4996 .4998				
Conrod bearing - piston side	Roller bearings	Roller bearings				
Conrod bearing - shaft engine side No. of rollers	Roller bearings 37	Roller bearings 37				
Shaft engine threading - flywheel side	7/16-20 UNF 2.A	7/16-20 UNF 2.A				

TECUMSEH EUROPA

2-STROKE ENGINE CLOSING TORQUE SPECIFICATIONS							
DESCRIPTION	SCREW SIZES	N x m	kgm	Inch x Lbs	AV-MV TYPE ENGINES		
					520 85S	600 100S	750 125
Cylinder head screw	1/4-20 x 18	10.1 - 11.28	1.029 - 1.15	90 - 100	X	X	X
Conrod screw	10-24 x 19.05	6.77 - 7.41	0.69 - 0.75	60 - 67	X	X	
Conrod screw	10-32 x 15.87	9.61 - 10.69	0.98 - 1.09	85 - 95			X
Reed plate screws	1/4-28 x 22.2	7.36 - 8.4	0.75 - 0.86	65 - 75	X	X	X
Carburettor fastening bolts	1/4-28	7.36 - 8.4	0.75 - 0.86	65 - 75	X	X	X
Conveyor/cylinder base fastening screws	1/4-20 x 16	14.7 - 18	1.5 - 1.84	130 - 160	X	X	X
Conveyor/cylinder fastening screws	1/4-20 x 12.7	9.02 - 10.1	0.92 - 1.03	80 - 90	X	X	X
Filter container fastening screws	10-32 x 18	3.33 - 4.51	0.34 - 0.46	30 - 40	X	X	X
Filter container fastening screws	10-32 x 11.1	3.33 - 4.51	0.34 - 0.46	30 - 40	X	X	X
Side starter rope guide fastening screws	8-32 x 9	1.67 - 2.26	0.17 - 0.23	15 - 20	X	X	
Reed plate to cylinder fastening screws	10-24 x 15	6.18 - 6.77	0.63 - 0.69	55 - 60	X	X	X
Starter to conveyor fastening screws	1/4-28 x 10	5.69 - 6.77	0.58 - 0.69	50 - 60	X	X	X
Side starter to cylinder fastening screws	1/4-20 x 12.7	7.95 - 9.61	0.81 - 0.97	70 - 85	X	X	X
Earthing terminal fastening screw	8-32 x 12.7	1.67 - 2.84	0.17 - 0.29	15 - 25	X	X	X
Spark plug	M14	20.30 - 33.94	2.07 - 3.46	180 - 300	X	X	X
Flywheel fastening screw	7/16-20	45.22 - 51.99	4.61 - 5.30	400 - 460	X	X	X
Cylinder stator fastening screws	1/4-20 x 16	8.44 - 10.1	0.86 - 1.02	75 - 90	X	X	X
2-liter tank fastening screws	1/4-20 x 22	2.85 - 3.92	0.29 - 0.4	25 - 35	X	X	X
Remote-control fastening screws	10-32 x 9	2.26 - 3.33	0.23 - 0.34	20 - 30	X	X	X
Cylinder silencer fastening screws	1/4-20 x 60	4.51 - 5.69	0.46 - 0.58	40 - 50	X	X	X
Ring silencer	5/16-18 x 48	11.87 - 13.73	1.21 - 1.4	105 - 120	X	X	X

L. MECHANICAL PARTS OF 4 STROKE ENGINES

1. GENERAL

The engine block/assemblies supplied for the vertical shaft and horizontal shaft engines are similar in construction (apart from mounting differences). The disassembly and inspection of these is therefore almost the same. (Fig 1).

2. COMPRESSION CHECK

Check compression by hand or with a compression gauge, for compression details see table. If compression is weak, check:
- spark plug threads
- cylinder head gasket for leaks
- valve seat condition
- cylinder, piston and rings

***NOTE** - If engine is fitted with compression release, it is necessary to remove the cylinder head and check components visually.*

HEAD AND GASKET

If leaking occurs at cylinder head, remove and check for distortion or damage to sparking plug threads, if necessary replace the head using a new gasket.

***NOTE** - With the SIC compression tester checking can be done without disassembling the cylinder head.*

3. VALVES

After removal of the head visually check the valves and seats. If removal is necessary remove breather assembly and parts with special tool 88841012 (Fig 2) lift valve spring. The securing cap may then be removed, the same procedure applies to both valves. Withdraw the valves and remove all carbon deposits from the seats and cylinder. The valves may now be “lapped” in.
In case of badly burned or pitted seats it will be necessary to re-cut the seats to an angle of 45 degrees using special tool 26990002 and 26990001 (Fig 3).

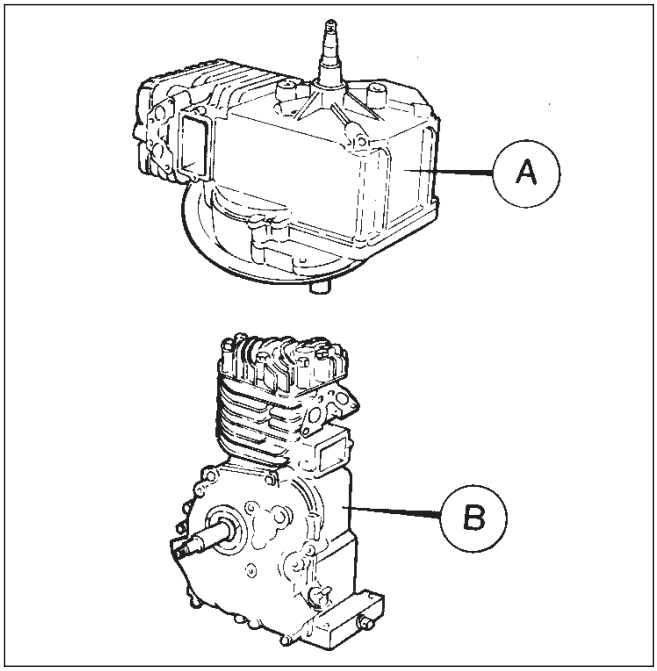


Fig.1

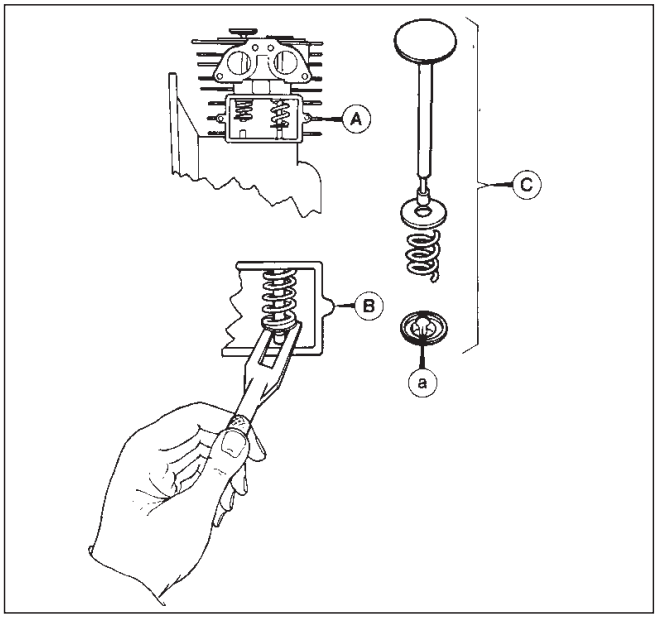


Fig. 2

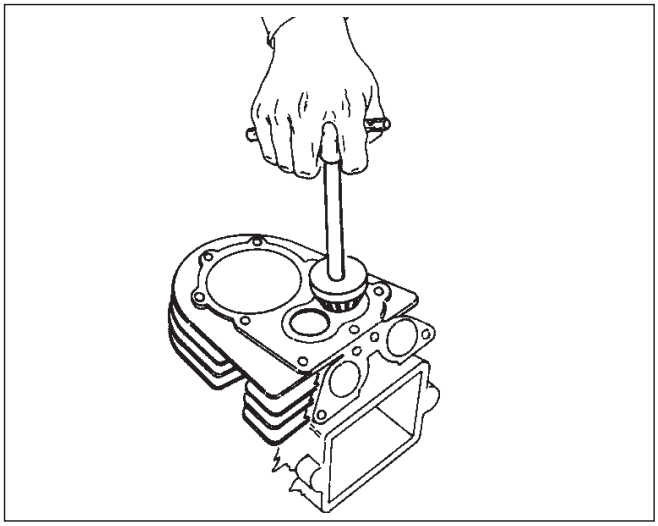


Fig. 3

If seats are beyond repair, it is necessary to change the complete cylinder as the seats are not replaceable.

Check the valve seats for pitting etc, the valves are marked '**E**' (exhaust) and '**I**' (inlet). If the valve guides are worn, valves with oversize stems are available and the guides should be reamed out to take these. Grind in the valve using tool no. 88841015 (Fig 4).

Check that the valve head is within dimensions shown in Fig 5.

Thickness '**A**' should not be less than 0,8 mm.

Valve seat should not exceed 1-2 mm (0.039"-0.078") in depth.

Check that the valve springs are not cracked or broken and that free, length is not less than 24 mm (15/16"). Replace springs if necessary.

Remove all traces of grinding paste and refit valves in their correct position, refit springs and securing caps (Fig 6).

Check the tappet clearance and set to 0,10-0,20 mm (.006"-.009"). The clearance is obtained by carefully grinding the stem to shorten valve length.

When checking the valve clearance on engines fitted with compression release, care must be taken to ensure that the reading is taken with the camshaft at the point where the cam is not in contact with the tappet (i.e. TDC compression stroke).

Check valve sealing by holding block in position (Fig 7) and filling the ports with petrol and checking the valve seats for leaks.

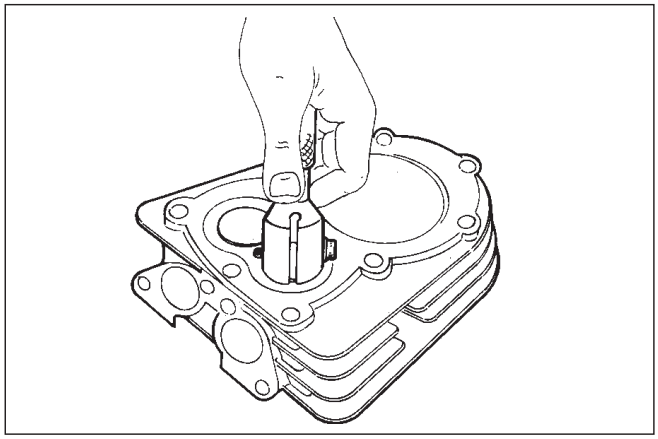


Fig. 4

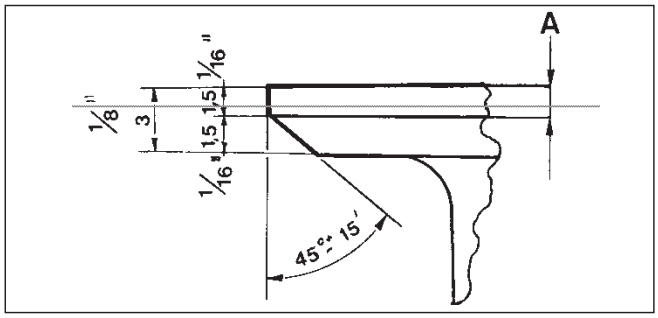


Fig. 5

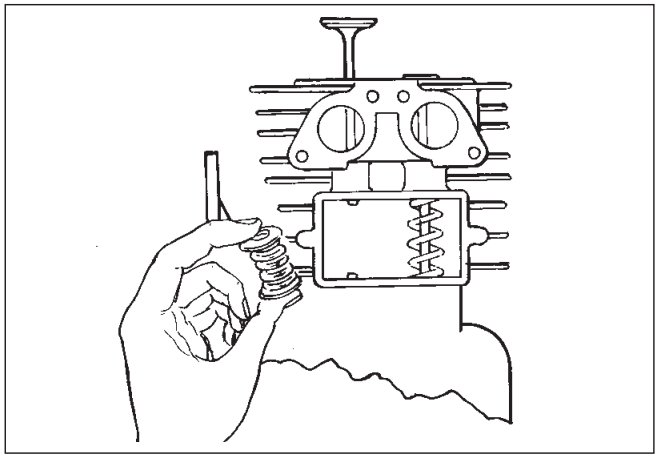


Fig. 6

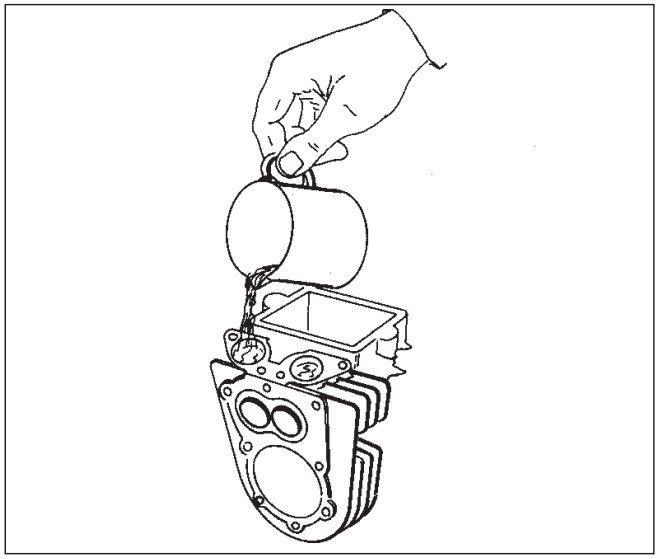


Fig. 7

***NOTE** - Early type valves were secured by a pin fitted through a hole in the valve stem and secured by the spring cap. This type can be removed by lifting the spring and removing the pin with a pair of long nosed pliers (Fig 8).*

4. DISASSEMBLING CYLINDER, PISTON AND RINGS

For removal and checking of piston and rings, drain oil from crankcase by removing plugs '**H**' for horizontal shaft engine and plug '**V**' for vertical shaft (Fig 9).

At this point check crankshaft for main bearing wear and, according to engine type, proceed as follows:

a) ENGINES LAV-BV-HS BVS VANTAGE PRISMA SYNERGY SPECTRA, FUTURA

Remove key from crankshaft (PTO end) and in order to prevent damage to bearing surface during removal, thoroughly clean shaft end and remove crankcase cover. Oil seal damage may be prevented by the use of special tool 670261 (Fig 10-a).

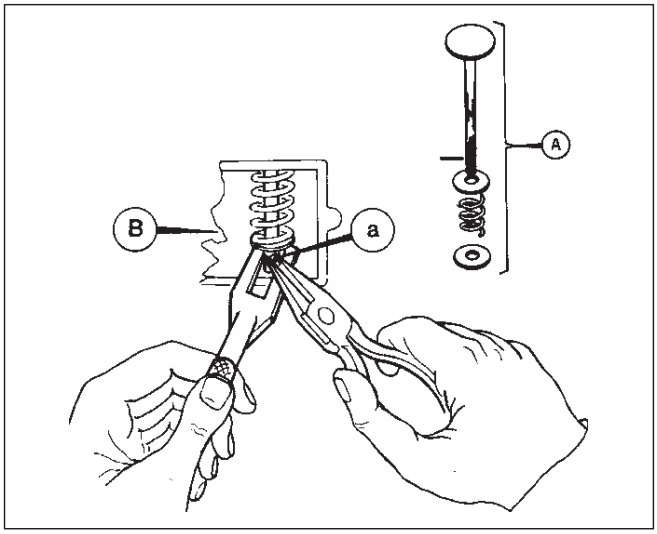


Fig. 8

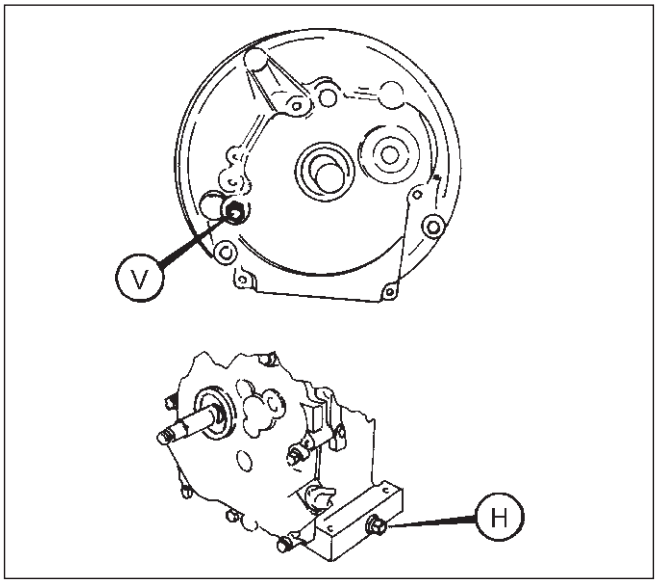


Fig. 9

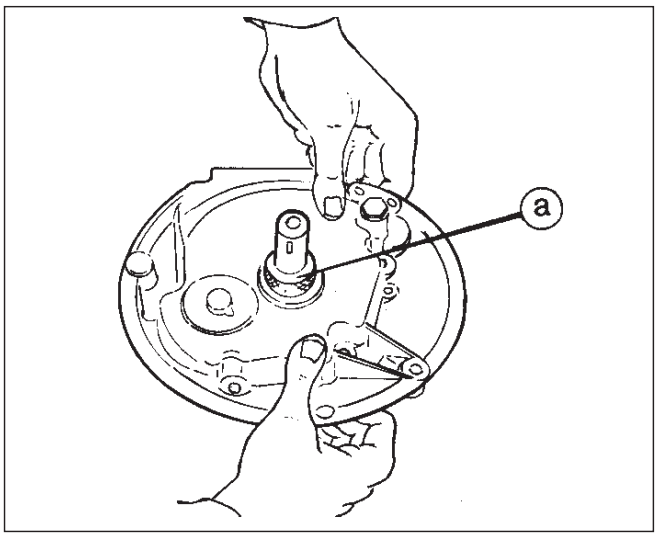


Fig. 10

b) ENGINES HTB-HCB-HSB-HBP-BH WITH BALL BEARING ON PTO

These engines are fitted with a ball race at the PTO end of the crankshaft and removal is as follows:

Remove crankshaft key and any dirt or rust present on the shaft.

On early engines remove oil seal (Fig 11) and with thin nose pliers, remove bearing circlip.

BH engines - the side plate can be removed complete with bearing and seal.

All types - remove crankcase cover bolts and withdraw cover.

With PTO end uppermost remove gasket, dowel pins, and oil pump (vertical shaft engines), camshaft and tappets, (mark tappets for refitting in same position).

Remove big end nuts, big end cap and dipper (H engines), remove carbon deposits from cylinder bore and withdraw piston and conrod.

Remove crankshaft, clean all components and check for wear or damage. (Fig 12 &13).

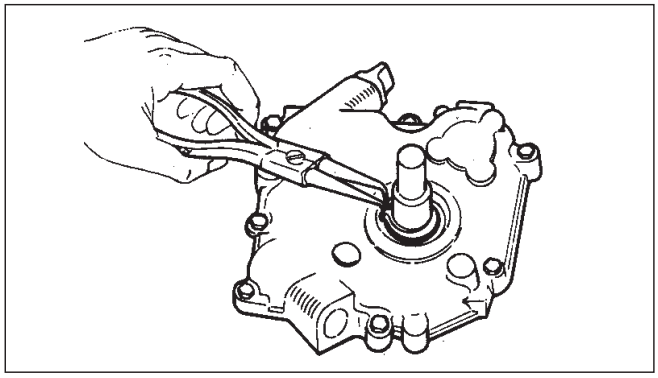


Fig. 11

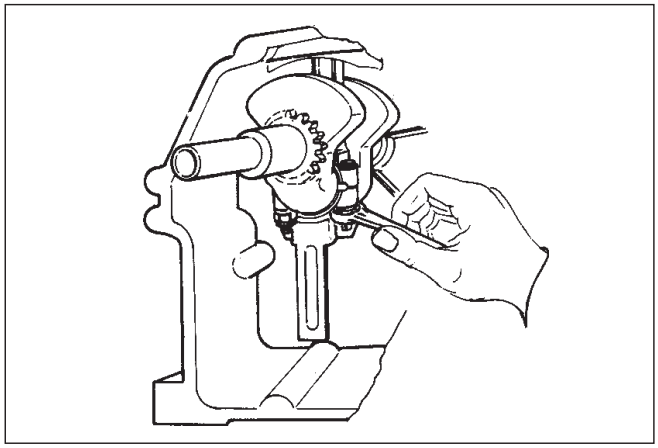


Fig. 12

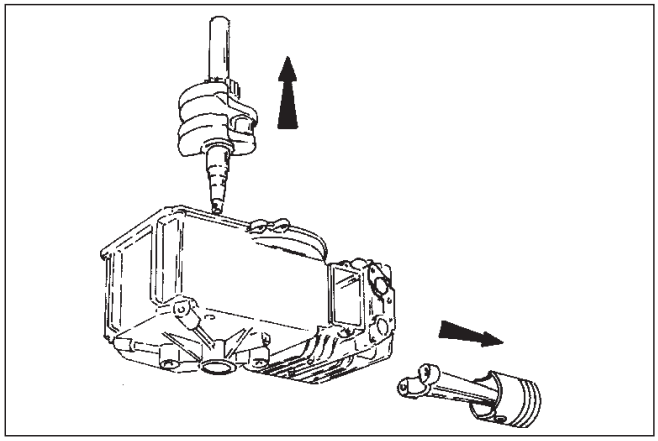


Fig. 13

5. INTERNAL INSPECTION

a) CYLINDER

Check with suitable instruments the wear on the following:

Cylinder bore (Fig 14-A)

(Fig 14). This should not exceed 0,15 mm (.006”). Ovality should also not exceed 0,15 mm (.006”). (See table for piston sizes).

Flywheel side bearing (Fig 14-B)

Check oil feed holes for obstruction, max diameter of bearing should not exceed size given in table.

Camshaft bearings (Fig 14-C)

Check oil feed holes (vertical shaft engines) and check that bearing conform to sizes given in table.

b) CRANKCASE COVER

Check the side cover or base plate for damage or distortion.

PTO side bearing (Fig 15)

On engines with ball bearing check the condition of the ball race.
On other engines check the bearing diameter for wear according to dimensions given in table.

c) CRANKSHAFT

Check crankshaft for size as in Fig 16.
Check main bearings for wear against dimensions given in table, max should not exceed:

- Flywheel side ..... 0,02 mm (0.0008”)
- PTO side ..... 0,03 mm (0.0012”)
- big end ..... 0,02 mm (0.0008”)

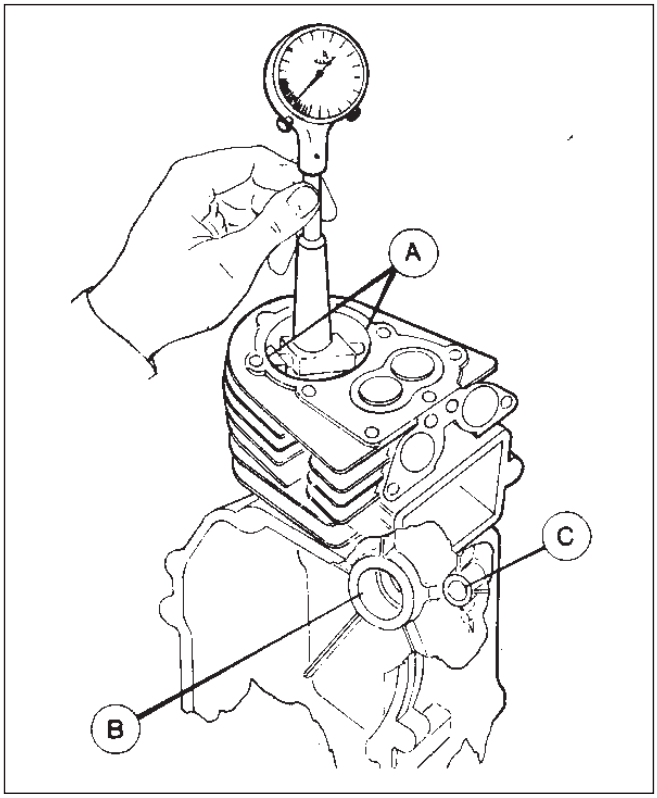


Fig. 14

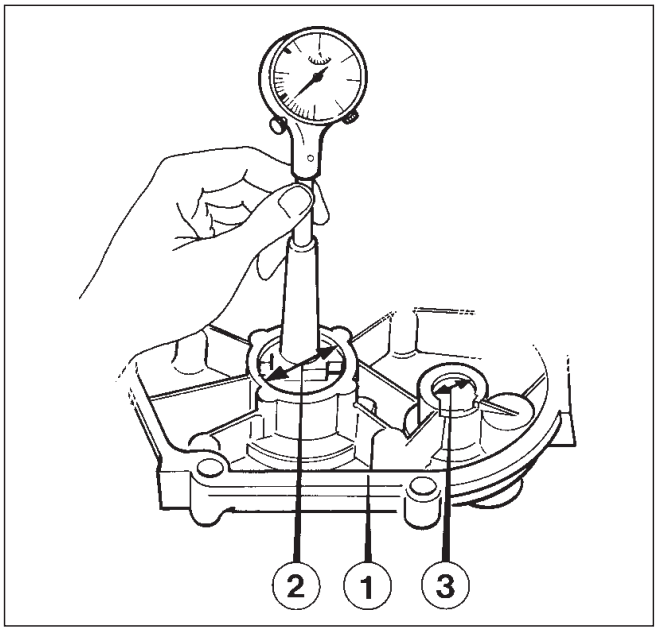


Fig. 15

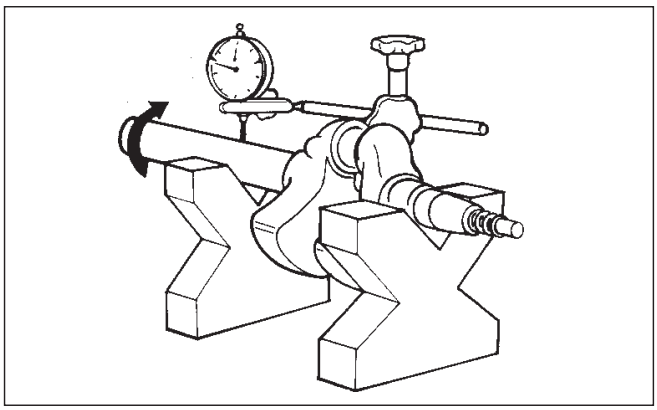


Fig. 16

d) CONNECTING RODS (Fig. 17)

Different types of conrods are fitted to the different engines. Some characteristics are common.
All conrods have match marks which must always be assembled together and when fitted onto the engine the marks must face outwards (towards the PTO).

Fig. 17

A. Vertical shaft conrod
B. Horizontal shaft conrod
X. Match marks
a. Oil passage
C. Oil dipper
D. Nuts

Conrods for engines with horizontal crankshaft have an oil dipper (**C**) and a lubricating hole (**a**).
Con Rod caps may be retained by one of the following methods:

- Lock Nut - (**D**-Fig 17)
- Bolt and Lock Tab - (Fig 18)
- Locking Bolt - (Fig 19)

Always renew lock nuts, lock tabs and locking bolts when removed. It is not recommended to re-use them.

- Lock tabs should be bent up securely around the bolt heads.
- If con-rod bearing surfaces are worn or scored, the complete con-rod must be replaced. Undersize bearings are not availble.

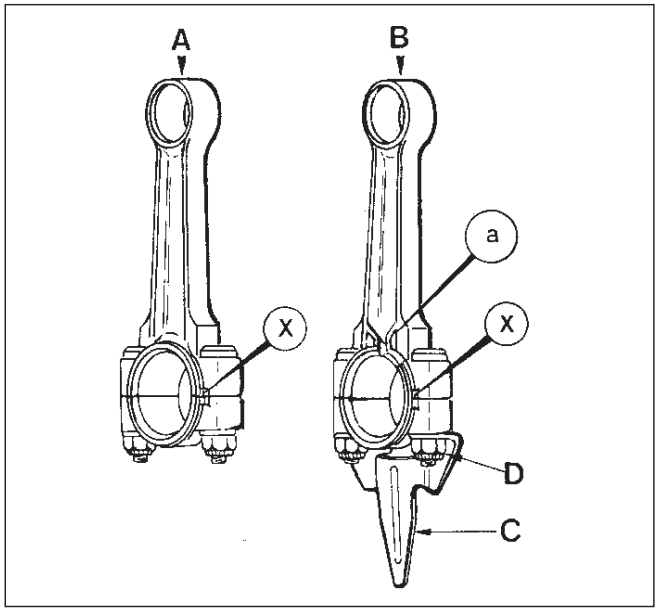


Fig. 17

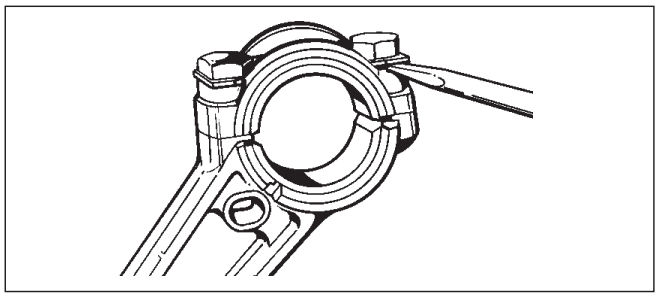


Fig. 18

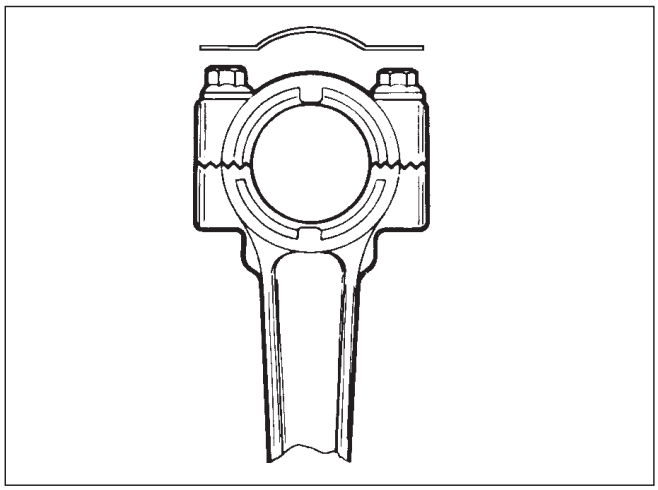


Fig. 19

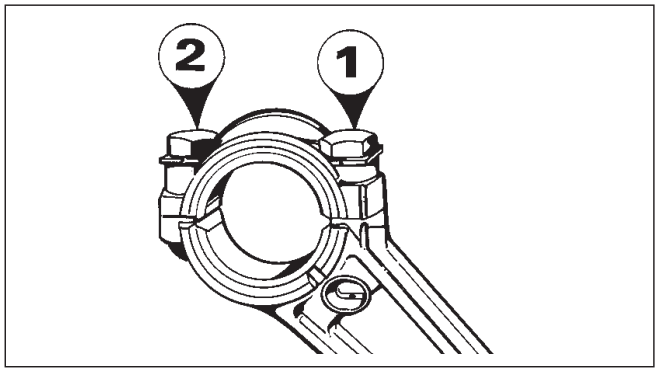


Fig. 20

e) PISTON RINGS AND PIN

Remove rings from piston and clean all carbon from ring grooves with the aid of a piece of old piston ring (Fig 21).

Check piston for damage. Piston wear and ovality should not exceed 0,15 mm (.006”). Refer to table for dimensions.

With a feeler gauge, measure ring clearance in groove (Fig 22). This should not exceed 0,15 mm (.006”).

Insert rings into cylinder bore pushing down about 25 mm or 1” with the piston top. Measure ring gap, replace rings if gap exceeds 0,5 mm (0.02”) (Fig 23).

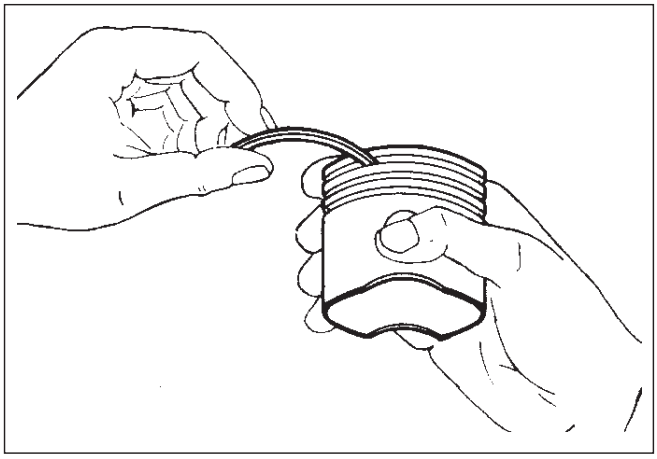


Fig. 21

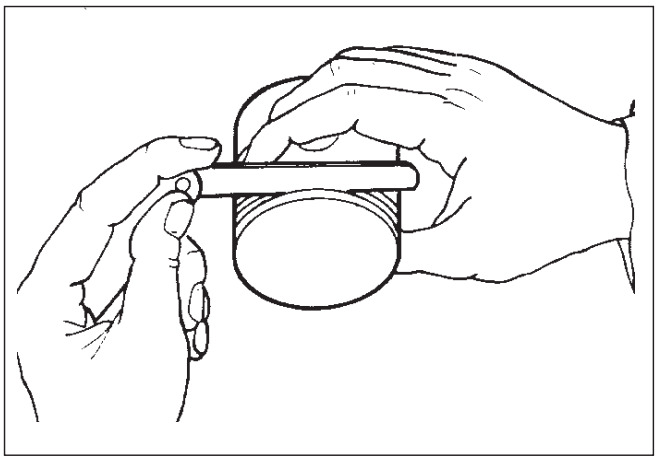


Fig. 22

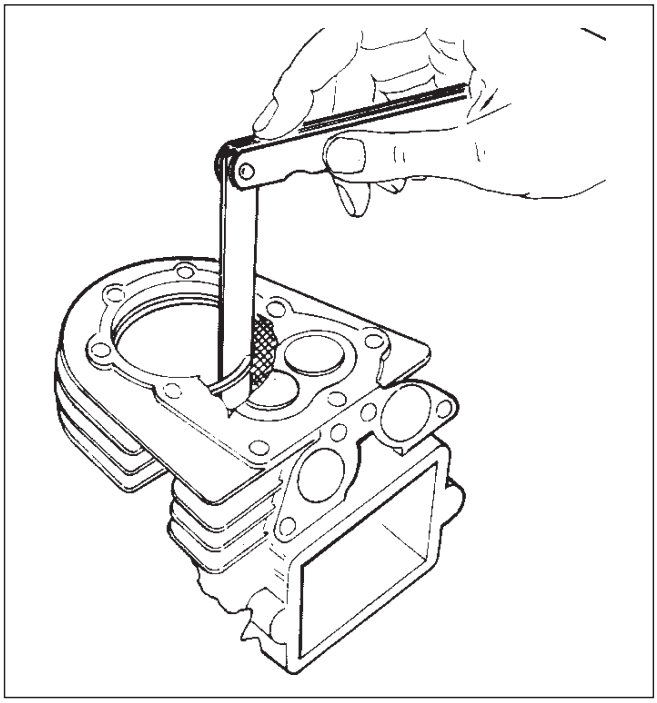


Fig. 23

Piston assembly (Figs 24 & 25)

For reassembly purposes there is a match mark on the piston pin boss (**A**). Depending on the engine type pistons may have an off-set piston pin. This must be fitted towards the magneto side.

Piston pin

Remove retaining rings (Fig 26) and withdraw pin from piston (Fig 27). Check for wear or damage and replace if necessary.

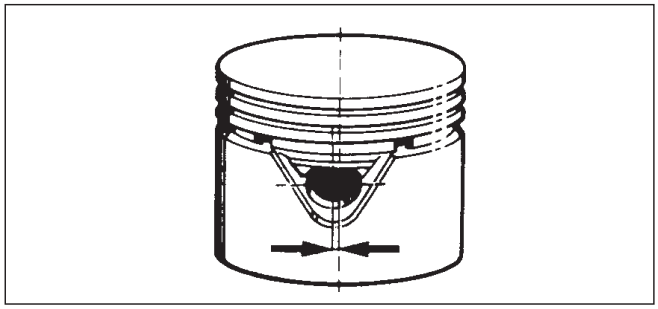


Fig. 24

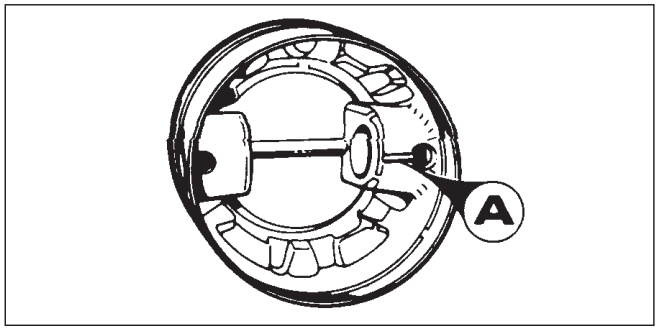


Fig. 25

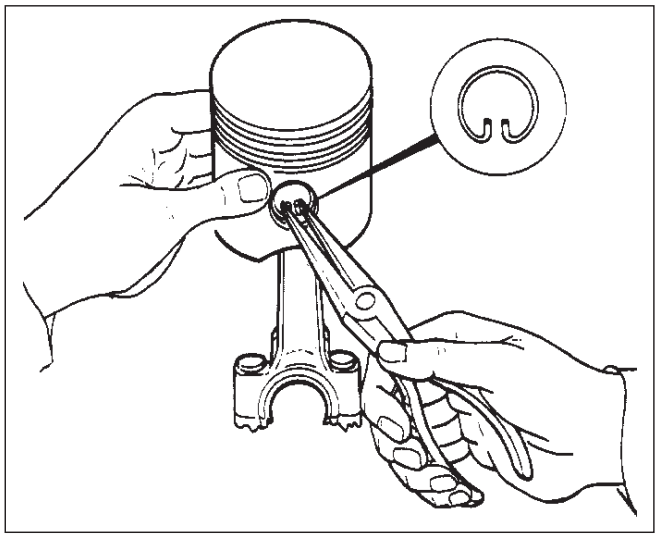


Fig. 26

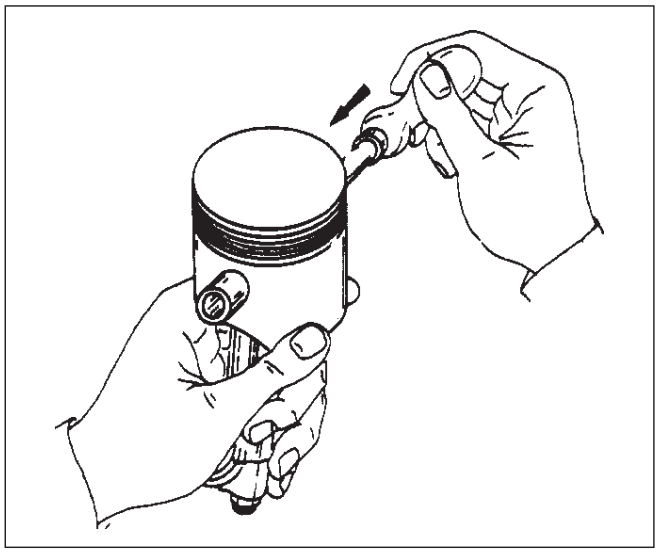


Fig. 27

f) CAMSHAFT

Check gear and cams for damage or wear. Check that shaft is not bent and that bearing dimensions conform to sizes given in table. On vertical shaft engines check that oil passages are clear, replace shaft if necessary.
Check dimension of cams (see tables).

Compression release

In order to assist in easy starting the 4-stroke engines may be fitted with a compression release, the function of which is to hold a valve off its seat at cranking speed thus lowering the compression ratio.

Mechanical compression release

The mechanical compression release is activated by a pin working through the crankshaft directly on the tappet (Fig 28).
When the engine reaches running speed, a centrifugal weight on the camshaft withdraws the pin thus allowing the valve to seat fully.

***NOTE** - Mechanical compression release usually operates on the inlet valve.*

Fig. 28 - Compression release assy

a. pin
b. rocker arm
c. centrifugal weight
d. return spring

Alternatively, the centrifugal weight has a ramp on it which lifts the valve at cranking speed. This ramp retracts at normal running speed. (Fig 28-1).

Lobe - cam (Fig 29)

Tecumseh has a compression release system called 'Lobe - Cam' which is not centrifugally operated as previously. The drawing illustrates the reshaped cam lobe which actuates the exhaust valve. It is important that the clearance of this valve is set at 0,10-0,20 mm (.006"-.010").

***NOTE** - Check valve clearance with piston at TDC compression stroke.*

Ramp type compression release (Fig 29-1)

Some engines now use a ramp type compression release system on the inlet valve.
Fig 29-1 Illustrates the new lobe profile
Decompressing on the inlet valve prevents unwanted emissions being expelled from the engine.

***NOTE** - Do not interchange Mechanical, Lobe or Ramp style camshafts, or poor starting and erratic engine running may occur.*

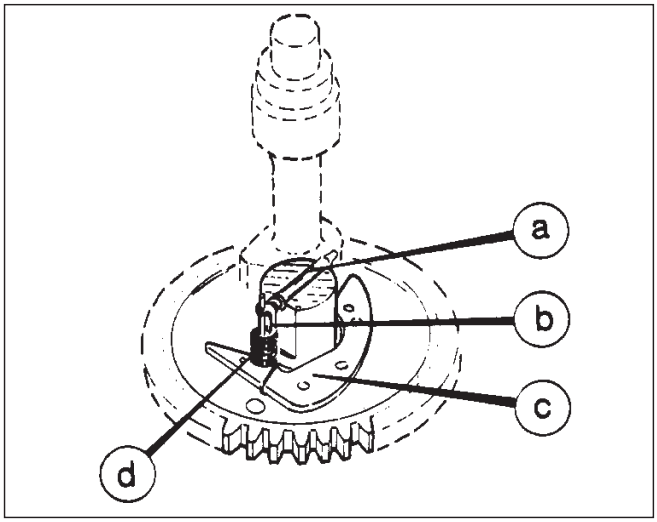


Fig. 28

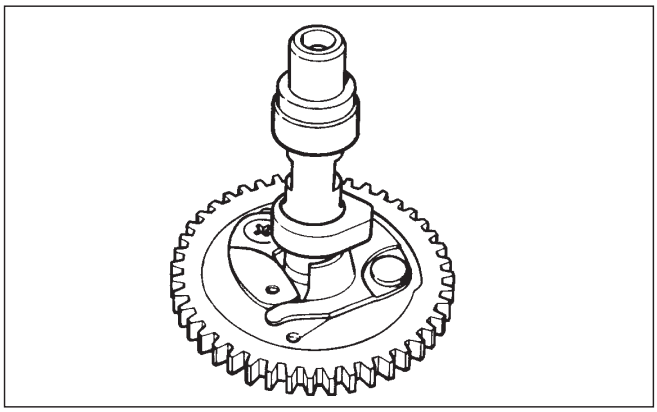


Fig. 28-1

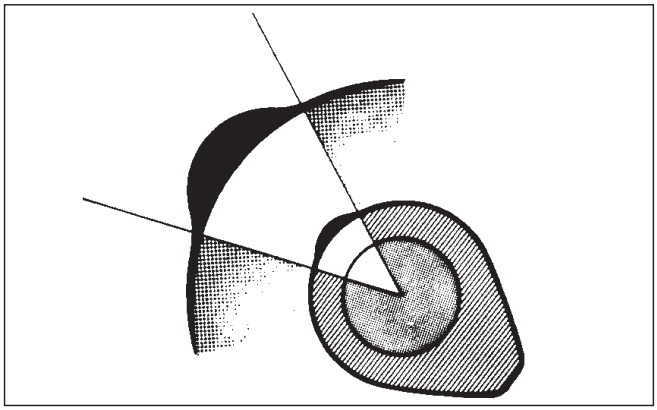


Fig. 29

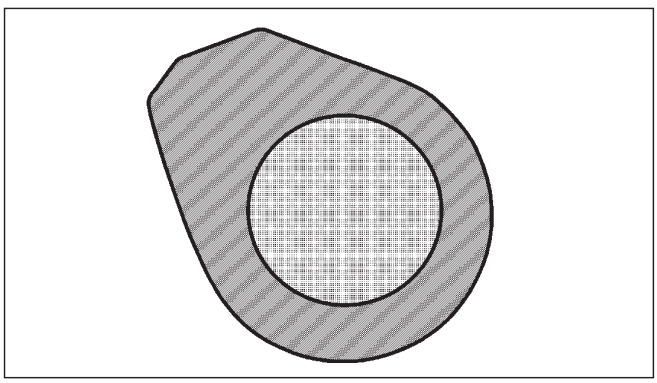


Fig. 29-1

g) LUBRICATION

On vertical shaft engines, lubrication is provided by a positive displacement type pump (Fig 30) which forces oil to the top main bearing via a drilling in the camshaft and a gallery in the crankcase (Fig 31).

The horizontal shaft engine is lubricated by means of a dipper (Fig 32) secured to the conrod by the big end bolts. After removal check the dipper for cracks or distortion; replace if necessary.

h) MECHANICAL GOVERNOR

Standard Governor (Fig 33)

The mechanical speed governor is situated inside the crankcase and consists of three parts:
1 - Governor gear
2 - Flyweights
3 - Spool
a. - shaft
b. - retaining rings

The unit is mounted on shaft (**a**) and is secured by two rings (**b**). Remove spool and check both parts for wear or damage Replace if necessary.

Some later governors use a barb on shaft (**a**) to retain the spool (**3**). Removal is by gripping the spool firmly in a vice, and pulling the spool over the barb.

To remove the governor gears (**1**), shaft (a) must be removed from the flange. Grip shaft (**a**) in a vice and strike the flange gently with a soft mallet.

The original spool should not be re-used if removed.

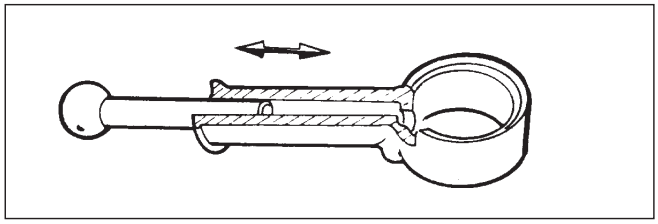


Fig. 30

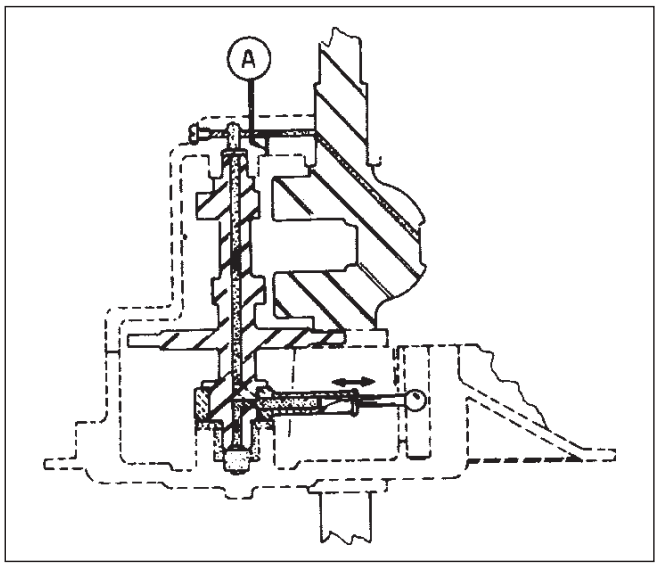


Fig. 31

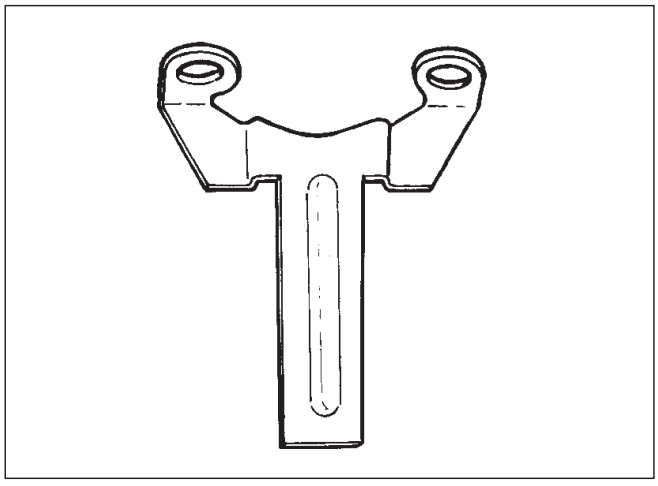


Fig. 32

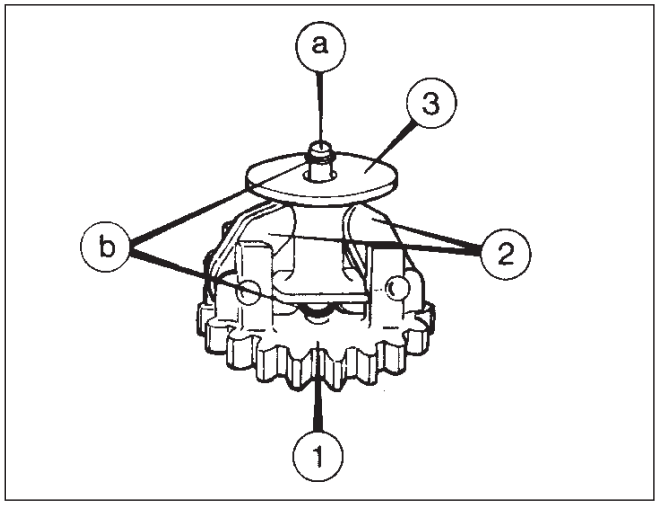


Fig. 33

Oleomatic Governor (Fig. 34)

A plastic sleeve (**A**) is actuated by two centrifugal weights (**D**), the plastic sleeve moving along the centre spindle; the spindle (**B**) being drilled through the centre to allow oil to be drawn in under the head of the sleeve.
This gives a low pressure oil damping effect which eliminates any slight governor fluctuation.

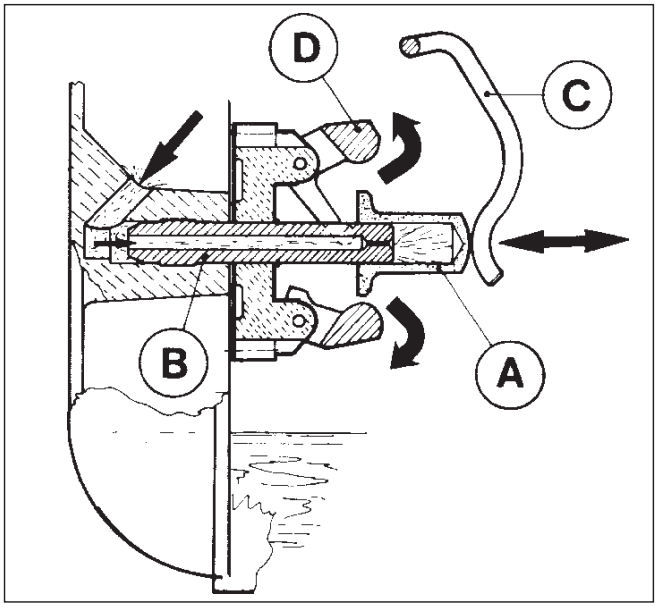


Fig. 34

i) CRANK CASE BREATHER

All four stroke engines are fitted with a crankcase breather, the body of which contains a small celeron valve (Fig 35).
Two body types are made, identified by the position of the oil drain hole :

Fig 35

A. Vertical type
B. Horizontal type

Check that valve moves freely and that seat is not damaged.

On earlier types the valve was of a metal spring type (Fig 36); this spring should be very resilient and sticking should not occur.

Some vertical crankshaft engines were also fitted with a filter between the breather cover and body (Fig 37).

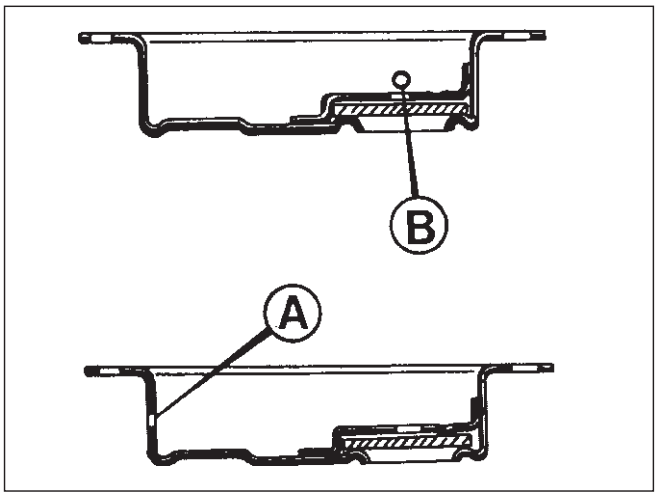


Fig. 35

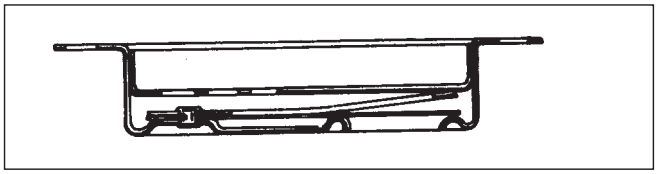


Fig. 36

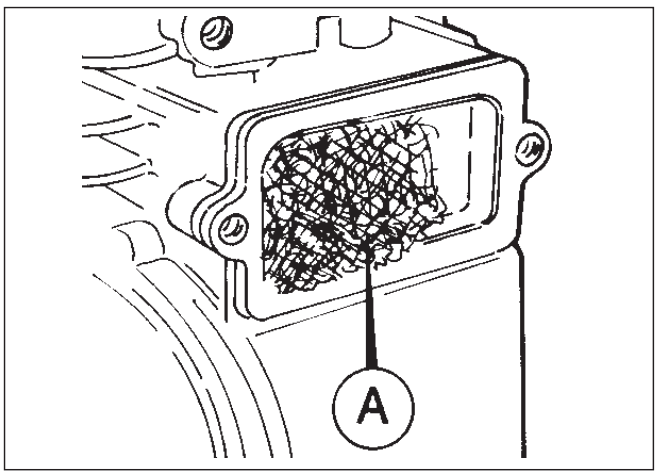


Fig. 37

Check the filter and replace if necessary. The valve breathes into a rubber pipe (Fig 38). This may be open to atmosphere (open type), or may be connected to the carburettor intake (closed type) (Fig 39).

k) TOP MOUNTED BREATHER

Fig. 40

1. Element
2. Baffle
3. Oil return
4. Pressure out
5. Check valve
6. Tube

A 4-cycle engine must be equipped with a crankcase breather in order to maintain a partial vacuum in the crankcase to prevent oil from being forced out of the engine oil seals, past the piston rings or any gasket area.

This type breather is mounted to the top rear of the cylinder block. The check valve allows excess pressure to be vented through the element and out the tube. Condensed oil vapour returns to the crankcase by means of the oil return holes. Some engines have the breather tubes connected to the air cleaner assembly.

The filter element can be cleaned using cleaning solvent. When reinstalling the check valve, apply oil to aid assembly.

***NOTE** - The check valve may expand if exposed to solvents for a period of time. This swelling will prevent correct operation of the breather.*

***NOTE** - The breather body may be retained by two screws, or may be a press fit into the crankcase. These two types are not interchangeable.*

l) OIL SEAL REPLACEMENT (Fig 41)

If oil leakage is apparent it is possible to change the oil seal with the crankshaft in position by the use of special tools for the flywheel side and for the PTO side, 670292 and 670272.
Always fit new seals.

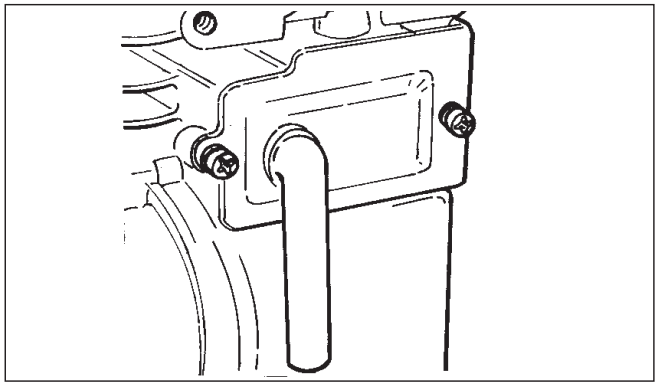


Fig. 38

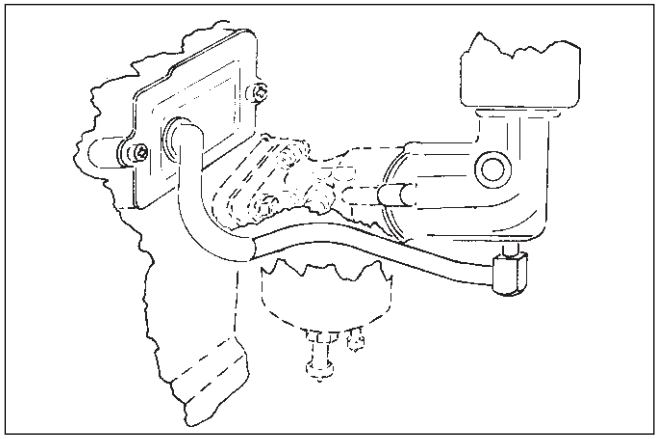


Fig. 39

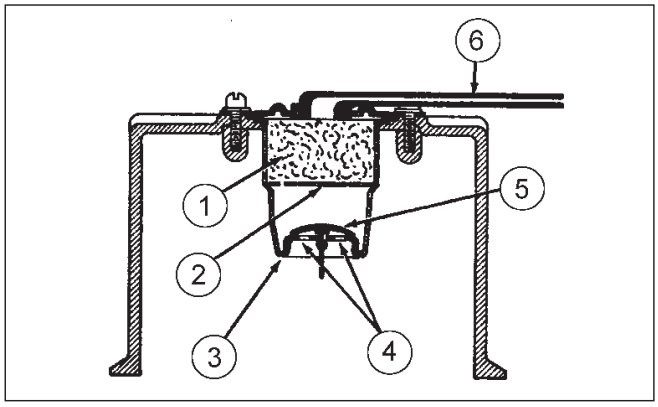


Fig. 40

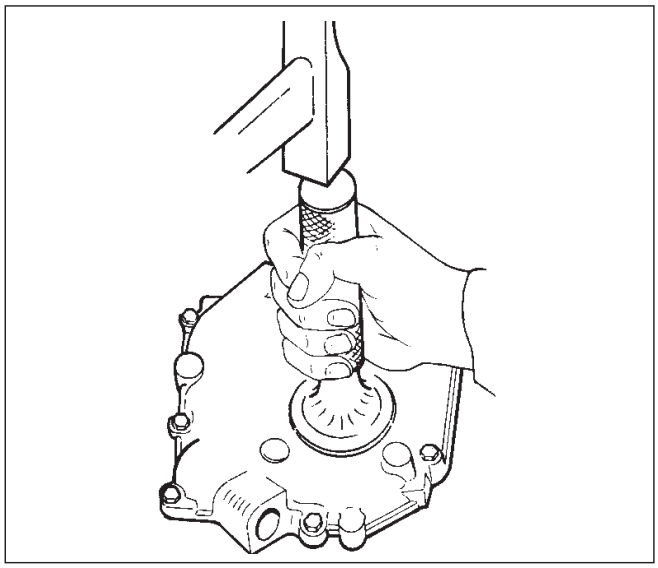


Fig. 41

6. REASSEMBLY

a) GENERAL

Reassembly should be carried out in the following order. After thoroughly cleaning all parts, position crankcase on bench (Fig 42). If replacement of flywheel side oil seal is necessary refit at this point.

b) CYLINDER

Cylinder with aluminium bearings (HTB, HSB and all vertical crankshaft engines)
Lubricate flywheel side bearing and install crankshaft with big end journal towards cylinder bore.

Cylinder with needle bearings (HBL 20-30-35-40)

Replacement of bearing. The needle bearing can be removed with the aid of special tool 88841026 (Fig 43) and a replacement bearing fitted using tools 88841531-670272 (Fig 44).

Lubricate flywheel side bearing and install crankshaft with big end journal towards cylinder bore.

the crankshaft runs in a needle bearing (flywheel side) and ball bearing (PTO side). The flywheel side crankshaft main bearing journal is hardened for use with needle bearings. It is therefore essential that the correct crankshaft is ordered and not confused with HTB or HSB.

Cylinder with ball bearing (BH)

Heat cylinder to 80-100 degrees C and drive out bearing. Bearing has a locating clip around the outer race, and must be driven into the crankcase. Use reverse procedure for replacement.

The bearing in the cylinder cover does not have the locating clip, but sits against a register in the cover. Heat the cover to 80-100 degrees C and drive bearing out of cover from the outside inwards.

Use reverse procedure for replacement.

Always refer to parts lists for correct identification.

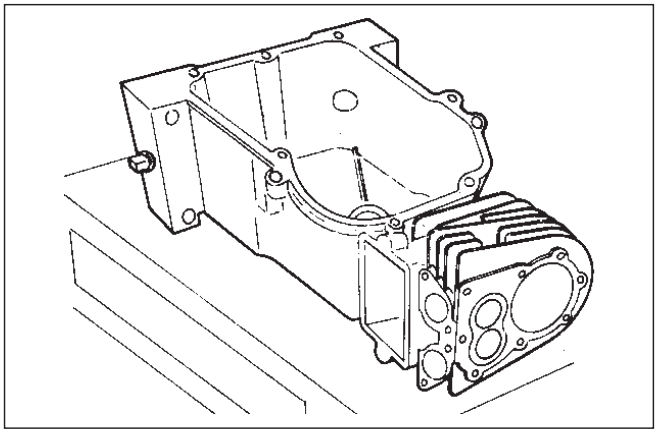


Fig. 42

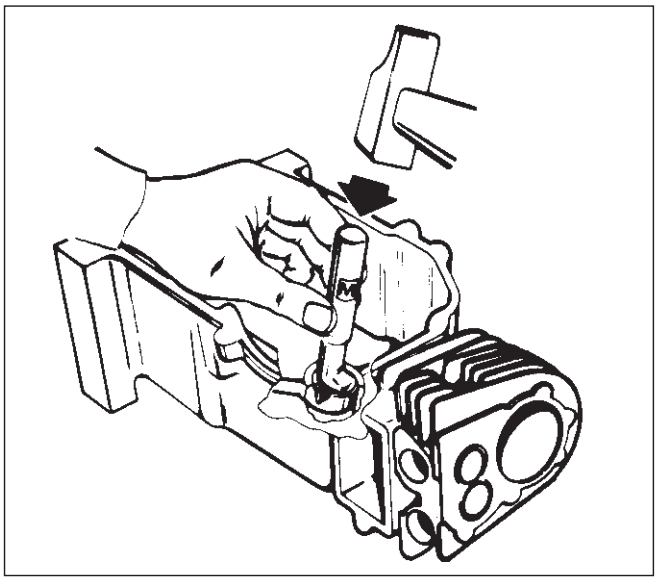


Fig. 43

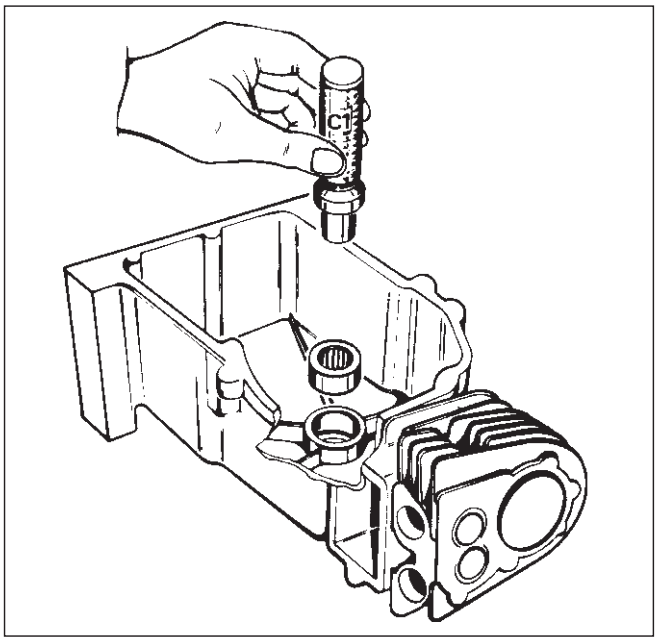


Fig. 44

c) OVERSIZED PISTONS FOR 4-STROKE ENGINES

As in all engine production Tecumseh occasionally produce cylinders bored above maximum allowable tolerance. In this case .010" oversize piston and rings will be fitted. These components may be identified by the figure 1 stamped on both cylinder and piston. The drawing shows location of these marks on 4-stroke engine components. (Fig 45).

d) PISTON AND RINGS

Piston rings must be fitted with tapers upwards (on compression rings) and expander under the scraper rings (Fig 46).

On some engines (LAV 172, HBP 40, BHG) the second compression ring is of L configuration and is fitted as per Fig 47.

On some types a spring is mounted under the oil scraper ring (HBP 40) in this case the third groove is deeper than normal (Fig 48).

***NOTE** - Always select parts according to correct parts list.*

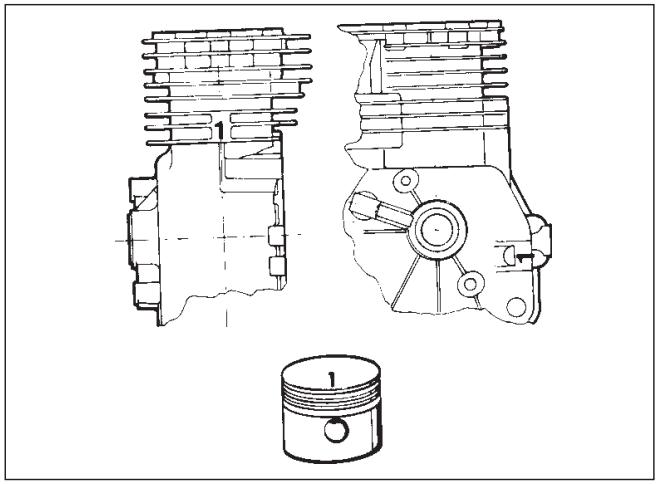


Fig. 45

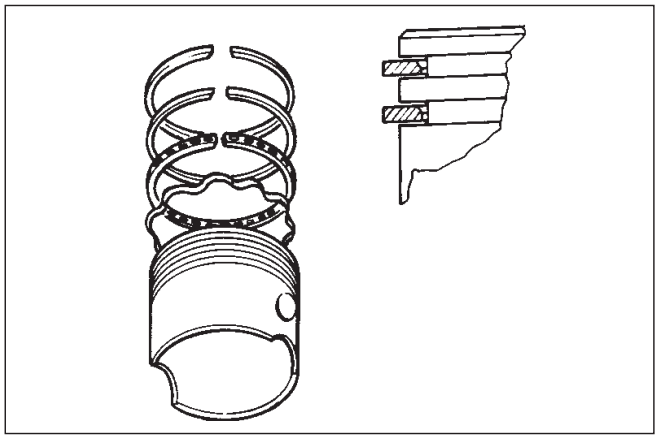


Fig. 46

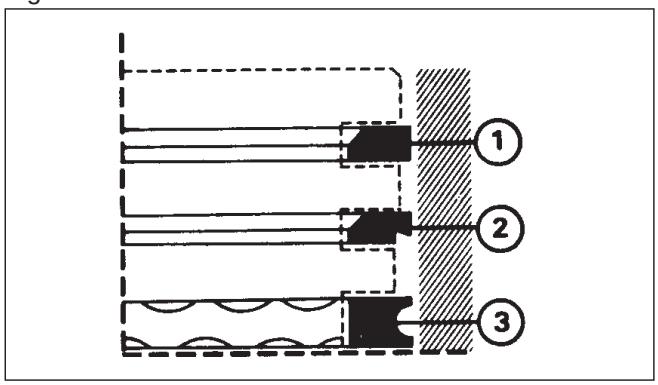


Fig. 47

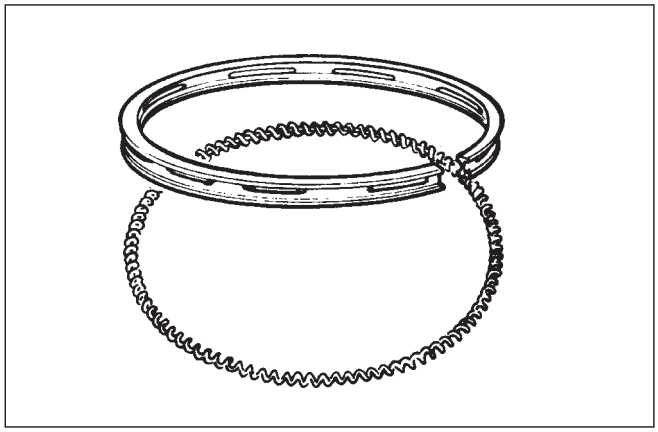


Fig. 48

e) PISTON AND CONNECTING ROD (FIG 49)

Fit conrod to piston by first fitting one retainer ring, lubricate conrod and secure with piston pin (Fig 51). Fit second retaining ring, if rings have been renewed rub cylinder wall with fine emery to remove “glaze” and assist the bedding of the rings.

Some pistons have match marks (**A**, Fig 50) and must be fitted so that match marks are toward magneto side (LAV 172, HBP 40).

Insert piston from top of bore with conrod match marks to open side of crankcase.

The piston match mark will then appear on the opposite side to those on the conrod (Fig 50-**B**).

Insert piston into bore from top, lubricate and enter rings with the aid of a ring compressor tool, push home until big end seats on crankshaft journal, lubricate well and fit big end cap (and dipper on horizontal shaft engines).

The cap and rod are marked for correct assembly. (**A** - Fig 52). These must be matched correctly.

For correct assembly, operate as follows:

- Locate conrod on crankshaft journal
- Align match marks and fit cap
- Fit lock tab and insert screws
- Hand tighten the two screws
- Screws should then be tightened by means of torque wrench to figures in table following the sequence shown on Fig 53.
- Secure screws with lock tab already fitted (Fig 54).

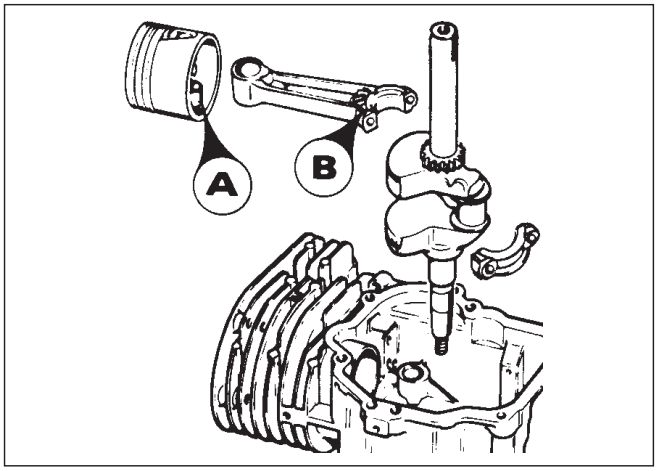


Fig. 49

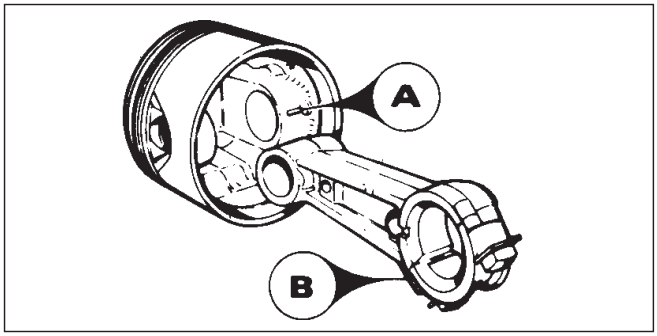


Fig. 50

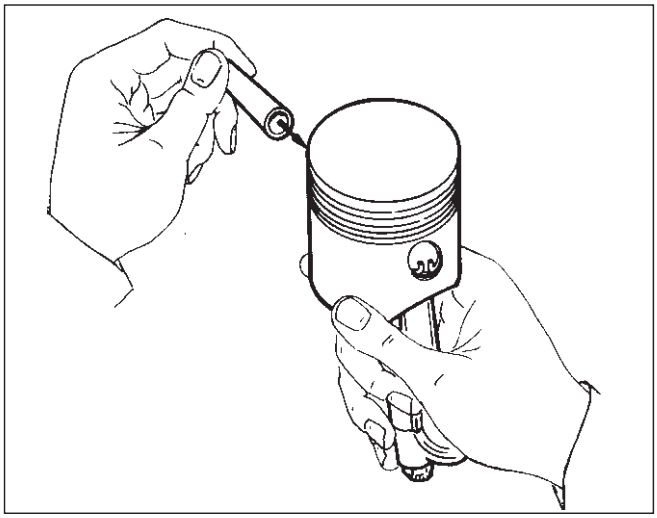


Fig. 51

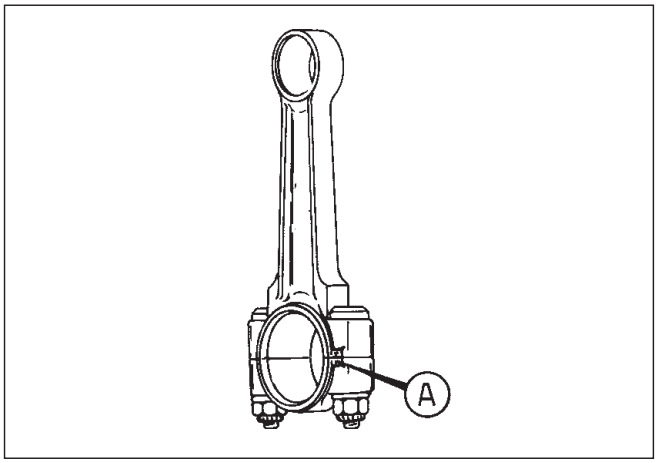


Fig. 52

f) CAMSHAFT - OIL PUMP - COVER

Position valve lifters in the correct order and fit camshaft with timing marks aligned as in Fig 55.
Check governor shaft and replace if worn or bent.
Install governor gear assembly.
Refit dowel pins in crankcase and fit a new gasket.

On engines with aluminium bearings

Place crankcase cover on crankshaft, position oil pump plunger in line with slot (vertical shaft engines) and push cover home, turning crankshaft to mesh governor gear, tighten securing bolts in sequence to torque figures in table.

On engines with ball bearings

Fit crankcase cover on crankshaft, turning crankshaft to mesh governor gear.
Push fully home and fit bolts in sequence (Fig 56), tighten to torque figures shown in table. On horizontal shaft engines fit snap ring to crankshaft and refit oil seal with special tool 88841533.

On BH models there is no circlip

To eliminate crankshaft end float a compressible washer is used on the magneto journal and of the crankshaft. This washer must be fitted prior to inserting the crankshaft into the magneto end bearing when assembling the engine.

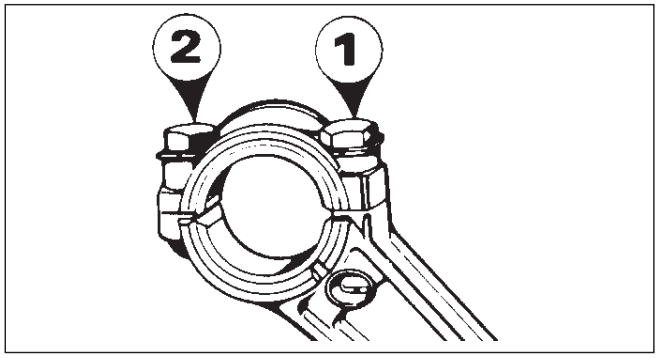


Fig. 53

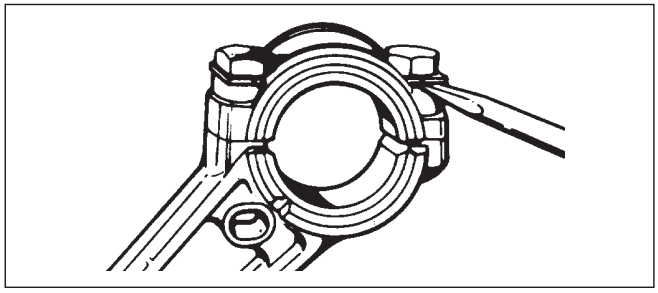


Fig. 54

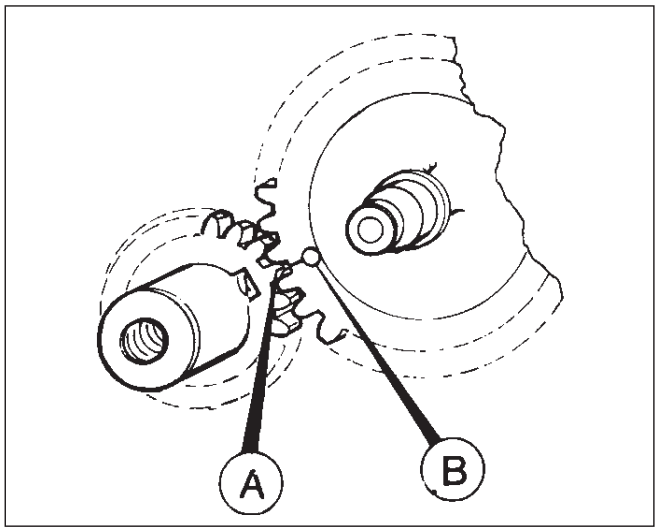


Fig. 55

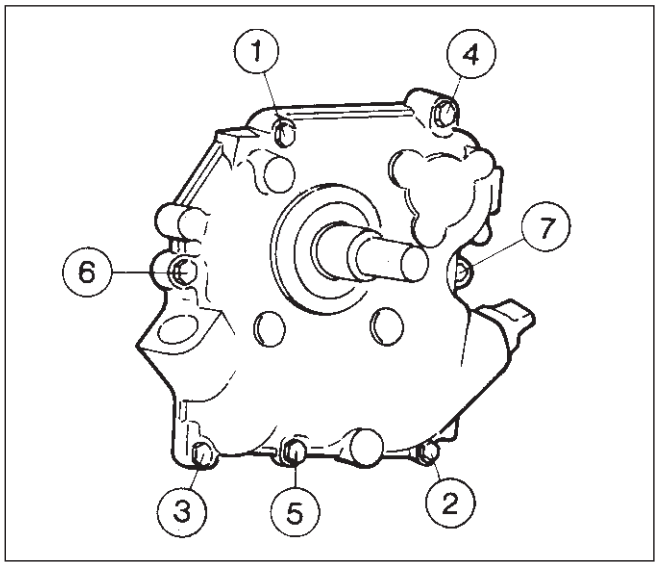


Fig. 56

g) MOUNTING FLANGE FOR ENGINES WITH LATERAL PTO

Reduction shaft service

A retaining ring secures the 8,5 : 1 PTO shaft. The sequence of the washers is the most important factor to consider for reassembly.
Insert PTO (Power Take Off) shaft through seal and into flange bosses. Follow sequence of parts shown in Fig 57.

***NOTE** - If base does not slide on crankshaft freely do not force. Turn crankshaft 1/8 of a turn and repeat until reduction gear in base plate rolls down worm gear on crankshaft.*
Always use new oil seal protector cap using proper approved tools to install.

***NOTE** - If gasket surface of base plate does not contact gasket surface of cylinder block, DO NOT FORCE. This indicates oil pump gear, or governor gear, is not meshed with crankshaft gear. Turn crankshaft slowly while exerting light pressure on base plate until gears mesh, at the same time ensuring that oil pump plunger is located in base plate.*

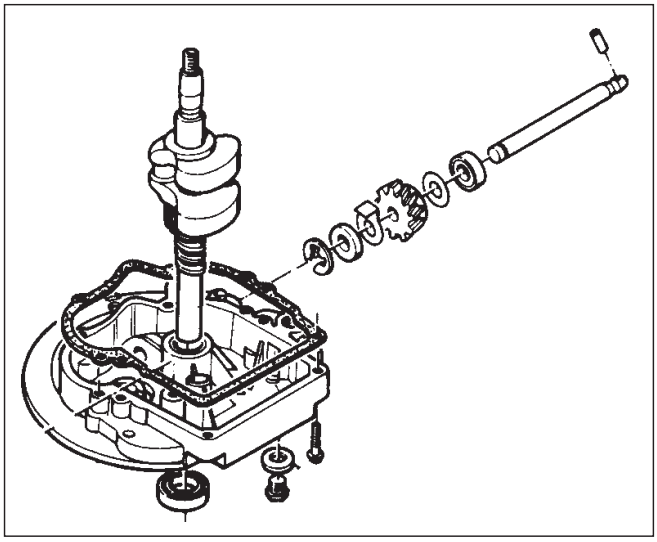


Fig. 57

Fitting external parts

Position cylinder head and gasket on cylinder and insert head bolts. Tighten as per torque figures given in tables. Fit the breather body and secure refit carburettor and ignition as in chapters G & E. Fit air shroud and starter.

7. OHV ENGINES

a) OH Valve Train Service (Fig 58)

The biggest difference between the OH engine compared to other rotary mower engines is the overhead valve concept. Many of the same procedures for repairing the OH engine are the same. The differences will be in servicing the valve train. This section will emphasize those changes.
The valve train consists of a cupped lifter. This cupped lifter enables the ball shaped end of the push rod to seat on the lifter. The push rod moves a valve rocker arm that opens the valve.

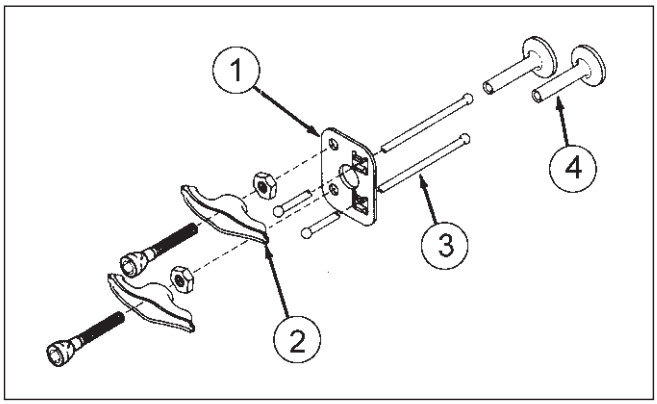


Fig. 58

Fig. 58 - Over Head Valve System.

1. Push rod guide plate
2. Valve rocker arm
3. Push rod
4. “Cupped” valve lifter

VALVE TRAIN SERVICE

Remove the rocker arm cover. The cover is secured with four bolts that are 3/8" external hex or a Torx 30 internal (Fig 59,A). The gasket between the rocker arm cover and the head should always be changed when the cover is removed to ensure proper sealing.

Loosen the two locking nuts (7/16”) on the rocker arm pivot screws. Loosen the two rocker arm pivot screws using a 3/16" AF Allen head wrench. Remove the screws, rocker arms and push rod guide plate. (Fig 60).

The push rods can be removed from the engine and the cylinder head bolts can be removed to take the head off the engine. (Fig 61).

The valve springs can be removed by supporting the valves with your fingers while compressing the valve springs, one at a time, with your thumbs. Then slide the larger part of the opening in the retainer towards the valve stem while the spring is compressed. (Fig 62).

CAUTION *- Proper safety equipment should be worn, such as safety glasses.*

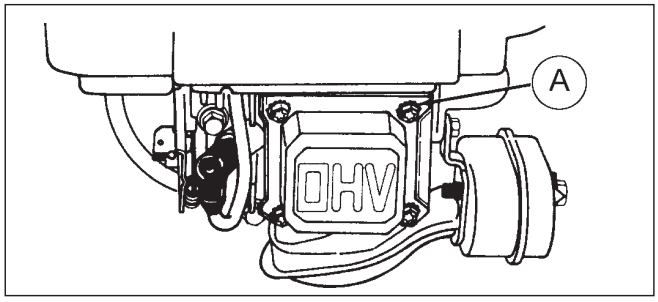


Fig. 59

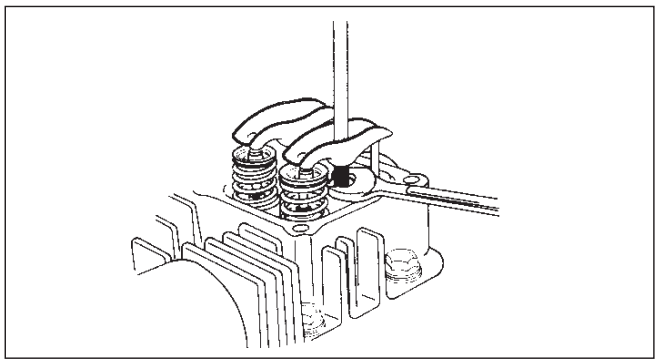


Fig. 60

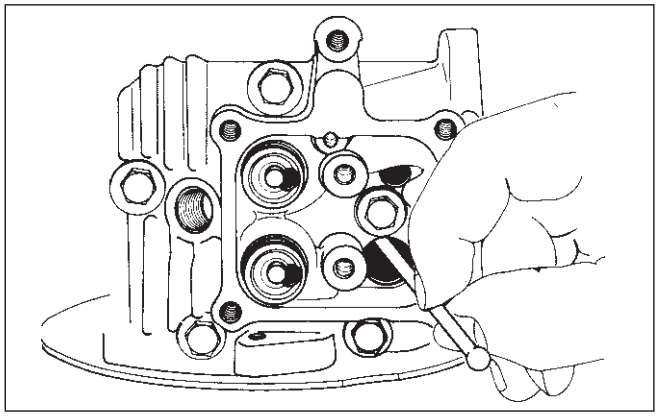


Fig. 61

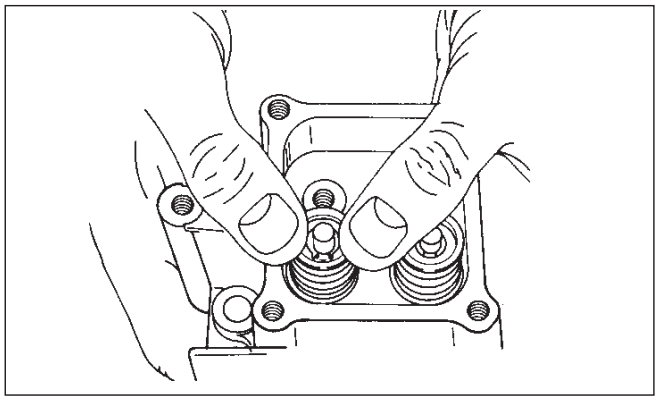


Fig. 62

The condition of the valves and valve seats can be inspected at this time and serviced accordingly. (Fig 63)

The all metal head gasket MUST be removed from the engine, and discarded (Fig 64). Always fit a new head gasket when Head is removed.

CAUTION *- Caution must be used so that there are no scratches or knicks in the cylinder or head gasket surfaces. This may cause a head gasket leak.*

Reassembly

The following procedures will show the proper steps to be taken to reassemble the valve train components into the engine.

After properly servicing the valves and valve seats, if so required, place the intake and exhaust valves into their proper position. Place the valve spring over the valve guide and install the retainer (Fig 65).

Compress the valve spring and retainer allowing the larger opening of the retainer to slide over the valve stem. Then slide the retainer towards the smaller opening when the retainer is pressed to the notch in the valve stem (Fig 66).

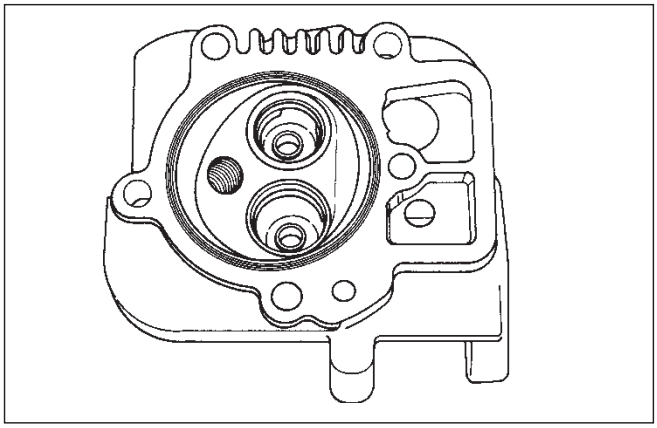


Fig. 63

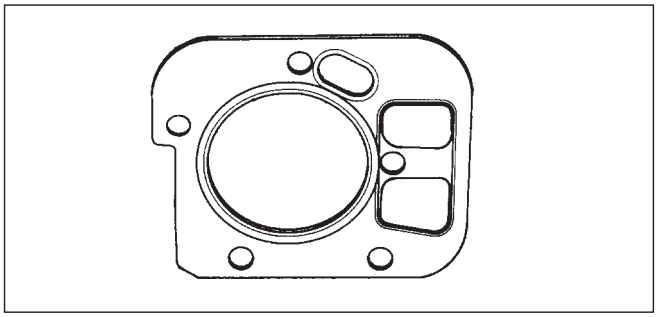


Fig. 64

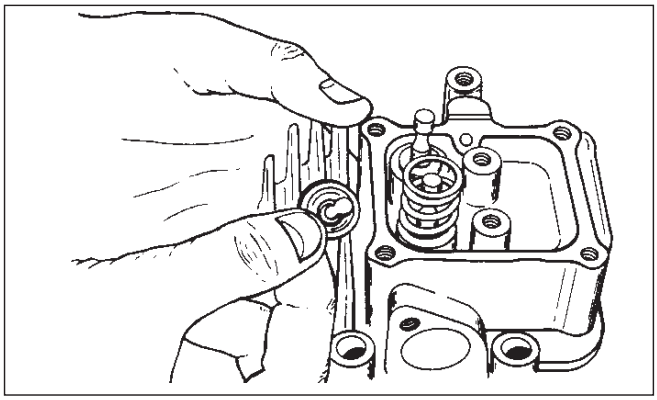


Fig. 65

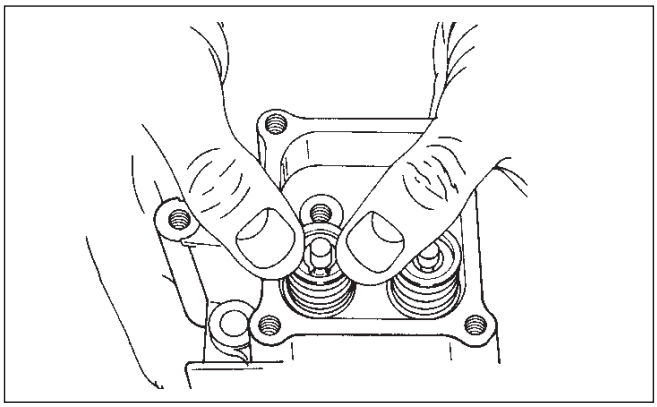


Fig. 66

When both valves have been installed back into the head, place a new head gasket into position and attach the cylinder head. (Fig 67).

NOTE *- The head gasket is coated. Any scratches or bending to the head gasket will require a new head gasket or leakage may occur.*

It is critical to the proper operation of the engine that the head bolts be torqued in the proper sequence and at 60 inch pound (6Nm) increments to 240 inch pound (24Nm). (5 ft. pound increments to 20 ft lbs. (Fig 68).

Place the guide plate in position on the head - the tabs on the guide plate face out. (Fig 69-1). Install the rocker arm and pivot ball screw with the lock nut on far enough to hold the guide plate in position. The valve lash will be adjusted later.

Insert the push rod into the engine. The block is designed so that the push rod will be guided onto the lifter. The push rod may be installed with either end sitting on the lifter. Place the push rod between the tabs on the guide plate and then place the rocker arm onto the push rod. The proper alignment is when the ball on the push rod sits in the socket of the rocker arm. (Fig 70).

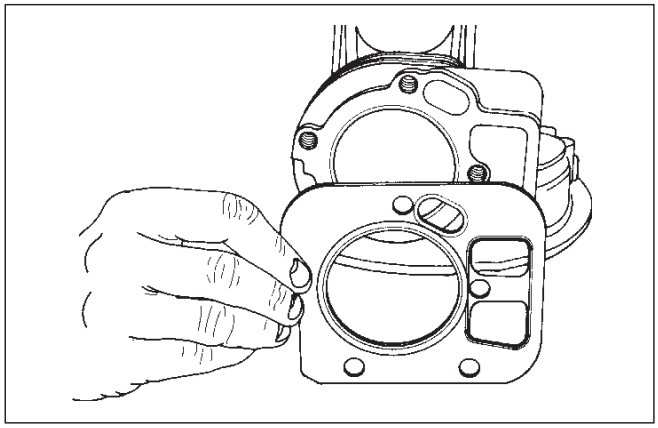


Fig. 67

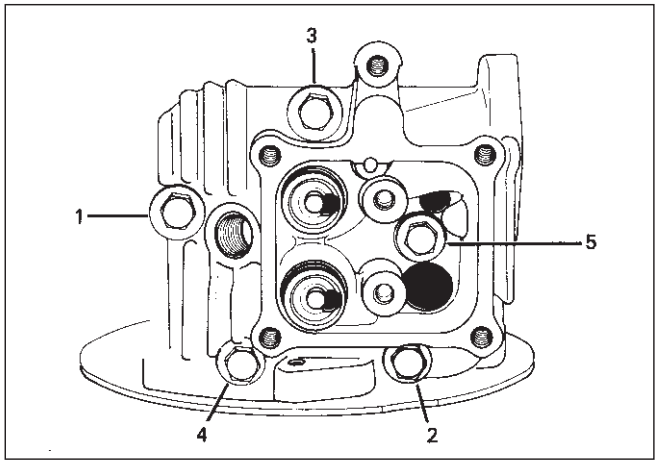


Fig. 68

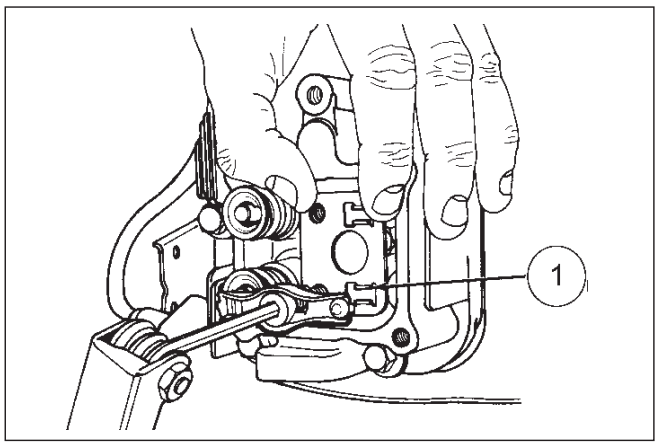


Fig. 69

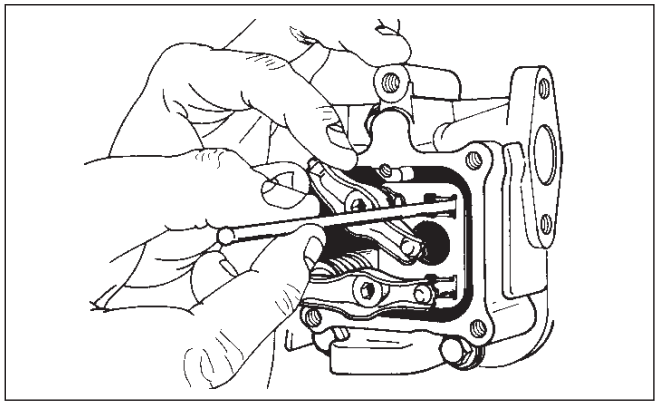


Fig. 70

SETTING THE VALVE LASH

To properly set valve lash on the OVRM engine make sure the engine is cold and at TOP DEAD CENTRE on the compression stroke (both valves are closed). The lash on both valves is 0.05-0.15 mm (.004") between the rocker arm and the valve stem. (Fig 71).

To lock this setting hold the Allen wrench on the pivot ball screw and tighten the lock nut to 65-85 inch pounds (6.5-8.5 Nm) of torque. Double check the setting to make sure that it did not change when the lock nut was tightened. (Fig 72).

Place a new rocker arm cover gasket in place and install the cover back onto the engine. (Fig 73). Torque the four screws to 30-50 inch pound (3-5 Nm).

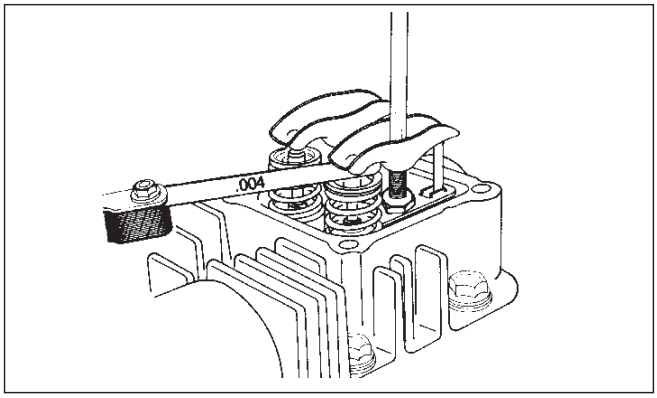


Fig. 71

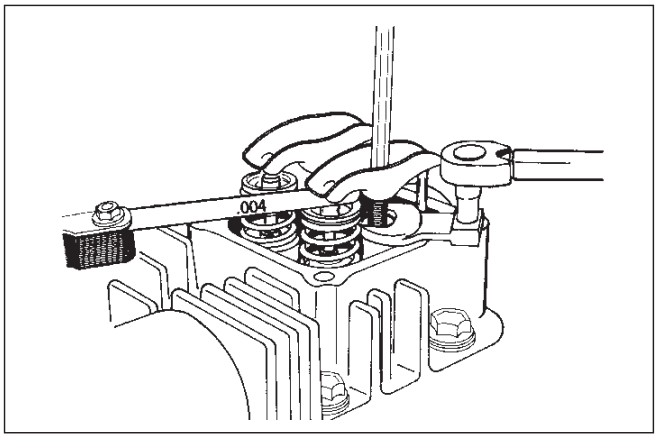


Fig. 72

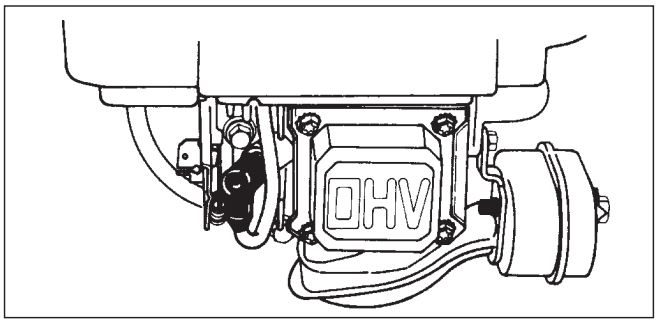


Fig. 73

b) VALVE SERVICE

Clean all parts and remove carbon from valve heads and stems. If valves are in usable condition, grind or cut the valve faces to 45 degrees angle using tools 26990002 and 26990001. Replace valves if they are damaged, distorted or if the margin is ground to less than 1/32" (0.8 mm) (Fig 74).

Valve seats

Valve seats are not replaceable. If they are burned or pitted they can be reground using a grinding stone or Neway Valve Reseater. Seats are ground at an angle of 46 degrees to a width of 3/64" (1.2 mm).

The recommended procedure to properly cut a valve seat is to use the Neway Valve Cutting System, which consists of different degree cutters. (88841013).

First use the 31 degree cutter to clean and narrow the seat from the top toward the centre (Fig 75).

Second use the 46 degree cutter to cut in the seat to a width of 3/64" (Fig 76).

Oversize valve guides

Valve guides are permanently installed in the head. If they become worn excessively they can be reamed to accommodate a 1/32" oversize valve stem.

You are recommended to bring guide diameter to 7 mm and then ream with reamer 670283 (670328 for exhaust valve guide). After oversizing the valve guide - the seats must be re-cut to align with the valve guides.

Valve lifters

It is a good practice not to interchange lifters, even though they are identical, once a wear pattern has been established.

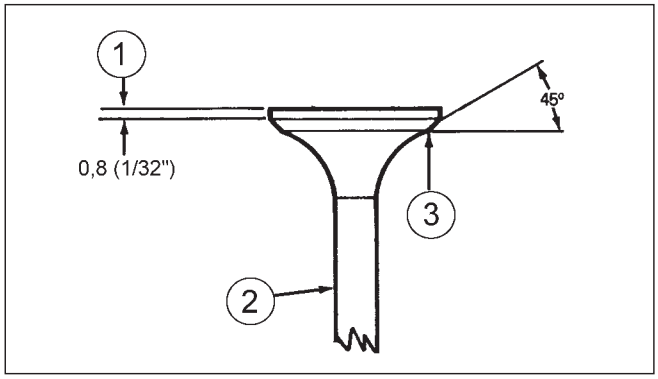


Fig. 74

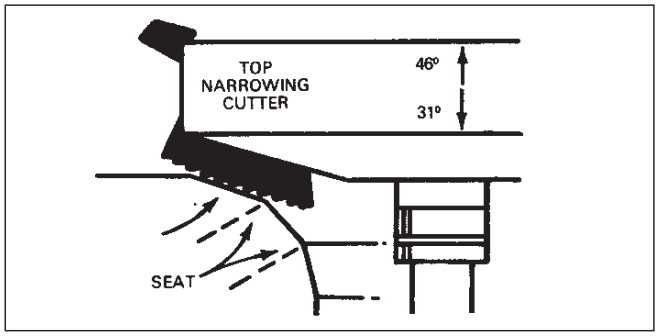


Fig. 75

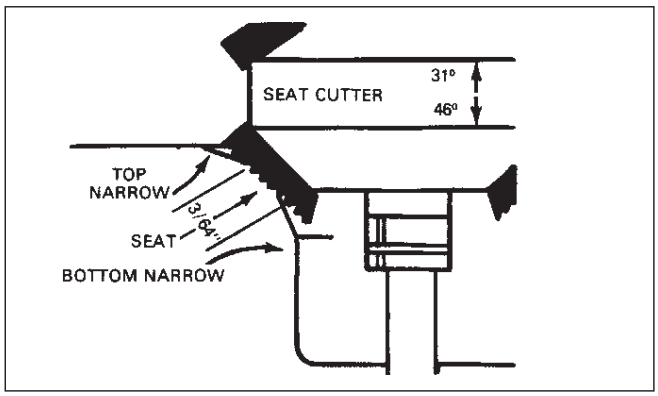


Fig. 76

4-STROKE ENGINE SPECIFICATIONS (BV – BVL – VANTAGE – PRISMA – SYNERGY – PREMIER – SPECTRA – FUTURA)									
Engine displacement	cm^3	148	156	172	198	195	148 OHV	172 OHV	195 OHV
Boring		63.500	63.500	66.675	71.425	70.993	63.500	66.675	70.993
	mm	63.525	63.525	66.700	71.450	71.018	63.525	66.700	71.018
Stroke	mm	47.1	49.2	49.2	49.2		47.1	49.2	49.2
Advance (P.M.S.)		FIXED							
Coil – flywheel air gap	mm	0.30	0.30	0.30	0.30		0.30	0.30	0.30
Distance between electrodes and spark plugs	mm	0.60 0.70	0.60 0.70	0.60 0.70	0.60 0.70		0.60 0.70	0.60 0.70	0.60 0.70
Valve clearance (may also be 0.10÷0.20)	mm	0.15 0.25	0.15 0.25	0.15 0.25	0.15 0.25		0.05 0.10	0.05 0.10	0.05 0.10
Valve seat angle		46°	46°	46°	46°		46°	46°	46°
Crank journal diameter	mm	21.869 21.882	25.387 25.400	25.387 25.400	25.387 25.400		21.869 21.882	25.387 25.400	25.387 25.400
Engine shaft toe diameter (flywheel side)	mm	25.362 25.375	25.362 25.375	25.362 25.375	25.362 25.375		25.362 25.375	25.362 25.375	25.362 25.375
Engine shaft toe diameter (power intake side)	mm	25.362 25.375	25.362 25.375	25.362 25.375	25.362 25.375		25.362 25.375	25.362 25.375	25.362 25.375
Engine shaft axial clearance	mm	0.155 0.689	0.155 0.689	0.155 0.689	0.155 0.689		0.155 0.689	0.155 0.689	0.155 0.689
Piston skirt diamter	mm	63.383 63.395	63.383 63.395	66.520 66.530	71.298 71.310	70.866 70.891	63.383 63.395	66.520 66.530	70.866 70.891
Distance between compression ring points	mm	0.178 0.432	0.178 0.432	0.178 0.432	0.25 0.50		0.178 0.432	0.178 0.432	0.25 0.50
Crankshaft bearing diameter (flywheel side)	mm	25.413 25.425	25.413 25.425	25.413 25.425	25.413 25.425		25.413 25.425	25.413 25.425	25.413 25.425
Crankshaft bearing diameter (power intake side)	mm	25.413 25.425	25.413 25.425	25.413 25.425	25.413 25.425		25.413 25.425	25.413 25.425	25.413 25.425
Inlet valve guide diameter	mm	6.355 6.382	6.355 6.382	6.355 6.382	6.337 6.387	6.355 6.382			
Exhaust valve guide diameter	mm	6.303 6.331	6.303 6.331	6.303 6.331	6.337 6.387	6.303 6.331			
Inlet valve diameter (may also 6.261÷6.274)	mm	6.312 6.325	6.312 6.325	6.312 6.325	6.312 6.325				
Exhaust valve diameter	mm	6.197 6.210	6.197 6.210	6.197 6.210	6.197 6.210				
Valve seat diameter	mm	1.32 1.07	1.32 1.07	1.32 1.07	1.32 1.07				
1st and 2nd retaining ring side clearance	mm	0.05 0.125	0.05 0.125	0.05 0.125	0.05 0.125		0.05 0.125	0.05 0.125	0.05 0.125
Oil scraper ring side clearance	mm	0.025 0.10	0.025 0.10	0.025 0.10	0.025 0.10		0.025 0.10	0.025 0.10	0.025 0.10

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4-STROKE ENGINE SPECIFICATIONS					
Engine displacement	**cm³**	148	156	172	195
Boring	**mm**	63.500 63.525		66.675 66.700	70.993 71.018
Stroke	**mm**	47.1	49.2	49.2	
Advance (P.M.S.)FIXED					
Coil-flywheel air gap	**mm**	0.30		0.30	
Distance between electrodes and spark plugs	**mm**	0.70		0.60 0.70	0.60
Valve clearance (may also be 0.10-0.20)	**mm**	0.15 0.25		0.15 0.25	
Valve seat angle		46°		46°	
Crank journal diameter	**mm**	21.869 21.882	25.387 25.400	25.387 25.400	
Engine shaft toe diameter (flywheel side)	**mm**	19.964 19.975		19.964 19.975	
Engine shaft toe diameter (power intake side)	**mm**	19.964 19.975		19.964 19.975	
Engine shaft axial clearance		NO		NO	
Piston skirt diameter	**mm**	63.383 63.395		66.520 66.530	
Distance between compression Ring points	**mm**	0.178 0.432		0.178 0.432	
Crankshaft bearing diameter (flywheel side)		Ball bearings			
Crankshaft bearing diameter (power intake side)		Ball bearings			
Inlet valve guide diameter	**mm**	6.355 6.382	6.355 6.382	6.355 6.382	6.355 6.382
Exhaust valve guide diameter	**mm**	6.303 6.331	6.303 6.331	6.303 6.331	6.303 6.331
Inlet valve diameter (may also be 6.261-6.274)	**mm**	6.312 6.325	6.312 6.325	6.312 6.325	6.312 6.325
Exhaust valve diameter	**mm**	6.197 6.210	6.197 6.210	6.197 6.210	6.197 6.210
Valve seat width	**mm**	1.32 1.07	1.32 1.07	1.32 1.07	1.32 1.07
1st and 2nd retaining ring side clearance	**mm**	0.05 0.125	0.05 0.125	0.05 0.125	0.05 0.125
Oil scraper ring side clearance	**mm**	0.025 0.10	0.025 0.10	0.025 0.10	0.025 0.10

4-STROKE ENGINE CLOSING TORQUES (BV-BVL-BVS-VANTAGE-PRISMA-SYNERGY- PREMIER-SPECTRA-FUTURA)			
DESCRIPTION	**Screw SIZE**	**N x m**	**Inch x Lbs**
Conrod fastening screws	1/4 - 20	10.10 ÷ 11.28	90 ÷ 100
Oil drainage cap	5/8 - 18	13.5 ÷ 15.8	120 ÷ 140
Flange fastening screws	1/4 - 20	11.28 ÷ 13.53	100 ÷ 120
Breather cover screws	10 - 24	5.10 ÷ 6.18	45 ÷ 55
Regulating lever fastening screw (left-hand thread)	8 - 32	0.88 ÷ 1.08	8 ÷ 10
Cylinder head fastening screws	5/16 - 18	13.5 ÷ 18.1	120 ÷ 160
Screws for fastening inlet pipe to cylinder	1/4 - 20	10.10 ÷ 11.28	90 ÷ 100
Control plate fastening screws (self-threading)	1/4 - 20	5.69 ÷ 9.02	50 ÷ 80
Conveyor fastening screw	10 - 24	4.51 ÷ 5.69	40 ÷ 50
Screws for fastening side starter or engine starter	1/4 - 20	8.44 ÷ 11.28	75 ÷ 100
Viti fissaggio avviat. later. o motorino elettrico	1/4 - 20	9.02 ÷ 10.10	80 ÷ 90
Oil expansion pipe fastening screw (self-threading)	10 - 32	1.67 ÷ 2.84	15 ÷ 25
Tank fastening screw (self-threading)	10 - 32	1.35 ÷ 2.26	12 ÷ 20
Silencer fastening screw	1/4 - 20	8.44 ÷ 10.10	75 ÷ 90
Screws for fastening lamination to cylinder	10 - 24	3.33 ÷ 4.51	30 ÷ 40
Flywheel bolt	1/2 - 20	45.22 ÷ 51.99	400 ÷ 460
Spark plug	M - 14	20.30 ÷ 33.94	180 ÷ 300
Exhaust gas deflector fastening screw	8 - 32	1.67 ÷ 2.26	15 ÷ 20
Screws for fastening filter shell to carburettor	10 - 32	2.26 ÷ 3.33	20 ÷ 30
Heat protection screw (self-threading)	Tipo A N° 10	2.8 ÷ 3.3	25 - 30
Heat protection screw	10 - 24	3.3 ÷ 4.5	30 - 40
ES screws	1/4 - 20	9.0 ÷ 10.1	80 ÷ 90
TOP starter screw	8 - 32	1.7 ÷ 2.8	15 ÷ 25
Brake screw	1/4 - 20	9.0 ÷ 10.1	80 ÷ 90

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4-STROKE ENGINE CLOSING TORQUES
BH ALL TYPES

DESCRIPTION	Screw SIZE	N x m	Inch x Lbs
Conrod fastening screw	1/4 - 20	10.10 ÷ 11.28	90 ÷ 100
Oil drainage cap	1/4 - 18	6.8 ÷ 9.0	60 ÷ 80
Screw for fastening electronic coil to cylinder	10 - 24	3.33 ÷ 4.51	30 ÷ 40
Breather cover screws	10 - 24	5.10 ÷ 6.18	45 ÷ 55
Cylinder head screws	5/16 - 18	13.5 ÷ 18.1	120 ÷ 160
Screws for fastening inlet pipe to cylinder	1/4 - 20	7.95 ÷ 9.02	70 ÷ 80
Screws for fastening carburettor to inlet pipe	1/4 - 28	6.18 ÷ 7.95	55 ÷ 70
Screws for fastening filter shell to carburettor	10 - 32	1.67 ÷ 2.84	15 ÷ 25
Silencer screws	1/4 - 20	8.44 ÷ 10.10	75 ÷ 90
Cylinder cover screws	1/4 - 20	11.28 ÷ 13.53	100 ÷ 120
Tank screws	1/4 - 15	2.84 ÷ 3.92	25 ÷ 35
Conveyor screws	1/4 - 20	9.02 ÷ 10.10	80 ÷ 90
Self-winding starter screws	1/4 - 28	5.69 ÷ 6.77	50 ÷ 60
Adjustment lever fastening screw	8 - 32	0.88 ÷ 1.08	8 ÷ 10
Flywheel bolt	1/2 - 20	45.22 ÷ 51.99	400 ÷ 460
Spark plug	M - 14	20.30 ÷ 33.94	180 ÷ 300

M. TROUBLESHOOTING

This section is designed to help the repairer identify the engine fault and perform the necessary repair.

The main symptoms of defective engines are listed below. The numbers listed under each defect indicate the causes and remedies contained in the following pages.

- ENGINE DOES NOT START OR HAS DIFFICULTY STARTING
  1/1, 1/4, 1/7, 2/4, 2/5, 2/6, 3/1, 3/4, 4/1, 4/2, 4/3, 4/4, 4/5, 5/1, 5/2, 5/6, 5/7, 5/8

- ENGINE DOES NOT GIVE
  1/2, 2/5, 2/8, 5/2, 5/3

- ENGINE DOES NOT SHUT OFF
  1/3

- ENGINE IS HARD AT START UP OR KICKS BACK
  1/4, 1/5, 1/7, 3/3, 4/3

- ENGINE STARTS BUT DOES NOT CONTINUE RUNNING
  2/1, 2/2, 2/3, 3/2

- ENGINE OPERATION IS FAULTY
  2/7, 2/8, 3/5

- ENGINE FALLS
  2/9

- ENGINE GIVES OFF OR CONSUMES OIL
  5/4, 5/5

- VIBRATIONS
  1/6

EQUIPMENT TROUBLE

SYMPTOM	CAUSE	DEFECT	REMEDY
1/1 Engine does not start or is slow in starting.	1) 2) 3) The remote control cable is not adjusted well inside the appropriate clamp on the engine control plate.	1) The starter throttle is not completely closed, therefore, the engine has difficulty in starting due to lack of fuel enrichment, especially when cold.	1) 2) 3) Adjustment of ends of stroke of control cable.
1/2 Engine does not give.		2) The MAX machine setting does not correspond to the MAX engine position. The regulator is not completely connected, therefore, the engine supplies less power.	
1/3 Engine does not shut off.		3) The machine's STOP position does not correpsond to the engine's STOP position.	
1/4 Engine does not start or kicks back	4) The blade is loose. Be careful of frictioned bosses, the blade can slide due to wearing of friction washers or the boss's autting end may be worn.	4) Without the flywheel effect, the engine has difficulty in starting and sometimes appears to be out-of.-phase, kicks back and breaks the flywheel pin easily, which creates additional difficulty in starting.	4) Act on boss or by locking the blade or replacing used parts. Check flywheel pin and replace, if necessary.
1/5 Engine does not respond and is slow in starting.	5) In the case of a self-moving machine, the latter does not appear to be disconnected properly or makes resistance.	5) The engine must be started from neutral, therefore disengaged. If resistance is created by traction in this position, the engine will be harder to start up. ***ATTENTION*** *- This effect is also created when the machine is started up with the blade makes resistance against the grass.*	5) Adjust or act on traction. ***ATTENTION*** *- Lift machine or replace on already cut grass.*

EQUIPMENT TROUBLE

SYMPTOM	CAUSE	DEFECT	REMEDY
1/6 The machine vibrates.	6) Blade is unbalanceds. Engine to machine fixing bolts are loose.	6) Blade balancing is more important than its sharpness. An unbalanced blade causes early wear of all engine and machine parts. **This type of damage is not covered by warranty.** The same holds true for loose fixing bolts which, in addition to being dangerous for the operator, will surely cause breakages not covered by warranty.	6) Blade balancing. Bolt tightening.
1/7 Engine does not start and responds with much difficulty.	7) Oil is present in cylinder head (only 4-stroke).	7) During machine cleaning and maintenance operations, avoid inverting the engine with head (spark plug side) facing downward. Avoid operating the machine with the engine head turned downward. On some versions of equipment, the engine's position at standstill is with head facing downward; we suggest positioning the machine with the engine level in order to avoid this inconvenience. **The defect is not covered by warranty.** When performing any under-body work, lift the machine so that the carburettor is the highest part of the machine.	7) Disassemble head and clean.

ENGINE – POWER SUPPLY UNIT TROUBLE

SYMPTOM	CAUSE	DEFECT	REMEDY
2/1 The engine starts up and stops after a short time. It is left off, start-up is repeated and trouble occurs again.	1) The fuel tank cap's breather is obstructed, missing or defective.	1) Insufficient fuel flow. This problem result in the engine starting while the tank is late in in supplying the carburettor float chamber. Once the fuel in the float chamber is consumed, the engine stops. By leaving the engine off for a few minutes, the float chamber is able to fill up agaiin and the engine will start, but the problem repeats itself.	1) If clogged, it will be suffiicient to clean it. For other cases, replace cap.
2/2 Engine has difficulty starting or stops after short time.	2) Insufficient fuel flow to carburettor.	2) There is a fine metal net inside the tank that functions as a fuel filter. If the tank contains dirt or stale fuel, a film forms on the net that does not allow fuel to flow.	2) Clean the tank and blow air jets inside the fuel output coupling.
2/3 Same as item 2.	3) Same as item 2.	3) The problem could be due to the air bubble inside the fuel pipe caused by the drawing between one of the couplings and the pipe, or by too narrow a bend in the pipe or by a pipe that is too long.	3) Eliminate the air bubble.
2/4 Engine does not start, especially when warm, or has difficulty in starting and releases smoke from exhaust.	4) Air filter clogged.	4) If the air filter is excessively clogged, carburetion is enriched too much and the engine is flooded.	4) Clean or replace the filter element.
2/5 Engine does not start or gives very little.	5) Carburettor clogged by dirt or by residue of stale fuel.	5) If the jet and the internal carburettor holes become clogged, the engine will not operate. In some cases, the internal ducts of the carburettor body become clogged and cleaning is uneffective.	5) Wash, clean, blow. Replace carburettor.
2/6 Engine does not start because it becomes flooded, or because oil contains traces of petrol (oil level increases).	6) Badly sealed carburettor needle.	6) If the carburettor's needle valve does not close properly, the fuel level increases and fuel spills out through the manifold into the combustion chamber, thus flooding the engine. If this situation continues, it becomes dangerous for the engine because by drawing petrol through the rings and the cylinder it ennds up in the oil cup. Here it mixes with the oil, which loses its lubricating properties causing the engine to wear irremediably in a short time.	6) Clean seat and needle. Replace needle. Replace carburettor.

TROUBLE CAUSED BY ENGINE – POWER SUPPLY UNIT

SYMPTOM	CAUSE	DEFECT	REMEDY
2/7 Engine runs irregularly at no-load or does not keep up idling (2000 rpm).	7) Air is drawn inside carburettor.	7) Air may drawn in through the parts that connect with the carburettor-air filter-inlet manifold-check tightness of carburetion adjusting screw.	7) Replace defective or worn parts. Replace carburettor.
2/8 Engine does not give, stops under stress or runs irregularly.	8) The cause may be in the external linkage of regulator.	8) Regulator is not calibrated to end of stroke. MAX rpm adjustment too low. Regulating spring unset or deteriorated. Linkage that sets, not perfectly free. Incorrect adjustment of control plate. Seat on the adjustment rod circuit is excessively worn, transverse clearance is excessive.	8) Resetting of adjustments or replacement of detriorated parts.
2/9 Engine falls.	9) Regulator blocked.	9) The regulator on the external levers can become blocked due to excessive dirt or tampering. **This is not covered by warranty.**	9) Cleaning. Resetting.

TROUBLE CAUSED BY ENGINE – IGNITION UNIT

SYMPTOM	CAUSE	DEFECT	REMEDY
3/1 Engine does not start.	1) Spark plug is lacking current or current is very weak.	1) Spark plug. Spark plug hood not connected properly. If electronic ignition is defective, replace it. If spark ignition is used: points are too closed or too open, points are oxidized or have deteriorated, inefficient capacitor, coil deteriorated or inefficient.	1) Makes sure that the control is not set to STOP. Use tester for troubleshooting. Replace èarts.
3/2 Engine starts, stops once warmed up and does not restart.	2) See item 1.	2) See item 1.	2) See item 1.
3/3 Engine does not start or kicks back.	3) Breakage of flywheel pin, flywheel pin is slightly bent.	3) In this case, current is present, but it is out-of-phase, therefore engine does not start. This problem (not covered by warranty) is generally caused by: violent shocks caused by equipment tools, loose blade, unbalanced blade, engine to machine fastenings loose, strong vibrations caused by equipment.	3) Replacement of pin. If flywheel tapers and shaft become deteriorated, replace both. Eliminate the causes of breakage.
3/4 Engine does not start.	4) Earthing connector on earthing control plate.	4) Sometimes dirt and damp grass deposits between the connector and the control plate, causing a circuit earthing fault, or the connector has deteriorated and has an earthing fault.	4) In the first case, cleaning of the connector area will be sufficient. In the second case, when possible, replace connector, or plate.
3/5 Engine misfires or does not rev up.	5) If ignition is electronic, it could be adjusted too close to flywheel. Or see item 1.	5) In the case of electronic ignition, set coil-flywheel air gap at between 0.40-0.50 mm and if this does solve problem, replace the coil. It is necessary to point out that for electronic engines, the number of revolutions must not exceed that set by the manufacturer.	5) Adjust air gap. Or see item 1.

TROUBLE CAUSED BY ENGINE – ELECTRIC STARTER UNIT

SYMPTOM	CAUSE	DEFECT	REMEDY
4/1 Engine does not start with E.S., starts correctly with pull start-up.	1) Battery worn out.	1) If battery is below a certain charge, the engine starter cannot run engine, or else it idles but does not engage. **A battery that is worn out or deteriorated due to faulty maintenance is not covered by warranty.**	1) Charge battery with battery charger supplied with equipment. If the battery does not charge even after a charging period of 24-48 hours, check to make sure the battery charger is not defective, if so replace it.
4/2 Same as item 1.	2) Engine starter turns, but does not engage.	2) Either the battery is worn out, as in item 1, or the engine starter gear is weak because the wworm screw on which it must slide is dirty.	2) Clean and lubricate with graphited grease.
4/3 Engine does not start with E.S.. Starts with pull start-up, but with difficulty.	3) Centrifugal decompressor ineffective. Or inlet valve air gap is too wide.	3) If the centrifugal decompressor installed on the cam shaft does not function, compression is too high for the engine starter pickup. If the inlet valve clearance is greater than 0.35 mm, this definitely reduces the decompressiion effect. Valve clearance between 0.15 and 0.25.	3) Replace the cam shaft. Reset inlet valve clearance.
4/4 Engine does not start either with E.S. or with pull start-up.	4) The cause is not to be found in the E.S. system.	4) Faults are to be found in the power supply system, or in the ignition system, or in the engine block or equipment.	4) Troubleshooting and resetting.
4/5 Engine has difficulty in starting, presence of metallic noise.	5) Flywheel teeth broken.	5) This fault occurs due to the incorrect use of starter by the user. Engine kickback (e.g., loose blade). Incorrect positioning of engine starter.	5) Replace flywheel and eliminate causes.

TROUBLE CAUSED BY ENGINE – MONOBLOCK ENGINE UNIT

SYMPTOM	CAUSE	DEFECT	REMEDY
5/1 Engine does not start or starts with great difficulty.	1) Excessive scaling in the combustion chamber.	1) The excessive scaling acts like a sponge, and at start-up it absorbs most of the fresh fuel at input, thus causing starting difficulties. Moreover, scaling can prevent valves from closing perfectly.	1) Remove scaling.
5/2 Same as item 1. In addition, low power.	2) Low compression.	2) Lack of tightness in one or both valves due to scaling, burning, workmanship defects. Piston retaining rings usually wear out because penetration of dust due to inadequate air filter maintenance, or overheating due to engine not being kept clean or to its improper use or to insufficient oil level.	2) Restore valves by sanding or milling seats and replace valves. Replace rings or replace miniblock.
5/3 Engine has low power.	3) Loose head screw.	3) Loss of compression from head with burning of gasket; this problem is also accompanied by the slight dripping of burnt oil from the head.	3) Replacement of head and closure gasket.
5/4 Engine gives off oil from breather pipe.	4) Pressure inside engine crankshaft high than average.	4) Engine oil level is too high, higher than MAX. Breather pipe jammed or defective. Excessively worn out retaining rings.	4) Replace worn or defective parts.
5/5 Engine consumes too much oil.	5) Excessive wear or incorrectly positioned retaining rings.	5) Wearing of barrel-piston-rings for reasons listed in item 2. Excessive clearance between stem and inlet valve guide, oil goes through and wears it out. Retaining rings that were positioned at assembling with openings all in a row (generally facing downwards).	5) Replace worn parts. Restore valves. Correct positioning of rings (120° out-of-phase).
5/6 Engine does not start.	6) Breakage of camshaft. Valves do not move causing engine to run by hand.	6) This problem is caused by violent shocks against the equipment tool. Spark plug installation with long thread (in general, bent or marked valve is noticed) or usually, imprint on cylinder scaliing between the two valves. Weakness or defect in spindle, or excessive scaling in head, valves touch against this causing breakage.	6) Replace spindle.

TROUBLE CAUSED BY ENGINE – MONOBLOCK ENGINE UNIT

SYMPTOM	CAUSE	DEFECT	REMEDY
5/7 Engine does not start. It idles without compression.	7) Broken conrod.	7) Conrod breaks with seizure on crank journal = oil missing. Engine out of turn – regulator tampered with or blocked due to dirt. If broken conrod presents no signs of seizure, it is presumably defective (contact Tecnamotor).	7) Replace conrod. If crankshaft is broken, replace miniblock.
5/8 Engine does not start and remains blocked.	8) Engine seizure.	8) Engine seizes due to lack of lubrication: oil missing, oil at minimum level, use on gradients of over 60%. If only the flywheel side is seized, check if lubrication hole is missing; if camshaft is correctly perforated, if oil pump is missing or incorrectly positioned or broken. In this case, warranty is valid only if engine has never been repaired, engine is new (at most it will have turned 30 minutes). If it is seized: - only on conrod - on conrod and flywheel side - on conrod, flywheel side and piston - on conrod and piston - on conrod, piston, flywheel side and flange side. In such cases, warranty is not valid since cause is missing oil, as described above. In case of doubt or complaint, consult Tecnamotor who will determine the cause of problem.	8) Replace deteriorated parts. Miniblock. Miniblock + shaft. Replace engine.

TECUMSEH EUROPA

WARRANTY POLICY

For the TECUMSEH Servicing Network Europe

VALIDITY MAY 1996

This warranty supersedes all previous versions.

WARRANTY DESCRIPTION

Tecumseh Europe S.p.A. guarantees the repair or replacement, at its own discretion, to the original purchaser of each product or product part whose material and/or workmanship is found to be defective after inspection by one of its Authorized Servicing Centres or one of our Centralized Dealers, and also by Tecumseh Europe S.p.A. itself.
If an Authorized Servicing Centre determines that the type of repair work is not covered by free warranty servicing, he must immediately inform the user of the machine of the reasons why the defect cannot be repaired under warranty.
This warranty exclusively covers defects in materials and/or workmanship.

VALIDITY OF WARRANTY

This warranty is valid starting from the date of purchase by the original purchaser of the product and/or the application on which the product is installed to the time specified in the instruction booklets of the various models: the repairer is responsible for verifying that the product is effectively under warranty.

WARRANTY PROCEDURE

If warranty servicing is necessary, immediately contact the closest Authorized Servicing Centre. Do not repeatedly attempt to operate the engine for which repair under warranty is being requested as this could result in further damage that will not be covered by warranty.
To obtain warranty servicing, it will be sufficient to present any document (invoice, tax receipt, tax voucher, etc.), that indicates the date of purchase of the equipment on which the product is installed. It is necessary to specify the product model, dressing code and serial number, as well as the number of hours of operation and the failure or defect noted.
If the Customer does not agree with the results of the examination by the Authorized Servicing Centre, he may request a further examination by the Centralized Dealer. If the Centralized Dealer or Tecumseh Europe recognizes that the fault is entitled to warranty, the Customer will be entirely refunded for the product or for the product parts whose materials and/or workmanship are defective. The new parts used for warranty servicing will be guaranteed for the remainder of the warranty period, up to the expiration of the entire warranty period.

Below is a list of the damages or circumstances not considered to be material and/or workmanship defects and for which warranty coverage is therefore not recognized.

- **Machine installation:** if the machine is supplied to the final user in its package, some items must be assembled by the user before the machine can be operated. In this case, we recommend that special care be placed in the regulation of the gas remote-control when allowed (see user and maintenance booklet supplied with the product), since incorrect regulation can seriously compromise machine start-up.
- Prolonged and/or incorrect restarts (for example, 4-stroke engines with spark plug turned downwards) can cause difficulties in starting up the engine due to the presence of oil in the combustion chamber and the soiling of spark plug electrodes. These inconveniences are not covered by warranty. In this case also, please strictly follow the instructions provided in the user's and maintenance booklet.
- **Improper use or negligence:** The user must scrupulously observe the usage and maintenance standards contained in the instructions booklet supplied with the engine. If this is not done, the engine may be subject to damages not covered by warranty.

Some examples of these are:

1. Broken or bent engine shaft: such damage is usually caused by the violent hitting of the lawnmower blade against heavy objects.
2. Repairs resulting from damages caused by the use of stale fuel: these damages include blockage of valves, clogging of carburettor or of the tank style carburettor couplings caused by sticky deposits that are formed by the use of stale fuel.
   Always use fresh and clean fuel.
3 Seizure of engine parts due to insufficient lubrication or to the use of unsuitable or unauthorized lubricants.
   Check oil as specified in the user and maintenance manual and restore correct level, if necessary.
   Change oil at recommended intervals. For two-stroke engines, use of the type of lubricant indicated in the user's and maintenance manual, and in the percentage specified, is compulsory.

4 Damages due to overheating or to speeds that are out of specifications. Usually an engine overheats or falls when its cooling and revolution regulation systems become clogged with grass, dust and dirt in general. Therefore it is necessary to clean the cooling fins on the cylinder and head, the flywheel and the adjustment linkage.
5. Damages and wear due to dust. These are caused by dust reaching the engine as a result of inadequate or incorrect air filter maintenance. Replace air filters regularly.
   Follow the instructions provided for each type of air filter.
6. Damages or loss of parts due to untightened engine nuts and bolts.
7. Engine tune-up or adjustment are not covered by warranty unless they become necessary following servicing performed under warrant. If the machine is assembled by the Customer, the operating and maintenance instructions provided in the manual are sufficient to allow anyone to be able to perform the small number of adjustments that may be required.
   These are not covered by warranty.
8. Parts broken as a result of excessive vibrations due to the inadequate fastening of engine to machine, to a loosened or unbalanced blade, to the engine being unsuitably connected to the equipment, to off-speed engines or to their excessive and/or improper use.
9. The repairing or adjustment of parts or assemblies such as: clutches, transmissions, remote controls, etc., that are not produced by Tecumseh Europe.
10. Spare parts and/or accessories that are not original, or those not approved by Tecumseh Europe.

NORMAL WEAR

The repairing of parts or engines that have become worn through normal operation is not covered by warranty. Like any mechanical device, to operate correctly, engines require routine maintenance, replacements and repairing of parts.

It is necessary to remember that tillers, land aerators and lawnmowers are very often used in particularly dusty and dirty environments. These conditions require more frequent maintenance operations and checks and may cause what could be considered early wear. Such wear, caused by the penetration of dust or dirt inside the engine as a result of incorrect maintenance, is not covered by warranty.

WARRANTY MANAGEMENT

If, after performing checks, the Authorized Servicing Centre verifies the presence of defects in the material or assembly, it must fill out the request for warranty servicing in four copies and have each copy signed by the Customer or by the person who has notified the defect. The repairer must completely fill out the form following the instructions provided below.

The Authorized Servicing Centre must perform small or medium repair work immediately. Defective parts must be kept at the disposal of Tecumseh Europe Turin until the file has been defined. Once the repair has been made, the duly filled out request for warranty, and the blue, white and pink copies, must be sent to the Centralized Dealer or to Tecumseh Europe Turin.

The Authorized Servicing Centres and other warranty repair locations must promptly forward the service forms directly to their spare parts supplier.

The forms received periodically will be examined promptly and divided into:

- **forms for which warranty servicing is approved:** in this case, Tecumseh Europe will calculate the cost of repairs, as specified below, and will request the Authorized Servicing Centre to issue a normal invoice;
- **forms whose main parts have been filled out incorrectly and/or incompletely:** in this case, Tecumseh Europe reserves the right to refuse requests, especially those in which it is impossible to verify the type of defect being reported.

REFUNDING OF WARRANTY

The warranty will be refunded according to the rules specified below:

a) The prices for replaced parts will be calculated on the basis of the price list in force at the time of the net adjustment of the specific discount granted to the various Authorized Servicing Centres. The overall amount calculated will undergo the following price increases for warranty management expenses:
   15%, if parts parts have been replaced
   7.5%, if the repair involves replacements using new engines, short block, miniblocks and transmissions.
b) Labor expenses will be paid applying the price schedule currently in force. The resulting times will be paid by applying the fees that are notified annually in writing by TECUMSEH EUROPE TURIN.

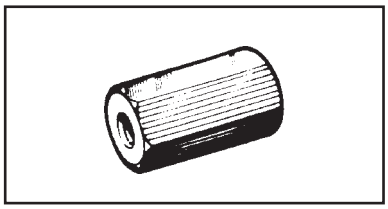
TECUMSEH EUROPE will not acknowledge any other expenses except those for parts replacement and labor, as per the SCHEDULE.

TEMPARIO.

- If engine is seriously damaged, the advisability of replacing the engine completely will be considered.
  In this case also, any transportation, maintenance and cleaning costs are at the Customer's expense.

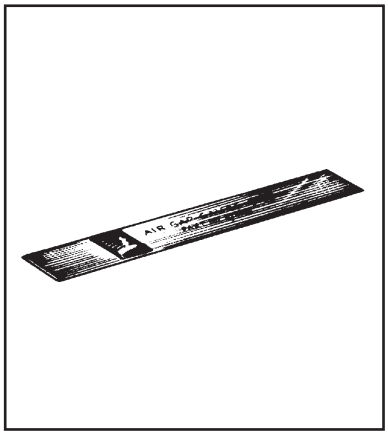
TECUMSEH EUROPA

SPECIAL TOOLS



670103
flywheel removal bolt

shaft with 7/16" thread

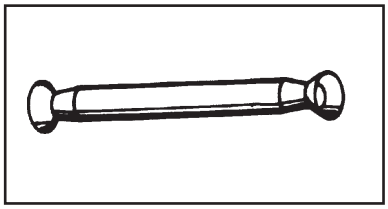


670297 (*)
thickness gauge for 0.3 mm flywheel air gap

Electronic ignition
3000/3150 rpm

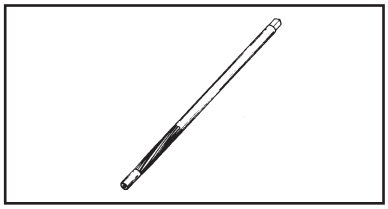
88841551
thickness gauge for 0.4 mm flywheel air gap

Electronic ignition
3350/3800 rpm



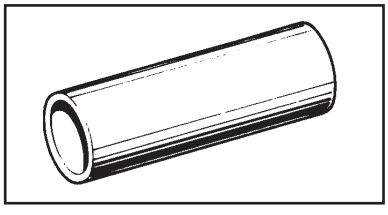
670154
valve lapping tool

all 4-stroke engines



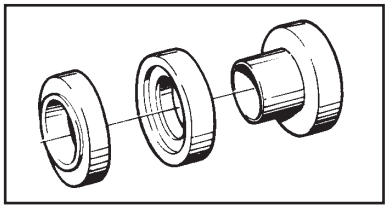
670328
borer for increasing OHV exhaust valve guides

all OHV engines



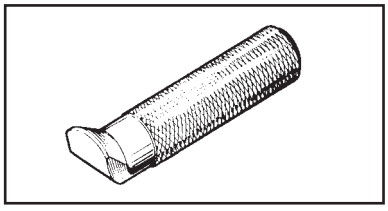
670272
tool for mounting retaining ring

all engines



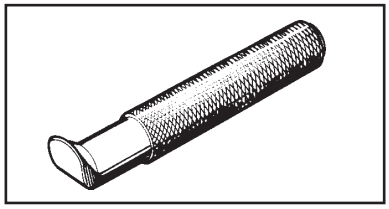
670292
tool for mounting retaining ring

1" diameter



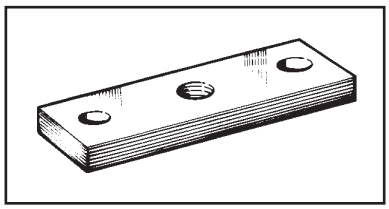
88841026
tool for disassembling roller bearings

2-stroke flywheel and H side



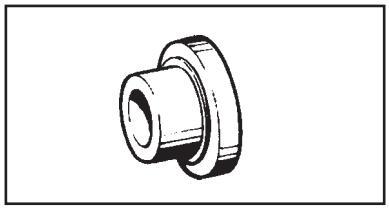
88841027
tool for disassembling roller bearings

2-stroke power intake side



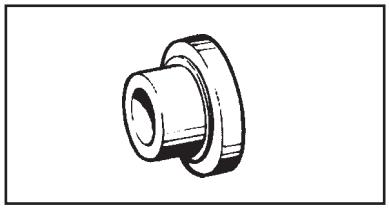
88841044
conveyor base removal mounting plate (see note)

2-stroke power intake side



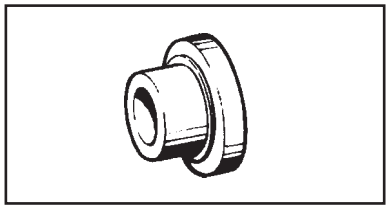
88841529
tool for mounting roller bearings

2-stroke power intake side



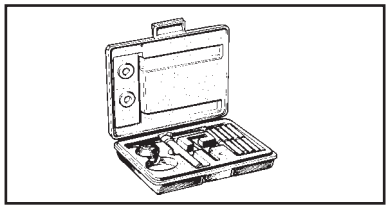
88841530
tool for mounting roller bearings

2-stroke flywheel side



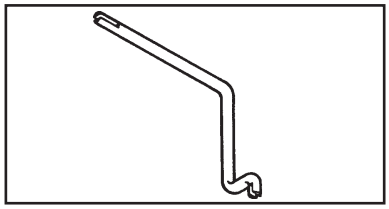
88841531
tool for mounting roller bearings flywheel side

H engines



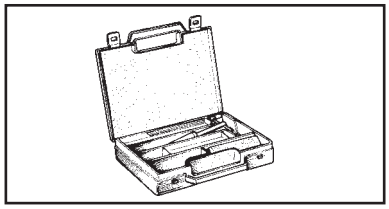
88841013
Neway method for grinding valve seats

all 4-stroke engines with side valves



670326
tool for adjusting speed

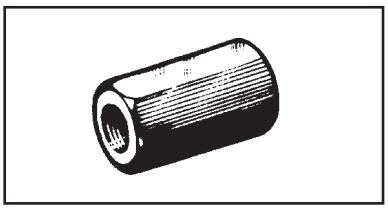
fixed turn carburettors



88841034
set Heli-coil
UNC ¼"x20x1.5d
88841035
set Heli-coil
UNC 5/16"x18x1.5d
88841036
set Heli-coil
UNC 3/8"x24x2d

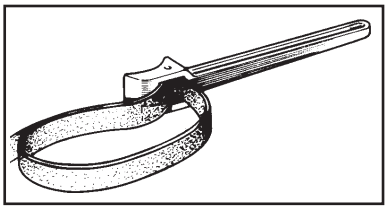
All engines

TECUMSEH EUROPA



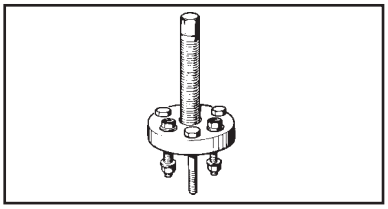
670169 (*)
flywheel removal bolt

shaft with ½" thread



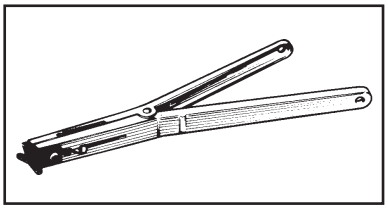
670305 (*)
flywheel locking belt

all engines



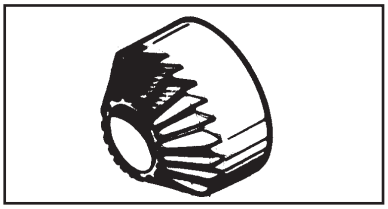
670306 (*)
tool for removing flywheel when there are roller bearings

2-stroke H engines



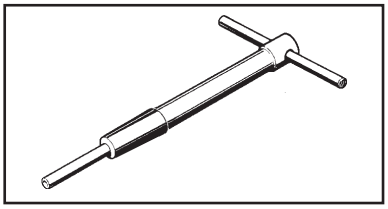
670117 (*)
pliers for retaining ring expansion

universal



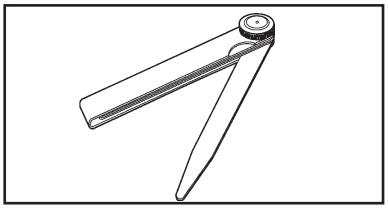
26990001 (*)
valve sanding miller

all 4-stroke engines



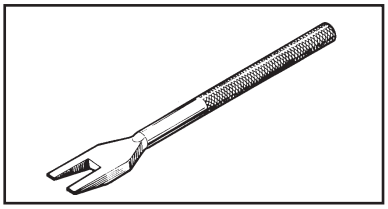
26990002 (*)
holder for valve sanding miller

all 4-stroke engines



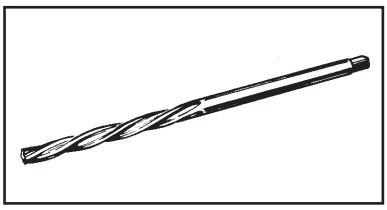
26995006
set of thickness gauges

all engines



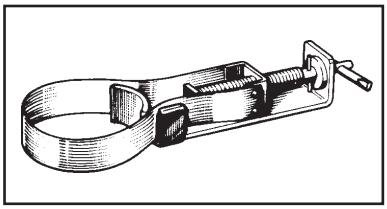
88841012 (*)
fork for valve spring

all 4-stroke engines



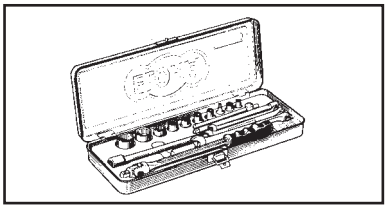
670283 (*)
borer for increasing valve guides

all 4-stroke engines



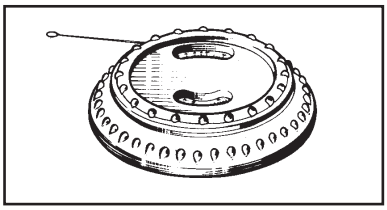
88841004 (*)
tool for mounting compression rings

all engines



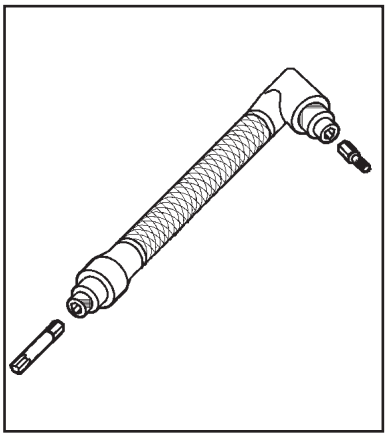
88840004 (*)
wrench set and bushings for inch measure

all engines



670156 (*)
wire rev counter

all engines

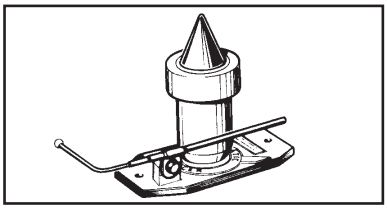


88841537 (*)
insert carrying key

888841538 (*)
inserto torx 10

88841539 (*)
max jet insert for carburettor

all engines



88841016 (*)
blade balancer

lawnmower equipment

1ST LEVEL TOOLING KIT (TOOLS WITH *)

16990003

all engines