tecnamotor spa

TECUMSEH ENGINES

A TECUMSEH - FIAT ENTERPRISE

FIAT settore componenti

tecnamotor spa

A

B

C

D

E

F

I

INDEX

CHAPTER «A»
CHECK—UP BEFORE REPAIR

CHAPTER «A»

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 SK).
Check the carburettor and governor controls, remote control, air cleaner, spark plug, oil level (four stroke engines) drain and re-fill fuel tank with clean fuel.
For 2-stroke engine model TA, VA, AH 81 use a 6% (16:1) petrol oil mixture.
For 2-stroke engines AV and MV use a 4% (25:1) petrol oil mixture.

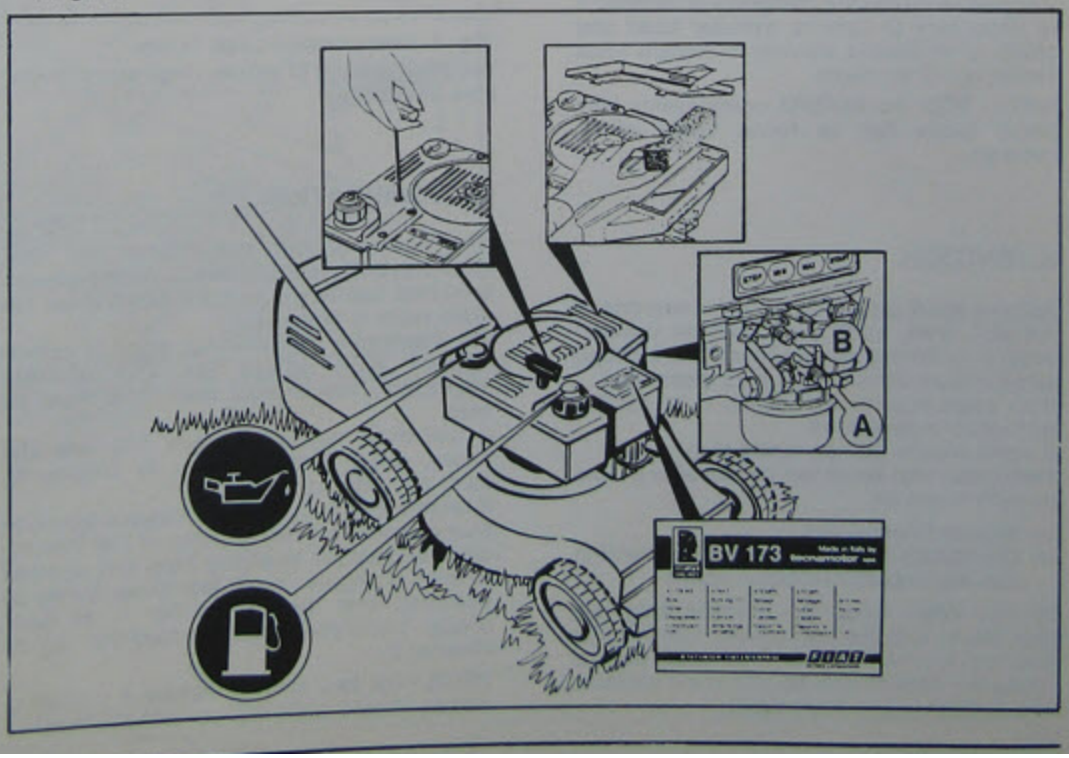
USE CLEAN FRESH FUEL FOR TESTING

Note: if engine is fitted with remote control, 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.

At this point, follow starting procedure:

— Open fuel tap (if fitted).
— Open vent screw on filler cap (if fitted).
— Press fuel drain valve on underside of float chamber to check fuel flow.
— On diaphragm carburettors without primer, remove main jet screw, actuate diaphragm, fuel should then flow from the jet hole.
— Check that earthing switch or lead is not shorting.
— Move control lever to «start» or «choke» position.
— Move throttle lever to choke position (unless this operation is covered by use of control lever).
— On diaphragm carburettors equipped with primers, operate primer several times.
— Pull starter rope slowly two or three times.
— Pull rope to bring engine onto compression, recoil, then pull starter firmly.
— If the engine starts and runs satisfactorily, the customer should be instructed on starting and maintenance procedure, otherwise continue engine fault check.



2. 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
— Carburation
— Equipment

a. STARTER

Pull starter and ensure that the starter dog engages and turns the engine, if not see chapter B service 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 gasket
— 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 Aspera Leak Tester is not available.

NOTE - With the ASPERA compression leak tester faults can be found easily within minutes.

c. IGNITION

Remove spark plug and connect a new one to the H.T. 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 C for service and repair instructions.
If spark occurs, fit new spark plug.
Remember that spark failure can also be due to such faults as:

— Broken flywheel key
— Crankshaft bearing worn thus preventing can from opening breaker points

NOTE - When using the ASPERA compression tester and the AM ignition tester faults may quickly be located. If no fault can be found the defect must be within the carburation system or the equipment.

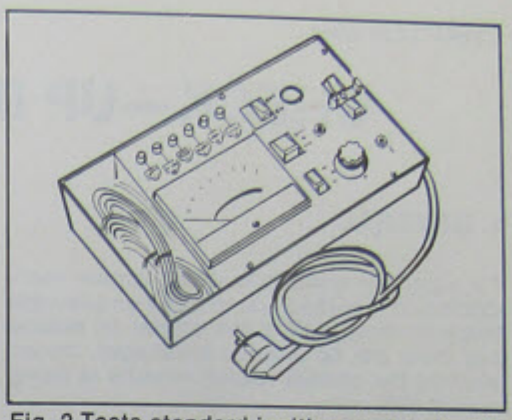


Fig. 2 Tests standard ignition system in situ. Solid state units must be removed for test.

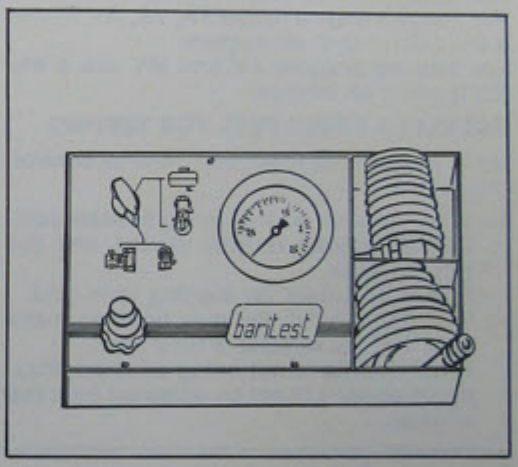


Fig. 3 Compression Leak Tester.
Tests for leakage of valves, rings and cylinder bore in situ.

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 D, 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 D.

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

e. EQUIPMENT

What may initialy appear to be an engine fault such as a starting difficulty or engine vibration ets. 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 separatly, the following being a list of the more common problems:

Hard Starting, Kickback, Will not start

- Loose blade. The blade must be tight on shaft or adaptor.
- Loose belt. A loose belt, as with a loose knife, can cause a backlash effect which will counteract the engine cranking effort.
- Starting under load; ascertain that the equipment is disingaged if the unit has a heavy starting load.

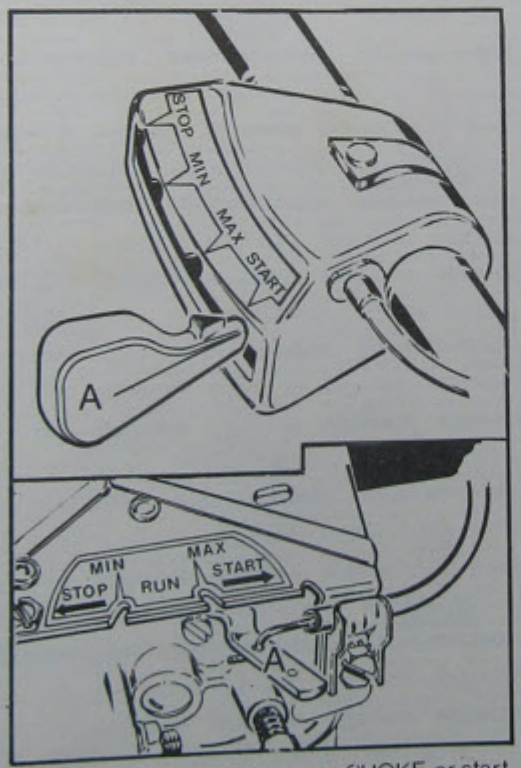


Fig.4 Remote control lever on CHOKE or start position

- Check remote control assy for proper adjustment, with the lever A in choke or start position the carburettor choke should be fully closed. (Fig. 4)
- Grass cutting build up under deck may cause difficulties, clean deck.
- Check that grass collectors are empty, an overfilled collector could cause engine malfunction.

Vibration

- Worn blade mounting; replace if mounting allows blade to move causing unbalance.
- Worn or damaged cutter balde.

Noise

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

CHAPTER «B»
STARTERS

CHAPTER «B»

STARTERS

1. GENERAL

On Aspera engines different starters have been fitted and are mounted, i.e.

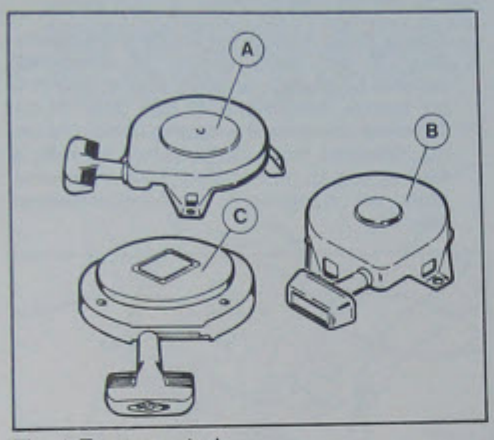


Fig. 1 Top mounted

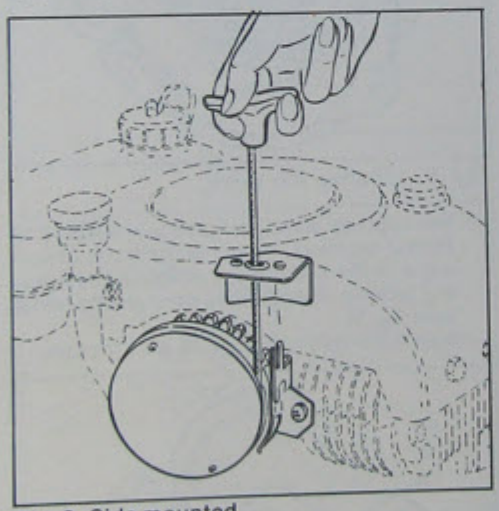


Fig. 2 Side mounted

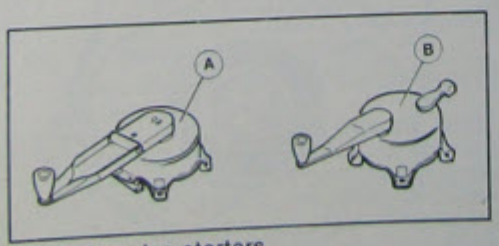


Fig. 3 Impulse starters
A = Standard
B = De Luxe

NOTE - In case of replacement of the starter only, it is recommended that a starter of type B is fitted.(see fig.1)
To fir starter type B on an engine previously equipped with starter type A it is necessary to replace hub and screen and associated nut and washer.

2. OPERATIONS ON TOP RECOIL STARTERS

a. OPERATIONS ON RECOIL STARTERS TYPE «A»

These types are no longer in production, spares are available in limited quantities, the use of rope rewind starter type B with hub and screen, nut and associated washer is recommended.
To disassemble starter, proceed as follows:

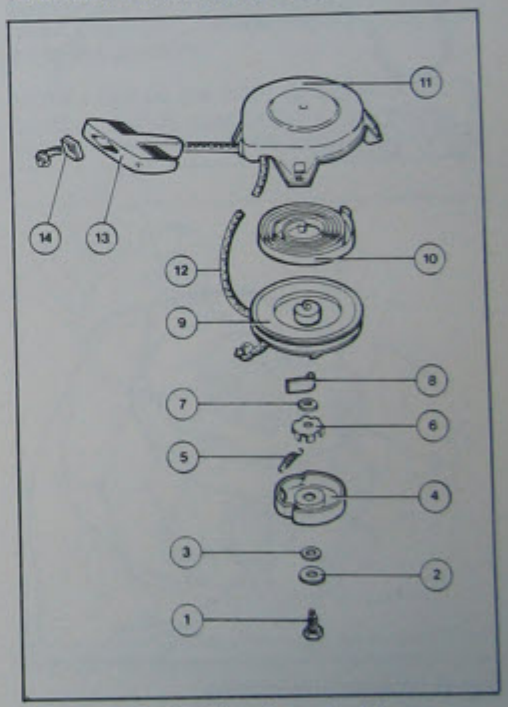


Fig. 4 Exploded view type A - 1st group

— Release tension of spring (10) to avoid accident during disassembly as follows:
— Pull starter rope (12) about half way and prevent recoil by firmly holding pulley (9).
— Tie a knot on rope A (see fig. 5) to prevent recoiling and remove handle (13 and 14) by loosening the knot fastening the latter to the rope.

— Loosen the knot previously tied on rope and let the spring unwind by slowly releasing the pulley.
— Unscrew centre screw (1) and remove brake and dog assembly (parts 2-3-4-5-6-7-8).

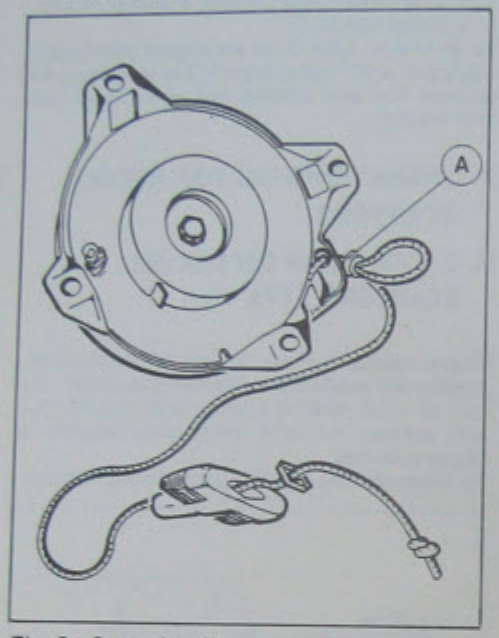


Fig. 5 Operation 2

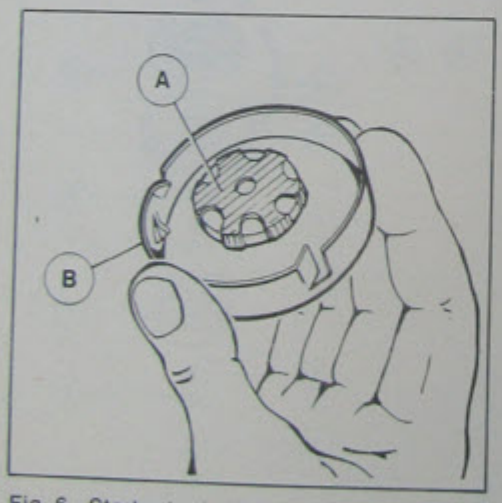


Fig. 6 Starter brake fitting

— Carefully remove pulley making sure that main spring does not escape from its housing. The starter will then be completely disassembled.

Before reassembling starter it is important:

— Check brake (6) for tight fit about retainer hub body (4). If brake "A" is a loose fit, it should be replaced (see fig. 6).

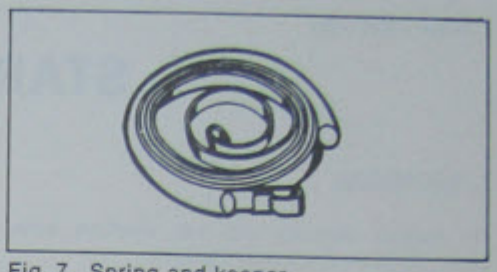


Fig. 7 Spring and keeper

— Check main spring for troublefree operation. If the main spring is damaged, remove by sharply striking starter box (11) on bench, keeping box feet downward. To avoid injury by the spring suddenly being released from its housing. To refit a new spring in its housing, use a genuine spare part supplied in the special keeper (see Fig. 7).

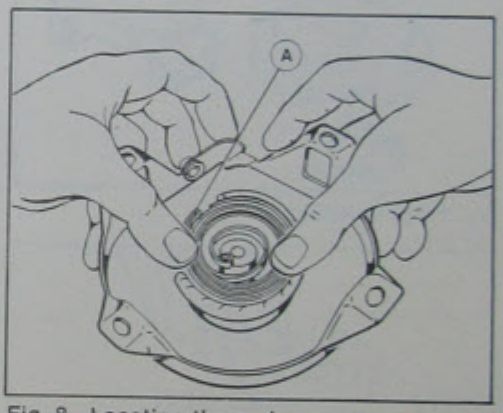


Fig. 8 Locating the spring

— Rest spring container on inner surface of starter housing, locate outer hook of spring A in the associated notch in the housing (see fig. 8) and press spring fully home (see fig. 9).
Lubricate spring well with soft grease.

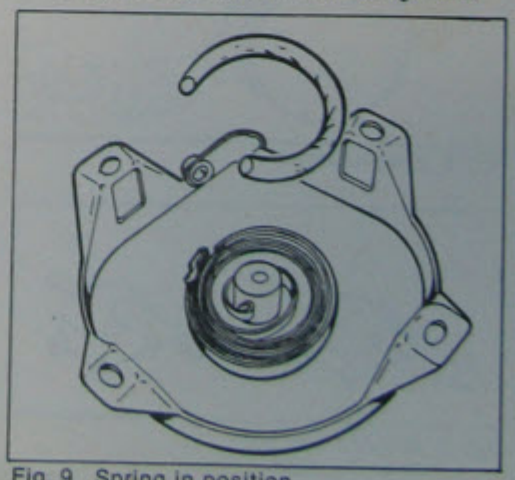


Fig. 9 Spring in position

To reassemble starter

— Re-seat pulley after having wound on the rope leaving the end through the notch provided on the pulley (see fig. 10). Insert pulley into the container, making sure that the spring locates in the notch provided.
— Reassemble brake (6) and washers 3 and 7) on retainer hub, greasing liberally.
— Refit dog in its housing in the pulley.
— Connect return spring (5) to lug on retainer hub (4), then, tensioning the spring, connect the other end to the post on the pulley while simultaneously seating retainer hub (see Fig. 11) and secure with screw and washer (1 and 2).

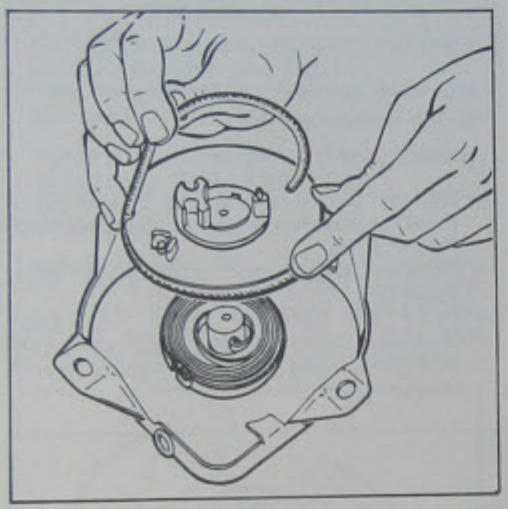


Fig. 10 Fitting the pulley

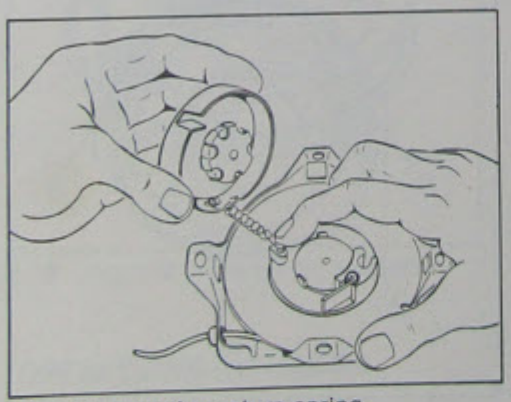


Fig. 11 Locating return spring

— Thread the rope through the guide hole and re-fit the handle.
— Pull the rope and check that the pulley winds five complete turns. If not, the pulley may be further wound by fitting the rope in the notch in the pulley and then turning the pulley the necessary extra amount by hand, as in Fig. 12. Then ascertain that dog protrudes from its slot by slightly pulling the rope.

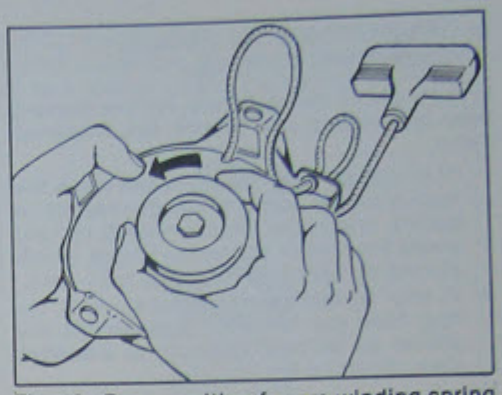


Fig. 12 Rope position for pre-winding spring

Next check that the rope can be pulled to its full extend and that it completly rewinds, and holds the handle firmly to the starter.

NOTE - By observing the following procedure, a broken or damaged rope can be replaced without dismantling the starter.
Completely wind up the pulley (if the rope is not broken, it is possible to pull the rope to the end of its stroke). Hold the pulley in this position, cut and withdraw the old rope and insert a new one, still keeping the pulley locked in this position.

NOTE - Should the main spring have left its housing during disassembly operations, it must be rewound and replaced in its housing.

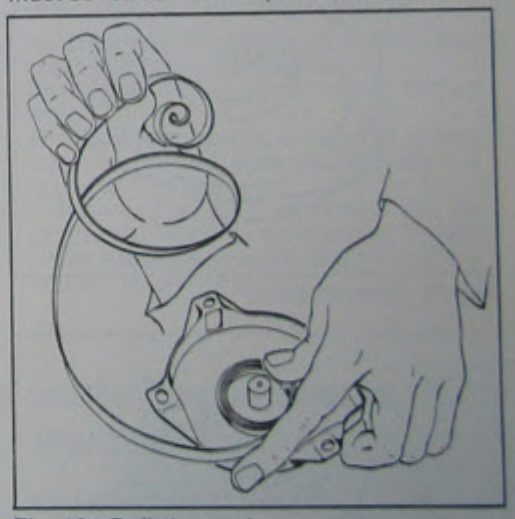


Fig. 13 Refitting spring

Begin from the outside, securing the spring on the outer side of housing in starter box (see Fig. 13), and then wind up counterclockwise working towards the centre.
This operation can be facilitade by rewinding the spring into one of the special keeper rings supplied with each new spring. Then refit as per a new spring.

b. OPERATIONS ON RECOIL STARTERS TYPE «B»

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

— That dog (A) (Fig. 14) protrudes when the rope is slowly pulled. If the rope cannot be pulled, check the retainer hub B locking screw for correct tightening torque, which should be kgm 0.5 - 0.6 (45/55 inch. lbs.).
— If, after correct tensioning of screw B, the dog does not function, disassemble the starter as follows, referring to exploded view shown in Fig. 15.

To disassemble starter

— Release spring. With this starter it is more expedient to slide the rope off the pulley by loosening the knot (see Fig. 16). To do this, pull the rope completely and locking the pulley, slide the rope into the associated slot. Then slightly release pulley while exerting a light pressure with the thumb upon pulley.
— Remove centre locking screw.
— Remove retainer hub, brake spring and dog.

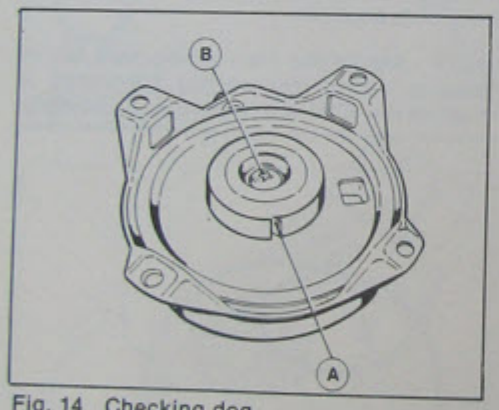


Fig. 14 Checking dog

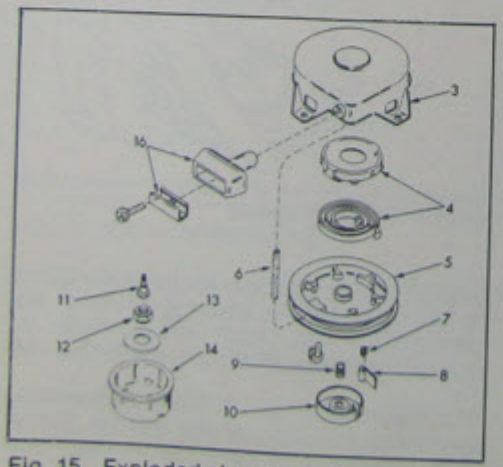


Fig. 15 Exploded view type «B»

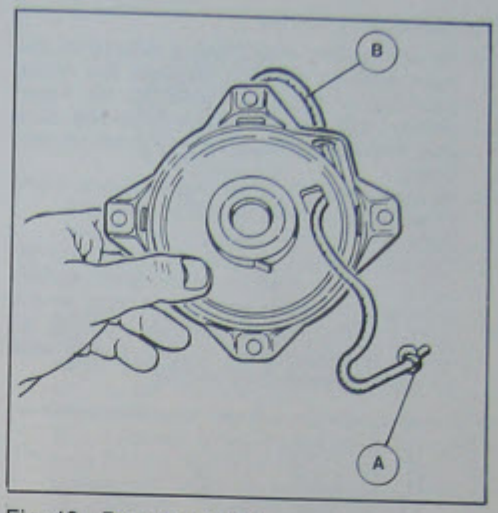


Fig. 16 Removing rope

— Remove dog return spring B, bearing in mind its position for correct replacement (see Fig. 19).
— Remove pulley and spring container assembly.
— Once the damaged parts have been replaced, lubricate spring container with soft grease (see Fig. 17) and proceed with reassembly.

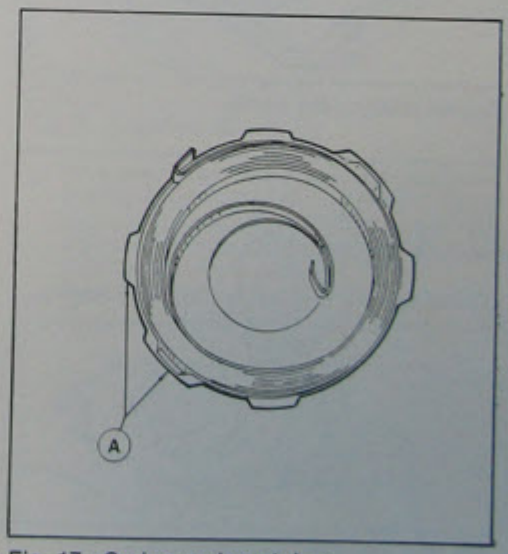


Fig. 17 Spring and container

To reassemble starter

— Accurately position spring container on pulley (see Fig. 18).
— Re-position the pulley assembly into container lubricating shaft and bushing of plastic pulley.

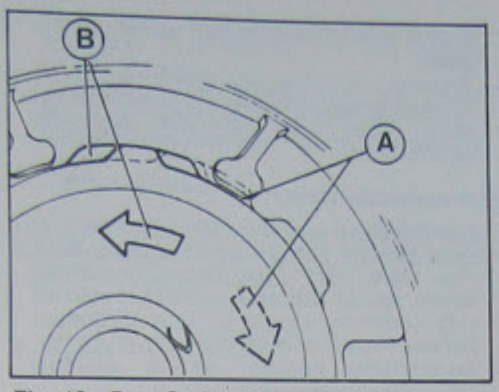


Fig. 18 B = Spring disengagement
A = Engagement

— Re-fit retainer spring, place dog and brake spring in position (see Fig. 19).
— Accurately position retainer hub and secure with the screw.
— Thread rope in and re-tie the knot, thereby securing the rope to the pulley.

After reassembling starter

Always make sure that by pulling the rope slightly, the starter dog operates and by pulling the rope completely, a full stroke is obtained and when released, fully recoils, and that the handle is held firmly to the starter.

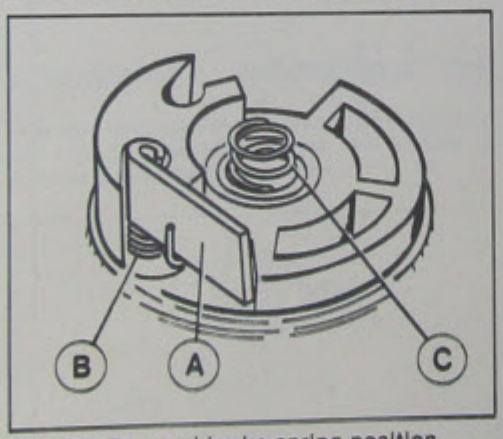


Fig. 19 Dog and brake spring position

c. OPERATIONS ON RECOIL STARTERS TYPE «C»

Starter type C can be found on earlier production AH 81 engines for outboard.
The main spring and pulley system is similar to that of the starters already dealt with. The basic difference between this starter and previous types can be seen from the exploded view Fig. 20 and is solely the method of securing the assembly to the hub.

NOTE - Parts for this starter are available in limited quantities. The starter can be replaced by a lateral type if the air shroud is also replaced.

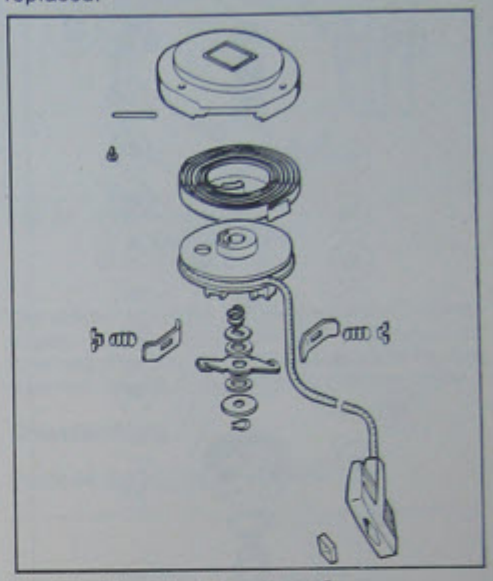


Fig. 20 Exploded view type C

For repairs to this type of starter, refer to the exploded view, and proceed as follows:

— Ascertain that the shoes are so fitted that sharp edges engage the hub.
— Should edges be worn, rotate friction shoe.
— Should slipping occur, check that mating faces of the two fibre washers are not fouled with grease.
— Direction of rotation of starter can be reversed by inverting main spring, friction shoes assembly and the reverse winding of the rope on the pulley.

3. OPERATIONS ON IMPULSE STARTERS

a. DE LUXE TYPE

For repairs to this type of starter, dismantle as follows, referring to exploded view Fig. 21. This type is no longer in production, spares are available in limited quantities, the use of rope rewind starter type B with hub screen, nut and associated washer is recommended.

To disassemble starter

— Move starting lever to start position in order to release spring tension.
— Remove starter from engine.

C D E F G

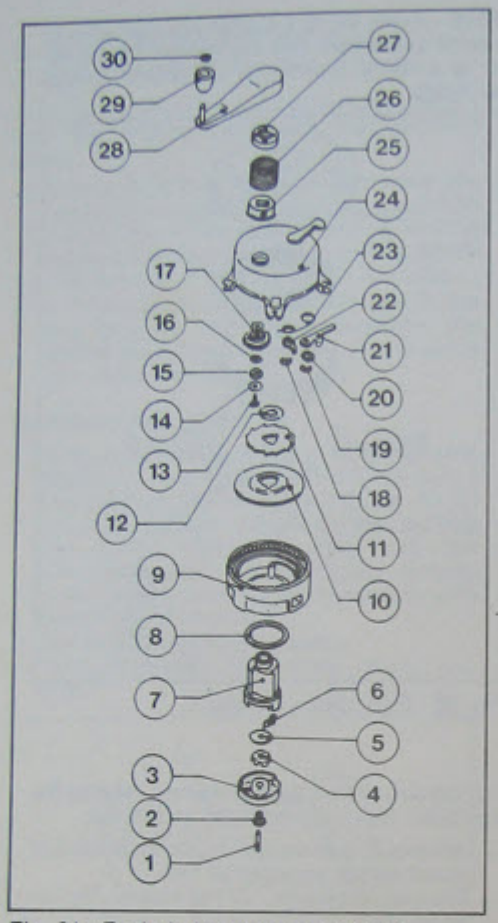


Fig. 21 Exploded view type De Luxe

— Extract centering shaft (1).
— Extract retainer hub (3) loosening clamping screw (2) (left-thread). Chack brake (4). It should firmly grip retainer hub. If brake is not securely fitted, starter dogs (6) do not separate. In case of looseness, fit a new brake.
— Remove brake washer (5) and starter dog (6).
— Remove cover assembly (24), and keeping the legs downwards, extract container assembly with spring (9) by tapping.
— Remove locking washer (12) (it should always be replaced by a new one), toothed crown (11) and spring cover (10). Check spring for fouling, clean if necessary. If broken or damaged or does not engage starter hub, it should be renewed. Spring and container are replaced only as an assembly.

— Remove screw (13), engaging washer (14), spring washer (16) and locking washer (15) from ratchet (17), and check tension of spring washer. If it is fatigued, replace.
— Check extent of wear of locking pawl (22) and ratchet teeth. Check tension of spring (23). it should hold ratchet firmly against gear.
— Remove friction spring (26) from handle (28) and ensure that there is sufficient tension. Clean and wipe dry. DO NOT LUBRICATE.

To re-assemble starter

— Accurately re-position spring into handle.
— Coat ratchet (17) with soft grease. With one hand keep lock dog (22) against return spring (23) and reposition ratchet (17). Lock dog should be kept stationary between teeth of rotating gear.
— Re-position handle, spring washer, lockwasher and screw.
— Place washer (8) on hub. Install hub (7) onto cover and spring assembly (9).
— Install cover (10) and gear (11). Fit a new retainer ring (12) to secure the assembly.
— Push cover and spring assembly in its seat. Make sure that cover teeth mesh with ratchet teeth.
— Re-assemble brake and washer on retainer hub (ascertaine that brake is fixed securely on hub). Fit starter dogs and tighten locking screw.
— Insert one end of centering pin (1) into centre of screw (2).

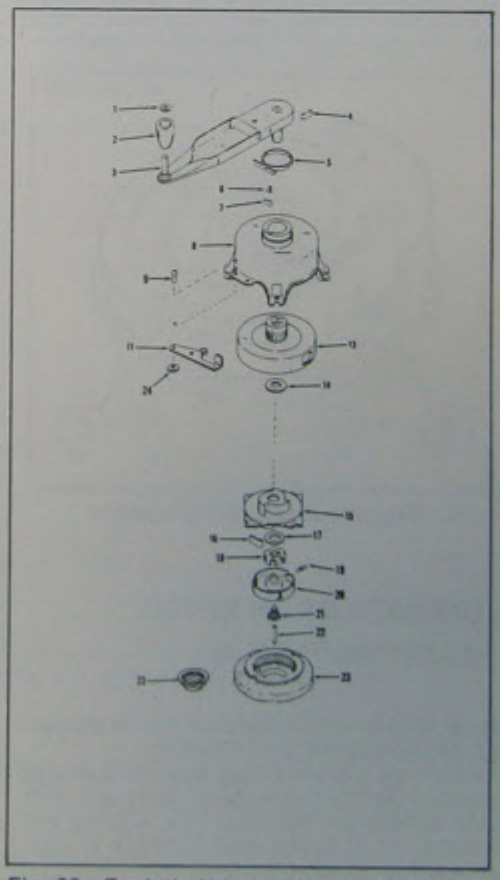


Fig. 22 Exploded view type Standard

— Re-fit starter with other end of centering pin into hole driller in the centre of crankshaft.
— Insert the four screws into the cover holes, screw the screws half way into air shroud holes and push starter completely home.
— Tighten screws.

NOTE - Centering pin must be used with these starters, in order to obtain proper alignment of hub and screen.

b. STANDARD TYPE

This type is no longer in production, spares are available in limited quantities, the use of rope rewind starter type B with hub and screen, nut and associated washer is recommend.
This starter differs from the foregoing by a number of features and is of much simpler design.
The main difference being the fact that the spring is directly wound instead of by means of the reduction gear (see Fig. 22).

4. OPERATIONS ON SIDE MOUNTED STARTERS

a. HORIZONTAL ENGAGEMENT TYPE

The side mounted starter has been developed for use on machine where the engine is mounted in a low position as in Fig. 23

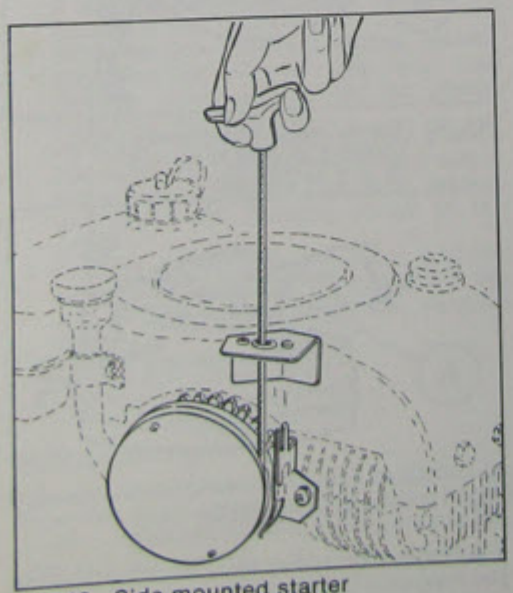


Fig. 23 Side mounted starter

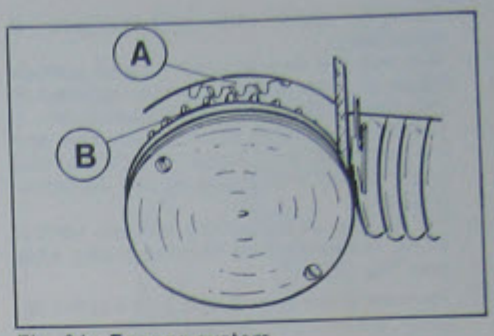


Fig. 24 Engage system
A = Flywheel gear
B = Pulley gear

The starter operates the engines by engaging a gear on the teeth on the underside of flywheel (Fig. 24). When the engine starts, the flywheel speed disengages the starter gear.

Disassembling

Remove the pulley as follows:

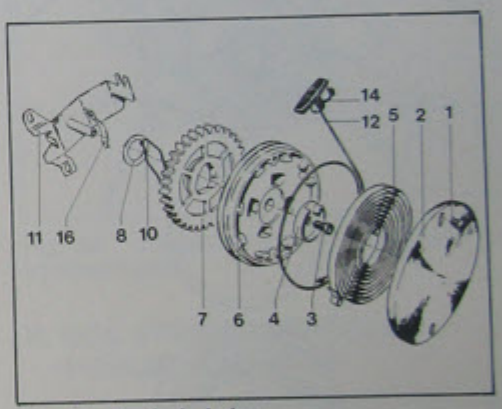


Fig. 25 Exploded view

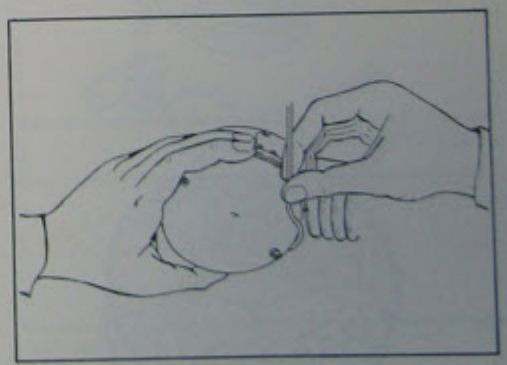


Fig. 26 Release main spring

— Release main spring (5) by separating the handle and sliding the rope (12) out of the rope clip (16) (see Fig. 26).

— Remove rope clip and replace if necessary.
— Remove the two screws (1) and springs cover (2). The spring may be replaced at this point without further disassembly.
— Remove old spring (5) and place new spring complete with keeper in position and push spring into place in the container (Fig. 27).
— For further disassembly remove central fixing screw (3) and remove pulley assy (see Fig. 28).
— 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. 29.

— Untie knot A and remove rope from handle (14) and pulley (6).
— Fit a new rope of the same dimentions and retie knot.
— Check all parts before reassembly.

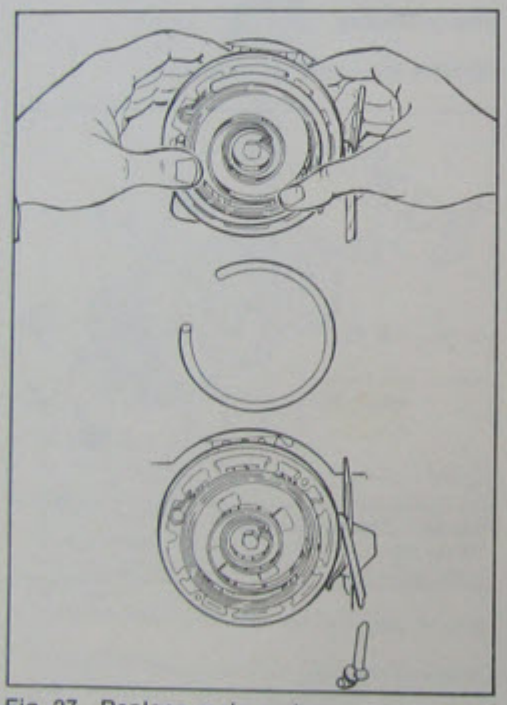


Fig. 27 Replace main spring

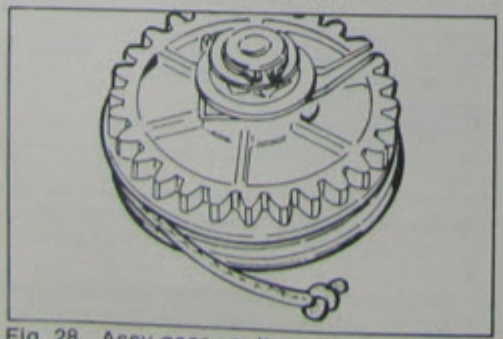


Fig. 28 Assy gear - pulley

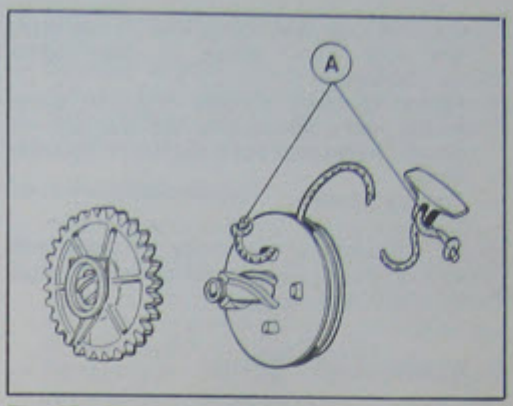


Fig. 29 Remove rope from pulley untie knot (A)

Reassembling

Refit gear (7) on pulley (6).

Wind the rope onto the pulley and fit the gear and pulley assy onto the braket pin (11).
Secure the assy with screw (3) (Fig. 30). Fit new brake spring (10) in its seat (Fig. 31) being careful to fit the side extention of the spring on its seat.
Refit the spring cover and secure with its two screws.

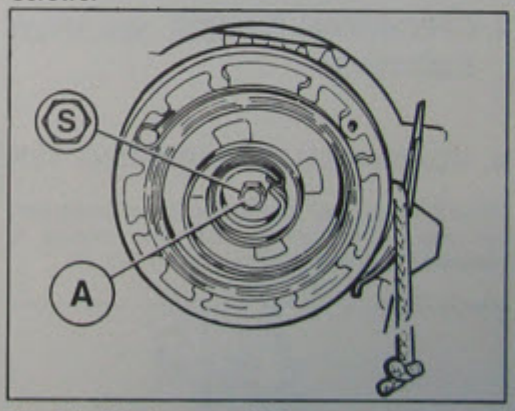


Fig. 30 Starter assy fixing screw (A)
Check L.M or R.M thread
(S = L.M thread)

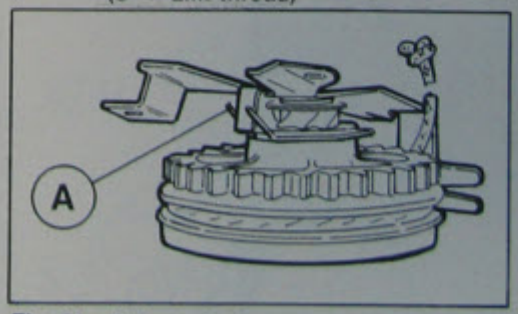


Fig. 31 Braket pin location

Pre-tension the spring by completely winding the rope onto the pulley in the direction of the arrow (see Fig. 32).

Fig. 32 Pre-tension

When the rope is fully wound give the pulley one more complete turn to obtain correct spring tension and fit the rope container (see Fig. 33).

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

Fault checking

— When rope does not recoil check:
the spring stop, 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 1/16" (see Fig. 34).
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 container is not loose and that the rope is of the correct length and diameter (5/32").

Refitting to engine

The distance between the gear teeth and the flywheel teeth must be 1/16", the clamp bracket mounting holes are elongated to provide this adjustment.

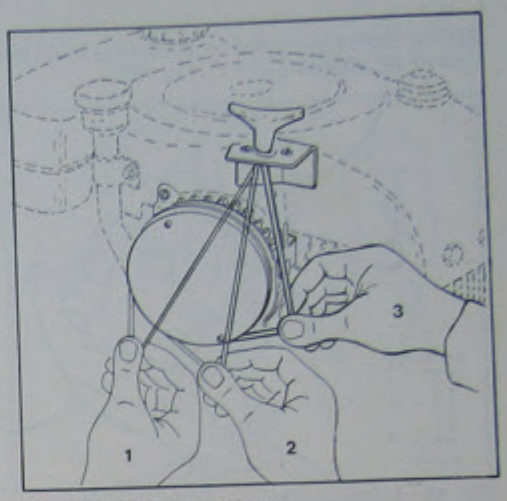


Fig. 33 Spring tension

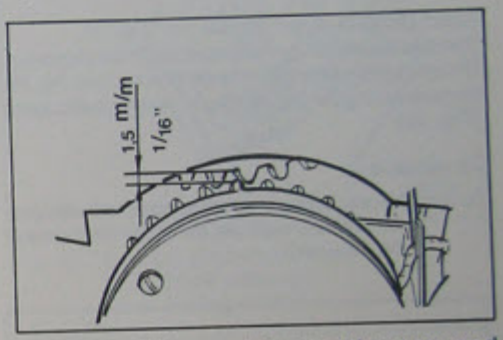


Fig. 34 Distance between the gear and flywheel teeth

B. SIDE STARTER VERTICAL ENGAGEMENT TYPE

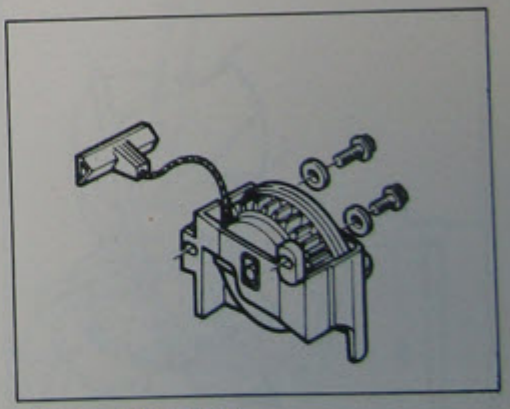


Fig. 35 Side starter

NOTE - Alternative type starter (below) may also be fitted.

Starter disassembly (detached from the engine)

Before dismantling the recoil spring must be locked by inserting pin C (Fig. 36).

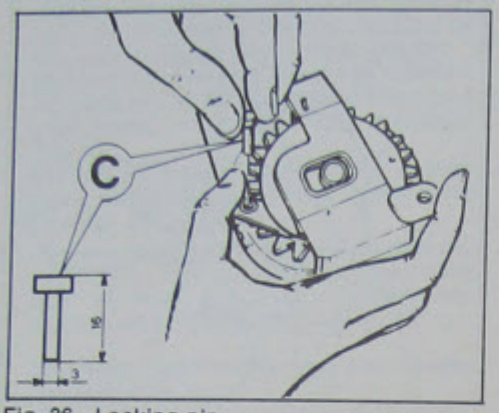


Fig. 36 Locking pin

Next remove taper pin as per Fig. 37.
Remove centre pin by means of a drift and hammer.
The spring/gear assy may now be removed (see Fig. 38).
Remove locking pin (Fig. 36 - C) and slowly release spring (Fig. 38).

To replace:

Spring: The new spring is supplied complete with container and new taper pin, the old pin should never be re-used.

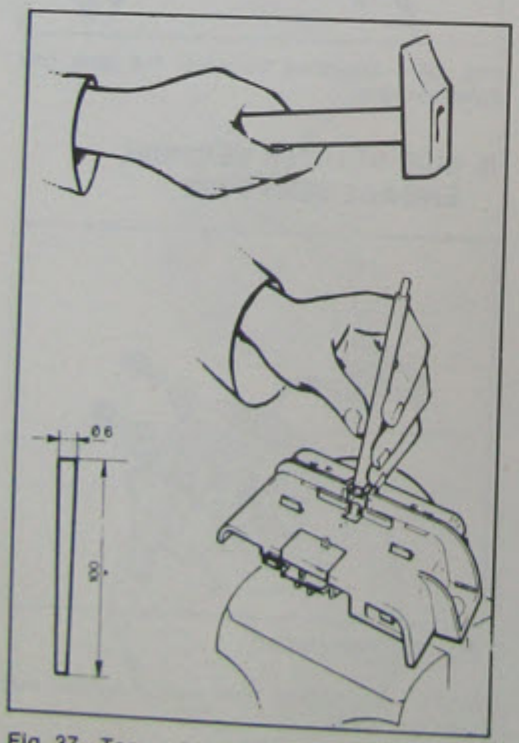


Fig. 37 Taper pin removal

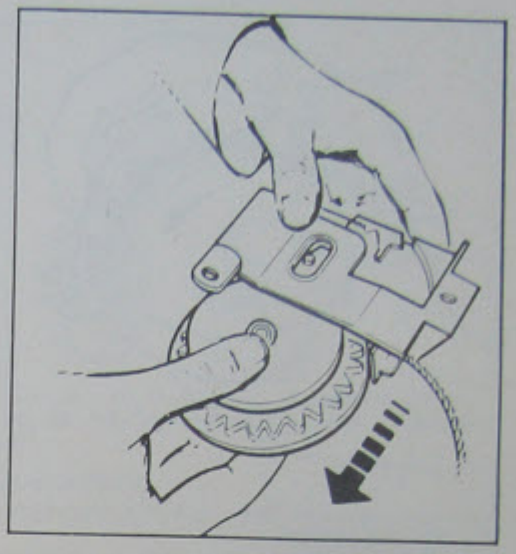


Fig. 38 Disassembly of the spring/gear

Rope-gear: To detach rope, remove clip A (not to be used again) (see fig. 39).

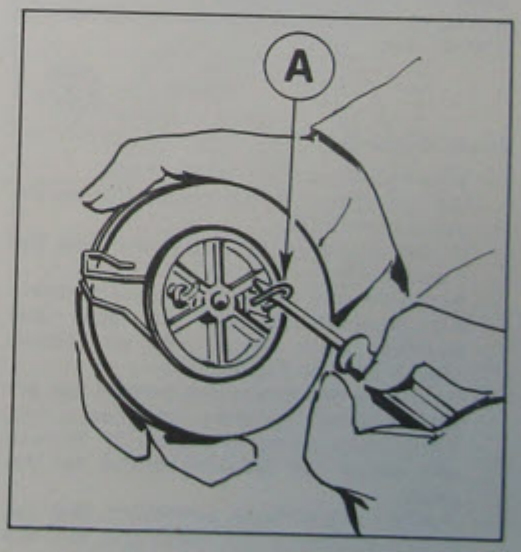


Fig. 39 Clip removal from rope

Assembly

To fit new rope, thread end through hole in gear and knot.
Rewind rope as perFig. 40.

Fig. 40 Rope assembly

Place spring on gear and preload two turns as per Fig. and lock by inserting locking pin (see Fig. 41).

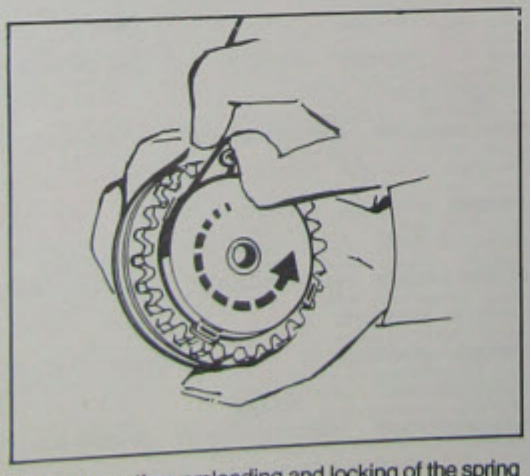


Fig. 41 Inserting, preloading and locking of the spring

The assembly can now be fitted into the body paying particular attention to position of the rope C and the brake spring M (Fig. 42).

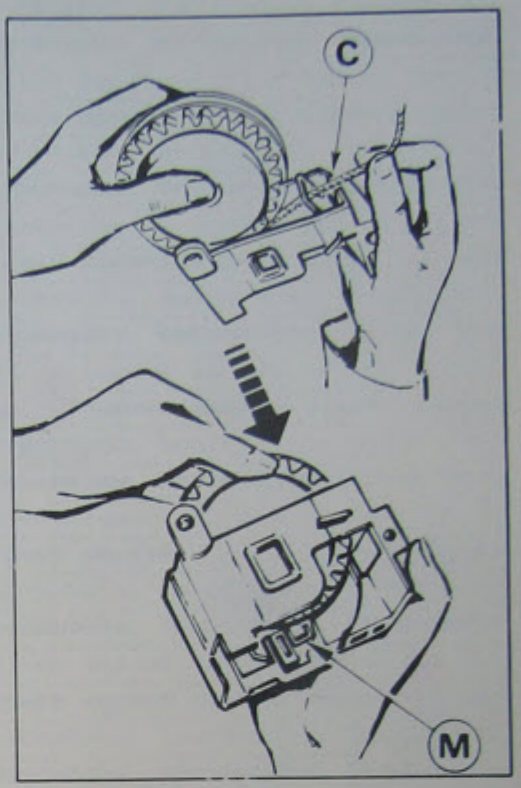


Fig. 42 Correct placement
C = Rope passage
M = Spring brake

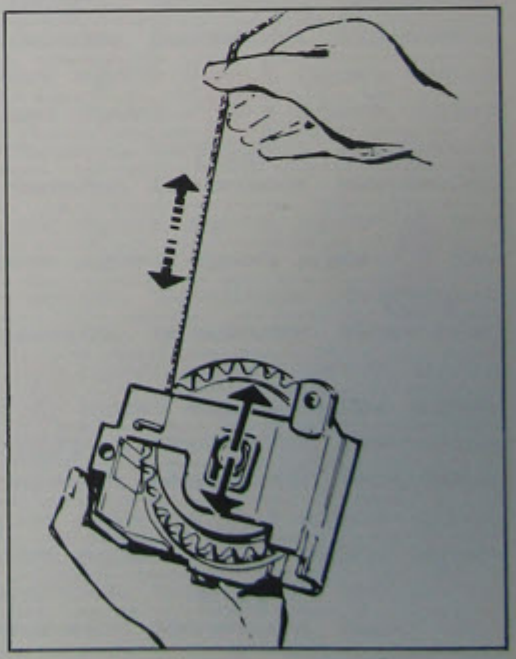
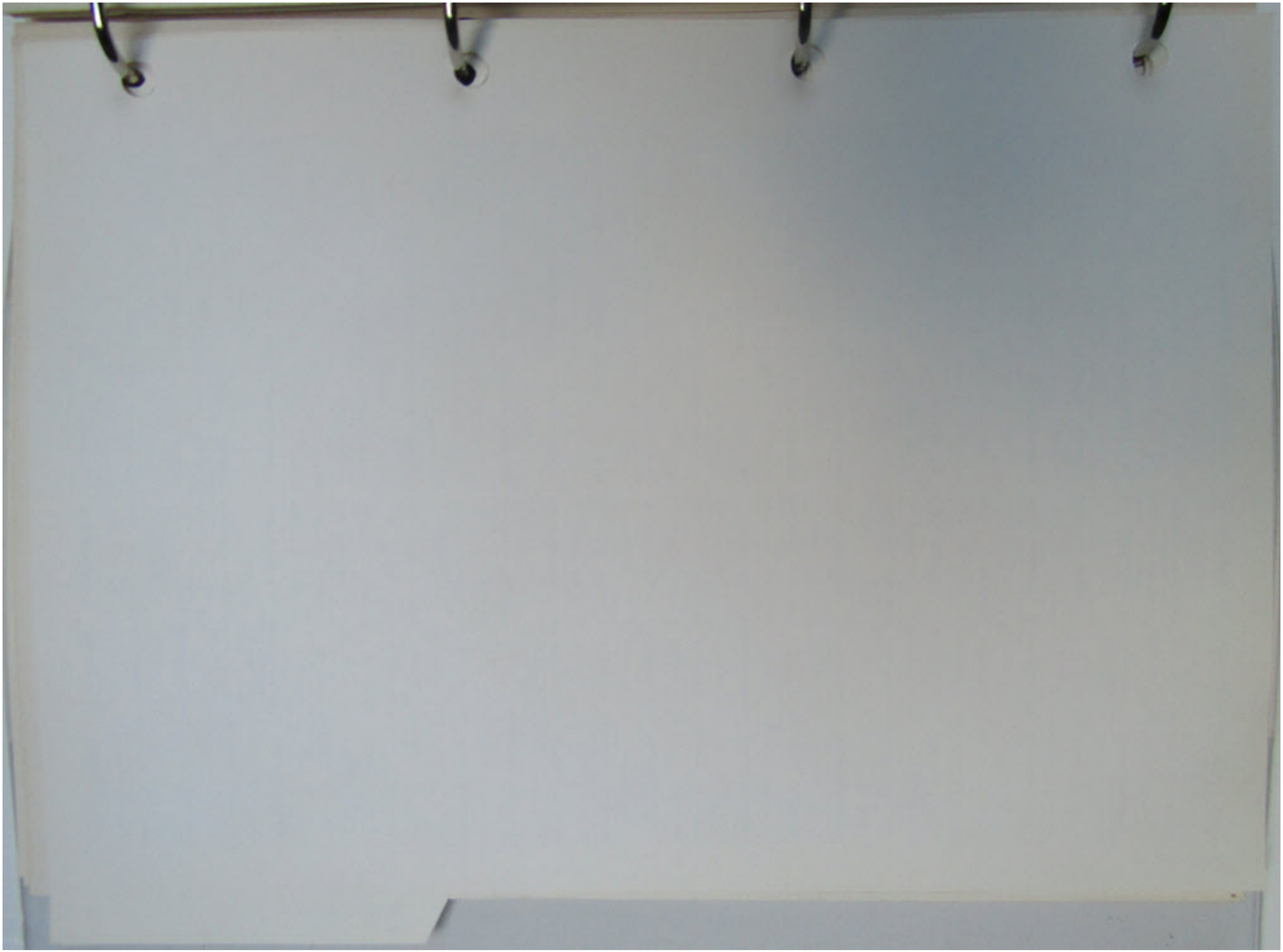


Fig. 43 Checking

Replace taper pin and remove locking pin.
Checking
The gear should now move up and down the slot when the rope is pulled and released (see Fig. 43).

C D E F G



CHAPTER «C»

IGNITION SYSTEM

D

E

F

G

CHAPTER «C»

IGNITION SYSTEM

1. GENERAL

Ignition system fitted to 2 and 4 stroke engines are of the flywheel type. Depending on the engine type or year of production the outer configuration may vary but in principal service on the different items is always the same.
Two systems are used:

— Conventional ignition system consisting of flywheel with built in magnets, ignition coil, condenser and breaker points.
— Solid state systems consisting of flywheel with built in magnets, coil and solid state assembly.

2. CONVENTIONAL FLYWHEEL MAGNETO IGNITION SYSTEM

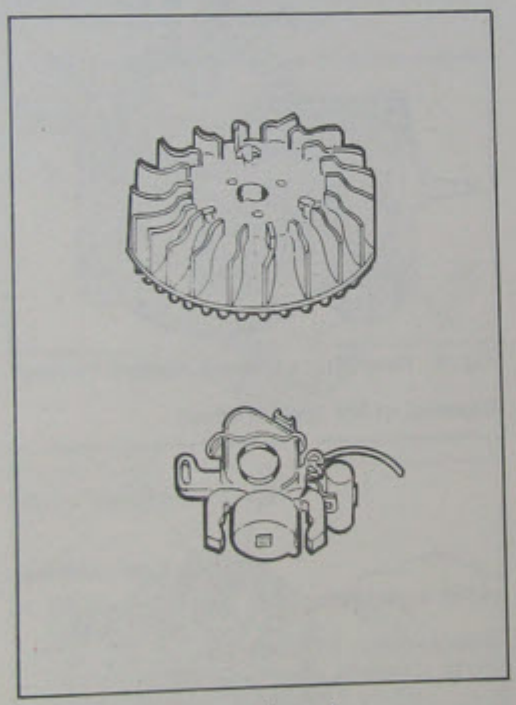


Fig. 1 Magneto assy type A

Supersedes type B on 2 and 4 stroke engines. The flywheel is of a larger diameter with teeth on the underside for side mounted starter use. The flywheel is the only difference between A and B types, the stator being unchanged.

This type was fitted on two and four stroke engines until the end of 1967 season.
The flywheel is of minor diameter without teeth on the underside.

Type A is completely on interchangeable both for the assembly and for the component parts.

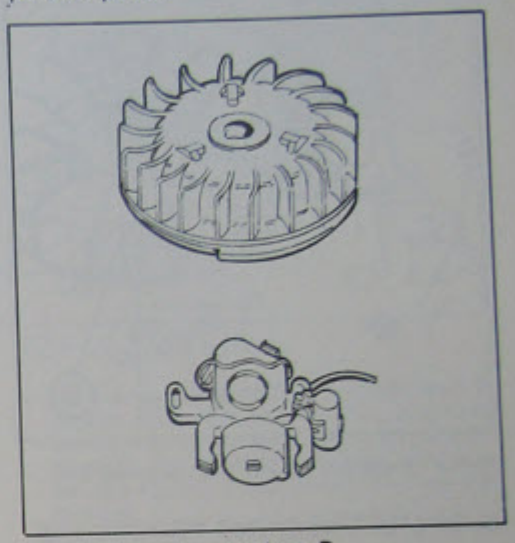


Fig. 2 Magneto assy type B

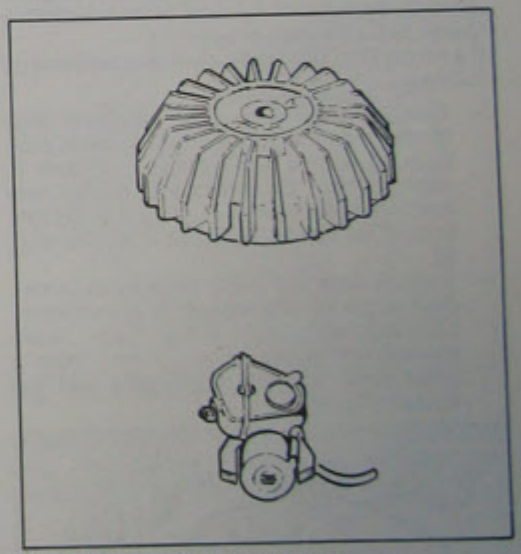


Fig. 3 Magneto assy type D

Magneto assy type D (Fig. 3) fitted to AH 81 outboard engines.

On external type coils the air gap must be adjusted to 0.38 mm. - .015"
The condensor and points assy are similar to type A.

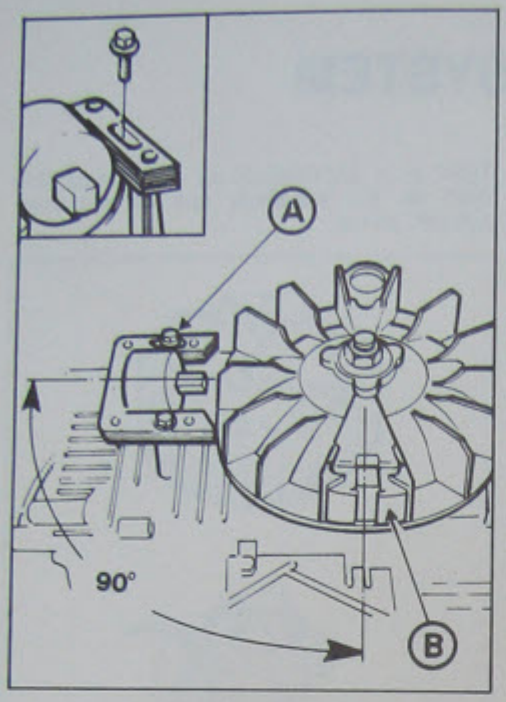


Fig. 4 Magneto type C with external coil

a. SPARK CHECKING PROCEDURE

The most efficient way to check the complete ignition system is by use of the ASPERA tester AM 0074 (see chapter E).
If a tester AM 0074 is not available proceed as follows:

— Remove spark plug and re-connect high tension lead to plug terminal, earth plug body to engine and with control lever in start position, pull sharply on starter rope and observe spark, at plug points this should be strong and blue in colour (Fig. 5).
— If spark does not jump or is weak or reddish in colour, disconnect plug and insert screwdriver into plug cap, hold screwdriver blade about 3 mm from a good earth on the engine and pull the starter (Fig. 8).

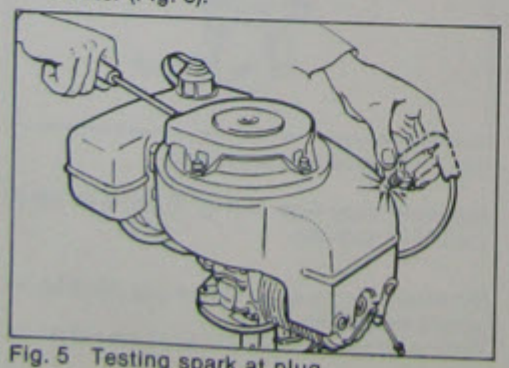


Fig. 5 Testing spark at plug

— If spark is good, clean or replace plug.
— If no spark occurs remove plug cap and repeat. Check on H.T. lead, if spark occurs, replace plug cap.
— If no spark, remove earthing wire from stop control terminal (Fig. 9).
Repeat test.
— If spark occurs check stop control and earth wire.
Replace as necessary. If still no spark it is necessary to remove flywheel.

Removal of flywheel standard method

— Remove air shroud complete with starter.
— Remove flywheel nut and starter hub completely using special tool T (TT for 1/2" diameter), screw on and back off one turn, and supporting the flywheel underneath strike puller a sharp blow with hammer.
— Check flywheel key.

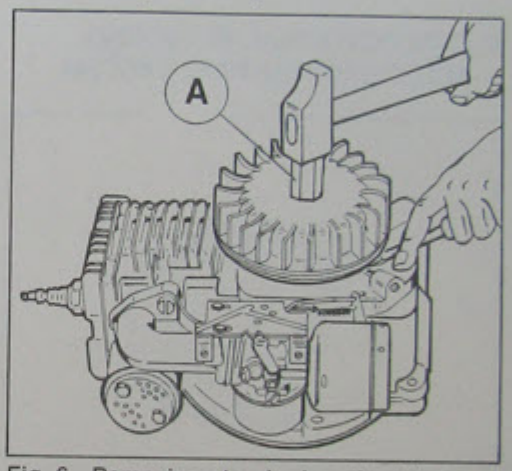


Fig. 6 Removing standard method flywheel

Removal of MV type flywheel

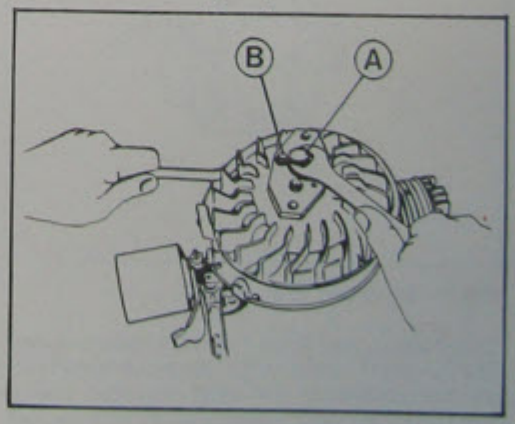


Fig. 7 MV engines using special tool K/1

See also chapter F.

The standard method of flywheel removal used on other engines can damage the balls and bearing tracks (Fig. 7).

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 as per Fig. 7 locating the screw "A" onto 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 and the 11/16 wrench the centre bolt can now be tightened (A). In this way the flywheel can be removed (see Fig. 7). For reassembling the flywheel, proceed as usual.

NOTE - Subsequent removal.
In this case the flywheel holes are already threaded. It is now necessary to screw the self-threading screws to at least one thread more than those already tapped.

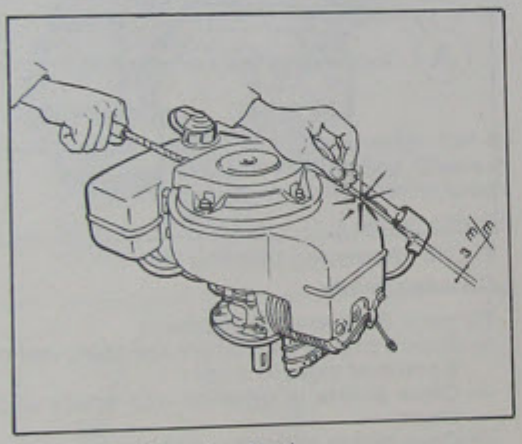


Fig. 8 Testing plug lead

Checking internal parts

— Remove breaker box cover and make visual check.
— Points gap - see table, if adjustment is necessary loosen screw securing static point and re-set with 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).

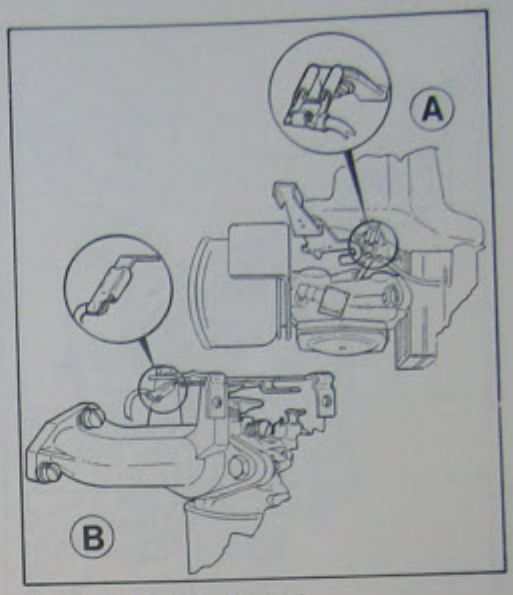


Fig. 9 Stop wire terminal

— Reassemble and carry out spark test. If engine does not properly run, the condenser may be suspect; this is usually indicated by burning of the contacts (always replace a condenser if points are burned).

b. STATOR ASSY SERVICING

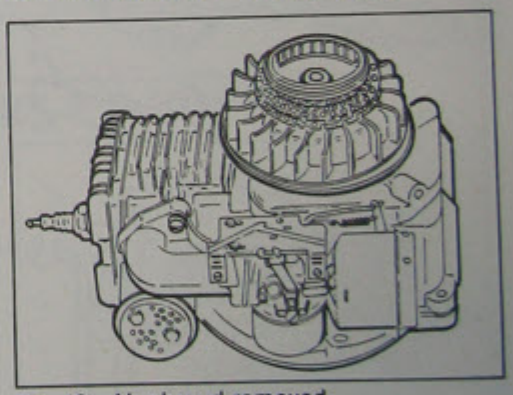


Fig. 10 Air shroud removed

Remove flywheel with the aid of special tool (Fig. 12). Check crankshaft and flywheel tapers for cracks or distortion.

Replace any damaged parts. Remove dust cover retaining spring, dust cover and gasket. Check all wires connections and insulation.

To replace breaker points

— Remove nut securing leads to breaker points A (Fig. 14). Remove breaker by lifting out and simultaniously easing insulator block A from box (Fig. 15).

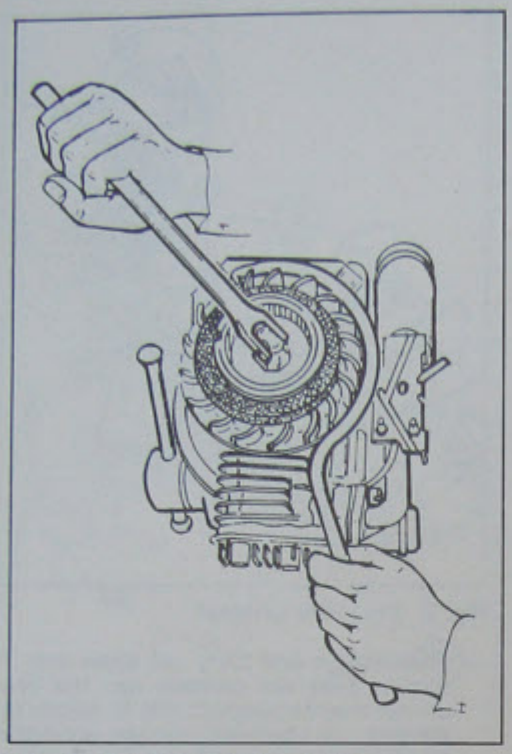


Fig. 11 Removing flywheel nut

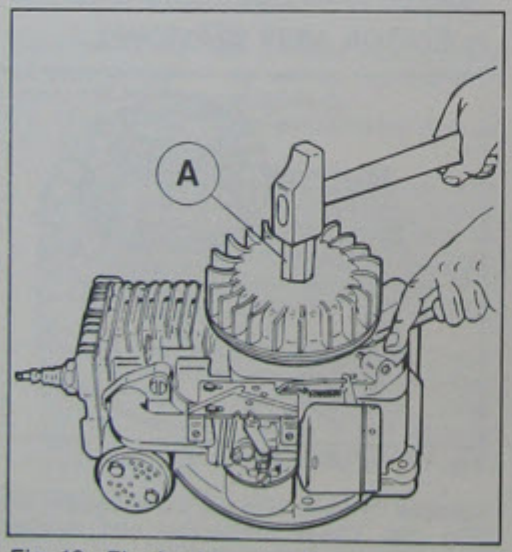


Fig. 12 Flywheel knock off tool

— Detach static point by removing securing screw A (Fig. 16).
— 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

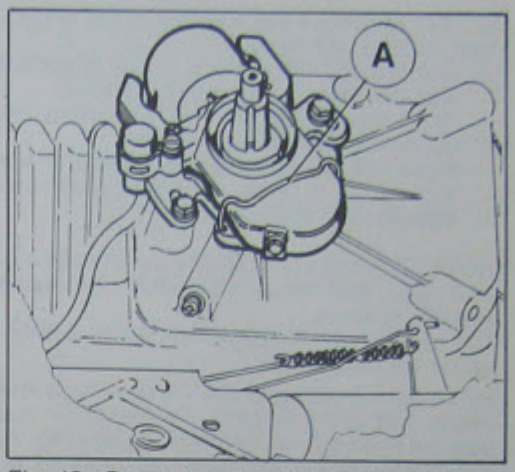


Fig. 13 Dust cover retaining spring "A"

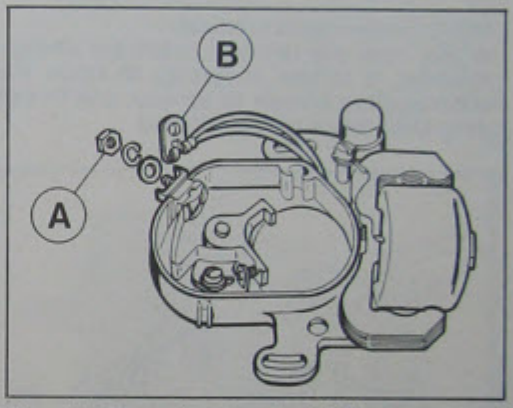


Fig. 14 Removing terminal "B"

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. 17).

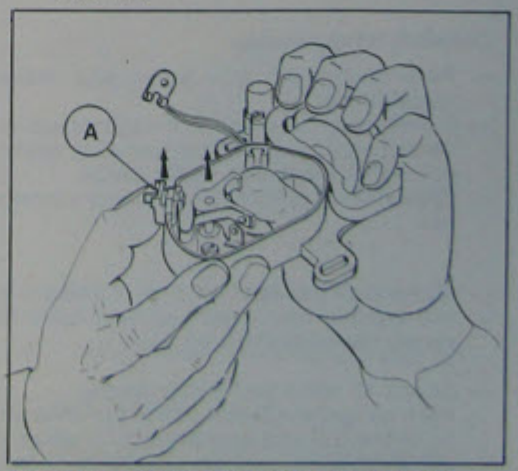


Fig. 15 Removing points and insulator

To adjust points

— Adjust point gap to 0.45 ÷ 0.50 mm (.020") as follows (see Breaker point setting table).
— Turn engine to bring cam heel to widest opening point.

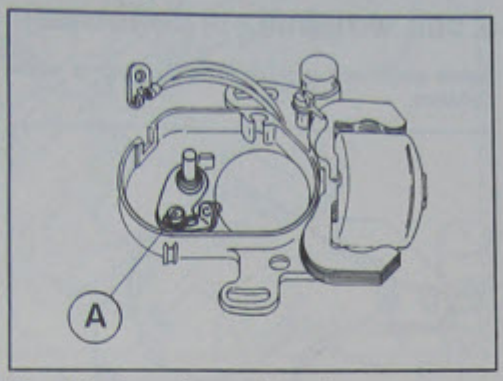


Fig. 16 Removing static point

— Insert feeler gauge with the aid of a screwdriver fitted in slot A (see Fig. 18). 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.

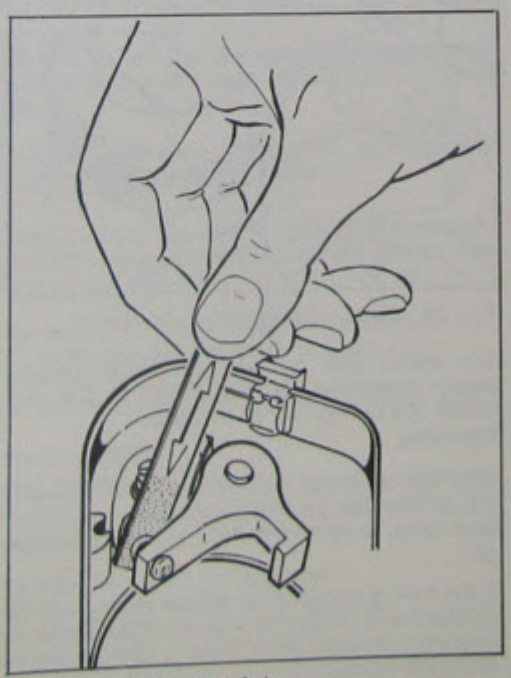


Fig. 17 Cleaning points

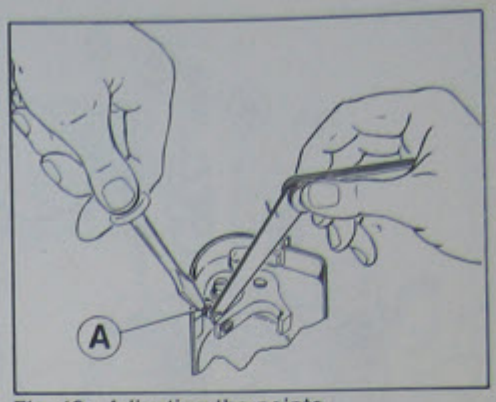


Fig. 18 Adjusting the points

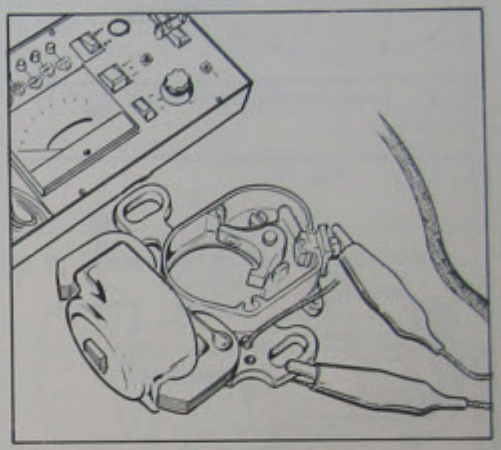


Fig. 19 Testing coil insulation

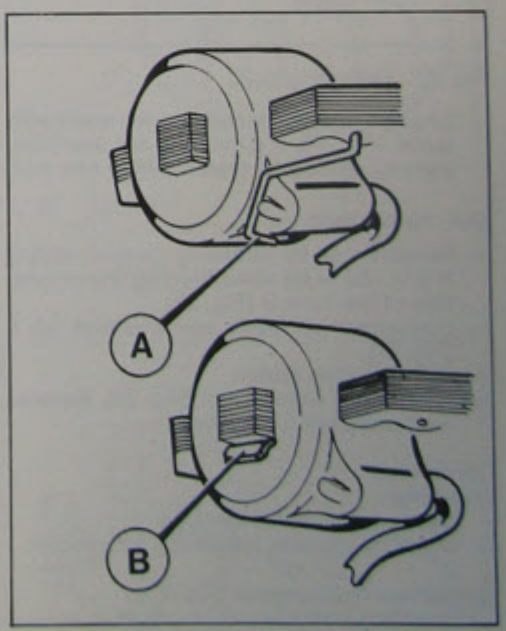


Fig. 20 Coil retaining methods

D
E
F
G

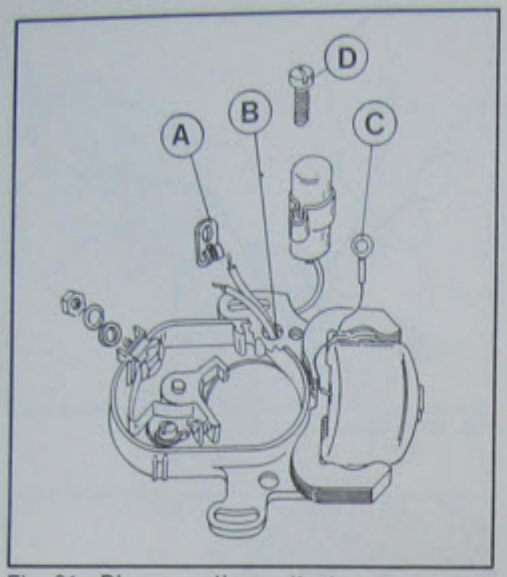


Fig. 21 Disconnecting coil wires

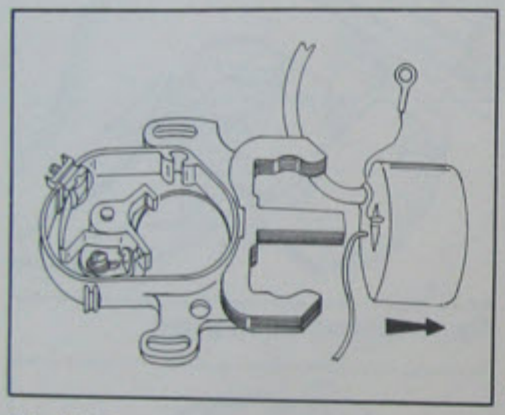


Fig. 22 Removing coil

— Check coil outer insulation for leaks with tester (Fig. 19). if a tester is not available, the engine may be tested with a new coil.

Coil replacement

— Remove coil by releasing retainer spring A (Fig. 20) or by streightening the lamination of the core B (Fig. 20).
— Disconnect all leads and unsolder tab A (Fig. 21).
— Pull coil from stator.
— Completely detach coil (Fig. 22). Reverse the procedure for refitting.

Condenser
Checking:
— Check for external damage
— check condenser efficiency with tester.

Condenser replacement (Fig. 21)
— Unsolder wire from connection A.
— Remove wire from hole B.
— Remove condenser securing screw.
— Reverse procedure for refitting.

NOTE - During soldering operations remove tab from screw in order to prevent damage to insulator A (Fig. 21).

c. COIL WITH BUILT-IN CONDENSER

Some coils are produced with built-in condensers.

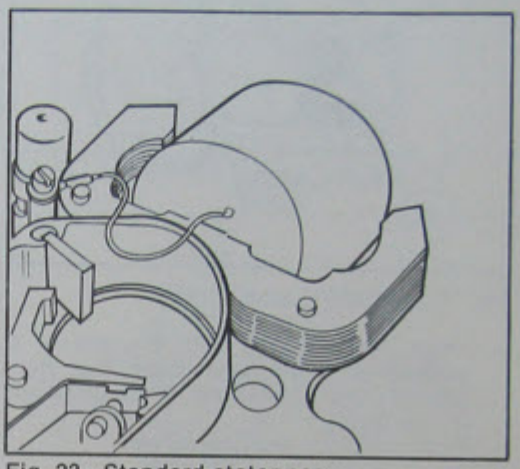


Fig. 23 Standard stator assy

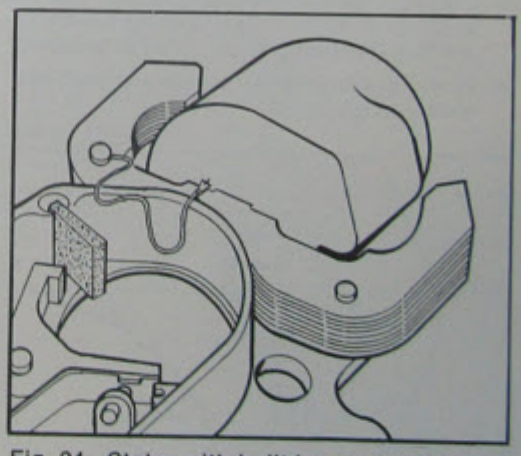


Fig. 24 Stator with built-in condenser

The stator with built-in condenser can be easily recognized by the bulge in the coil where the condenser is housed.

Checking

With the ASPERA AM tester both coil and condenser can be checked easily.
With other testers only the coil can be checked.

If the coil is serviceable on the tester but the condenser is defective proved by the tester or indicated by burned or blue or grey points a separate condenser may be fitted.

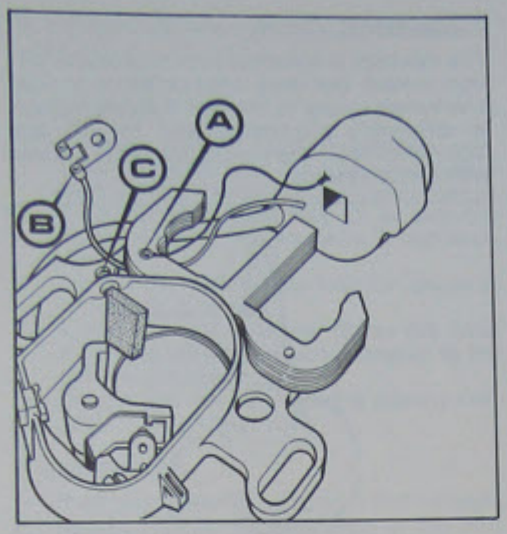


Fig. 25 Replacing coil
A = Primary earthing wire
B = Primary wire terminal
C = Separate condenser fixing hole

Coil replacement

The replacement of the coil is similar to the replacement of the standard coil. If a coil with built-in condenser is not available a standard coil and a separate condenser may be fitted.

d. EXTERNAL COIL IGNITION SYSTEM

On BV engines an external coil ignition system is fitted.
On this model the coil assembly is mounted on two pillars (M) cast on the cylinder (Fig. 26).

NOTE - attention should be paid to the routing of wires and H.T. lead.

A redesigned flywheel is fitted to this system with the magnetic mass located on the outside of the flywheel (Fig. 27).

The technical advantages of this system are:
— More consistent spark at low r.p.m.
— 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 previous engines (gap 0.5 mm).

Lamination/flywheel air gaps

To set air gap, proceed as follows:
— Set coil at maximum gap.
Position flywheel magnets B as per Fig. 26.

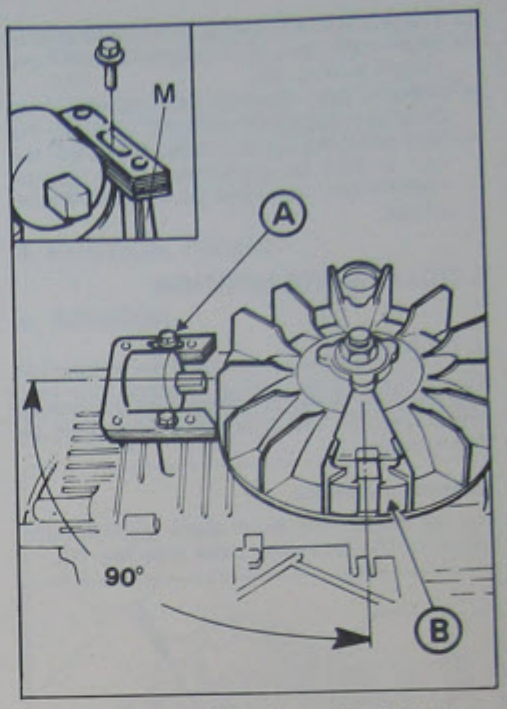


Fig. 26 First position for coil assembly

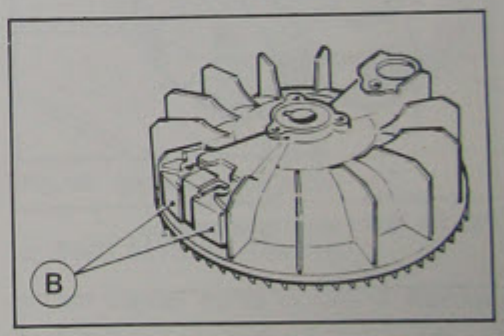


Fig 27 Flywheel
B = Magnetic mass

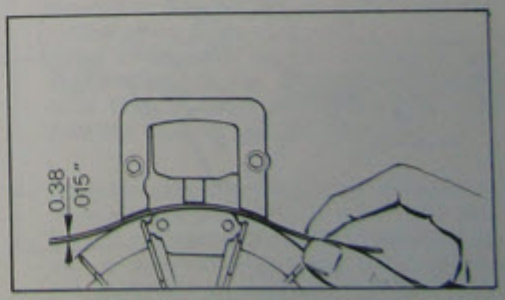


Fig. 28 Air gap adjustment

— Place a 0.38 mm gauge or metal strip of at least 100 mm in lenght across the magnets. (Fig. 28)
— Rotate the flywheel to position the magnets opposite the coil, slacken the coil securing bolts, following wich the coil should be attracted to the gauge; tighten the securing bolts and remove gauge.

3. SOLID STATE IGNITION

a. GENERAL

The solid state system embodies no moving parts. Ignition timing is none adjustable on this system.

Magneto assembly

Fig. 29 shows the solid state ignition comprised of the following parts (see Fig. 30).

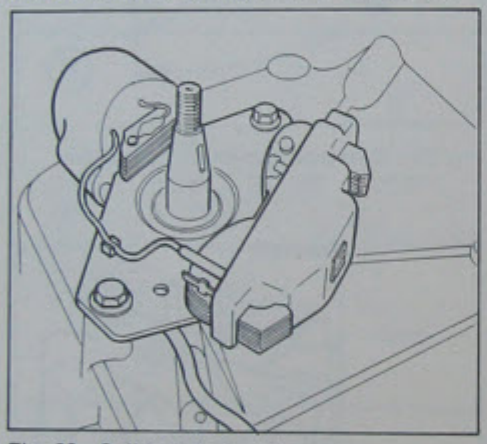


Fig. 29 Solid state ignition assy

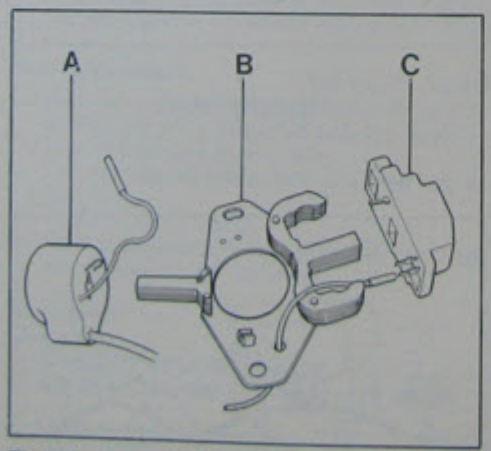


Fig. 30 A = H.T. Coil
B = Core lamination plates
C = Solid state assembly

Crankshaft

The flywheel is identical to the standard ignition system but does necessitate a special crankshaft owing to the fact that the keyway is differently positioned (see Fig. 31 and 32)(crankshafts may have 2 key ways for use with either system).

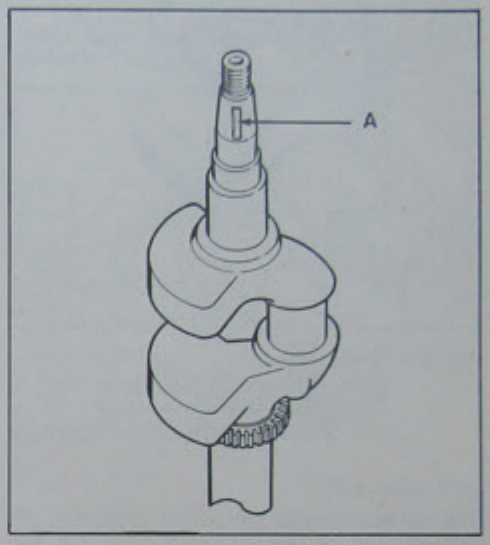


Fig. 31 A = Solid state cranshaft keyway

The solid state ignition crankshaft is recognizable by the fact that the keyway is of the woodruff type (flywheel side).

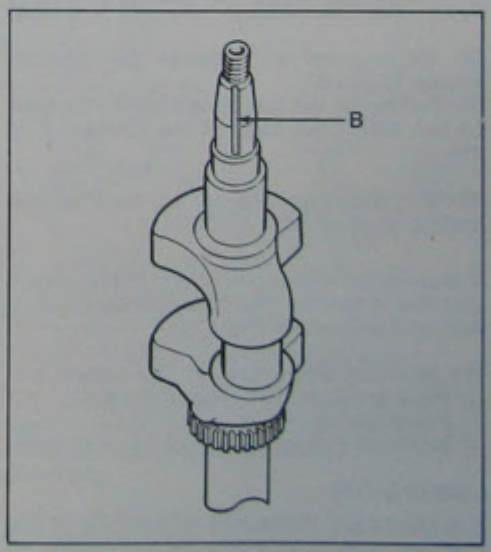


Fig. 32 B = Standard ignition crankshaft keyway

With the ASPERA tester AM 0074 all components of the solid state ignition can be checked within minutes. If tester AM 0074 is not available proceed as follows:

b. OPERATIONS ON SOLID STATE IGNITION

Visual check

Terminal No. 4 is the earth connection.
- Visually check that the low tension (red lead) is not earthed (1) and is connected to the solid state assembly (C) at terminal (5). Also check that the wire is not shorting.
- Inspect the high tension lead for cracks or indication of arcing.
- Check that the terminal (3) on the solid state assembly is securly soldered to the core laminations.
- Ensure that the earth lead is securly connected to terminal (4).

Coil inspection

- If all connections are correct and no spark occurs, check the efficiency of the H.T. coil by means of a coil tester, this test must be carried out with the coil mounted on the core laminations.
  If tester is not available, the engine should be tested using a new coil.
- Using a tester, check the coil outer insulation for leaks.
- Replace the coil if found defective.
  If the coil is not defective replace the solid state assy (C).

Coil replacement
- Streighten the lower lamination of the core.
- Disconnect the earthing wire from the primary winding terminal of the coil and pull coil from the lamination core.
- Reverse the procedure for refitting.

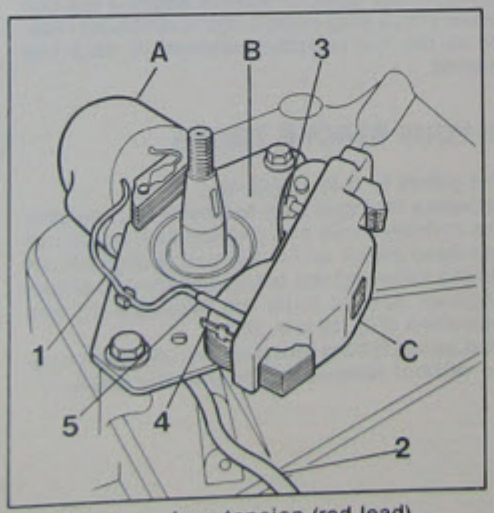


Fig. 33 1 = Low tension (red lead)
2 = High tension lead
3 = Terminal
4 = Earth terminal
5 = Terminal of low tension connection

Replacement of the solid state assembly
- Strengthen the lower lamination of the core.
- Unsolder the earth terminal (3) (see Fig. 33) from the lamination core.
  Pull solid state assy (C) from the lamination core.
- Reverse the procedure for refitting.

4. IGNITION TIMING

a. GENERAL

All engine are correctly timed before delivery and the timing marked as in Fig. 34. On engines with outside coil and solid state ignition timing is fixed.

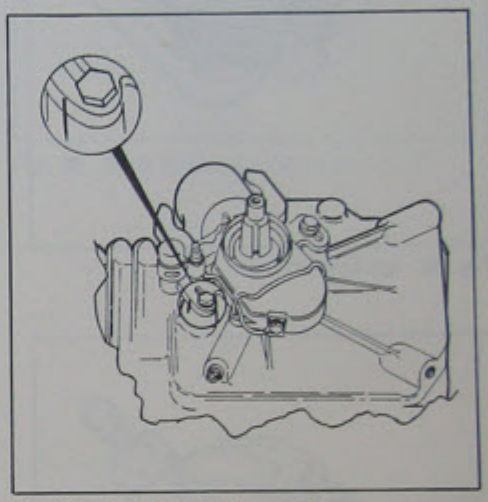


Fig. 34 Ignition timing marks

b. TWO STROKE TIMING

- Set breaker points to 0.45 ÷ 0.50 mm (.20").
- Remove plug, insert a narrow rule on to piston top, place a streight edge across top of cylinder (Fig. 35) (a special tool is available for this operation. See Fig. 36).
- Turn crankshaft in direction of rotation and bring piston to top dead centre (indicated by position of rule against edge or indicated on scale of special tool.
- Refer to table for correct amount of advance. Turn l engine in reverse direction until this is obtained, denoted by rule position against streight edge.

- 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.

D E F G

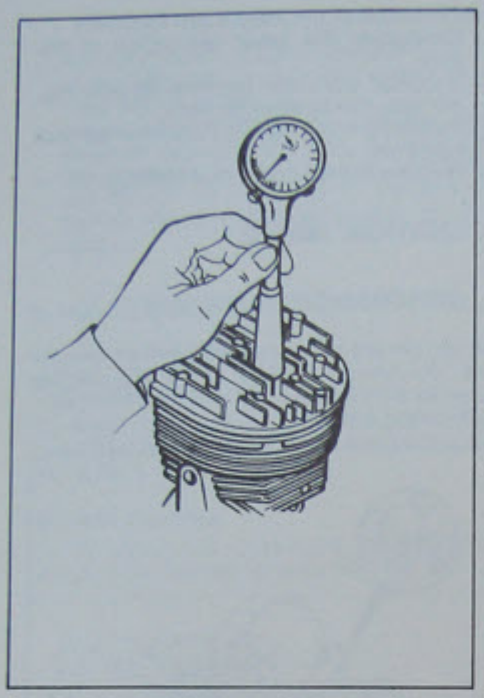


Fig. 35 Ignition timing

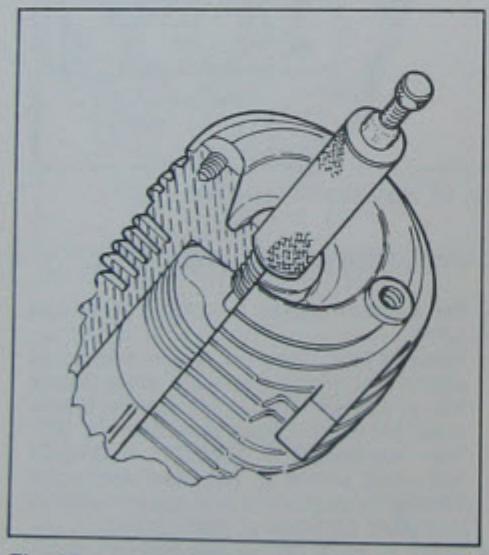


Fig. 36 Ignition timing special tool

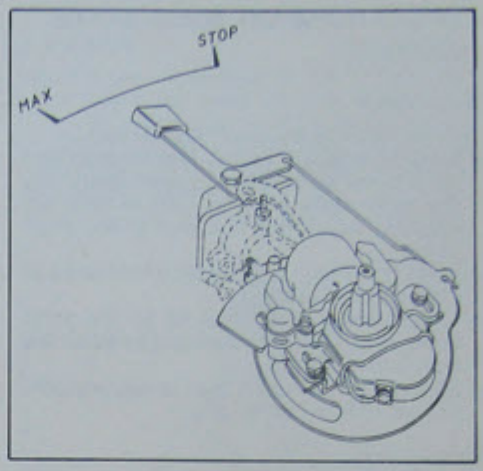


Fig. 37 Marined engine ignition control

c. OUTBOARD ENGINES

Engines for this application are fitted with a control to vary the ignition timing in relation to the engine speed.
The stator is mounted on a movable plate controlled by a hand lever, and is also connected to the throttle control, thus regulating the timing in relation to the amount of throttle opening (Fig. 37).
The max ignition timing should not exceed thatgiven in the table and is checked with the lever in the max position.

NOTE - later types of marine engines are not fitted with a stop switch, the lever being moved to the full retarded position to stop the engine.

d. FOUR STROKE TIMING

Set points to 0.45 - 0.50 mm.
Accurate timing is best achieved by removing the cylinder head and gasket, turn engine to top dead centre and using gauge (Fig. 39) set timing following the procedure for two stroke engines; special tools are available for this operation (Fig. 38 and 39).
Dial gauge timing tool (see Fig. 38) may be used without removal of the cylinder head.

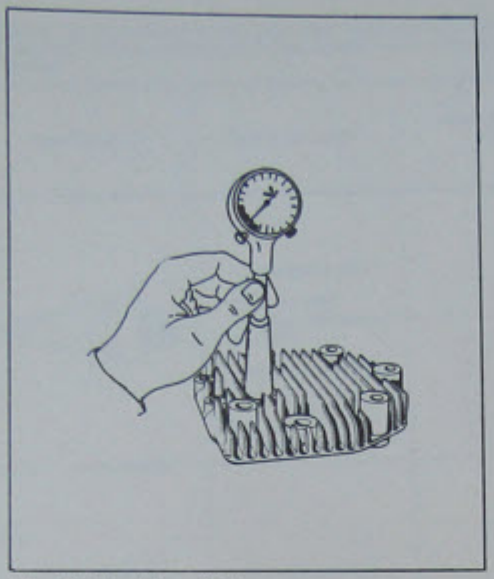


Fig. 38 Ignition timing

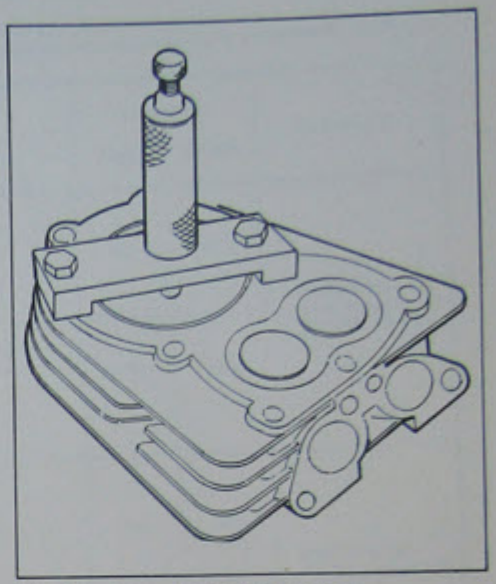
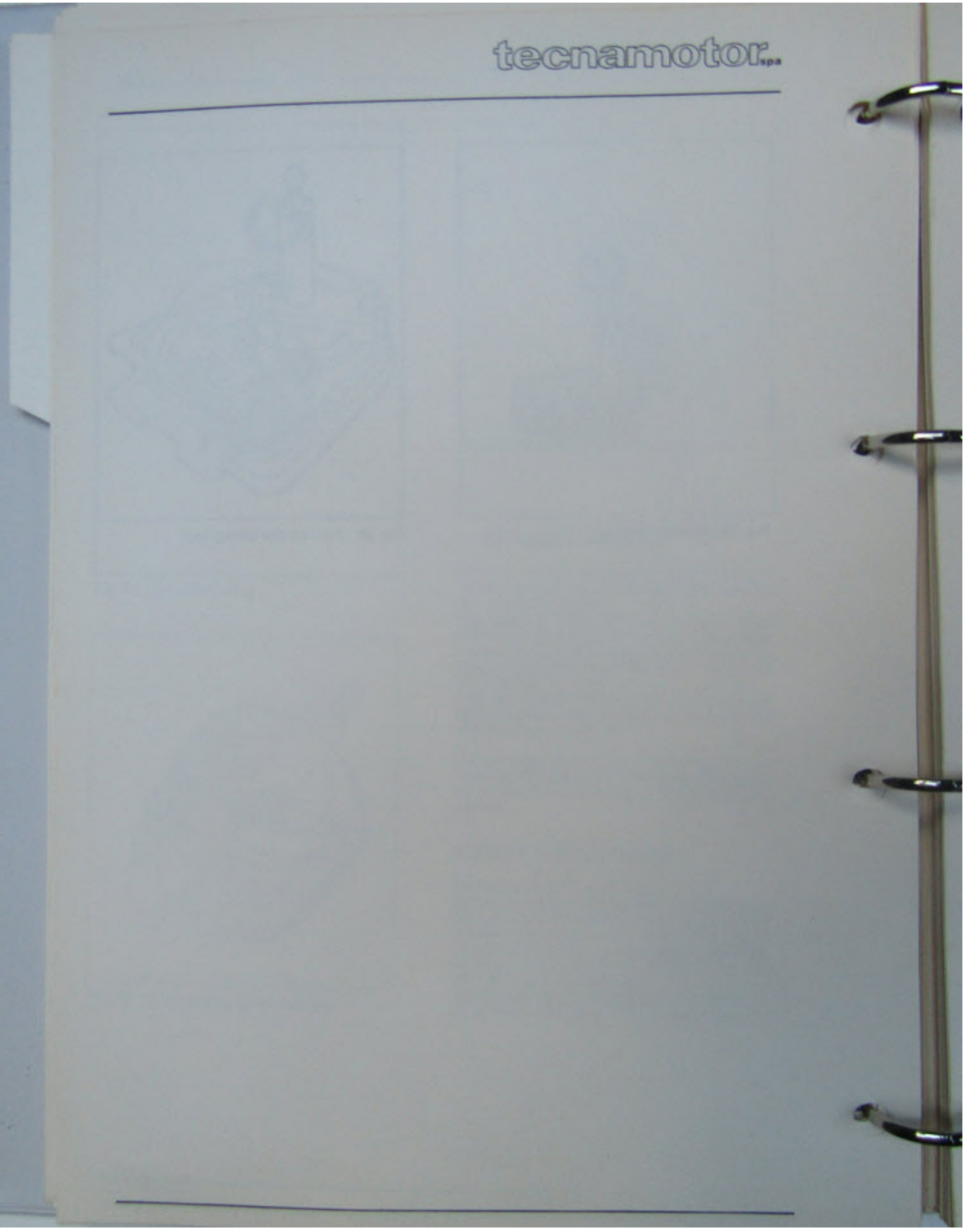
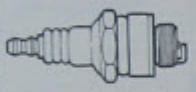
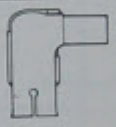
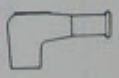


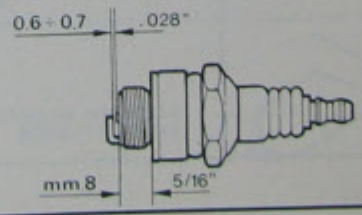
Fig. 39 Four stroke timing tool


tecnamotor spa

SPARK PLUGS AND SPARK PLUGS CAPS

The following table shows all the spark plug types which can be fitted on the engine in production.
It shows also all the spark plug cap types which can be fitted and the coupling consequences as far as the radio noises are concerned.

Spark plug	Spark plug type	Spark plug cap type	Screening		Engine type
			Cap	System	
	CHAMPION J8J BOSCH W9E (old denomination: W125T3 MARELLI CW4CJ		NO	NO	Valid for all engines except: AV 750 - AV 125
			YES	YES	
	CHAMPION J6J MARELLI CW6CJ		NO	NO	Valid only for AV 750 and AV 125 engines
			YES	YES	
	CHAMPION RJ-17LM BOSCH WR9E0 (R - Resistorized)		NO	YES	Valid for all engines
	MARELLI DW4CJ CHAMPION J17LM BOSCH W9EO		NO	NO	Valid for all engines
			YES	YES	



RADIO NOISE SUPPRESSION ON ASPERA ENGINES

To avoid interference with radio and TV reception there are 2 possibilities:

1. Resistorized spark plug and rubber cap.
2. Standard spark plug with suppressed cap or screened and suppressed cap.

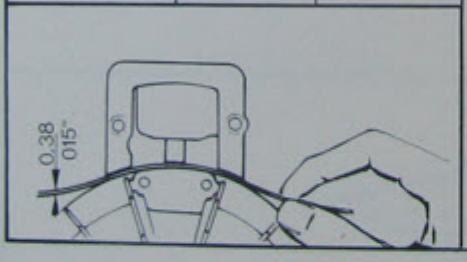
Solution No. 1 is standard for Aspera BV engines and becoming more and more popular on the full range.
Resistorized spark plug is identified by an R in the specification code (i.e. - CHAMPION RJ17LM or BOSCH WR9EO or MARELLI DW4CJR). Never use a resistorized spark plug and suppressed cap together on the same ignition system.
A double resistance on the same H.T. line will cause a weak spark.

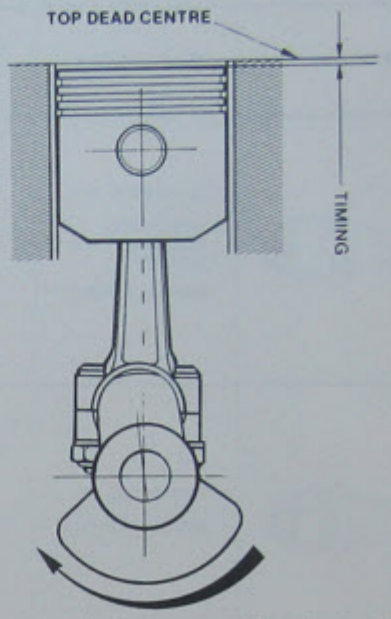
D E F G

tecnamotor spa

4 STROKE IGNITION SYSTEM TABLE OF SPECIFICATION

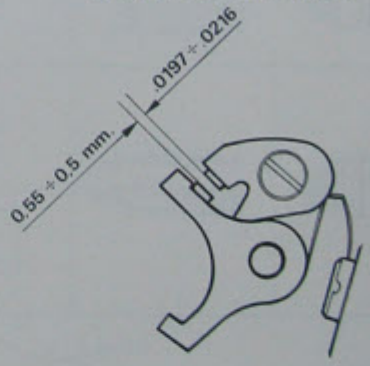
ENGINE MODELS	TIMING DIMENSION T.D.C. mm	T.D.C. Inch
LAV - LAVR 30 - 35	1,070 - 1,770	3/64 - 1/16
LAV - LAVR 40 - 172	0,635 - 1,143	1/32 - 3/64
H 22 - 25 - 30	1,070 - 1,770	3/64 - 1/16
H 35	0,755 - 1,003	1/32 - 3/64
HS - HSB 40	0,635 - 1,143	1/32 - 3/64
HS - HBL 30	1,070 - 1,770	3/64 - 1/16
HS - HBL 35	0,755 - 1,003	1/32 - 3/64
HBL - HBP 40	0,635 - 1,143	1/32 - 3/64
BV 150 BVR 150	Fixed 0,635 - 1,143	Fixed 1/32 - 3/64
BV 172 BVR 172	Fixed 0,635 - 1,143	Fixed 1/32 - 3/64





Rotate engine clockwise when viewed from flywheel side

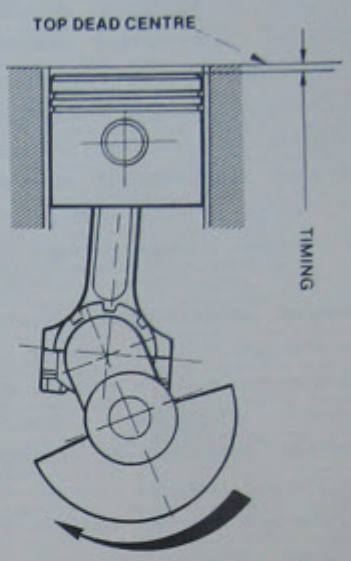
BREAKER POINT GAP SETTING



NO TIMING ADJUSTMENT ON EXTERNAL LAMINATION IGNITION SYSTEM

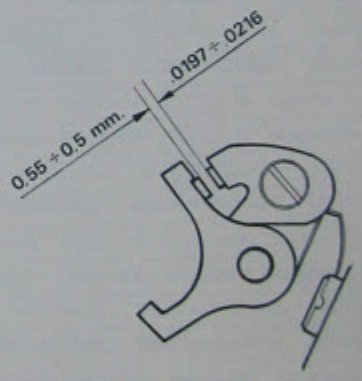
2 STROKE IGNITION SYSTEM TABLE OF SPECIFICATION

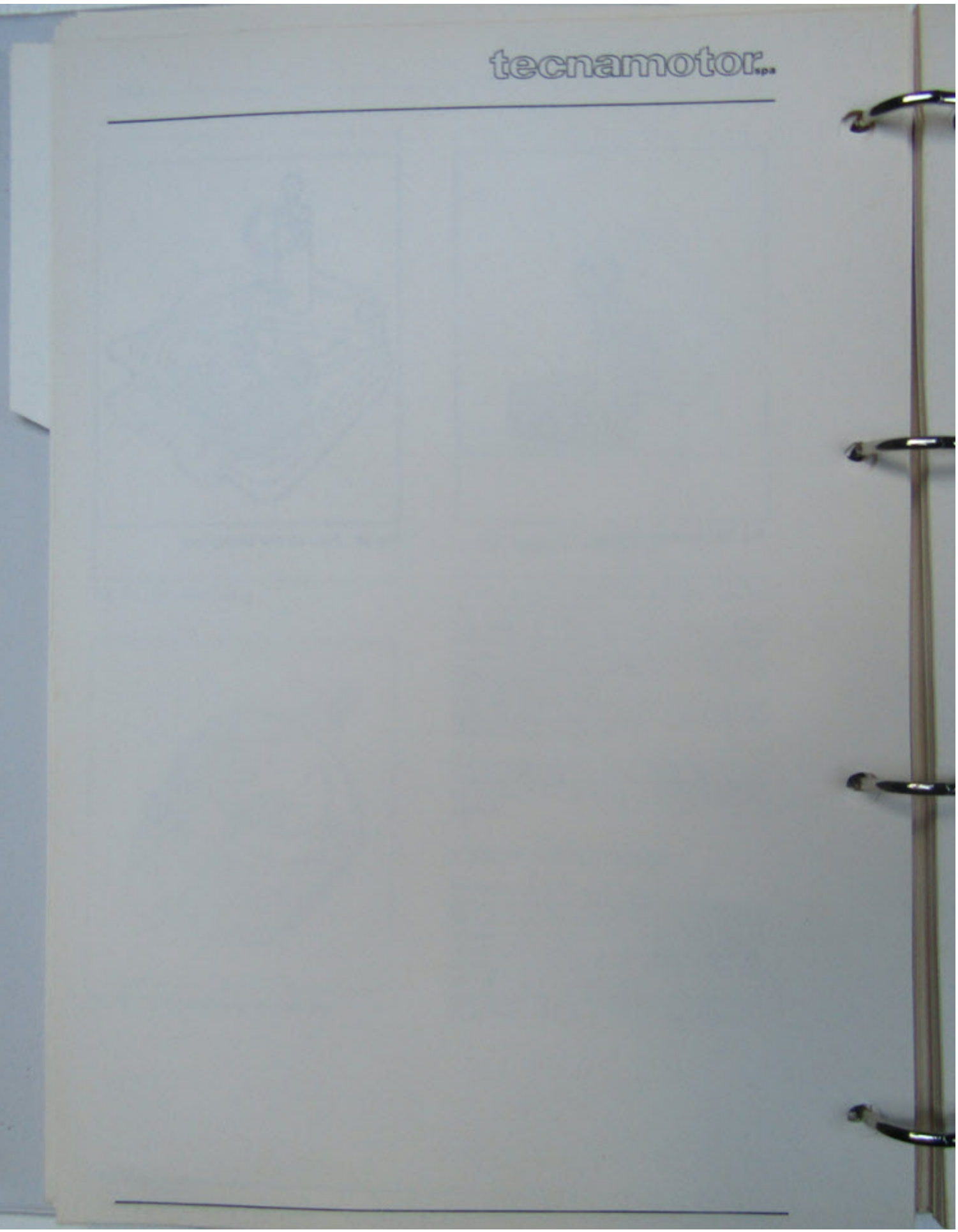
ENGINE MODELS	TIMING DIMENSION T.D.C. mm	T.D.C. Inch
TA	3,09 - 3,75	1/8 - 9/64
TA Marino	3,99 - 4,48	5/32 - 11/64
VA	3,02 - 3,70	1/8 - 9/64
VA MARINO	4,05 - 4,55	5/32 - 11/64
AH 81 MARINO	3,78 - 4,75	5/32 - 3/16
AV 47	4,42 - 5,03	11/64 - 3/16
ZH	fixed	fixed
AV 520 - 521 - 525 AV600 - 601 - 605	2,25 - 2,75	3/32 - 7/64
MV 100S	2,25 - 2,75	3/32 - 7/64
AV 750 - 755 AV 125	2,00 - 2,50	5/64 - 7/64



Rotate engine clockwise when viewed from flywheel side

BREAKER POINT GAP SETTING





CHAPTER «D»

FUEL SYSTEM

E

F

G

CHAPTER «D»

FUEL SYSTEM

1. AIR CLEANERS

a. 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.

2. TYPES OF AIR CLEANERS AND SERVICING METHODS

Aspera engines are fitted with the following tvpes of air cleaners:

a. ALUMINIUM FOIL AIR CLEANER

This consists, as shown in Fig. 1, of a metal foil element held in its housing by a spring retainer ring. A screen in the base of the housing prevents the metal foil from being drawn into the carburettor.

Fig. 1 Aluminium foil cleaner

Maintenance of this air cleaner is carried out by flushing the metal foil in petrol or solvent. After cleaning, dry and re-oil the mesh, making sure that the lubricant is evenly distibuted throughout.

b. POLYURETHANE TYPE AIR CLEANER

This consists, as shown in Fig. 2, of a polyurethane foam element retained in its housing by a cover. 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 petrol (a mixture of water and household detergent may also serve this purpose, providing that the element is thoroughly dried before re-oling).
(Should the foam element be excessively impregnated with dirt, after prolonged use, replace it).
After this cleaning operation, wet the polyurethane foam with a spoonfull 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.

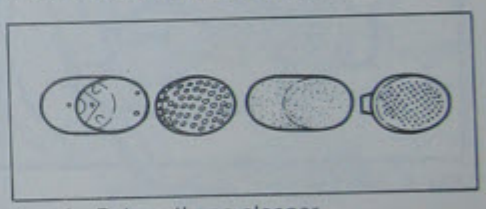


Fig. 2 Polyurethane cleaner

c. 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. 3) in order to secure the muffler by means of 3 self-threading screws.

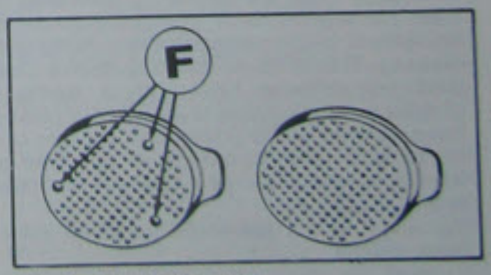


Fig. 3 Standard cover
F - Cover suitable for muffler assembly

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. 4).

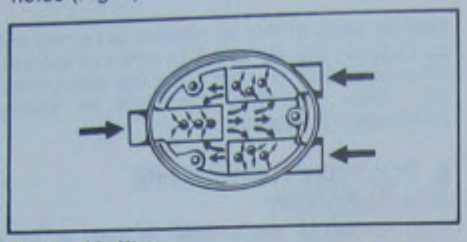


Fig. 4 Muffler

Diassembly and maintenance

— For disassembly, first remove the muffler-cover group (Fig. 5).
— 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.

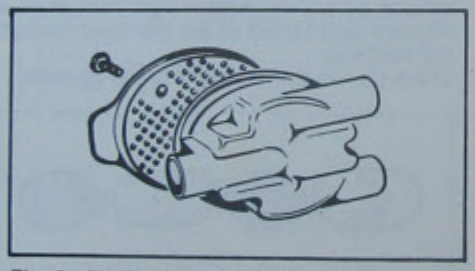


Fig. 5 Muffler cover disassembly

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

d. POLYURETHANE AIR CLEANER WITH SNORKEL

A snorkle type pre-cleaner is available to meet the requirements of manufacturers of equipment operating in extremely dusty condistions. This consists (see Fig. 6) of a standard polyurethane filter with a specially shaped cover to which is attached a plastic hose, carryng 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 suface. 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.

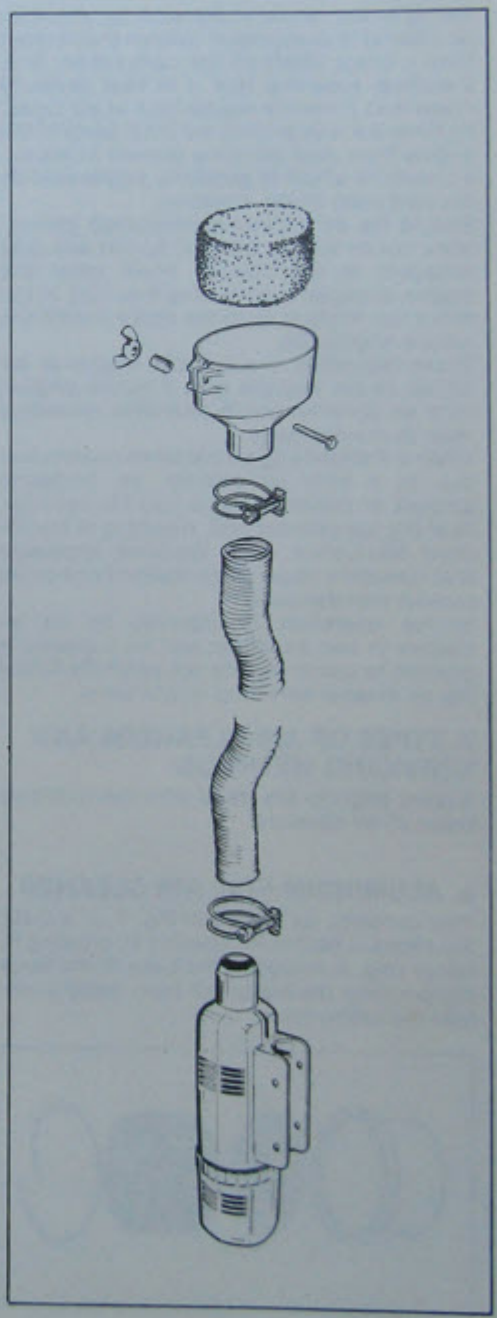


Fig. 6 Polyurethane air cleaner with snorkel

e. CLEAN-ASP-AIR

As illustrated in Fig. 7, 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.

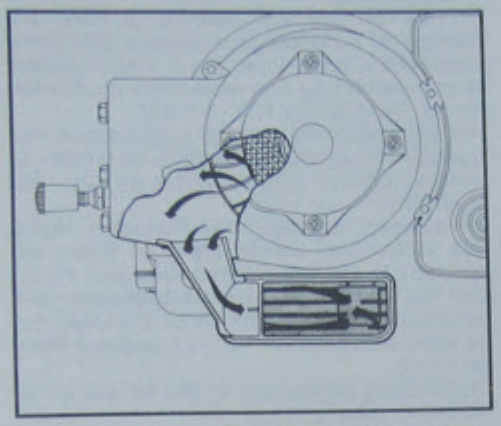


Fig. 7

The clean air enters tube A in Fig. 8 and flows into a pre-cleaning chamber B (Fig. 8) before passing through a large dimension polyurethane air filter (C in Fig. 8).

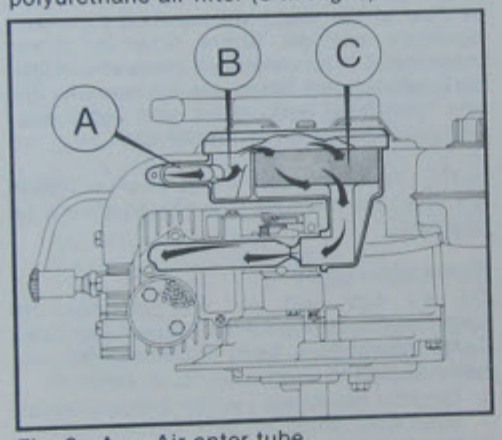


Fig. 8 A = Air enter tube
B = Chamber
C = Polyurethane filter

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 distibute the oil

Air shroud

To fit a Clean Asp Air filter it is necessary to have a different air shroud from the preceding one, with a hole to eccept tube (Fig. 9).

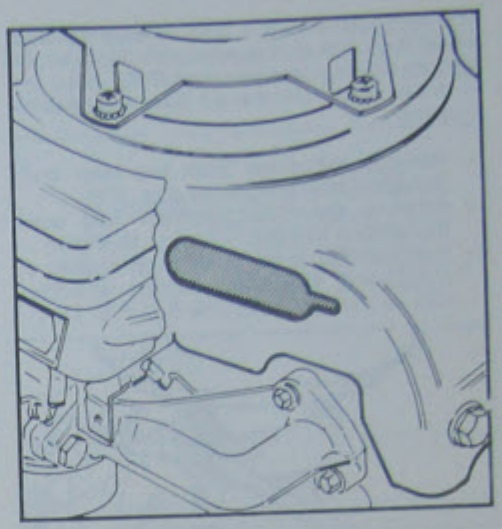


Fig. 9

f. STANDARD OIL BATH FILTER

This consists of a bowl containing oil into which a filter element is fitted (see Fig. 10).

Inspection

Before starting the engine fill with oil to level indicated.

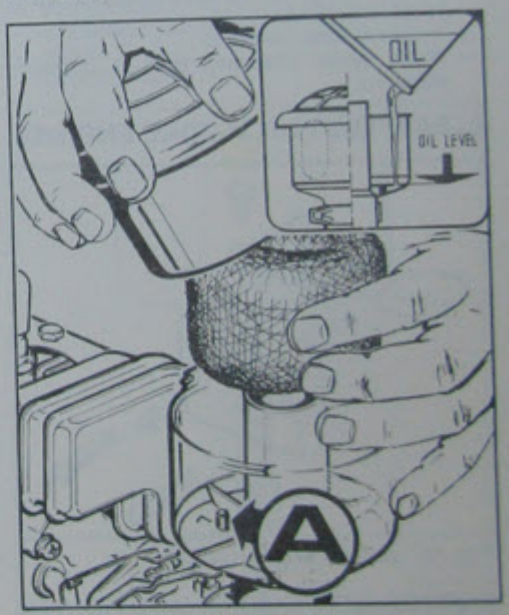


Fig. 10 Removal of standard oil bath air cleaner elements and oil level

Check oil level every 5 hours. If not to correct level refill container with same brand of engine oil. Periodically change the oil according to the ambient conditions. If engine is fitted to fixed applications (motorpumps, generators, etc.) check filter oil every 10 hours, change every 50 hours or before if evidently dirty.

The standard oil bath filter is only efficient when the oil is at the level indicated on the bottom of the container (see A Fig. 10).
In order to service the air filter, proceed as follows:

— Remove the cover from the filter body (twist counter clockwise (Fig. 10).
— Remove the filter element and wash thoroughly in clean petrol or kerosene.
— Remove the filter bowl from engine by slackening the clamp screw attaching this to the manifold (see B in Fig. 11).

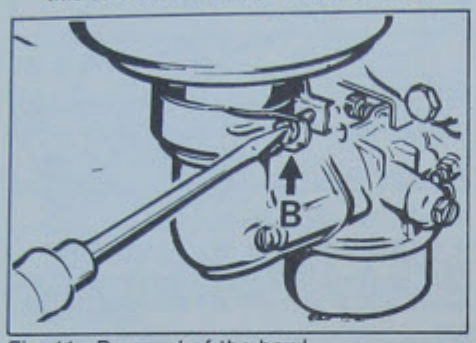


Fig. 11 Removal of the bowl

— Wash bowl thoroughly.
— Reassemble and fill with clean oil up to level indicated.
— Replace filter element.
— Refit cover ensuring this is correctly secured.

g. BAFFLES FOR MARINE ENGINES

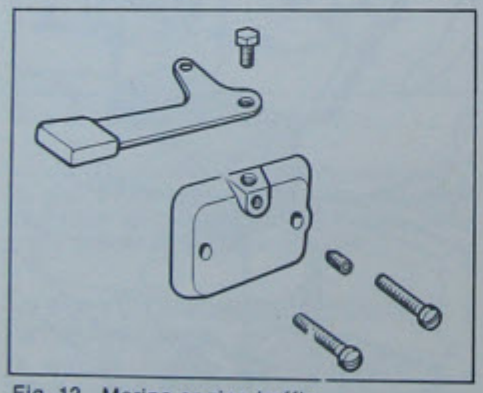


Fig. 12 Marine engine baffle

Engines supplied for marine use are not fitted with air cleaners. Such engines are equipped with a baffle located at the carburettor inlet (see Fig. 12).

h. AIR CLEANER FOR FLYMO

Flymo carburettor standardization

Over 12 months experience in the field has proved the bowl (Safe) carburettor together with turbo filter to be the most successful combination.

This experience has shown:
— better starting.
— better engine performance also on slopes.
— better air filtration resulting in longer engine life.

In view of this and bearing in mind the number of different carburettors previously employed it is the intention of Flymo-Aspera to standardize on one replacement carburettor for TA - VA - AV 520 - AV 600.
For the above engines the replacement carburettor will be the one with fixed jet 68 - as used on current production for AV 520 - 600 engines.
We strongly recommended that when fitting this carburettor all old types of filters are replaced by the latest turbo filter unit Flymo part No. 10407-03. This same carburettor will be supplied with conversion kit to enable it to be used with previous TA - VA engines fitted on Flymo.
Instructions on the use of the kit will be included in the kit.

For extreme conditions (over approximately 60° working angle) diaphragm carburettor is available and here again the above turbo filter is recommended.

In view of the many different types of carburettors and air filters fitted to these machines it is recommended that all old type carburettors and filters are replaced by the late type bowl carburettor and turbo filter now available as a conversion kit.

NOTE - When different carburettors or filters are fitted the main jet size should always be checked.

Flymo turbo filters

On AV 520 and AV 600 engines for lawnmowers, Flymo have fitted a turbo filter. Turbo filters have been supplied with four types of plastic filter housing as follows:

1. Original machines - white 2 piece cover - used with .55 jet
2. Intermediate machines with white three piece cover - used with .55 jet - Detachable end cap for ease of cleaning.
3. As 2 above, but with brown three piece cover.
4. Current machines - brown three piece cover - used with .68 jet. Enlarged louvres in end cap.

This latest turbo filter used with .68 jet is identifiable by passing a thin steel rule completely through the louvres and across the diameter of the end cap (see Fig. 13). This is not possible with earlier turbo filters as used with .55 jets.

Jet .68 can be used on 1 and 2 together with turbo filter 10407-03.
Jet .68 can be used on 3 together with either turbo filter 10407-03 or end cap 26163-01.

JET		TURBO FILTER COMPLETE	END CAP ONLY
1.	.55	10407-00 (white)	Integral
2.	.55	10407-01 (white)	26078-00
3.	.55	10407-02 (brown)	26078-01
4.	.68	10407-03 (brown)	26163-01

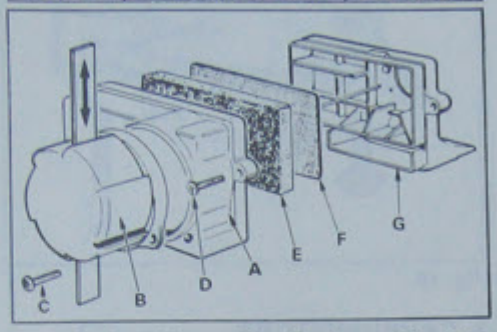


Fig. 13 A = Cover B = End cap C = Cap screw
D = Cover screw E = Thick filter
F = Thin filter G = Body

Attention
Flymo maintenance instructions for turbo filters are as follows:

Maintenance instructions
Your mower is fitted with a turbo filter, the maintenance for which is as follows:
When the engine performance drops (e.g. difficult starting or loss of revs.) check the air cleaner.

— 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 durst.

Fitting instructions - Conversion kit for TA-VA Flymo engines
This conversion kit is a bowl carburettor with fixed jet ∅ .68 as used for AV 520 - AV 600 engines with Flymo turbo filter 10407-03.
This latest turbo filter used with .68 jet is identifiable by passing a thin steel rule completely through the louvres and across the diameter of the end cap (see Fig. 14). This is not possible with earlier turbo filters as used with .55 jets.

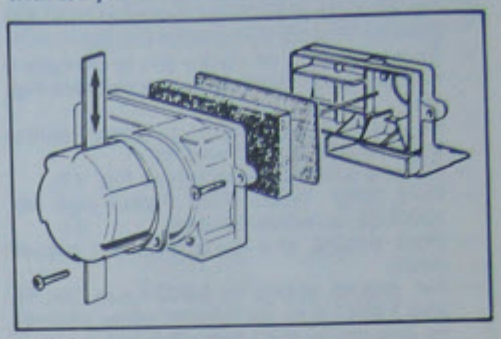


Fig. 14

The carburettor can be fitted on AV 520 - AV 600 as replacement for any other carburettor provided the above turbo filter is fitted.
If an earlier type turbo filter is fitted it will be necessary to replace the end cap with latest type Flymo part No. 26163-01 or a completely new turbo filter.

Conversion kit
The kit comprise the following parts:
— carburettor
— adjustable jet assembly
— screw
— governor lever

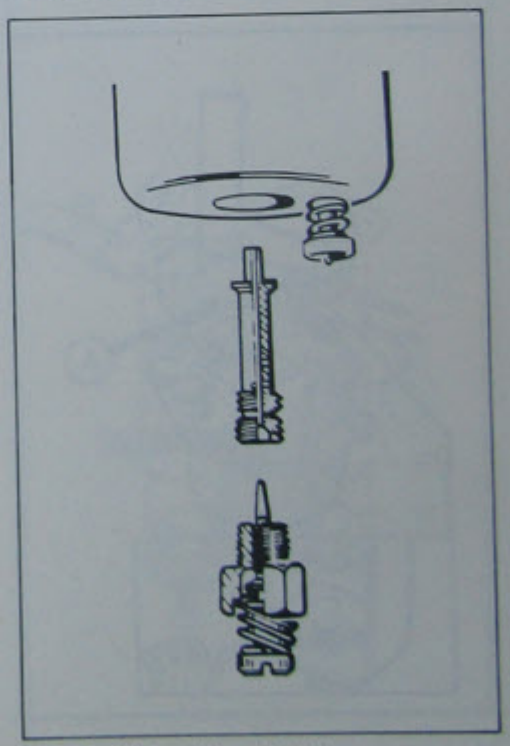


Fig. 15 Adjustable main jet

— spring

When fitting the kit to TA-VA Flymo engines proceed as follows:

— Remove fixed jet (see Fig. 15).
— Fit adjustable main jet assembly and set initially to 1 1/2 turns from closed.
— Reduce lenght of choke pin to protude 6 mm to prevent fouling on bracket (see Fig. 16).
— Fit new fixed speed governor spring bracket (see Fig. 17 and 18).
— Fit new governor spring (see Fig. 17).
— Refit filter. Turbo filter Flymo part No. 10407-03 is recommended.
— Start engine and make final jet adjustment.
— Set engine speed to 3.600 r.p.m. for TA and 3.800 r.p.m. for VA and other engines by deforming the spring bracket.

NOTE - The original fuel mixture (petrol oil ratio) must be maintained.

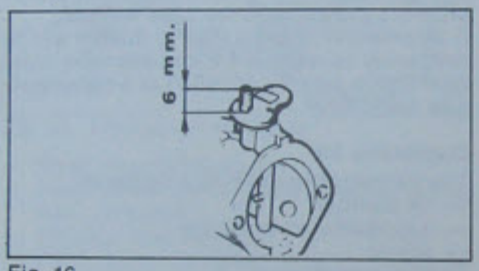


Fig. 16

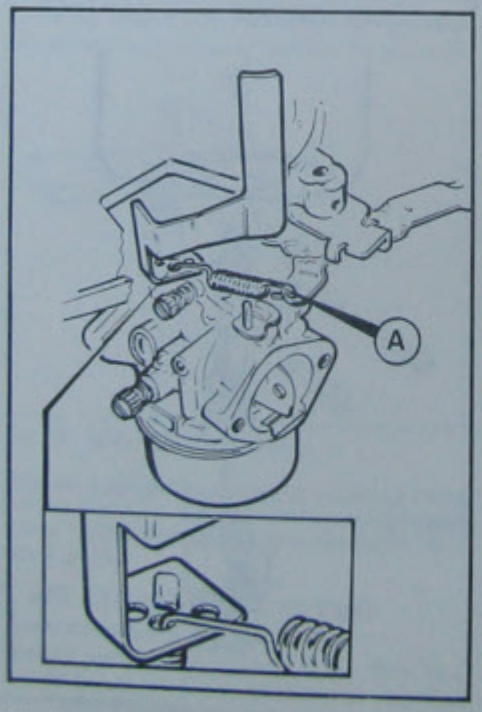


Fig. 17 A = Fixed speed governor spring

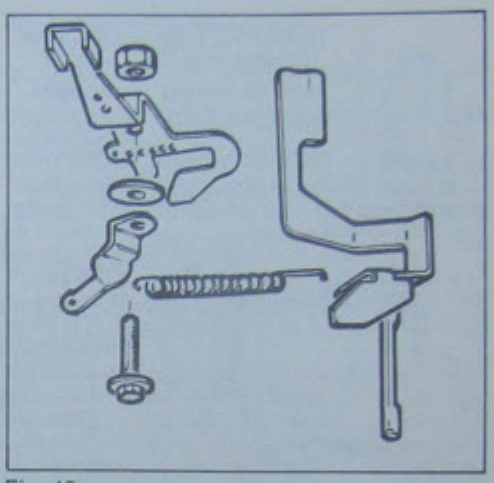


Fig. 18

3. CARBURETTORS

a. GENERAL

Two basic type of carburettors are fitted to Aspera engines:

— Diaphragm carburettor
— Float carburettor

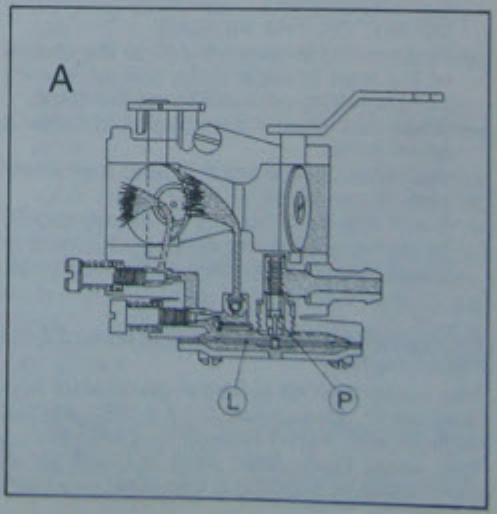
The operating and constructional differences of these types of carburettors are as follows:

Diaphragm carburettor

Fig. 19 clearly illustrates the operation of the diaphragm type carburettor in the various position of:

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.



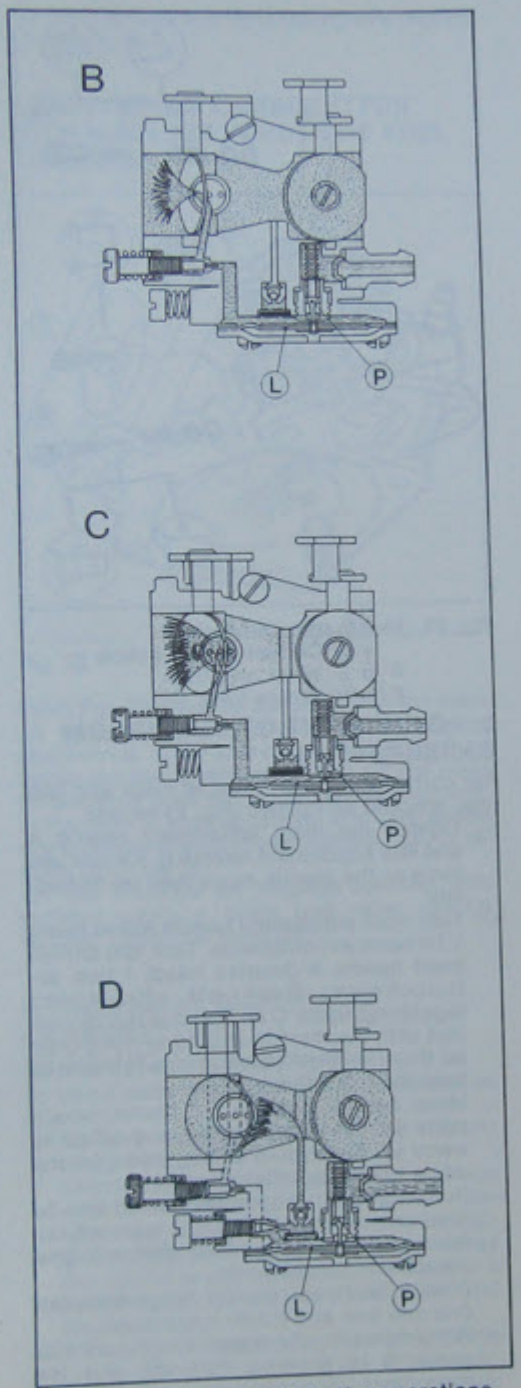
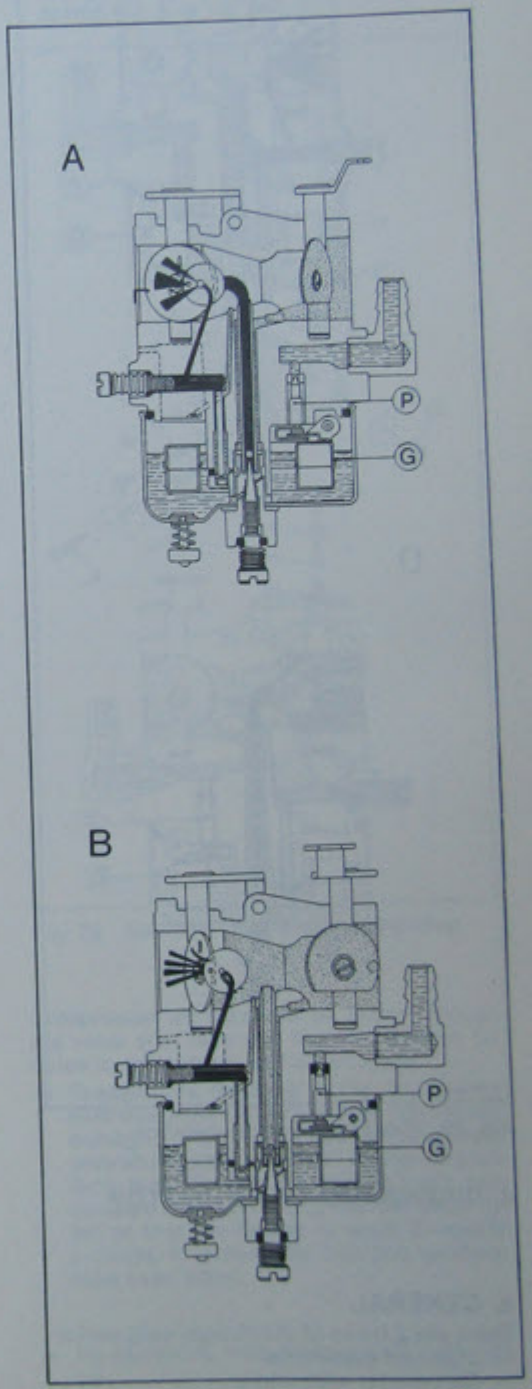


Fig. 19 Diaphragm carburettor operations

Float type carburettor
Fig. 20 illustrates the operation of the float type carburettor in the position of:
A — Choke
B — Idle
C — Intermediate speed
D — 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.



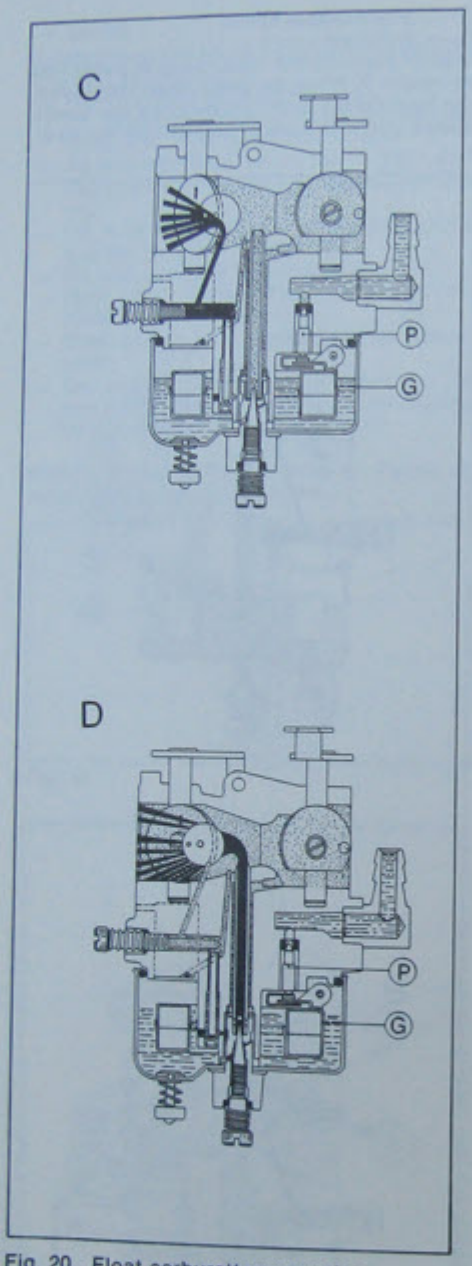


Fig. 20 Float carburettor operation

4. DIAPHRAGM CARBURETTOR

a. GENERAL

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

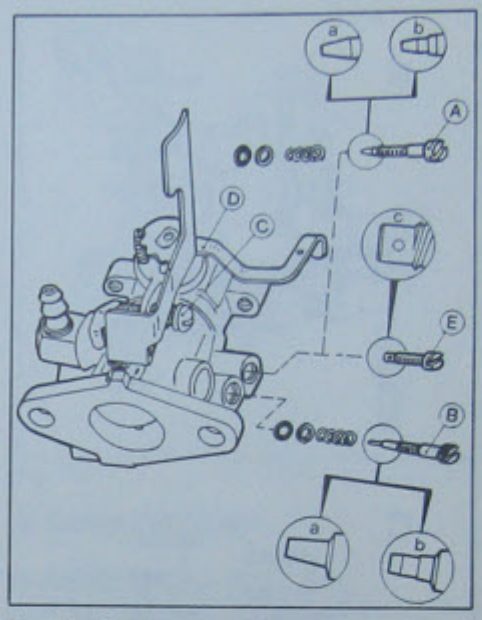


Fig. 21 Diaphragm carburettor
B { a = Correct needle shape
B { b = Worn condition
E { c = Orifice fixed jet

b. ADJUSTMENT OF DIAPHRAGM CARBURETTOR

For carburettors with variable main and idle jets, proceed as follows (Fig. 21 refers):
— 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 renge 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 r.p.m.
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 rich mixture.

c. DIAPHRAGM CARBURETTOR WITH MAIN JET INSIDE THE FUEL CHAMBER

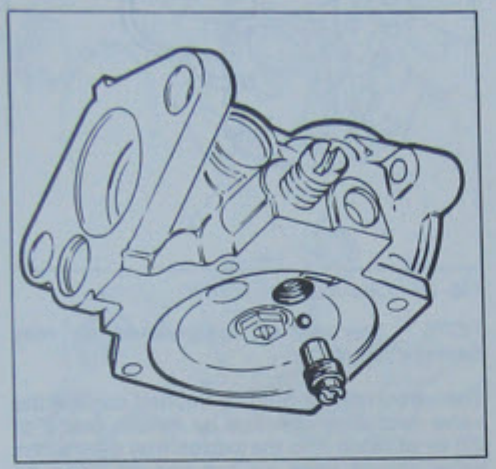


Fig. 22

From Fig. 22 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 r.p.m. a nylon ball valve will be located under the main jet.

d. SERVICING DIAPHRAGM CARBURETTOR

Standard diaphragm carburettor

To clean carburettor (see Fig. 23) 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 throttle (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 old type), taking care to extract washer, spring etc. (see fig. 24).

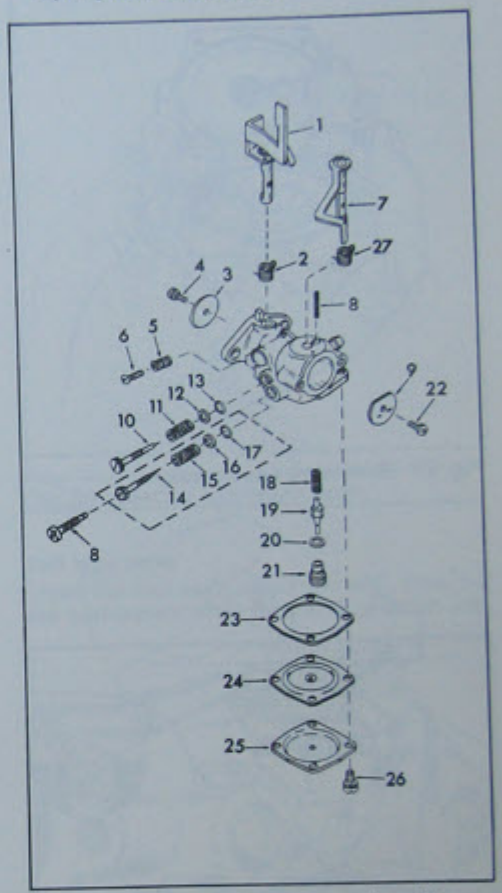


Fig. 23 Standard diaphragm carburettor

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. 23, making sure that valve (21) and needle (19) are not damaged or bent. The needle (19) should protrude approx. level with the carburettor face, (see Fig. 25). 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.

— Re-assemble, install and adjust carburettor.

E

F

G

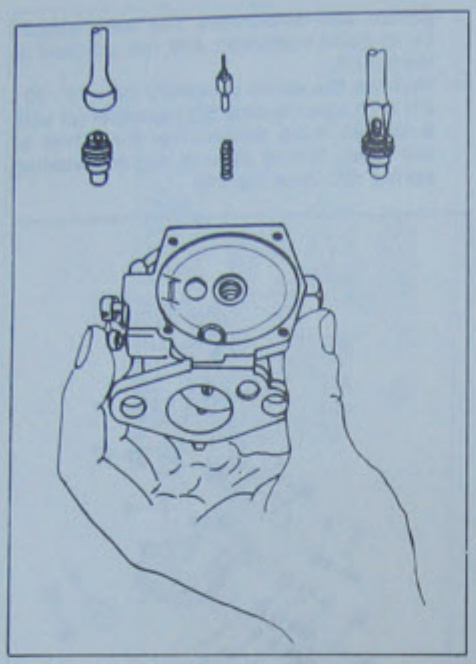


Fig. 24 Removing needle assy

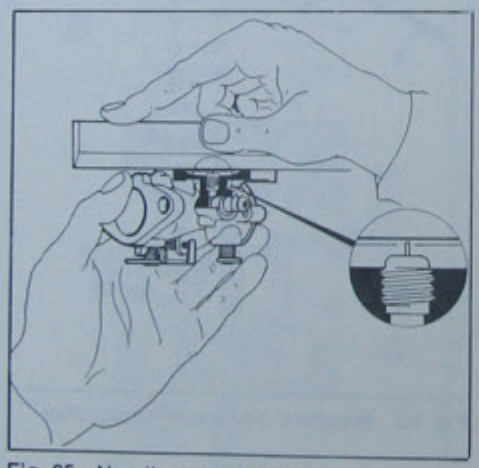


Fig. 25 Needle valve setting

Diaphragm carburettor with primer

The carburettor with primer is characterized 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 (see Fig. 26).

The cover has a small hole (see Fig. 26 - Part 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.

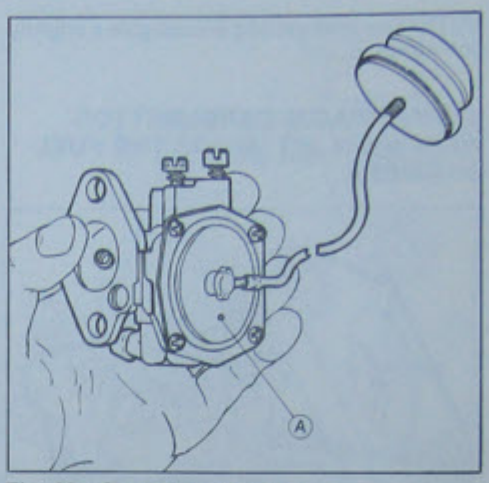


Fig. 26 Operation of primer

NOTE - The use of compressed air may damage this valve.

The carburettor should be flushed cut and the valve operation checked by mouth (see Fig. 27) by blowing into the petrol inlet elbow, the valve should pass air but should close by sucking.

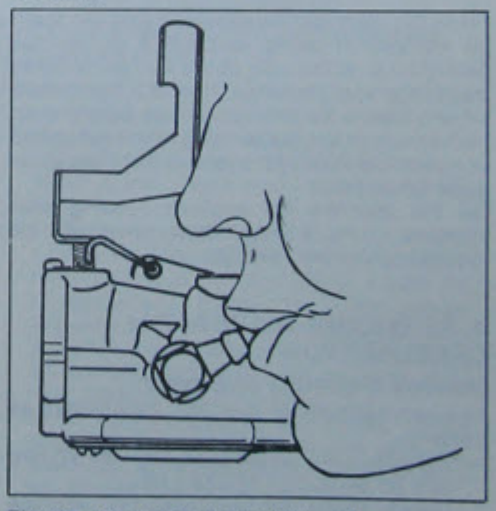


Fig. 27 Checking non-return valve

NOTE - 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 re-assembly. 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 (see Fig. 28).

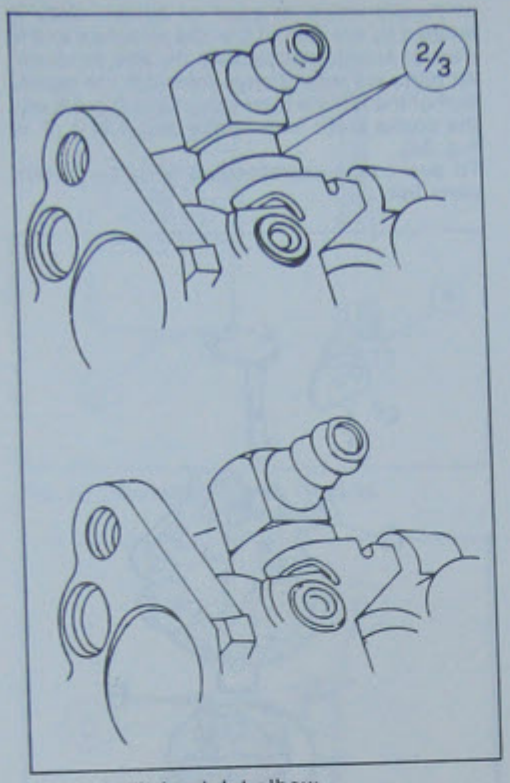


Fig. 28 Fitting inlet elbow

Valve falls to operate (Brass type pressed in valve)
After removal of the elbow, remove valve for replacement. For this operation proceed as follows (referring to Fig. 29).

— Tap centre hole A of valve with a 5/32 tap.
— Remove tap and, with a 5/32 screw, nut and washer (assembled as in Fig. 29 - part 3), 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.

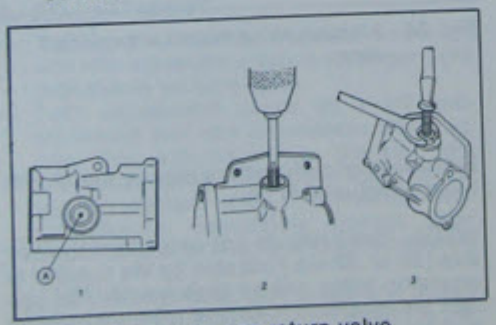


Fig. 29 Removing non-return valve

— 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 (see Fig. 30). Supply petrol by means of a plastic pipe and check that petrol does not escape from the valve (A of Fig. 30) but readily flows past the valve when the inner disc is held off its seat.

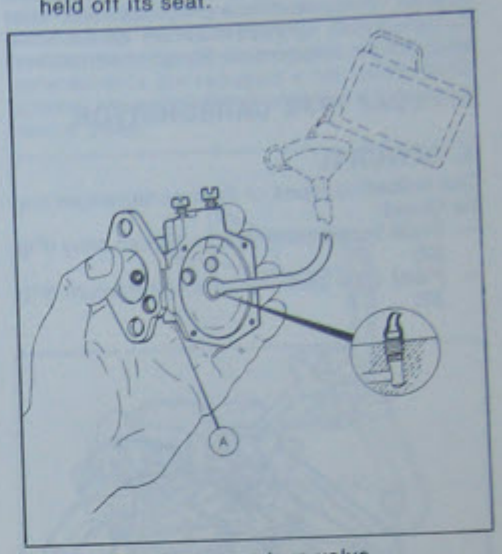


Fig. 30 Testing non-return valve

Ball type valve
Clean the ball seat, check the ball, blow out the carburettor after removing relevant jets,

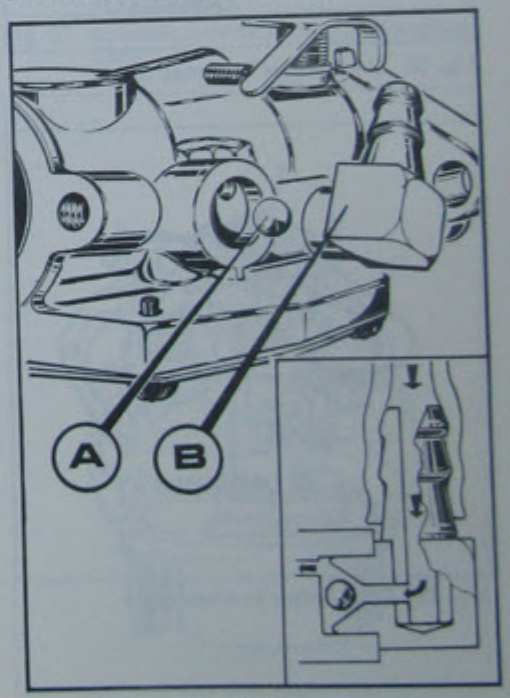


Fig. 31 A = Steel ball
B = New inlet elbow

E
F
G

diaphragm and needle and seat.
Re-assemble carburettor and position the ball in its housing and refit elbow to carburettor.

NOTE - When changing or repairing carburettors on Flymo lawnmowers please also refer to paragraph «Standardisation of carburettors and air cleaners on Flymo lawnmowers» Chapter D.

5. FLOAT TYPE CARBURETTOR

a. GENERAL

The following types of float carburettors may be found:
- Float type carburettor in Zamac alloy (Fig. 32)
- Float type carburettor in Aluminium (Fig. 33).

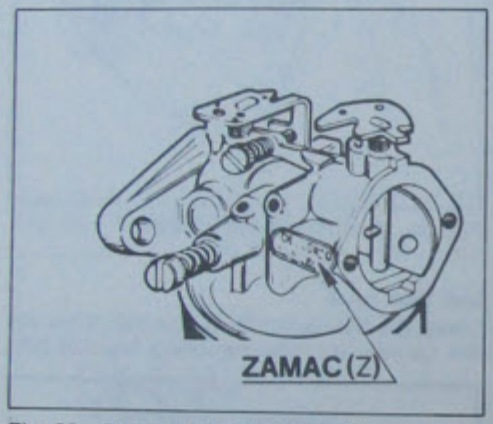


Fig. 32 Carburettor in zamac alloy

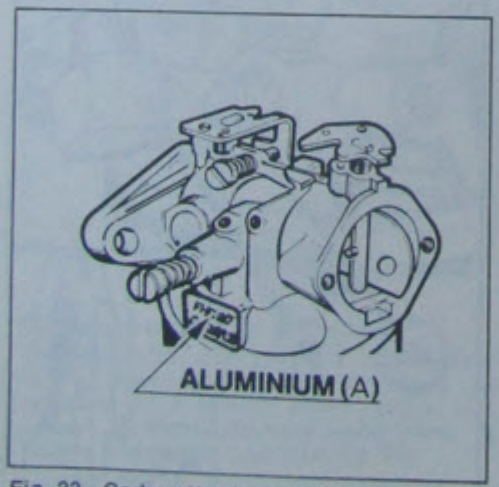


Fig. 33 Carburettor in Aluminium

Identification of Zamac alloy or Aluminium can be easily made by the name plate (Fig.32 or Fig.33) which in case of Zamac alloy is located by the side of the idle air screw and in case of Aluminium beneath the idle air screw.
All parts are interchangeable with the exception of the jet, the inlet valve (B in Fig. 34) and the choke shaft with choke and screw (D in Fig. 34).
To avoid misunderstanding refer to correct parts list.

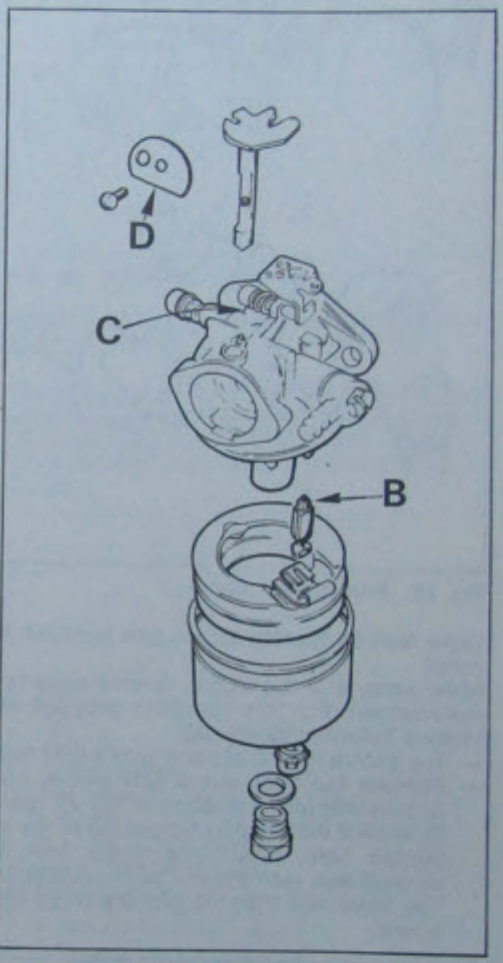


Fig. 34 Aluminium carburettor exploded view

Both types of carburettors may be found with fixed or adjustable jet.

NOTE - 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.

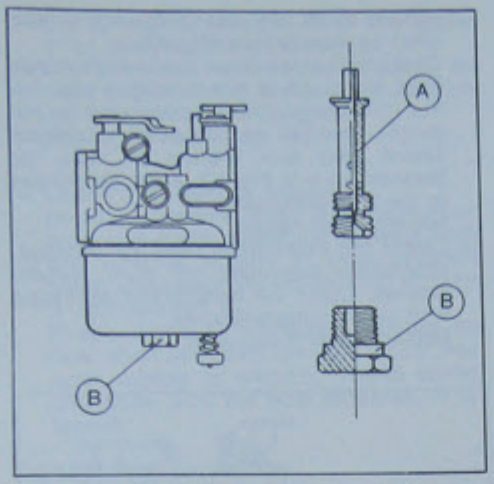


Fig. 35 Carburettor with fixed jet

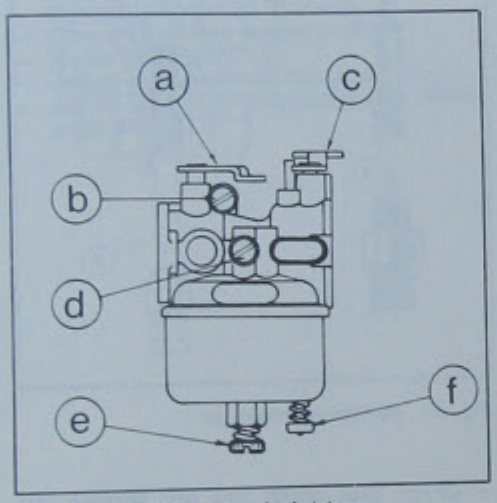


Fig. 36 Adjustable main jet type

b. ADJUSTMENT

- Tighten the main adjustment screw (e) and idle adjustment screw (d) finger tight (adjustable jet type only).
- Turn adjustment screw (e) 1 1/2 anti-clockwise and idle adjustment screw (d) one turn anti-clockwise. 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 the 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 r.p.m. Use a tachometer to check speed.

c. START-O-MATIC AND AUTOMAGIC CARBURETTOR

See Fig. 37 and Fig. 38. Those carburettors have no choke and the carburettor control plate differs from the control plate on other models. See Fig. 39. When parts or complete replacements are required a choke type carburettor should be fitted with the appropriate control plate.

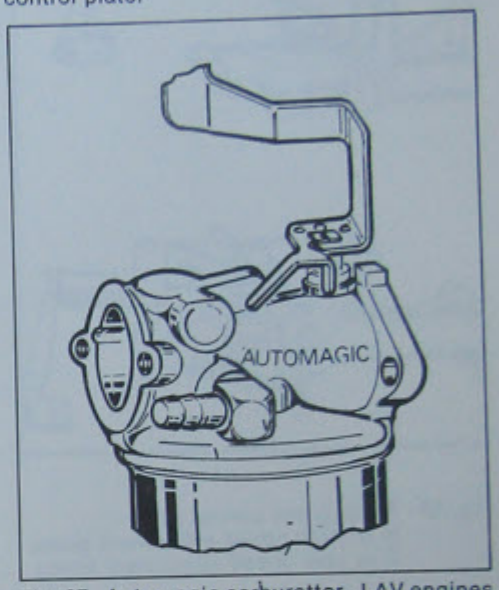


Fig. 37 Automagic carburettor - LAV engines - RM

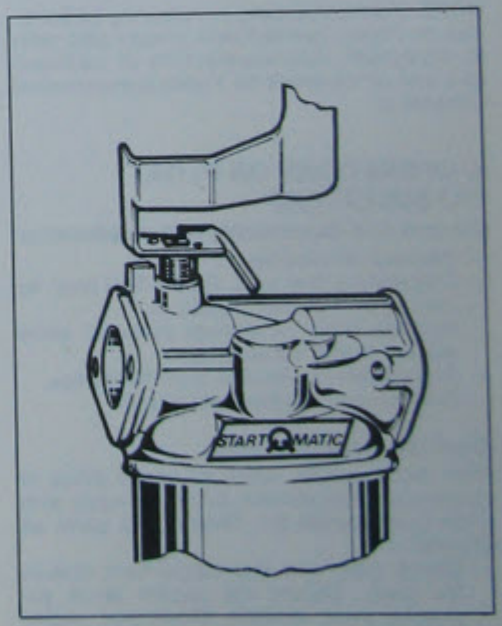


Fig. 38 Start-O-Magic carburettor VA Flymo engines

E
F
G
I

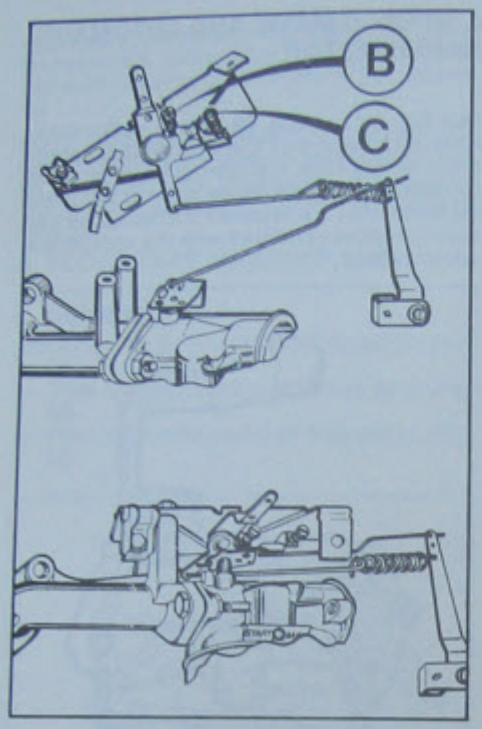


Fig. 39 RM engines control plate
B = High speed adjustment screw
C = Low speed adjustment screw

NOTE - When changing or repairing carburettors on Flymo lawnmowers please also refer to paragraph «Standardisation of carburettors and air cleaners on Flymo lawnmowers» Chapter D.

d. OPERATIONS ON FLOAT CARBURETTORS

Removal and disassembly of the carburettor

- Remove air cleaner.
- Disconnect fuel pipe. Empty fuel bowl by means of the push botton (f).
- 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 Aspera (see Fig. 40).
- Check that screwdriver cut in main nozzle (part B Fig. 40) is not damaged and that the main adjustment screw seat is not deeply stepped or otherwise damaged. Check that fuel orefice in main jet (denoted by e in Fig. 40) 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.

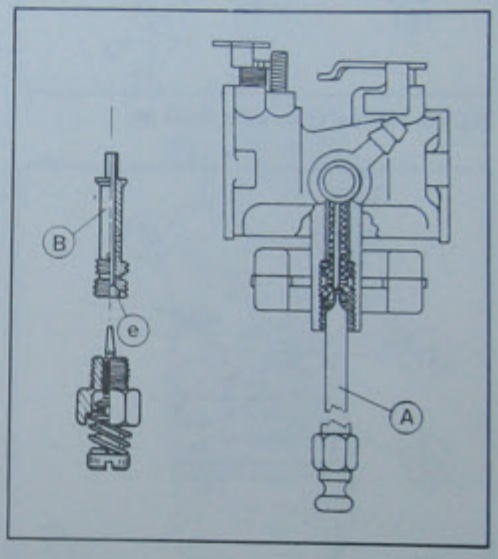


Fig. 40 Removing main jet

- 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

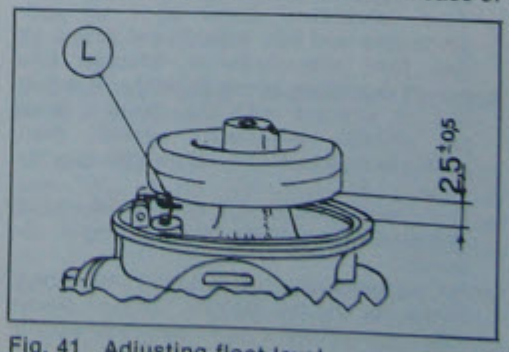


Fig. 41 Adjusting float level

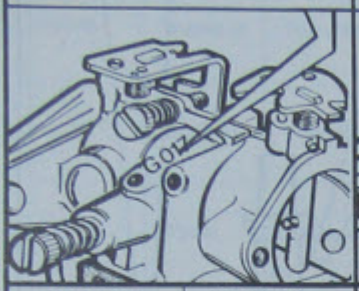
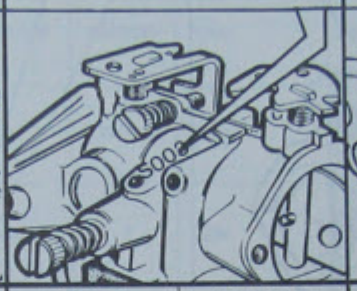
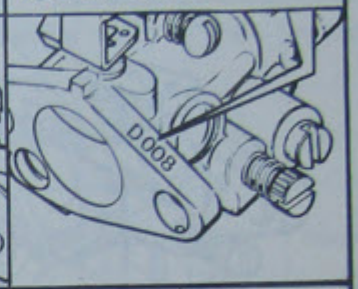
any damage or wear, both on the needle or its seat, replace both parts.
— Check throttle and choke spindles for wear or the bearing surfaces for possible distortion or other damages. Replace if necessary.

— 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) (see Fig. 41). 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.

Installation of carburettor

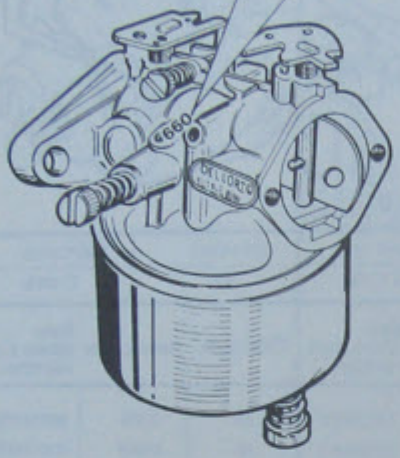
— Reassemble and refit to engine.
— Install cover or control panel. Connect linkage to choke and throttle.
— Connect fuel line to carburettor.
— Install air cleaner.
— Adjust carburettor ad described.
— Adjust linkage to carburettor with remote control lever.

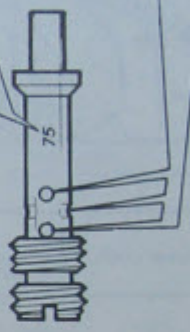
The folliwing table shows the old code, the new code and the pertinent new spare part Number for each type of carburettor

Ⓖ Bowl carburettor	Ⓢ Safe carburettor	Ⓓ Diaphragm carburettor
		
3001660 / 23020017	3001678 / 23030003	3001092 / 23010008
660 / G 017	678 / S 003	92 / D 008

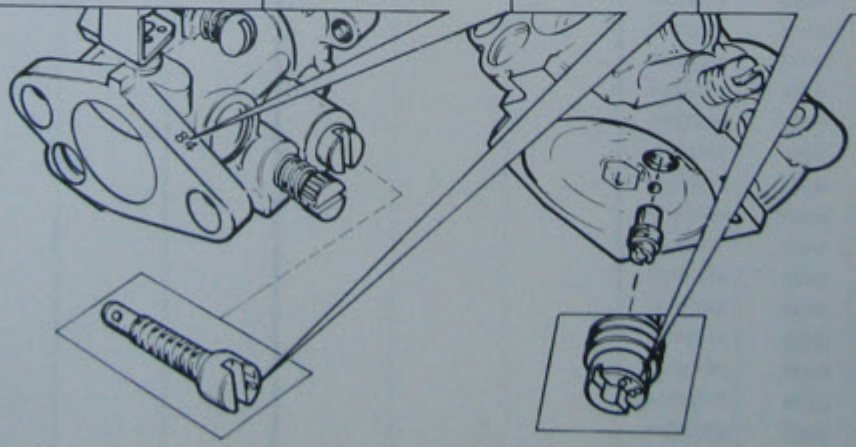
Old code	New code	New spare part number	Old code	New code	New spare part number	Old code	New code	New spare part number
660	G017	23020017	678	S003	23030003	88	D005	23010005
686	G030	23020030	679	S052	23020052	92	D008	23010008
674	G022	23020022	696	S006	23030006	84	D003	23010003
569	G002	23020002	664	S001	23030001	96	D015	23010015
698	G040	23020040	676	S002	23030002	89	D014	23010014
701	G043	23020043	683	S004	23030004	94	D010	23010010
682	G027	23020027				93	D009	23010009
681	G026	23020026				95	D011	23010011
699	G041	23020041				91	D007	23010007
687	G031	23020031						
680	G025	23020025						
695	G038	23020038						
670	G020	23020020						
623	G011	23020011						
694	G037	23020037						
703	G054	23020054						
704	G055	23020055						
666	G051	23020051						
561	G001	23020001						
669	G019	23020019						
631	G012	23020012						
688	G032	23020032						
689	G033	23020033						
685	G029	23020029						
692	G036	23020036						
690	G034	23020034						
684	G028	23020028						
697	G039	23020039						
702	G053	23020053						

CARBURETTOR		MAIN JET	
Type	Part N.	Calibration	Emulsion N.holes
Float	3001 (660)	Ø 0.75	6



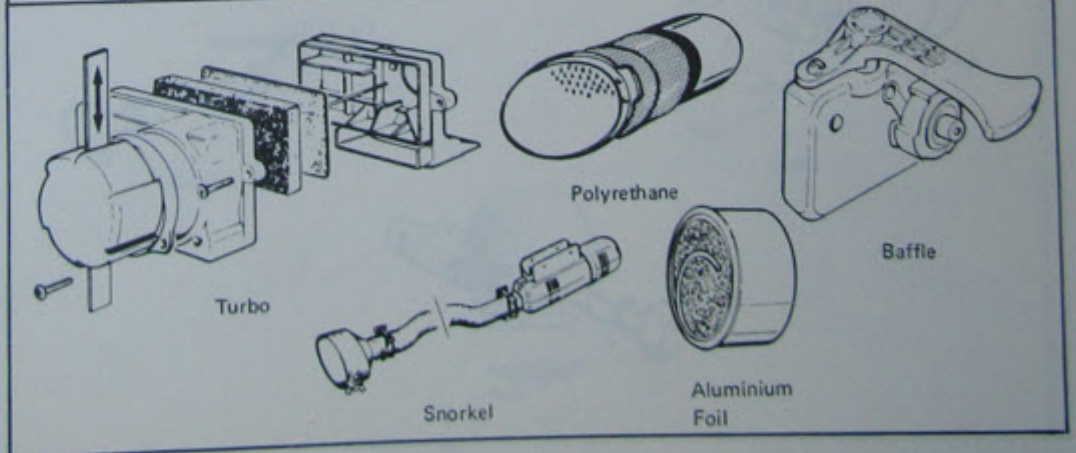


CARBURETTOR		MAIN JET	
Type	Part N.	Calibration outside main jet	Calibration inside main jet
Diaphragm with Primer	30010 (84)	Ø 72	Ø 0.68



2 STROKE ENGINES CARBURETTOR SPECIFICATION IN ALUMINIUM

Engine type	Application	AIR CLEANER		CARBURETTOR		MAIN JET		
		TYPE	Part no.	TYPE	Part no.	Calibration ⌀	Emulsion no. holes	Part N°
AV 520	Standard	Polyurethane	23410001	Float	23020017	0.75	6	23950063
AV 520	Standard	Snorkel	17060164	Float	23020030	0.80	10	23950087
AV 520	Flymo	Pre-cleaner	*	Safe	23030006	0.68	10	23950080
AV 520	Flymo	Pre-cleaner snorkel	*	Diaphragm with choke	23010005 23010008	0.72 0.70	— —	23940040 23940043
AV 520	Flymo	Turbo	26163	Safe	23030006	0.68	10	23950080
AV 520	Alpina Kober	Alluminium Foil	23410006	Diaphragm with Primer	23010003	0.72	—	23940035
AV 520	Southern Cross	Snorkel	*	Float	23020022	0.92	10	23950011
AV 520	Alpina Kober	Polyurethane	23410001	Diaphragm with Primer	23010015	0.70		23940043
AV 525	Outboard	Baffle	21510012	Float	23020002	0.92	10	23950011

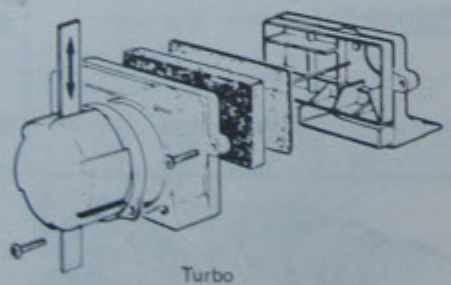


* it is not supplied by Aspera S.p.A.

tecnamotor spa

2 STROKE ENGINES - CARBURETTORS SPECIFICATION IN ALLUMINIUM

Engine type	Application	AIR CLEANER		CARBURETTOR		MAIN JET		
		TYPE	Part no.	TYPE	Part no.	Calibration ∅	Emulsion no. holes	Part no.
AV 600/601	Standard	Polyurethane	23410001	Float	23020017	0.75	6	23950063
AV 600/601	Standard	Snorkel	17060164	Float	23020030	0.80	10	23950087
AV 600	Giralda Maffei	Snorkel Giralda	*	Float	23020017	0.75	6	23950063
AV 600	Flymo	Pre-cleaner	*	Safe	23030001	0.70	6	23950067
AV 600	Flymo	Snorkel	*	Safe	23030002	0.78	4	23950071
AV 600	Flymo	Turbo	26163	Safe	23030006	0.68	10	23950080
AV 600	Flymo Sud Africa	Snorkel	*	Safe	23030004	0.76	4	23950085



Turbo

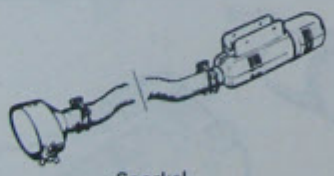
Polyurethane

Snorkel

* It is not supplied by Aspera S.p.A.

2 STROKE ENGINES - CARBURETTOR SPECIFICATION IN ALUMINIUM

Engine Type	Application	AIR CLEANER		CARBURETTOR		MAIN JET		
		TYPE	Part no.	TYPE	Part no.	Calibration ⌀	Emulsion no. holes	Part no.
AV 600	Southern Cross	Snorkel	*	Float	23020022	0.92	10	23950011
AV 600	Hay hoe	Snorkel	*	Float	23020040	0.78	6	23950009
AV 600	Flymo GCR	Snorkel	*	Float	23020053	0.80	4	23950093
AV 600	Flymo	Pre-cleaner *	*	Diaphragm with Choke	23010008	0.70	—	23940043
AV 600	Flymo South Africa	Snorkel	*	Diaphragm with Choke	23010010	0.68	—	23950044
AV 600	Zimbabwe Jepperson A.M.S.C.	Snorkel	*	Float	23020027	0.86	6	23950084
AV 600	Alpina	Aluminium	23410006	Diaphragm with Primer	23010003	0.72	—	23940035
AV 605	Outboard	Baffle	21510012	Float	23020002	0.92	10	23950011



Snorkel

Baffle

Aluminium Foil

* It is not supplied by Aspera S.p.A.

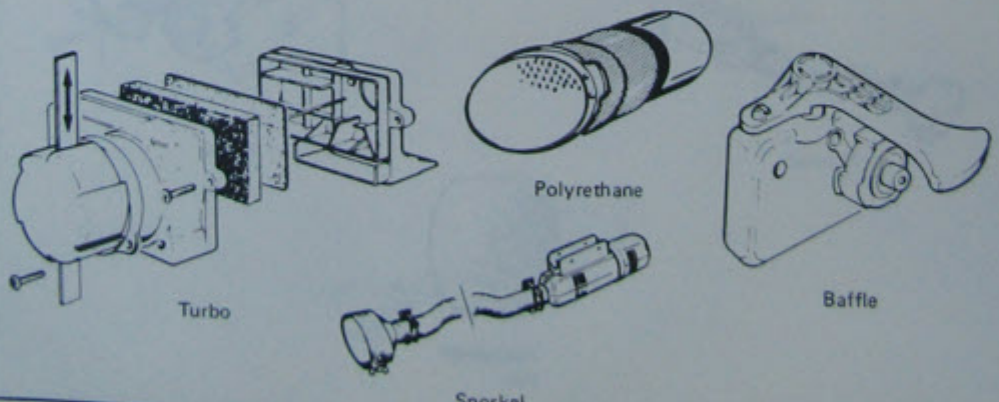
E

F

G

2 STROKE ENGINES - CARBURETTOR SPECIFICATION IN ALUMINIUM

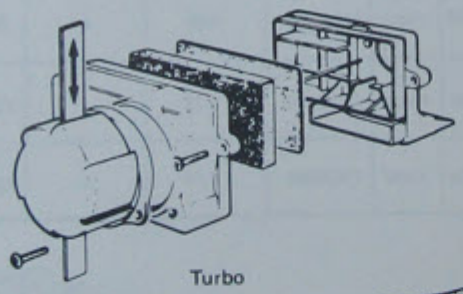
Engine type	Application	AIR CLEANER		CARBURETTOR		MAIN JET		
		TYPE	Part N°	TYPE	Part no.	Calibration Ø	Emulsion no. holes	Part no.
AV 750	Standard	Snorkel	17060164	Float	23020024	0.85	10	23950077
AV 750	Giralda Maffei	Snorkel Giralda	*	Float	23020026	0.95	10	23950083
AV 750	Flymo	Snorkel	*	Diaphragm with Choke	23010009	0.72	—	23940040
AV 750	Line Pal	Polyurethane	23410001	Diaphragm with Choke	23010011	0.70	—	23940043
AV 750	Miracle	Snorkel	*	Float	23020024	0.85	10	23950077
AV 750	Transfer	Polyurethane	23410001	Diaphragm with Choke	23010007	ADJUSTABLE		
AV 755	Marino	Baffle	21510012	Float	23020031	0.96	6	23950088
AV 125	Standard	Snorkel	17060164	Float	23020024	0.85	10	23950077
AV 125	Flymo	Turbo	*	Safe	23030008	0.65	6	23950103



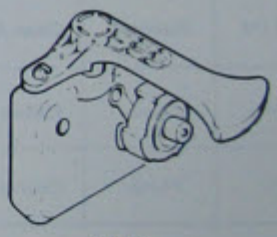
* It is not supplied by Aspera S.p.A.

2 STROKE ENGINES - CARBURETTOR SPECIFICATION IN ALUMINIUM

Engine Type	Application	AIR CLEANER		CARBURETTOR		MAIN JET		
		TYPE	Part no.	TYPE	Part no.	Calibration ø	Emulsion no. holes	Part no.
MV 100S	Standard	Polyurethane Muffler cover	23410001 16290006	Float	23020040	0.78	6	23950009
MV 100S	Standard	Snorkel	17060164	Float	23020040	0.78	6	23950009
MV 100S	Southern Cross	Snorkel	*	Float	23020022	0.92	10	23950011
MV 100S	Miracle	Snorkel	*	Float	23020043	0.78	4	23950071
MV 100S	Outboard	Baffle	21510012	Float	23020041	0.82	10	23950098
MV 100S	Flymo	Turbo	*	Safe	23030006	0.68	10	23950080

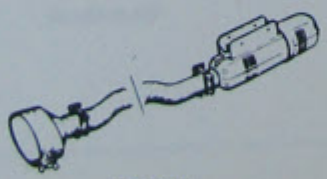


Turbo



Baffle

Polyurethane



Snorkel

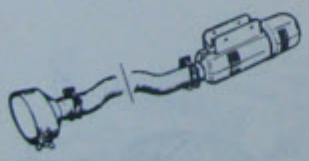
Muffler

*It is not supplied by Aspera S.p.A.

E F G

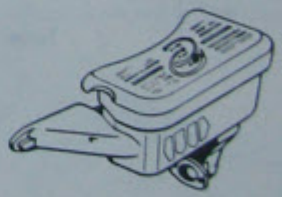
4 STROKE ENGINES - CARBURETTOR SPECIFICATION IN ALUMINIUM

Engine Type	Application	AIR CLEANER		CARBURETTOR		MAIN JET		
		TYPE	Part no.	TYPE	Part no.	Calibration ⌀	Emulsion no. holes	Part no.
LAV - LAVR 30	Standard	Polyurethane Clean Asp Air	23410001 13400001	Float	23020025	0.75	4	23950082
LAV - LAVR 35	Standard	Polyurethane Clean Asp Air	23410001 13400001	Float	23020038	0.78	4	23950071
LAV - LAVR 40	Standard	Polyurethane Clean Asp Air	23410001 13400001	Float	23020020	0.82	4	23950072
LAV - LAVR 40	Standard	Polyurethane Clean Asp Air Snorkel	23410001 13400001 17060164	Float	23020011	Adjustable		
LAV - LAVR 172	Standard	Clean-Asp-Air	13400001	Float	23020037	0.80	4	23950093
BV - BVR 150	Standard	Clean-Asp-Air	16290008	Float	23020054	0.78	4	23950071
BV - BVR 172	Standard	Clean-Asp-Air	16290008	Float	23020055	0.80	4	23950093
BV 150 HI	Flymo	Clean-asp-air	16290008	Float	23020060	0.78	4	23950071
BV 172 HI	Flymo	Clean-asp-air	16290008	Float	23020061	0.78	4	23950093



Snorkel

Polyurethane



Clean-asp-air

STANDARDIZATION from 1982

Engine Type	Application	AIR CLEANER		CARBURETTOR		MAIN JET		
		TYPE	Part no.	TYPE	Part no.	Calibration ∅	Emulsion no. holes	Part no.
LAV 35 LAV 40 LAV 153 LAV 172 LAV 173	Standard	Clean-asp-air	13400001	Float	23020038	0.78	4	23950071
BV 150 BV 153 BV 172 BV 173	Standard	Clean-asp-air	16290008	Float	23020055	0.80	4	23950093
BV 150 HI BV 153 HI BV 172 HI BV 173 HI	Flymo	Clean-asp-air	1629008	Float Separ. Choke	23020061	0.80	4	23950093
BV 153 BV 173	Bernard	Air cleaner	23410019	Float	23020064	0.82	4	23950070
BV 172 BV 173	Wolf	Clean-asp-air	16290008	Float	23020038	0.78	4	23950071

E

F

G

4 STROKE ENGINES - CARBURETTOR SPECIFICATION IN ALUMINIUM

Engine Type	Application	AIR CLEANER		CARBURETTOR		MAIN JET		
		TYPE	Part no.	TYPE	Part no.	Calibration ø	Emulsion no. holes	Part no.
HB - HBL 30 - 35	Standard	Polyurethane	23410001	Float	23020032	0.78	4	23950071
HS - HBL 30 - 35	Standard	Oil bath	23400005	Float	23020033	0.94	4	23950089
HS - HBL 40	Standard	Polyurethane	23410001	Float	23020019	0.82	4	23950070
HS - HBL - HBP 40	Standard	Oil bath	23400005	Float	23020029	0.96	4	23950086
HBP - HBL 40	Generatore	Polyurethane Muffler Cover	23410001 16290006	Float	23020034	0.78	4	23950071
HBL 40	Gen-Set	Gen-Set	-	Float	23020028	0.75	4	23950082
HBL153	Water Pump	Double Polyurethane	13400030	Float	23020063	0.84	4	23950104

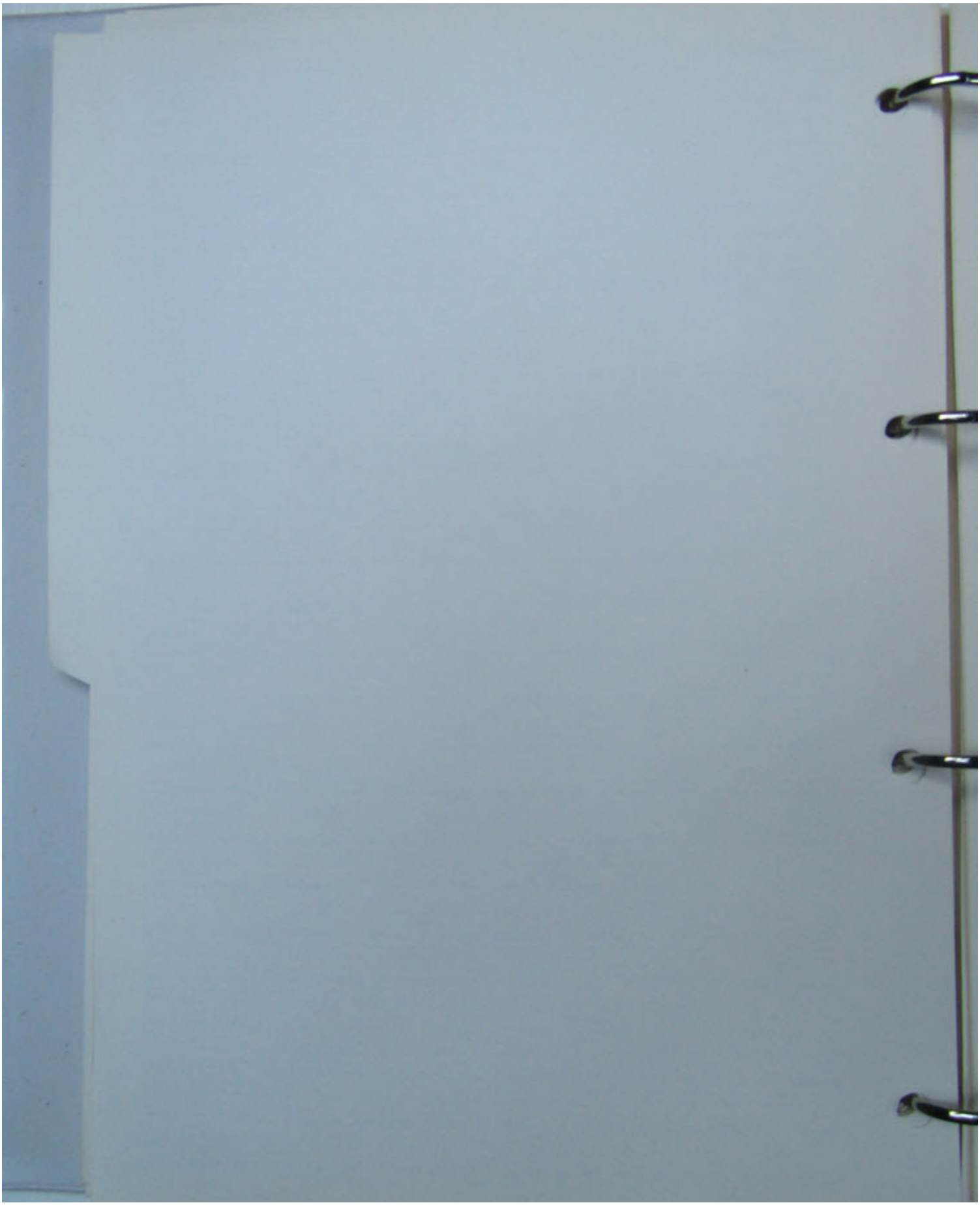
Muffler

Oil Bath

Polyrethane

* It is not supplied by Aspera S.p.A.


tecnamotor.
aspera
TECUMSEH ENGINES



CHAPTER «E»

GOVERNORS

CHAPTER «E»

GOVERNORS

1. GENERAL

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

Two stroke engines

Two stroke engines usually are fitted with pneumatic governors.
Outboard engines are not fitted with governors.

Four stroke engines

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

2. 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.
The dimensions being different to accomodate the larger Ducati flywheel (see Fig. 2) the air vane being smaller.

Fig. 1 Air vane governor

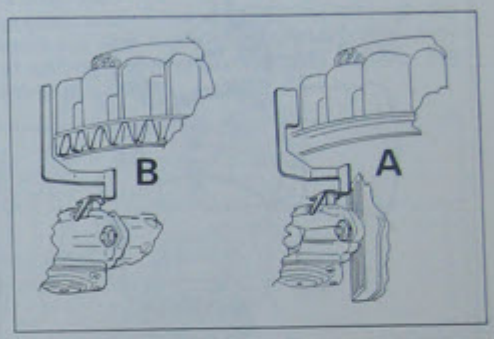


Fig. 2 Pneumatic governor types

Type A no longer available, use type B instead.

Different executions of this governor are produced:

a. VARIABLE CONTROL TYPE

The control lever «L» secured to the bracket (see 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.

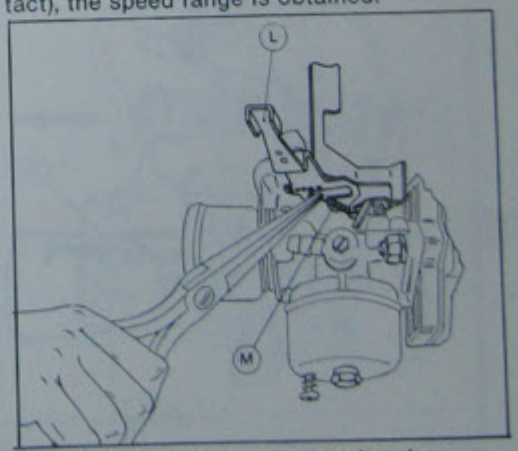


Fig. 3 Adjusting speed control spring

To increase or decrease the max speed, the spring «M» is moved to another hole in the lever «L» (Fig. 3); by moving the spring to a hole further away from throttle the speed is increased and viceversa.
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.

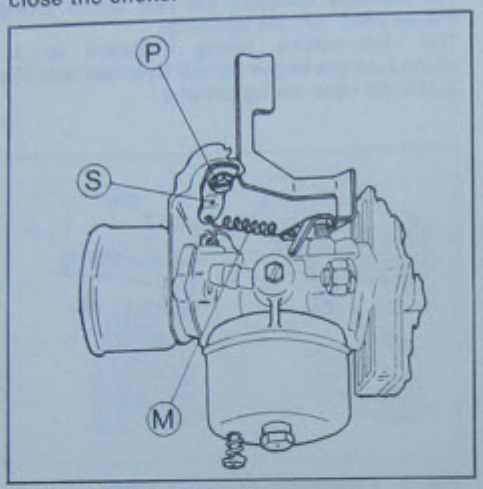


Fig. 4 Fixed speed type

b. FIXED SPEED EXECUTION

A fixed speed type is available (Fig. 4). 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.

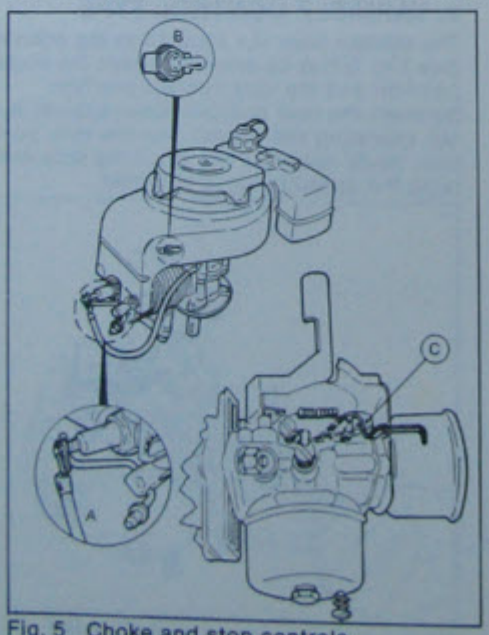


Fig. 5 Choke and stop controls

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.

c. GOVERNOR FOR FLYMO ENGINES

The governor fitted to Flymo engines is similar to that described in (A) Fig. 5.
On this type, a locating spring plate «K» is fitted in order to hold the lever «L» in the position selected (min or max).
The spring «K» should be secured and not moved when the control lever is operating.

NOTE - Before carrying out any speed settings or adjustments make sure that the air cleaner is clean.

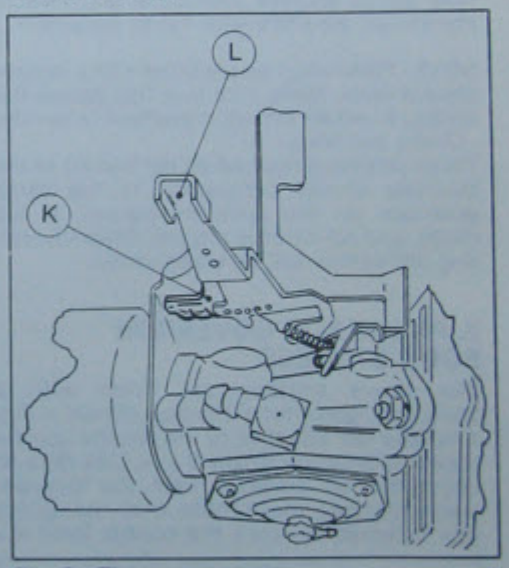


Fig. 6 Flymo governor

d. GOVERNORS FOR AV 520-600-750 ENGINES AND MV MODELS

AV 520-600-750 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 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 (see Fig. 7).

On AV engines the governor spring must be fitted as shown in Fig. 8 with the hooks inserted from the top.

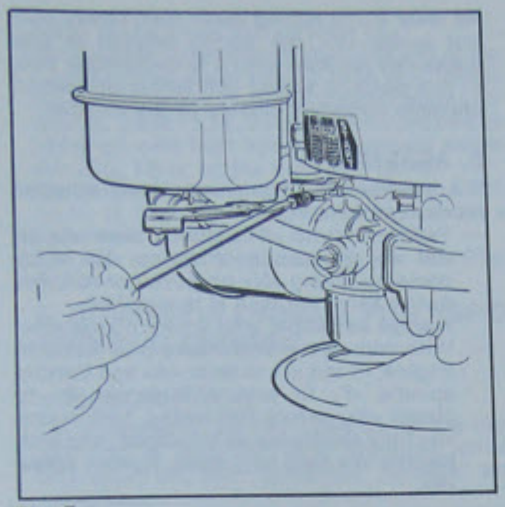


Fig. 7

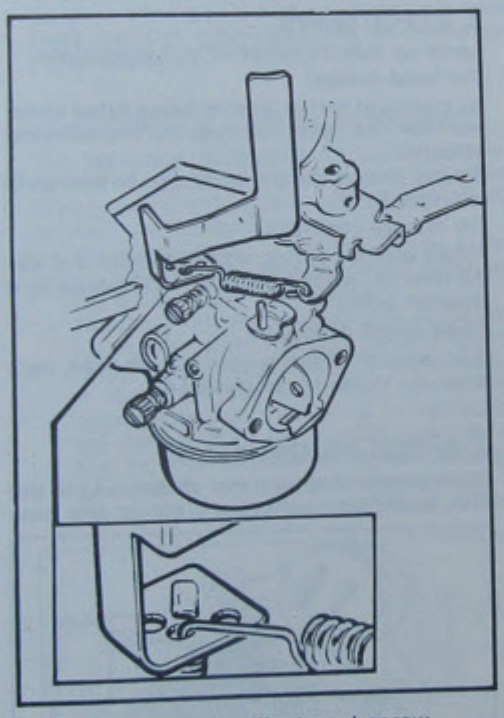


Fig. 8 High speed adjustment screw

The spring must be located in the second hole of the carburettor throttle lever (see Fig. 9) to allow the opening of the throttle in order to obtain maximum power.

Fig. 9

3. FLYBALL GOVERNORS FOR FOUR STROKE ENGINES

a. GENERAL

All four stroke engines are fitted with flyball type governor (Fig. 10). This consists of a plastic gear «A» which is caused to rotate by the camshaft gear.

b. STANDARD GOVERNOR

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» (Fig. 10).
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.

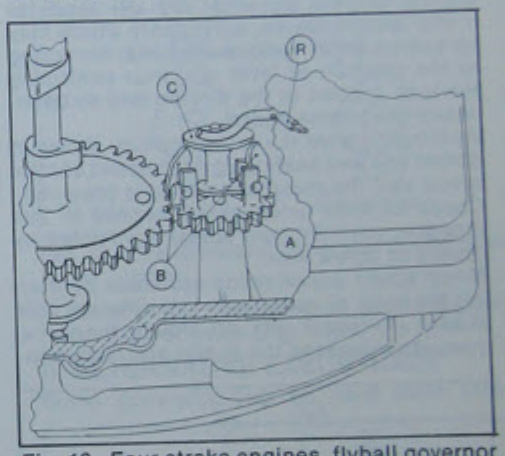


Fig. 10 Four stroke engines, flyball governor

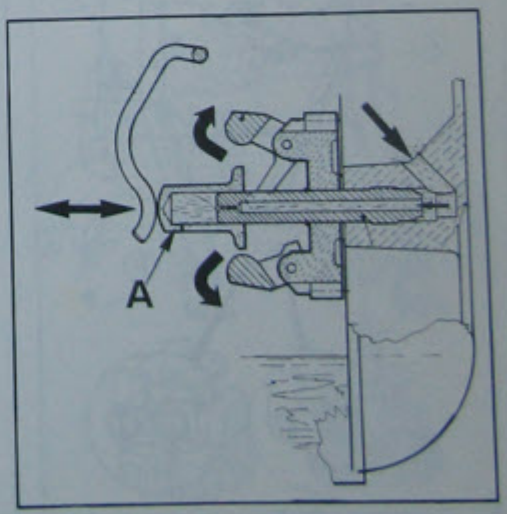


Fig. 11

c. OLEOMATIC GOVERNOR FOR HORIZONTAL ENGINES

The governor spool is replaced by a plastic sleeve (Fig. 11 - A) and the governor shaft on which the gear and the sleeve rotate is drilled through. Thus oil is drawn under the head of the sleeve. This gives a low pressure oil dampening effect which eliminates any slight governor fluctuation. This type of governor is used mainly in generator applications.

4. GOVERNOR LINKAGE FOR HORIZONTAL CRANKSHAFT ENGINES

a. DESCRIPTION AND ADJUSTMENT

A link «T» positively connects lever «A» with main throttle lever «F» (see Fig. 12). With engine running, governor rod «R» tends to rotate anticlockwise, spring «M» which may be tensioned by various amounts, according to the position of lever «L», thus controling the load applied to the throttle and so determines the engine speed.
By bringing lever «L» to the position shown in dotted line and seating against speed control screw «V», the maximum speed is obtained. Check for max recommended speed in this position, the minimum speed is adjusted by means of screw «m».
Minor speed adjustments are made by moving the hook of spring «M» to a different hole in lever «A» (see D - Fig. 12). Moving the spring upwards increases the speed and viceversa.

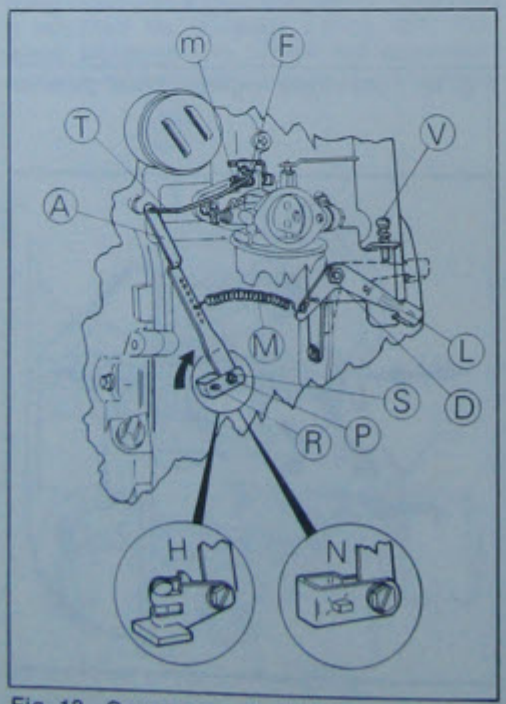


Fig. 12 Governor control, H engines

As lever «L» is moved away from speed control screw «V», the spring tension is progressively reduced until it is completely free. In this position adjust idle screw «m» which prevents complete closure of the throttle.

b. ASSEMBLY

If a governor has been completely stripped proceed as follows:

— Position clamp «S» carrying lever «A» on rod «R» by means of clamp «H» or by pressing clamp «N» on governor rod. For easier servicing type H is supplied.
Always assemble with a new clamp «N».
— With carburettor and intake pipe fitted to engine, fit rod «T» to lever «A» and throttle spindle «F» fit arm with screw «P» to clamp «S», before tightening, turn clamp «R» fully clockwise as indicated, and with throttle «F» held fully open, tighten screw «P».

c. EXECUTIONS

Lever «L» may be supplied in 3 executions:

For hand control

By means of spring washer being fitted under nut «D» the lever is held in the position selected.
By this means the governor can be manually controlled.

For remote control

Fitted without spring washer under nut «D» the lever is free to be controlled remotely by a Bowden cable.

Fixed speed execution

If no control of the governor is desired, lock lever «L» in full speed position.

d. SPEED ADJUSTMENT

Hook governor spring «M» on arm «A» in the fifth hole from the bottom out of the nine

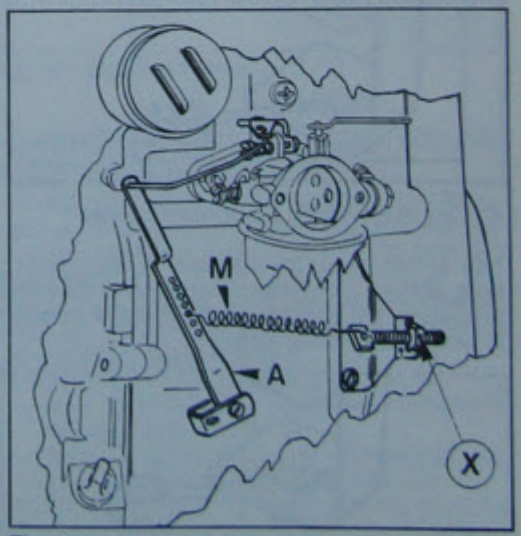


Fig. 13

holes in the lower part of lever «A».
For variable speeds hook the other end of the spring on the lower hole in lever «L». This is the correct position of the governor spring for approx. 3.600 r.p.m., minor adjustment can be obtained with high speed adjustment screw «V» (Fig. 12) or on the nut «X» (Fig. 13).
If a maximum speed of much less than 3.600 r.p.m. is required hook the spring «M» in a lower hole on arm «A».
Set idle speed by adjusting screw «m» (Fig. 12).

5. GOVERNOR LINKAGE FOR HBP/G OR HBL/G ENGINES

a. DESCRIPTION

On above engines the position of the carburettor is different and therefore small changes on the governor linkage are necessary.
HBP/G and HBL/G engines are mainly used on generators and therefore usually run with fixed speed at 3.000 r.p.m. Fig. 14 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 HBL/G 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.
— There are nine alternative holes at the bottom of the arm. The long control spring being fitted to the first hole (3.600 r.p.m.) or to the second hole (3.000 r.p.m.). The opposite end of the spring is hooked to the third hole of the control lever «B» in Fig. 14. The shortest spring for carburettor butterfly is hooked to the braket as in Fig. 15. This short spring differs also from

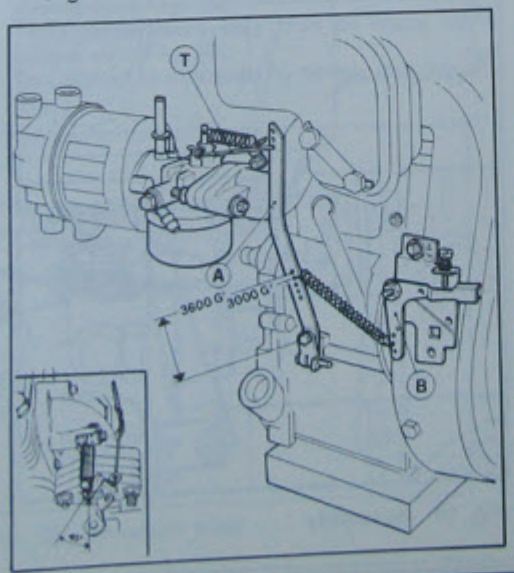


Fig. 14

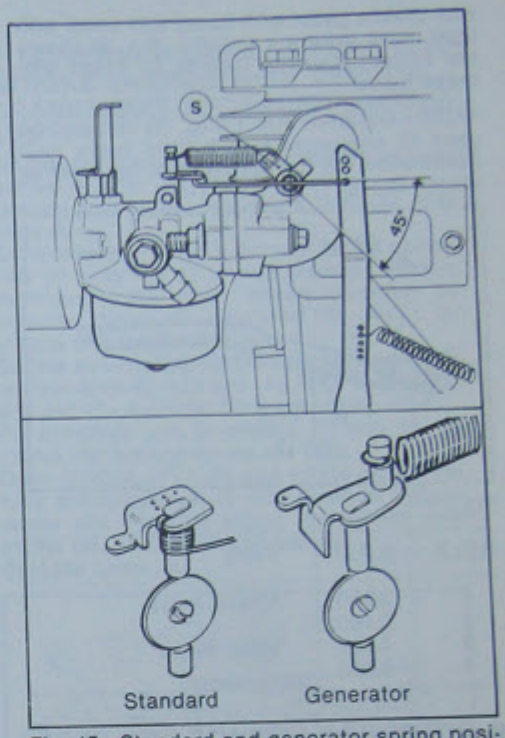


Fig. 15 Standard and generator spring position

the normal spring used on other horizontal shaft engines (Fig. 15).

c. ALTERNATIVE EXECUTIONS

Some generator engines have been fitted

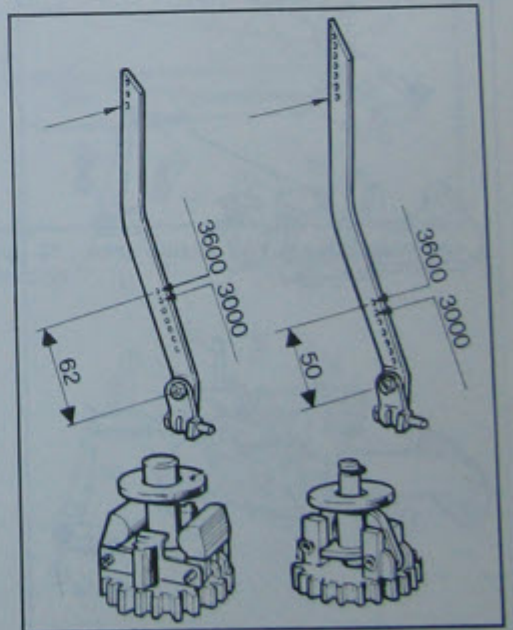


Fig. 16 Matching of governor arm to gear assemblies.

with plastic gears with heavy and some with light mass governor weights. Fig. 16 shows the correct governor arm to be fitted with these types.

NOTE - Governor arm 1 (Fig. 17) can also be used in conjunction with light mass gear assemblies but the spring must be fitted as shown in Fig. 17.

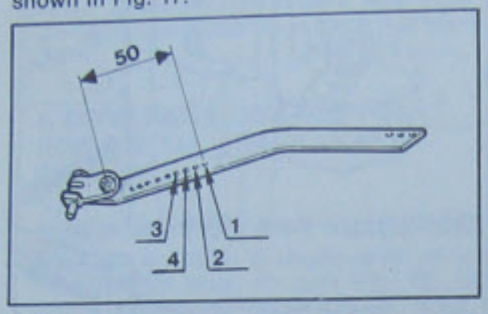


Fig. 17

HOLE	R.P.M.	TYPE
1	3.600	Heavy mass
2	3.000	" "
3	3.600	Light mass
4	3.000	" "

6. GOVERNOR LINKAGE FOR FOUR STROKE ENGINES WITH VERTICAL CRANKSHAFT

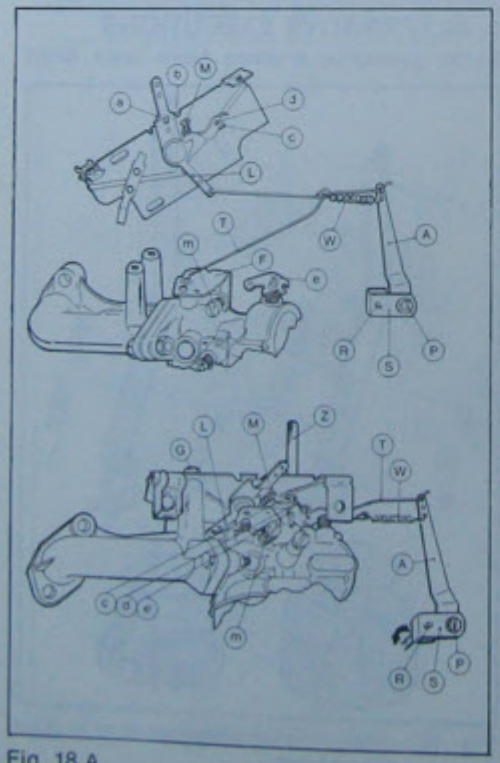


Fig. 18 A

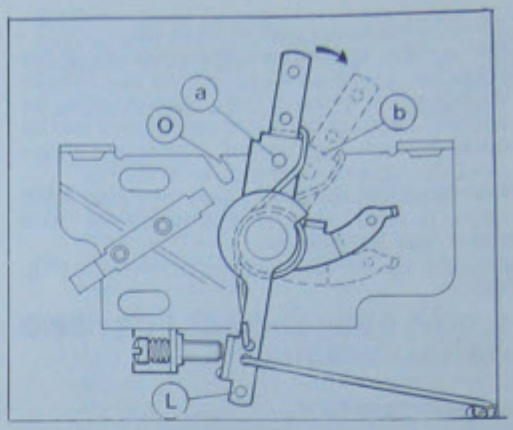


Fig. 18 B Assy details for LAV models

a. DESCRIPTION

A link «T» positively connects lever «A» with main throttle lever «F» (see Fig. 18).
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 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 - Execution of the carburettor control has changed, see Fig. 18. The new carburettor control plate is completely interchangeable. Should however the control plate touch the carburettor linkages fit two washers under the fixing screws (see Fig. 19).

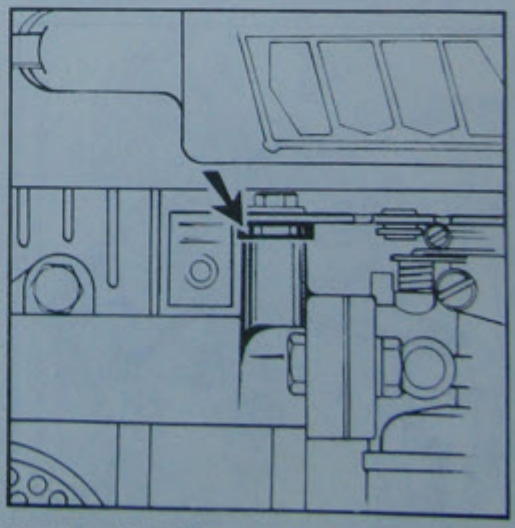


Fig. 19 Assembly

b. ASSEMBLY AND PRIMARY ADJUSTMENT

To install this type of governor linkage (see Fig. 18) procede 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 though 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 carburettors and control plate when replacements are required.

c. SPEED ADJUSTMENT

— Hook spring «W» in the hole of lever «A» which corresponds to the required high speed. On early production engines there may not be the required No. of holes.
In this case the lever «A» can be easily drilled (see Fig. 20).
Final adjustment may then be made by screw «M» (Fig. 18).
— Idle speed is adjusted by screw «m» (Fig. 18).

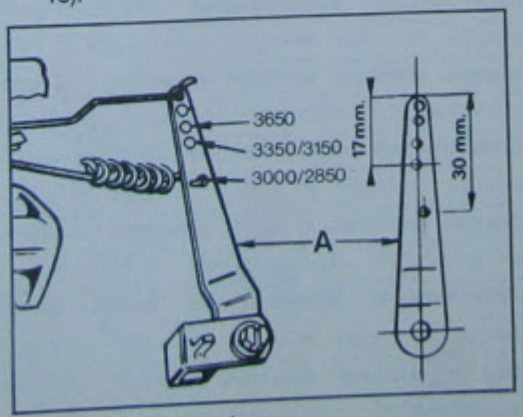


Fig. 20 Governor lever

7. GOVERNOR LINKAGE FOR FOUR STROKE ENGINES WITH VERTICAL CRANKSHAFT PRODUCED BEFORE 1967

On this type of governor only link «T» is connected to lever «A».
Control spring «M» connects link «T» with lever «L».
Control lever «C» acts through thrust spring «W» on lever «L» up to max position. By this movement the max speed position is selected, lever «C» operates the choke by means of a further link «D».
Before assembling carburettor to engine, fit control lever «C» «L» and «A», with spring «W» and rod «T» and «D». Connect spring «M».
Fit complete unit to engine, fit arm «A» to clamp «S» leaving screw «P» slck.
Open throttle «F» fully and rotate clamp «S» fully anticlockwise. in this position tighten screw «P» (Fig. 21) adjust idle speed with screw «m» and max by screw «v».
Replace cover «X».

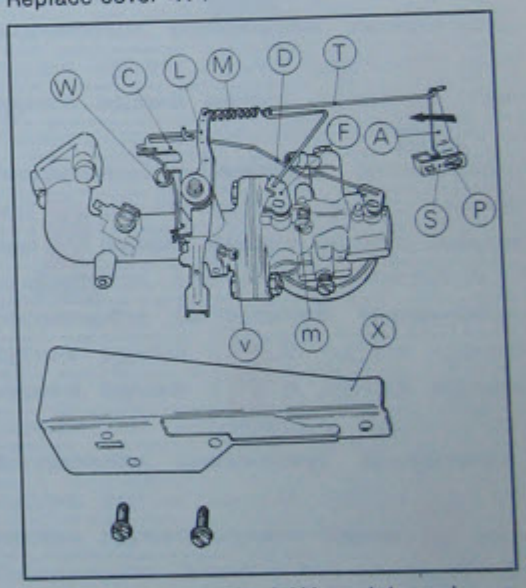
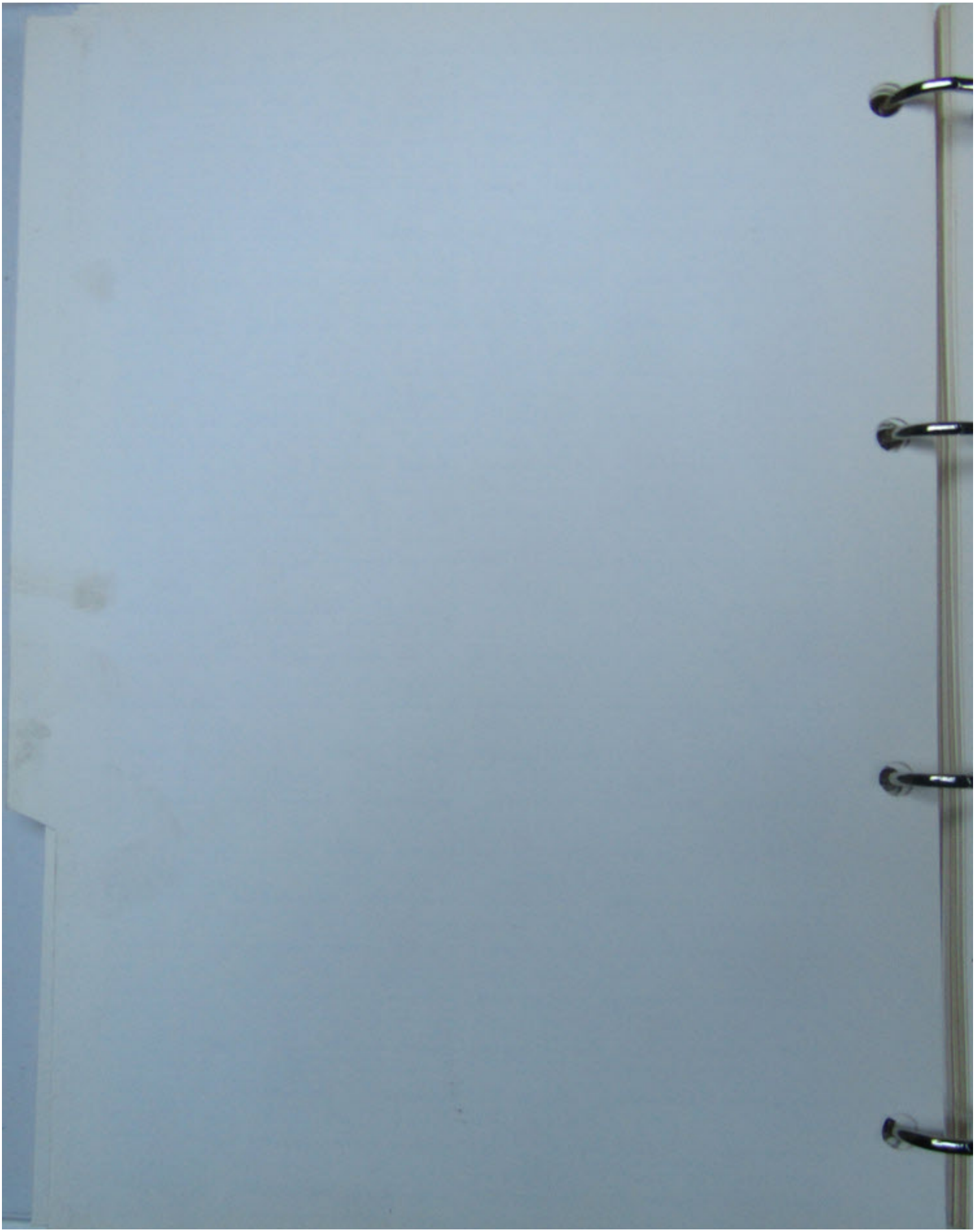


Fig. 21 Assy details LAV models early production



CHAPTER «F»

MECHANICAL PARTS OF 2 STROKE ENGINES

CHAPTER «F»

MECHANICAL PARTS OF 2 STROKE ENGINES

1. INTRODUCTION

2 stroke engines range is derived from 2 basic types of short-block.

a. SPLIT BLOCK ENGINES

This type of engines has a split crankcase and removable cylinder. The following engine types belong to these groups:

TA engines
(No longer in production). These engines are fitted with a deflector type piston. The deflector side must be fitted to exhaust side (see Fig. 6) and with monoblock cylinder and head, secured to crankcase by four nuts.
Lower main bearing and con-rod bearings bronz bushings.

VA engines
As above but with flat top piston and three ports, detachable cylinder and detachable cylinder head. Needle bearings through out.

AH 81 engines
As above but with flat top piston and three ports. Monoblock cylinder and head, ball bearing on pto-side of crankshaft, all other bearing needle bearings.

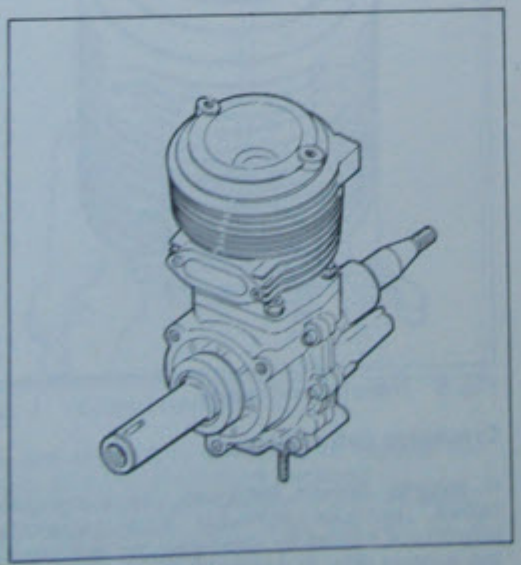


Fig. 1 Split block

b. UNIBLOCK ENGINES

This group comprises of types AV 520-AV 600-AV 750 and AV 125.

Cylinder and one half of the crankcase are one piece.
Magneto side of crankcase is removable, three port constructions.
Needle bearings throughout. (AV 520 - AV 600 AV 750)
AV 125 Ball bearing magneto side and needle bearings throughout.

Model AV 85 S - MV 100 S

Same as previous but reduced tolerances. Ball bearing on magneto side, bronze bearing throughout for reduced noise (except special execution).
All parts selective fitted.

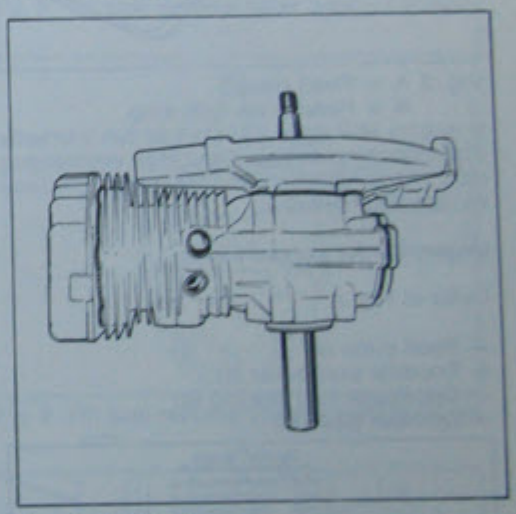


Fig. 2 Uniblock

2. SPLIT BLOCK ENGINES

Short-block for TA, VA and AH 81 are similar in construction. TA is dealt with below and the differences on VA and AH 81 are noted where necessary.

a. SHORT-BLOCK TA

Check mechanical parts as follows:

Engine lacks compression.

Remove spark plug and test compression with a gauge by cranking engine (see table for compression figures) or with spark plug fitted, test by pulling starter.

NOTE - Disconnect plug lead for this operation.

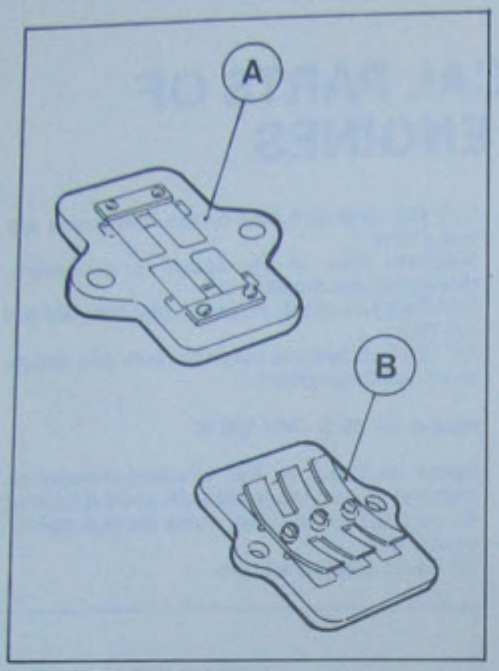


Fig. 3 A = Reed plate
B = Reed plate with stop

If engine still does not start or run correctly after checking as above and after overhauling carburettor, ignition and governor, proceed as detailed hereafter.

Inspection for pressure loss

Refer to Fig. 4.

— Reed plate (a)
— Transfer port cover (b)
— Crankcase half sealing (c)
— Cylinder Base (d)

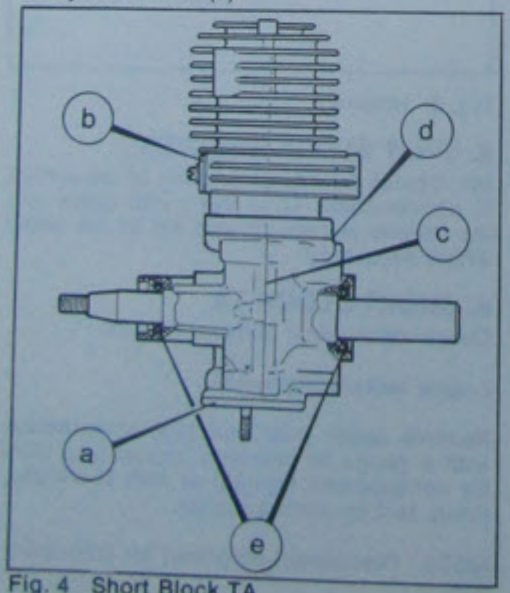


Fig. 4 Short Block TA

— Crankshaft seals (e)

Reed plate

The reed plate functions as an inlet valve and retains the crankcase compression on the down stroke of the piston, the reeds should be flat on the face of the plate within 0,13 mm or 0,005"), check for cracks or bent reeds, in case of a broken or damaged reed, it is necessary to change the complete reed.

Transfer port cover

Check the cover for leaks (see Fig. 5) the cover should be curved outwards to ensure a good seal when the securing screw are tightened, the gasket should be in good condition.

NOTE — The H.T. lead securing clip is located by one of the cover retaining screw and care shoul be taken to locate this in the correct position when the screws are tightened (see Fig. 5).

Cylinder base joint

If leakage occurs at this point, remove the four cylinder securing nuts, remove gasket, check faces and refit with new gasket.

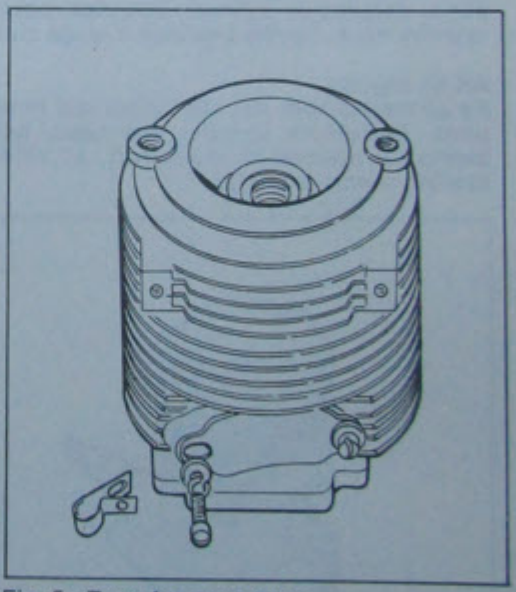


Fig. 5 Transfer port cover

Crankcase half sealing

If leaking occurs between the crankcase faces, remove cylinder and separate crankcase halves by removing the six securing screws (Fig. 6), taking care not to disturb or loose the main bearing needles. Refit as in «C».

NOTE — Use gasket cement only on parts not fitted with a gasket.

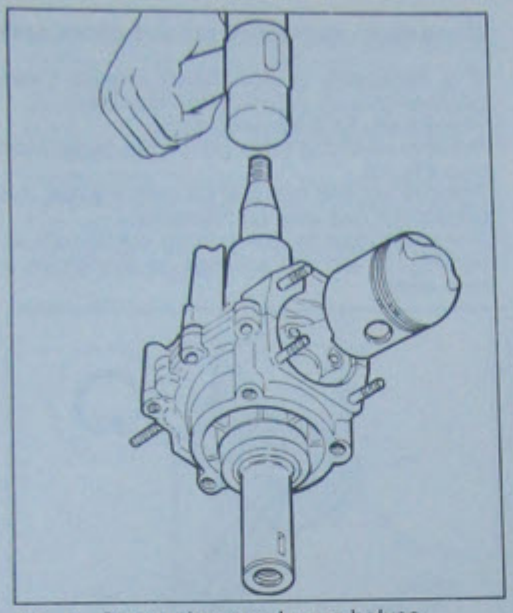


Fig. 6 Separating crankcase halves

Crankshaft seals

Visually check both crankshaft seals and replace if oil is apparent on the outside of the seal.

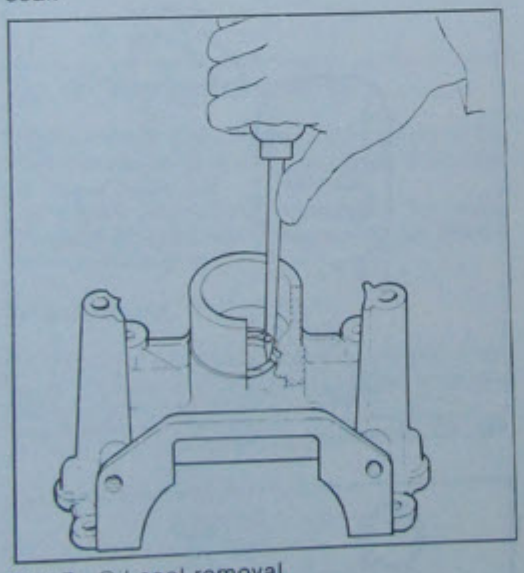


Fig. 7 Oil seal removal

On old types it is advisable to replace the seals with the crankshaft removed.
Remove the oil seal retainer ring and washer, then extract the seal with the aid of a screwdriver (see Fig. 7).

On later type engines, the crankshaft seals may be removed with the crakshaft in position with the aid of special tools «Q and O» for the p.t.o. side (Fig. 8) and tool «X» for the flywheel side (Fig. 9).

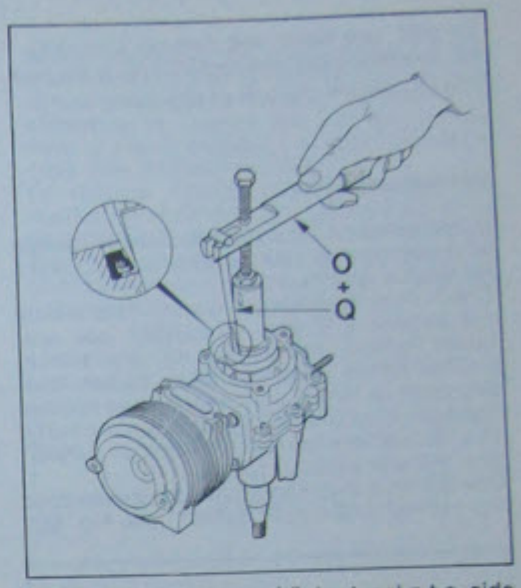


Fig. 8 Oil seal removal (later type) p.t.o. side

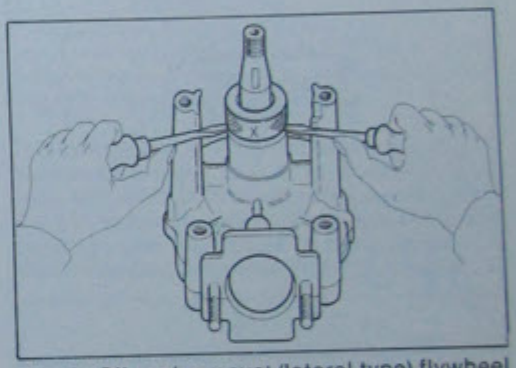


Fig. 9 Oil seal removal (lateral type) flywheel side

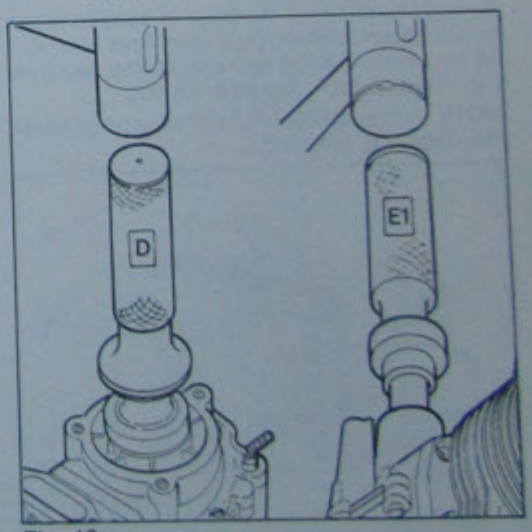


Fig. 10
Fitting oil seal D. (p.t.o. side)
Fitting oil seal E1 (flywheel side)

To refit new seals use special tool «E1» for flywheel side, and tool «C» for p.t.o. side. (Fig. 10 shows the use of the tools).

Internal inspection

If compression loss occurs after inspection of the foregoing, remove cylinder and check for scores, cracks, etc.
Check bore for wear and ovality. This should not exceed 0,10 mm or 0,0039" (see spe. table), remove connecting rod and piston, remove piston rings and clean carbon from ring grooves, check piston for scores or other damage, measure piston for wear or ovality; this should not exceed 0,05 mm or 0,0020" over the size given in table.
Check that piston ring groove clearance does not exceed 0,12 mm or 0.0047" (see Fig. 11).

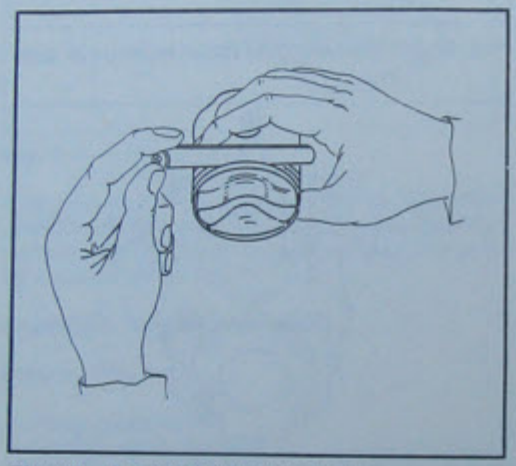


Fig. 11 Checking ring clearance

Renew the piston if the wear is outside these limits. Insert piston rings into bore to about 15 mm from the top and check ring gap (see Fig. 12 - see table for wear limits).

NOTE — It is advisable to fit new rings when the engine is stripped.

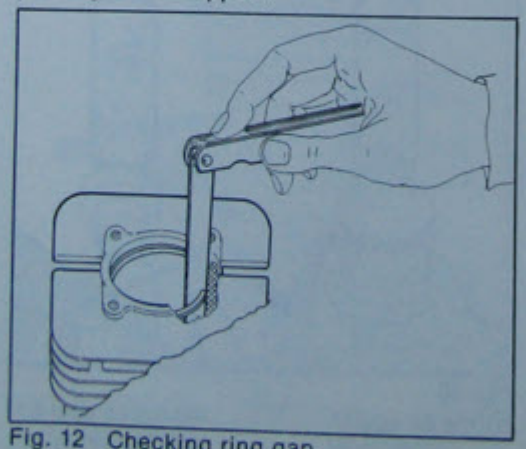


Fig. 12 Checking ring gap

Crankshaft - connecting rod and piston assy

It is necessary to completely remove these components for a complete inspection.
Proceeding as outlined before.
Remove retaining rings piston pin and piston (see Fig.13).
Remove big end cap and connecting rod, the crankshaft can now be inspected.
Check for truth by positioning crankshaft as per Fig. 14 (do not attempt to streighten a bent shaft).

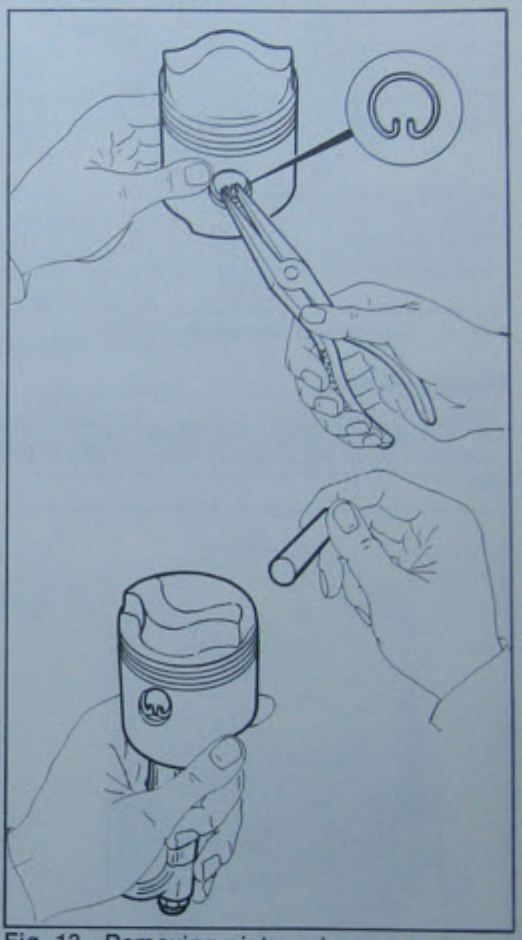


Fig. 13 Removing piston pin

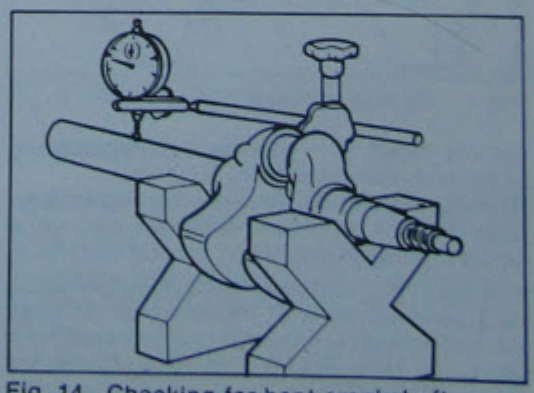


Fig. 14 Checking for bent crankshaft

Check crankshaft bearings for wear or ovality. This should not exceed 0,025 mm or 0.001" big ends, and 0,013 mm or 0.0005 mains; crankshaft with wear outside these limits should be replaced as undersized parts are not available.
Reassemble connecting rod onto crankshaft, matching alignment marks (on steel con-rods it is advisable to renew the needles if the engine has done a reasonable amount of work). See Fig. 15

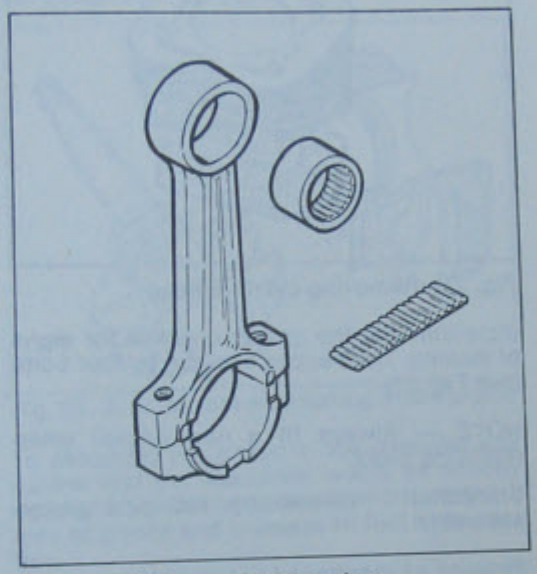


Fig. 15 Fitting needle bearing

Tighten the big end screws alternately. If big end clearance is excessive, replace con-rod or renew bearings.
Fit piston and check piston pin for wear. Replace pin and rod if necessary, or needle bearing if steel rod.

Main bearings

TA engines are fitted with an integral plain bush bearing at the p.t.o. side and a needle bearing at flywheel side (see Fig. 16)

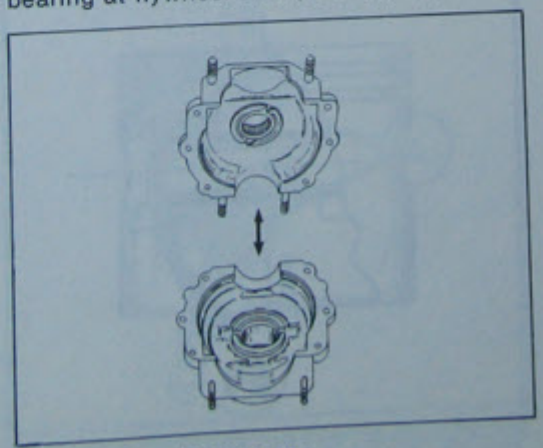


Fig. 16 Crankcase assy

Where crankshaft sizes are connect and play is still evident, it is necessary to change the needle bearings; on plain bearings it is necessary to change the crankcase if the wear or ovality exceeds the specified size by more than 0,05 mm or 0.0020".
To replace needle bearings remove the crankshaft seals and place crankcase halves on a hot plate and heat to about 200°C (see Fig. 17) and using some hand protection tap crankcase halves on to a metal base, the bearings should then fall out.

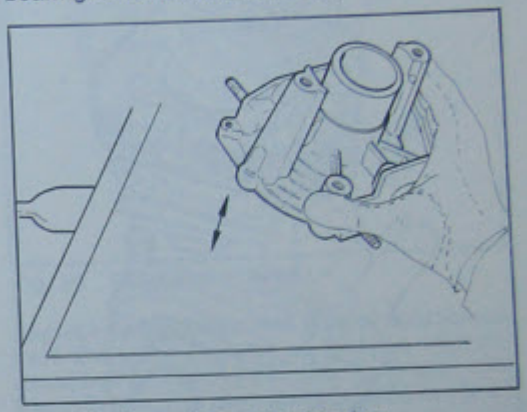


Fig. 17 Removing main bearing

If bearings are still tight, they can easily be removed by using special tool «M» for p.t.o. side and «N» for flywheel side (see Fig. 18).
To refit bearings, reheat crankcase and insert bearings with inscription to the outside.
Allow crankcase to cool and fit oil seals.

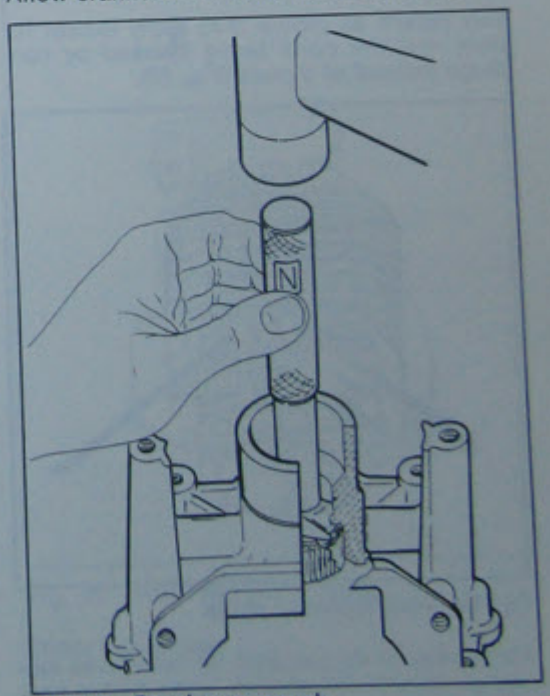


Fig. 18 Bearing removal:
Tool «N» for flywheel side
Tool «M» for p.t.o. side

b. SHORT-BLOCK VA

Engines derived from this type of short-block differ from type TA by the following features only:

— Twin transfer ports
— Detachable head
— Flat top piston
— Needle bearings throught

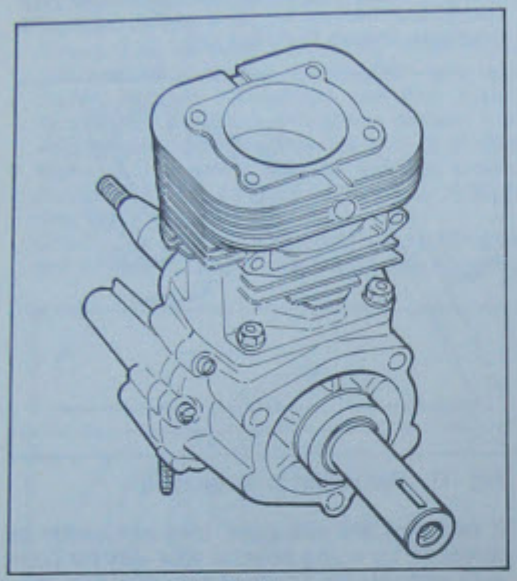


Fig. 19 Short Block VA

Outer inspection

The details as before (TA) apply except for item «b», the ports being blanked by core plugs instead of a plate (Fig. 20).

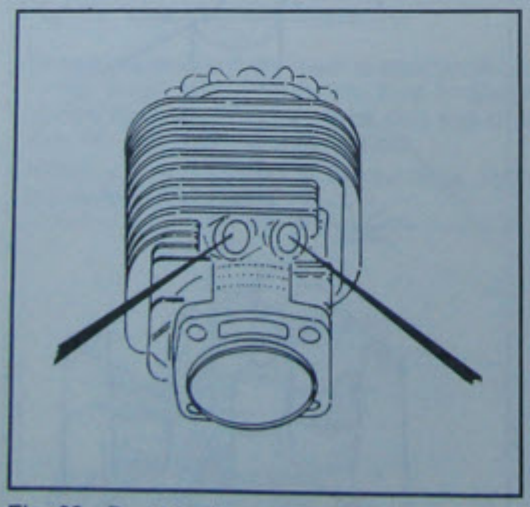


Fig. 20 Port blanking plugs

These should be checked for leaks; use loctite or cement for sealing when fitting new plugs.
When checking for compression loss the head should be removed and checked for distortion and the gasket checked for signs of leaking. The head is secured by four bolts (see Fig. 21).

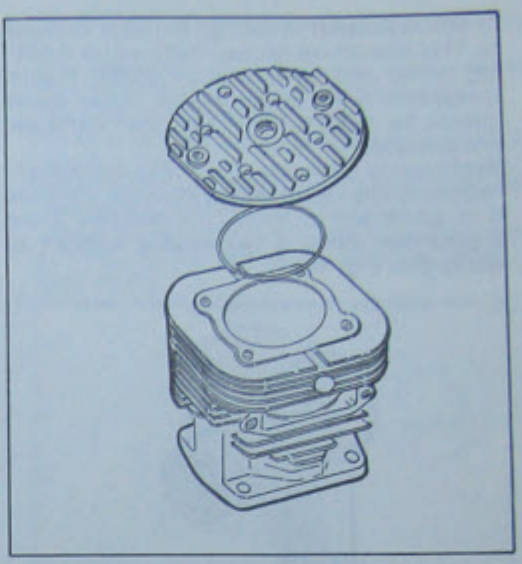


Fig. 21 Removing cylinder head

NOTE — Always fit a new gasket when raplacing head.

Crankshaft - connecting rod and piston assembly

Proceed as mentioned before (TA).

NOTE — Where this type of short block is fitted, needle bearings are fitted to both sides of the crankshaft.
The big end is fitted with loose needles «A» and the little end with a caged bearing «B» (Fig. 24).
The same wear tolearances as in chapter before (TA) apply.

Piston for VA engines

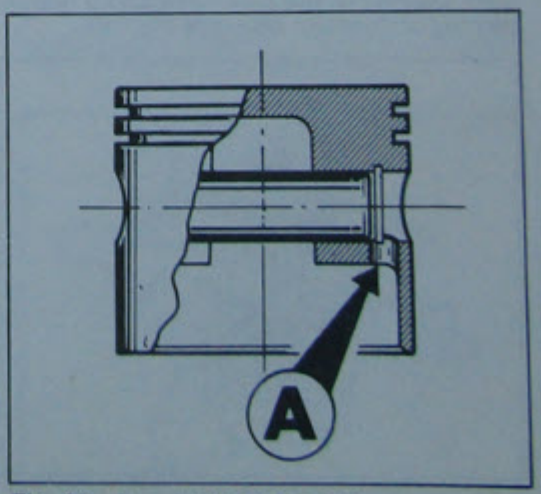


Fig. 22 A = Lubricating hole

To improve the lubrication between piston and cylinder on VA engines, Aspera has modified the piston by the introduction of a hole (A in Fig. 22 and 23).
This hole allows the direct passage of mixture from the crankcase to the piston-cylinder surfaces for a better lubrication of the piston skirt.

The hole of the piston must be assembled on the flywheel side (opposite to the exhaust port) (see A in Fig. 23).

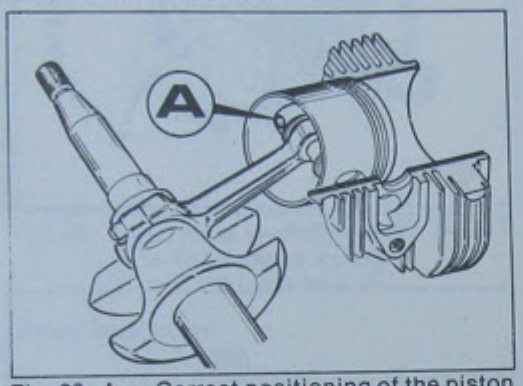


Fig. 23 A = Correct positioning of the piston

To assemble the piston in the opposite way means that the hole piston would be directly connected with the exhaust which means a loss of power and increase in fuel consumption.

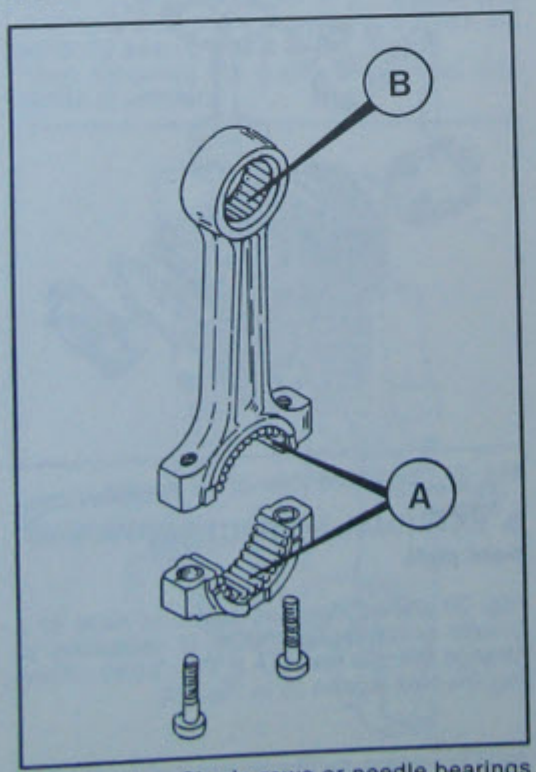


Fig. 24 A = Single rows or needle bearings
B = Caged needle bearings

c. SHORT-BLOCK AH 81

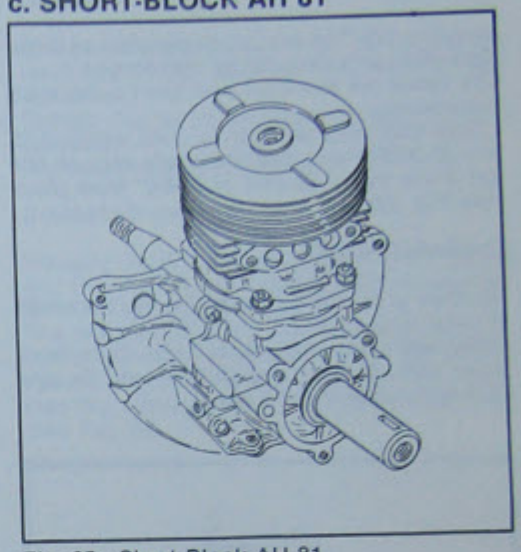


Fig. 25 Short Block AH 81

Engines derived from this type of short-block have the same features as type VA with the exception of the head which is integral with the cylinder. The reed plate is special for all types AH 81 (see Fig. 26).

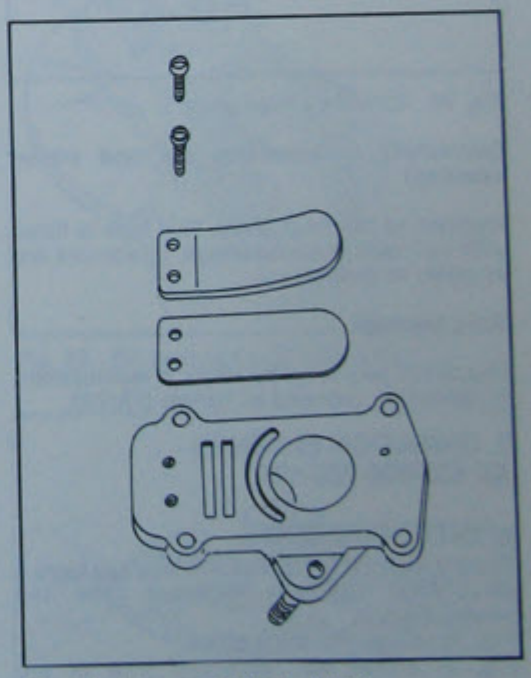


Fig. 26 Assy reed plate AH 81

Outer inspection

Proceed as before (TA-VA) with the exception or the cyl. transfer port cover and (A) reed plate and (B) crankshaft oil seals.

Reed Plate

(See Fig. 26). The reed plate consists of three separate parts secured by two screws.
The reeds are standard and can be replaced individually.
Check that reed lies flat to plate within 0,13 mm (0.0005") and that the blade stop is not set more than - 10 mm or 25/64" from plate (see Fig. 27).

Crankshaft seals

Remove crankshaft to replace flywheel side oil seal (Fig. 7 - TA).
Refit seal using special tool «B». To remove p.t.o. side oil seal, use tool «P and O» and refit with tools «I» and «A».

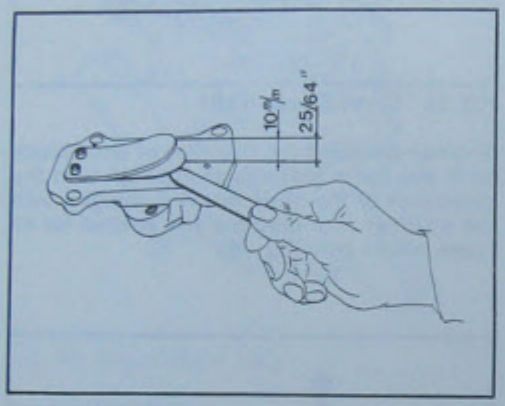


Fig. 27 Checking reed plate

Crankshaft - connecting rod and piston assembly

Proceed as before (TA/VA). This type is fitted with ball race main bearings, tolerances are as given in chapter.

Main bearings

Check ball race wear by «feel». If replacement is necessary proceed as before (TA/VA).

3. UNIBLOCK ENGINES - AV 520-600-750-125

a. INTRODUCTION

The AV 520 - 600 - 750 and 125 engines have a short-block basically different from the previous types.
Fig. 28 shows the short-block.
Fig. 29 shows an exploded view of the engine.
As may be seen the monoblock is compact (combined crankcase and cylinder) and it is sealed in the upper part by the shroud mounting base.
The bottom of the engine is sealed by the reed plate.

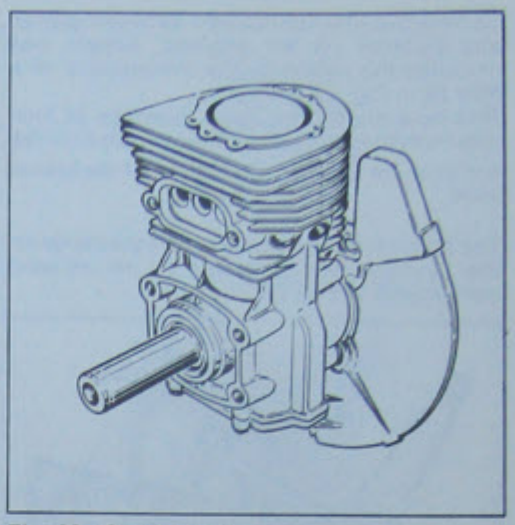


Fig. 28 Short-block

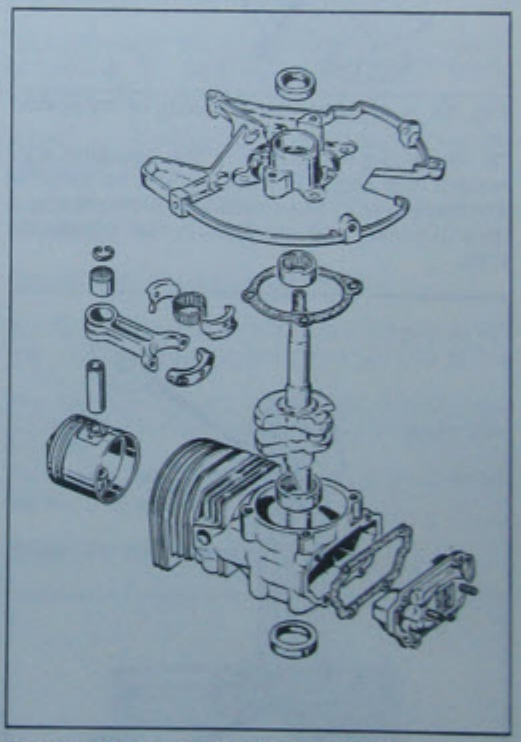


Fig. 29 Exploded view of AV engine

b. EXTERNAL INSPECTION

Reed plate

Fig. 30 shows the reed plate. In case of a broken or damaged reed it is necessary to change the two reeds (A in Fig. 30) by removing the two screws (B in Fig. 30).

NOTE — Use loctite or similar for sealing when fitting the two screws (B in fig. 30).

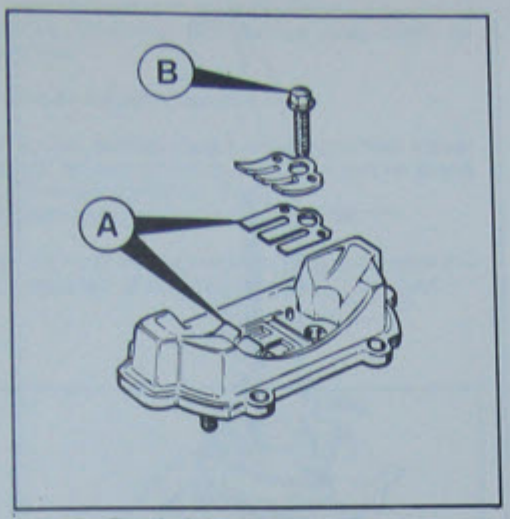


Fig. 30 Reed plate shows:
A = Reed plates spring
B = Reed plate screws

Seals inspection

Fig. 31 shows the points to which are fitted the gaskets and oil seals that must be always checked to ensure good running of the engine.
On a 2 stroke engine all the seals are very important for good running.

NOTE — On a short block N. 5 it is important to ensure that the 4 transfer port plugs are perfectly sealed (see A in Fig. 31).
When replacing the 4 core plugs, seal with loctite or similar.

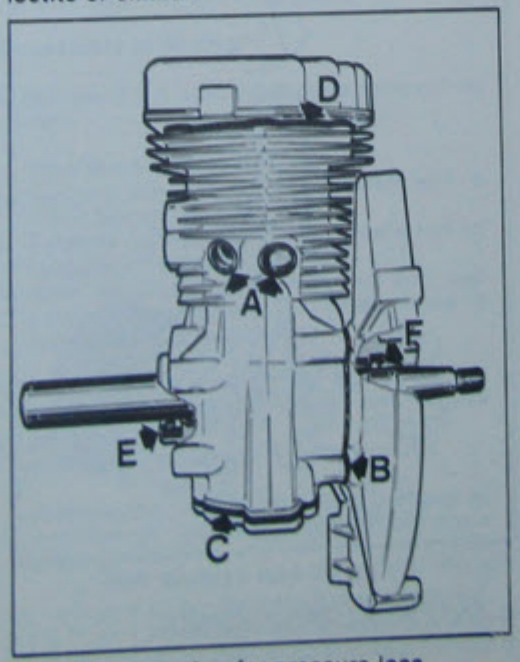


Fig. 31 Inspection for pressure loss

Gaskets

Gaskets fitted to points B - C - D (see Fig. 31) must be fitted without the aid of any adhesive.
Grease may be used every time the engine is stripped.
Replace the above gaskets.

Crankshaft seals

Visually check both crankshaft seals (see E and F in Fig. 31) 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 tools «O» and «Q» for the p.t.o. side (see Fig. 32) and tool «X» for the flywheel side (see Fig. 33).

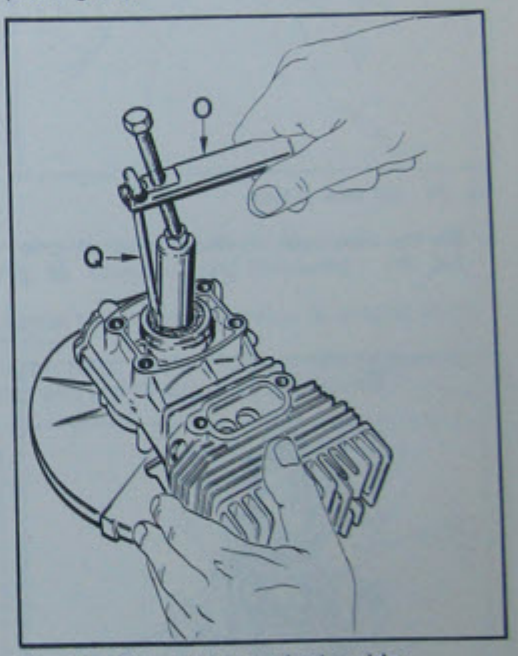


Fig. 32 Oil seal removal p.t.o side

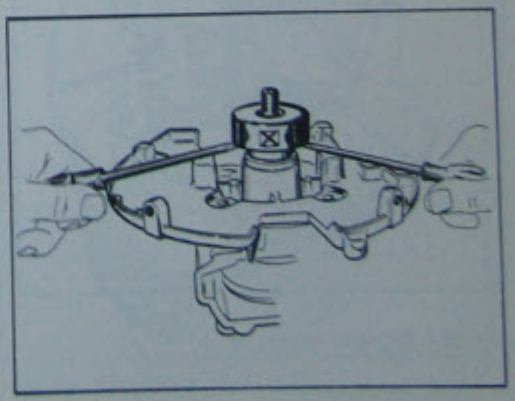


Fig. 33 Oil seal removal flywheel side

To refit new seals p.t.o. side proceed as follows:

— Place tool «H» on the seal (see Fig. 34).

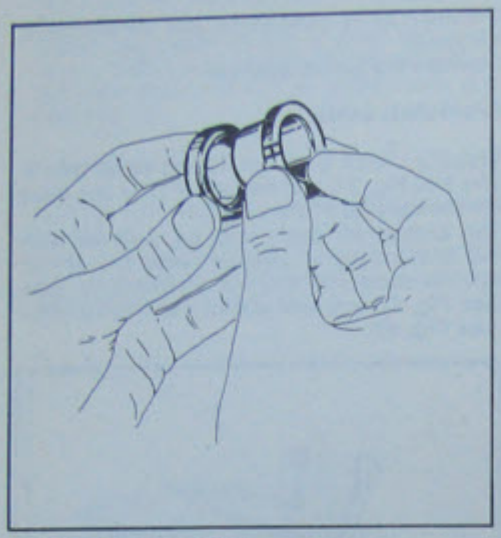


Fig. 34 Oil seal sleeve

— Fit the new seal on the crankshaft (see Fig. 35).

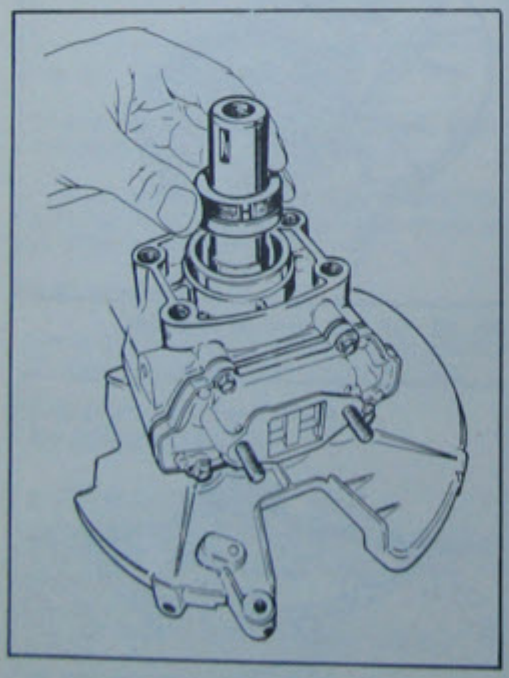


Fig. 35 Oil seal sleeve H

— Remove tool «H».
— Fit the oil seal in its seat with special tool «D» (see Fig. 36).

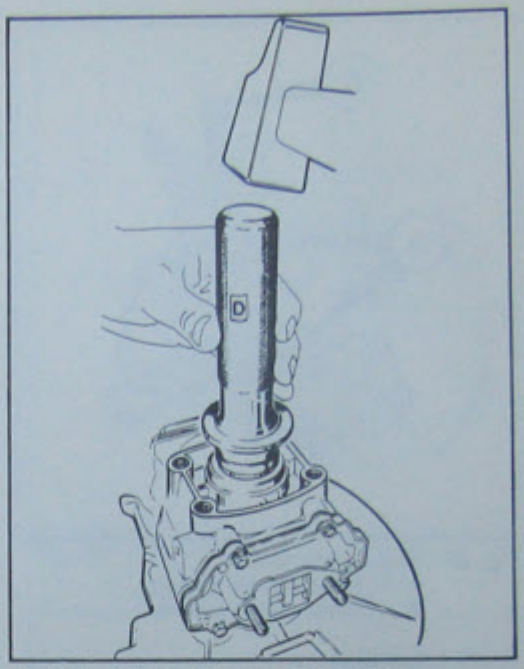


Fig. 36 Fitting oil seal p.t.o. side

To refit oil seal flywheel side proceed as follows:

— Place the oil seal in position ensuring that same is not damaged by the keyway slot (see Fig. 37).
— Then finally seat with tool "E/1"

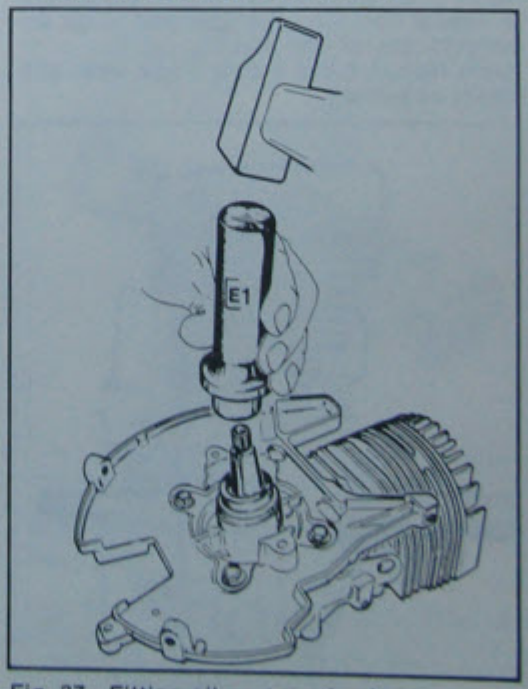


Fig. 37 Fitting oil seal flywheel side

c. INTERNAL INSPECTION

If compression loss occurs after inspection

of the foregoing, remove 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 (see Fig. 38).

NOTE — During disassembling, take care the 27 needles of the bearing do not get lost.

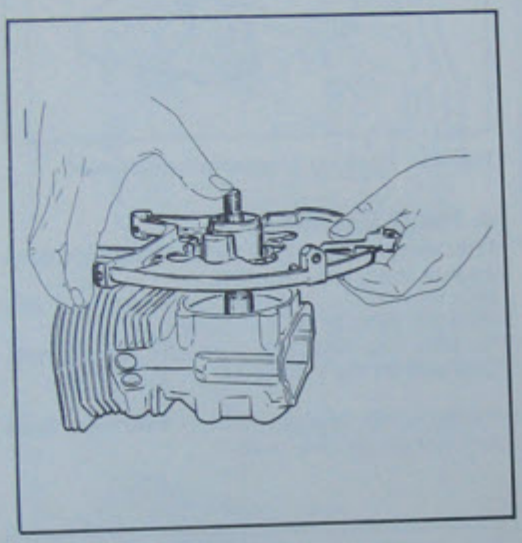


Fig. 38 Removal of shroud base

Reassemble of engine

At this point the con-rod may be removed as follows:

— Turn the piston to BDC
— Remove the two con-rod screws with a 3-16" hexagonal head key
— Remove big end cap taking care not to lose the 37 needles
— After having removed the bid 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 con-rod.

— 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 that piston ring groove clearance does not exceed 0.12 mm or 0.0047" (see Fig. 39).

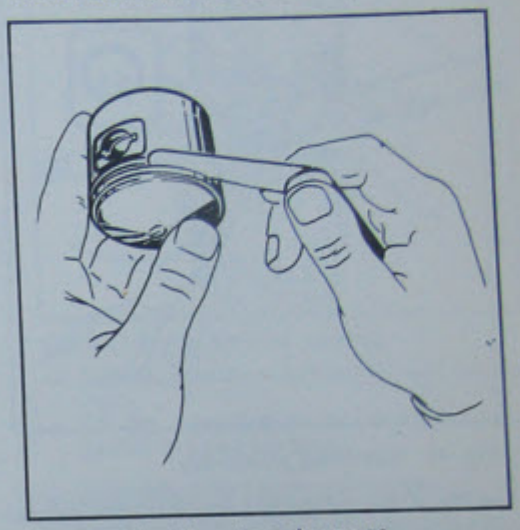


Fig. 39 Checking ring clearance

Renew the piston if the wear is outside these limits.
Insert rings into bore about 15 mm from the top and check ring gap (see Fig. 40).

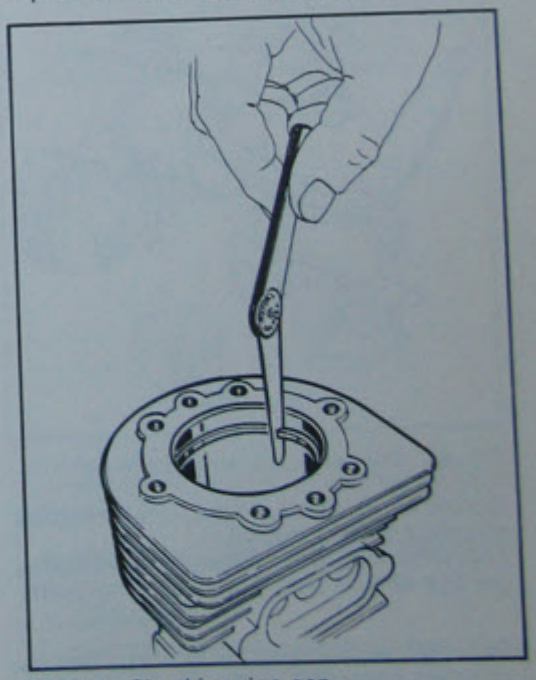


Fig. 40 Checking ring gap

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

To replace the piston take off the two retaining rings (see Fig. 41).

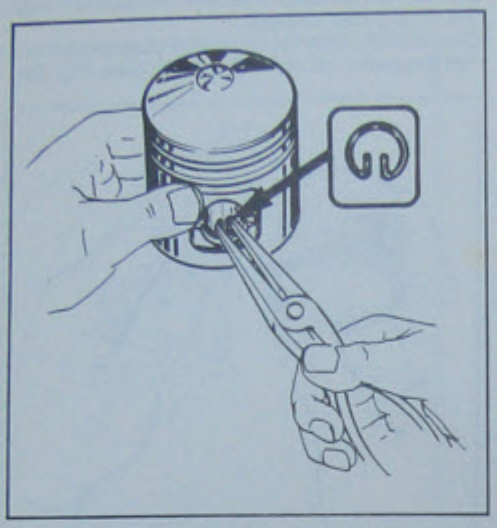


Fig. 41 Removing piston pin

NOTE — The piston has a hole on the piston pin boss (see Fig. 42).

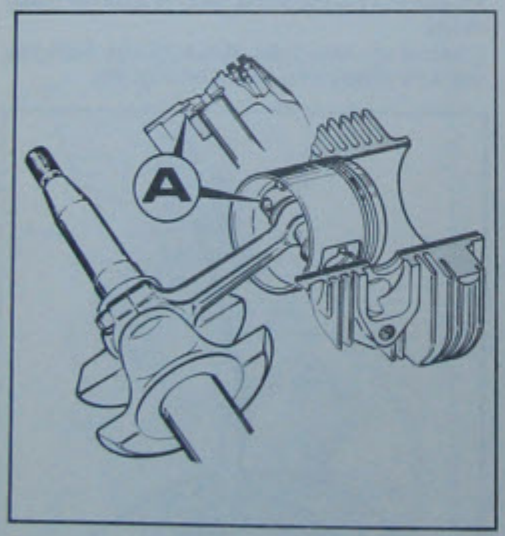


Fig. 42 Correct positioning of the piston

Ensure that this hole is fitted to flywheel side (opposite to the exhaust).
Check for truth by positioning crankshaft as per Fig. 43 to ensure that same is not bent.

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 or 0.0005" mains and 0.025 mm or 0.001" big ends.

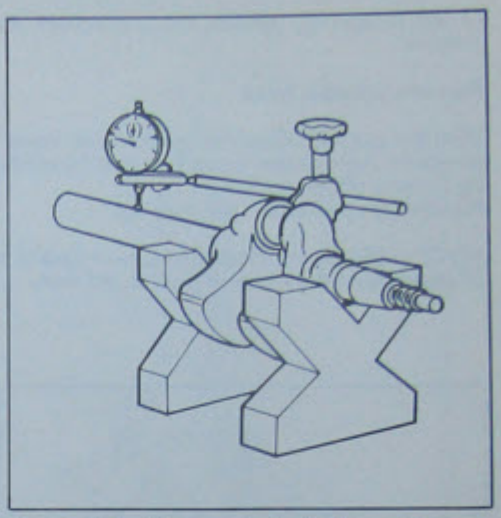


Fig. 43 Cheking crankshaft alignment

d. MAIN BEARING

The needle bearings can be replaced using Aspera tools (see Fig. 44).
Use tool «N» for flywheel side and tool «M» for p.t.o. side to remove bearings.
To refit bearings use tool «A» for flywheel side and tool«E1» for p.t.o. side.

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

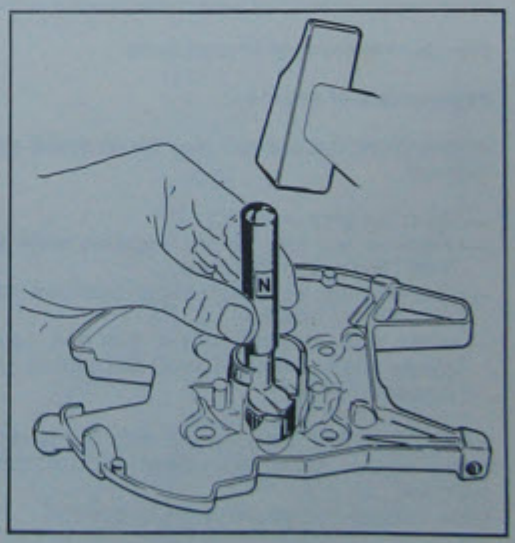


Fig. 44 Bearing removal

Reassemble of engine

— After having assembled the piston on the con-rod ensure that the half bearing matches with the other steel half bearing shelf which must be inserted on the con-rod cap.

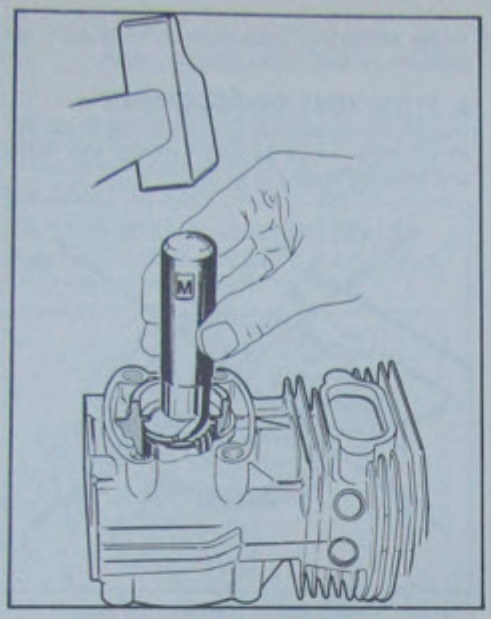


Fig. 45

Also ensure that the two bearing shells are correctly located. Ensure that the alignment marks on the con-rod cap and con-rod are matched.

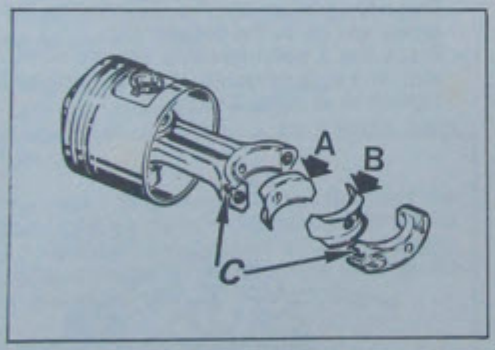


Fig. 46 Steel bearing shell

— Fit the crankshaft protecting the oil seal with Aspera tool «H».
— Fit the piston con-rod assembly ensuring that hole on the piston pin seat is on the flywheel side (opposite to the exhaust).
— Place the cylinder-piston-con-rod crankshaft block on a plane (as shown in Fig. 47) and turn piston to BDC.
— Fit the 37 needles around crank pin leaving some tolerance between con-rod and crankshaft.
— Fit the con-rod 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.

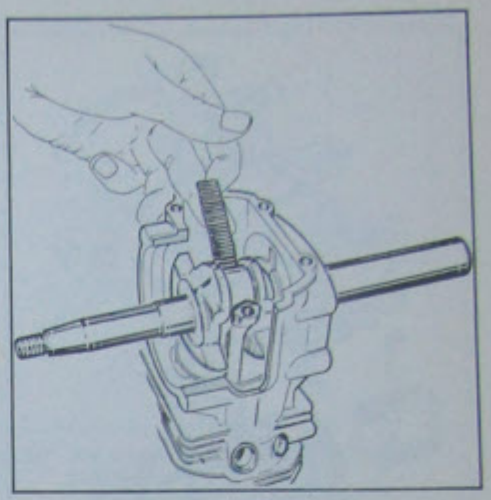


Fig. 47 Fitting needles bearing

— Tighten con-rod according to torque limits.
— Fit the shroud base ensuring that the gasket is fitted correctly.

e. OVERSIZED PISTONS FOR 2 STROKE ENGINES

As in all engine production Aspera 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.
The drawing (Fig. 48) shows location of these marks on 2 stroke engine components.

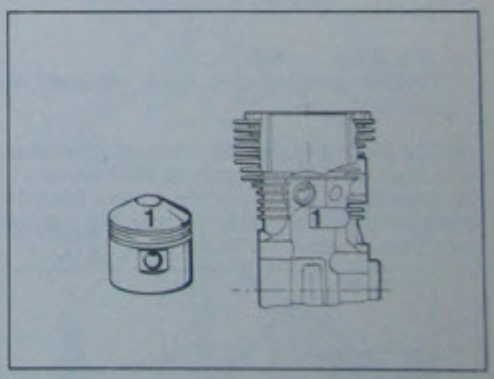


Fig. 48

4. UNIBLOCK ENGINES - MV100S

a. GENERAL

In order to reduce the noise some mechanical parts have been modified.
The MV 85 S and MV 100 S engines are fitted with bearings different from those of AV 520 and AV 600 (see Fig. 49).

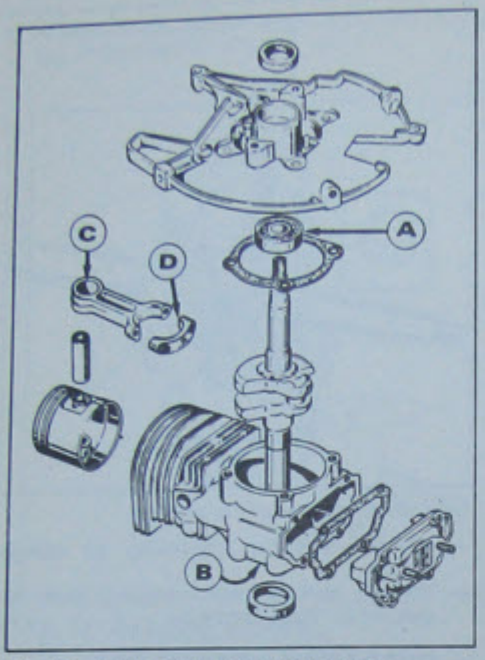


Fig. 49 Exploded view of MV engine

— Crankshaft - air shroud base top bearing
Needle bearing has been replaced by ball bearing

— Crankshaft - bottom bearing
Needle bearing has been replaced by bushing

— Piston pin - con-rod
Needle bearing has been replaced by bushing

— Crank pin - con-rod
Needle bearing has been replaced by bushing

Ball bearing (A in Fig. 49) prevents crankshaft end float as the bearing is an interferance fit on crankshaft and into shroud base. Also the diameters of the parts as per Fig. 50 are selective fitted.

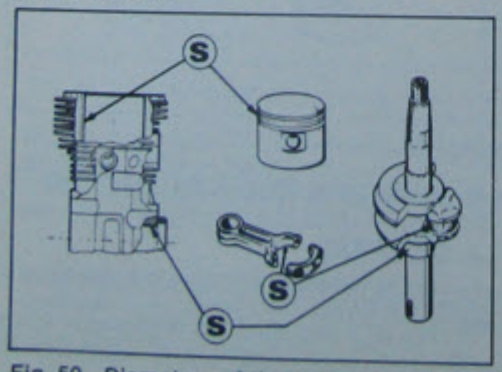


Fig. 50 Diameters of the selected parts

These selections have considerably reduced clearances and consequently noise.

b. FLYWHEEL DISASSEMBLY

The standard method of flywheel removal used on other engines can damage the balls and bearing tracks (Fig. 51).

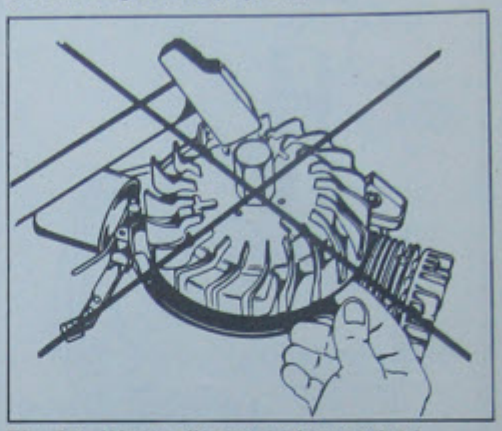


Fig. 51 Wrong dissassembly method

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 as per Fig. 52 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.

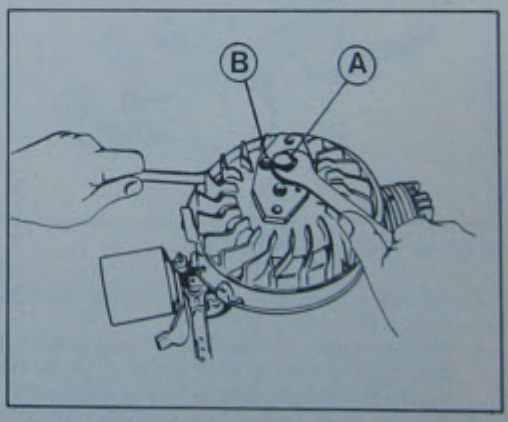


Fig. 52 Correct disassembly using tool K/1

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 and the 11/16 wrench the centre bolt can now be tightened (A). In this way the flywheel can be removed (see Fig. 52).

For reassembling the flywheel, proceed as usual.

NOTE — Subsequent removal
In this case 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 fitted to the cylinders (see Fig. 53).

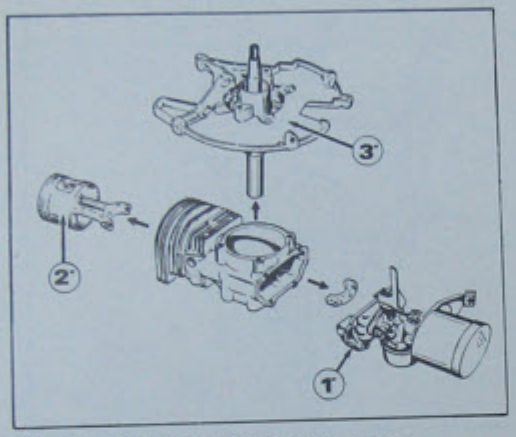


Fig. 53 Main engine block groups

In order to disassembly these groups, proceed as per Fig. 53.

1) Reed valve - carburattor group
2) Con-rod - piston pin group
3) Crankshaft - bearing - air shroud base group

If the repair concerns only the first and the second groups do not disassemble the third set (crankshaft-bearing and air shroud base). In case of repair concerning the third group proceed as follows:

Air shroud base disassembling

Remove external parts (air shroud, flywheel, ignition system), then unscrew the 4 screws fixing the base (see A in Fig. 54).
On silent engines the air shroud base cannot be easily removed as it is fixed by the ball bearing.

— For removing use the tool K/1 with the relevant bolts (see B in Fig. 54).

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. 54).
With an 11/16 wrench tighten centre bolt and pull off base.

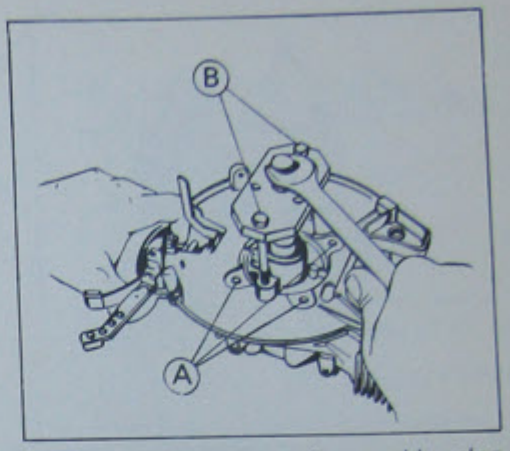


Fig. 54 Air shroud base disassembly using tool K/1

— Remove the sealing ring of the base as shown in Fig. 33 by using tool «X».
The bearing will remain on the crankshaft.

Air shroud base assembly

Assembly should be made only after expanding the base.
— Place the sealing ring on the cylinder.
— Heat the air-shroud base by immersing in oil or water at a temperature of about 80° - 100°C (Fig. 55).

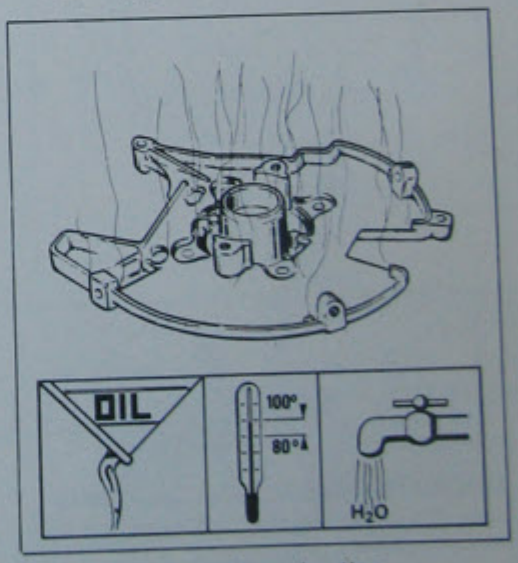


Fig. 55 Air shroud base heating

— Place the base on the bearing and press into position until it completely lies on the cylinder.

NOTE — After fitting, the air shroud base should be perfectly horizontal to the cylinder (Fig. 56). Otherwise the bearing seat and the fit could be damaged.

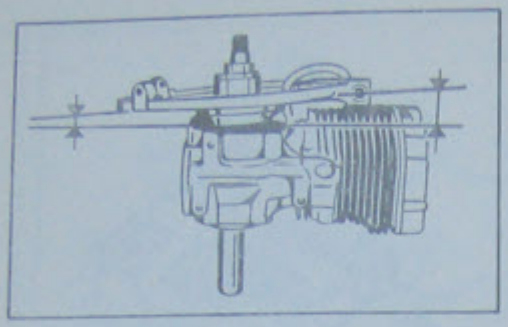


Fig. 56 Wrong assembly

Fit the 4 securing bolts.

If 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 AV 520 - 600 - 750 engines.

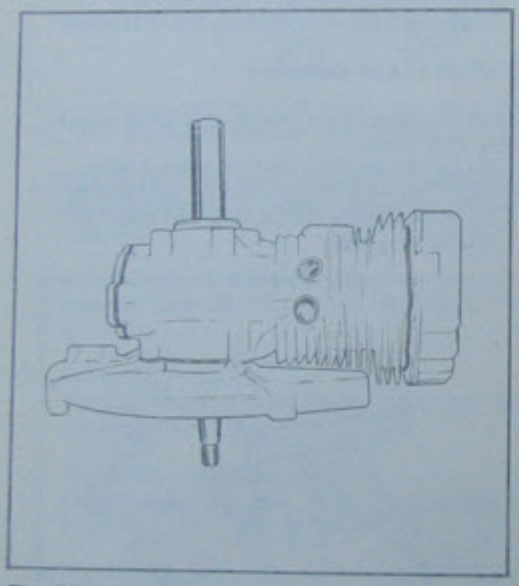


Fig. 57

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

d. OPERATIONS ON BALL BEARING

In case of bearing replacement, remove it by means of a puller.

NOTE — The removed ball bearing cannot be used again.

Bearing assembly

Throughly clean the bearing and the crankshaft seat.
Hold the crankshaft in the vice as per Fig. 58 and by using the tool "E/1" fit the bearing.

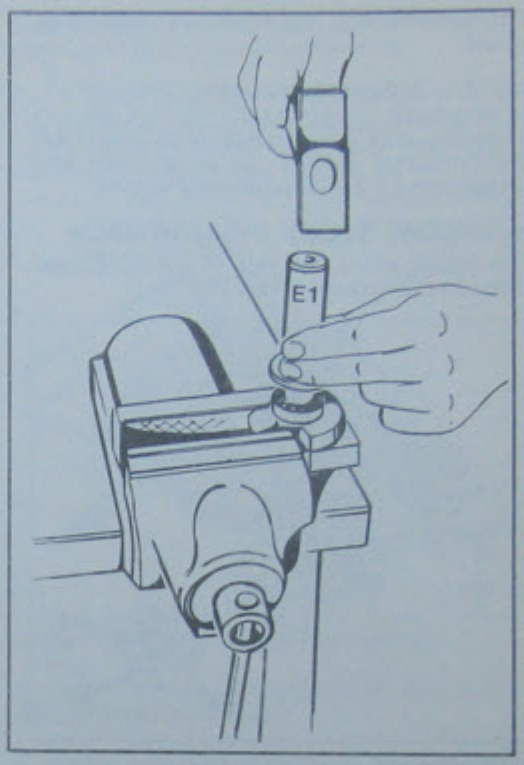


Fig. 58 Placing the bearing

e. SPARE PARTS

Owing to the mechanical parts selections, in case of replacement of these parts it is very difficult to maintain the original clearances. If complete silence is required the only possibility is to replace the short-block (Fig. 59).

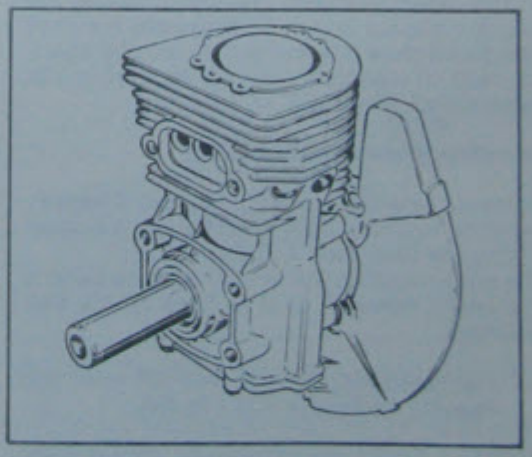


Fig. 59 Short-block

If separate parts are fitted a completely silent engine cannot be guaranteed, although such parts are available upon request.

HIGH R.P.M. MV 100 S
To enable engine operation at high r.p.m. a special version of the MV 100 S has been produced. This engine is identified as follows: MV 100 S P.T.O. side.
a) FIRST VERSION - **Temporary - Crankshaft mounted on ball races top and bottom with needle bearings on connecting rod (see Fig.)**

Crankshaft and cylinder
The bottom main bearing is an interference fit both on the crankshaft and into the cylinder.
The top main bearing is free fitting on the crankshaft and an interference fit into the shroud base.

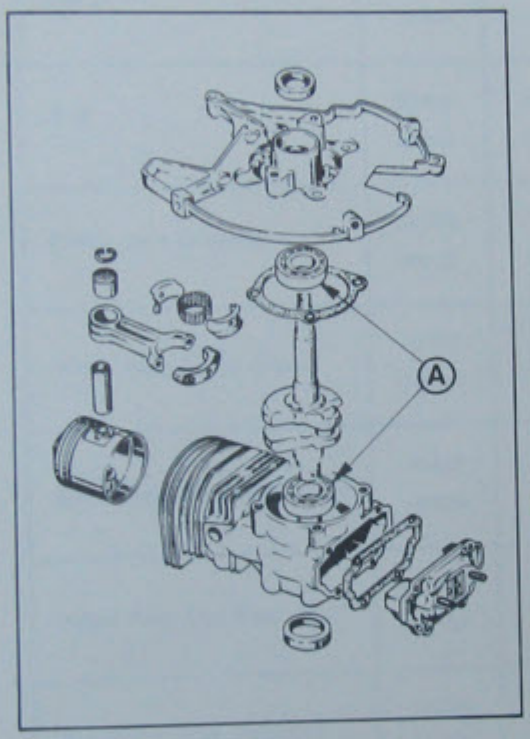


Fig. 60 Exploded view
A = ball bearings

Removing and refitting the crankshaft
After removing the four shroud base securing screws, the base and bearing may be removed without the use of a puller (see Fig. 61).

In order to remove or replace the bearing the shroud base must be pre-heated to 80/100° C. chapter F paragraph 4-c

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.

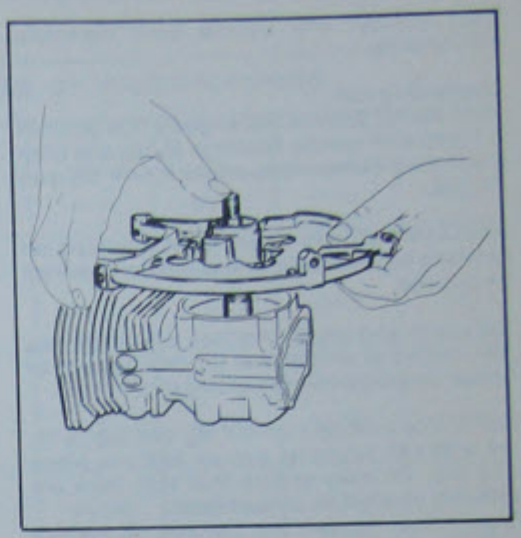


Fig. 61

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

Support the shaft as in Fig. 62

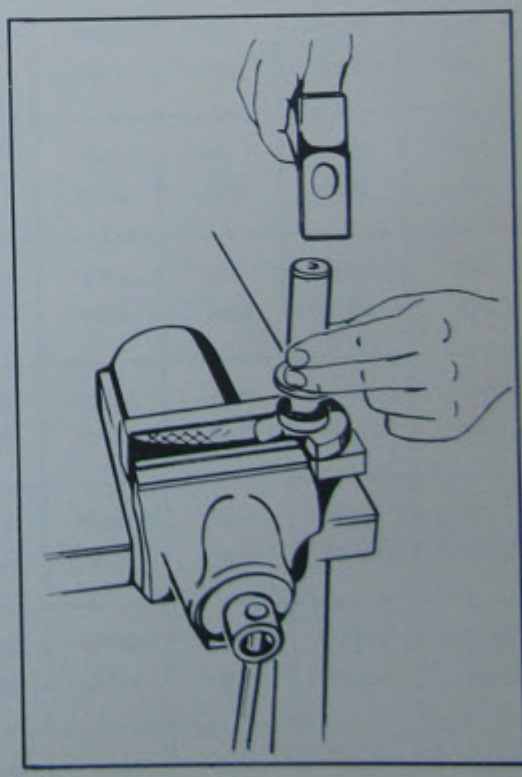


Fig. 62

Heat cylinder and replace shaft complete with bearing.

Connecting rod
As in the AV 520 and 600 engines, the con-rod is fitted with needle bearings at big and little end; fitting instructions are as for AV 520 and AV 600.

b) SECOND VERSION - **Crankshaft mounted on ball race top and bottom and bronze bearings on con-rod**

The crank and crank bearings will remain as previously but with bronze bushes in place of needle bearings on connecting rod.

NOTE: The bushed con-rod 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:

N x m	6,8 - 7,4
Kg x m	0,7 - 0,75
Inch/lbs	60 - 67

2 STROKE ENGINES - TABLE OF SPECIFICATIONS

	AH 47 - AV 47		AH 58		AH 81	
	m/m	inch.	m/m	inch.	m/m	inch.
Displacement	cm^3 77	cu.in. 4.7	cm^3 95,14	cu.in. 5.8	cm^3 130,8	cu.in 7.98
Stroke	38,252 37,948	1.506 1.494	42,840 42,534	1.6867 1.6746	41,428 41,122	1.631 1.619
Bore	50,825 50,800	2.001 2.000	53,188 53,162	2.094 2.093	63,589 63,563	2.5429 2.5419
Piston Skirt Diameter	50,675 50,668	1.995 1.9948	53,043 53,035	.0883 .088	63,436 63,429	2.4975 2.4972
Width Piston Ring Groove	2,476 2,451	.0975 .0965	1,689 1,664	.0665 .0655	1,689 1,664	.0665 .0655
Side Clearance Ring Groove	0,127 0,089	.005 .0035	0,127 0,077	.005 .0035	0,127 0,077	.005 .003
Piston Ring End Gap	0,279 0,152	.011 .006	0,279 0,152	.011 .006	0,330 0,127	.011 .006
Piston Pin Hole Diameter	12,700 12,695	.500 .4998	12,700 12,695	.500 .4998	12,700 12,695	.500 .4998
Piston Pin Diameter	12,697 12,692	.4999 .4997	12,697 12,692	.4999 .4997	12,697 12,692	.4999 .4997
Connecting Rod Diameter Crankshaft End	17,638 17,630	.6944 .6941	23,904 23,891	.9411 .9406	23,904 23,891	.9411 .9406
Connecting Rod Small End Bearing inside diameter	12,746 12,712	5018 .5005	12,746 12,712	.5018 .5005	12,746 12,712	.5018 .5005
Connecting Rod needle diam. No. of needles	1,664 1,659 N° 30	.0655 .0653	2,400 2,395 N° 56	.0945 .0943	2,400 2,395 N° 56	.0945 .0943

tecnamotor spa

2 STROKE ENGINES - TABLE OF SPECIFICATIONS

	AH 47 - AV 47		AH 58		AH 81	
	m/m	inch.	m/m	inch.	m/m	inch.
Crankshaft journal crankpin	14,270 14,262	.5618 .5615	19,055 19,047	.7502 .7499	19,055 19,047	.7502 .7499
Crankshaft Main bearing journal dia. (P.T.O. side)	17,003 16,993	.6694 .669	17,003 16,993	.6694 .669	20,002 19,992	.7875 .7871
Crankshaft Main bearing journal dia. (flywheel side)	17,003 16,993	.6694 .669	17,003 16,993	.6694 .669	19,053 19,045	.7501 .7498
Crankshaft End play	0,56 0,23	.022 .009	0,56 0,23	.022 .009	0,56 0,23	.022 .009
Main bearing Housing diameter (flywheel side)	39,941 39,924	1.5725 1.5708	39,941 39,924	1.5725 1.5708	25,380 25,362	.9992 .9985
Main bearing Housing diameter (P.T.O. side)	39,941 39,924	1.5725 1.5708	39,941 39,924	1.5725 1.5708	46,942 46,929	1.8481 1.8476
Main bearing inside diameter (P.T.O. side)	Ball Bearing 17 RIV 01A	Ball Bearing 17 RIV 01A	Ball Bearing 17 RIV 01A	Ball Bearing 17 RIV 01A	Ball Bearing 20 RIV1A Car53	Ball Bearing 20 RIV1A Car53
Main bearing inside diameter (flywheel side)	Ball Bearing 17 RIV 01A	Ball Bearing 17 RIV 01A	Ball Bearing 17 RIV 01A	Ball Bearing 17 RIV 01A	Needle Bearing 19.078 19.062	Needle Bearing 0.7511 .7505
Thread crankshaft flywheel side		7/16 20 UNF 3 A		7/16 20 UNF 3 A		7/16 20 UNF 3 A
Compression pressure at cranking speeds	5,6 ÷ 6,3 kg/cm²	80 ÷ 90 psi	5,6 ÷ 6,3 kg/cm²	80 ÷ 90 psi	6,3 ÷ 7 kg/cm²	90 ÷ 99 psi

2 STROKE ENGINES - TABLE OF SPECIFICATIONS

	V51 - TA		H51 - TH		VA - VH	
	m/m	inch.	m/m	inch.	m/m	inch.
Displacement	cm^3 83,7	cu.in. 5.1	cm^3 83,7	cu.in. 5.1	cm^3 95	cu.in. 5.8
Stroke	41,098 41,402	1.618 1.630	41,098 41,402	1.618 1.630	42,840 42,534	1.687 1.675
Bore	50,825 50,800	2.001 2.000	50,825 50,800	2.001 2.000	53,188 53,162	2.094 2.093
Piston Skirt Diameter	50,675 50,668	1.995 1.9948	50,675 50,668	1.995 1.9948	53,043 53,035	2.0882 2.088
Width Piston ring Groove	2,476 2,451	.0975 .0965	2,476 2,451	.0975 .0965	1,689 1,664	.0665 .0655
Side Clearance Ring Groove	0,127 0,089	.005 .0035	0,127 0,089	.005 .0035	0,127 0,077	.005 .003
Piston Ring End Gap	0,279 0,152	.011 .006	0,279 0,152	.011 .006	0,279 0,152	.011 .006
Piston Pin Hole Diameter	12,700 12,695	.500 .4998	12,700 12,695	.500 .4998	12,700 12,695	.500 .4998
Piston Pin Diameter	12,697 12,692	.4999 .4997	12,697 12,692	.4999 .4997	12,697 12,692	.4999 .4997
Connecting Rod Diameter Crankshaft End	17,46 17,45	.6885 .688	17,46 17,45	.6885 .688	23,891 23,904	.9406 .9412
Connecting Rod Small End Bush Diameter	12,720 12,711	.5008 .5004	12,720 12,711	.5008 .5004	12,746 12,712	.5018 .5005
Connecting Rod needle dia. No. of needles					2,400 2,395 N° 28	.0945 .0943 N° 28

2 STROKE ENGINES - TABLE OF SPECIFICATIONS

	V51 - TA		H51 - TH		VA - VH	
	m/m	inch.	m/m	inch.	m/m	inch.
Displacement	cm^3 83,7	cu.in. 5.1	cm^3 83,7	cu.in. 5.1	cm^3 95	cu.in. 5.8
Stroke	41,098 41,402	1.618 1.630	41,098 41,402	1.618 1.630	42,840 42,534	1.687 1.675
Bore	50,825 50,800	2.001 2.000	50,825 50,800	2.001 2.000	53,188 53,162	2.094 2.093
Piston Skirt Diameter	50,675 50,668	1.995 1.9948	50,675 50,668	1.995 1.9948	53,043 53,035	2.0882 2.088
Width Piston ring Groove	2,476 2,451	.0975 .0965	2,476 2,451	.0975 .0965	1,689 1,664	.0665 .0655
Side Clearance Ring Groove	0,127 0,089	.005 .0035	0,127 0,089	.005 .0035	0,127 0,077	.005 .003
Piston Ring End Gap	0,279 0,152	.011 .006	0,279 0,152	.011 .006	0,279 0,152	.011 .006
Piston Pin Hole Diameter	12,700 12,695	.500 .4998	12,700 12,695	.500 .4998	12,700 12,695	.500 .4998
Piston Pin Diameter	12,697 12,692	.4999 .4997	12,697 12,692	.4999 .4997	12,697 12,692	.4999 .4997
Connecting Rod Diameter Crankshaft End	17,46 17,45	.6885 .688	17,46 17,45	.6885 .688	23,891 23,904	.9406 .9412
Connecting Rod Small End Bush Diameter	12,720 12,711	.5008 .5004	12,720 12,711	.5008 .5004	12,746 12,712	.5018 .5005
Connecting Rod needle dia. No. of needles					2,400 2,395 N° 28	.0945 .0943 N° 28

tecnamotor spa

2 STROKE ENGINES - TABLE OF SPECIFICATIONS

	V51 - TA		H51 - TH		VA - VH	
	m/m	inch.	m/m	inch.	m/m	inch.
Crankshaft journal crankpin	17,437 17,424	.6865 .686	17,437 17,424	.6865 .686	19,053 19,045	.7505 .7498
Crankshaft main bearing journal dia. (P.T.O. side)	25,400 25,387	1.000 .9995	25,400 25,387	1.000 .9995	25,400 25,387	1.000 .9995
Crankshaft main bearing journal dia. (flywheel side)	19,063 19,050	.7505 .750	19,063 19,050	.7505 .750	19,063 19,050	.7505 .750
Crankshaft End Play	0,56 0,23	.022 .009	0,56 0,23	.022 .009	0,56 0,23	.022 .009
Main bearing Housing Diameter (flywheel side)	25,380 25,362	.9992 .9985	25,380 25,362	.9992 .9985	25,380 25,362	.9992 .9985
Main bearing Housing Diameter (P.T.O. side)	25,476 25,425	1.003 1.001	33,297 33,315	1.3109 1.3116	33,315 33,297	1.3116 1.3109
Main bearing inside Diameter (flywheel side) No. of needles	19,078 19,062 28	.7511 .7505	19,078 19,062 28	.7511 .7505	19,078 19,062 28	.7511 .7501
Main bearing inside Diameter (P.T.O. side) No. of needles	25,476 25,525	1.003 1.001	25,400 25,416 N° 28	1.000 1.0006 N° 28	25 400 25,416 N° 28	1.000 1.0006 N° 28
Thread crankshaft (flywheel side)		7/16 20 UNF 3 A		7/16 20 UNF 3 A		7/16 20 UNF 3 A
Compression pressure at cranking speed	5,6 ÷ 6,3 kg/cm²	80 ÷ 90 psi	5,6 ÷ 6,3 kg/cm²	80 ÷ 90 psi	5,6 ÷ 6,3 kg/cm²	80 ÷ 90 psi

2 STROKE ENGINES - Table of specification

DENOMINATION	ZH					
	mm.	inch.				
Displecement	cm³ 66	cu.in. 4				
Stroke	38.8	1.190				
Bore	50.8	2.000				
Piston skirt Diameter	50.675 50.688	1.995 1.9948				
Width Piston ring Groove	1.689 1.664	.0665 .0655				
Side Clearance Ring Groove	0.127 0.077	0.005 0.003				
Piston Ring End Gap	0.273 0.152	.0107 .006				
Piston Pin Hole Diameter	12.700 12.695	.500 .4998				
Piston Pin Diameter	12.697 12.692	.4999 .4997				
Connecting Rod Diameter Crankshaft End	17.485 17.475	.6884 .688				
Connecting Rod Small End Bush Diameter	12.720 12.711	.5008 .5004				
Crankshaft journal Crankpin	17.437 17.424	.6865 .6860				

tecnamotor spa

2 STROKE ENGINES - Table of specification

DENOMINATION	ZH					
	mm.	inch.				
Crankshaft main bearing journal dia. (P.T.O. side)	22.220 22.207	.8748 .8743				
Crankshaft main bearing journal dia. (Flywheel side)	19.063 19.050	.7505 .7500				
Crankshaft End Play	0.56 0.23	.022 .009				
Main bearing Housing Diameter (flywheel side)	25.380 25.362	.9992 .9985				
Main bearing Housing Diameter (P.T.O. side)	28.552 28.570	1.1241 1.1248				
Main bearing inside Diameter (Flywheel side) No. of needles	19.078 19.062 27	.7511 .7505 27				
Main bearing inside Diameter (P.T.O. side) No. of needles	22.240 22.227 37	.8756 .8751 37				
Thread crankshaft (flywheel side)		7/16 20-UNF 3 A				
Compression pressure at cranking speed	6 ÷ 6.7 kg/cm²	85,4 95,3 p.s.i.				

2 STROKE ENGINES – TABLE OF SPECIFICATIONS

DESCRIPTION	AV 520 – AV 525		AV 600 – AV 605		AV 750 – AV 755	
	m/m	inch.	m/m	inch.	m/m	inch.
Displacement	cm^3 84,58	cu. in. 5,15	cm^3 98,45	cu.in. 6,01	cm^3 123,14	cu.in. 7,5
Stroke	38,10	1.500	44,4	1.748	50	1.969
Bore	53.175	2.094	53,175	2.094	56,012	2.205
Piston skirt diameter	53,035 53,043	2,088 2,0883	53,035 53,043	2,088 2,0883	55,872 55,881	2,088 2,0883
Width piston ring groove	1,638 1,664	.0642 .0655	1,638 1,664	.0642 .0655	2,040 2,080	.0642 .0655
Side clearance ring groove	0,051 0,102	.002 .004	0,051 0,102	.002 .004	0,050 0,102	.002 .004
Piston ring end gap	0,279 0,152	.011 .006	0,279 0,152	.011 .006	0,350 0,200	.0138 .0079
Piston pin hole diameter	12,703 12,698	.501 .4999	12,703 12,698	.501 .4999	12,703 12,698	.501 .4999
Piston pin diameter	12,697 12,692	.4999 .4997	12,697 12,692	.4999 .4997	12,697 12,692	.4999 .4997
Connecting rod diameter crankshaft end (without shell)	26,525 26,512	1.0049 1.0044	26,525 26,512	1.0049 1.0044	24,097 24,114	.9487 .9494
Connecting rod diameter crankshaft end (with Shell)	25,458 25,535	1.0023 1.0053	25,458 25,535	1.0023 1.0053		
Connecting rod small end housing diameter	17,412 17,437	.6855 .6865	17,412 17,437	.6855 .6865	17,450 17,475	.687 .688

2 STROKE ENGINES – TABLE OF SPECIFICATIONS

DESCRIPTION	AV 520 – AV 525		AV 600 – AV 605		AV 750 – AV 755	
	m/m	inch.	m/m	inch.	m/m	inch.
Connecting rod small end-needles bearing inside diameter	12,738 12,763	.5015 .5025	12,738 12,763	.5015 .5025	12,712 12,746	.5005 .5018
Crankshaft journal crankpin	21,399 21,412	.8425 .843	21,399 21,412	.8425 .843	19,269 19,277	.7586 .7589
Connecting rod needle diameter N. of needles	1.984 1.981 37	.0781 .780	1.984 1.981 37	.0781 .0780	2,400 2,395 28	.0945 .0943
Crankshaft main bearing journal diameter (P.T.O.side)	25,400 25,387	1" .9996	25,400 25,387	1" .9996	25,400 25,387	1" .9996
Crankshaft main bearing journal diameter (flywheel side)	19,063 19,050	.7505 .7500	19,063 19,050	.7505 .7500	19,063 19,050	.7505 .7500
Crankshaft end play	0,907 1,100	.0357 .0433	0,907 1,100	.0357 .0433	0,907 1,100	.0357 .0433
Main bearing housing diameter (flywheel side)	25,362 25,380	.9985 .9992	25,362 25,380	.9985 .9992	25,362 25,380	.9985 .9992
Main bearing housing diameter (P.T.O. side)	33,297 33,315	1.3109 1.3116	33,297 33,315	1.3109 1.3116	33,297 33,315	1.3109 3.3116
Main bearing inside diameter (Flywheel side) N. of needles	19,078 19,062 27	.7511 .7505 27	19,078 19,062 27	.7511 .7505 27	19,078 19,062 27	.7511 .7505 27
Main bearing inside diameter (P.T.O. side) N. of needles	25,412 25,438 29	1.0005 1.0015 29	25,412 25,438 29	1.0005 1.0015 29	25,412 25,438 29	1.0005 1.0015 29
Thread crankshaft (Flywheel side)	7/16–20	UNF–2A	7/16–20	UNF–2A	7/16–20	UNF–2A
Compression pressure at cranking speed	8,4	119,3	7,8	110,9 p.s.i.		

2 STROKE ENGINES TABLE SPECIFICATION

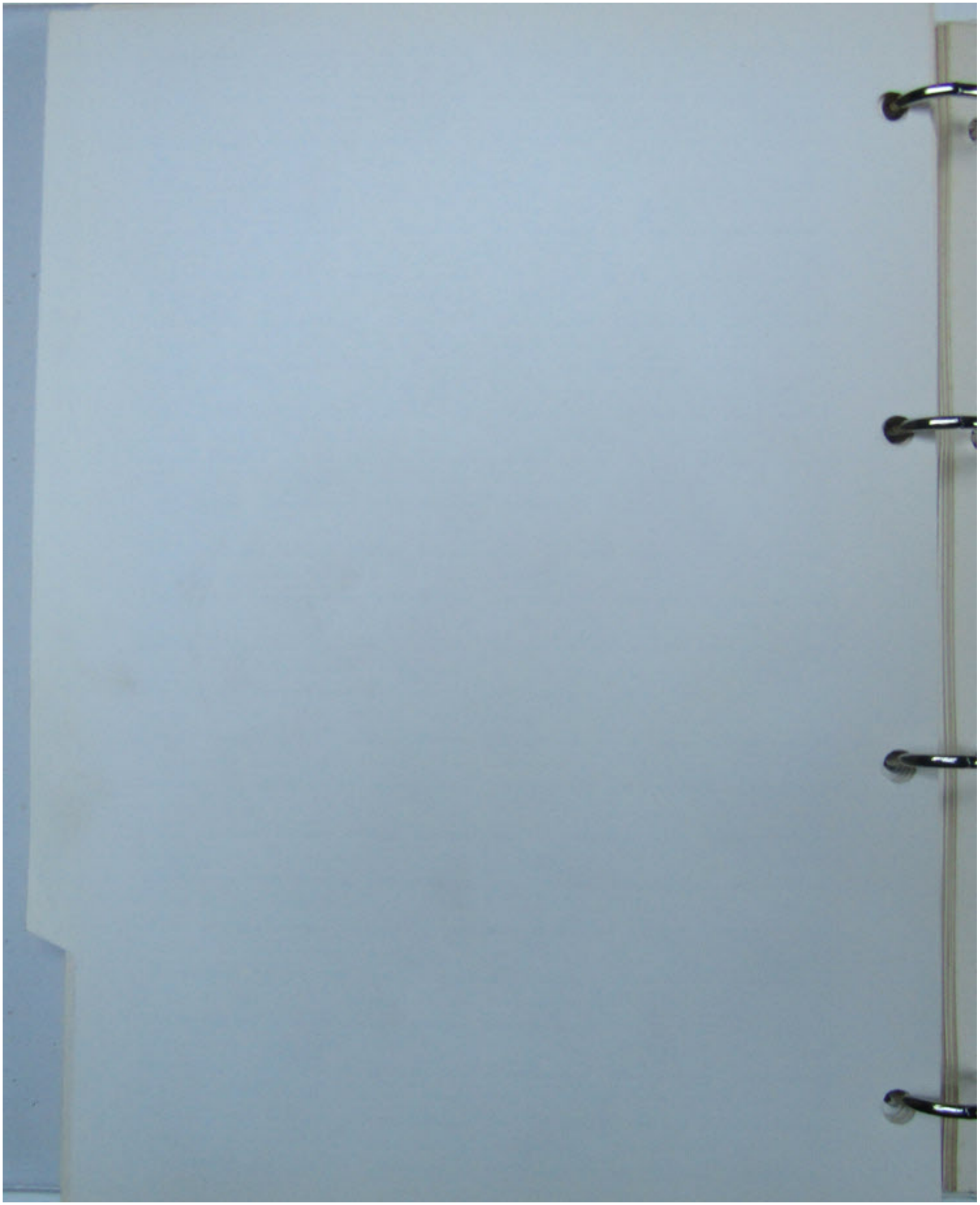
SPECIFICATION	AV 125		MV 100 S		MV 100 SB HIGH RPM	
	mm	Inch	mm	Inch	mm	Inch
Displacement	cm^3 123,19	cu. Inch 7,5	cm^3 984,9	cu. Inch 6.01	cm^3 984,9	cu. Inch 6.01
Stroke	50,15	1.974	44,5	1.752	44,5	1,752
Bore	sel. A 56,000 – 56,012	2.2047 – 2.2052	53,061 – 53,086	2.089 – 2.090	53,061 – 53,086	2.089 – 2.090
	sel. B 56,012 – 56,024	2.2052 – 2.2056				
Piston skirt diameter (Profile piston) See match mark on cyl.	sel. A 55,91 – 55,92	2.2011 – 2.2015				
	sel. B 55,92 – 55,93	2.2015 – 2.2019				
Piston skirt diameter			35,070 – 53,079	2.0893 – 2.0897	53,070 – 53,079	2.0893 – 2.0897
Width piston ringe groove	I 2,09 – 2,11	.0822 – .0830	1,638 – 1,664	.0644 – .0656	1,638 – 1,664	.0644 – .0656
Side clearance ring groove	I 0,100 – 0,132	.00394 – .00520	0,051 – 0,082	.00201 – .00323	0,051	.00201
Piston ring end gap	0,20 – 0,35	.0078 – .0137	0,152 – 0,279	.0059 – .0109	0,152 – 0,279	.0059 – .0109
Piston pin hole diameter	12,698 – 12,703	.499 – .500	12,698 – 12,703	.499 – .500	12,698 – 12,703	.499 – .500
Piston pin diameter	12,697 – 12,692	.4998 – .4996	12,697 – 12,692	.4998 – .4996	12,697 – 12,692	.4998 – .4996
Connectfng rod diameter crankshaft end (Without shell)	24,097 – 24,114	.9480 – .9493	21,457 – 21,464	.8447 – .8450	21,457 – 21,464	.8447 – .8450
Connecting rod diameter crankshaft end (With shell)	25,387 – 25,400	.986 – 1.000				

tecnamotor spa

2 STROKE ENGINES TABLE SPECIFICATION

SPECIFICATION	AV 125		MV 100 S		MV 100 SB HIGH R.P.M.	
	mm	Inch	mm	Inch	mm	Inch
Connecting rod small end housing diameter	17,450 17,475	.6870 .6879	— —	— —	— —	— —
Connecting rod small end needles bearing inside diameter	12,712 12,746	.500 .501	— —	— —	— —	— —
Connecting rod small end bush diameter	— —	— —	12,720 12,711	.5007 .5004	12,720 12,711	.5007 .5004
Crankshaft journal crankpin	19,269 19,277	.7580 .7589	21,400 21,408	.842 .842	21,400 21,408	.8425 .8428
Connecting rod needle diameter (Big end) No. of needles	2,400 2,395 28	.0945 .0943 1.102	— —	— —	— — 37	— — 1.457
Crankshaft main bearing journal diameter (P.T.O. side)	25,387 25,400	.999 1.000	25,385 25,395	.9994 .9998	25,008 25,017	.9845 .9849
Crankshaft main bearing journal diameter (flywheel side)	17,009 17,001	.6694 .6693	17,009 17,001	.6694 .6693	17,009 17,001	.6694 .6693
Main bearing housing diameter flywheel side	Ball bearing 39,955 39,971	 1.5730 1.5736	Ball bearing 39,955 39,971	 1.5730 1.5736	ball bearing 39,955 39,971	 1.5730 1.5736
Main bearing housing diameter P.T.O. side	33,299 33,317	1.3109 1.3116	— —	— —	ball bearing 46,951 46,935	 1.8484 1.8478
Main bearing inside diameter P.T.O. side No. of needles	25,4 29	1.000 1.181	—	—	25,000 24 990	.9842 .9838
Cylinder main bearing bush diameter P.T.O. side —	— —	— —	25,456 25,466	1.0022 1.0025		
Thread crankshaft flywheel side	7/16 - 20 UNF - 2A		7/16 - 20 UNF - 2A		7/16 - 20 UNF - 2A	

STROKE ENGINES TABLE OF TORQUE LIMITS					ENGINE TYPES AV - MV		
DESCRIPTION	VITE Size	N x m	Kgm	Inch x Lbs	520 85S	600 100S	750 125
Cylinder head screws	1/4-20 x 18	10,1 - 11,28	1,029 - 1,15	90 - 100	X	X	X
Connecting rod screws	10-24 x 19,05	6,77 - 7,41	0,69 - 0,75	60 - 67	X	X	
Connecting rod screws	10-32 x 15,87	9,61 - 10,69	0,98 - 1,09	85 - 95			X
Reed spring to reed plate screws	1/4-28 x 22,2	7,36 - 8,4	0,75 - 0,86	65 - 75	X	X	X
Carburettor to reed plate screws	1/4-28	7,36 - 8,4	0,75 - 0,86	65 - 75	X	X	X
Shroud base to cylinder screws	1/4-20 x 16	14,7 - 18	1,5 - 1,84	130 - 160	X	X	X
Shroud to cylinder screws	1/4-20 x 12,7	9,02 - 10,1	0,92 - 1,03	80 - 90	X	X	X
Air filter housing to carburettor screws	10-32 x 18	3,33 - 4,51	0,34 - 0,46	30 - 40	X	X	X
Air filter housing to carburettor screws	10-32 x 11,1	3,33 - 4,51	0,34 - 0,46	30 - 40	X	X	X
Rope guide side starter to shroud screws	8-32 x 9	1,67 - 2,26	0,17 - 0,23	15 - 20	X	X	
Reed plate to cylinder screws	10-24 x 15	6,18 - 6,77	0,63 - 0,69	55 - 60	X	X	X
Starter to shroud screws	1/4-28 x 10	5,69 - 6,77	0,58 - 0,69	50 - 60	X	X	X
Side starter to cylinder screws	1/4-20 x 12,7	7,95 - 9,61	0,81 - 0,97	70 - 85	X	X	X
Stop wire terminale 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 nut	7/16-20	45,22 - 51,99	4,61 - 5,30	400 - 460	X	X	X
Stator assy to cylinder screws	1/4-20 x 16	8,44 - 10,1	0,86 - 1,02	75 - 90	X	X	X
2 lt. petrol tank screws	1/4-20 x 22	2,85 - 3,92	0,29 - 0,4	25 - 35	X	X	X
Remote control bracket screws	10-32 x 9	2,26 - 3,33	0,23 - 0,34	20 - 30	X	X	X
Silencer to cylinder screws	1/4-20 x 60	4,51 - 5,69	0,46 - 0,58	40 - 50	X	X	X
Ring silencer to cylinder screws	5/16-18 x 48	11,87 - 13,73	1,21 - 1,4	105 - 120	X	X	X



CHAPTER «G»

MECHANICAL PARTS OF 4 STROKE ENGINES

CHAPTER «G»

MECHANICAL PARTS OF 4 STROKE ENGINES

1. GENERAL

The short-blocks supplied for the vertical shaft and horizontal shaft engines are similar in construction. The disassembly and inspection of these is therefore almost the same (Fig. 1).

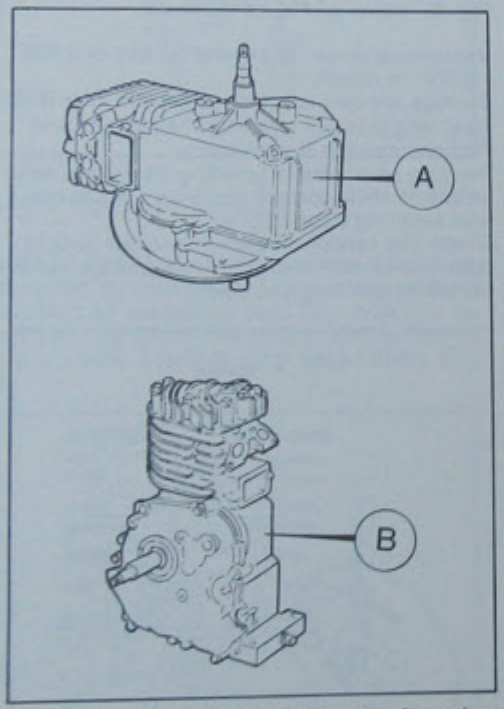


Fig. 1 A = Short-block vertical shaft engine
B = Short-block horizontal shaft engine

2. COMPRESSION CHECK

Check compression by hand or with a compression gauge, for compression details see table. If compression is weak, check:
— thread of spark plug
— 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 Aspera 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 as per Fig. 2 with special tool «V» (Fig. 2) lift valve spring.

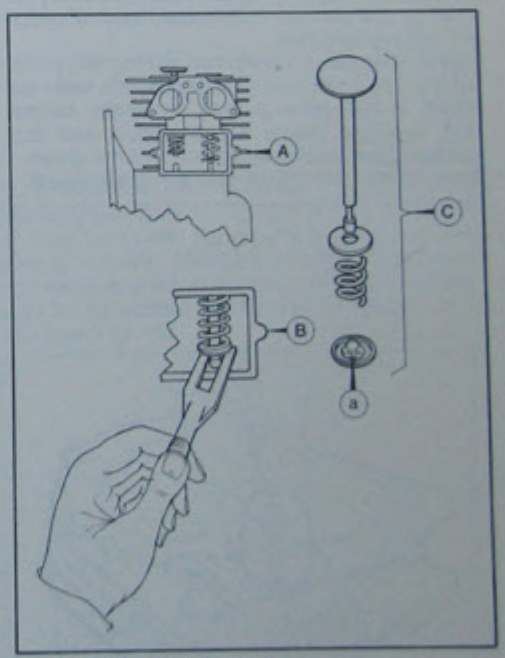


Fig. 2 Removing valves

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 recut the seats to an angle of 45° using special tool «Z» (see Fig. 3).

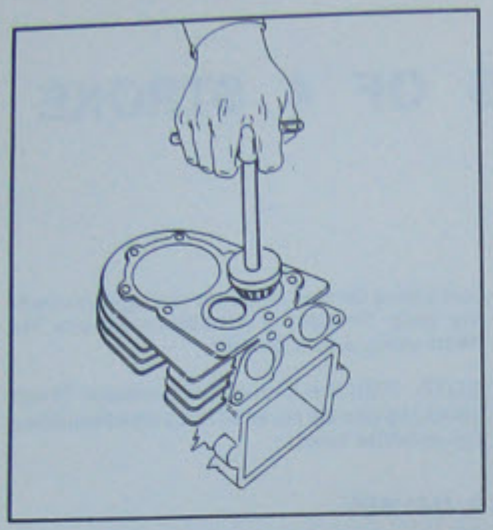


Fig. 3 Re-cutting valves seats

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 with tool «U» (see Fig. 4).

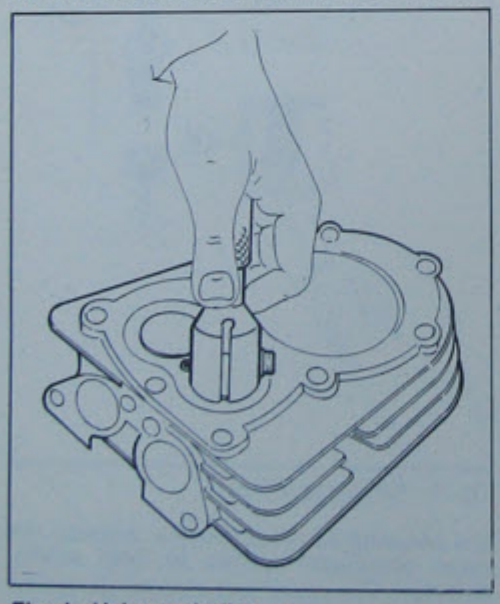


Fig. 4 Valves grinding

Valves head is within dimensions shown in Fig. 5
Thickness «A» should not be less than 0,8 mm.

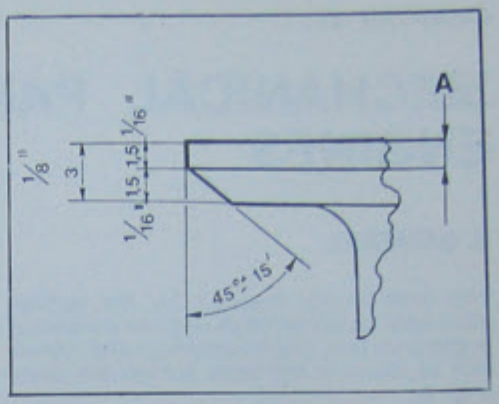


Fig. 5 Valve seat dimension

Valves seat does not exceed 1-2 mm or 0.039" - 0.078" in depth.
Springs are not cracked or broken and that free, length is not less than 24 mm or 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 0,15 - 0,25 mm or .006" - .009" the clearance is obtained by grinding the stem.

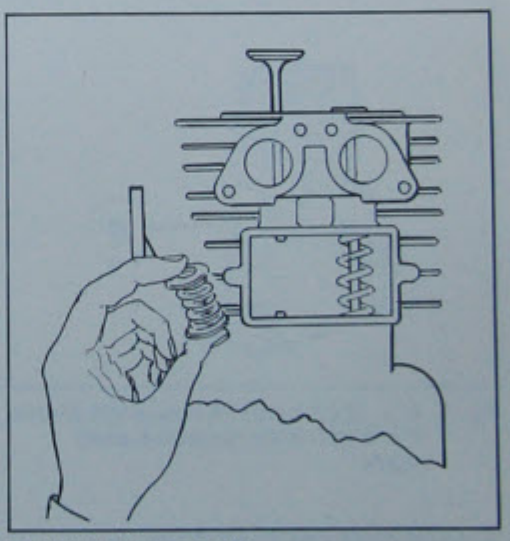


Fig. 6 Valve assembly

When checking the exhaust 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 pin is not in contact with the tappet (i.e. T.D.C. compression stroke).
Check valve sealing by holding block in position shown in Fig. 7 and filling the ports with petrol and checking the valve seats for leaks.

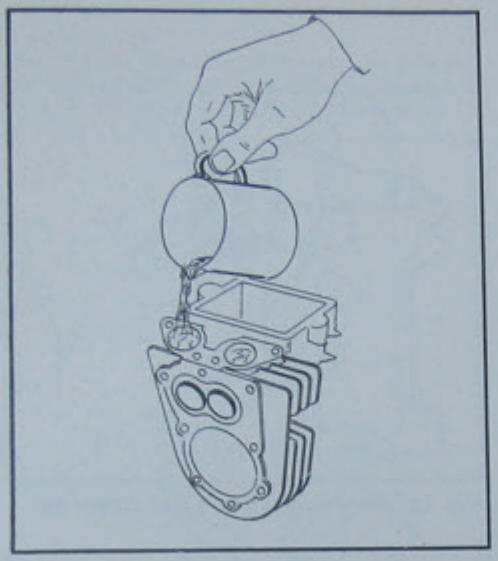


Fig. 7 Testing valve seats

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).

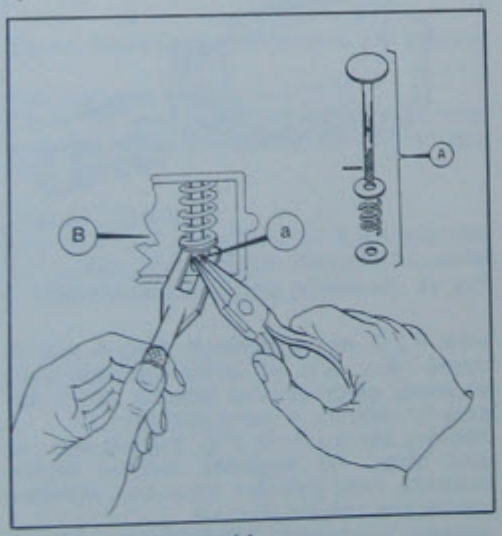


Fig. 8 Valve assembly

4. DISASSEMBLING OF 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 (see Fig. 9).

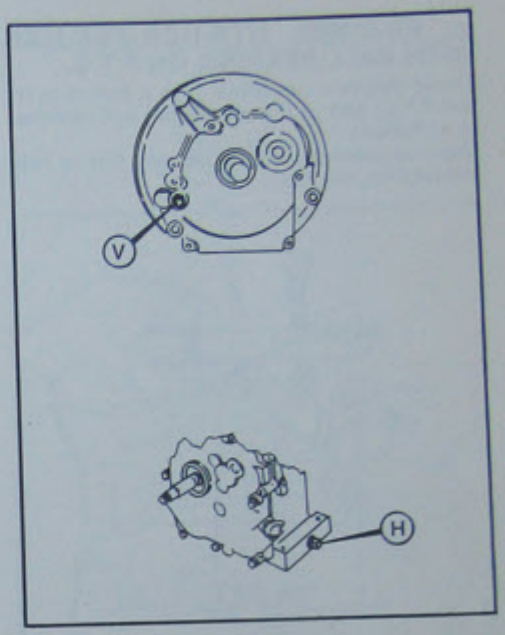


Fig. 9 Oil drain plug positions

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

a. ENGINES LAV-BV-HS

Remove key from crankshaft (P.T.O. 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 «G» (see Fig. 10).

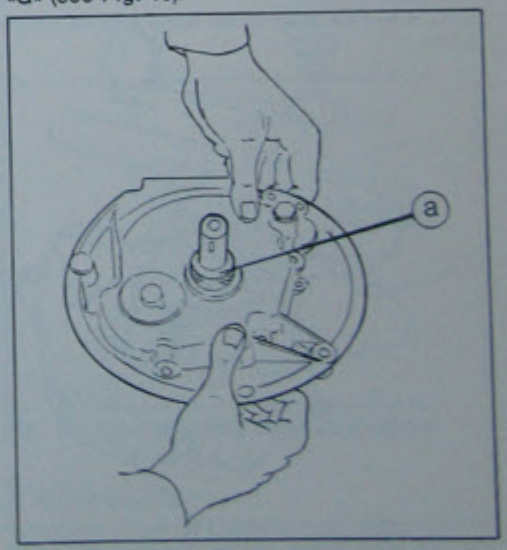


Fig. 10 Removing mounting flange
a = oil seal tool

b. ENGINES HTB-HCB-HSB-HBP WITH BALL BEARING ON P.T.O.

These engines are fitted with a ball race at the P.T.O. end of the crankshaft and removal is as follow:
Remove crankshaft key and any dirt or rust present on the shaft.

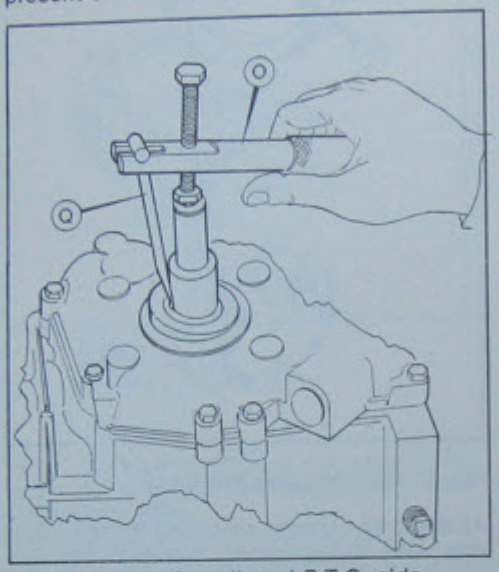


Fig. 11 Removing oil seal P.T.O. side

Remove oil seal with special tools «O and Q» (Fig. 11) and with thin nose pliers, remove bearing circlip (Fig. 12).

All types
Remove crankcase cover bolts and withdraw cover.

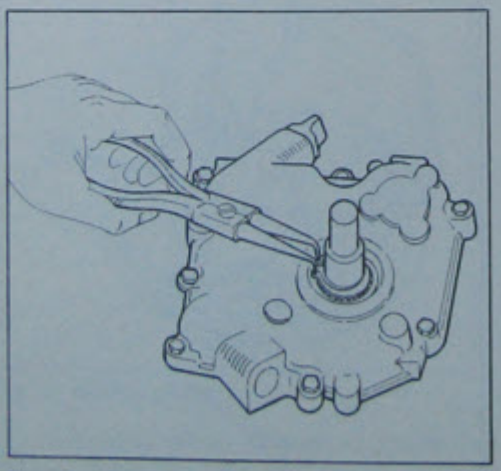


Fig. 12 Removing circlip P.T.O. side

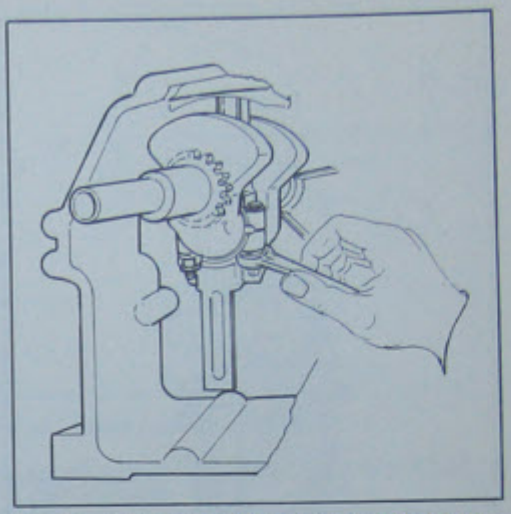


Fig. 13 Removing big end and dipper any

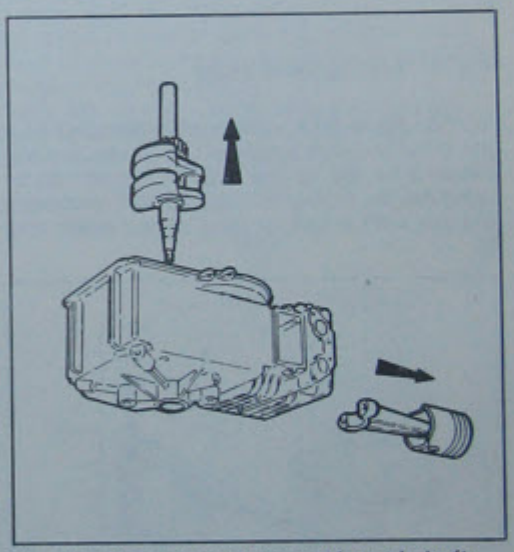


Fig. 14 Removing piston and crankshaft

With P.T.O. 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 (Fig. 13), big end cap and dipper (H engines), remove carbon deposits from cylinder bore and withdraw piston and con-rod (Fig. 14).
Remove crankshaft, clean all components and check for wear or damage.

5. INTERNAL INSPECTION

a. CYLINDER

Check with suitable instruments the wear on the following:

Cylinder bore
See Fig. 15. This should not exceed 0,15 mm or .006". Ovality should also not exceed 0,15 mm or .006" (see table for piston sizes).

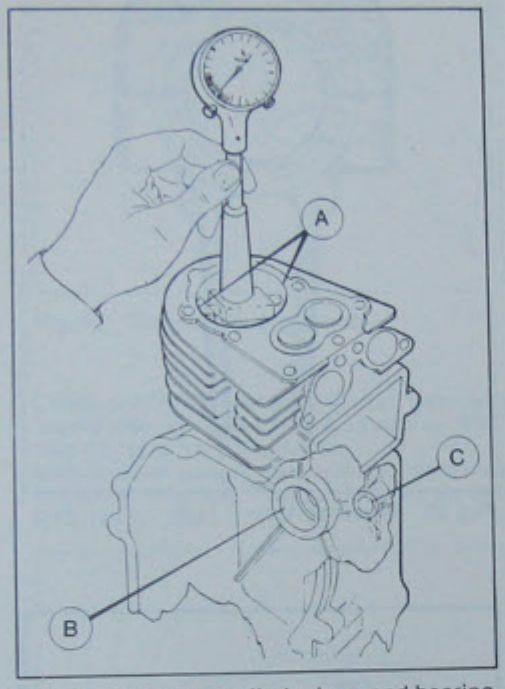


Fig. 15 Measuring cylinder bore and bearing

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

Camshaft bearings
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.

P.T.O. side bearing

On engines with ball bearing check the condition of the ball race.
On other engines check the bearing diameter for wear (Fig. 16) according to dimensions given in table.

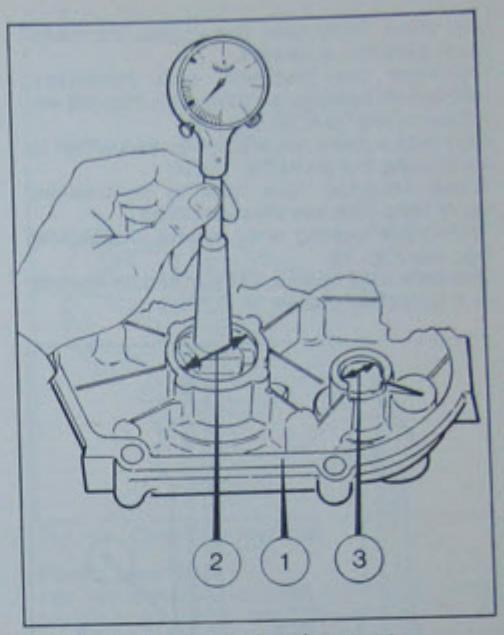


Fig. 16 Checking for bearing wear

c. CRANKSHAFT

Check crankshaft for truth as in Fig. 17. Check main bearings for wear against dimensions given in table, max should not exceed:
— flywheel side 0,02 mm or 0.0008"
— P.T.O. side 0,03 mm or 0.0012"
— big end 0,02 mm or 0.0008"

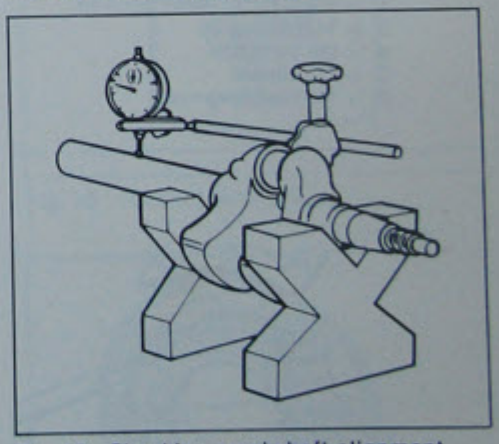


Fig. 17 Checking crankshaft alignment

d. CON-RODS

Different types of con-rods are fitted to the different engines. Some characteristics are common.
All con-rods have match marks (X, Fig. 18) which must be always assembled together

and when fitted onto the engine the marks must face the outwards.
Con-rods for engines with horizontal crankshaft have an oil dipper (C, Fig. 18) and a lubricating hole (A, Fig. 18).
Con-rods screws are always locked either by a securing nut as in Fig. 18.
Those securing nuts have to be changed every time they are disassembled.
Alternative locking is by means of a locking tab, see Fig. 19.
Con-rods may have a flat surface on the cap or a broached cap as in Fig. 20.

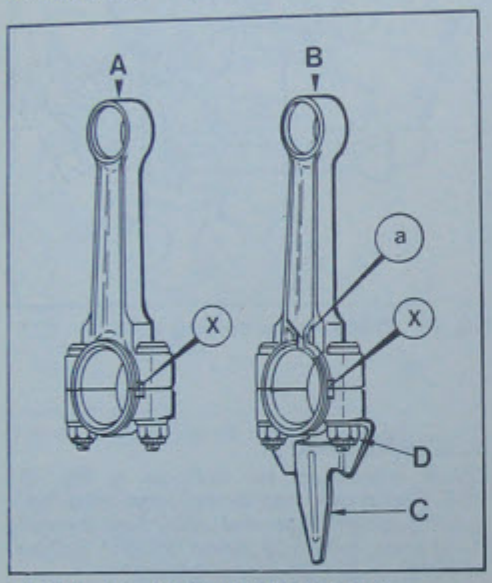


Fig. 18 A = Vertical shaft con-rod
B = Horizontal shaft con-rod
X = Match marks
a = Oil passage
C = Oil dipper
D = Self locking nuts

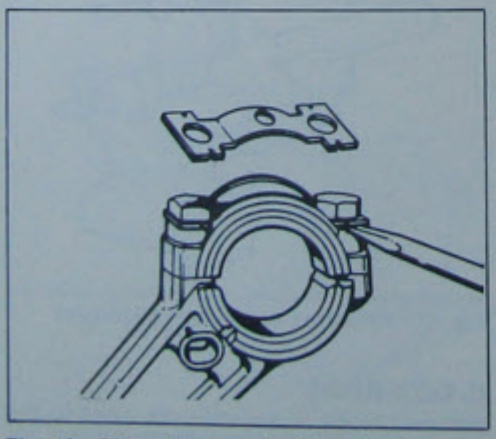


Fig. 19 Big end screw locking tab

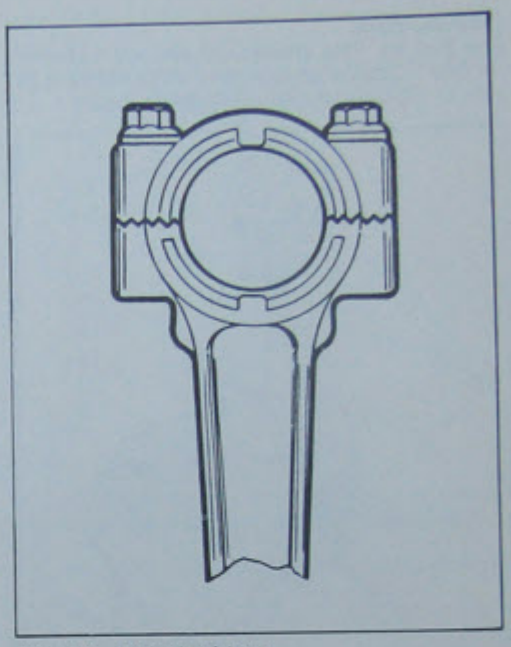


Fig. 20 Broached type

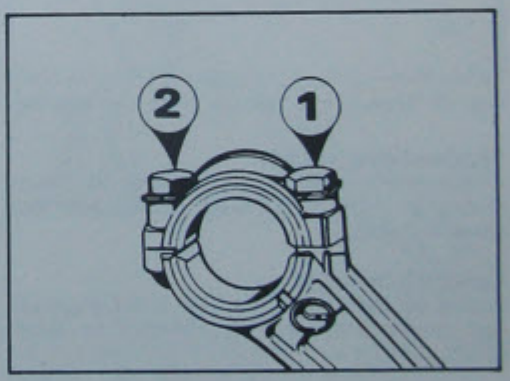


Fig. 21 Screw tightening sequence

— Secure screws with lock tab already fitted (see Fig. 21).
— If bearings are worn or scored, the con-rod must be replaced, undersize bearings are not available.

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. 22).

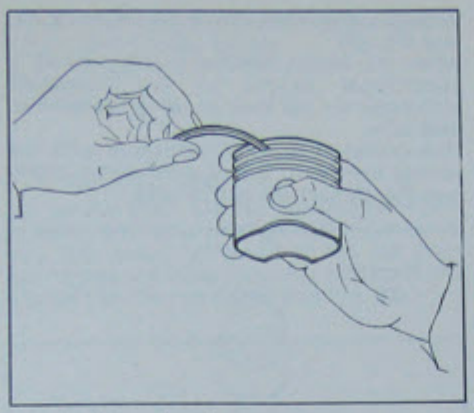


Fig. 22 Cleaning ring grooves

Check piston for damage. Piston wear and ovality should not exceed 0,15 mm or .006'' refer to table for dimensions.
With a feeler gauge, measure ring clearance in groove (Fig. 23). This should not exceed 0,15 mm or .006''.

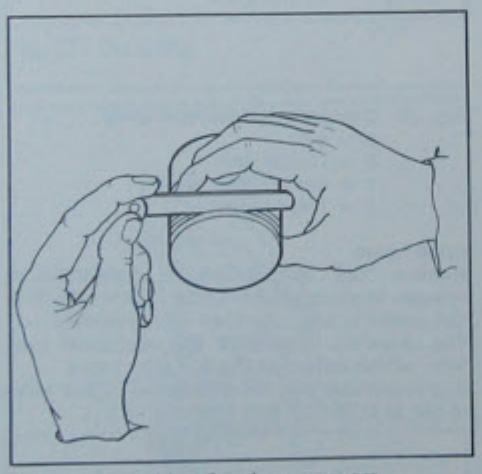


Fig. 23 Checking for ring groovers

Insert rings into cylinder bore pushing down about 25 mm or 1'' with the piston top. Measure ring gap, replace rings if gap exceeds 0,3 mm or .012'' (see Fig. 24).

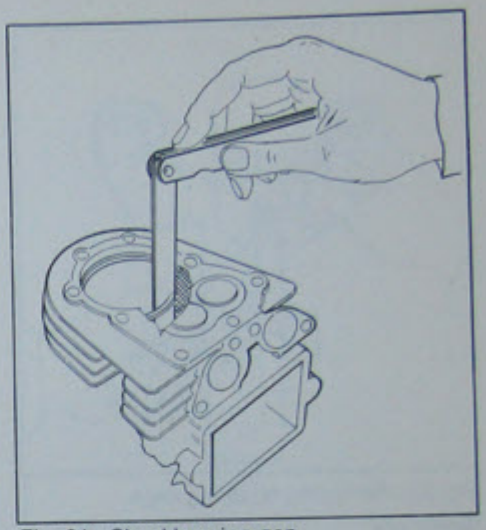


Fig. 24 Checking ring gap

Piston assembly
For reassembly purposes there is a match mark on the piston pin boss (see A Fig. 26). Depending on the engine type pistons may have an off-set piston pin (Currently LAV 172 and HBP engines). This is identified by a match mark «A» which must be fitted to the magneto side (see Fig. 26).

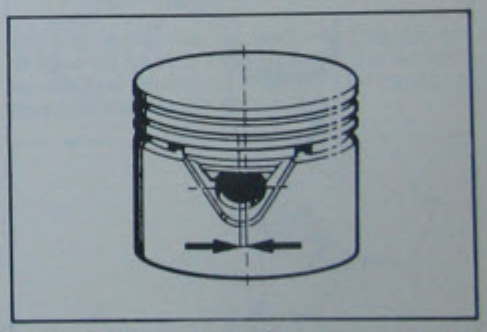


Fig. 25 Off-set piston pin

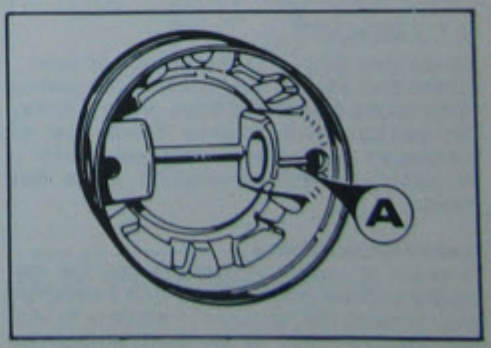


Fig. 26 A = Matck mark must be fitted to the magneto side

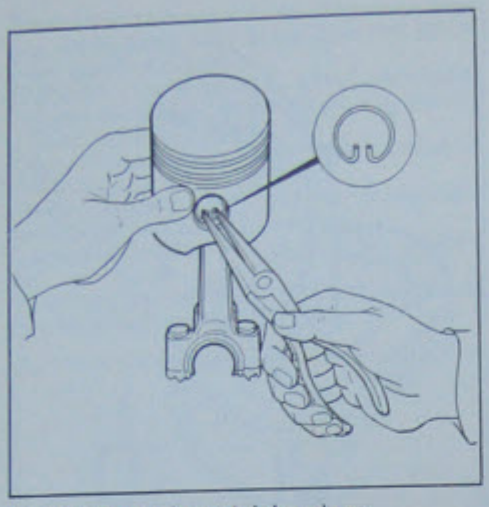


Fig. 27 Removing retaining rings

Piston pin
Remove retaining rings (Fig. 27) and withdraw pin from piston (Fig. 28). Check for wear or damage and replace if necessary.

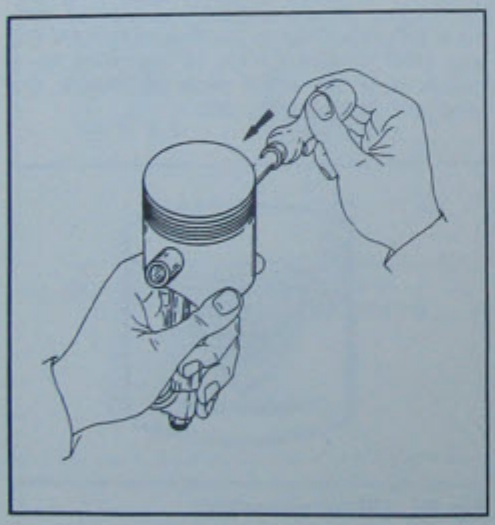


Fig. 28 Removing piston pin

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 dimensions cams (see tables).

Compression release
In order to assist in easy starting the four stroke engines may be fitted with a compression release, the function of which is to hold the exhaust valve of its seat at cranking speed thus lowering the compression ratio; the release is activated by a pin working through the crankshaft directly on the tappet (see Fig. 29).
When the engine reaches running speed, a centrifugal weight on the camshaft withdraws the pin thus allowing the valve to seat fully.
This camshaft is interchangeable with the normal camshaft. Check dimensions cams, (see Fig. 29 part «a» and tables).

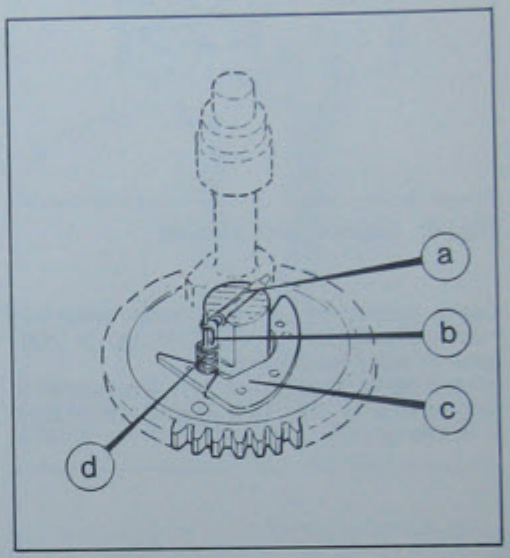


Fig. 29 Compression release assy
a = pin
b = rocker arm
c = centrifugal weight
d = retur spring

Lobe - cam
Aspera has introduced 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 0,15-0,25 mm (.006"÷.010")

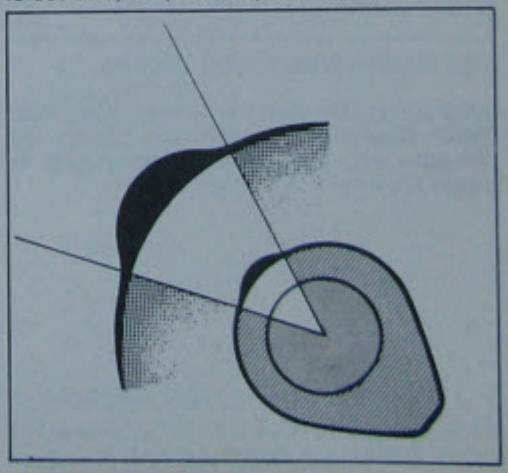


Fig. 30 Lobe-Cam

NOTE - Check valve clearance with piston at T.D.C. compression stroke.

g. LUBRICATION

On vertical shaft engines, lubrication is provided by a positive displacement type pump (Fig. 31), which forces oil to the top main bearing via a drilling down the camshaft and a gallery in the crankcase (see Fig. 32).

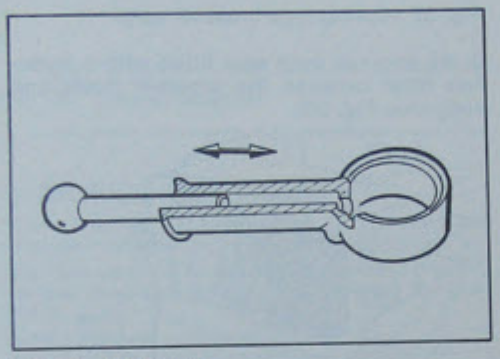


Fig. 31 Oil pump

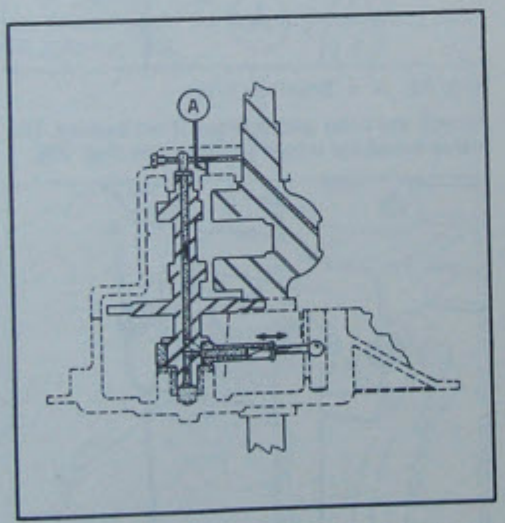


Fig. 32 Lubrication system of vertical shaft engine

The horizontal shaft engine is lubricated by means of a dipper (Fig. 33) secured to the con-rod by the big end bolts, after removal check the dipper for cracks or distortion; replace if necessary.

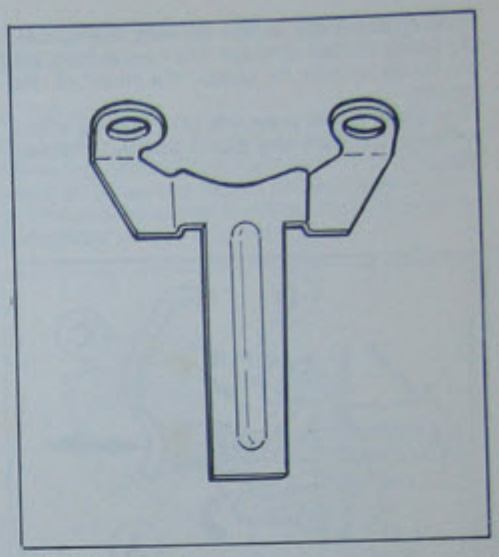


Fig. 33 Oil dipper

h. MECHANICAL GOVERNOR

Standard governor

The mechanical speed governor is situated inside the crankcase and consists of three parts:

— Governor gear
— Flyweights (4 or 6)
— Spool

The unit is mounted on shaft «A» (Fig. 34) and is secured by two seeger rings «B». Remove spool and check both parts for wear or damage. Replace if necessary.

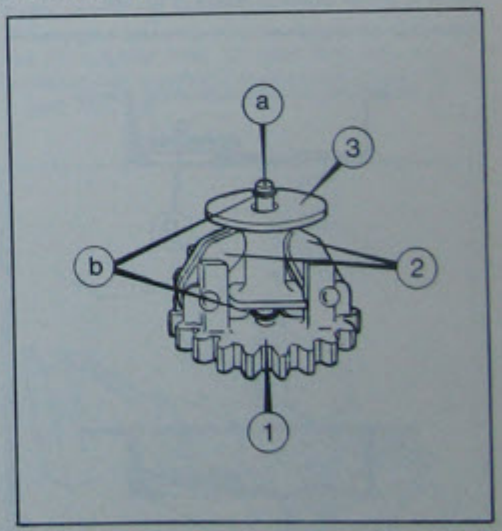


Fig. 34 Mechanical governor assy

Oleomatic governor

A plastic sleeve (A - Fig. 35) 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.

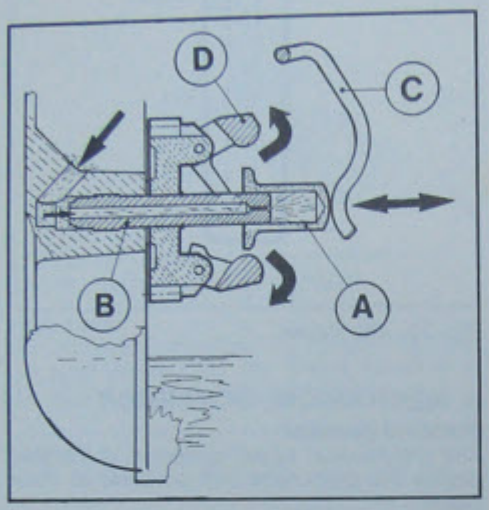


Fig. 35

i. BREATHER BODY

All four stroke engines are fitted with a crankcase breather, the body of which contains a small celeron valve (Fig. 36).

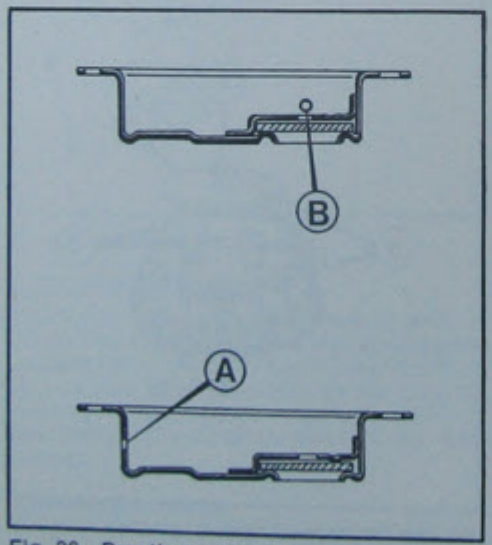


Fig. 36 Breather with celeron valve

Check that valve moves freely and that seat is not damaged.
On earlier types the valve was of a metal spring type (Fig. 37), this spring should be very resilient and no sticking should occur.

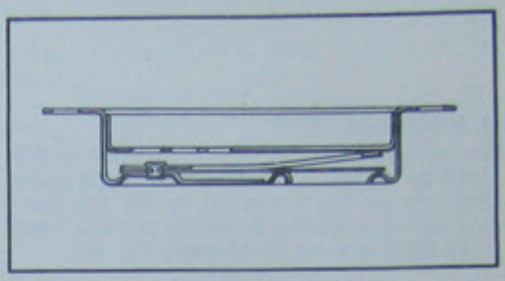


Fig. 37 Spring type breather assy

Some engines were also fitted with a horsehair filter between the breather cover and body (see Fig. 38).

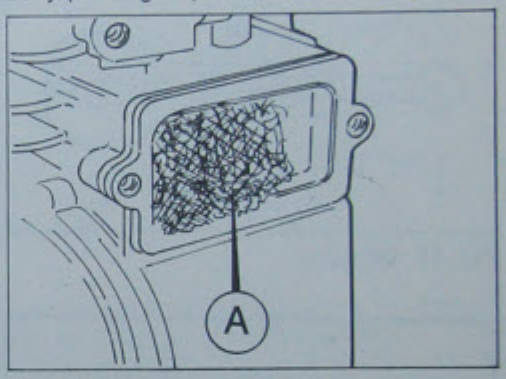


Fig. 38 A = Breather filter

Check the filter and replace if necessary. The valve breathes into a rubber pipe (Fig. 39).

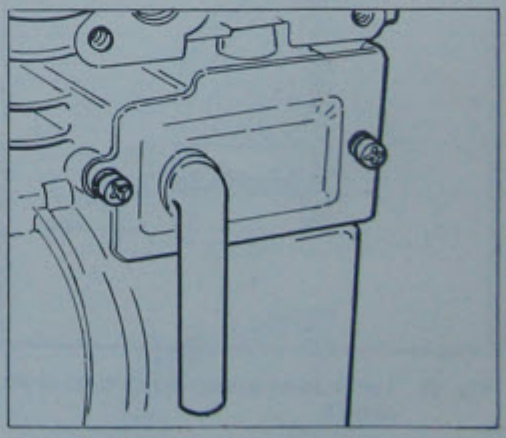


Fig. 39 Open breather

This may be open to atmosphere (open type-), or may be connected to the carburettor intake (closed type) (Fig. 40).

NOTE - The breather bodies of the horizontal shaft engine and the vertical shaft engine are not interchangeable owing to the position of the small breather hole (A in Fig. 36).

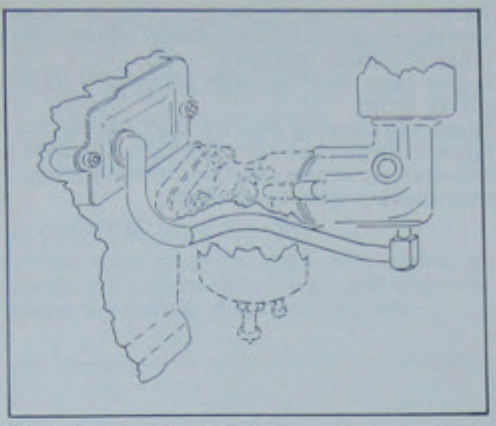


Fig. 40 Closed breather

k. OIL SEAL REPLACEMENT

If oil leakage is apparent it is possible to change the oil seal with the crankshaft in position by the use of special tools «O and P» for the flywheel side and «O and Q» for the P.T.O. side.
Refit new seal using tools:
F for P.T.O. side, ball bearing engine
G for P.T.O. side, standard engine
F for flywheel side.
The seals should be driven home using tool «D» (see Fig. 41).

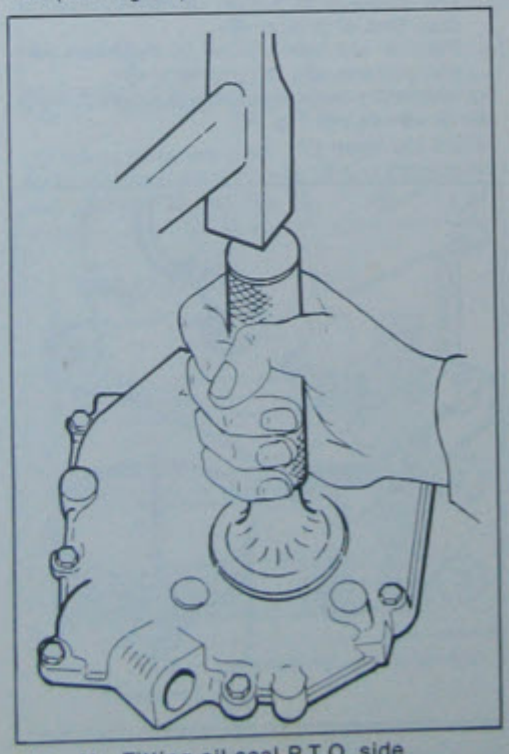


Fig. 41 Fitting oil seal P.T.O. side

6. REASSEMBLY OF FOUR STROKE ENGINES

a. GENERAL

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

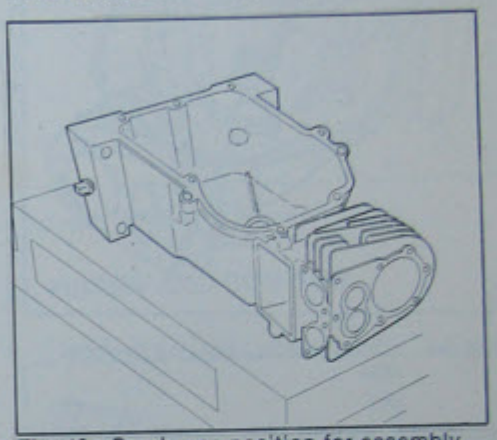


Fig. 42 Crankcase position for assembly

b. CYLINDER

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

Cylinder with needle bearings
Replacement of bearing.
The needle bearing can be removed with the aid of special tool M (see Fig. 43) and a replacement bearing fitted using tools C1 (see Fig. 44).

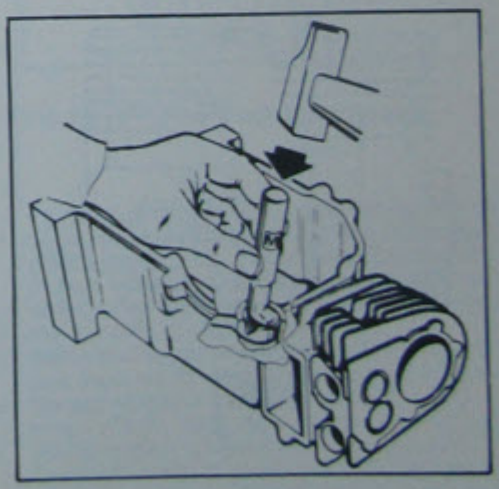


Fig. 43

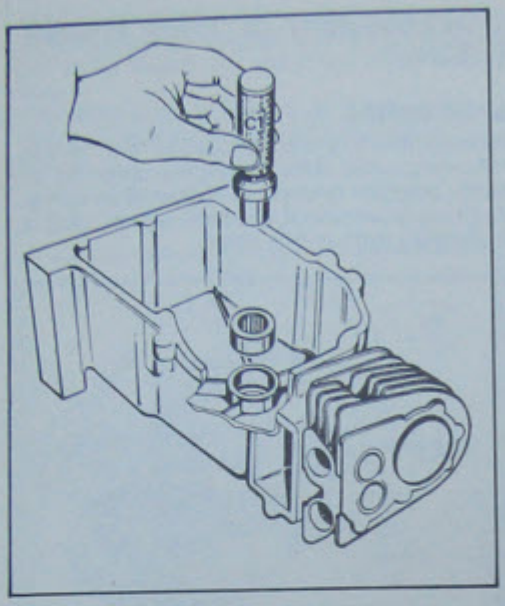


Fig. 44 Fitting needle bearing flywheel side

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 (P.T.O. 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.
Always check parts lists for correct identification.

c. OVERSIZED PISTONS FOR FOUR STROKE ENGINES

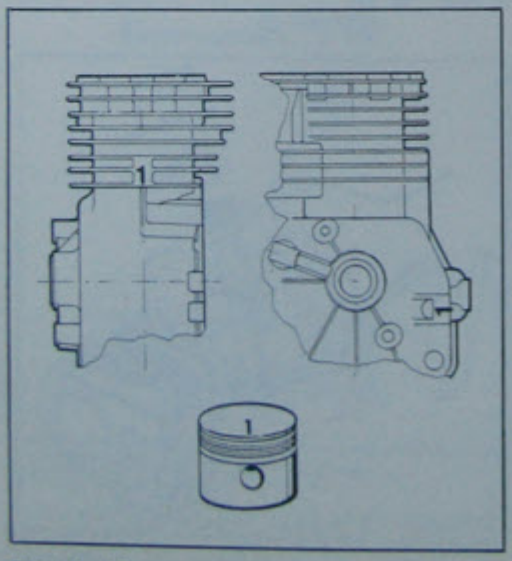


Fig. 45 Match mark positions

As in all engine production Aspera 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.

d. SELECTED PISTONS

On some engines (as HBP) pistons and cylinder are selective fitted.
Both piston and cylinder are selective fitted according to 2 different groups: A and B.

— The diameter of piston «A» being smaller than that of piston «B».
— Pistons «A» being fitted to cylinders «A» and pistons «B» to cylinders «B».

For assembly purposes there is a match mark «A» or «B» as per Fig. 46.

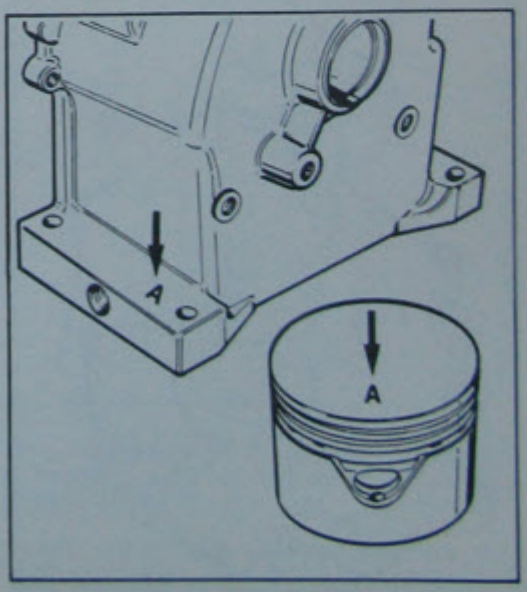


Fig. 46 Match mark positions

Piston and cylinder replacement.
For piston and cylinder replacement our Spare Parts Dept. will supply:
— the cylinder complete with piston if the cylinder only is requested;
— the requested piston if a piston «A» or «B» is required.

e. PISTON AND RINGS

Piston rings must be fitted with tapers upwards (on compression rings) and expander under the scraper rings (see Fig. 47).

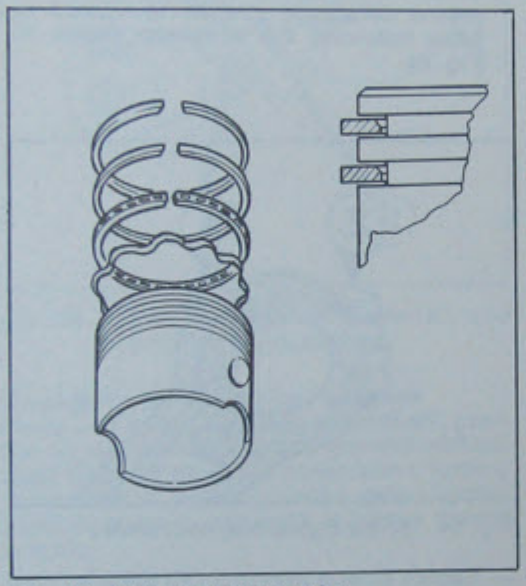


Fig. 47 Ring seat assembly

On some engines (LAV 172, HBP 40) the second compression ring is of L configuration and is fitted as per Fig. 48.

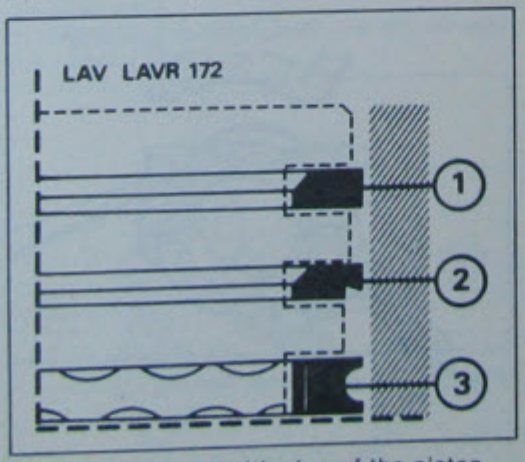


Fig. 48 Correct positioning of the piston rings

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. 49)

NOTE - Always select parts according to correct parts list.

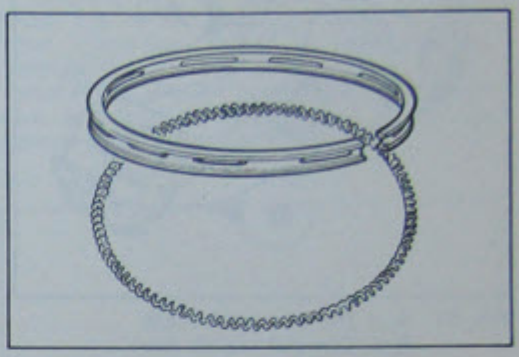


Fig. 49 Oil scraper ring with spring

f. PISTON AND CON-ROD

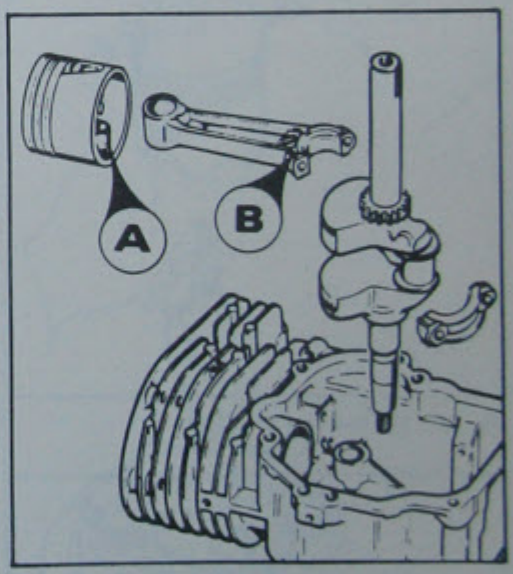


Fig. 50 Piston and con-rod assembly

Fit con-rod to piston by first fitting one retainer ring, lubricate con-rod and secure with piston pin (Fig. 52). 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. 51) and must be fitted so that match marks are toward magneto side (LAV 172, HBP 40).
Insert piston from top of bore with con-rod match marks to open side of crankcase.
The piston match mark will then appear on the opposite side to those on the con-rod (see Fig. 51).

H

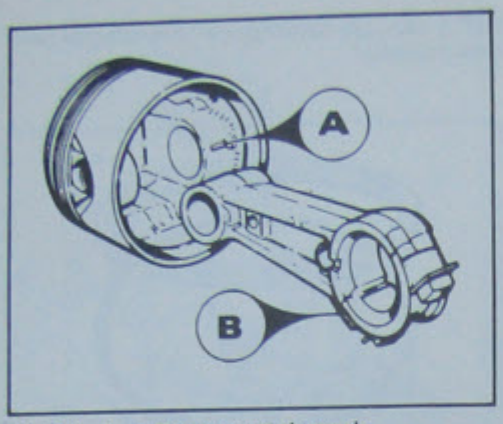


Fig. 51 A = Piston match mark
B = Con-rod match mark

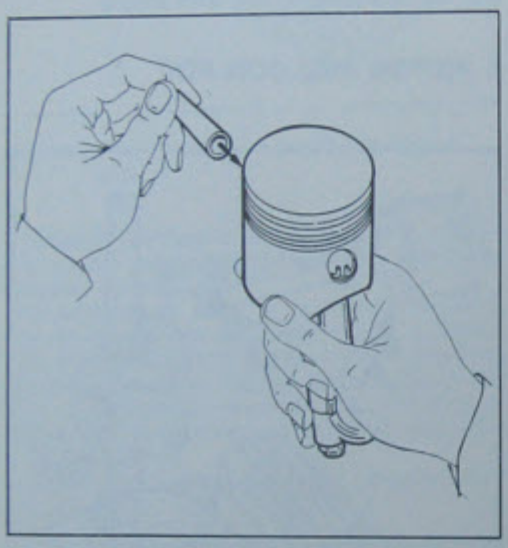


Fig. 52 Fit con-rod to piston

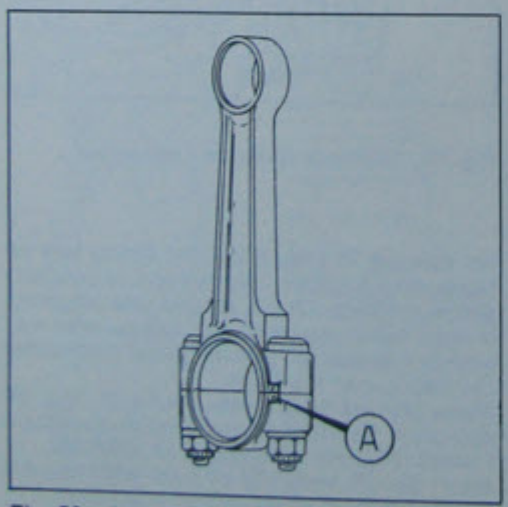


Fig. 53 A = Match mark

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.

These must be closed correctly.
For correct assembly operate as follows:
— Locate con-rod 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 in Fig. 54.

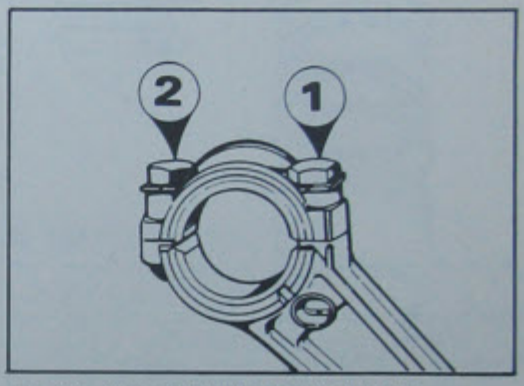


Fig. 54 Screw tightening sequence

— Secure screws with lock tab already fitted (see Fig. 55).

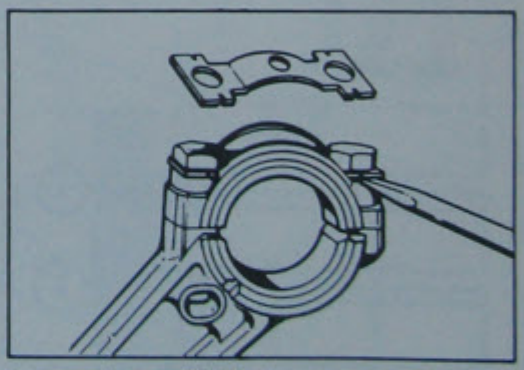


Fig. 55 Big end screw locking tab

g. CAMSHAFT - OIL PUMP - COVER

Position valve lifters in the correct order and fit camshaft with timing marks aligned as in Fig. 56.

Check governor shaft and replace if worn or bent.
Install governor gear assembly.
Refit dowel pins in crankcase and fit a new gasket.

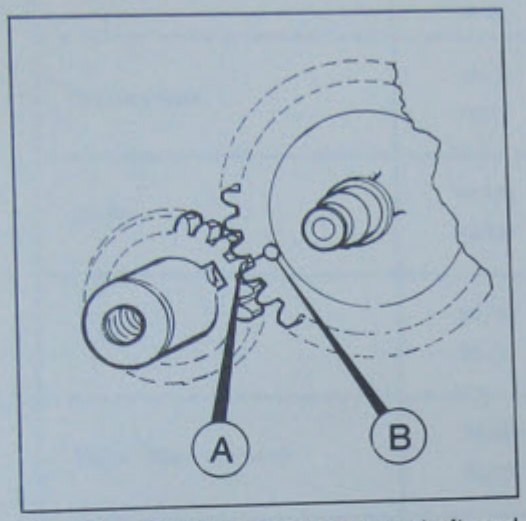


Fig. 56 Timing marks on camshaft and crankshaft gears aligned

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 shown in Fig. 57, tighten to torque figures shown in table.
Fit seeger ring to crankshaft and refit oil seal with special tool.

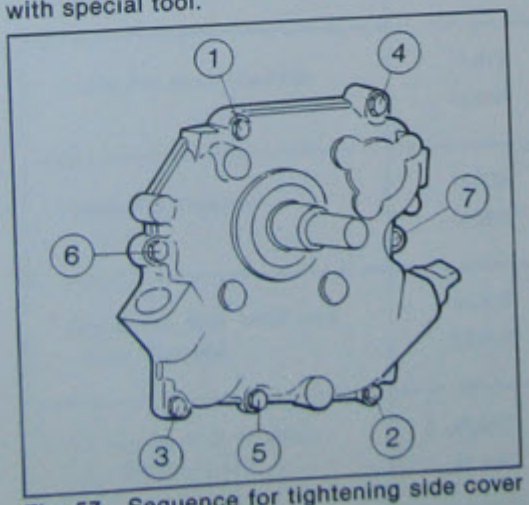


Fig. 57 Sequence for tightening side cover bolts

h. MOUNTING FLANGE FOR ENGINES WITH LATERAL P.T.O.

Reduction shaft service
A retaining ring secures the 8,5 : 1 P.T.O. shaft. The sequence of the washers is the most important factor to consider for reassembly.
Insert P.T.O. (Power Take-Off) shaft through seal and into flange bosses. Follow sequence of parts shown in Fig. 58

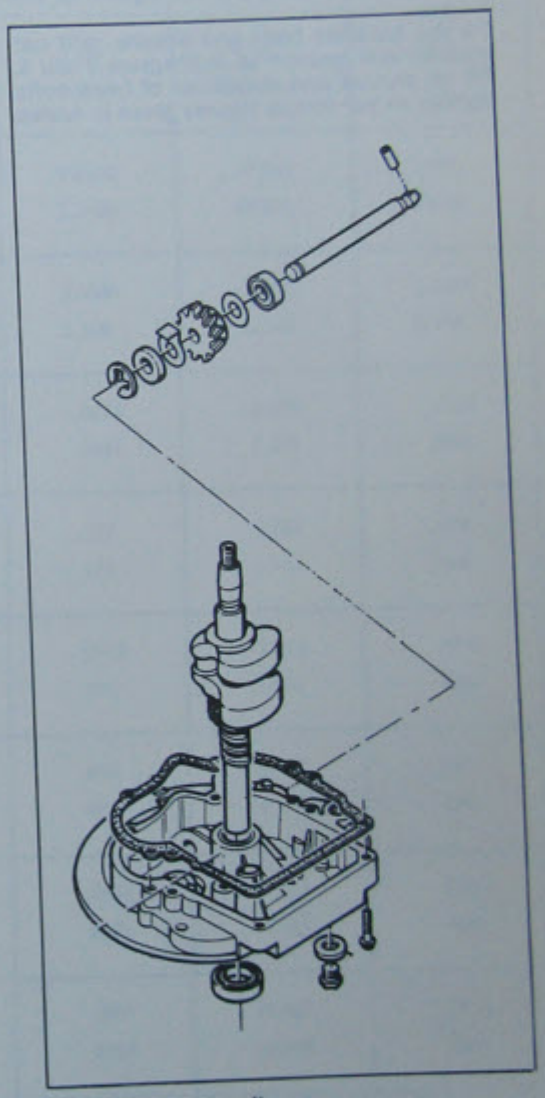


Fig. 58 Mounting flange

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.
Refer to Mechanics Manual.

H

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.

Fitting external parts

Position cylinder head and gasket and locate with first three bolts (do not tighten at this stage).

Fit the breather body and secure, refit carburettor and ignition as in chapters 3 and 4.

Fit air shroud and remainder of head bolts, tighten as per torque figures given in tables.

FOUR STROKE ENGINES - TABLE OF SPECIFICATIONS

	Horizontal 22 - 25 - 30 Vertical 22 - 25 - 30		Horizontal 35 Vertical 35	
	m/m	inch.	m/m	inch.
Displacement	cm³ 127	cu.in. 7.75	cm³ 148,5	cu.in. 9.06
Stroke	47,092 46,584	1.854 1.834	47,092 46,584	1.854 1.834
Bore	58,763 58,737	2.3135 2.3125	63,525 63,500	2.501 2.500
Piston Skirt Diameter	58,636 58,623	2.3085 2.308	63,360 63,348	2.4945 2.494
Width Compression Ring Groove	2,476 2,426	.0975 .0955	2,476 2,426	.0975 .0955
Width oil Ring Groove	3,226 3,175	.127 .125	3,226 3,175	.127 .125
Side Clearance Ring Groove	0,114 0,051	.0045 .002	0,114 0,051	.0045 .002
Piston Ring End Gap	0,432 0,178	.017 .007	0,432 0,178	.017 .007
Piston Pin Hole Diameter	14,313 14,303	.5635 .5631	14,313 14,303	.5635 .5631
Piston Pin Diameter	14,303 14,298	.5631 .5629	14,303 14,298	.5631 .5629
Connecting Rod small end bush diameter	14,318 14,305	.5637 .5632	14,318 14,305	.5637 .5632
Connecting Rod Diameter Crankshaft End	21,907 21,895	.8625 .862	21,907 21,895	.8625 .862

FOUR STROKE ENGINES - TABLE OF SPECIFICATIONS				
	Horizontal 22 - 25 - 30 Vertical 22 - 25 - 30		Horizontal 35 Vertical 35	
	m/m	inch.	m/m	inch.
Crankshaft journal Crankpin	21,882 21,862	.8615 .8607	21,882 21,862	.8615 .8607
Crankshaft Main bearing journal dia. (P.T.O. side)	22,200 22,187	.874 .8735	22,200 22,187	.874 .8735
Crankshaft Main bearing journal dia. Flywheel side	22,200 22,187	.874 .8735	22,200 22,187	.874 .8735
Crankshaft End play	0,48 0,15	.019 .006	0,48 0,15	.019 .006
Main bearing diameter P.T.O. side	22,250 22,238	.876 8755	22,250 22,238	.876 .8755
Main bearing diameter Flywheel side	22,250 22,238	.876 .8755	22,250 22,238	.876 .8765
Camshaft journals diameter	12,649 12,636	.498 .4975	12,649 12,636	.498 .4975
Cam Lobe diameter Nose to Heel	24,5	.964	24,5	.964
Camshaft bearings diameter	12,700 12,675	.500 .499	12,700 12,675	.500 .499
Valve Clearance	0,20 0,30	.008 .012	0,20 0,30	.008 .012
Valve seat angle	45°	45°	45°	45°
Valve seat width	1,32 1,07	.052 .0411	1,32 1,07	.052 .0411

FOUR STROKE ENGINES - TABLE OF SPECIFICATIONS				
	Horizontal 22 - 25 - 30 Vertical 22 - 25 - 30		Horizontal 35 Vertical 35	
	m/m	inch.	m/m	inch.
Valve spring free lenght	24,6	.9685	24,6	.9685
Valve guide diameter	6,363 6,337	.2505 .2495	6,363 6,337	.2505 .2495
Intake valve stem diameter	6,325 6,312	.249 2485	6,325 6,312	.249 .2485
Exhaust valve stem diameter	6,299 6,286	.248 .2475	6,299 6,286	.248 .2475
Compression pressure at cranking speed		7/16 20 UNF 3 A		7/16 20 UNF 3 A
Thread crankshaft Flywheel side	6 ÷ 6,7 kg/cm²	85 ÷ 95 psi	6 ÷ 6,7 kg/cm²	85 ÷ 95 psi

tecnamotor spa

FOUR STROKE TABLE SPECIFICATION

SPECIFICATION	LAV 172-173		BV 150-153		BV 172-173	
	mm	Inch	mm	Inch	mm	Inch
Displacement	cm^3 172,7		cm^3 149,13		cm^3 172,7	
Stroke	49,48	1.948	47,092	1.854	49,48	1.948
Bore	66,675 66,700	2.6250 2.6259	63,500 63,525	2.500 2.501	66,675 66,700	2.6250 2.6259
Piston skirt diameter	66,243 66,142	2.6079 2.6040	63,395 63,383	2.483 2.481	66,243 66,142	2.6079 2.6040
Width compression ring groove	I^a 2,040 2,060	.0803 .0811	2,426 2,476	.0955 .0974	I^a 2,040 2,060	.0803 .0811
	II^a 2,020 2,040	.0795 .0803			II^a 2,020 2,040	.0795 .0803
Width oil ring groove	3,98 4,00	.1567 .1574	3,175 3,226	.125 .127	3,98 4,00	.1567 .1574
Side clearance ring groove	I^a 0,082 0,05	.00323 .00197	0,127 0,064	.005 .0025	I^a 0,082 0,05	.00323 .00197
	II^a 0,03 0,02	.00118 .00079			II^a 0,03 0,02	.00118 .00079
Piston ring end gap	0,178 0,432	.007 .017	0,178 0,432	.007 .017	0,178 0,432	.007 .017
Piston pin hole diameter	14,313 14,303	.5635 .5631	14,313 14,303	.5635 .5631	14,313 14,303	.5635 .5631
Piston pin diameter	14,303 14,298	.5631 .5629	14,303 14,298	.5631 .5629	14,303 14,298	.5631 .5629
Piston pin diameter	14,303 14,298	.5631 .5629	14,303 14,298	.5631 .5629	14,303 14,298	.5631 .5629
Connecting rod small end bush diameter	14,305 14,318	.5632 .5637	14,318 14,305	.5637 .5632	14,305 14,318	.5632 .5637
Connecting rod diameter crankshaft end	25,430 25,442	1.000 1.001	21,907 21,895	.8624 .8620	25,430 25,442	1.000 1.001

FOUR STROKE TABLE SPECIFICATION

SPECIFICATION	LAV 172-173		BV 150-153		BV 172-173	
	mm	Inch	mm	Inch	mm	Inch
Crankshaft journal crankpin	25,400 25,387	1.0000 .9995	21,882 21,869	.8615 .8609	25,400 25,387	1.0000 .9995
Crankshaft main bearing journal diameter (P.T.O. side)	25,362 25,375	.9985 .9990	22,200 22,187	.8740 .8735	25,362 25,375	.9980 .9990
Crankshaft main bearing journal dia. flywheel side	25,375 25,362	.9990 .9985	25,375 25,362	.9990 .9985	25,375 25,362	.9990 .9985
Crankshaft end play	0,689 0,155	.0271 .0061	0,689 0,155	.0271 .0061	0,689 0,155	.0271 .0061
Main bearing diameter P.T.O. side	25,425 25,413	1.0009 1.0005	22,250 22,238	.8759 .8755	25,425 25,413	1.0009 1.0005
Main bearing diameter flywheel side	25,413 25,425	1.0005 1.0009	25,413 25,425	1.0005 1.0009	25,413 25,425	1.0005 1.0009
Camshaft journals diameter	12,649 12,636	.4979 .4974	12,649 12,636	.4979 .4974	12,649 12,636	.4979 .4974
Camshaft bearings diameter	12,700 12,675	.5000 .4990	12,700 12,675	.5000 .4990	12,700 12,675	.5000 .4990
Cam lobe diameter nose to heel	5,093	.2005	5,029	.1979	5,042	.1985
Valve clearange	0,15 0,25	.0059 .0098	0,15 0,25	.0059 .0098	0,15 0,25	.0059 .0098
Valve seat angle	46°		46°		46°	
Valve seat width	1,32 1,07	.052 .0411	1,32 1,07	.052 .0411	1,32 1,07	.052 .0411

tecnamotor spa

FOUR STROKE TABLE SPECIFICATION						
SPECIFICATION	LAV 172-173		BV 150-153		BV 172-173	
	mm	Inch	mm	Inch	mm	Inch
Valve spring free length	28,829 28,069	1.1350 1.0500	28,829 28,069	1.1350 1.0500	28,829 28,069	1.1350 1.0500
Valve guide diameter	6,331 6,304	.2490 .2480	6,331 6,304	.2490 .2480	6,331 6,304	.2490 .2480
Intake valve stem diameter	6,274 6,261	.2470 .2465	6,274 6,261	.2470 .2465	6,274 6,261	.2470 .2465
Exhaust valve stem diameter	6,210 6,197	.2444 .2437	6,210 6,197	.2444 .2437	6,210 6,197	.2444 .2437
Thread crankshaft flywheel side	7/16 - 20 UNF - 3A		1/2 - 20 UNF - 2A		1/2 - 20 UNF - 2A	

4 STROKE ENGINES TABLE SPECIFICATION

DESCRIPTION	HS - H&L 30		HS - HBL 35		HS - HBL 40		HBP - HBP 40 G	
	mm	inch	mm	inch	mm	inch	mm	inch
Displacement	cm^3 127	cu.in. 7.75	cm^3 148,5	cu.in. 9.06	cm^3 172	cu.in. 10.48	cm^3 172	cu.in 172
Stroke	47,092	1.854	47,092	1.854	49,48	1.948	49,48	1.948
Bore	58,763 58,737	2.3135 2.3125	63,525 63,500	2.501 2.500	66,700 66.675	2.626 2.625	66,700 66,675	2.626 2.625
Piston skirt diameter	58,636 58,623	2.3085 2.308	63,360 63,348	2.4945 2.494	66,243 66,142	2.608 2.604	— —	— —
Piston skirt diameter Barrel type HBP 40							A 66,625 66,635 B 66,635 66,645	A 2.623 2.6234 B 2.6234 2.6238
Width compression ring grove	2,476 2,426	.0975 .0955	2,476 2,426	.0975 .0955	2,476 2,426	.0975 .0955	I 2.040 2,060 II 2,020 2,040	I .0803 .0811 II .0795 .0803
Width oil ring groove	3,226 3,175	.127 .125	3,226 3,175	.127 .125	3,98 4,00	.1567 .1574	3,98 4,00	.1567 .1574
Side clearance ring groove	0,114 0,051	.0045 .002	0,114 0,051	.0045 .002	0,127 0,064	.0025 .005	0,062 0,030	.0024 .0011
Piston ring end gap	0,178 0,432	.007 .017	0,178 0,432	.007 .017	0,178 0,432	.007 .017	0,178 0,432	.007 .017
Piston pin hole diameter	14,313 14,303	.5635 .5631	14,313 14,303	.5635 .5631	14,313 14,303	.5635 .5631	14,313 14,303	.5635 .5631
Piston pin diameter	14,303 14,298	.5631 .5629	14,303 14,298	.5631 .5629	14,303 14,298	.5631 .5629	14,303 14,298	.5631 .5629
Connecting rod small end bush diameter	14,305 14,318	.5632 .5637	14,305 14,318	.5632 .5637	14,305 14,318	.5632 .5637	14,305 14,318	.5632 .5637

H

tecnamotor spa

FOUR STROKE ENGINES TABLE OF TORQUE LIMITS

DESCRIPTION	Size	N × m	Kgm	Inch × Lbs	ENGINE TYPES LAV 30	LAV 35	LAV 40
Connecting rod screws	1/4-20 × 24	11,28 - 12,46	1,15 - 1,27	100 - 110	X	X	X
Connecting rod units	1/4-28	7,36 - 8,44	0,75 - 0,86	65 - 75	X	X	
Mounting flange screws	1/4-20 × 30	11,28 - 13,53	1,15 - 1,38	100 - 120	X	X	X
Magneto stator plate screws	1/4-20 × 16	8,44 - 10,10	0,86 - 1,03	75 - 90	X	X	X
Cylinder head screws	5/16-18 × 50	15,79 - 22,56	1,61 - 2,3	140 - 200	X	X	X
Intake pipe to cylinder	1/4-20 × 34,9	6,77 - 8,14	0,69 - 0,83	60 - 72	X	X	X
Carburettor to intake pipe	1/4 -28 × 24	6,18 - 7,95	0,63 - 0,81	55 - 70	X	X	X
Lever mechanical governor rod	8-32 × 9	0,88 - 1,08	0,09 - 0,11	8 - 10	X	X	X
Speed control cover-fastener screws	4,8	3,33 - 4,51	0,34 - 0,46	30 - 40	X	X	X
Breather cover screws	10-24 × 15,8	3,92 - 5,10	0,4 - 0,52	35 - 45	X	X	X
Silencer screws	1/4-20 × 84	4,51 - 5,69	0,46 - 0,58	40 - 50	X	X	X
Flywheel nut	7/16-20	45,22 - 51,99	4,6 - 5,3	400 - 460	X	X	X
Oil drain plug	1/4-18	20,31 - 27,07	2,07 - 2,76	180 - 240	X	X	X
Shroud screws	1/4-20 × 12,7	9,02 - 10,10	0,91 - 1,02	80 - 90	X	X	X
Side mounted starter screws	1/4-20 × 12,7	9,02 - 10,10	0,92 - 1,03	80 - 90	X	X	X
Top mounted starter	1/4-28 × 10	5,69 - 6,77	0,58 - 0,69	50 - 60	X	X	X
Spark plug	M14	20,3 - 33,94	2,06 - 3,46	180 - 300	X	X	X

FOUR STROKE ENGINES TABLE OF TORQUE LIMITS

DESCRIPTION	Size	N x m	Kgm	Inch x Lbs	ENGINE TYPES BV 150	172
Connecting rod screws	1/4-20 x 24	11,28 - 12,46	1,15 - 1,27	100 - 110	X	X
Connecting rod nuts	1/4-28	8,44 - 9,61	0,86 - 0,98	75 - 85	X	
Oil drain plug	5/8-18	16,97 - 22,56	1,73 - 2,3	150 - 200	x	X
Mounting flange screws	1/4-20 x 30	11,28 - 13,53	1,15 - 1,37	100 - 120	X	X
Lever (mechanical governor rod)	8-32 x 9	0,88 - 1,08	0,09 - 0,11	8 - 10	X	X
Breather cover screws	10-24 x 15,87	3,92 - 5,10	0,4 - 0,52	35 - 45	X	X
Cylinder head screws	5/16-18 x 38,1	20,31 - 24,86	2,07 - 2,53	180 - 220	X	X
Intake pipe to cylinder	1/4-20 x 24	10,1 - 11,28	1,02 - 1,15	90 - 100	X	X
Carburettor to intake pipe	1/4-28 x 22,35	6,18 - 7,95	0,63 - 0,81	55 - 70	X	X
Speed control cover (fastener) screws	4,8 autof.	3,33 - 4,51	0,34 - 0,46	30 - 40	X	X
Shroud screws	1/4-20 x 12	9,02 - 10,1	0,9 - 1,02	80 - 90	X	X
Shroud screws	10-32 x 11,1	3,33 - 4,51	0,34 - 0,46	30 - 40	X	X
Side mounted starter	1/4-20 x 16	9,02 - 10,1	0,92 - 1,03	80 - 90	X	X
Oil fill tube to shroud	10-32 x 12,7	1,67 - 2,84	0,17 - 0,29	15 - 25	X	X
Silencer screws	1/4-20 x 82,5	4,51 - 5,69	0,46 - 0,58	40 - 50	X	X
Silencer screws	1/4-20 x 62	3,33 - 5,1	0,34 - 0,52	30 - 45	X	X
Magneto stator plate screws	1/4-20 x 16	8,44 - 10,10	0,86 - 1,03	75 - 90	X	X
Spark plug	M14	20,30 - 33,94	2,07 - 3,46	180 - 300	X	X
Flywheel nut	7/16-16 x 20	45,22 - 51,99	4,61 - 5,3	400 - 460	X	X
Coil lamination to cylinder	10-24 x 25	3,33 - 4,51	0,34 - 0,46	30 - 40	X	X
Air filter housing to carburettor	10-32 x 23,5	2,26 - 3,33	0,23 - 0,34	20 - 30	X	X

tecnamotor spa

FOUR STROKE ENGINES TABLE OF TORQUE LIMITS

DESCRIPTION	Size	N × m	Kgm	Inch × Lbs	ENGINE TYPES H 30	35	40
Connecting rod screws	1/4-28 × 34,13	8,44 - 9,61	0,86 - 0,98	75 - 85	X	X	X
Connecting rod nuts	1/4-28	7,36 - 8,44	0,75 - 0,86	65 - 75	X	X	
Cylinder Cover screws	1/4-20 × 24,5	11,28 - 13,53	1,15 - 1,37	100 - 120	X	X	X
Magneto stator plate screws	1/4-20 × 12,7	8,44 - 10,10	0,86 - 1,03	75 - 90	X	X	X
Cylinder head screws	5/16-18 × 5,08	15,79 - 22,56	1,61 - 2,3	140 - 200	X	X	X
Intake pipe to cylinder screws	1/4-20 × 24	5,77 - 8,14	0,69 - 0,83	60 - 72	X	X	X
Carburettor to intake pipe screws	1/4-28 × 24	6,18 - 7,95	0,63 - 0,81	55 - 70	X	X	X
Carburettor to intake pipe nuts	1/4-28	6,81 - 7,95	0,63 - 0,81	55 - 70	X	X	X
Breather cover screws	10-24 × 15,87	3,9 - 5,1	0,39 - 0,52	35 - 45	X	X	X
Silencer screws	1/4-20 × 60	3,33 - 5,1	0,34 - 0,52	30 - 45	X	X	X
Silencer screws	1/4-20 × 76	6,77 - 7,95	0,69 - 0,81	60 - 70			X
Silencer screws	1/4-20 × 57,5	2,45 - 3,92	0,25 - 0,40	22 - 35	X	X	
Silencer screws	1/4-20 × 74,55	4,51 - 5,69	0,46 - 0,58	40 - 50	X	X	X
Silencer screws	1/4-20 × 44,45	2,84 - 3,92	0,29 - 0,4	25 - 35	X		
Flywheel nut	7/16-20	45,22 - 51,99	4,6 - 5,3	400 - 460	X	X	X
Shroud screws	1/4-28 × 12,7	8,14 - 9,52	0,83 - 0,97	72 - 84	X	X	X
Housing reduction gear screws	5/16-24 × 22,2	19,22 - 21,48	1,95 - 2,19	170 - 190	X	X	X
Top type starter screws	1/4-28 × 10	5,69 - 6,77	0,58 - 0,69	50 - 60	X	X	X
Spark plug	M14	20,30 - 33,94	2,07 - 3,46	180 - 300	X	X	X
Oil drain plug	1/4-18	20,31 - 27,07	2,07 - 2,76	180 - 240	X	X	X

H

tecnamotor spa
10135 TORINO ITALY VIA DELLE CACCE 99 TEL (011) 342002 TELEX 221514 TECMOT I