

# CAN-AM MOTORCYCLE

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SCHOOL  
OF  
ELECTRICAL  
AND  
MECHANICAL ENGINEERING  
BORDON HANTS



## INTRODUCTION

The role of the Can-Am motorcycle is to provide a means of transport for liaison, reconnaissance and courier duties.

The motorcycle is based on a standard commercial pattern vehicle with service options. The high compression 250 cc single cylinder, 2 stroke cycle, air cooled engine has a direct oil injection lubrication system and is capable of using 91 Octane/Military fuels. The engine and gearbox is of unit construction having a 5 speed foot operated gearbox.

The suspension consists of hydraulic telescopic front forks and swinging arm with hydraulic damping rear suspension.

The lighting system comprises, instrument panel lights, headlamp with main/dip beams and pilot light, stop light and flashing indicators. An isolation switch is provided for tactical purposes, lights, indicators, warning lights and horn. Headlamps dip to left or right hand as necessary to conform to existing Traffic Regulations.

A facility is provided to enable a radio to be fitted.

The motorcycle is painted with infra red reflective paint.

## FOREWARD

This publication is designed to summarise the build up of the Can-Am motorcycle as taught in this School. The information it contains can act as a form of reference and is a valuable aid to revision.

Each chapter follows roughly the sequence in which the topics are dealt with during the training programme, which builds up the information in a logical order.

The publication is a teaching aid only, it sets out the principles of operation. It is not designed to take the place of any Army Equipment Support Publications (AESPs) or Maintenance Schedule. There is no automatic updating process.

ASSOCIATED PUBLICATIONS

ARMY EQUIPMENT SUPPORT PUBLICATION

WORKSHOP MANUAL                    2340-K-201-302

MAINTENANCE SCHEDULE            2340-K-201-601

OPERATING INFORMATION           2340-K-201-201

ILLUSTRATED SPARE PARTS LIST

MK I VEHICLE                        2340-K-201-701

MK II VEHICLE                       2340-K-201-711

MOTOR CYCLE LIGHTWEIGHT

250 cc CAN-AM

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## CHAPTER 1

### ENGINE

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1.1 Engine Operation. Basically, the rotary valve engine performs the same operation as the ordinary two-stroke engine. The only difference is in the location and operation of the intake.

1. The intake port is positioned directly in the crankcase.
2. The opening and closing of the intake port is controlled by a rotary valve instead of the piston.
3. The rotary valve is driven by the crankshaft in an anti-clockwise direction when seen from the left hand side of the engine.

1.2 Intake and Secondary Compression. As the piston starts its upward stroke, the air/fuel mixture is drawn into the crankcase from the carburettor via the intake port (the rotary valve uncovers the intake port). At the same time, the piston blocks the exhaust and transfer ports, and compresses the air/fuel mixture in the combustion chamber (secondary compression).

1.3 Ignition and Combustion. As the piston nears the top of the cylinder (TDC), the compressed air/fuel mixture is ignited by the spark plug. These burning gases expand and push the piston downwards, thus causing the power stroke.

1.4 Exhaust and Primary Compression. As the piston descends, the intake port is blocked by the rotary valve and pressure begins to build up inside the crankcase (primary compression).

The exhaust port is uncovered as the piston continues its downward stroke and burnt gases are allowed to escape.

1.5 Transfer. Near the bottom of the downward stroke, the transfer ports are uncovered by the piston, and the compressed air/fuel mixture in the crankcase rushes into the combustion chamber. Piston dome, combustion chamber configuration and exhaust back pressure prevents the fresh charge escaping through the exhaust port. This also assists in cleaning the combustion chamber of all burnt gases.

1.6 Transfer Configuration. The configuration of the transfer ports is termed as being "tangential type flow". In other words, the indirect positioning of the transfer port openings in the cylinder create an upward swirling movement of the air/fuel mixture. This swirling action is, in general, limited to the sides of the cylinder wall.

1. When this upward swirl reaches the cylinder head dome, it attempts a downward inward movement. However, since the piston is also ascending at the same time, a vortex type of effect occurs. This vortex retains the air/fuel mixture in the upper part of the combustion chamber area, therefore burnt exhaust gases are completely expelled by the vortex pressure and upward movement of the piston.

2. By doing this, the large volume of air/fuel mixture taken into the engine during intake is wholly retained in the engine, and not partially expelled with the exhaust. Combustion, therefore, is with a completely fresh charge.

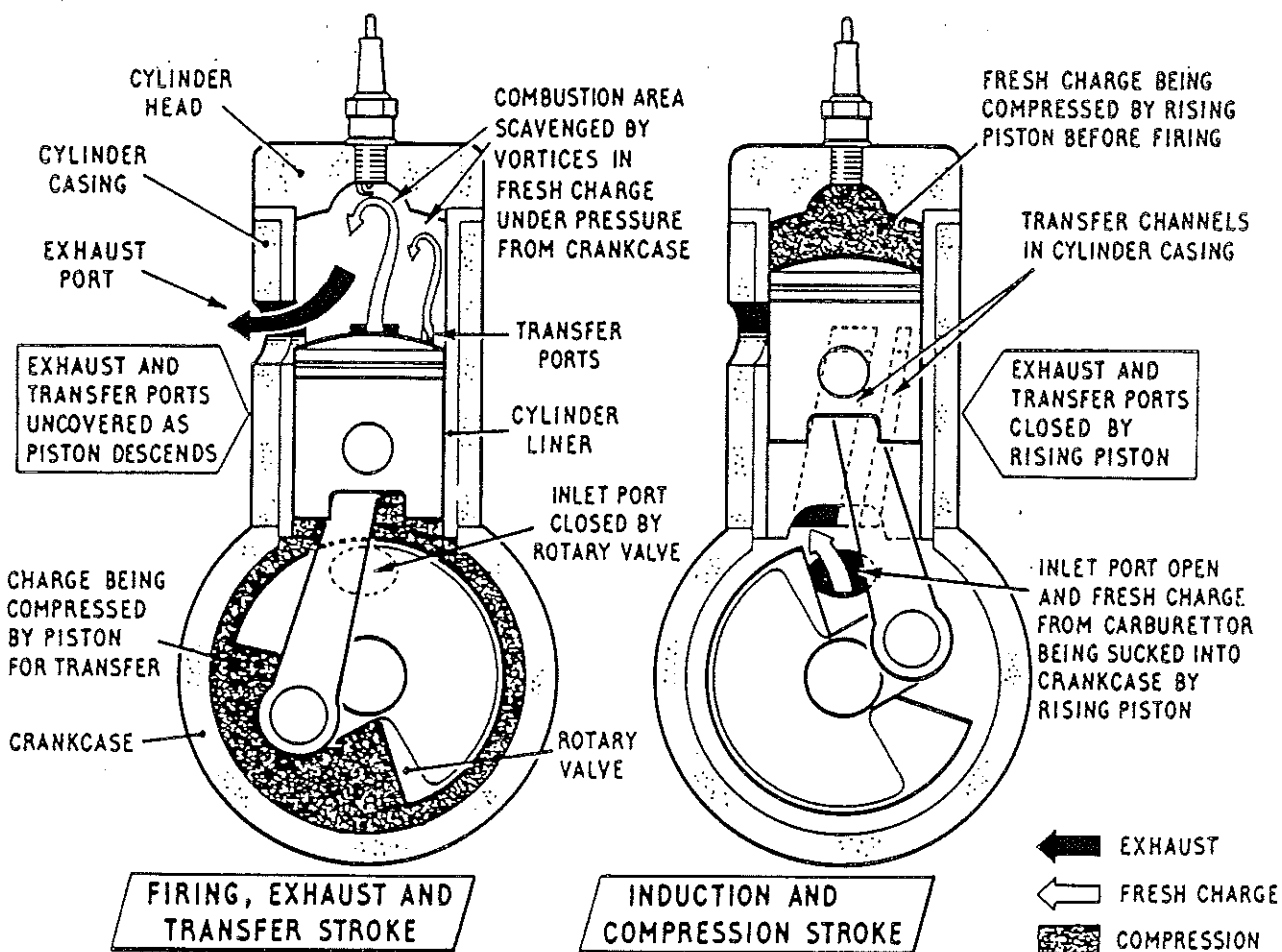


FIG. 1.1 TRANSFER PORTS



### 1.7 Differences between Rotary and Three Port System

1. Intake port directly positioned in the crankcase.
2. The opening and closing of the intake port is controlled by a rotary valve disc instead of by the piston.

1.8 Advantages of Rotary Valve. The use of a rotary valve enables a very short inlet track. The design introduces the mixture in a very suitable position, without obstruction to the gas flow that would impair the volumetric efficiency. This intake position also enhances the lubrication of the lower connecting rod bearings. With rotary valves, the opening duration of the intake port is specifically controlled by the disc. Therefore, it is possible to determine the maximum possible intake, resulting in better crankcase filling.

INTAKE	NORMAL (Third Port Engine)	ROTARY VALVE ENGINE
TOTAL DURATION	150°	195°
OPENING	75° BTDC	140° BTDC
CLOSING	75° ATDC	55° ATDC

FIG. 1.2 COMPARISON CHART

By comparison, the rotary valve engine produces an earlier intake opening and a longer total duration of opening than the normal piston operated three port engine. In addition earlier intake closing prevents fresh charge spitback.

### CONSTRUCTION DETAILS

1.9 Squish Area. Unlike conventional cylinder heads where the combustion chamber contour conforms to the shape of the piston dome, the Bombardier-Rotax rotary valve cylinder head incorporates a squish area. This area is basically a 'ledge' jutting into the combustion chamber area. In operation, as the piston ascends and approaches the ledge, a rapid squeezing action is applied to the air/fuel mixture contained in the area immediately between the piston dome and the ledge. This squishing action forces the entrapped mixture rapidly into the combustion chamber area, creating a greater mixture turbulence and a higher compression ratio. The maximum permissible distance between the cylinder head 'ledge' and the piston is 1.45 mm (0.057") and the minimum 1.02 mm (0.041").

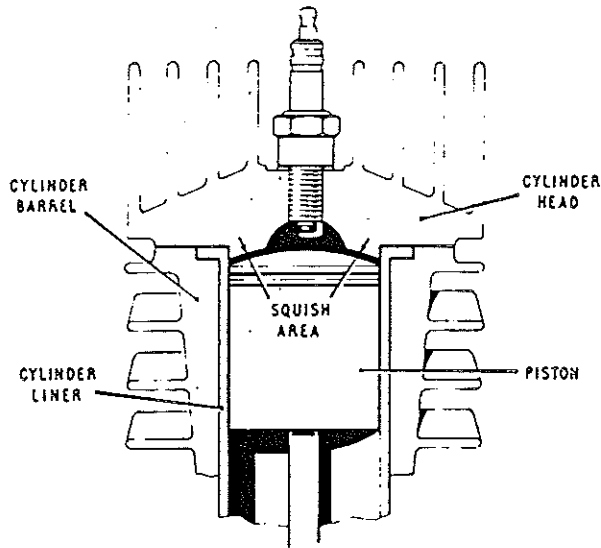


FIG. 1.3 - SQUISH AREA

If the dimension is increased a loss in power will occur. If it is reduced, detonation, piston/head hammering and serious engine damage will result.

#### 1.10 Measuring Squish Area

1. Remove Cylinder Head, clean combustion chamber and piston crown.
2. Tape a piece of resin cored solder ( $\frac{1}{8}$ " dia) across the piston crown parallel to the gudgeon pin. Bring piston to within  $\frac{1}{4}$ " BTDC (See Fig. 1.4a).
3. Replace the cylinder head and tighten the cylinder head nuts to 1.9 Kg/m (14 ft/lbf) torque.
4. Rotate crankshaft in order for the piston to pass TDC.
5. Remove cylinder head. (See Fig. 1.4b).
6. Measure the ends of the solder, this should be within 1.05 to 1.45 mm (0.041" to 0.057").
7. If the squish area is outside these limits the size of the shims/shim should be adjusted to bring the squish area within the set range.
8. Replace cylinder head.

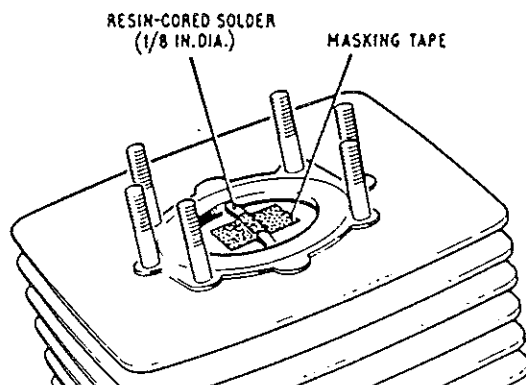


FIG. 1.4a.- MEASURING SQUISH AREA

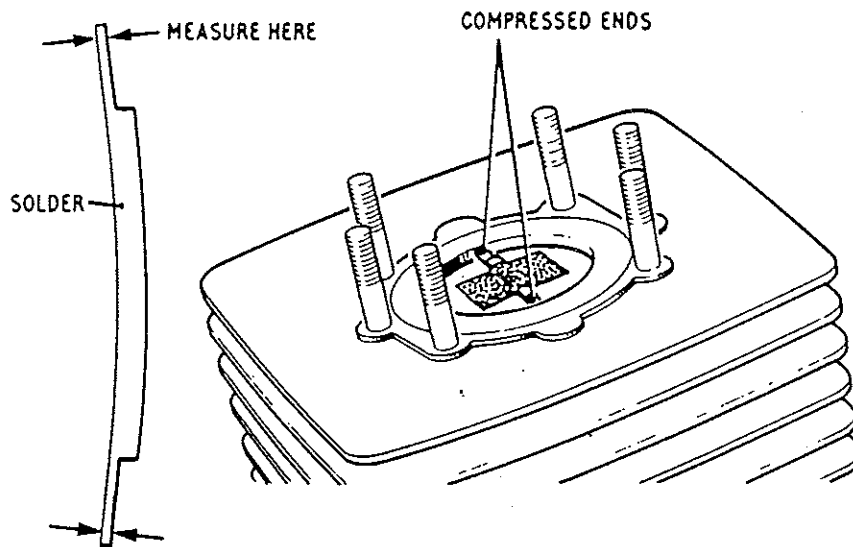


FIG.1.4b - MEASURING SQUISH AREA

1.11. Timing Rotary Valve

1. With Mark on Crankcase

- a. Set engine at TDC using the crankshaft locking bolt.
- b. Position Rotary Valve so that the leading edge corresponds with the mark on the crankcase (the rotary valve can be fitted with either face to the crankcase).
- c. Re-assemble engine.
- d. Remove crankshaft locking bolt.

2. With No Mark on the Crankcase.

- a. Using a degree wheel, mark  $137^\circ$  after the opening of the inlet port (anti-clockwise). See Fig. 1.5.
- b. From the closing edge of the inlet port mark  $75^\circ$  (clockwise). See Fig. 1.6.

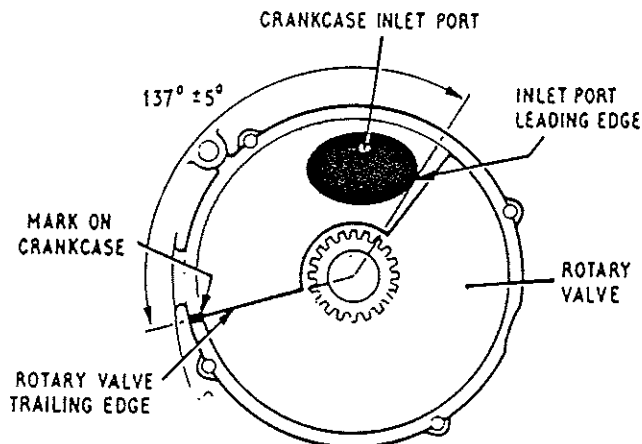


FIG. 1.5 - ROTARY VALVE TIMING (A)

- c. Using a DTI, or the crankshaft locking bolt, set engine at TDC.

d. Place disc to have the edges as close as possible to the two marks. If the edges do not align exactly make sure the error is equally divided between either mark. Maximum permissible tolerance,  $5^{\circ}$  on either side of the marks.

e. Re-assemble the engine and remove the locking bolt or DTI.

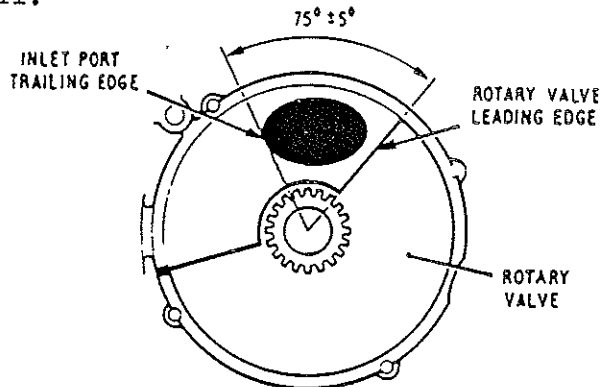


FIG. 1.6 - ROTARY VALVE TIMING (B)

1.12 Degree Wheel. The figure on page 7 can be stuck onto cardboard covered in plastic and used to time the rotary valve.

### 1.13 ENGINE REMOVAL PROCEDURE

1. Remove the Following:

Spark Plug  
Drive Chain  
Exhaust Pipe (Remove silencer first)  
Magneto Cover  
Gear Change Pedal

2. Disconnect the Following:

Vent Tubes  
Neutral Wire (at gearbox)  
Oil Pump Cable  
Clutch Cable  
Oil Line and Filter Input (Block with Mag Cover Bolt)  
Carburettor at Engine

3. Remove:

Lower Engine Studs and Spacers  
Front Engine Mountings and Bolts  
Rear Engine Mounting Bolt (Swing Arm Pivot)

Pull the engine upward and forward and withdraw it from the frame through mag side.

To refit engine reverse removal procedure.

## CHAPTER 2

### LUBRICATION SYSTEM

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2.4	Synchronizing Oil and Throttle Cables	10

#### 2.1 Advantages of Direct Oil Injection

1. Better Lubrication at Cold Start. When engine is cold, normal 2 stroke mixture tends to stick to the cold metal surfaces of the engine. Using oil injection, the oil is injected directly to where it is required.
2. Cuts out Mixture Error. Providing the oil tank has sufficient oil the mixture strength should always be correct.
3. Direct supply of oil. When using a rotary valve, as the inlet is on the LH side of the crankcase, insufficient oil will be supplied to the RH crankshaft bearing. With this system a direct supply of oil is fed to the RH crankshaft and big-end bearings.

#### 2.2 Components

1. Oil Tank - Part of the frame backbone.  
Capacity 2.16 lts (3.8 pts)  
The oil level must be checked on the dipstick whenever the fuel tank is checked.
2. Oil Pipes & Filter - The oil pipes are of clear plastic. On the inlet side of the pump, an in-line oil filter is fitted. This must be cleaned regularly. When refitting the filter the taper must be pointed toward the oil flow.
3. Oil Pump - A Makuni oil injection pump with a single control operated on the inlet side. This effects the quantity of oil supplied to the engine. The pump is driven directly off the crankshaft. The pressure of the oil is controlled by engine speed. Maximum oil supplied at full throttle is 175 ml/hr (0.32 pt/hr)  
The pump has twin outlets.
  - a. Direct to the LH side of the crankcase via the rotary valve.

b. To the RH side of the crankshaft and big-end bearings.

IF ANYTHING MECHANICAL GOES WRONG WITH THE PUMP IT MUST BE REPLACED NEVER REPAIRED

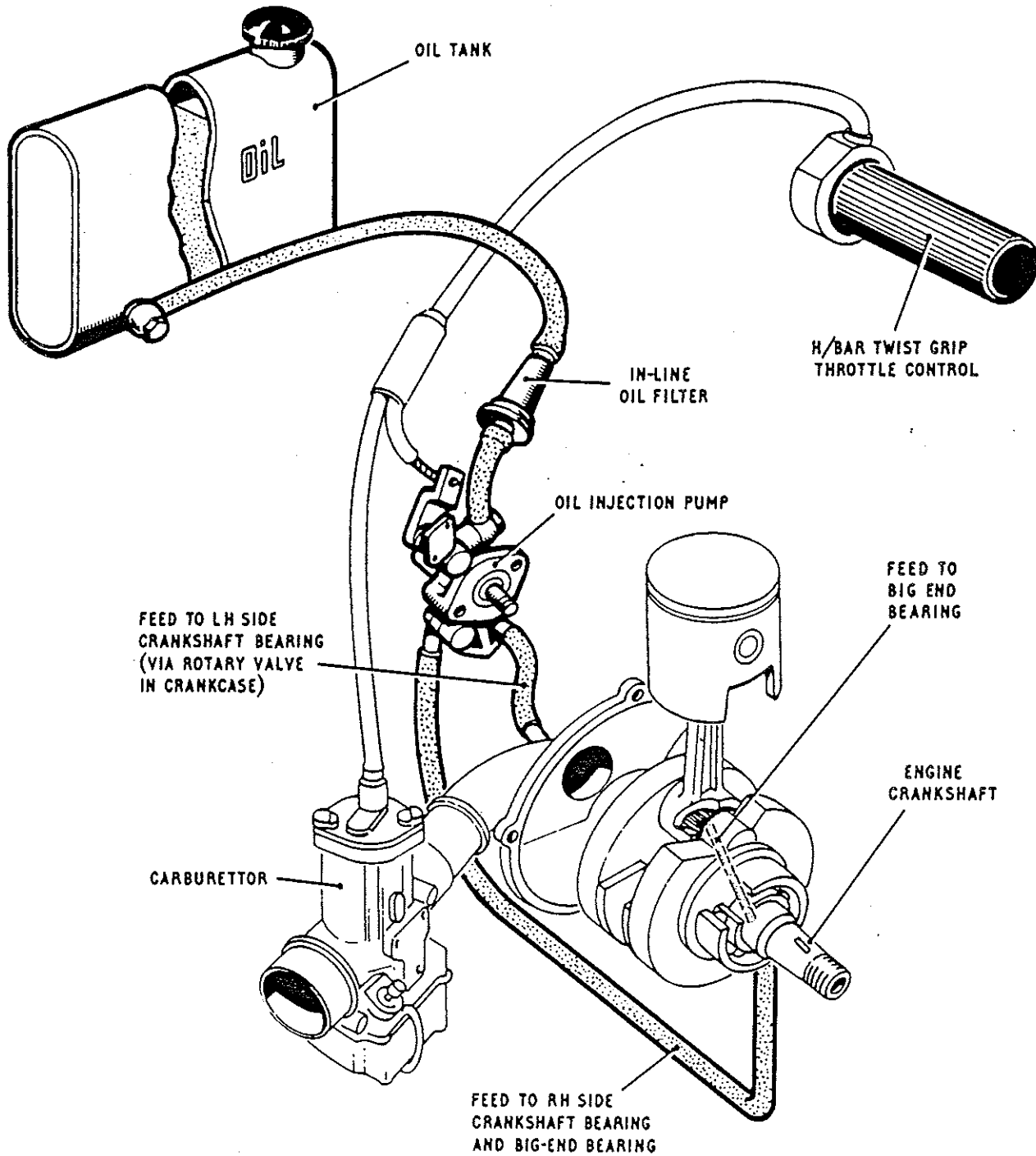


FIG. 2.1 - LUBRICATION SYSTEM

### 2.3 Bleeding the Oil Pump

1. Fill the oil tank.
2. Unscrew the lower bleed screw (Phillips type) until air is no longer escaping.
3. Tighten screw.
4. Start engine and allow it to idle between 1400-1500 rpm.
5. Push control lever to maximum for 3-5 mins (this will bleed the air out of the pump).

2.4 Synchronizing Oil and Throttle Cables. It is imperative that the oil pump is synchronized with the throttle so that the correct amount of oil is supplied to the engine.

1. Connect throttle and oil cables.
2. Loosen throttle cable adjustment (at twistgrip) to provide maximum slack.
3. Using cable adjuster on throttle slide chamber cover, set cable slack to 1.6mm (1/16").
4. Using injection pump cable adjuster (at engine casing) adjust cable to align pump marks.
5. Adjust throttle cable (at twistgrip) to provide 1.6mm of slack.
6. Lock all cable adjuster nuts.

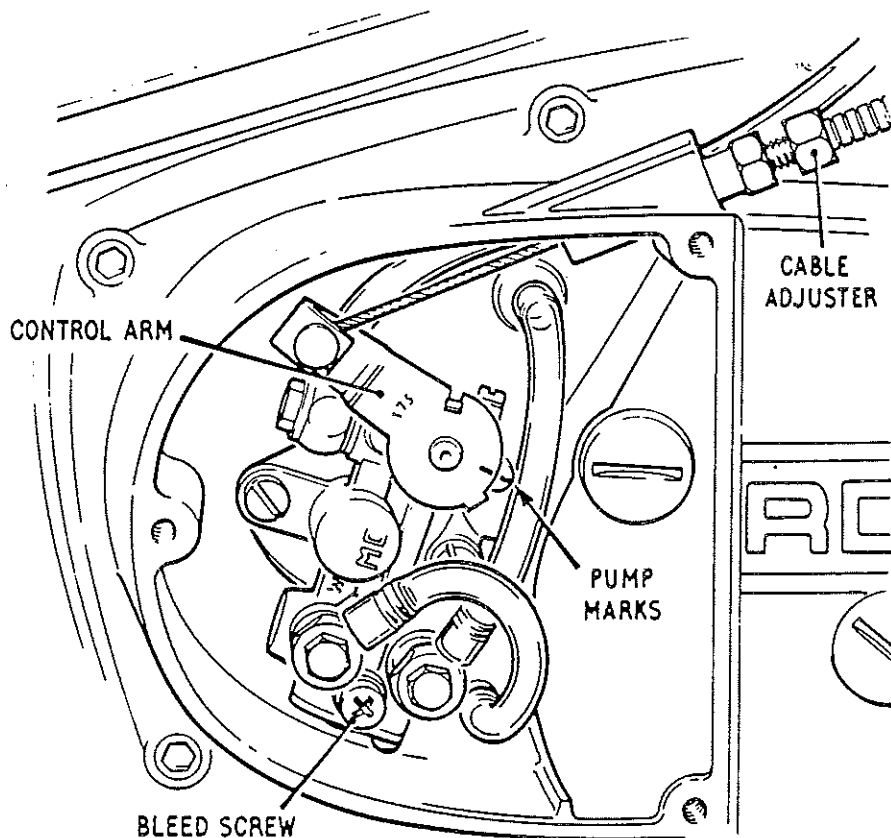


FIG. 2.2 - OIL PUMP TIMING MARKS

## CHAPTER 3

### CLUTCH ASSEMBLY

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3.1 Build up. The clutch is built up of the following - clutch drum, friction plates, pressure plates, inner pressure plate, clutch springs, spring pressure plate and clutch hub.

1. The crankshaft gear is in mesh with the clutch drum outer gear. The clutch drum is mounted on bearings which are on a sleeve on the clutch shaft. The sleeve is slightly larger than the clutch drum, this will give a small amount of end float, which allows the drum to rotate independently of the sleeve. The small gear on the back of the clutch drum is in mesh with the kickstart idler gear which is in turn in mesh with the kickstart gear. There are slots cut in the drum to drive the friction plates.

2. The clutch hub is splined to the clutch shaft and held in place by splined lock washer and nut. The outside of the hub is splined to take the pressure plates. There are holes in the hub through which the posts on the inner pressure plate protrude. (See Fig. 3.1).

3. There are two types of plates. There are friction plates, these have cork on both faces and lugs on the annulus, they are also free to rotate on the hub. The other set of plates are pressure plates made of mild steel and splined to the hub. The two types of plates are alternately mounted on the hub (Fig. 3.2).

4. The inner pressure plate is internally splined and geared to the clutch hub (Fig. 3.1). The posts on the inner pressure plate protrude through the clutch hub with springs positioned over them (Fig. 3.2), the posts are internally threaded. Screws secure the plate to the top of the posts holding the springs under tension. In this position the springs force the retaining plate away from the hub (Fig. 3.2), which draws the inner pressure plate to the hub, and so clamps all the plates together.

3.2 Power Flow:

- Crankshaft gear
- Clutch drum
- Friction plates (via Lugs)
- Driven plates
- Clutch hub
- Clutch shaft



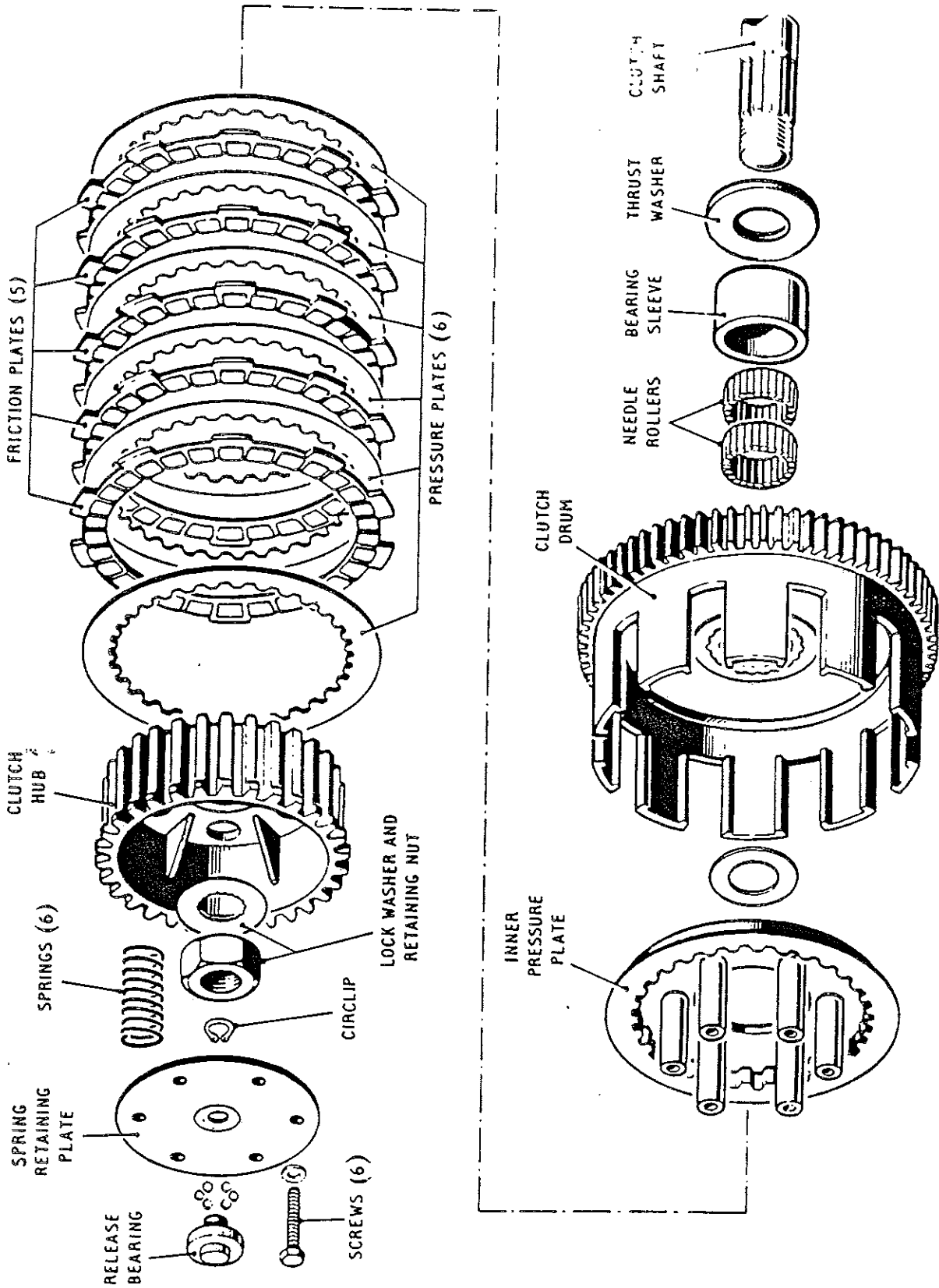


FIG. 3.1 CLUTCH ASSEMBLY EXPLODED VIEW

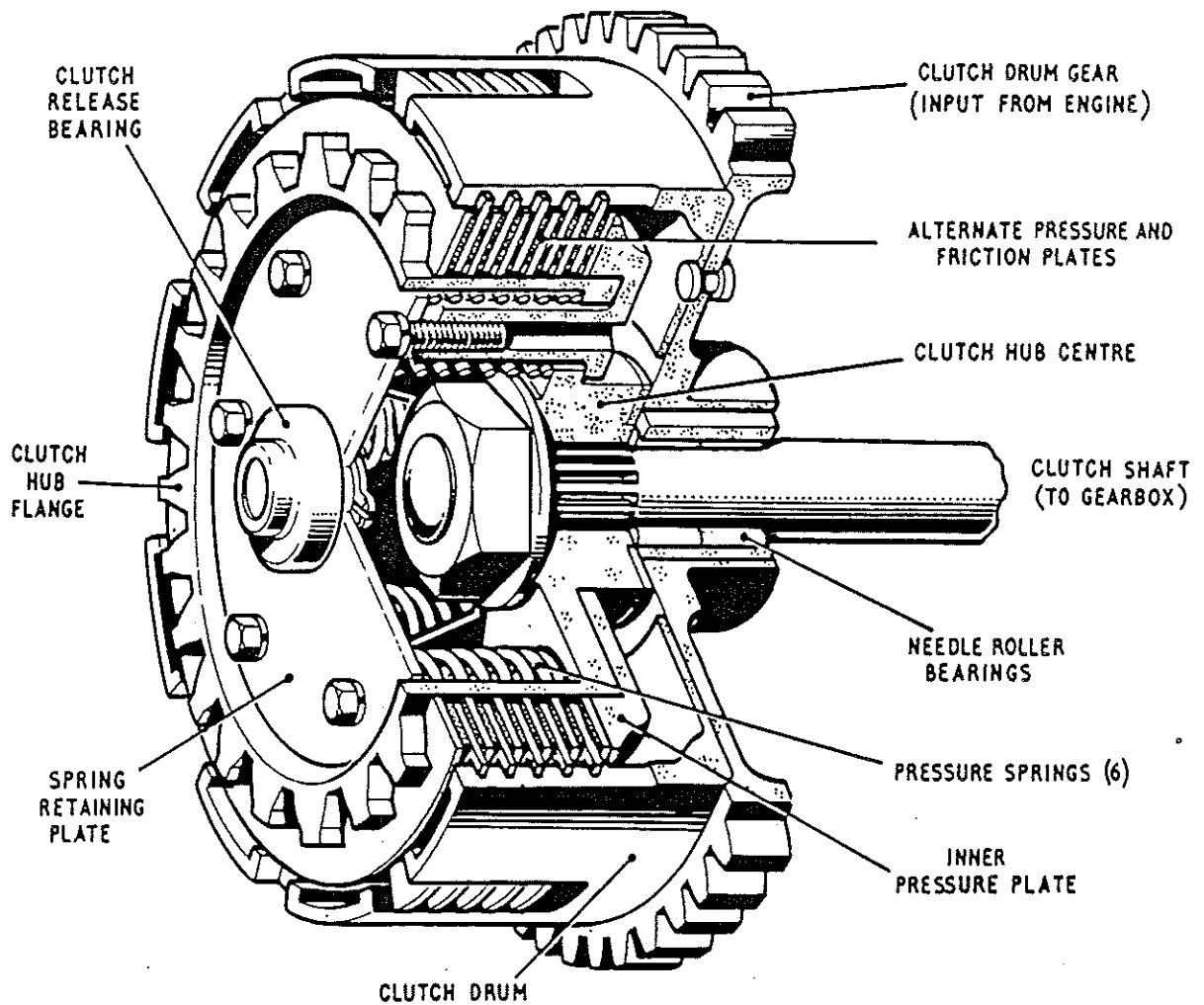
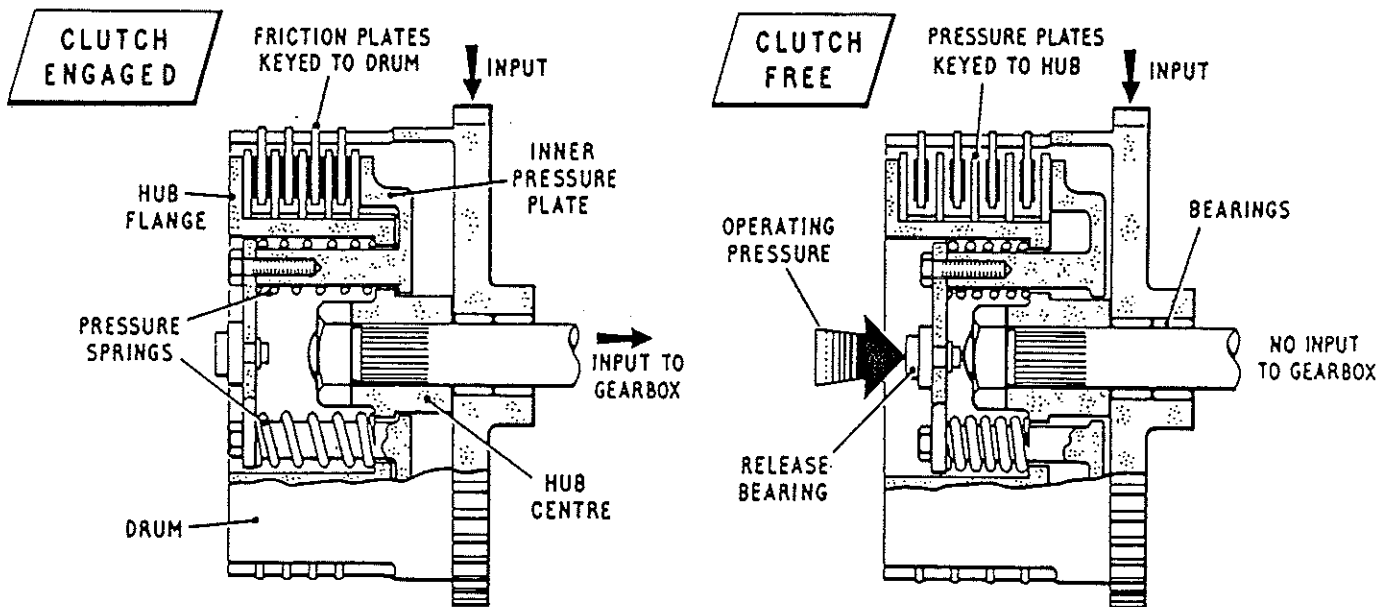


FIG. 3.2 CLUTCH ASSEMBLED VIEW



FRICTION PLATES COMPRESSED BETWEEN HUB AND PRESSURE PLATE BY SPRINGS. DRUM AND HUB LOCKED TOGETHER AND REVOLVE AS ONE UNIT.

PRESSURE PLATE MOVED INWARD BY OPERATION OF CLUTCH H/BAR CONTROL. FRICTION PLATES RELEASED FROM COMPRESSION AND SEPARATE AXIALLY. NO DRIVE BETWEEN DRUM AND HUB.

FIG. 3.3 CLUTCH OPERATION

### 3.3 Clutch Faults

1. Slip - Worn friction plate  
Bent plates (friction or driven)  
Weak or broken springs  
Insufficient clutch freeplay
2. Drag - Bent plates (friction or driven)  
Burrs or grit on hub splines  
Too much clutch free play  
Worn drum slots

RELEASE BEARING NOISE - Seized or damaged bearings

CLUTCH DRUM BEARING NOISE - Seized or damaged bearings

### 3.4 Clutch Adjustment

1. Loosen the clutch adjuster at handlebar to provide maximum slack.
2. Remove the adjuster access plug.
3. Loosen the 4mm set screw.
4. Turn the 8mm adjustment screw in and out to locate the point of contact with the release bearing then turn the screw  $\frac{1}{4}$ - $\frac{1}{2}$ " turn (anti-clockwise).
5. Tighten the 4mm set screw.
6. Replace access plug.
7. Adjust the cable at handlebar to provide  $\frac{1}{8}$ "- $\frac{1}{4}$ " slack between the clutch lever and housing.

3.5 To Release the Clutch. By applying a pressure to the spring retaining plate via the release bearing, the inner pressure plate is pushed away from the clutch hub and allows the friction and driven plates to turn independently of each other.

## CHAPTER 4

### GEARBOX ASSEMBLY

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#### 4.1 Construction and Operation

1. It is a five speed constant mesh gearbox mounted integral with the engine casing to the rear of the crankcase. The gears are all spur gears and gear engagement is by dog teeth. There are two shafts, the main shaft and the clutch shaft. The clutch shaft has 1st gear built into it, 4th and 5th gear sit on bearings on the clutch shaft and 2nd and 3rd are splined to it. Third gear also has a recess to accept the selector fork. By sliding 3rd gear left or right it will engage 4th or 5th. The gears are mounted 1st, 4th, 3rd and 2nd from the left. The clutch shaft is mounted on two ball bearings located in both crankcase halves. The left side of the clutch shaft protrudes through the crankcase and the clutch hub is splined to it and secured by a nut.

2. The main shaft also has 5 gears mounted to it in the same relationship as the clutch shaft, 1st, 2nd, and 3rd are mounted on bearings, and 4th and 5th are splined to the shaft. 4th and 5th gears have recesses to accept the selector forks. By sliding 5th gear to the left, 2nd gear will be engaged and 4th moves left for 3rd and right for 1st. The main shaft is also mounted on two ball bearings pressed into the crankcase halves. The LH end of the shaft protrudes through the crankcase as a plain shaft and the kick start idler gear with an internal bush fits on it. The RH side of the shaft projects through the crankcase and the chain sprocket is splined onto it and held rigidly by a nut. (See Fig. 4.2).

3. Gear selection is achieved by moving the selector forks and gears in and out of mesh. The movement of the selector fork is controlled by the selector drum. The drum is mounted to the LH and RH crankcase halves and is allowed to rotate. The selector fork pegs follow grooves in the drum, the pattern of the grooves allows two selectors to remain stationary and the other to move the chosen gear in and out of mesh.

4. The RH side of the drum also has a grooved plate of which the depressions refer to an engaged gear or neutral and into which a sprung pawl locates, this acts as a locking device. The drum is rotated by a toothed arm which coincides with pegs integral on the drum. The arm is returned to the central position after gear engagement. The eccentric pin adjusts the position of the arm in relation to the drum. The arm is controlled by the gear selector shaft and the foot pedal.

5. An insulated washer is integral with the selector drum and fits between the drum and the RH crankcase. A metal pin protrudes through the washer and coincides with an electrical switch when the gearbox is in neutral, this provides an earth path for the neutral light.

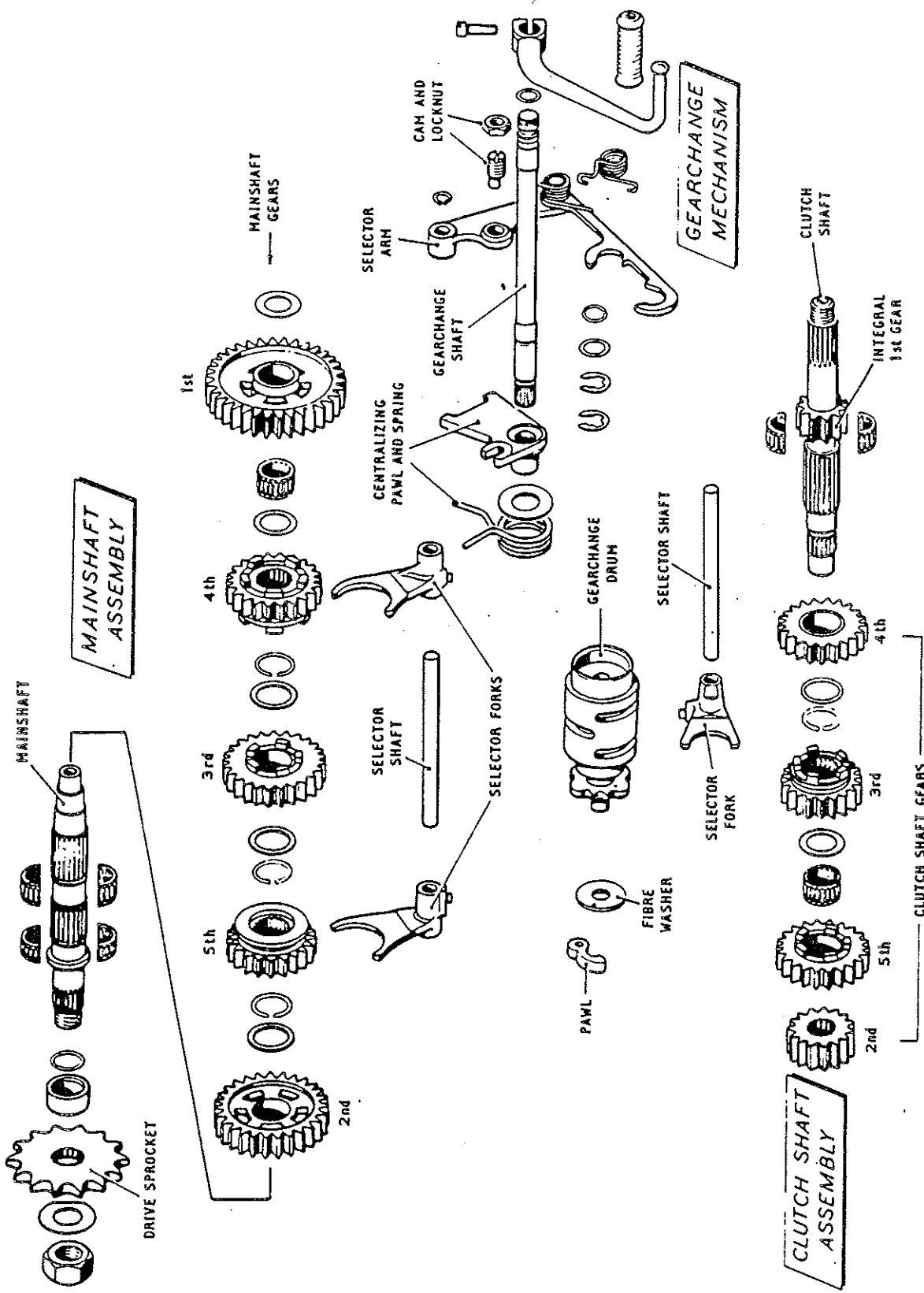
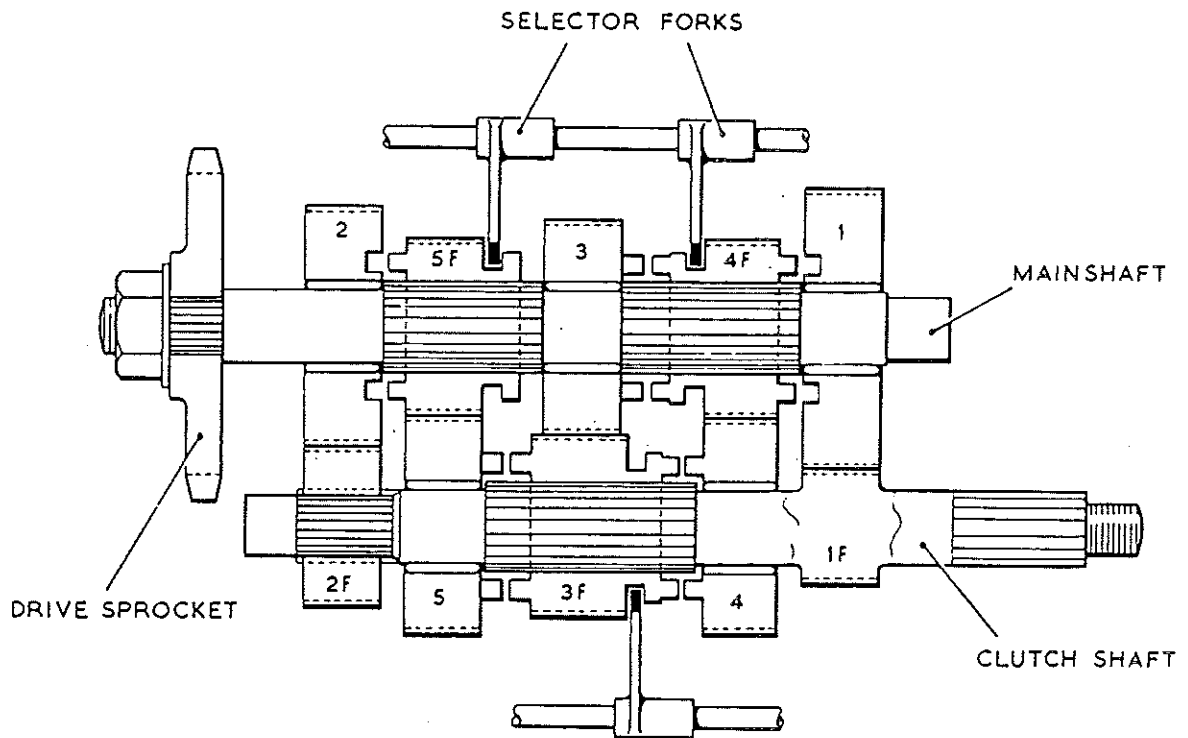


FIG. 4.1 GEARBOX ASSEMBLY EXPLODED VIEW

## 4.2 Faults

1. No gear engagement. Return spring on the gear selector arm broken, seized drum. Broken gear selector shaft.
2. Failure to Select Individual Gears. Teeth missing. Bent selector forks. Eccentric out of adjustment (Only on top gears).
3. Jumping Out of Gear. Index pawl spring broken. Bent selector fork. Too much end float on shafts. Eccentric out of adjustment.



GEARS IN NEUTRAL

FIG. 4.2 GEAR TRAIN

DRIVE CHAIN AND SPROCKETS

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5.1 Chain Length. The chain is of single link construction and the standard length is 102 links. To adjust the tension, adjusters are fitted either side of the rear wheel hub. The chain should be renewed when the length of 16 pitches exceeds 25.6cms (10 $\frac{1}{2}$ " ). 16 pitches on a new chain will be 25.4cm (10").

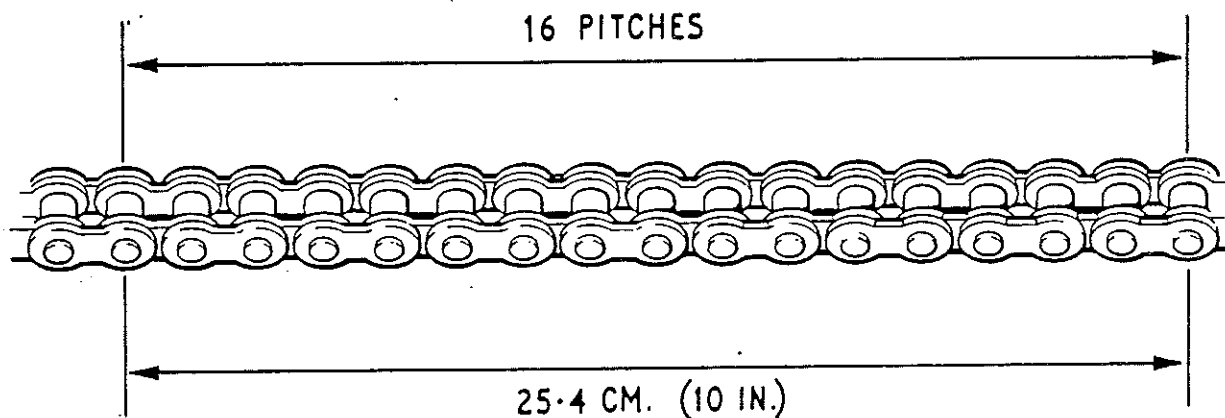


FIG. 5.1 CHAIN MEASUREMENT

5.2 Chain Lubrication. The chain should be lubricated with OMD 75 as and when required (daily if necessary). To lubricate the chain, support the frame on the centre stand or a box, to raise the rear wheel clear of the ground. Rotate the wheel and apply a liberal quantity of oil to each roller and link.

1. At every 1000 mls or 3 months during servicing the chain and sprockets should be checked for wear.
2. To prevent rapid chain wear the sprocket should be replaced as soon as a hooked appearance is noticed.

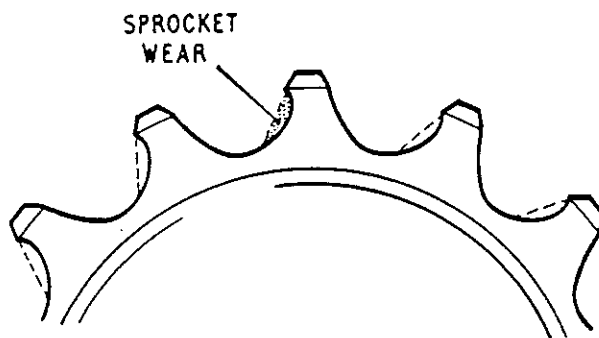


FIG. 5.2 SPROCKET WEAR

5.3 Chain Wear. To prevent rapid sprocket wear the chain should be checked for wear. If the chain can be lifted away from the sprocket, Fig. 5.3, the chain should be removed and measured, Fig. 5.1.

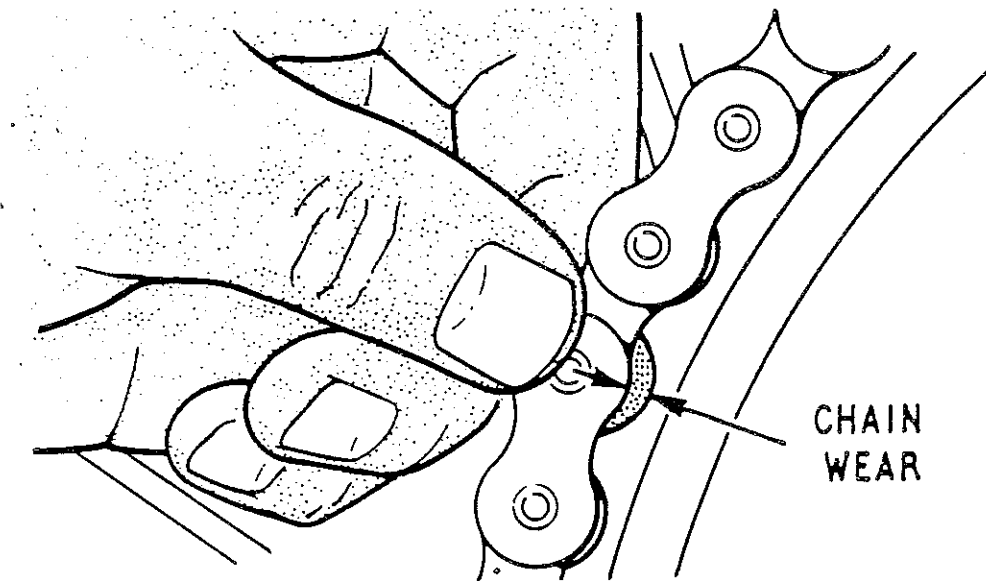


FIG. 5.3 CHAIN WEAR

5.4 Master Link Fitting. When refitting the chain master link, the clip must be installed with its closed end facing the direction of chain travel.

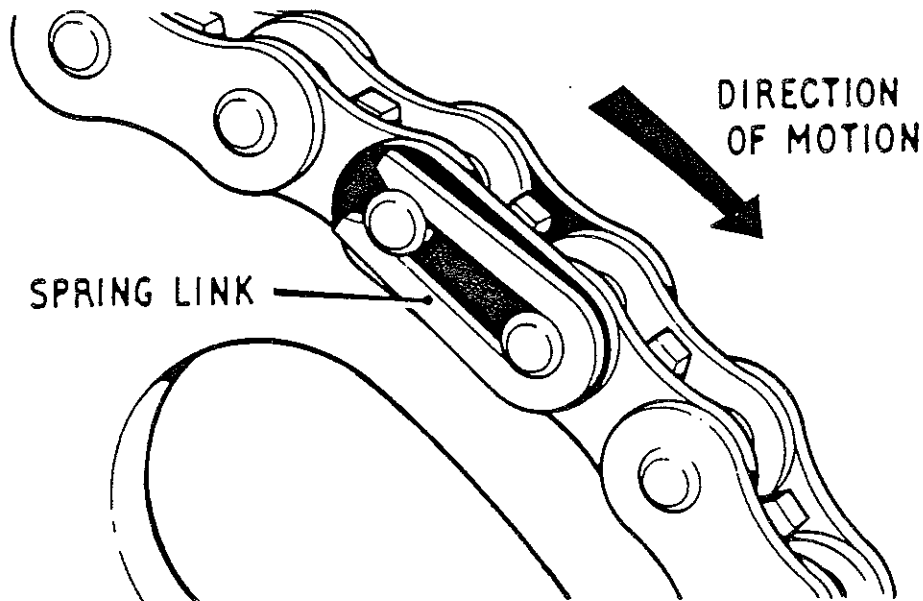


FIG. 5.4 MASTER LINK FITTING

This is so that the link does not spring off as the chain is subjected to stress of drive and over-run on the road. In cross country riding the link could strike a protruding rock or root and spring off.



## CHAPTER 6

### BING 84 CARBURETTOR

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#### 6.1 Cold Start System

1. With the throttle closed and the choke lever depressed, the engine will draw air from the piston by-pass hole and fuel from the float bowl via the starting jet, to form a rich starting mixture.

2. Opening the throttle will reduce the depression in the starting system, and it will not supply the required enriched mixture. There are no adjustments to the starting system.

6.2 Idle Jet System. At idling speeds, there is insufficient vacuum to draw fuel through the main jet system, hence the need for the idle jet system. With the carb piston held open slightly by the idle speed adjustment screw, air is drawn from the carb inlet, via the piston, and as air bleed to the idle jet. Fuel is drawn from the float chamber via the idle jet. The fuel/air mixture is adjusted by means of the idle air screw. This varies the amount of air fed to the idle jet from the bleed. Screw in to richen, screw out to weaken.

6.3 Needle Jet System. Once the piston is lifted to partial throttle opening sufficient depression is felt to draw fuel up the needle jet system from the float chamber. At this stage the throttle cut-away controls the amount of air admitted. Lifting the tapered needle allows a larger volume of fuel to pass through the needle jet. The needle can be fitted into the piston in 4 different positions, lowering it restricts the flow through the needle jet and so weakens the mixture. At this stage the main jet has no effect on the supply of fuel.

6.4 Main Jet System. When the slide is three quarters open the needle valve has little effect on the fuel flow. Then the fuel supply is controlled by the main jet, and the air supply by the height of the slide.

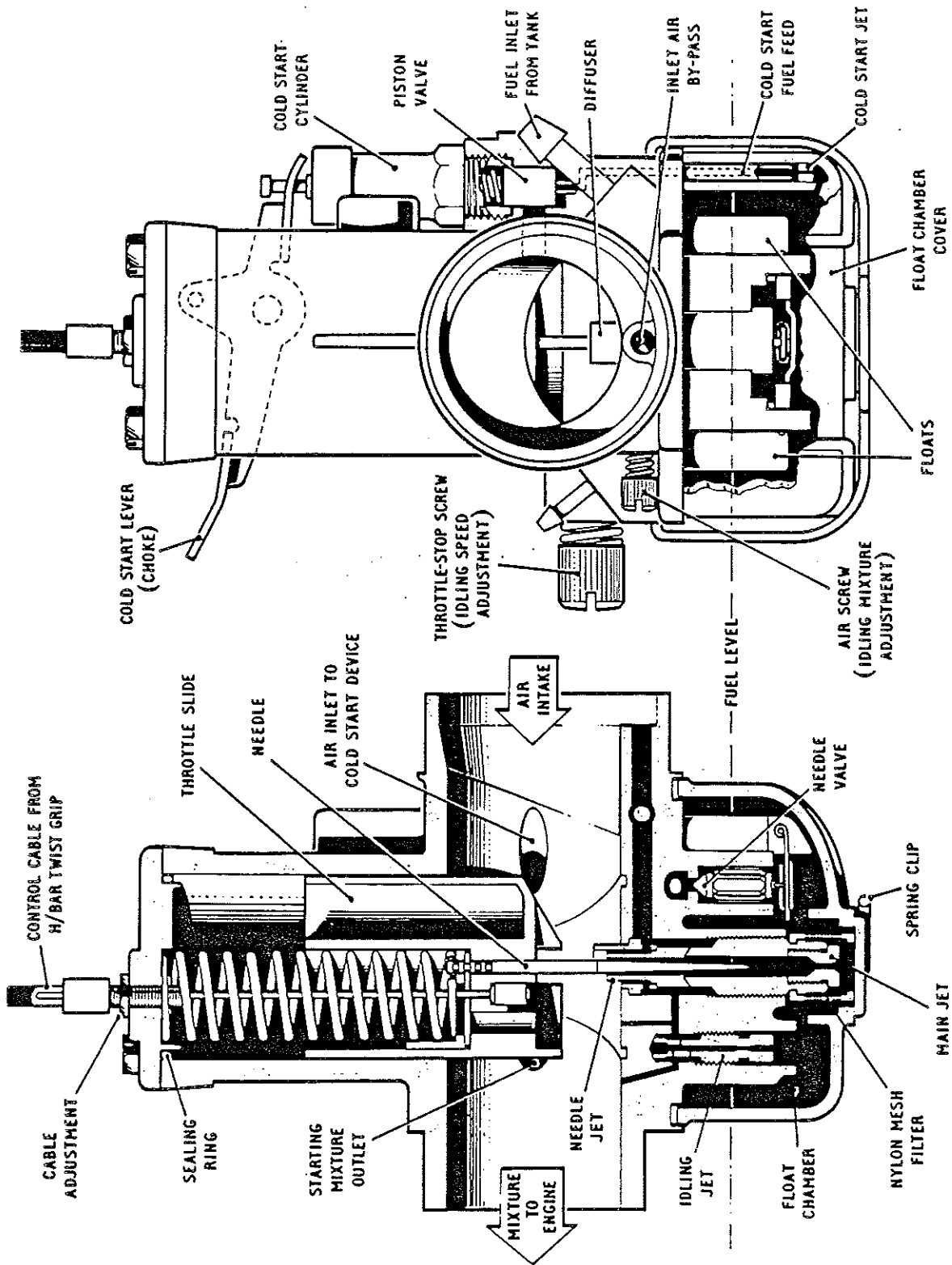


FIG. 6.1 CARBURETTOR

## 6.5 Idle Speed and Mixture Adjustments

1. Turn mixture adjusting screw in until it stops, then back out 1 turn.
2. Start engine and allow it to warm up.
3. Adjust idle speed screw in or out for desired idle speed (1400 rpm approx).
4. The idle air screw can be turned in or out (within  $\frac{1}{4}$  turn of basic setting) to achieve smoothest idle possible. Re-adjust idle speed if necessary with idle speed adjuster.

6.6 Cable Adjustment. This is the same procedure as the oil pump and throttle synchronization.

THE THROTTLE CABLE MUST NEVER BE ADJUSTED WITHOUT THE OIL PUMP CABLE OTHERWISE ENGINE DAMAGE COULD OCCUR.

6.7 Float Height Adjustment. With carburettor on its side the float adjustment tab just touching needle, measure distance between top of float and float chamber body (from the gasket groove bottom). Adjust float height to 22.5mm. To adjust, carefully bend adjustment tab of float arm until specified height is reached. If no measuring device is available position top of float parallel with the carburettor body.

## 6.8 Range and Sequence of Carburettor Adjustments

1	0 - $\frac{1}{8}$ Slide opening	Idle Jet and Air Screw Adjustment
2	$\frac{1}{8}$ - $\frac{1}{4}$ Slide opening	Throttle Slide Cut Away Size
3	$\frac{1}{4}$ - $\frac{3}{4}$ Slide opening	Needle, Needle Jet and Needle Clip Position
4	8 - Full Slide opening	Main Jet

## CHAPTER 7

### ELECTRICAL SYSTEM

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#### 7.1 Lights and Operating Circuits

1. The Can-am Motor Cycle incorporates conventional lighting circuits which include: Headlight and Tail-light operated initially by the ignition key to switch the circuit on and a main beam and dip switch mounted on the LH side of the handlebar. Also a main beam warning light. An indicator system with four amber indicator lamps LH front and rear and RH front and rear. Power is supplied from the battery/alternator and is fed through the ignition switch to the flasher relay, located below the battery. From there the supply goes to a three position indicator switch mounted on the LH side of the handlebar, and so to the lights. An indicator warning light is fitted to the speedometer.

2. The brake light is also fed off the ignition switch and a separate switch is provided for each of the brakes. The front brake light switch operated by the front brake lever and the rear by the brake pedal. Operation of either switch will light the brake light bulb.

3. The horn is also fed from the ignition switch and an earth button is mounted on the LH handlebars.

4. A green neutral light is also mounted in the speedometer, and operates when the gearbox is in neutral.

5. The charging circuit is a normal AC system. The generator, rectifier, battery and lighting circuits are fed through the ignition switch. An amperage detector is fitted between the rectifier and the ignition switch operating the generator warning light.

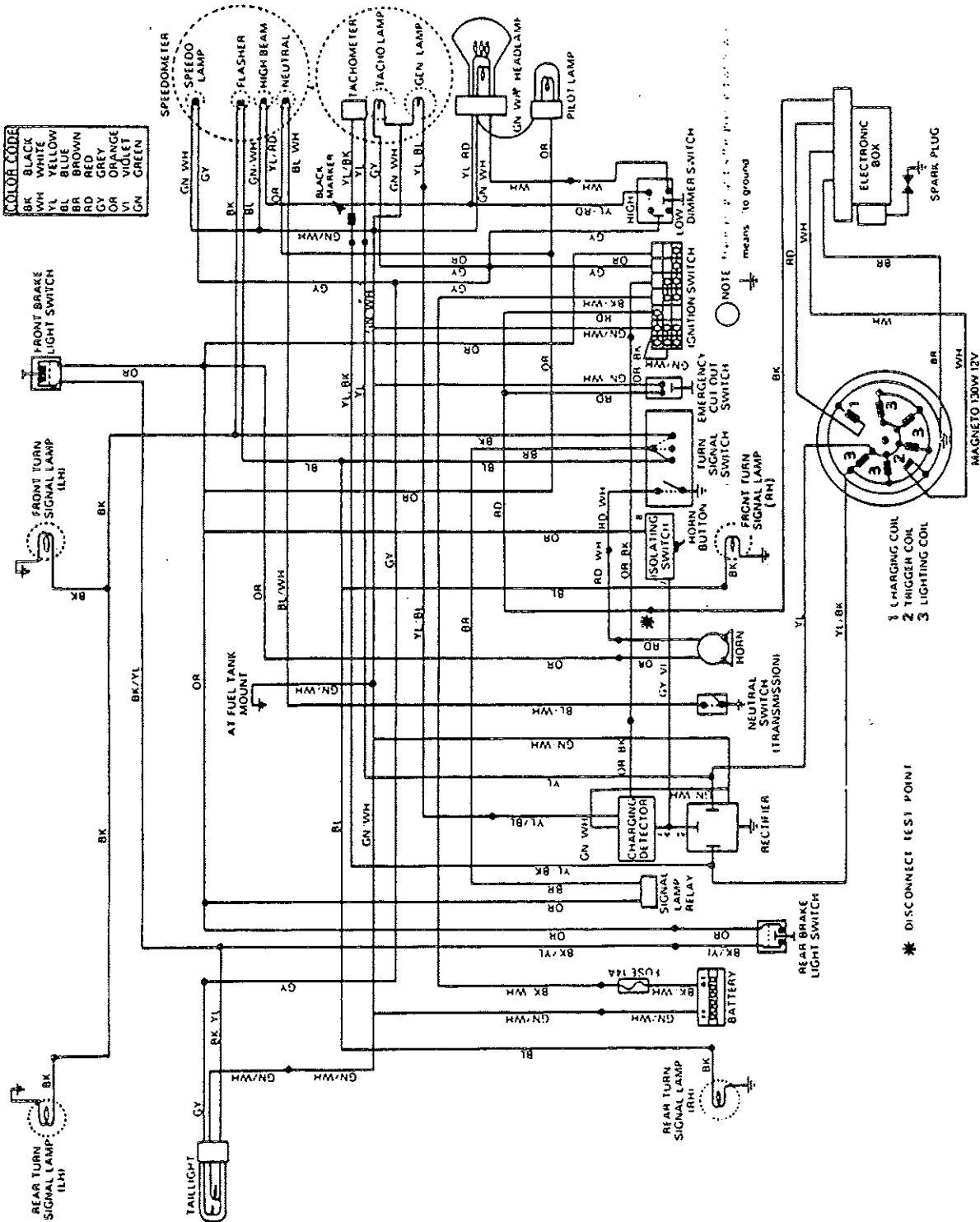


FIG. 7.1 WIRING DIAGRAM

6. The impulse tachometer receives AC from the alternator via the two alternator/rectifier leads.

7.2 Charging Checks. In the event of the battery not being charged, certain checks must be made. Firstly, a fuse is fitted in line with the main battery positive lead to the ignition switch and this must be checked. At the same time a visual check should be made on the battery connections and the battery condition.

### 7.3 Alternator Coil Checks

1. If the tacho is operating correctly the lighting coils are functioning correctly. If the tacho is inoperative connect a suitable test lamp between alternator outputs YL and YL/BK. Start engine, if lamp lights and gets brighter with increasing engine revs the alternator is OK.

2. If results are not positive ie lamp fails to light or lights only dimly the lighting coils should be checked.

3. Connect ohmmeter between YL and YL/BK. A good reading is between 0.15 x 0.9 ohms.

7.4 Rectifier Check. Disconnect the BK/WH leads from the rectifier. Connect a suitable test lamp from the rectifier output to earth. Start the engine - lamp lights rectifier OK.

7.5 Charging Detector Check. Disconnect the output from the detector YL/BL. Connect test lamp between the detector output and earth. Start the engine, if lamp lights the detector is OK.

7.6 Generator Warning Light. In the event of the warning light failing ie stays on permanently with the ignition switch on or fails to light at all the battery will still be charged.

### 7.7 Ignition Components:

Charging coil  
Trigger coil  
Electronic box  
Spark plug

7.8 Ignition Operation. The switches in Fig. 7.2 are shown in the 'on' position, the engine is running.

1. Magnets in the flywheel pass over the charging coil inducing a voltage in it, the output is A/C. The voltage passes through to the electronic box and is rectified to D/C by a diode. The voltage then flows to the capacitor and charges it. The voltage finds an earth path from the capacitor through the primary windings of the coil.

2. Once every 360° two pole shoes on the magnets pass over the trigger coil inducing a voltage, the output is A/C. The voltage passes to a diode in the electronic box where it is rectified to D/C. The rectified voltage flows to the thyristor and switches it on, in the same manner as a transistor.

3. Now that the thyristor is live a path to earth is opened through it allowing the capacitor to discharge. In doing so an electromagnetic field is induced in the coil primary windings. When the voltage from the trigger coil ceases to flow to the thyristor the earth path is switched off. Therefore the electromagnetic field in the coil collapses inwards from the primary to the secondary windings inducing a high tension voltage. The voltage flows to the spark plug and fires the engine.

4. If either the 'ignition' or the 'cut out' switches are closed the trigger coil voltage is passed to earth. Therefore the thyristor receives no switching voltage, so no high tension voltage is produced.

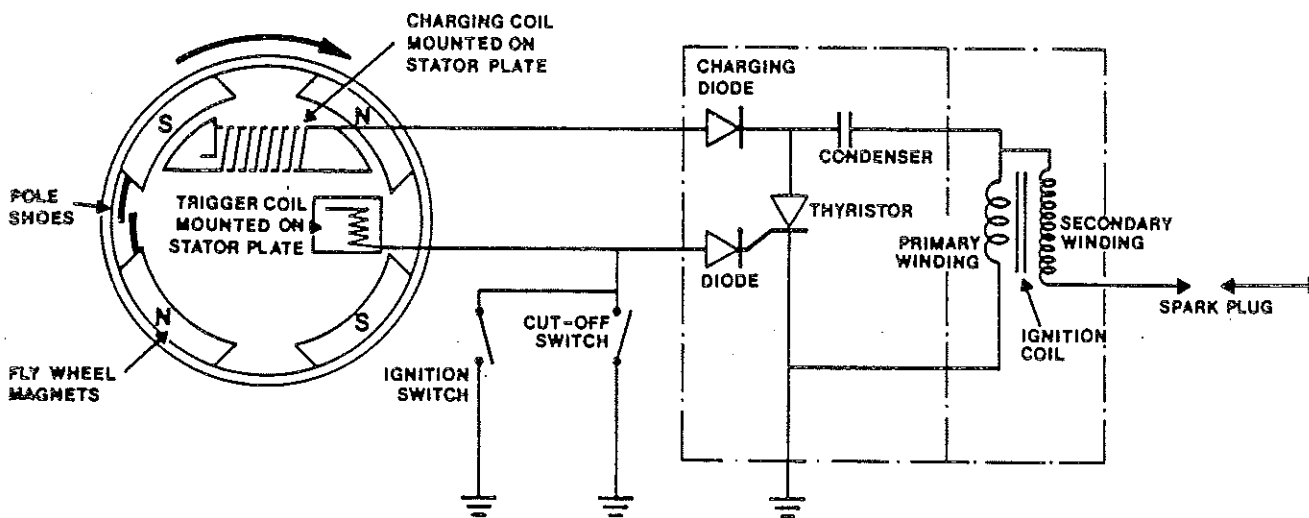


FIG. 7.2 CDI (THEORETICAL)

## 7.9 Ignition Checks

1. Ensure ignition is switched on and emergency cut out is at RUN. Try to start.
2. Remove sparking plug, fit a known good plug and EARTH. Kick engine over. If there is a spark on the good plug, original plug is faulty.
3. Disconnect black wire from red wire beneath battery. This cuts ignition and emergency switch out of the circuit. Try to start.
4. Remove jack plug from beneath electronic box.
  - a. Charging Coil Check - Connect ohmmeter from red to earth. It should read between 450-550 ohms.
  - b. Trigger Coil Check - Connect ohmmeter from white to earth, reading should be between 59-67 ohms.
5. If OK, check connections in box, if satisfactory change box.

## 7.10 Ignition Timing (Static)

1. Remove spark plug.
2. Remove Mag cover plug.
3. Select top gear, fit DTI.
4. Rotate back wheel in DOR until TDC is registered on the DTI. Turn the wheel against DOR until 0.054" is before TDC.
5. Check timing marks, Mag cover and flywheel marks must align with one another.
6. If the flywheel mark does not align, re-check static timing, if it is still incorrect the flywheel must be re-marked.

## 7.11 Ignition Timing (Strobe)

1. Remove the timing inspection plug and connect the timing light pickup to HT lead.
2. Start engine and allow it to warm up.
3. Point the timing light beam straight into the inspection hole and revving the engine to 7000 rpm for a brief instant, check the timing mark alignment.
4. If the marks do not align, remove magneto cover, loosen stator retaining screws and advance or retard stator plate as necessary. Tighten screws.
5. Refit magneto cover and re-check.
6. Repeat procedure until timing marks align.



## CHAPTER 8

### SUSPENSION AND BRAKES

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8.12 Faults	31

8.1 Frame. Tubular double loop frame with tapered backbone, incorporating engine oil tank. If the frame requires welding repairs use steel welding rods to minimize heat.

8.2 Swing Arm. Strengthened swing arm mounted on silent block bushes with shims between the engine/swing arm and frame/swing arm.

#### 8.3 Shimming the Swing Arm

1. With swing arm removed fit a 0.4mm (0.018") shim under each flanged bush.
2. Fit swing arm, if clearance is detected between flanged bush and frame or engine boss, fit a 0.9mm (0.036") shim at that point.
3. Fit pivot bolt.
4. Set swing arm at the middle of its travel and tighten nut to 100 NM (75 ft/lbf).
5. Using feeler gauge check that there is at least 0.5mm (0.020") clearance between shims and swing arm boss.
6. If the clearance is less renew the silent block bush.

8.4 Front Forks. BETOR telehydraulic front forks using approx 1/3 pint OMD 75.

8.5 Operation. The fork springs form the main part of the suspension as in normal vehicle systems employing leaf or coil springs. The spring oscillations are damped out by using a hydraulic damper. As the unit is compressed, air in the top chamber is pressurized. The pressure is felt down the centre of the piston rod and forces the oil level down. The oil is forced out of the hole(s) in the piston rod. As soon as the oil uncovers the hole, air pressure is released into the bottom chamber. If the unit is compressed more the pressure in the top tube is increased and the oil in the piston rod is forced down further. The travel is consequently greater and the second hole is uncovered. The damping effect therefore is by forcing the oil out of the holes. If a thinner oil is used it will pass through the holes more readily giving a softer ride and conversely if thicker oil is used it would mean harsher damping. Again if the oil level is too high more pressure would be required to push the oil level down to the holes, and again it would lead to harder suspension. Conversely if the level were too low only a small pressure would be required to uncover the holes. As the spring re-asserts itself a depression would be felt in the top chamber as the volume increased and oil would be drawn from the bottom chamber through the holes to the inside of the piston rod. Thus causing a damping effect on the upward stroke as well as the downward stroke. See Fig. 8.1.

#### 8.6 Faults

1. Weak or broken springs.
2. Oil leaks.
3. Incorrect oil level.
4. Incorrect grade of oil.

8.7 Rear Suspension. Girling Gas Shockabsorbers with an adjustable cam for increasing or decreasing spring pressure.

8.8 Operation. As in the front suspension unit the spring does all the work and the spring oscillations are damped put by the hydraulic action. The Girling gas shocks have a single chamber sealed at both ends. The bottom seal being made by a piston attached to an operating rod. The top chamber is attached to the frame, and the operating rod to the swing arm. The sealed chamber has a level of oil and above that, nitrogen gas under pressure.

As the unit is operated nitrogen readily mixes with the oil. The action of the piston moving up the chamber compresses the oil/nitrogen mixture and the effect felt is similar to that of a spongy brake pedal. The more it is depressed the harder it becomes.

#### 8.9 Faults

1. Weak or broken springs.
2. Oil leaks.
3. Bent operating rod.
4. Damaged mountings.

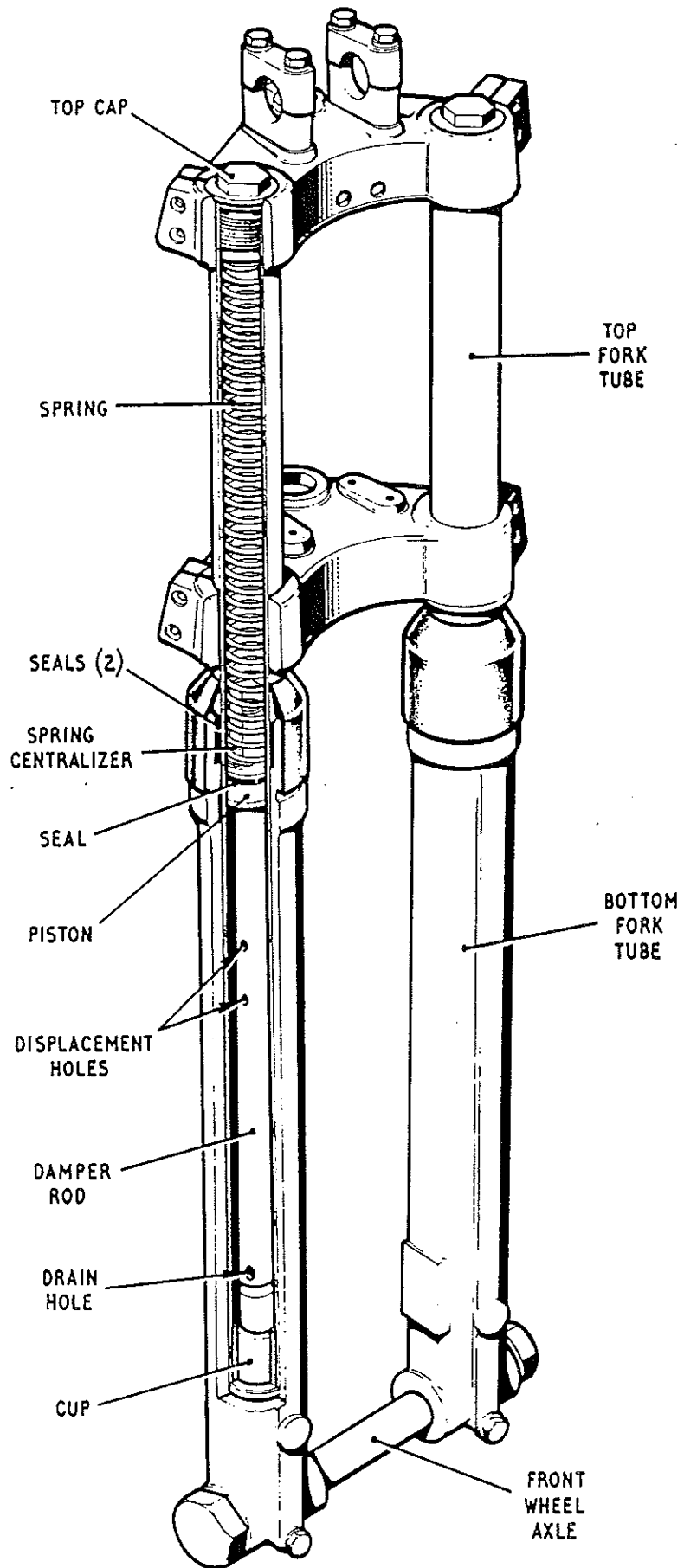


FIG. 8.1 FRONT SUSPENSION UNIT

8.10 Steering Head Bearing Adjustment. If play is felt on the steering head bearings they should be adjusted. Remove the steering damper before adjustment is made. There should be no free play felt on the steering head.

8.11 Braking System. The Can-am Motor Cycle employs a single leading, single trailing internal expanding shoe set-up. The shoes are operated by a cam which forces the shoes into contact with the drum. The front brake is cable operated by a lever on the RH of the handlebar, the rear brake by a rod operated by a foot pedal. The front and rear brake shoes are interchangeable.

8.12 Faults. Worn shoes  
Worn drum  
Stretched cable  
Incorrect adjustment  
Dirt in drums  
Suspension faults

CHAPTER 9

DATA, OILS AND SEALANTS

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9.9	Liquid Capacities	33
9.1	<u>Engine</u>	
	Rotary valve 2 stroke, single cylinder, air cooled 247 cc engine Horsepower at rear wheel 26 at 7,500rpm 5 speed gearbox with gear change on left hand side Multiplate 5 disc oil bath clutch	
9.2	<u>Carburettor</u>	
	Bing 32mm V84 Main jet 1.30 Needle jet 2.70 Idle jet 40 Needle setting 2nd from the top Air filter foam oil impregnated	
9.3	<u>Electrical</u>	
	Ignition system	Bosch CDI (Capacitor discharge ignition)
	Spark plug	Bosch W260
	Plug gap	0.020"
	Battery	12v 5AH
9.4	<u>Chassis</u>	
	Type	Tubular double loop space frame with tapered back bone
	Front Forks	Betor teledraulic 6.6 in travel
	Rear suspension	Trailing arm, Girling shock absorbers
	Front/Rear brake	Drum single leading shoe
	Tyres front	Dunlop 19 x 350
	Tyres rear	Dunlop 18 x 400
9.5	<u>Oils</u>	
	Engine oil OMD 45	2.2 ltr 3.75 pt
	Gearbox oil OMD 75	1.1 ltr 2.0 pt
	Front Forks oil OMD 75	0.2 ltr 0.35 pt
	Air Filter oil OMD 75	-
	Chain oil OMD 75	-

9.6 Sealants

241 Medium strength	H1 8030.99.224.7305
270 High strength	H1 8030.99.224.8261 10cc
	8992 50cc
SILCOSET 151	H1 8030.99.334.1408 tubes
<u>DIELECTIC GREASE</u>	XG 250

9.7 Torque Figures

1. Engine

	<u>NM</u>	<u>Ft/lbf</u>
Crankshaft nut	75 - 80	55 - 60
Mag Retaining nut	75 - 80	55 - 60
Clutch Shaft nut	100	75
Sprocket nut	100	75
Cylinder Head nuts	19	14
Clutch Spring Retaining Plate screws	5	4
Clutch Cover screws	8	6

2. Frame and Suspension

	<u>NM</u>	<u>Ft/lbf</u>
Front Axle nut	34 - 81	25 - 60
Rear Axle nut	88 - 100	65 - 75
Swing Arm bolt & nut	100	75
Fork Spring Retaining cap	40 - 55	30 - 40
Fork Piston Retaining screw	16	12
Fork Leg Clamp screw	11	8
Steering Head Cap nut	135	100
Steering Head Clamp screws	16	12
Handle Bar screws	14 - 16	10 - 12

9.8 Dimensions

Overall height (without mirror)	44½ in
Overall width (without mirror)	34 in
Seat height	33 in
Ground clearance	9 in
Wheel base	55 in
Overall length	84 in
Weight	320 lb

9.9 Liquid Capacities

Oil tank	3.75 pints
Transmission	2.0 pints
Front forks (each leg)	0.35 pint

NOTES

NOTES