# NORTON

## Commando

745cc ~ 828cc. 1968 to 1977

# OWNERS WORKSHOP MANUAL

Haynes®

THE BOOK

# English/American terminology

Because this book has been written in England, British English component names, phrases and spellings have been used throughout. American English usage is quite often different and whereas normally no confusion should occur, a list of equivalent terminology is given below.

| English | American | English | American |
|---|---|---|---|
| Air filter | Air cleaner | Number plate | License plate |
| Alignment (headlamp) | Aim | Output or layshaft | Countershaft |
| Allen screw/key | Socket screw/wrench | Panniers | Side cases |
| Anticlockwise | Counterclockwise | Paraffin | Kerosene |
| Bottom/top gear | Low/high gear | Petrol | Gasoline |
| Bottom/top yoke | Bottom/top triple clamp | Petrol/fuel tank | Gas tank |
| Bush | Bushing | Pinking | Pinging |
| Carburettor | Carburetor | Rear suspension unit | Rear shock absorber |
| Catch | Latch | Rocker cover | Valve cover |
| Circlip | Snap ring | Selector | Shifter |
| Clutch drum | Clutch housing | Self-locking pliers | Vise-grips |
| Dip switch | Dimmer switch | Side or parking lamp | Parking or auxiliary light |
| Disulphide | Disulfide | Side or prop stand | Kick stand |
| Dynamo | DC generator | Silencer | Muffler |
| Earth | Ground | Spanner | Wrench |
| End float | End play | Split pin | Cotter pin |
| Engineer's blue | Machinist's dye | Stanchion | Tube |
| Exhaust pipe | Header | Sulphuric | Sulfuric |
| Fault diagnosis | Trouble shooting | Sump | Oil pan |
| Float chamber | Float bowl | Swinging arm | Swingarm |
| Footrest | Footpeg | Tab washer | Lock washer |
| Fuel/petrol tap | Petcock | Top box | Trunk |
| Gaiter | Boot | Torch | Flashlight |
| Gearbox | Transmission | Two/four stroke | Two/four cycle |
| Gearchange | Shift | Tyre | Tire |
| Gudgeon pin | Wrist/piston pin | Valve collar | Valve retainer |
| Indicator | Turn signal | Valve collets | Valve cotters |
| Inlet | Intake | Vice | Vise |
| Input shaft or mainshaft | Mainshaft | Wheel spindle | Axle |
| Kickstart | Kickstarter | White spirit | Stoddard solvent |
| Lower leg | Slider | Windscreen | Windshield |
| Mudguard | Fender | | |

with their ends bent at a right angle, to form a hook. There is a total of eight, four plain and four friction. The clutch inner drum can now be released by unscrewing the centre nut. To prevent the clutch from turning, select top gear and apply the rear brake by pressing on the operating arm. The centre nut has a right hand thread and should be removed, after bending back the tab washer, complete with the spring washer beneath it. Pull out the clutch pushrod. The clutch inner drum can now be withdrawn.

11 The triplex primary chain is of the endless type and has no split link joint. In consequence it is necessary to remove the clutch outer drum with its integral sprocket and the engine sprocket in unison. The engine sprocket is a keyed taper fit on the end of the crankshaft and it is essential to use a sprocket puller to achieve its release. Norton Villiers service tool 060941 is specified for this purpose; the sprocket is tapped to accept the extractor bolts. If the service tool is not available, a two or three-legged sprocket puller can be used with equal effect. Lift away both sprockets together with the triplex chain. Take special care of the collar and spacers fitted over the gearbox mainshaft, behind the clutch, since they determine the accurate alignment of the two sprockets. Place them in a safe place until reassembly commences. There are spacers on the crankshaft, behind the engine sprocket location, and a Woodruff key.

12 The rear half of the chaincase is attached to the left hand crankcase by three screws secured by tab washers. Bend back the tabs, remove the screws, and pull away the rear chaincase. Remove the spacers used on the centre stud which engages with the sleeve nut that retains the chaincase. The overall length of the spacers must be correct to prevent distortion of the chaincase when the sleeve nut is tightened.

## 9 Dismantling the engine - removing the crankcase assembly from the frame

1 Unscrew the tachometer cable from the union joint in front of the right hand cylinder barrel. At the same time it is convenient to drain the oil from the oil tank by removing the drain plug, or in the case of the early models, by taking out the larger oil filter union which secures the main oil feed pipe from the oil tank. It will be necessary to detach the right hand side cover in order to gain access to the oil tank. This task is best accomplished whilst the oil is warm, so that it will flow more freely.

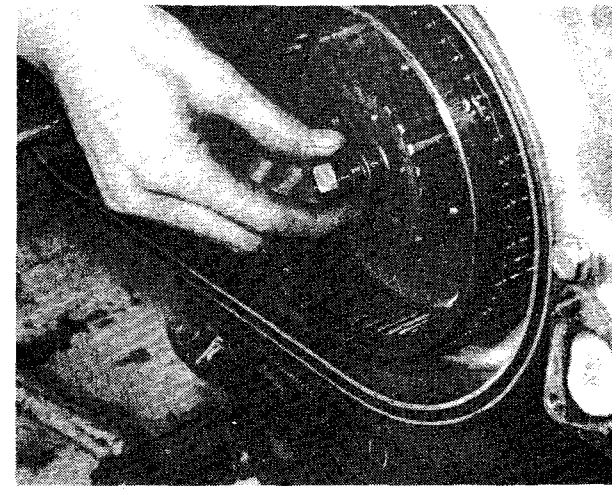
2 Remove the rocker feed pipe which is joined to the timing cover by a banjo union. Take care not to lose the copper sealing washers.

3 Remove the gear indicator from the gearbox end cover which is retained by a setscrew and the gear change lever, secured on splines by a pinch bolt. Push the crankcase breather pipe clear of the oil tank. Remove the right hand footrest secured by two nuts and a bolt.

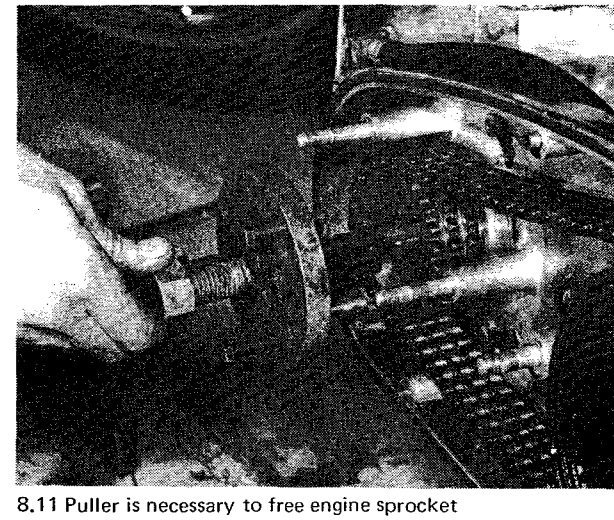
4 Place a large capacity tray under the crankcase assembly and remove the oil pipe junction block from the right hand crankcase, assuming the oil tank has drained completely. Slacken and remove the hexagon headed drain plug in the bottom of the left hand crankcase. Early models (engine numbers prior to 200000 and those of 850 cc capacity) have a large diameter plug (7/8 inch Whitworth) which houses a separate filter. Later 750 cc models have a much smaller plug of the magnetic type which obviates the need for a filter. This is an additional fitting on the 850 cc engines. Allow all excess oil to drain off. Take off the crankcase breather (early models only).

5 It is necessary to remove the crankcase assembly by detaching the front engine mounting. Remove the large diameter bolt which passes through the centre of the mounting, taking care to align the flats on the head so that the bolt will clear the timing case during removal. The bolt has a small head to facilitate its removal in this fashion. Prise back the gaiter on one end of the engine mounting so that the spacer, end cap and shims can be removed to ensure freedom of movement within the frame lugs.

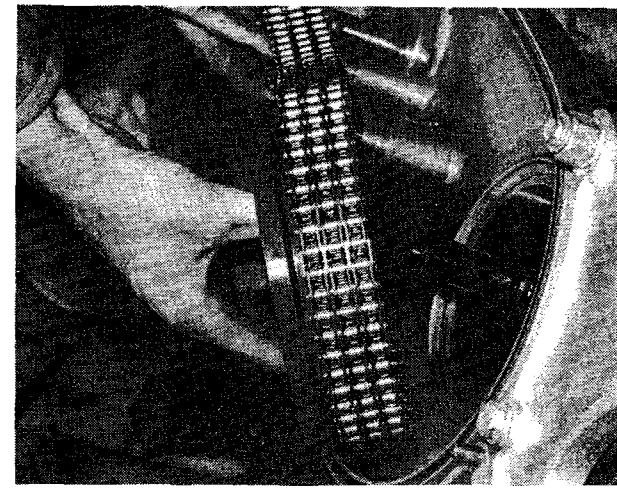
6 Remove the two nuts from the right hand side of the front engine mounting sutds, then pull out the studs complete with the remaining nuts from the left hand side of the mounting. The



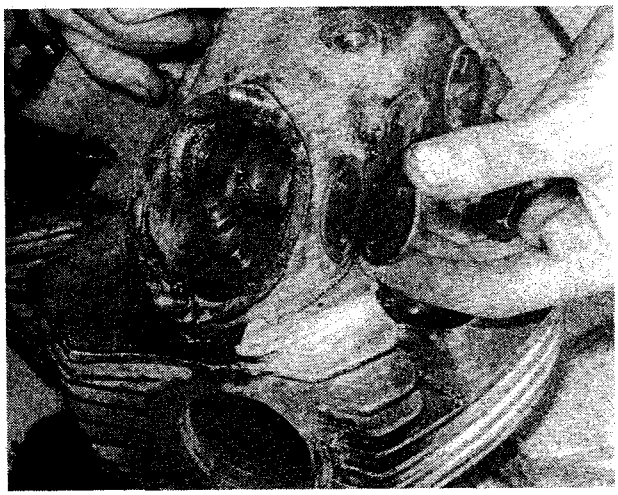
8.10 Release inner drum by unscrewing retaining nut



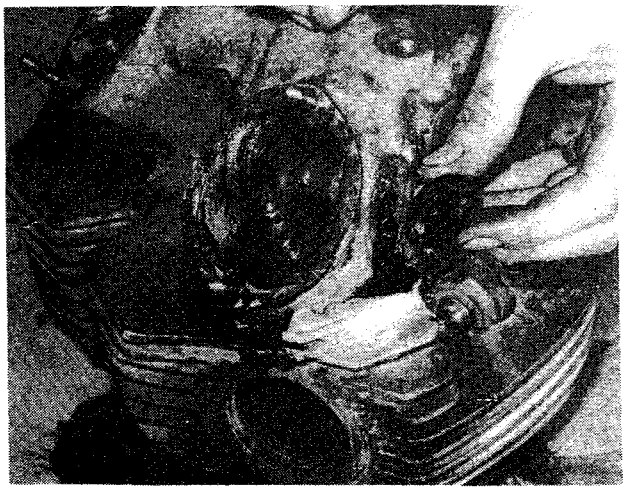
8.11 Puller is necessary to free engine sprocket



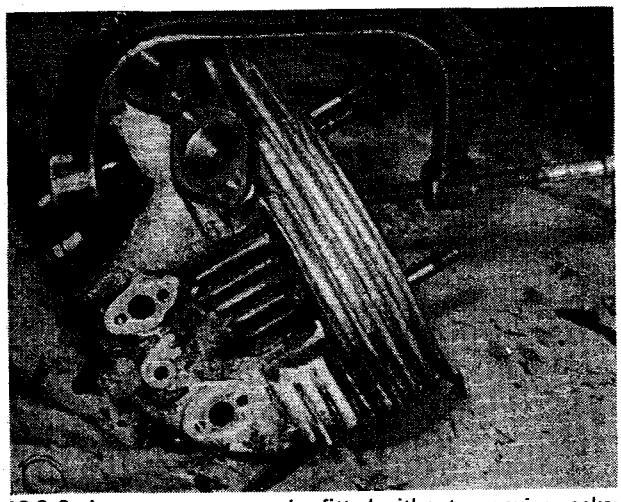
8.11a Chain is endless. Take off sprockets together



19.1 Remove rocker cover plates first



19.1a Locking plate locates with end of rocker spindle



19.3 Spring compressor can be fitted without removing rocker spindles

this type of wear to occur on its own, but if the side float appears excessive, new pistons of the correct size should be fitted.

5 Piston ring wear is measured as detailed in Section 17.3. If the end gap in the two positions is near identical, but is greater than the recommended limit of 0.012 inch, the piston rings are worn and must be renewed.

6 The gudgeon pins must be a good sliding fit in the small end of the connecting rods without evidence of play. The connecting rods are not bushed and must be renewed if excessive small end wear occurs. Worn small ends produce a rattle, not unlike piston slap, which will rapidly increase in intensity.

## 19 Valves, valve springs and valve guides - examination and renovation

1 Before the valves, valve springs and valve guides can be examined, it is preferable to remove the rocker arms and valves from the cylinder head to give better access for a valve spring compressor. Commence by withdrawing the rocker spindles, to which access is gained after the cover plates have been removed. Each cover plate is secured by two bolts; it is probable that the cover can be lifted away together with the rocker spindle lock plate and the associated gaskets, as a complete unit. Under these circumstances there is no necessity to separate the individual parts.

2 The rocker spindles are an extremely tight fit in the cylinder head casting and it will be necessary to use Norton Villiers service tool 061028 to extract them, preferably after the whole cylinder head has been immersed in hot water to help expand the surrounding housing. Note that each rocker arm has a double spring washer against the innermost end of its boss and a plain washer against the outer end. Three thrust washers take up end float and will be displaced, along with the rocker, when the spindle is withdrawn.

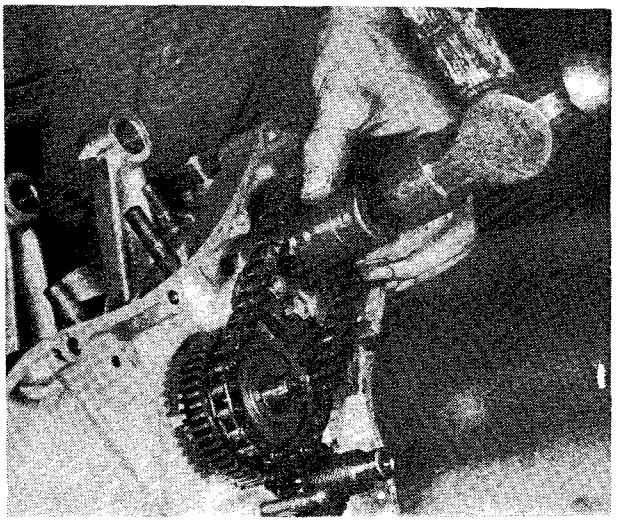
3 It is now possible to insert a valve spring compressor and release each of the valves in turn. Keep the valves, valve springs and collets etc together in sets so that they are eventually replaced in their original location. Note that the inlet valve stems have a rubber seal, which must be renewed on reassembly.

4 After cleaning all four valves to remove carbon and burnt oil, examine the heads for signs of pitting or burning. Examine the valve seats in the cylinder head. The exhaust valves and their seats will require the most attention because they are the hotter running. If the pitting is slight, the marks can be removed by grinding the seats and valve heads together, using fine valve grinding compound.

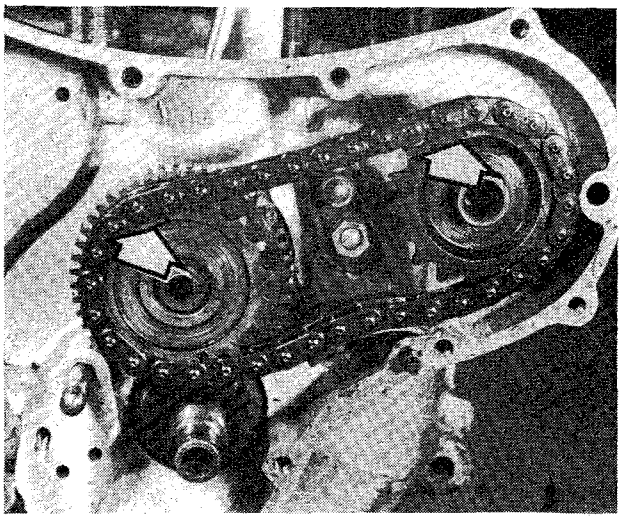
5 Valve grinding is a simple, if somewhat laborious task. Smear a trace of fine valve grinding compound (carborundum paste) on the seat face and apply a suction grinding tool to the head of the valve. Oil the stem of the valve and insert it in the guide until it seats in the grinding compound. Using a semi-rotary motion, grind-in the valve head to its seat, using a backward and forward motion. It is advisable to lift the valve occasionally to distribute the grinding compound more evenly. Repeat this application until an unbroken ring of light grey matt finish is obtained on both valve and seat. This denotes the grinding operation is now complete. Before passing to the next valve, make sure that all traces of the valve grinding compound have been removed from both the valve and its seat and that none has entered the valve guide. If this precaution is not observed, rapid wear will take place due to the highly abrasive nature of the carborundum base.

6 When deep pits are encountered, it will be necessary to use a valve refacing machine and a valve seat cutter, set to an angle of 45°. Never resort to excessive grinding because this will only pocket the valves in the head and lead to reduced engine efficiency. If there is any doubt about the condition of a valve, fit a new one.

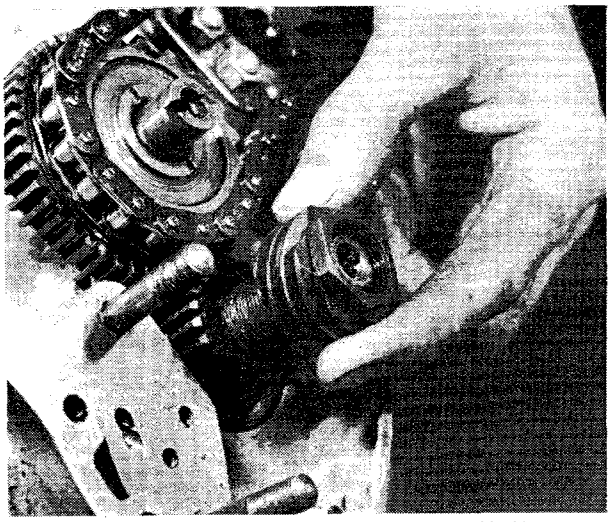
7 Examine the condition of the valve collets and the groove on the valve stem in which they seat. If there is any sign of damage, new parts should be fitted. Check that the valve spring collar is not cracked. If the collets work loose or the collar splits whilst the engine is running, a valve could drop in and cause extensive damage.



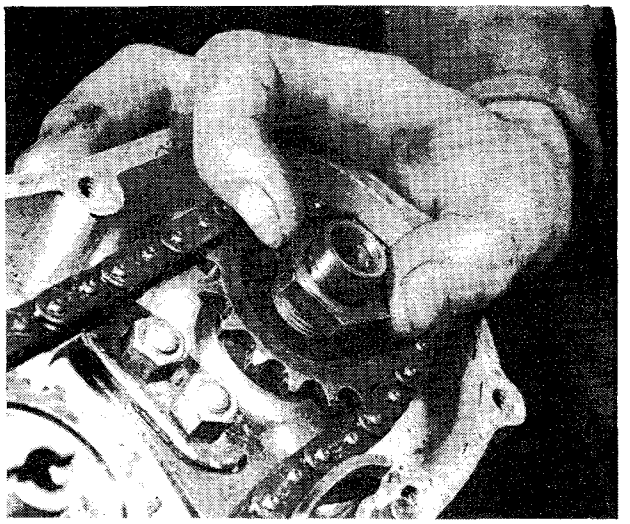
27.2a Drive sprocket on to camshaft, after ...



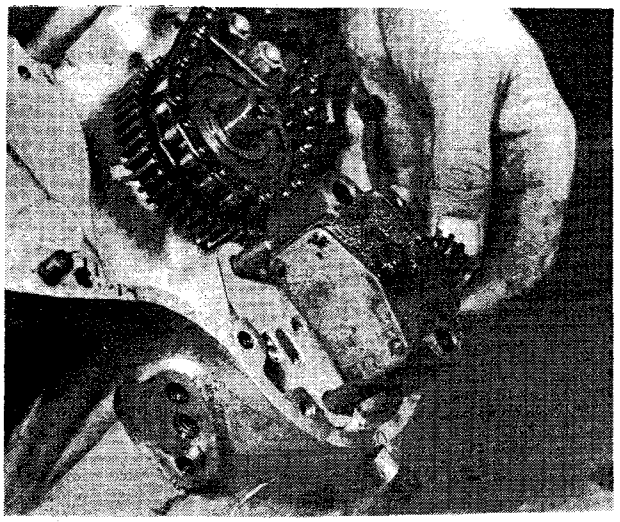
27.2b ... fitting timing sprockets and chain in unison. Note timing marks



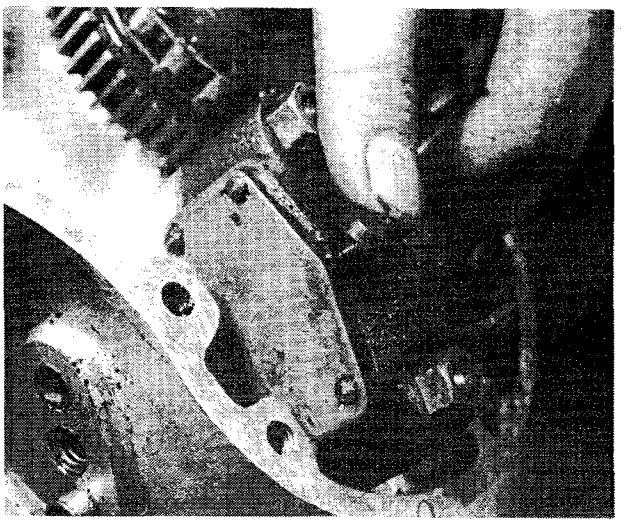
27.5 Oil pump worm is retained by nut with LEFT HAND thread



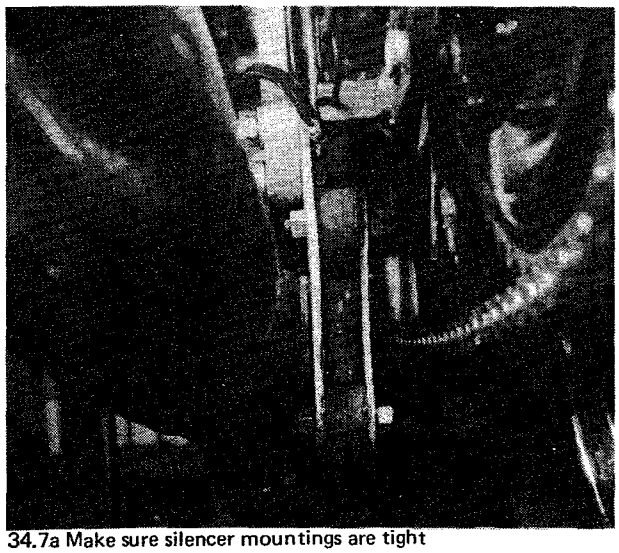
27.6 Fit and tighten camshaft sprocket nut whilst engine is locked



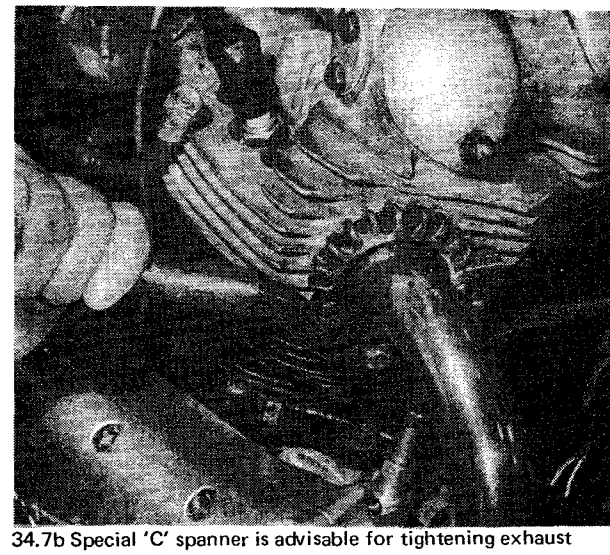
27.7 Oil pump slides into position down mounting studs



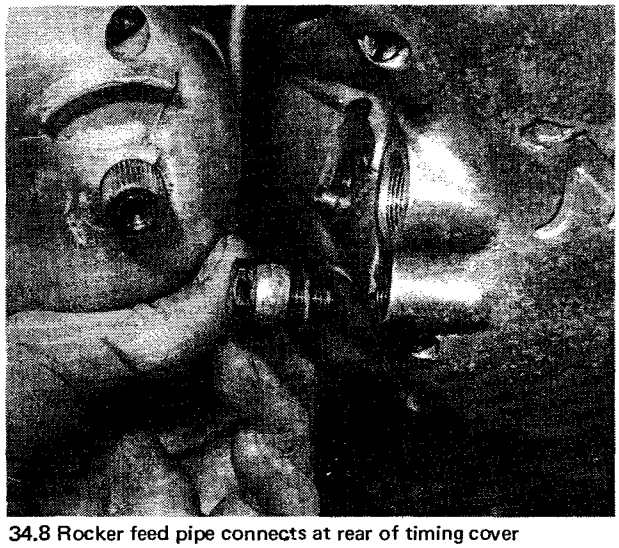
27.9 Fit new conical rubber to pump outlet



34.7a Make sure silencer mountings are tight

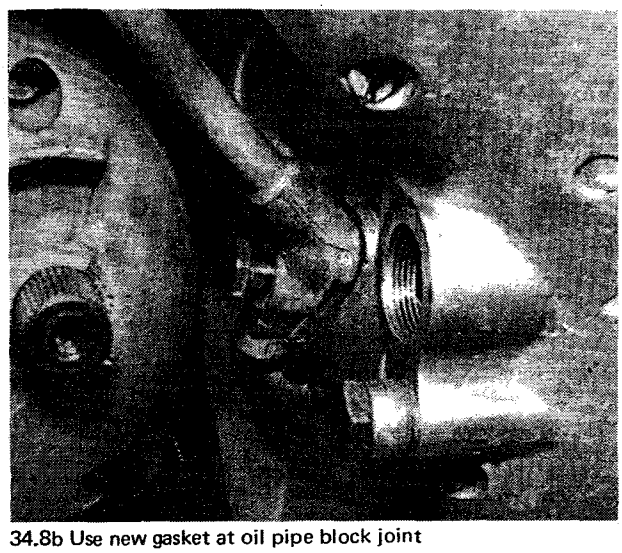


34.7b Special 'C' spanner is advisable for tightening exhaust rings

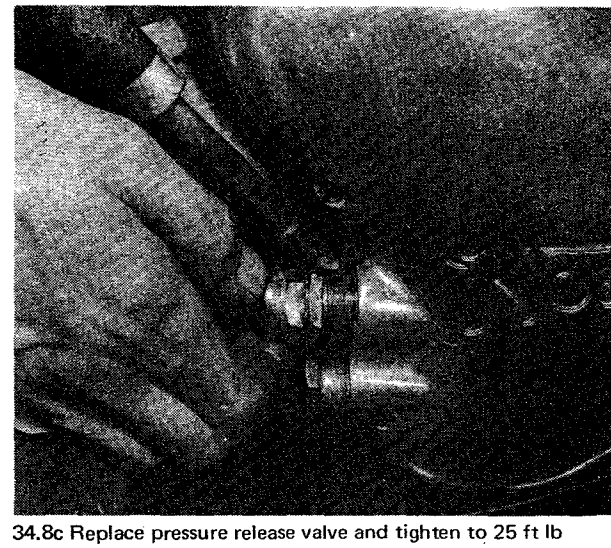


34.8 Rocker feed pipe connects at rear of timing cover

34.8a Ensure unions do not twist whilst tightening



34.8b Use new gasket at oil pipe block joint



34.8c Replace pressure release valve and tighten to 25 ft lb

plunger and tighten the acorn nut fully. Check that the alignment of the camplate in relation to the quadrant is still correct.
6 Fit the sleeve gear, complete with bushes, through the sleeve gear bearing and oil seal, taking care not to damage the latter. Coat the inside of the oil seal and the projecting shaft of the sleeve gear to obviate risk of damage, whilst the sleeve gear is driven through the bearing from within the gearbox shell.
7 Fit the spacer for the final drive sprocket and then the final drive sprocket itself. The sprocket has a splined centre fitting which engages with the end of the sleeve gear shaft and is retained by a large diameter nut with a LEFT HAND thread. Tighten to a torque setting of 80 lb ft and fit the locking plate and screw. The sprocket can be held steady during the tightening operation by wrapping the final drive chain around it and holding both ends of the chain in a vice.
8 Insert the mainshaft through the sleeve gear pinion and fit the layshaft third gear pinion and bush to the layshaft, followed by the layshaft fourth gear pinion. Fit the fourth gear pinion with its flat face against the third gear pinion and its shouldered face towards the bearing. The layshaft, complete with pinions, can now be pushed into the layshaft main bearing, within the gearbox shell.
9 Assemble together the mainshaft third gear pinion and the selector fork, then slide the assembly along the mainshaft and engage the pin of the selector fork with the innermost track of the camplate. Replace the mainshaft second gear, complete with centre bush, on the mainshaft. The dogs on the end of this pinion should face the inside of the gearbox.
10 Assemble together the layshaft second gear pinion and selector fork, slide the assembly along the layshaft and engage the pin of the selector fork with the outer track of the camplate. The selector rod can now be inserted through both selector forks and threaded into the gearbox shell. The rod has a flat on the outer end so that it can be tightened fully with a spanner.
11 Fit the layshaft first gear pinion and the mainshaft bottom gear pinion, the latter with its long extension facing outwards.

## 11 Gearbox reassembly - refitting the inner cover

1 Before refitting the inner cover of the gearbox, make sure the roller is replaced in the end of the gear change quadrant arm. It is not possible to fit the roller after the inner cover has been located since projections in the casting prevent its insertion.
2 If the mainshaft ball journal bearing has been displaced for renewal, the inner cover casting must be heated before the new replacement is fitted. Check that the kickstarter spindle, if removed, is replaced so that the pawl is behind the stop on the inner cover, as shown in the accompanying illustration.
3 Replace the kickstarter return spring on the kickstarter shaft. The spring is positioned so that the projecting portion faces outwards; the spring should be slid down the kickstarter shaft until the forward facing end enters the locating hole in the shaft. Check that the pawl is located correctly, as detailed in the preceding paragraph, then tension the kickstarter spring by turning the curved end of the spring clockwise until it locates with the stop pin to the right of the kickstarter shaft housing.
4 Lightly smear the jointing faces of the gearbox shell and the inner cover with gasket cement and fit a new jointing gasket. Ensure the dowel pins are in position in the gearbox shell.
5 Check that all the gearbox components are pushed home fully, especially the selector rod, which must engage to the full depth of thread. Then fit the inner cover, checking that it locates with the dowels and that the quadrant roller is still in position. It may be necessary to guide the unsupported end of the selector rod into position and to twist the inner cover to and fro a small amount so that the dowels will locate correctly. When the cover is fully home, replace the seven nuts which retain the end cover, but before they are tightened, check that both the layshaft and the mainshaft revolve quite freely. If they bind or if the inner cover will not seat correctly, one of the gearbox components has not located correctly or has been assembled in incorrect order. If the end cover is tightened under these conditions it may crack or become permanently distorted.
6 When the gearbox shafts revolve freely, tighten the seven nuts which retain the inner cover, to a torque setting of 10 - 15 ft lb.
7 Replace the mainshaft nut on the right hand end of the gearbox mainshaft and lock the gearbox so that it can be tightened to a torque setting of 70 ft lb. If the gearbox has been dismantled whilst in the frame, reconnect the final drive chain, select top gear and apply the rear brake to lock the mainshaft during the tightening operation. If the gearbox is out of the frame, wrap the chain around the final drive sprocket and clamp both ends in a vice to form an equally effective lock.
8 If the clutch withdrawal lever assembly has been dismantled, which is rarely necessary, reassemble the lever, roller, bush and pivot screw and tighten the locknut. Grease and replace the clutch pushrod, then locate the clutch withdrawal lever and locking ring, not forgetting to insert the large diameter ball bearing first. This bears directly on the pushrod end and is actuated by the clutch withdrawal lever.
9 Tighten the locking ring, whilst the clutch withdrawal lever assembly is held in its correct location. The centre punch marks made when the assembly was dismantled will ensure correct re-location. Tighten the locking ring fully.

## 12 Gearbox reassembly - refitting the outer cover

1 If the gear change mechanism within the outer cover has been dismantled, a check should be made to ensure the spring retaining washer is fitted between the pawl carrier assembly and the outer cover itself. The pawl carrier assembly must be able to move freely and the ratchet spring must be located correctly. The outer cover can be fitted with the ratchet plate assembly attached, or inserted into the already reassembled inner cover; the method of reassembly is identical.
2 Lightly smear the mating surfaces of the inner and outer end covers with gasket cement and fit a new jointing gasket. Check that the locating dowels are fitted to the inner cover.
3 Locate the ratchet spring in the central position and guide the outer cover over the kickstarter shaft, so that it engages with the dowels. If the cover shows any reluctance to locate fully, it is probable that the pawl has rotated, because the ratchet spring

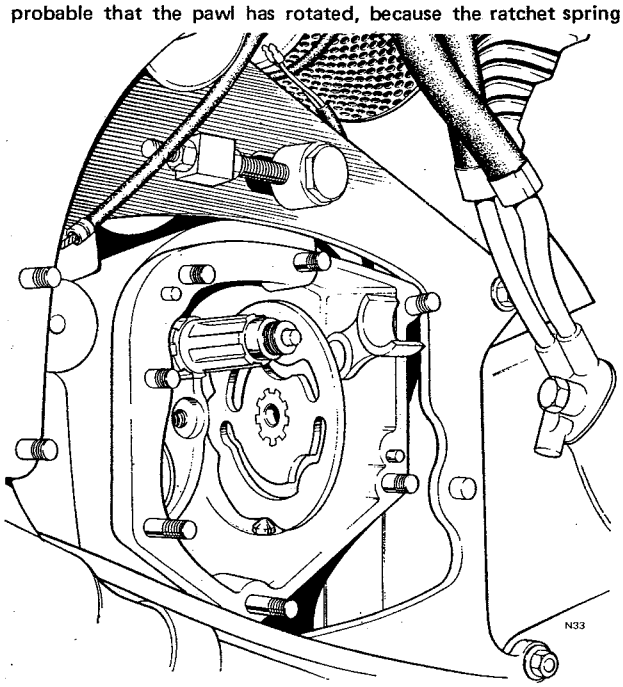



**Fig. 2.3. When reassembling gearbox, knuckle end of quadrant must be in line with the top right hand stud of the gearbox shell. This will ensure correct 'timing' of gears**

# Chapter 4 Carburation and lubrication

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**Specifications**

**Carburettors**

| | |
|---|---|
| Make and type | Amal Concentric, left and right handed, type 930 (Type 932, Combat, late 750 cc, and all 850 cc) |
| Choke size | 30 mm<br>32 mm (Combat, late 750 cc, and all 850 cc) |

**Carburettor settings**

| Model type | Standard Commando | Combat | 850 cc |
|---|---|---|---|
| Main jet | 220 * | 220 † | 260 |
| Needle jet | 0.107 | 0.106 | 928/104 # |
| Needle position | Middle ** | Middle ** | Top |
| Throttle valve | 3 | 3 | 3½ |

* Varies on 1970 models, according to type of megaphone silencers fitted
† 210 if mute fitted
** Top, if mute fitted (1972 and Combat models)
# Must be used in conjunction with choke tube 928/107

**Replaceable oil filter**

| | | |
|---|---|---|
| Make | Crossland* | AC* |
| Type | 631* | X4* |

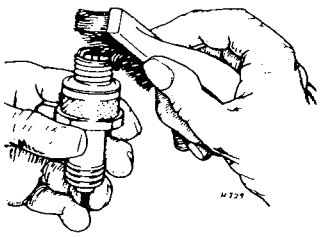
* or equivalent in another range

## 1 General description

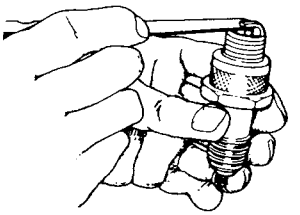
The fuel system comprises a petrol tank astride the large diameter top frame tube from which petrol is fed by gravity to the twin Amal Concentric carburettors. Two petrol taps, each with a built-in gauze filter, are located at the lower rear end of the petrol tank. If only the left hand tap is used, the other can be turned on to provide a small quantity of petrol when the main body of the tank is empty, thus acting as a reserve.

A large capacity air cleaner with a replaceable corrugated paper element is connected to the intakes of both carburettors. It is located immediately to the rear of the carburettors, below the rear end of the petrol tank.

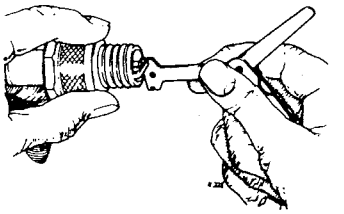
The twin Amal carburettors have their throttle slides and air slides linked together by means of separate junction boxes so that only one cable emerges from the twist grip and the air lever.



*Cleaning deposits from electrodes and surrounding area using a fine wire brush*

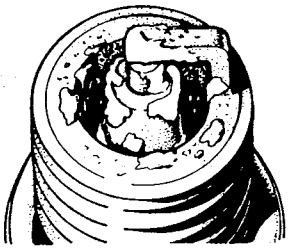


*Checking plug gap with feeler gauges*

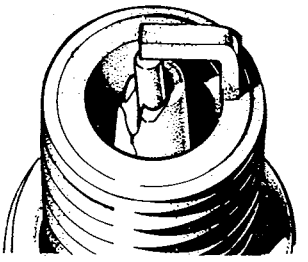


*Altering the plug gap. Note use of correct tool*

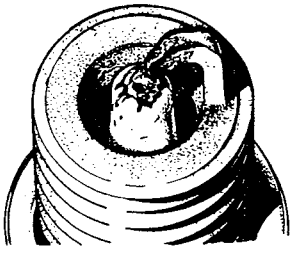
**FIG. 5.2. SPARKING PLUG MAINTENANCE**



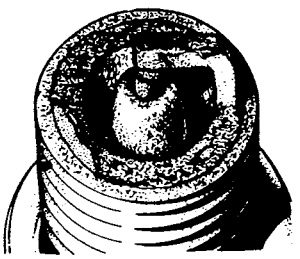
*White deposits and damaged porcelain insulation indicating overheating*



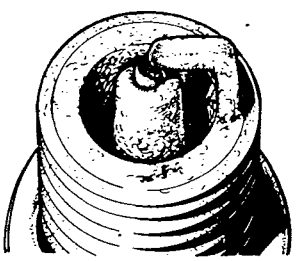
*Broken porcelain insulation due to bent central electrode*



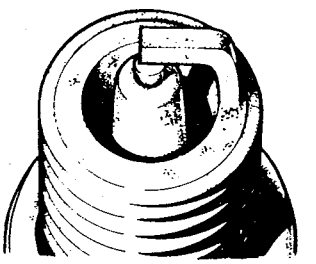
*Electrodes burnt away due to wrong heat value or chronic pre-ignition (pinking)*



*Excessive black deposits caused by over-rich mixture or wrong heat value*



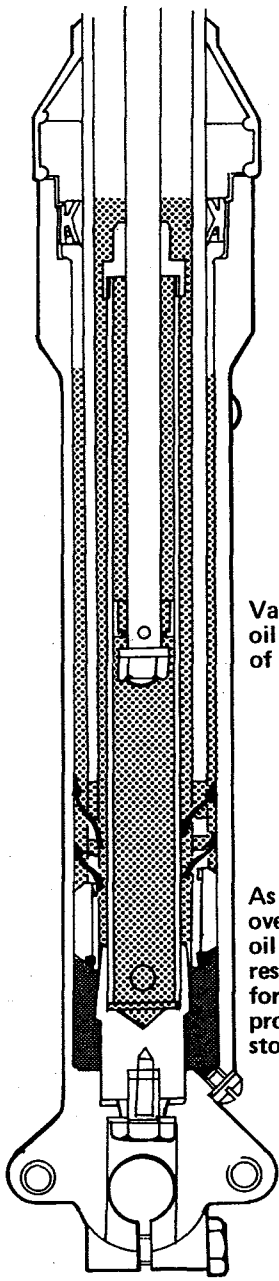
*Mild white deposits and electrode burnt indicating too weak a fuel mixture*



*Plug in sound condition with light greyish brown deposits*

**Sparking plug electrode conditions**

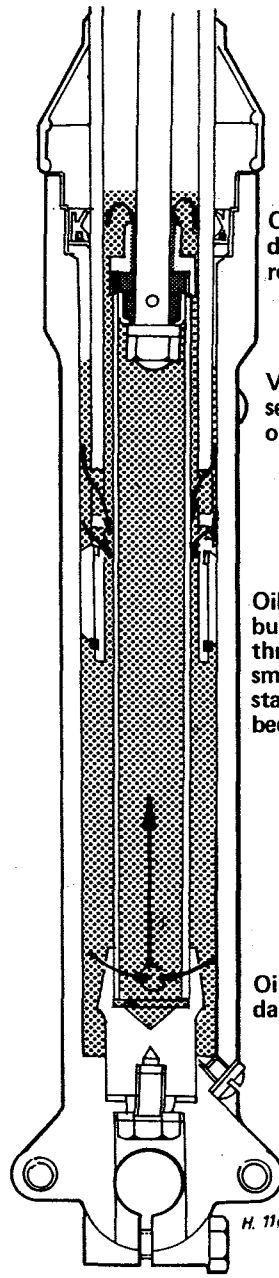
## FINAL COMPRESSION C2



Valve still lifted and oil passing to top half of damper body

As stanchion passes over damper tube taper, oil passage progressively restricted to slow down fork action and finally provide hydraulic bump stop

## EXTENDING




Oil forced out of damper between rod and body

Valve closed onto seat preventing oil passage

Oil trapped between bushes forced back through big hole then small hole into stanchion as big hole becomes blanked off

Oil sucked into damper body

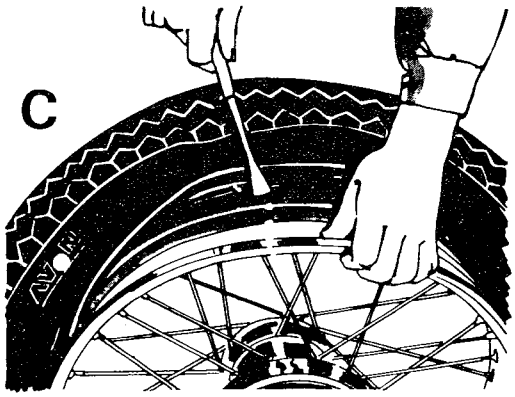
Diagrammatic illustration of fork damping action (Final compression and extending)

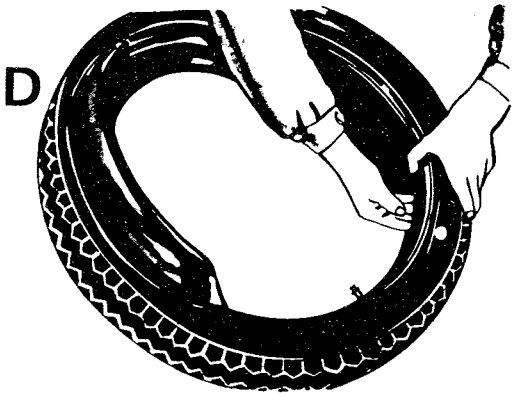
## 4 Front disc brake assembly - examination, renovation and reassembly

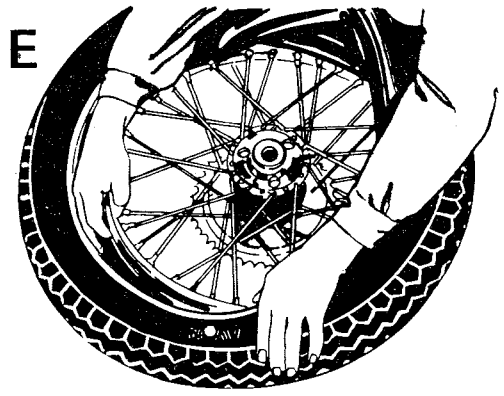
1 The brake disc attached to the front wheel rarely requires any attention. Renewal is necessary only if the surface is scored or damaged. Rust build-up may occur on the cast iron discs fitted to early models, which may prevent entry of the disc when new friction pads are fitted. Provided the rust is not too deep, it can be removed with fine, smooth emery paper. Later machines employ a stainless steel disc, which obviates this problem completely.
2 The disc is bolted to the wheel hub with five bolts and tab washers. If the front wheel is removed from the forks, as described in Chapter 6, Section 2.3, the disc will be freed when the bolts are withdrawn. In this instance the machine can be supported on the centre stand. There is no necessity to detach the hydraulic brake system or for that matter to dismantle any part of it. The disc will pull clear of the friction pads in the caliper. It is, however, advisable to place a clean spacer, such as a piece of wood or metal, between the pads to prevent them being ejected if the front brake is unintentionally applied. This precaution is not necessary if the caliper piston assemblies are to receive attention.
3 The friction pads will lift out of the brake caliper if they are turned slightly. Inspect the friction faces for excessive wear, uneven wear or scoring. Renew both pads if there is any doubt about the condition of either one. Pads should always be renewed in pairs, never singly.
4 Clean out the recesses into which the pads fit and the exposed end of the pistons, using a soft brush. Do not on any account use a solvent cleanser or a wire brush. Finish off by giving the piston faces and the friction pad recesses just a smear of brake fluid.
5 If it is found that the pistons do not move freely or are seized in position, the caliper is in urgent need of attention and must be removed, drained and overhauled. Seek advice from a professional experienced with motor cycle disc brakes. If a piston is seized, the only satisfactory course of action is renewal of the complete brake caliper unit.
6 To remove the brake caliper unit from the machine, unscrew the union where the hydraulic fluid pipe enters the unit and drain the complete hydraulic system into a clean container. Never re-use brake fluid. The caliper unit can now be detached from its mounting on the lower left hand fork leg by removing the two retaining bolts.
7 If the caliper unit shows evidence of brake fluid leakage, accompanied by the need to top up the hydraulic fluid reservoir at regular intervals, the piston seals require renewal. This is a simple task which is carried out as follows: Remove the front wheel complete with disc as described in Chapter 6, Section 2.3, after positioning the machine on the centre stand. There is no necessity to detach the hydraulic brake system. Lift both friction pads out of position and mark the friction faces so that they are replaced in an identical position. Drain the hydraulic system by placing a clean receptacle below the unit to catch the hydraulic fluid and squeezing the handlebar lever so that both pistons are expelled to release the fluid. Unscrew the caliper end plug which has two peg holes and will require the use of the correct peg spanner tool because it is a tight fit. Remove the two pressure seals from their respective grooves, using a blunt nosed tool to ensure the grooves are not damaged in any way.
8 Wet the new seals with hydraulic fluid and insert the first seal into the innermost bore, making sure it has seated correctly. The diameter of the seal is larger than that of the groove into which it fits, to that a good interference fit is achieved. Furthermore, the sections of the seal and seal groove are different to ensure the sealing edge is proud of the groove. Wet one of the pistons with hydraulic fluid and insert it through the outer cylinder (uncovered by removal of the caliper end plug) so that it passes through into the innermost cylinder bore, closed end facing inward. Check that it enters the seal squarely and leave it protruding approximately 5/16 inch (8 mm) from the mouth of the inner bore.
9 Fit the seal and piston in the outer bore of the caliper unit using an identical procedure. Fit a new O ring seal and replace the end plug, tightening it to a torque setting of 26 lb ft. Replace the friction pads in their original positions after checking that all traces of fluid used to lubricate the various components during assembly have been removed, replace the front wheel and refill the master cylinder reservoir with the correct grade of hydraulic fluid. It will be necessary to bleed the system before the correct brake action is restored by following the procedure described fully in Section 6.
10 Note that all these operations must be carried out under conditions of extreme cleanliness. The brake caliper unit must be cleaned thoroughly before dismantling takes place. If particles of grit or other foreign matter find their way into the hydraulic system there is every chance that they will score the precision made parts and render them inoperative, necessitating expensive replacements.

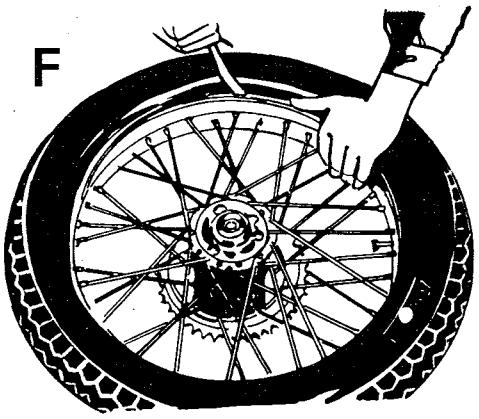
## 5 Master cylinder - examination and replacing seals

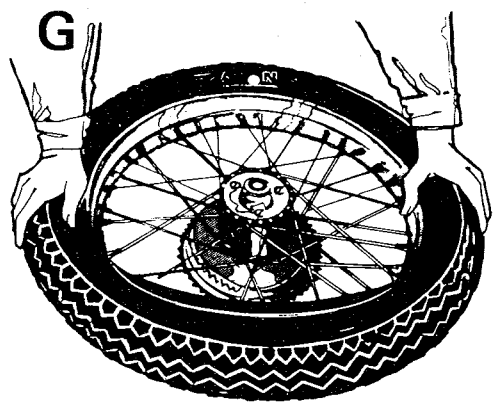
1 The master cylinder and hydraulic fluid reservoir take the form of a combined unit mounted on the right hand side of the handlebars, to which the front brake lever is attached. The master cylinder is actuated by the front brake lever and applies hydraulic pressure through the system to operate the front brake when the handlebar lever is manipulated. The master cylinder pressurises the hydraulic fluid in the pipe line which, being incompressible, causes the pistons to move within the brake caliper unit and apply the friction pads to the brake disc. It follows that if the piston seals of the master unit leak, hydraulic fluid will be lost and the braking action rendered much less effective.
2 Before the master unit can be removed and dismantled, the system must be drained. Place a clean container below the brake caliper unit and attach a plastic tube from the bleed screw of the caliper unit to the container. Open the bleed screw one complete turn and drain the system by operating the brake lever until the master cylinder reservoir is empty. Close the bleed screw and remove the pipe.
3 To gain access to the master cylinder, disconnect the front brake stop lamp switch by pulling off the spade terminal connections. Lift away the switch cover and detach the hose from the master cylinder by unscrewing the union joint. Remove the four screws securing the unit to the handlebars by means of a split clamp and withdraw the unit complete with integral reservoir.
4 Remove the reservoir cap and bellows seal from the top of the reservoir. Remove the front brake stop lamp switch by unscrewing it from the master cylinder body. Release the handlebar lever by withdrawing the pivot bolt. The rubber boot over the master cylinder piston is retained in position by a special circlip having ten projecting ears. If three or four adjacent ears are lifted progressively, the circlip can gradually be lifted away until it clears the mouth of the bore and is released completely. It will most probably come away with the piston together with the secondary cup.
5 Remove the primary cup washer, cup spreader and bleed valve assembly which will remain within the cylinder bore. They are best displaced by applying gentle air pressure to the hose union bore.
6 Examine the cylinder bore for wear in the form of score marks or surface blemishes. If there is any doubt about the condition of the bore, the master cylinder must be renewed. Check the brake operating lever for pivot bore wear, cracks or fractures, the hose union and switch threads, and the piston for signs of scuffing or wear. Finally, check the brake hose for cuts, cracks or other signs of deterioration.
7 Before replacing the component parts of the master cylinder, wash them all in clean hydraulic fluid and place them in order of assembly on a clean, dust-free surface. Do not wipe them with a fluffy rag; they should be allowed to drain. Particular attention should be given to the replacement primary and secondary cup

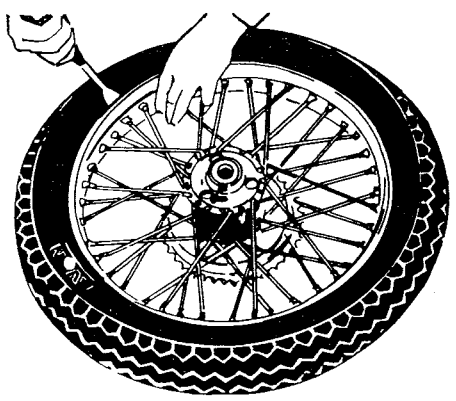


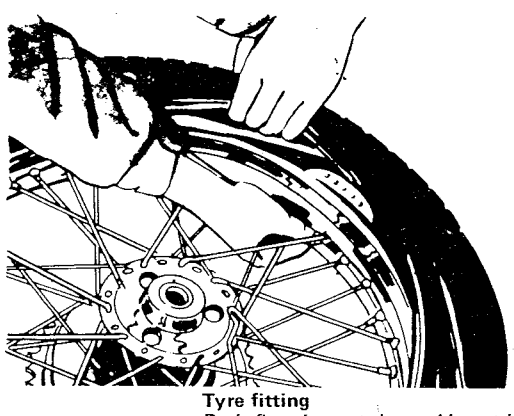



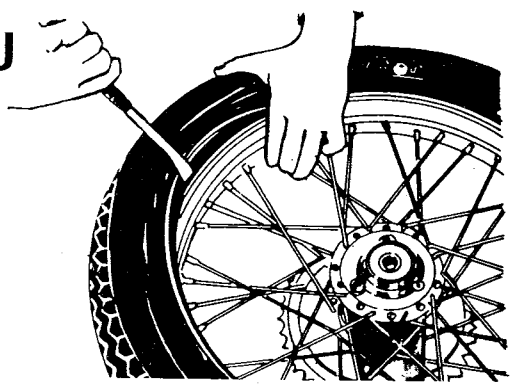




**Tyre fitting**

*D Inflate inner tube and insert in tyre*
*E Lay tyre on rim and feed valve through hole in rim*
*F Work first bead over rim, using lever in final section*
*G Use similar technique for second bead. Finish at tyre valve position*
*H Push valve and tube up into tyre when fitting final section, to avoid trapping*

**Security bolts**

*I Fit the security bolt very loosely when one bead of the tyre is fitted.*
*J Then fit tyre in normal way. Tighten bolt when tyre is properly seated.*

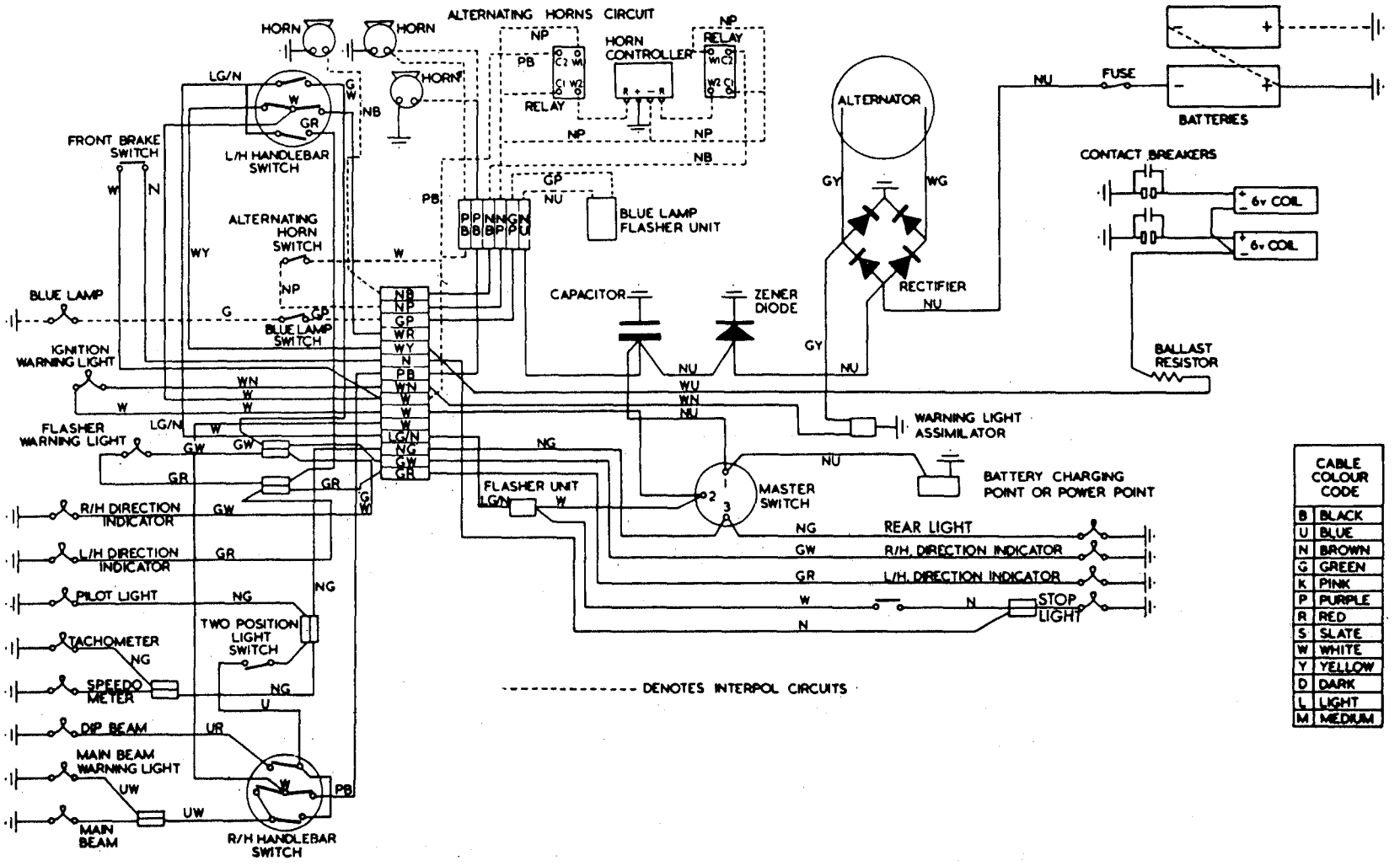



Fig. 8.5. 1971 wiring diagram, all models

## 10 Backfire overload device

1 The backfire overload device should not be dismantled since it has been preset by the factory
2 If the device has been dismantled, it must be preloaded on assembly to slip at a torque wrench setting of 50lbs/ft ± 2.0 lbs/ft (6.92kg/m ± 0.28 kg/m). The outer edge of the adjuster nut must be peened over to prevent movement.

## 11 Engine reassembly - reassembling the primary transmission and electric starter mechanism

1 Replace the starter motor and small intermediate gear in the inner primary chaincase. Do not forget to fit the large rubber O-ring. Tighten the two screws evenly.
2 Fully screw the backing nut onto the central supporting nut, then replace the washer. Replace the Woodruff key used to locate the engine sprocket on the left-hand end of the crankshaft. Lightly smear the smooth circular face of the left hand crankcase with gasket cement and the matching face of the back of the inner chaincase casting. Fit a new gasket to the crankcase face and fit the inner chaincase, taking care that the gearbox mainshaft does not damage the oil seal within the centre of the rear of the casting. It is advisable to grease both the seal and the mainshaft, or cover the splines with plastic tape, to obviate risk of damage. To prevent damage to the oil seal, as assembly sleeve is available (part No. ST4928D) which can also be turned up on a lathe.
3 Check that the chaincase is aligned correctly. Tighten the backing nut on the central supporting stud until it touches the chaincase. Replace and tighten the retaining nut and washer (see Fig. 9.4).
4 Replace the clutch locating circlip and slide the clutch location spacer over the gearbox mainshaft, recessed portion inwards. Add the spacing washers, necessary to ensure correct alignment of the sprockets and chain.
5 The triplex chain has no spring link and it is necessary to fit the engine sprocket, chain and clutch as a unit. Before assembling and fitting these components, check the centre bearing of the clutch. This is a ball journal bearing, retained by a circlip. If any play is evident or if the bearing runs roughly as the clutch body is rotated, it should be replaced. It is a drive fit in the clutch body.
6 With the large starter gear located in the machined recess behind the top run of the primary chain, fit the clutch, engine sprocket and chain over the respective shafts. The clutch has a splined centre and the engine sprocket has a keyway which engages with the key already inserted in the crankshaft. If necessary, use a tubular drift to ensure both sprockets are correctly located to the full depth of engagement. Fit the clutch centre securing nut and tab washer. Lock the engine by either of the methods described in this Chapter; replace and torque tighten the clutch centre nut to 70 lbs/ft (9.678 kg/m). Bend over the lockwasher onto two flats of the nut.
7 Reassemble the clutch plates. The plain steel plate with the two small dowels on the inner face must be fitted first; the dowels engage with matching holes in the main body of the clutch. Then fit the friction and steel plates in alternate order, ending with the extra thick steel plate which has a serrated outer rim. Later models may have some variation of the clutch make-up including the use of sintered bronze friction plates in place of the earlier friction material used and a specially-hardened clutch centre. The method of assembly is, however, broadly identical.
8 The clutch diaphragm should be reassembled with the compressor tool and tensioned so that it is completely flat. Push the diaphragm, complete with compressor tool, as far into the clutch as possible and enter one end of the retaining circlip into the groove within the clutch body. Feed the remainder of the circlip into the groove and check that it has located correctly BEFORE RELEASING THE COMPRESSOR. This precaution cannot be overstressed. If an attempt is made to fit the diaphragm without the correct type of compressor, or if the retaining circlip is not located positively, THERE IS RISK OF PERSONAL INJURY if the compressed diaphragm works free.
9 Replace the clutch pushrod within the hollow mainshaft, after coating it with grease. Insert it through the centre of the clutch, and replace the pushrod adjuster screw and locknut. Adjust the pushrod by slackening off the handlebar adjuster completely and screwing in the adjuster until the clutch commences to lift. Slacken back the adjuster one complete turn and lock it in this position with the locknut. It may be necessary to detach the inspection cover from the gearbox during this operation because if the clutch operating arm within the gearbox outer shell has dropped out of location, clutch action will be rendered inoperative. It can be raised back into position if the clutch adjuster is temporarily slackened off.
10 Replace the thrust collar in the sprocket, with the small diameter end facing outwards. Slide on the hardened sleeve, using a tubular drift if it is a tight fit.
11 Replace the sprag clutch in the sprocket. It is imperative that it is fitted the correct way round ie; sprags leaning to the left when viewed at the top of the sprocket (see Fig. 9.7).
12 Replace the crankshaft starter gear complete with needle roller bearing, over the hardened sleeve. Revolve the gear anticlockwise to check that the sprags are driving the correct way to start the engine.
13 Assemble the chain tensioner, making sure the plungers are in their correct positions. Replace the tensioner over the studs. Apply a thread locking compound to the studs and torque tighten the 5/16 in. nuts to 12 lbs/ft (1.66 kg/m) and the ¼ in. nut to 4-5 lbs/ft (0.553 - 0.691 kg/m). These torque figures are critical since the plungers are likely to jam if the nuts are over-tightened.
14 Prime the chain tensioner by squirting a little oil into the tensioner housing.
15 Replace the backfire device on its spline. Fit the outrigger plate over the four studs whilst locating the backfire device's shaft into the bearing. Replace the lockwashers and nuts. Bend the tabs on the lockwashers backwards over the outrigger plate. Torque tighten the nuts to 15 lbs/ft (2.07 kg/m). Knock up the other tabs of the lockwashers onto the flats of the nuts.
16 Replace the large thrust plate on the mainshaft and fit the Woodruff key. Clean the rotor of any metal particles that may have been attracted to it. Replace the rotor with its name and timing marks facing outwards. Replace the shaped washer and torque tighten the rotor nut to 70 lbs/ft (9.68 kg/m).
17 Replace the stator on the three studs, with the leads facing outwards and positioned at 5 o'clock. Pass the leads through the rubber grommet in the inner chaincase. Reconnect the leads at their snap connectors.

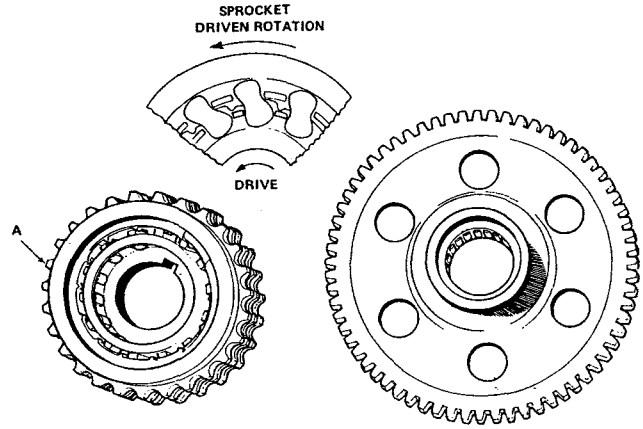



**Fig. 9.7 Assembly position of the sprags**