



Norton

Riders Manual

for
COMMANDO

850

motor cycles
including
special noise
control model

COMMANDO



**Norton
Riders manual
850 models
Including special
noise control
model**

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INTRODUCTION

The Norton Commando 850 is designed and built to offer the modern knowledgeable rider a unique experience in safe, high-performance motor-cycling. Its designed-in virtues of high torque and smooth power delivery, stable precise handling and powerful fade-free braking combine to give a level of performance unmatched by any other high-speed roadster or sports tourer.

This motorcycle has been designed with robust, modern features and components. Along with materials chosen for their quality and suitability, this ensures a built-in ruggedness that, with care, will result in a long and useful service life. The well-proven Norton parallel twin engine and the revolutionary Iso-elastic power unit suspension system combine to offer this unequalled performance while retaining the advantages of smooth engine response with complete freedom from vibration.

To take full advantage of the performance offered by this motorcycle, it is essential that certain routine maintenance be performed to keep all parts in peak condition. Greatest effort has been put into ensuring that this maintenance is minimal, simple, and well within the capabilities of the owner.

This Handbook provides general details

for operating and maintaining the motorcycle, and these instructions should be followed carefully to allow the rider to get the best service from the motorcycle. For additional information about use or service, consult your Norton dealer.

This Handbook is intentionally simple to provide a handy week-to-week guide. More detailed information on dismantling or major overhauls will be found in the Norton Commando 850 Workshop Manual, available through your dealer.

Use only genuine Norton replacement parts (parts manufactured or approved by Norton Villiers Limited) when parts are needed.

When ordering parts or requesting service information from your dealer or distributor, always quote your engine number to ensure correct identification.



Norton Villiers reserves the right to vary the specification of all motorcycles and spare parts without notice and this information does not therefore constitute a term of any sale. All descriptions and claims are given and made in good faith but are intended to apply generally and variations in performance and construction of individual machines may occur. In particular, performance will be affected by conditions circumstances and the rider.

Technical Data

Engine number: Stamped on crankcase.
Gearbox number: Stamped on gearbox shell.

Frame number: Stamped on frame head lug.

Engine

Bore: 3.03 in. (77 mm).
Stroke: 3.50 in. (89 mm).
Capacity: 55cu. in. (828 cc).
Compression Ratio: 8.5 : 1.
Peak Power RPM: 5800.

Rocker clearances (cold).
Inlet: 0.006 in. (0.15 mm).
Exhaust: 0.008 in. (0.2 mm).

WARNING:
DO NOT EXCEED 7,000 RPM.

Electrical

Ignition timing BTDC:
Fully advanced: 28°
Contact breaker points gap:
0.014/0.016 in. (0.35/0.4 mm).

Spark plug: Champion N7Y
Spark plug gap:
0.023–0.028 in. (0.59–0.72 mm).

Gear ratios

Engine sprocket: 26 teeth.
Clutch sprocket: 57 teeth.
Primary ratio: 2.19 : 1.
Gearbox sprocket: 22T (21T optional).
Rear wheel sprocket: 42 teeth.

Overall gear ratios	22T	21T
Top:	4.185:1	4.38:1
Third:	5.10:1	5.30:1
Second:	6.84:1	7.16:1
First:	10.71:1	11.20:1

Chain sizes

Primary: $\frac{3}{8}$ in. Triple row (92 pitches).

Rear: $\frac{5}{8}$ in. by $\frac{3}{8}$ in. (99 Pitches.)
(100 pitches with 22 tooth sprocket)

Capacities

Oil tank: 5 Imp (6 US) pints 2.8 litres
Gearbox: .75 Imp (.9 US) pints .42 litres
Front Forks: 150 cc. (5 fl. oz.) each leg
Primary Chaincase: 200 cc. (7 fl. oz.)

Fuel tank:

Roadster 2.50 Imp (3 US) gallons 11 litres
Interstate 5.25 Imp (6.3 US) gallons
23.87 litres
Interpol 4 Imp (4.8 US) gallons 18.16
litres
Hi-Rider 2 Imp (2.3 US) gallons 9.1
litres

Carburetors

850 Mk 2
Type: Amal 932 (dual). 32 mm.
Main jet: 260.
Throttle valve: No. 3½.

850 Mk 2A
Type: Amal 932 (dual). 32 mm.
Main jet: 230.
Throttle valve: 3½.

Choke tube: 928/107.
Needle jet: 0.106.
Needle: 928/104.
Needle position: Centre notch.

Choke tube: 928/107.
Needle jet: 106.
Needle: 928/104.
Needle position: Lower notch.

Dimensions

Overall length: 87½ in. (221 cm).
Overall width: 26 in. (65 cm).
Ground clearance: 6 in. (15 cm).
Weight: 415–430 lb (189–196 Kg).
dependent on specification.

Wheelbase: 56¾ in. (144 cm).
Seat height (rider seated):
31 in. (78 cm).

Tires

4.10 by 19 in. Avon GP or Dunlop
"TT 100".
Wheel rims: WM 2 by 19 in.
Tire pressures: (Nominal).
Front: 24 psi. (1.7 Kg/cm).
Rear: 26 psi. (1.8 Kg/cm).
For alternative load/pressure figures, see
your Norton dealer.

Note

Do not fit tires other than the stated
types and sizes or the handling of the
machine may be adversely affected.

Larger section tires may also foul the
mudguards (fenders) and stays.

Lubricants Recommended

Efficient lubrication is of vital importance and it is false economy to use cheap grades of oil. When buying oils or grease it is advisable to specify the brand as well as the grade and, as an additional precaution, to buy from sealed containers.

UNIT	ENGINE	PRIMARY CHAINCASE	GEARBOX	SWINGING ARM BUSHES	HUBS AND FRAME PARTS	FRONT FORKS	REAR CHAIN	EASING RUSTED PARTS
Castrol	Castrol HD40 or Castrol GTX	Castrol GTX	Castrol Hypoy	Castrol Hi-Press	Castrol LM Grease	Castrolite 10W/30	Castrol Graphited Grease	Castrol Penetrating Oil
Mobil	Mobiloil 40 or Mobiloil Super Mobiloil 20W/50	Mobiloil Super or Mobiloil 20W/50	Mobilube HD90	Mobilube HD140 or C140	Mobilgrease MP or Mobilgrease Super	Mobiloil Super	Mobilgrease MP or Mobilgrease Super	Mobil Spring Oil or Mobil Handy Oil
Esso	Uniflo or Esso Extra Motor Oil 20W/50	Esso Uniflo	Esso Gear Oil GX90/140	Esso Gear Oil GX90/140	Esso Multipurpose Grease H	Esso Uniflo	Esso MP Grease Moly	Esso Penetrating Oil
Texaco	Havoline SAE40 or Havoline 20W/50	Havoline Motor Oil 20W/50	Multigear Lubricant EP90	Multigear Lubricant EP140	Marfak All-Purpose Grease	Havoline Motor Oil 10 w / 30	Marfak All-Purpose Grease	Graphited Penetrating Oil
Duckhams	Flectol HDX40 or Duckhams Q20/50	Duckhams Q20/50	Duckhams Hypoid 90	Duckhams Hypoid 140	Duckhams LB10 Grease	Duckhams Q5500	Duckhams "Chainguard"	Duckhams Adpenol Penetrating Oil
Sun Oil	Sunlube 2800-C SAE50 or Sunoco Special Motor Oil	Sunoco Special Motor Oil	Sunep 1070	Sunep 140	Sunep 1130	Sunoco Special Motor Oil 20W/50	Sunoco MD2 Moly	Sunoco Penetrating Oil
Filtrate	Filtrate Racing 40 or Filtrate Super 20W/50	Filtrate Super 20W/50	Filtrate EP90	Filtrate Gear 140	Filtrate Super Lithium Grease	Filtrate AT Fluid F	Filtrate Linklyfe	Filtrate PDO
Gulf	Gulf Formula G40 or Gulf Multi-G 20W/50	Gulf Multi-G 20W/50	Gulf Multi-purpose Gear Lubricant 90	Gulf Multi-purpose Gear Lubricant 140	Gulfcrown Grease No. 2 or Gulflex A	Gulf Multi-G 10W/30	Gulflex Moly	Gulf Penetrating Oil
BP	BP Super Visco-Static 20W/50	BP Super Visco-Static 20W/50	BP Gear Oil SAE 90 EP	BP Gear Oil SAE 90 EP	BP Energrease L2	BP Super Visco-Static 10W/40	BP Energrease A0	BP Penetrating Oil
Shell	Shell Super Motor Oil	Shell Super Motor Oil	Shell Spirax 90 EP	Shell Spirax 90 EP	Shell Retinax A or CD	Shell Super Motor Oil	Shell Retinax A or CD	Shell Easing Oil

LUBRICANTS RECOMMENDED

* NO SUITABLE MONOGRADE AVAILABLE

The engine lubricants recommended above are suitable for all operating temperatures above 0°C (32°F). For ambient temperatures above 32°C (90°F) HD50 monograde engine oils are recommended.

Approval is given to companies other than those listed, provided they have similar grade characteristics and meet API service SD/SE performance.

Lubrication chart

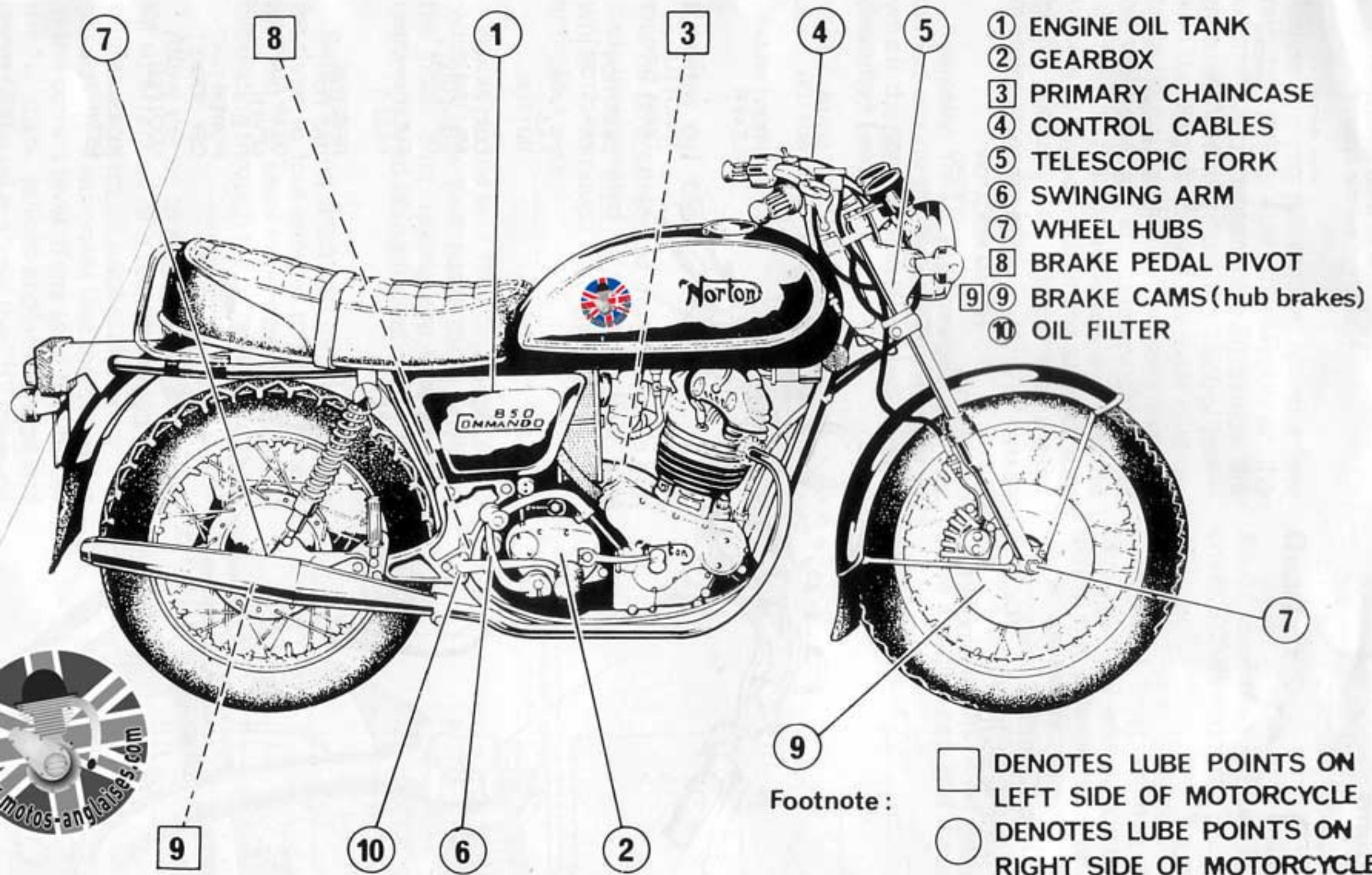
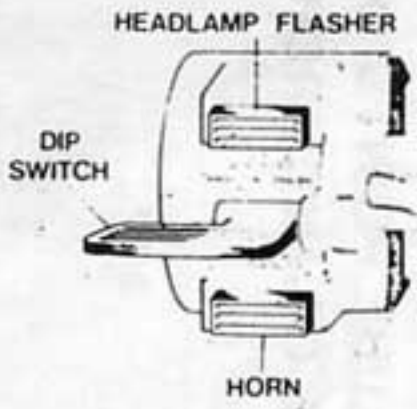


ILLUSTRATION 1

Controls

LEFT HAND HANDLEBAR SWITCH CLUSTER



RIGHT HAND HANDLEBAR SWITCH CLUSTER

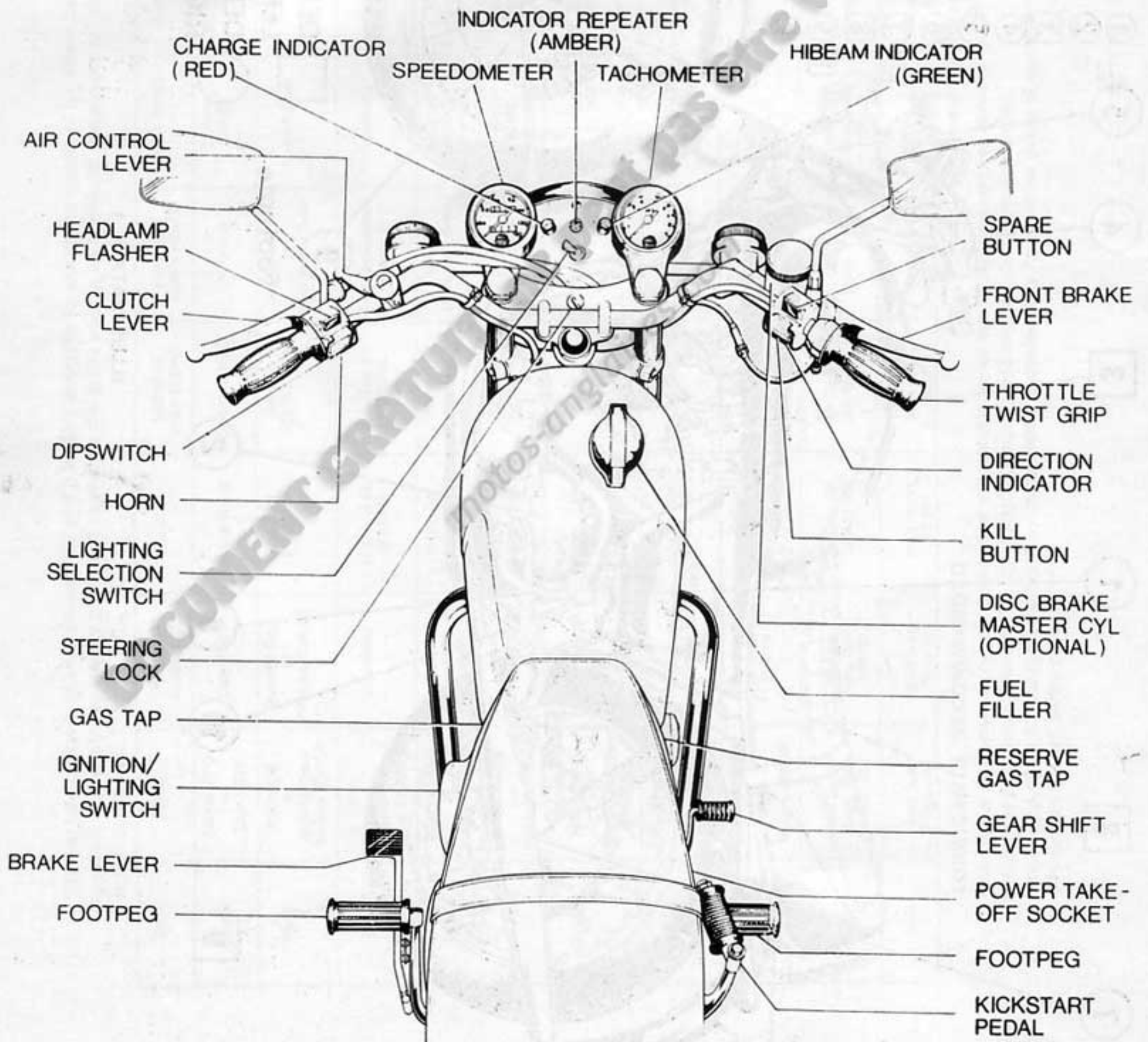
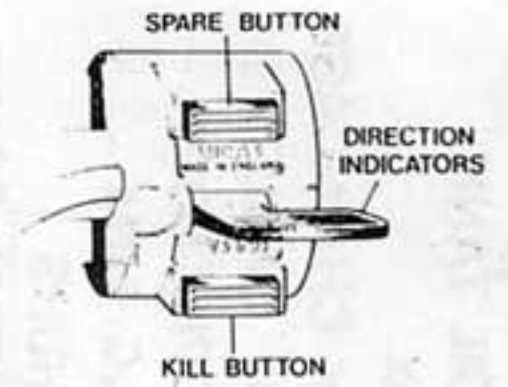


ILLUSTRATION 2

Taking over a new motorcycle

Before running the engine, spend a few minutes going over the layout of the controls and instruments. Sit astride the motorcycle and adjust the control levers and handlebars to give the most comfortable riding position. Make sure that the oil tank, gearbox and primary chaincase are filled to the correct levels and that the battery is topped up. In the case of disc brake motorcycles, check the master cylinder reservoir level.

Normally these preparations will be carried out by the dealer. The manner in which the various levels are indicated is described below.

Engine oil tank

The oil tank content is indicated on a dip stick incorporated in the tank filler cap which is removed by turning the cap anti-clockwise.

Access to the tank filler cap is made by: releasing the two hand discs retaining the riders seat, raising the seat slightly rearwards and lifting it clear.

Before filling fresh oil, run the engine for three to four minutes to return excess oil from the crankcase, observing the oil circulating through the oil tank filler orifice.

Allow the oil to settle in the tank, then fill sufficient oil of a recommended grade until the correct oil level is shown on the dipstick. It is important that the oil is kept at the correct level. If the level falls below the "L" mark, serious engine damage will occur; if the oil is above the "H" mark, oil may pass into the airbox and foul the air filter.

Gearbox

An oil level plug is fitted in the gearbox cover: (*Illustration 3*).

To check level, remove plug (*Illustration 3 item B*) whereupon oil should seep gently out if level is correct. If topping up is necessary, remove the filler cap (*Illustration 3, item C*) and replenish with correct grade of oil until the oil begins to seep from the level plug orifice. Replace the filler cap and the level plug.

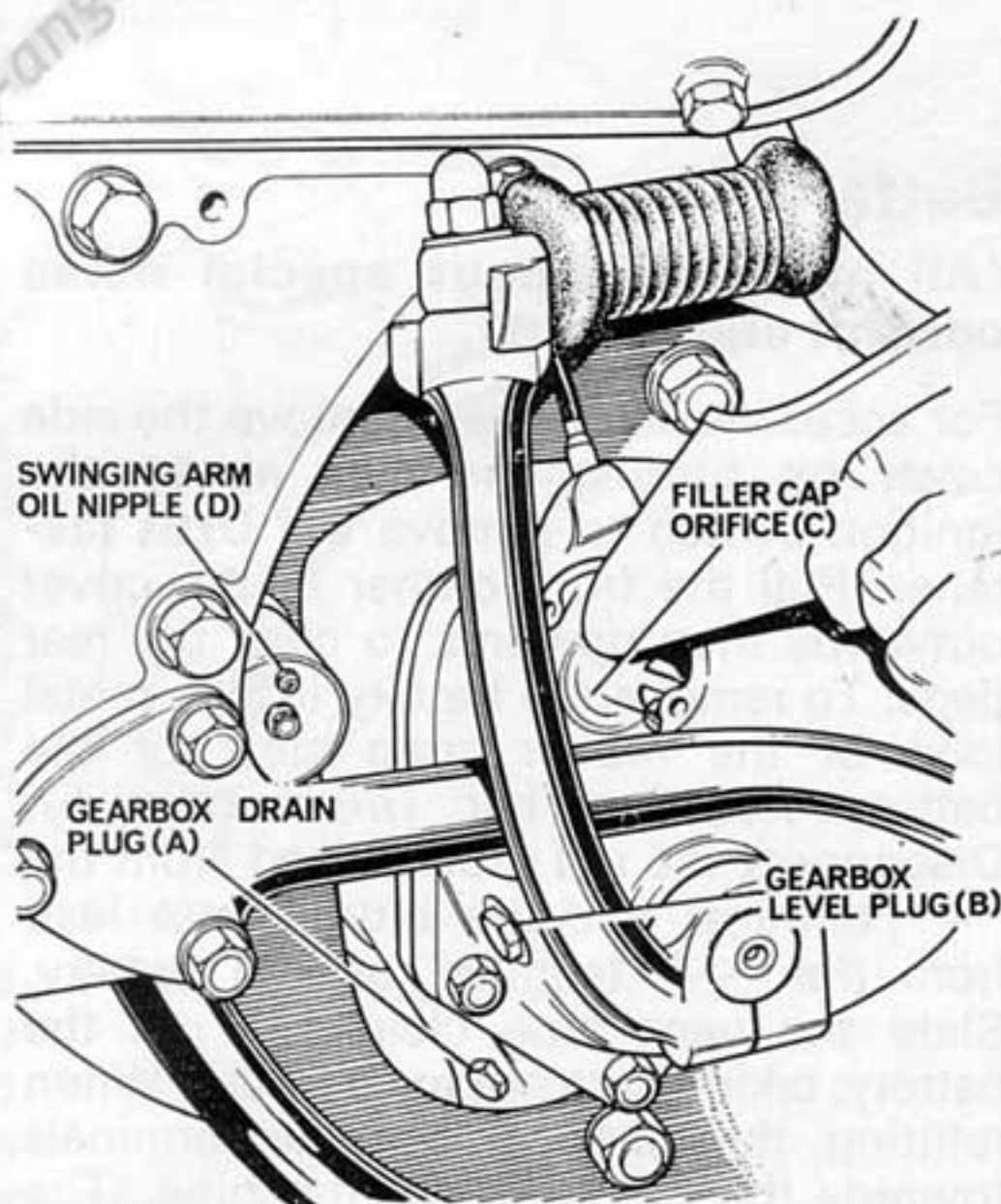


ILLUSTRATION 3

Primary chaincase

An oil level plug is fitted in the primary chaincase outer cover. (*Illustration 4*).

To check level, remove plug (*Illustration 4, item B*) whereupon oil should seep gently out if level is correct. If topping up is necessary, remove the filler cap (*Illustration 4, item C*) and replenish with correct grade of oil until the oil begins to seep from the level plug orifice. Replace the filler cap and the level plug.

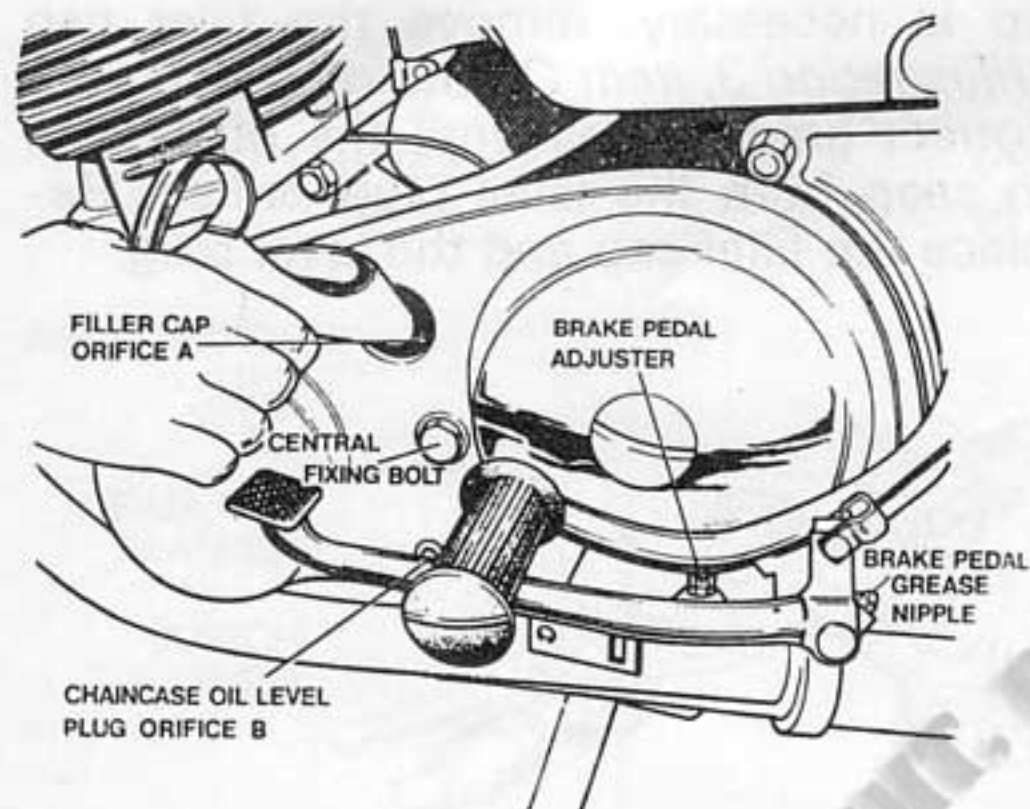


ILLUSTRATION 4

Battery

(All models without special noise control equipment)

For access to the battery remove the side cover by turning the ring above the ignition switch to remove the Dzus fastener. Pull the front corner of the cover outwards then upwards to clear the rear pegs. To remove the battery lift the metal loop of the rubber strap clear of the battery retaining bar (*Illustration 5*). Disconnect the red ground lead from the "+" terminal and the blue/brown lead from the "-" terminal on the battery. Slide the vent pipe clear. Lift out the battery, taking care not to spill acid. When refitting the battery, turn the terminals towards the centre of the machine. The correct electrolyte level is embossed on the left side of the battery.

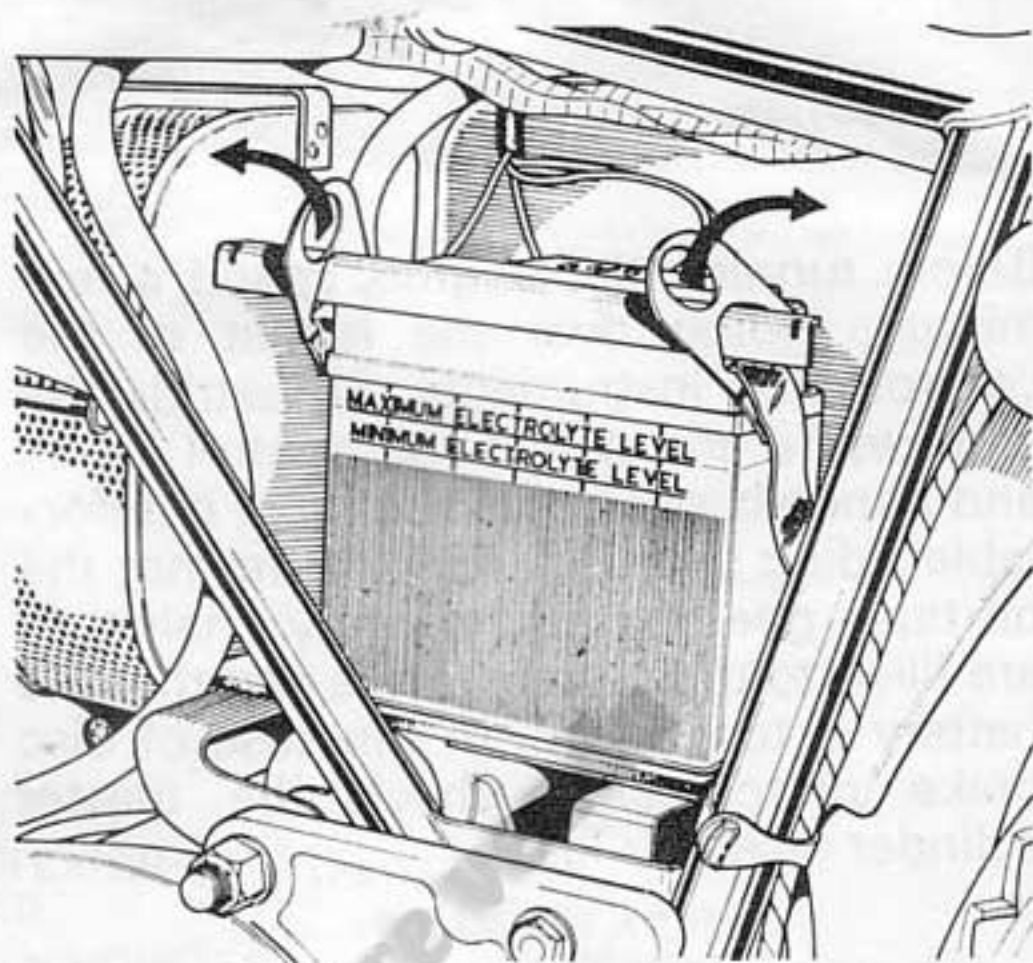


ILLUSTRATION 5

Battery

(Special noise control model)

For access to the battery, remove the side cover by giving one half turn on the slotted fastener at the bottom of the left side panel using a coin or similar object and lifting the panel up and forwards clear of the locating pegs.

To remove the battery, pull down on the battery strap hook to disengage it from the battery carrier hook (*Illustration 6*). Disconnect the red ground lead from the red "+" terminal and the blue/brown lead from the "-" terminal on the battery. Slide the vent pipe clear. Lift out the battery, taking care not to spill the acid. When refitting, turn the battery so that the terminals are towards the rear of the motorcycle. If the tension on the battery strap is insufficient, the strap can be tightened through the buckle before the buckle is hooked on to the battery tray. The electrolyte level can be seen embossed on the battery casing without removal.





ILLUSTRATION 6

Disc brake

The disc brake is hydraulically operated. Before taking the motorcycle on the road for the first time ensure that the master cylinder reservoir contains the correct amount of fluid.

The master cylinder contains a flexible bellows seal which fits into the reservoir **over** the fluid. **DO NOT FILL THIS.** Lift the bellows out (*Illustration 7*) and lay on the upturned cap so that dirt does not adhere. Check that the fluid is to a level of $\frac{1}{2}$ in. from the top of the reservoir and if necessary, correct the level using the recommended hydraulic fluid. Replace the bellows seal closed end downwards then refit the cap tightly.

Hydraulic brake fluid absorbs moisture and it is most important to keep the cap on tight and also to store the fluid only in sealed containers. The breather hole in the cap must be kept clear and no dirt or foreign matter must be allowed to enter the system.

Important

Hydraulic brake fluid must be handled with care as it will attack paintwork, certain types of rubber and plastic.

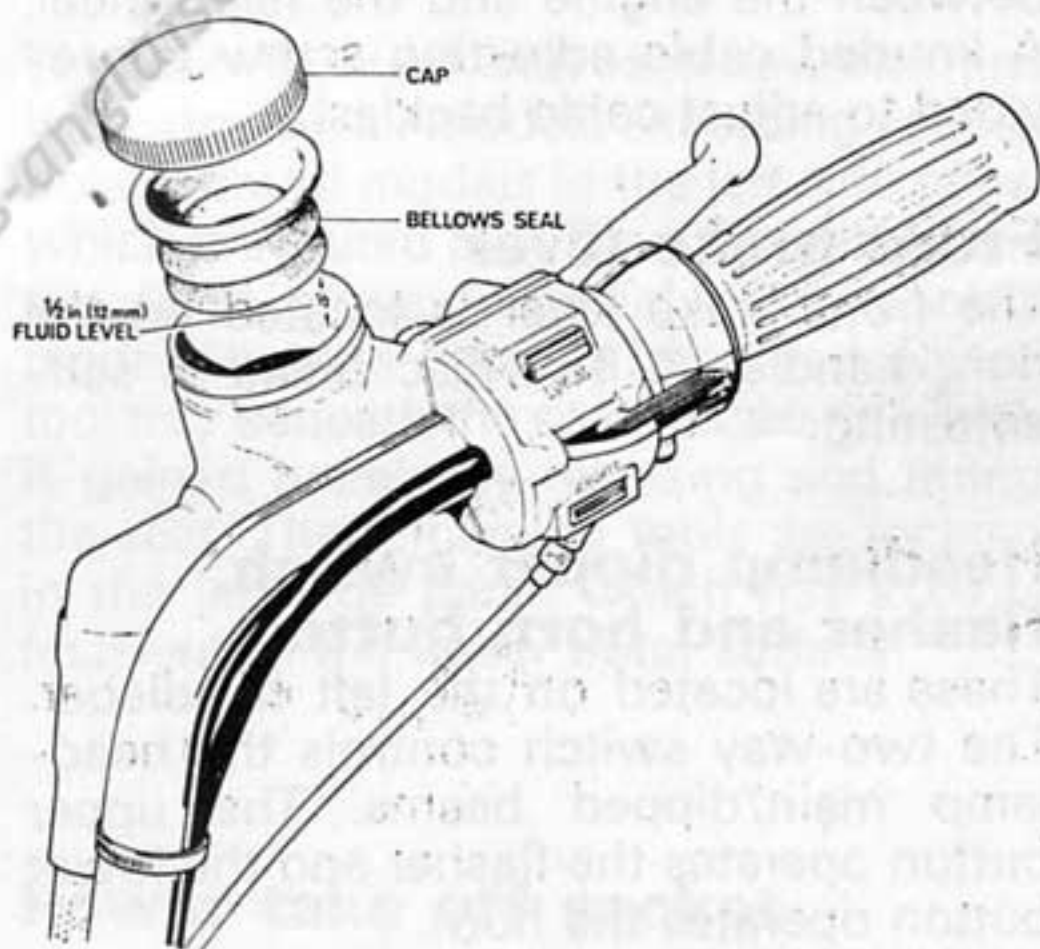


ILLUSTRATION 7

Controls and instruments

(Illustration 2)

Throttle twistgrip

This is mounted on the right handlebar and controls the throttle opening and, therefore, the engine speed. An adjuster is provided in the cable to vary the amount of backlash between the twistgrip control and the junction box to the twin carburetors. A spring-loaded friction adjusting screw is located in the twistgrip body.

Carburetor air control

Mounted on the handlebar this controls the carburetor air slides. For cold starting the control can be closed to provide a rich mixture by moving lever away from rider (to the slack wire position), but should be fully open for normal running with the engine at its normal working temperature.

Clutch control

The clutch lever is on the left handlebar and when pulled towards the bar with a gear engaged, disengages the drive between the engine and the rear wheel. A knurled cable-adjusting screw is provided to adjust cable backlash.

Front brake lever

The front brake lever is located on the right handlebar. The disc brake is self-adjusting.

Headlamp dipper switch, flasher and horn button

These are located on the left handlebar. The two-way switch controls the headlamp main/dipped beams. The upper button operates the flasher and the lower button operates the horn.

Direction indicator switch and kill button

These are located on the right handlebar. The two-way switch controls the optional direction indicators (up for left and down for right). The lower button is the kill button and the upper is spare.

Fuel taps

These are beneath the fuel tank on each side. The left-side tap is 'Reserve'. Both taps must be turned off whenever the machine is parked to avoid damage to engine or carburetor.

Light selection switch

Located on top of the headlamp shell, the switch selects in the left position, parking lights and in the right position, headlamp and tail lamp.

Steering lock

This is mounted on the handlebar lug. The lock is operated by a key and effective only with the handlebars turned fully to either right or left. **WARNING**—Always ensure the steering is unlocked before starting the engine.

Ignition and lighting switch

The four-position switch with waterproof cover is attached on the left side of the machine and is operated by a key which can only be withdrawn when the ignition is switched either to the "Parking with lights" position or to the "Lights and Ignition off" position. The switch positions, starting from the anti-clockwise position are:

- (1) Parking with lights (ignition off).
- (2) Lights and Ignition off.
- (3) Ignition only.
- (4) Ignition and lights.

(Illustration 8).

Gearshift lever

The lever is on the gearbox on the right side of the machine and operates the positive-stop mechanism which returns the lever to a central position when foot pressure is released after each gear change. The neutral position is between first and second gears. Downward movement of the lever selects the higher gears, upward movement selects the lower gears. An indicator is fitted.

The lever is attached to the spindle on splines and can be repositioned to suit individual requirements.

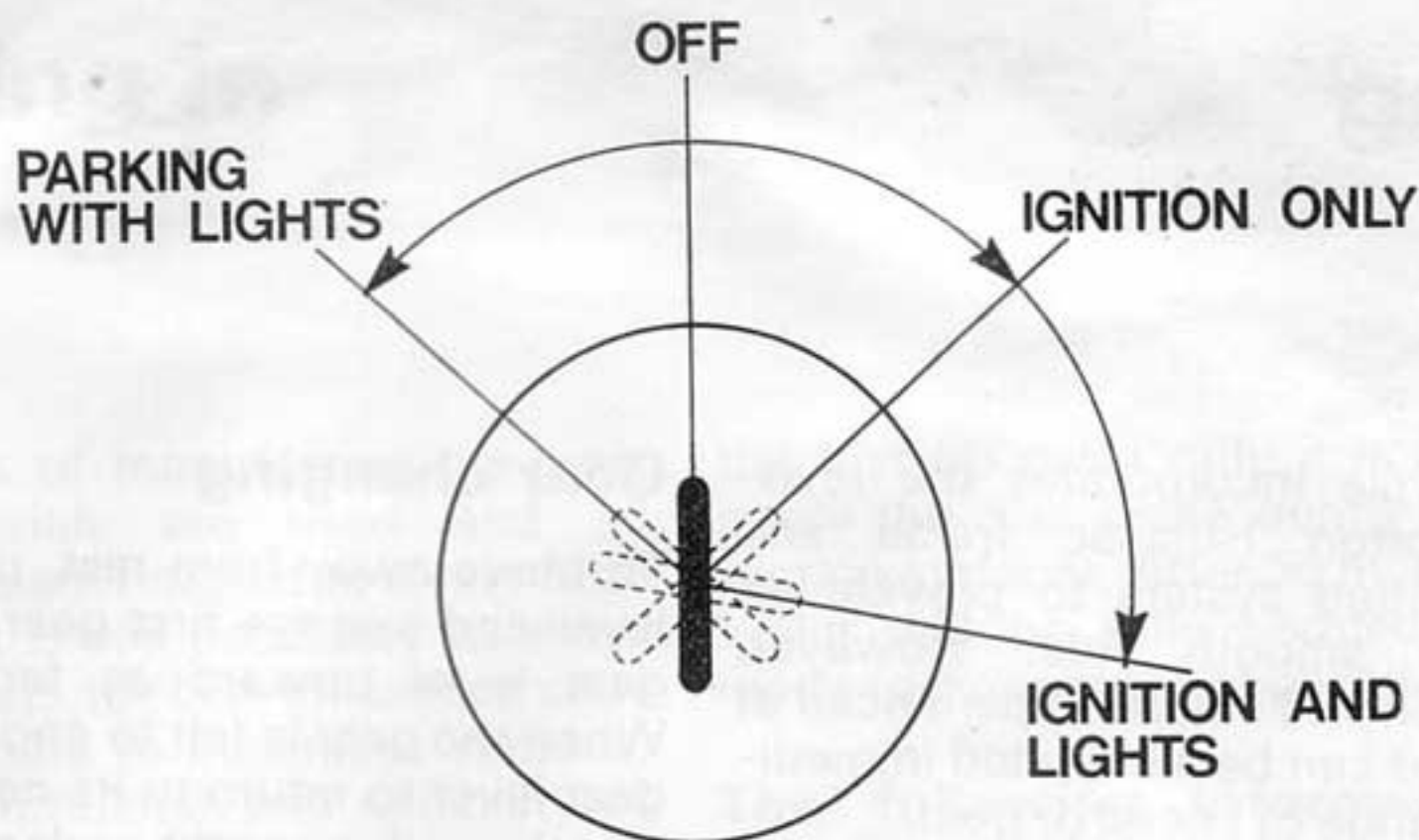


ILLUSTRATION 8

Kick starter pedal

This is on the right side of the machine.

Rear brake pedal

The rear brake pedal is on the left side footrest and can be adjusted for height to suit the rider. (Illustration 4 page 10).

Stop lamp switch

The rear brake stop light switch is located on the rear brake pedal. After the pedal is positioned to suit the rider, care must be taken that the switch functions properly but does not act as the pedal stop. To adjust, loosen the nuts holding the switch and slide the switch in the slots until it is positioned correctly. Tighten the nuts, then make sure that the stop bolt, not the switch, is taking the force of the pedal return.

A non-adjustable stop light switch is also included in the front brake system.

Speedometer

The speedometer records road speed in miles or kilometres per hour, and the odometer records the total mileage in miles or kilometres. On certain models, a trip odometer is fitted.

Tachometer

Driven by cable from the camshaft, the tachometer records engine speed in revolutions per minute.

Tools

The tool kit issued with each new machine is located on all models excepting special noise control models in the left side panel which is secured by a Dzus fastener at the top front corner. Special noise control models have a vacuum moulded plastic tool tray beneath the seat, access to which is gained merely by releasing and lifting the seat. The remaining tools are located in the left side panel which has a Dzus fastener on the lower outer surface.

Power take off socket

A plug and socket, mounted on the right hand side of the battery tray, provides 12v at a maximum of 17½ amps for accessories, such as a radio or shaver, or may be used for battery charging. When appropriate, ensure that the plug is wired with the correct polarity. On this motorcycle, the positive, indicated by a red wire, is earthed (grounded).

Driving

This motorcycle incorporates the revolutionary Norton Isolastic frame and engine mounting system to provide an exceptionally smooth ride. However, some vibration will still be experienced at lower rpm and can be eliminated immediately by a change of speed or gear.

Starting the engine

Ensure the gear lever is in the neutral position (Gear indicator registers with N on indicator plate).

Switch on the ignition—turn on the left-hand fuel tap.

If the engine is cold depress the carburetor ticklers to flood the carburetors. Do not overflood or starting will be difficult and do not jab the ticklers sharply up and down as this will eventually damage the floats. Close the air control lever.

Open the throttle a little and give a firm downwards swing on the kick starter pedal using the whole weight of the body. After the engine has started, open the air lever as soon as the engine temperature permits.

When restarting with the engine at working temperature it should not be necessary to close the air lever or flood the carburetors.

If starting is difficult owing to flooding, switch off the ignition and turn off the fuel tap. Operate the kickstarter briskly a few times with the air and throttle controls open to clear excess fuel from the combustion chambers. Switch on the ignition, turn the fuel tap on and start in the normal manner.

Gear changing

To move away from rest, pull the clutch lever and engage first gear by lifting the gear lever upward as far as possible. When the gear is felt to engage, allow the gear lever to return to its normal position. Gently and smoothly release the clutch lever and at the same time open the throttle slightly to give the power necessary to move off.

To change to a higher gear, accelerate gently then close the throttle, pull the clutch lever and press the gear lever downwards to select the next gear. Release the gear lever and the clutch lever and open the throttle. Select the gears in this manner until top gear is reached.

When changing down to a lower gear, the throttle should be opened slightly so that the engine speed is increased to keep in step with the lower gear ratio.

Use of the gearbox

The gearbox should be used intelligently to keep the engine running smoothly with the least possible stress. The gear ratios are carefully chosen to meet the characteristics of the engine. The rider should at all times select the most suitable gear for the prevailing conditions.

Do not slip the clutch to control road speed. The neutral position must be located and the clutch control released whenever the motorcycle is stationary for any period.

Breaking in

In the process of manufacture the most suitable materials are used and all machined parts are finished to a very high standard but it is still necessary to allow the moving parts to 'bed in' before subjecting the engine to maximum stresses. The future performance and reliability of the engine depends on the care and restraint exercised during its early life.

For the first 500 miles throttle openings should be limited to about one third of twist grip movement and the cruising speed should be varied as much as possible within this limit. Provided the engine is not allowed to labour, the actual road speed is relatively unimportant, but throttle control should be smooth and the gearbox used to the full to enable the engine to cope with the prevailing conditions without undue stress. This will also assist to 'break-in' the gearbox components. At all times avoid violent acceleration.

After the 500 mile service the amount of throttle opening can be increased progressively but the cruising speed should still be varied. Full throttle should not be used until the machine has covered at least 1,000 miles and even then only for short bursts until 1,500 miles has been covered, whereupon maximum performance may be sought whenever desired.

During the 'break-in' period, a certain amount of adjustment will be necessary as the components bed in. Attention should be given to valve rocker adjustment, chain tension, contact breaker points gap and rear brake, all of which tend to settle down. (*Routine Maintenance, Page 17*).

Do not allow the engine oil level in the tank to fall below the "L" mark because a reduced amount of oil in circulation will become overheated.

On the disc brake, it is most essential to avoid glazing of the friction surfaces during the first few miles of use. During

the first 50 miles only it is necessary to apply the disc brake gently to mate the friction surfaces. After 50 miles of use, the brake will be fully bedded down and ready for maximum application.

The following information is in accordance with the requirements of the US National Highway Traffic Safety Administration, Department of Transportation. Part 575 Consumer Information.

Brakes should be bedded in progressively during the first 300 miles. This is achieved by gradually increasing brake lever pressure during the period, and braking from progressively increasing speeds.

For guidance refer to the table below. The deceleration in ft/sec² is converted to the equivalent braking time/distance.

Stage	1	2	3
Speed of commencement of stage (mph)	30	50	70
Speed at end of stage (mph)	0	30	30
Deceleration (ft/s ²)	12.5	12.5	12.5
Distance travelled (ft)	77	135	344
Time taken (sec)	3.5	2.3	4.7

Stage 1

A minimum of 20 stops using the front and rear brakes together. Decelerate from 30 mph to rest using the distance travelled or time taken to obtain the required deceleration.

Stage 2

A minimum of 50 decelerations from 50 to 30 mph using front and rear brakes together.

Stage 3

A minimum of 30 decelerations from 70 to 30 mph using front and rear brakes together.

The distance between brake applications should not be less than $\frac{1}{4}$ mile in each case. Disengage the clutch when carrying out the procedure to ensure that

the brakes receive the full braking load. The use of the above procedure, subject to traffic conditions will ensure that any high spots on the brake linings are not hardened, resulting in reduced brake efficiency. Correct burnishing will give an approximate minimum lining contact area of 50% which qualifies the published brake performance figures.

Free Service Check

All owners of new Commando motorcycles are entitled to a FREE SERVICE CHECK at 500 miles (800 km) or, at latest, three months after taking delivery.

This service should preferably be undertaken by the supplying dealer but can be undertaken by any Norton franchised dealer.

- 1 Check and adjust, if necessary :
 - (a) Valve clearances.
 - (b) Contact breaker. Set gap.
 - (c) Ignition timing. Strobe each cylinder.
 - (d) Spark plugs. Check heat range and gap.
 - (e) Clutch operation and cable adjustment.
 - (f) Examine and adjust rear drum brakes.
(Disc, check fluid level).
 - (g) Adjust and inspect chains.
 - (h) Wheels. Check for freedom of rotation, bearing looseness, and spoke tension.
 - (i) Wheel alignment. Check and adjust rear wheel if necessary.
 - (j) Check tire pressures.
 - (k) Isolastic mountings. Check for clearance and adjust.
- 2 Drain oil tank and sump, clean gauze strainer and tank, and replace cartridge oil filter and grade of oil.
- 3 Drain and refill primary chaincase.
- 4 Top up gearbox.

Fuels

This motorcycle is designed to operate on fuels of at least 94 octane rating (UK 3-Star or USA regular).

Always ensure that the fuel used is clean and free from water. Do not allow foreign matter or water to enter the fuel tank at any time.

Any engine that shows a tendency to overheat or detonate (ping) under hard use when ignition system and carburetors are in proper order may be cured by switching brands of fuel or using fuel of a higher octane rating.

- 5 Top up battery.
- 6 Check all electrical equipment.
- 7 Drain and clean carburetors.
- 8 Adjust and oil all control cables.
- 9 Grease all external nipples and fill swing arm pivot cavity with SAE.140 oil. Replace nipple.
- 10 Tighten all external nuts and bolts. Retorque cylinder head and base nuts.
- 11 Drain and refill front forks.
- 12 Start the engine and check for :
 - (a) Oil leaks.
 - (b) Oil return to tank and feed to rockers.
 - (c) Alternator charging battery.
- 13 Road test the machine. If no other rectification is necessary; set carburetor idling adjustment. While engine is hot, tighten exhaust lockrings fully. Ensure that tabbed lockwashers are properly located. Check for any signs of oil or fuel leakage.

The owner must pay for all replacement materials but labor and time are free of charge.

It is essential for the FREE SERVICE card to be completed, detached from inside the front cover of this manual and handed to the dealer who has carried out this service for return by him to the main distributor

The warranty applies only to the first owner. There is no transfer of warranty under any circumstances.

Routine maintenance

To obtain the best possible service from your Commando, a regular sequence of maintenance is essential. This is divided into simple checks by the rider at frequent intervals, supplemented by dealer services at set mileages. Full details of such services are given both as follows and in the service voucher booklet which you will receive automatically.

Regular check procedures by the owner

Weekly

Check tire pressure and wheel alignment.

Every two weeks

Check battery electrolyte level.

Every 250 miles (400 Km)

Check engine oil tank level.

Every 500 miles (800 Km)

Check and adjust rear chain.

Every 1000 miles (1600 Km)

Check primary chaincase oil level.

Oil all control cables.

Adjust rear brake (disc brake is non-adjustable).

Check disc brake fluid level.

Examine disc brake pads for wear.

Service voucher chargeable by franchised Norton dealer

Mileage (Km)	Type of service
3,000 (4,800)	A
6,000 (9,600)	B
9,000 (14,400)	A
12,000 (19,200)	C
15,000 (24,000)	A
18,000 (28,800)	B
21,000 (33,600)	A
24,000 (48,400)	C

Service A

Check timing and adjust contact breaker points.

Clean spark plugs and set gaps.

Charge primary chaincase oil.

Check clutch adjustment.

Check primary chain adjustment.

Change engine oil and filter cartridge.

Relubricate and adjust rear chain.

Check gearbox oil level.

Grease rear brake pedal pivot.

Check Isolastic mounting for excessive free play.

Check and adjust valve rocker clearances.

Special noise control model only—clean and re-oil air filter element.

Service B

Includes 'A' Service—plus the following:

Change gearbox oil

Change oil in forks.

Check and adjust camshaft chain.

Clean contact breaker points.

Lubricate contact breaker cam felt and auto advance unit.

Grease brake expander lever pivots (one stroke of grease gun).

Fit new air filter element.

Check and oil swinging arm bushes.

Check loose or unequal spoke tension—front and rear wheels.

Check front and rear wheel spindle clamp and nut tightness.

Check on front and rear tire tread and wear pattern. Rebalance wheels where necessary.

Examine and if necessary replace the rear wheel shock absorbing pads.

Service C

Includes 'B' Service—plus the following: Repack wheel bearings (including the rear wheel sprocket bearing) with grease. Dismantle and clean both carburetors and check for wear.

Adjust rear chain.

Check steering head bearings.

Check head steady and head steady mounting rubbers.

Check and tighten all front and rear engine mounting bolts.

Check swinging arm spindle.

Changing engine oil

(Illustrations 9 & 10)

Remove the seat, take out the two side cover top fixing bolts and lift the cover clear at the bottom rubber mounting. Place a funnel or piece of stiff cardboard under the drain to catch the oil into a container and remove the oil drain plug (Illustration 9, item A). This should be done when the oil is warm and flowing freely. Place a catch-pan under the engine and remove the crankcase drain plug to drain the small amount of oil in the sump.

Also remove and clean the crankcase gauze strainer plug (Illustration 10, item B and Illustration 11).

Replace the oil tank and crankcase drain plugs. Fill the tank to the dip stick level with fresh oil and run the engine at a steady speed to check the oil circulation. The oil level should not exceed the "H" mark or fall below the "L" on the dipstick.

As the old oil in the sump has been drained off, a moment will elapse before the scavenge pump begins to return fresh oil to the tank. Run the engine for three minutes, then stop the engine and allow the oil to settle in the tank for a further two minutes. Recheck the oil level and top up as required. Finally refit the side panel.

Removing oil tank

Remove the seat, take out the two side cover top fixing bolts and lift the cover clear at the bottom rubber mounting. Drain the oil as described before under the heading "Changing engine oil". Remove the fuel tank after releasing the rear fixings, removing the two forward mounting nuts and disconnecting the fuel lines from the taps.

Slide the rubber oil pipes off the stubs on top of the oil tank breather space and filler neck. Remove the large filter bolt at the banjo at the rear end of the oil tank and collect the two large washers for re-use. Pull the return oil pipe with clip clear of the oil tank metal pipe. Disconnect the chain oiler pipe.

Remove the top rear mounting nut, leaving the bolt, rubber and washers in position. Slacken the front mounting nut only (the tank bracket is slotted). Remove the bottom bolt completely. The tank is now free. Pull the bottom clear then slide the tank forward whilst continuing to lift. Reverse these processes to assemble.

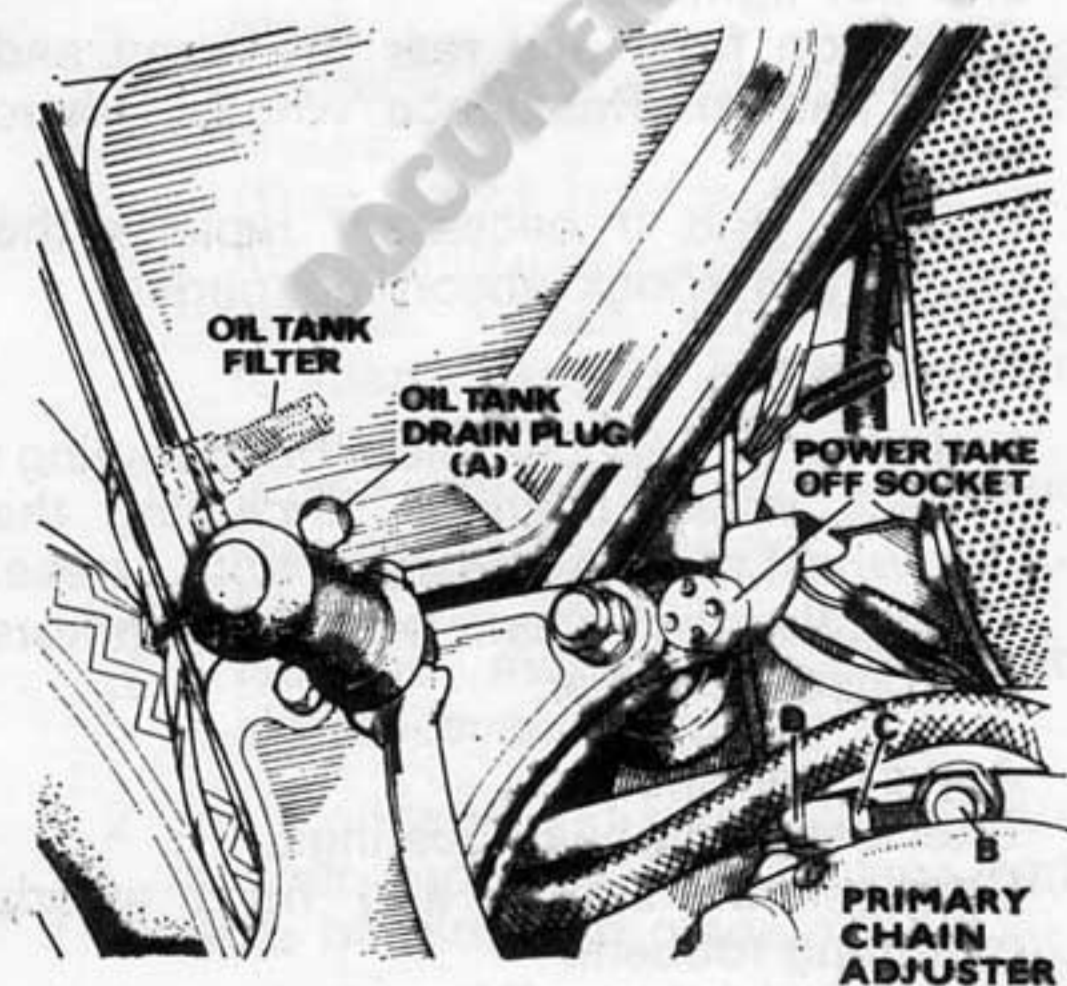


ILLUSTRATION 9

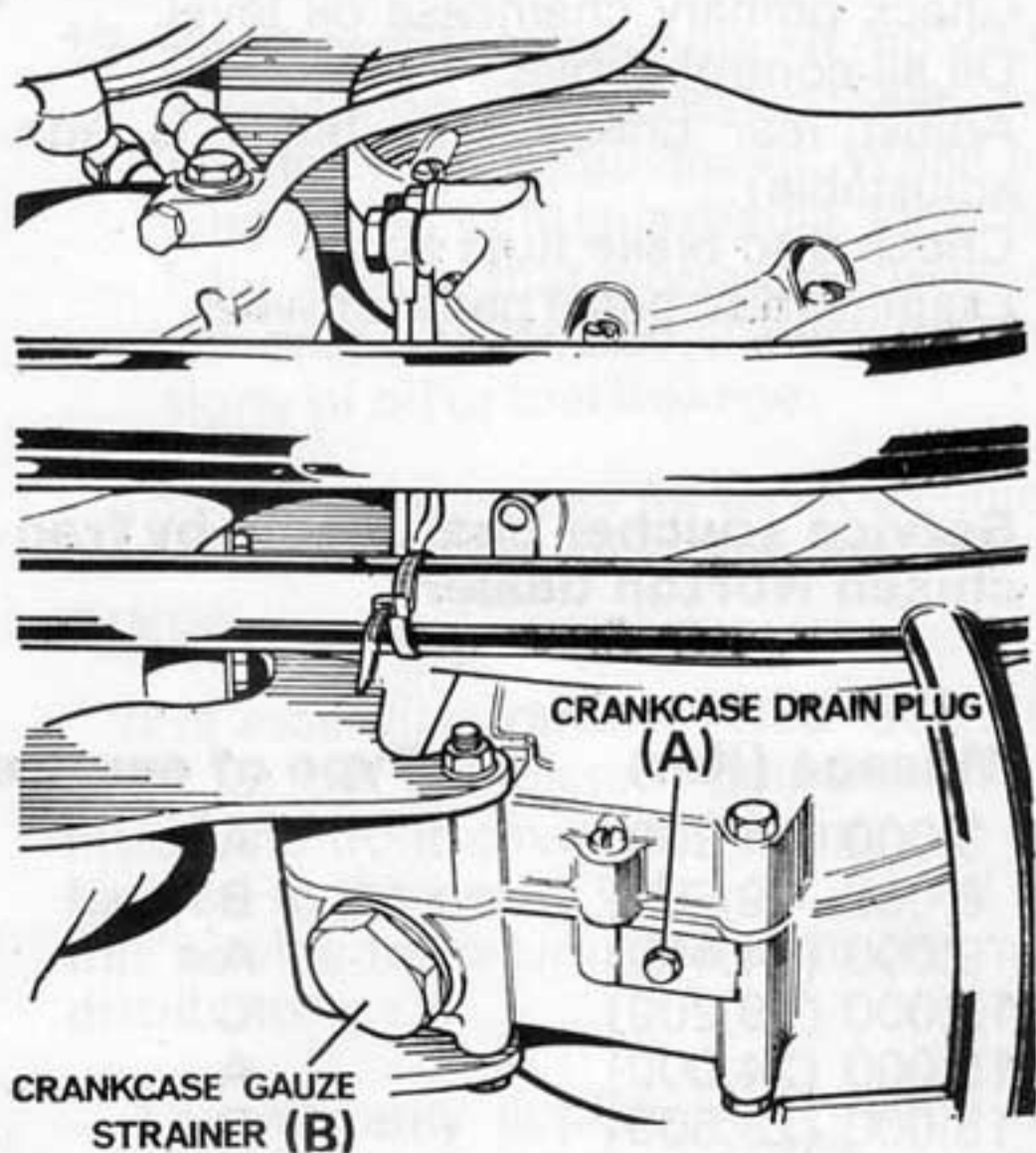


ILLUSTRATION 10

Oil tank filter

(Illustration 9)

A coarse mesh metal filter is incorporated with the oil feed pipe fixing bolt, which should be cleaned at 2,500 miles intervals when the oil is changed.

Cartridge type oil filter

(Illustration 12)

After the first 500 mile service, this filter must be changed at least every 3000 miles. The filter (shaded area) is located behind the gearbox, between the Isolastic mounting plates. To change, remove screw clamp, place oil drip-tray under filter and unscrew. Remove filter and old sealing ring. Moisten new sealing ring with oil and install new filter hand-tight only. Replace screw clamp.

Changing gearbox oil

(Illustration 3 on page 9)

The gearbox oil should be changed after a run so that the warm oil flows more freely. Remove the filler cap (C) and drain plug (A). Drain the oil into a suitable container. Replace the drain plug and fill the gearbox through the filler cap orifice (C). Allow time for oil to pass through the inner cover into the shell. When the level plug is removed and oil runs from the level plug hole (B) allow the surplus oil to drain off and replace the level plug and filler cap.

Changing oil in the primary chaincase

(Illustration 4 on page 10)

Remove the footrest and place a metal tray under the chaincase. Unscrew the central fixing bolt (A) and break the joint to allow the oil to drain into the tray. Wash out the case with clean paraffin. Refit the outer case and remove the filler cap. Pour in 7 fl. oz. (200 cc.) of fresh oil. Be careful not to overfill. Refit the filler cap and footrest.



ILLUSTRATION 11

Rear chain lubrication

The rear chain is lubricated by a pipe with felt restrictor from the rear of the oil tank. The flow can be reduced or cut off as desired by a compression type adjuster on the pipe. After use, ensure that the adjuster is clear of the battery and all electrical components.

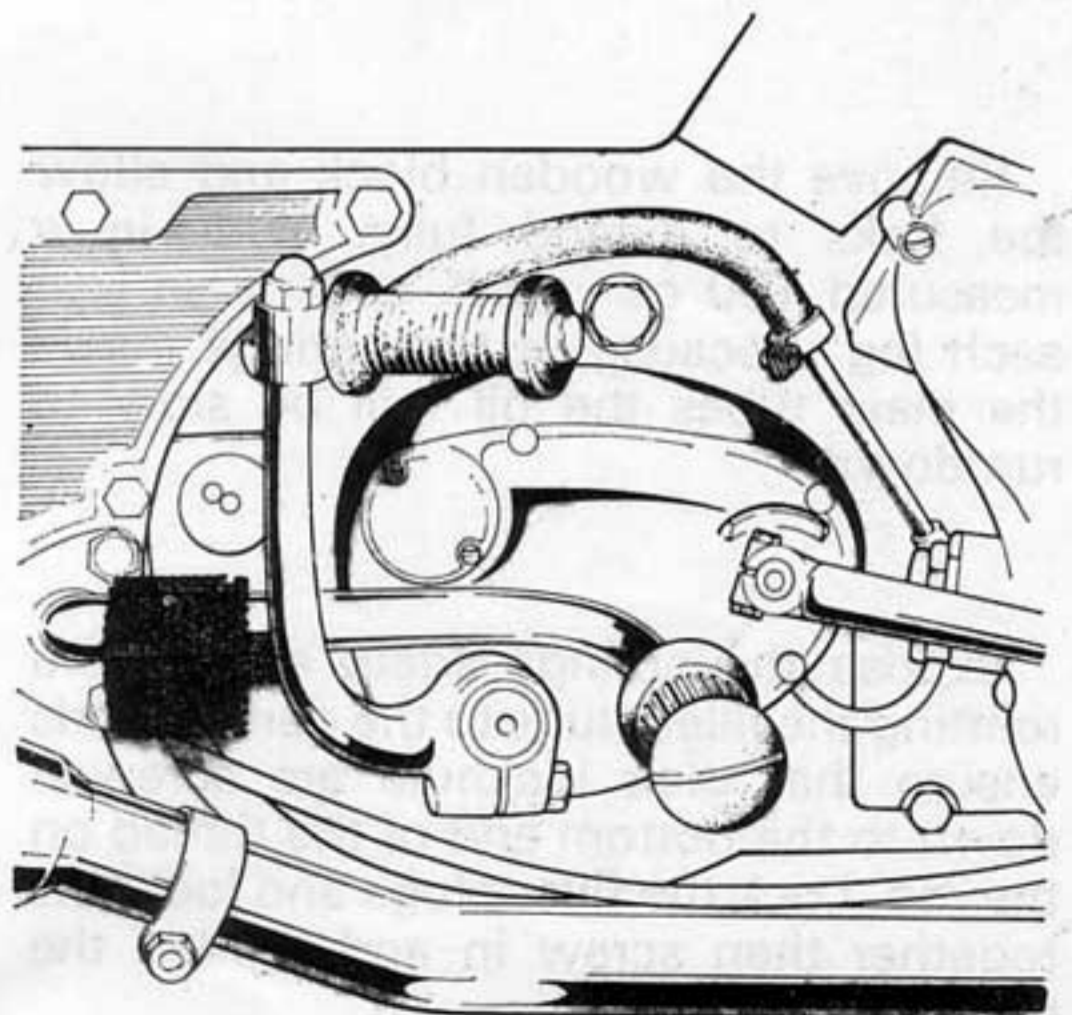


ILLUSTRATION 12

Changing oil in the front forks

(Illustrations 13 & 20)

Under normal conditions the front forks will require no servicing other than an occasional change of oil. Should the oil level become low it will be indicated by excess movement of the forks, but only after considerable mileage.

Each fork leg is provided with a drain screw and each leg should be treated separately. Remove the drain screw, take care not to lose the small fibre sealing washer. Take the machine off the stand, apply the front brake and move the forks up and down to expel the oil. Allow a few minutes for draining and repeat the operation with the other leg. Whilst draining the right fork leg, the forks should be turned on full right lock. Conversely for draining the left fork leg.

Refit the drain screws, place the machine on the centre stand. Remove handlebars to improve accessibility.

Unscrew the large filler plug at the top of each leg, remove the speedometer and tachometer and lift the front wheel to expose the springs.

Support the wheel with a block of wood to hold the springs clear. Using two spanners, unscrew the filler plugs from the damper rods.

Remove the wooden block and allow the forks to extend fully. Pour in a measured 150 cc (5 fl. oz.) of oil into each leg. Because of the springs inside the main tubes the oil will be slow to run down.

Expose the springs again and before refitting the filler plugs to the damper rods ensure that their locknuts are screwed down to the bottom end of the thread on the rod. Lock the filler plugs and locknuts together then screw in and tighten the filler plugs.

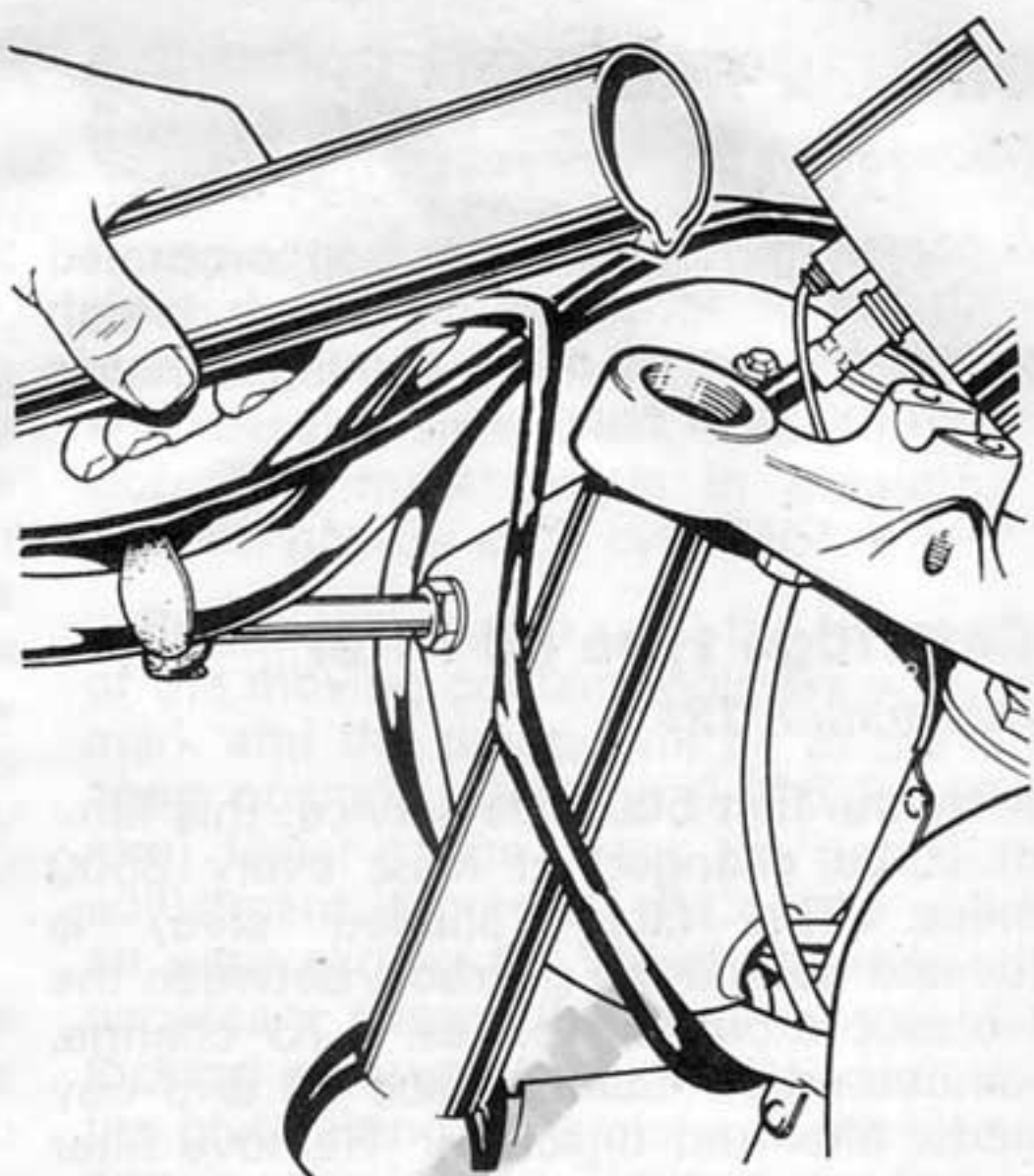


ILLUSTRATION 13



Lubricating swinging arm bushes

(Illustration 3 on page 9)

For lubrication purposes, an oil nipple (D) is used on the plate covering the right side of the swinging arm bush housing.

To maintain the oil content, use a grease gun filled with S.A.E. 140 oil, inject oil sufficient to fill the cavity every 5,000 miles.

Engine and ignition system

Rocker clearances

The rocker clearances are measured by feeler gauges inserted between the end of the valve stem and the rocker adjusting screw. Release the two milled discs securing the seat; draw the seat backwards to clear the frame and lift off.

Remove the fuel tank. This is attached to the frame by two nuts at the front and a rubber band fixing at the rear, except on Hi-rider which has two rear tank bolts and a cross strap replacing the rubber band. The two fuel pipes must be disconnected.

Remove the spark plugs and the three rocker covers on the cylinder head.

By means of the kick-starter pedal, rotate the engine until the left side inlet valve is fully open. With a 0.006 in. (0.15 mm) feeler gauge, check the rocker clearance of the right side inlet valve. If adjustment is necessary, slacken the right side rocker adjusting screw locknut (A) and screw the adjuster (B) out a couple of turns. Place the feeler gauge between the adjuster and the end of the valve stem and screw the adjuster in until it just nips the feeler gauge. Tighten the locknut and withdraw the gauge. It should not be tightly gripped but should slide easily through the gap.

Rotate the engine until the right side inlet valve is fully open and adjust the left side inlet valve in the same way.

Adjust the exhaust valve rocker clearances in the same sequence but using a 0.008 in. (0.2 mm) feeler gauge.

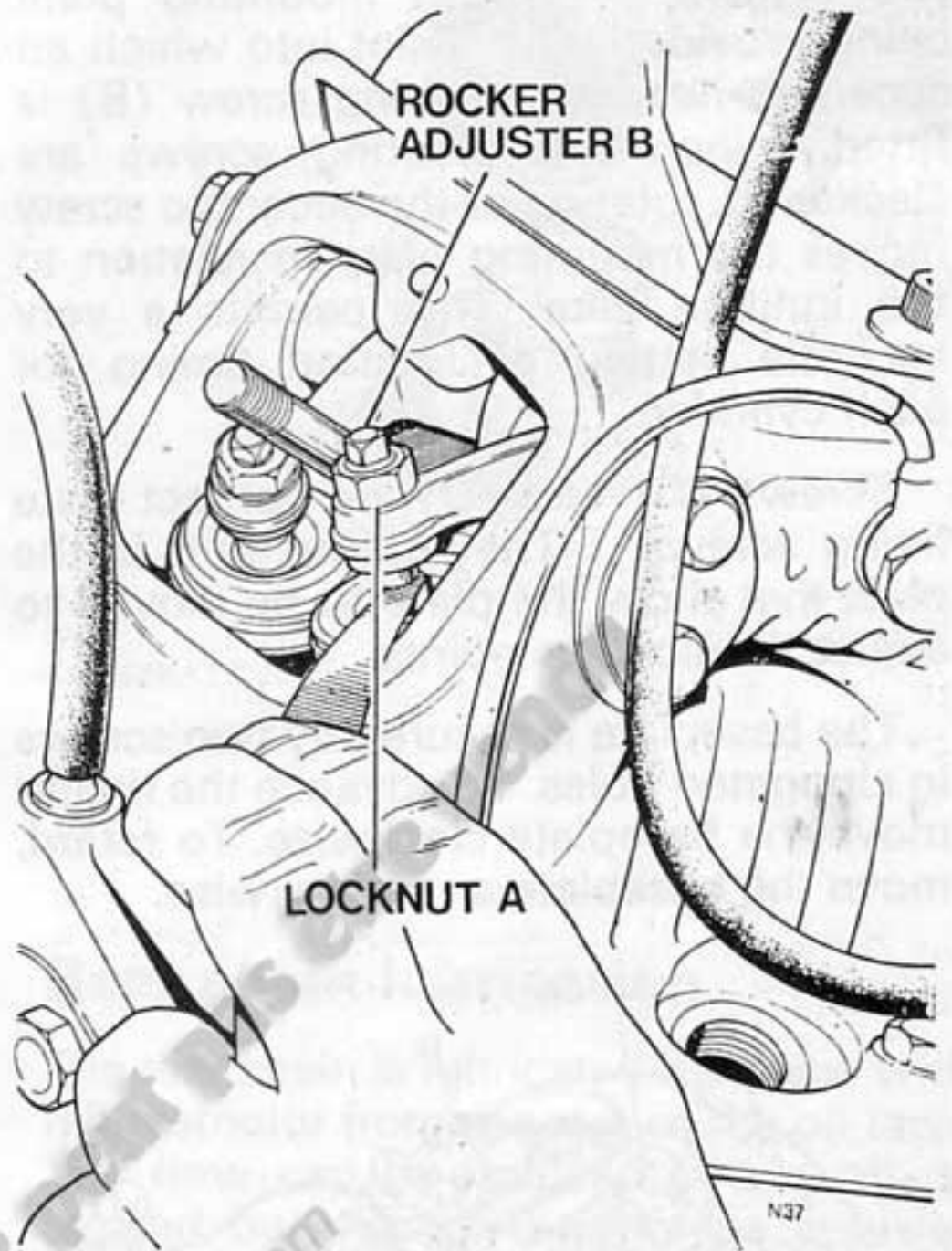


ILLUSTRATION 14

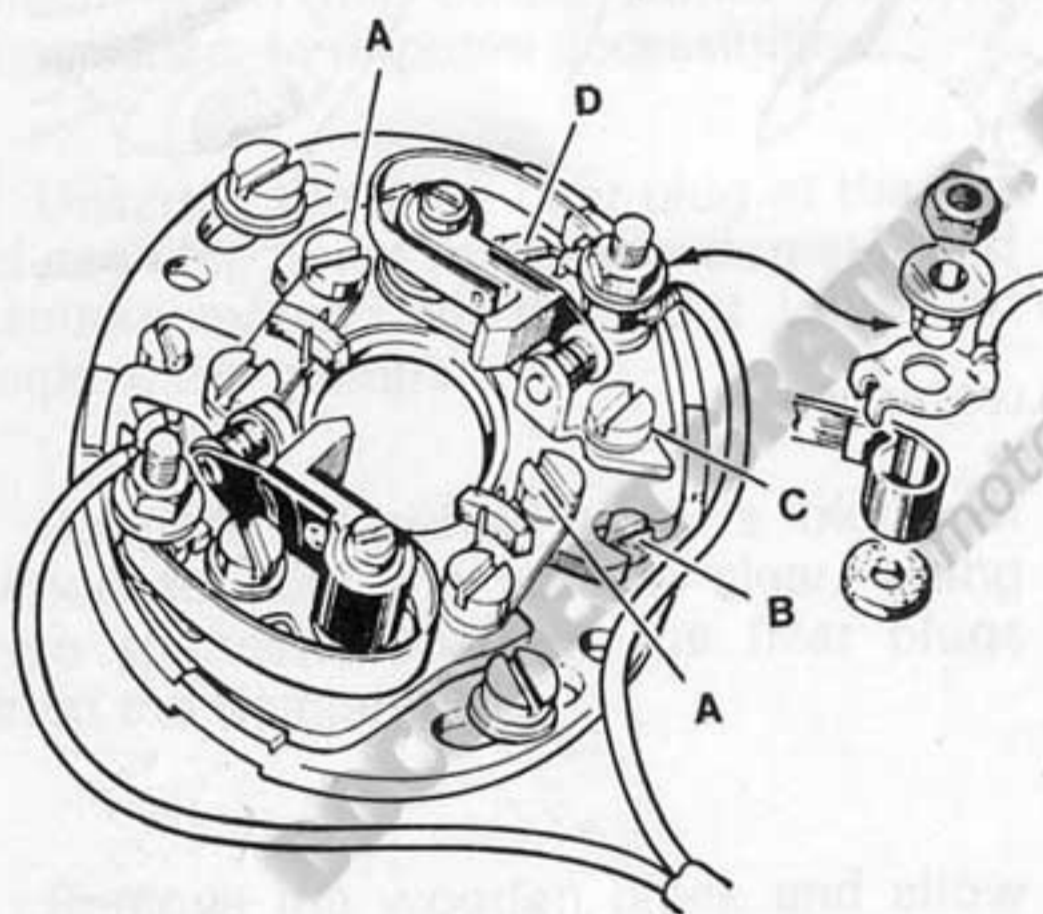
Contact breaker points

(Illustration 15)

The Lucas contact breaker contains a separate contact set for each cylinder. Each contact set has its own mounting plate held to the circular base plate by two screws (A), each mounting plate being provided with a slot into which an eccentric headed adjusting screw (B) is fitted. When the securing screws are slackened, rotation of the eccentric screw moves the mounting plate in relation to the ignition cam. This permits a very accurate setting of ignition timing for each cylinder.

Screws (C) and (D) are contact plate fixing screws. They fit into slots in the plate that allow the plate to be moved to adjust the contact points.

The baseplate is secured by two screws in elongated holes. To advance the timing move the baseplate clockwise. To retard, move the baseplate anti-clockwise.



DATUM POINT FOR ADJUSTING CONTACT
BREAKER POINTS GAP

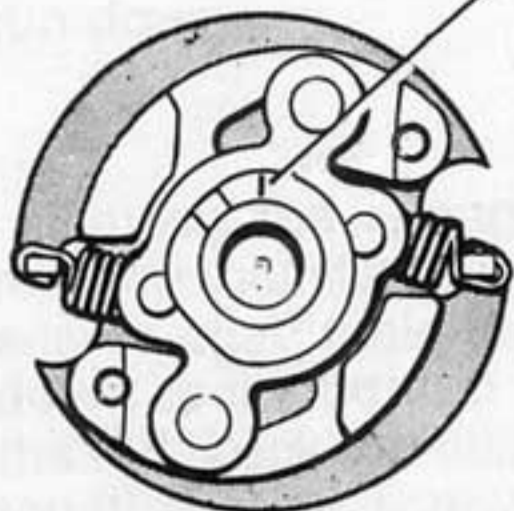


ILLUSTRATION 15

Adjusting the contact breaker points gap

Remove the spark plugs so that the engine can be rotated easily by means of the kick start pedal. An examination of the cam will reveal a small mark adjacent to the slot. This mark assists in obtaining a uniform gap for each cylinder.

Rotate the engine until the nylon heel of the moving contact registers with this mark and the points will be in the fully open position. Using a 0.015 in. (0.38 mm) feeler gauge check the gap. If the adjustment is correct, the gauge will be an easy sliding fit. When adjustment is necessary, release the fixed contact plate locking screws (C) and (D), and slide the plate along the slots until the correct gap is obtained. Tighten the locking screws. Adjust the other contact set in a similar manner.

Maintenance

Every 5,000 miles the contact breaker points should be examined to determine their condition. Remove the nut securing the contact breaker spring to the anchor post and lift off the spring heel, together with the terminals, insulating bush and the insulating washer. Remove the fixed contact plate locking screw and take off the fixed contact plate.

Points which are slightly burnt or pitted can be smoothed with a fine carborundum stone and afterwards cleaned with a brush moistened in petrol or white spirit; if they are badly affected they should be renewed.

Before reassembly, smear the contact breaker pivot post and the cam very sparingly with Retinax 'A' grease and add three drops of engine oil to each lubricating felt. When reassembling ensure that the insulating washer, contact breaker spring, terminal and insulating bush are fitted in the order shown in *illustration 15* and that the terminal tags are inside the curve of the spring.

Auto advance unit

The auto advance unit automatically and progressively advances the ignition timing as the engine speed increases and returns it to the fully retarded or static position when the engine stops.

To expose the mechanism, it is necessary to remove the contact breaker plate complete, but before doing so mark the exact position of the plate so that when it is refitted the timing is not disturbed.

Remove the contact breaker plate fixing screws and take off the plate complete with the contact sets. Ensure that the springs of the auto advance unit are intact with the taper loops attached to the pins. Check the automatic action by turning the cam by hand to the fully advanced position in which the bob weights will be fully extended. When the cam is released, the springs should return the bob weights to the static position.

Lubricate the mechanism sparingly at the point where the cam turns on the base plate. Do not over lubricate as an excess of oil may reach the contact breaker points. If the contact breaker plate has been removed from its original position without being marked, the ignition timing should be checked and reset when the plate has been refitted.

Engine camshaft chain

(Illustrations 16 & 17)

Have available timing cover gasket 06.1092.

To examine, or adjust camshaft chain, the timing cover must be removed by:-
Disconnect oil union for rocker box oil pipe from timing cover.

Remove cap covering contact breaker cover (two screws).

Remove contact breaker base plate - with wires attached (two hexagon bolts).

Remove auto advance unit - use extractor bolt 06.4298.

Remove 12 screws securing cover. Tap lightly the joint face to break seal, withdraw the cover.

When the cover is removed oil will seep from drilling in crankcase. Blank off drilling. (Illustration 16).

The camshaft chain (Illustration 17) is provided with a slipper tensioning device (A). To adjust the chain, release the two nuts (B) securing the slipper, and move as required. The permissible amount of free up and down movement measured in the centre run of this chain is $\frac{3}{16}$ in.

Check chain tension in more than one position.

Retighten the two tensioner nuts when the correct adjustment has been made.

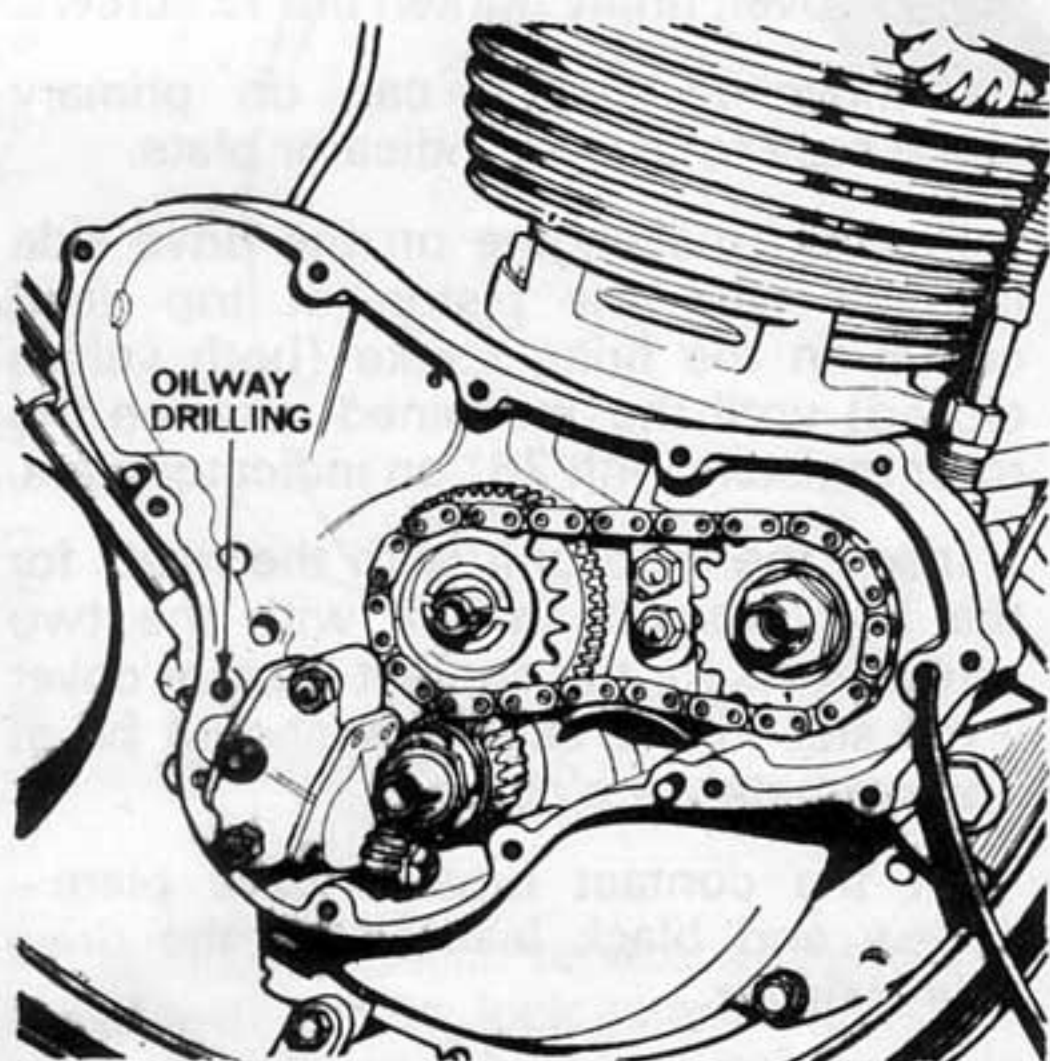


ILLUSTRATION 16

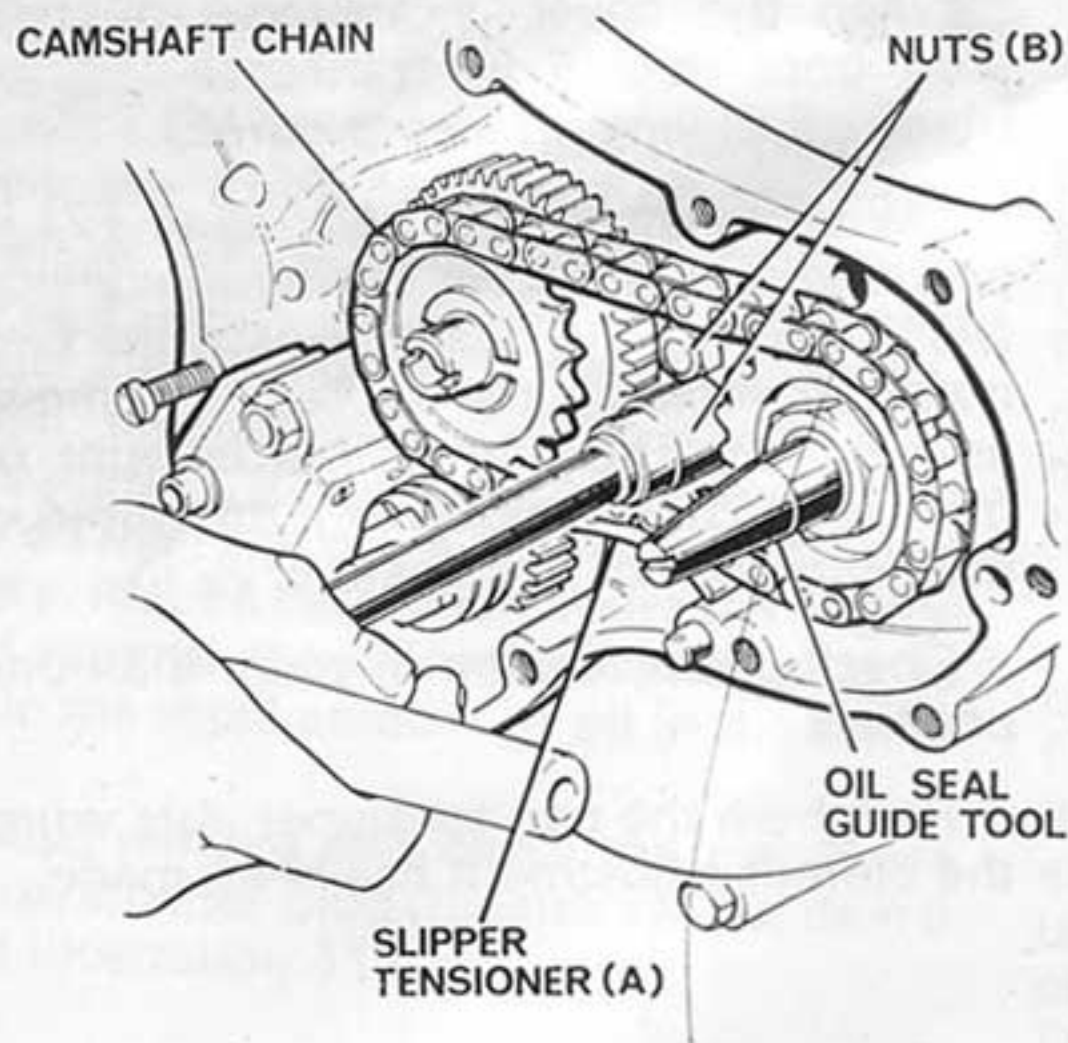


ILLUSTRATION 17

Refitting the timing cover

Use a new gasket to guard against oil leakage. Screw oil seal guide (supplied in tool kit) into camshaft. Put back the timing cover, firmly tighten the 12 screws.

Remove inspection cap on primary chain case to expose indicator plate.

Position the engine on the drive side cylinder with the piston at top dead centre on the firing stroke (both valves closed) until the machined mark on the rotor registers with 28° on indicator plate.

Insert the auto unit with the rivets for the bob weights in line with the two screw holes for the contact breaker cover – the slot in the cam face should be at approximately 9 o'clock.

Fit the contact breaker base plate – yellow and black lead is for the drive side cylinder.

Reset ignition timing as described on page 25.

When the timing cover has been refitted, pour oil into the inlet rocker box until full, then replace the rocker cover. Oil will then drain gradually through the rocker box drain hole into the timing case, thus providing initial lubrication for the timing gear until oil accumulates normally when running.

Spark plug

It is most important to use the correct grade of spark plug, as a spark plug with a low heat factor can cause pre-ignition and subsequent damage to the engine (*Technical data on page 4*).

To avoid damage to the insulator, use the plug spanner provided in the tool kit to remove and refit the spark plug, which should be firmly tightened to ensure a gas tight joint.

To adjust or reset the spark plug gap, bend the side wire which is ductile.

Before refitting the plugs, see that the sealing washers are sound. Clean the threads of the spark plug body.

A smear of graphite grease applied to the threads of the plug will assist in subsequent removal.

Cleaning the spark plug insulator either with a sandblaster or scraping is not recommended. The insulator surface will be abraded and will thus tend to attract increased deposits. When the insulator becomes heavily fouled, the spark plugs should be renewed.

Ignition timing

(Illustration 18)

To check or reset the ignition timing, a timing indicator plate is attached to the outer position of the primary chaincase, with a corresponding mark on the rotor for the alternator, which is exposed by removing the screwed cap adjacent to the indicator plate. Timing can be checked with the engine stationary, or with the engine running by using a Stroboscope.

ENGINE STATIONARY

Remove both spark plugs.

Remove inspection cap on chaincase

Remove contact breaker cover – check and adjust contact breaker points as described on page 22.

Temporarily lock auto advance unit in the full advanced position by:

Removing the central fixing bolt.

Take off the washer for this bolt, replace it with one with a hole large enough to clear the central portion of the unit to bear on the cam when the central bolt is tightened.

Replace the central bolt with washer – hold the auto unit in the full advanced position – tighten the bolt.

Rotate the engine until the machined mark on the rotor registers with the 28° on the indicator plate. If the timing is correct – the contact points should commence to separate.

The exact point of separation can be determined by inserting a strip of very thin paper between the points. The points will grip the paper when closed – by moving the engine slowly, a light pull on the paper will indicate the exact point of separation. Safeguard against a shred of the paper being trapped between the points.

As an alternative, use a low wattage bulb and holder with a short length of wire soldered to the bulb body with a second length of wire attached to the bulb connection, with crocodile clips attached to the ends of both wires.

Connect one wire to the contact breaker spring of the points that are being checked the second wire should be attached to a suitable earth point on the engine.

Switch on the ignition and by moving the engine the bulb will light immediately the contact points separate.

To adjust the timing, refer to sub heading 'Contact Breaker Points' (page 22).

Remove central fixing bolt – discard washer temporarily used – fit the bolt with its original washer and tighten.

ENGINE RUNNING

To check the timing with a Stroboscope see instructions in the Workshop Manual.

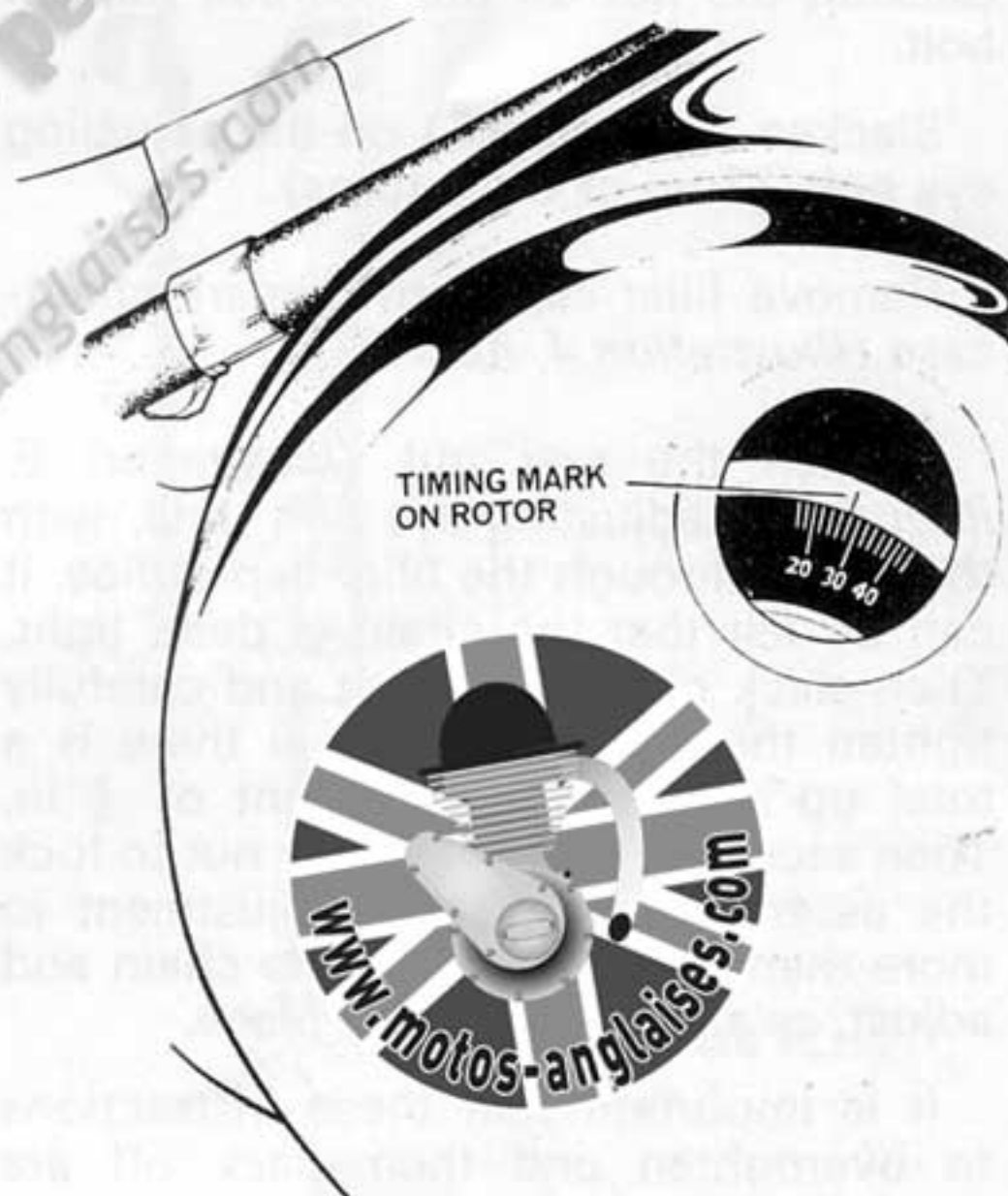


ILLUSTRATION 18

NOTE: A special service washer 06-0949 is available to lock temporarily the auto advance unit whilst the ignition timing is being checked.

Transmission

(Illustrations 4 & 7)

Adjustment of primary chain

The primary drive from the engine to the gearbox is by triple row chain; as the chain operates in an oil bath, long life and reliability are ensured provided that correct adjustment is maintained and the chaincase oil level maintained by topping up at regular intervals. If the chain is too tight the engine and gearbox bearings will be overloaded, and if the chain is too loose there will be excessive wear of both the chain and the sprockets: in either case maladjustment will cause excessive transmission noise.

Tighten the primary chain by:

Slacken (*Illustration 9, item B*) gearbox top fixing bolt from right hand side. Slacken the nut on the gearbox bottom bolt.

Slacken front nut (C) on the adjusting eye bolt. (Two or three turns).

Remove filler cap from primary chaincase (*Illustration 4, item C*).

Tighten the rear nut (*illustration 9, item D*) on adjusting eye bolt until, with the finger through the filler cap orifice, it can be felt that the chain is dead tight. Then slack off the rear nut and carefully tighten the forward nut until there is a total up and down movement of $\frac{3}{8}$ in. Then securely tighten the rear nut to lock the assembly. Check the adjustment in more than one position of the chain and adjust, as above, at tightest place.

It is important that these instructions to overtighten and then slack off are carefully followed.

Tighten nut on gearbox top and bottom fixing bolts. The top bolt, with lubricated thread should be secured to 50lb ft torque, from the right hand side. Do not attempt to turn the nut at the left.

Replace chaincase filler cap.

Adjustment of rear chain

(*Illustration 28*).

Slacken the rear wheel spindle nuts (A) and release the chain adjuster locknuts (B). Pull downward on the bottom run of the chain to bring the spindle hard up against the adjusters (C). Move each adjuster an equal amount until, with a rider seated, there is a total up and down movement, measured in the centre of the chain run, of $\frac{3}{4}$ to 1 in. (19 to 25 mm). Centralize the brake by applying fully as the spindle nuts are tightened thoroughly. Tighten the chain adjuster locknuts.

Check rear brake adjustments. (*Page 33*).

If the chain has covered a considerable mileage it may have worn unevenly; the adjustment should be checked at the tightest part of the chain run.

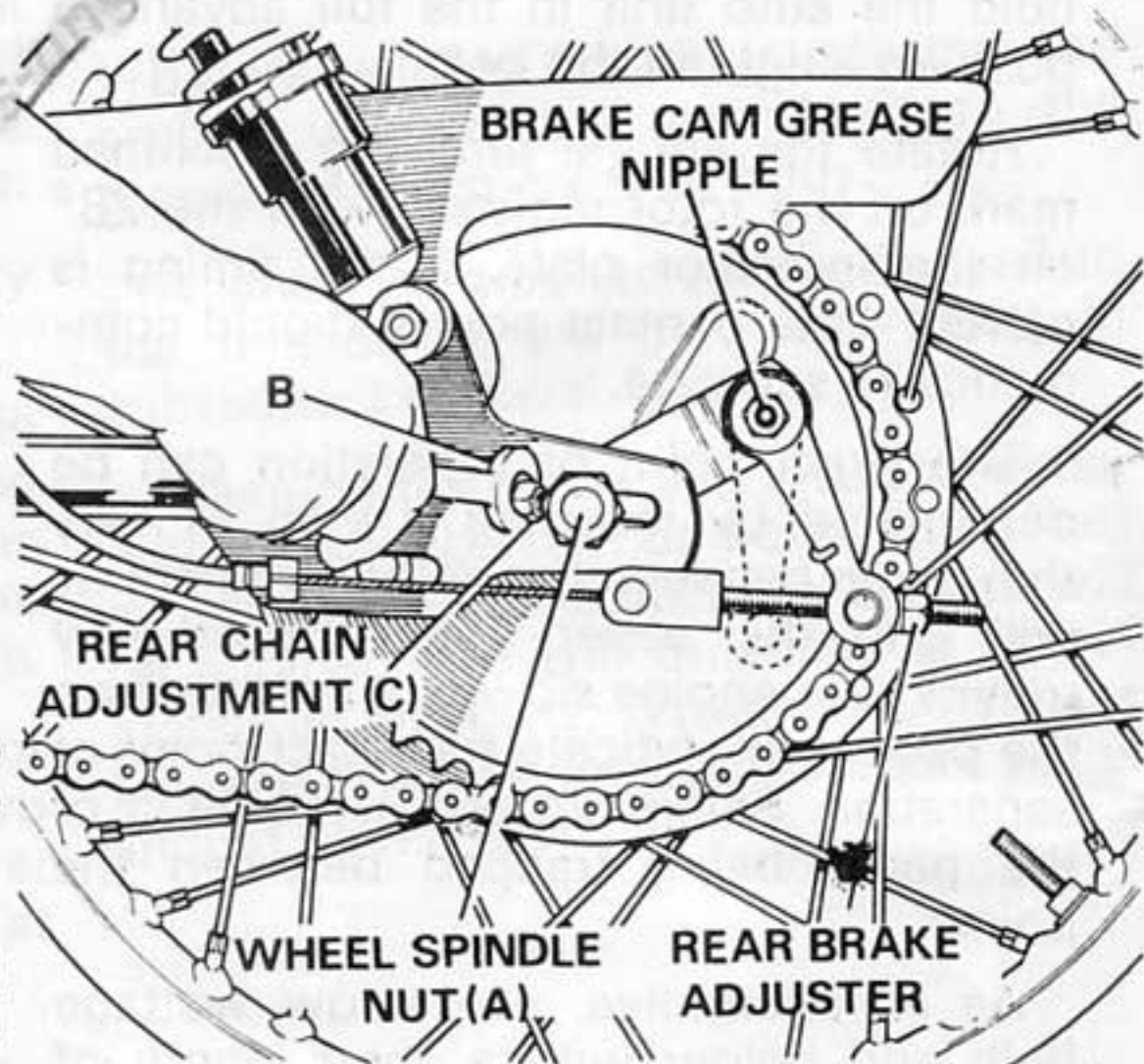


ILLUSTRATION 19

Front forks and rear suspension



The front forks are of the spring controlled, oil damped, variety. The only routine attention required is a periodic oil change as detailed on page 20.

The bearings are of the ball journal type, pre-packed and sealed for life. These bearings require no adjustment at all. Unlike earlier models, the fork stem is fixed to the top yoke, the stem nut being fitted below the lower yoke.

The Girling rear suspension units are sealed units filled with oil on assembly. They should require no further attention.

A cam-ring adjuster is provided to raise the base of the springs into three alternative positions to suit varying loads. The 'soft' or normal solo position is when the adjuster is rotated as far as possible in an anti-clockwise direction when viewed from above.

Caution

If fitting a rear carrier, ensure that the carrier is completely clear and free of the rear suspension units top fixing bolts to avoid the possibility of the carrier bearing on the damper spring top collars with the consequent risk of fracturing the suspension units.



ILLUSTRATION 20

Clutch

(Illustrations 3 & 21).

The diaphragm spring clutch is mounted on the gearbox mainshaft and operated by a push rod which passes through the hollow mainshaft.

The clutch operating lever is controlled by the handlebar lever. Movement imparted to the push rod by the operating lever causes the clutch plates to separate.

The clutch plates are compressed by a circular diaphragm spring, thereby ensuring an even distribution of spring pressure.

To enable the clutch to operate satisfactorily, there must be a little free movement between the operating lever to which the clutch cable is attached and the push rod, in addition to the $\frac{3}{16}$ in. to $\frac{1}{4}$ in. of free play in the clutch cable itself.

If this free play is absorbed by the friction plates settling down, clutch slip will develop. Conversely, if the free play is excessive, the clutch plates will not separate, causing clutch drag.

To ensure that this free movement exists, slacken off the clutch cable adjuster at the handlebar end as far as possible and then take off the filler cap (Illustration 3, item C) on the gearbox outer cover.

With the index finger, move the operating lever to which the clutch cable is connected inside the kick starter case to and fro, which will indicate whether there is a slight movement or otherwise.

If no movement exists, remove the clutch inspection cap on chaincase (Illustration 21) and release nut (B) on the gearbox mainshaft, then turn the screw (C) gently in an anti-clockwise direction until movement is felt on the operating lever. Then turn screw (C) in a clockwise direction until it is felt that the screw just touches the push rod.

Now unscrew the screw (C) one full turn and holding it in this position, retighten the lock nut (B). This will ensure that there is the specified amount of movement between the clutch operating mechanism and the push rod.

Finally, unscrew the clutch cable adjuster at the handlebar end leaving a minimum of $\frac{1}{8}$ in. free movement between the cable outer casing and the adjuster.

WARNING: Do not attempt to dismantle the Diaphragm Spring Clutch without the proper tools as serious personal injury could result. (Refer to the *Workshop Manual*).

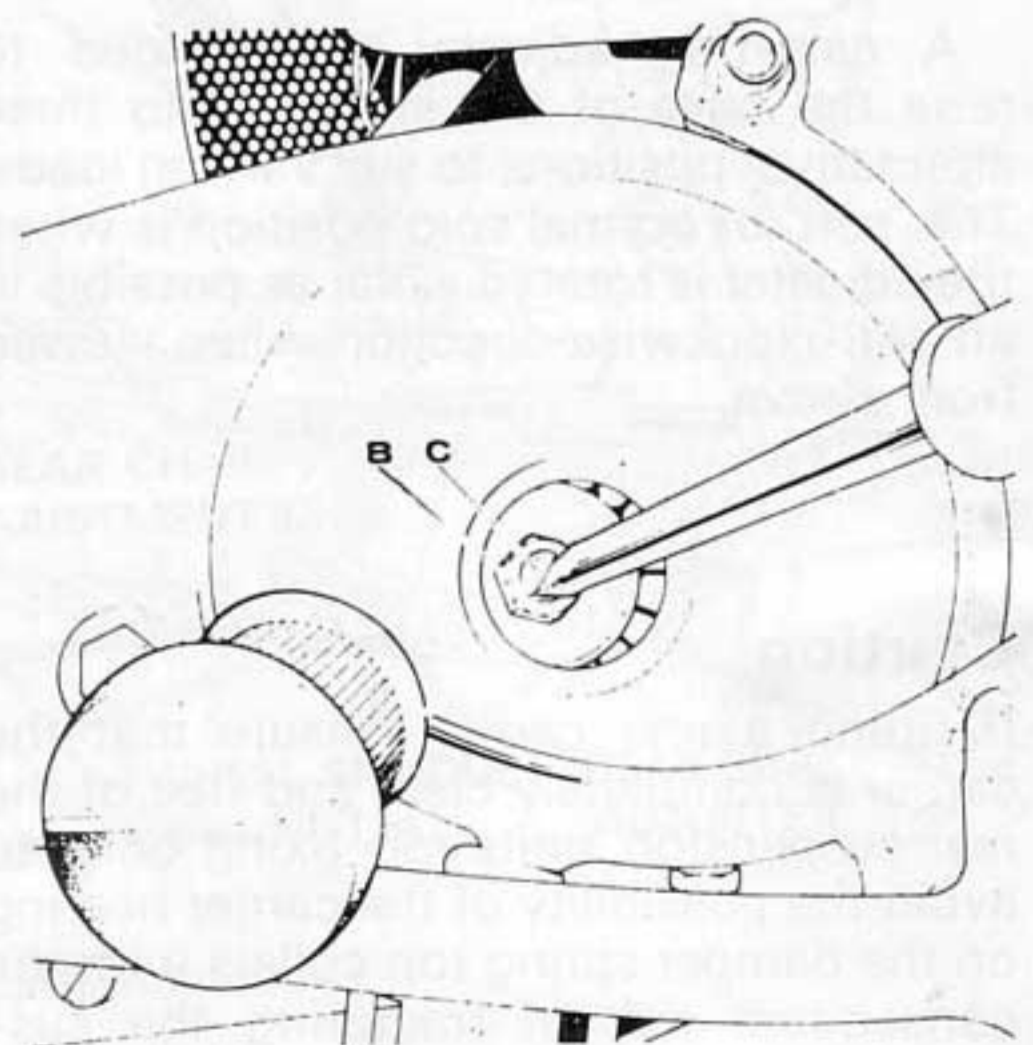


ILLUSTRATION 21

Carburetors

The Commando is fitted with twin Amal concentric carburetors series 900.

The carburetor settings and jet sizes shown in the technical data have been determined after long tests to obtain maximum performance consistent with good petrol consumption.

It should not be necessary to alter the carburetor settings unless the machine is operating at altitudes over 3,000 feet above sea level.

The workshop manual describes the function of the carburetors and the method of tuning.

Synchronising the twin carburetors

It is most important that both throttle slides should operate simultaneously. To ensure this, slacken the throttle stop screws and adjust the throttle cables until there is a minimum of backlash but on initial movement of the twistgrip, both throttle slides begin to lift simultaneously. Make sure the throttle cable adjuster lock-nuts are tightened securely. Start the engine and adjust slow-running only when the engine is warm. Now detach one spark plug lead. Adjust the pilot air screw and throttle stop screw to gain satisfactory idling. Refit this spark plug lead. Remove the other and adjust idling on the second cylinder. When this plug lead is replaced and the engine is again running on two cylinders, idling speed may be too fast, in which case the throttle stop screws should be unscrewed slightly until idling is correct.

Cleaning the carburetors

The float bowl on each carburetor incorporates a drain plug which is both slotted and knurled for ease of removal. The plugs enable the float bowls to be cleaned without removal.

Air filter (not special noise control models) (Illustration 22)

To remove and replace air filter element: Take out the two bolts securing the air filter front plate. Lever the front plate outwards at the bottom. The plate can then be pulled clear of the element and the element removed from the left side. The element is of the disposable resin impregnated type which cannot be cleaned effectively. Loose dirt can be dislodged by tapping the element on a hard surface and blowing with compressed air but when the element is badly clogged it should be replaced by a new element.



ILLUSTRATION 22

Air filter (special noise control models)

(Illustration 23)

This filter fulfills the dual roles of air cleaner and air silencer. It incorporates a micro-cellular plastic foam element which must be oil-wetted. Access to the filter element is gained by removing three bolts and the front cover plate. The foam element is wire reinforced and may be withdrawn easily with the fingers. Take care not to tear the foam when drawing this past the carburetor float bowl drain plugs.



ILLUSTRATION 23

Every 3,500 miles (4,800 km) or less in extremely dusty conditions, wash the foam element thoroughly in clean petrol to expel dirt, then squeeze out to dry. Next immerse the element in clean engine oil, squeeze out the surplus and the element is ready to refit.

Wheels

DISC BRAKE FRONT WHEEL

Removal of front wheel

Removal of front wheel (*Illustrations 24 and 25*). Support the machine with the front wheel well clear of the ground.

The brake assembly remains undisturbed since only the disc is removed with the wheel.

Slacken the fork end clamping nut (*Illustration 24, item A*) and remove the wheel axle nut (*Illustration 24, item B*). Take the weight of the wheel in one hand, withdraw the axle using a tommy bar, and withdraw the wheel forwards to disengage the disc from the pads.

To prevent the brake pads being ejected by unintentional application of the brake with the wheel removed, place a $\frac{1}{4}$ in. (7 mm) thick spacer of clean wood or metal between the pads.

Collect the wheel bearing dust covers to prevent loss. (*Illustration 25*).

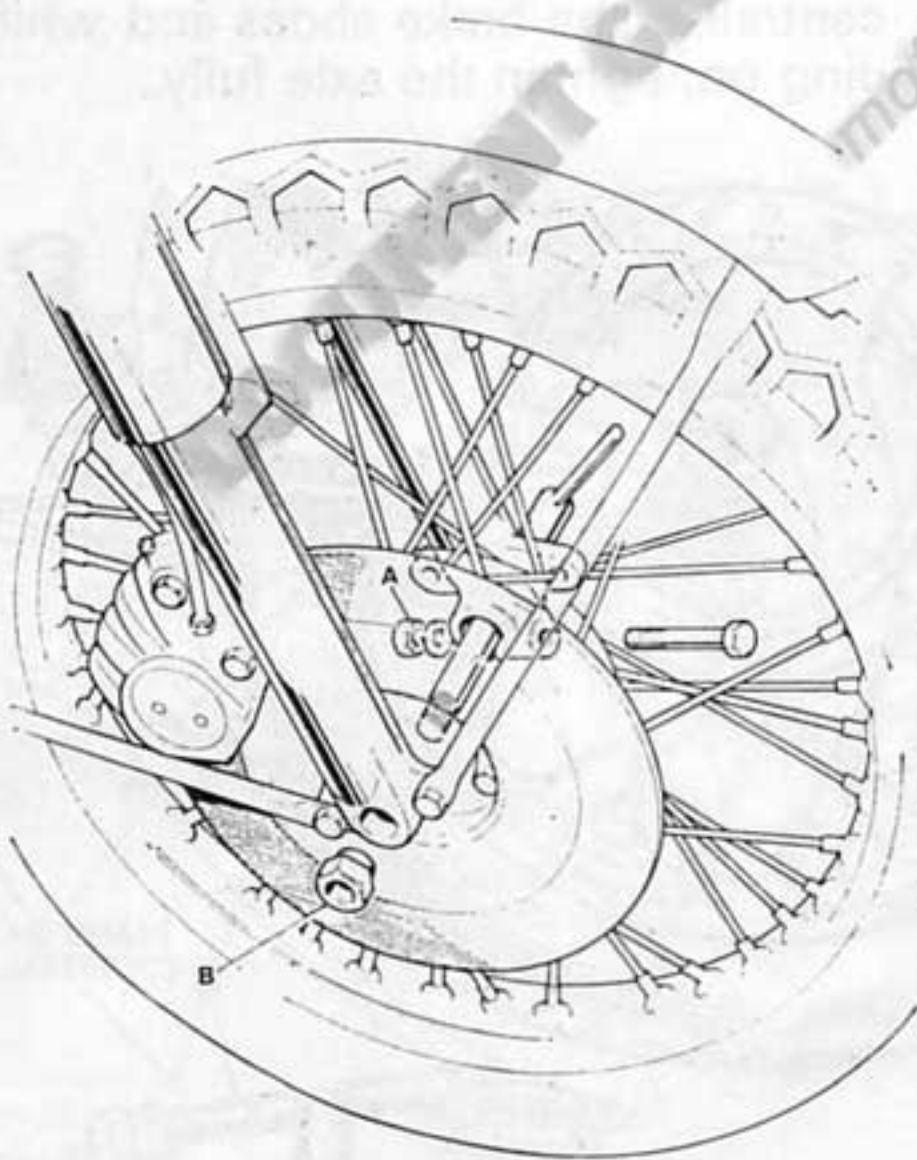


ILLUSTRATION 24

Refitting front wheel

Offer the wheel with both dust covers in position and, with care, guide the disc between the brake pads (*Illustration 26*).

Grease the wheel axle when refitting. Before tightening the fork end clamping nut, compress the forks a few times to centralise the axle. Do not overtighten the nut as there is a danger of fracturing the lug. If the fork action is stiff, slacken the axle nut and fork end clamping nut and move the forks up and down to allow the fork tubes to take up alignment. Retighten the nuts.

N.B. When removing or refitting the tire, do not rest the wheel on the disc side or damage may be caused.

It is essential to apply the brake lever several times after the wheel has been refitted in order to restore full pressure before the brake is returned to service.

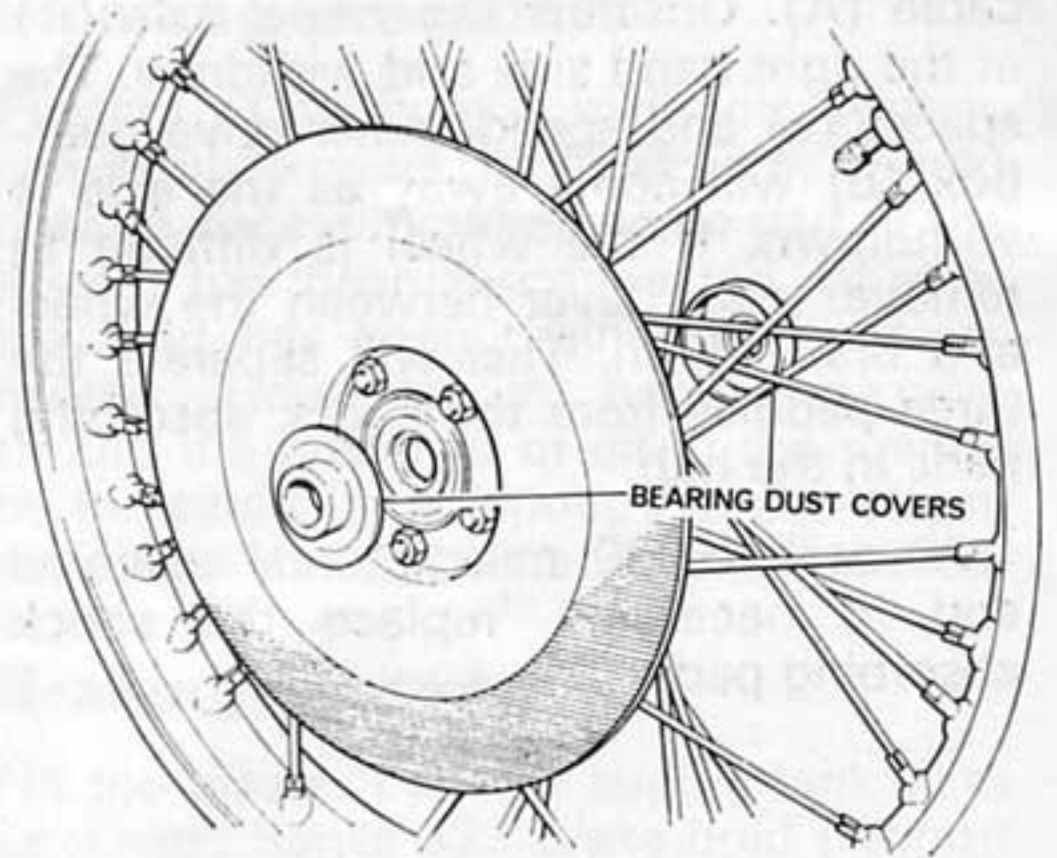


ILLUSTRATION 25

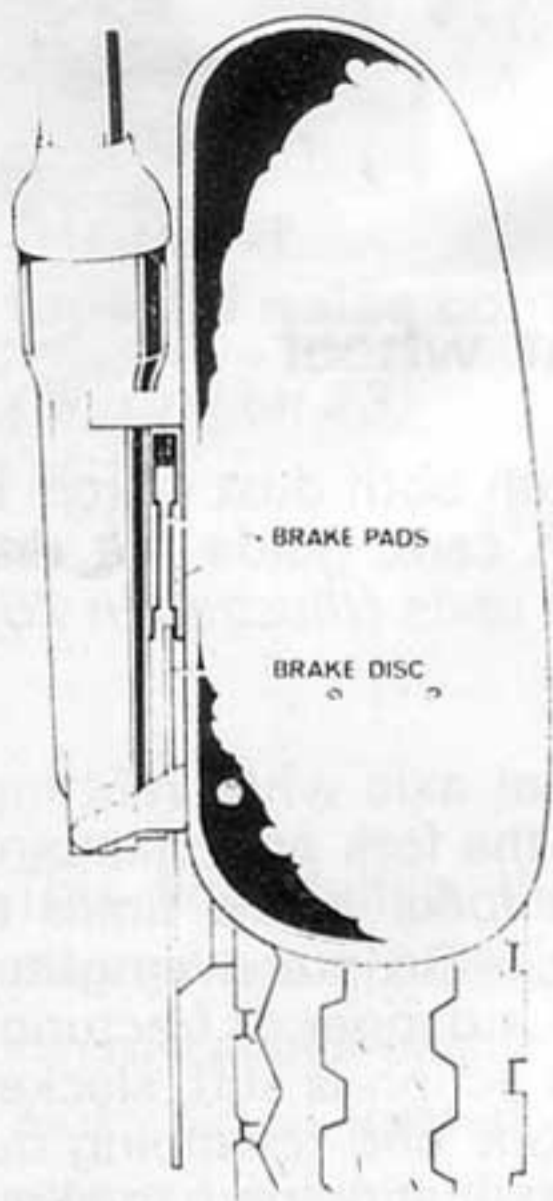


ILLUSTRATION 26

Removal of rear wheel

(Illustration 27)

The rear wheel is removed by detaching it from the brake drum, leaving the drum, rear sprocket and chain in position.

Disconnect the speedometer drive cable (A). Unscrew the wheel axle (B) at the right hand side and withdraw. The spacer (C) and speedometer drive gearbox (D) will come away as the axle is withdrawn. If the wheel is difficult to remove, use a lever between the wheel and brake drum. This will separate the three paddles from the shock absorbing pads in the hub.

At each 5,000 mile interval examine and, if necessary, replace the shock absorbing pads.



Refitting rear wheel

When refitting the wheel, turn the brake drum so that one of the three paddles is approximately in line with the pivoted fork tubes and so facilitate passing the bearing boss on the hub over the other two paddles. Fit the wheel to the paddles, fit the speedometer drive gearbox, exercising care to engage the two drive dogs with the slots in the hub bearing ring.

Position the spacer – fit the wheel axle with its washer, apply the rear brake fully to centralise the brake shoes and whilst holding on, tighten the axle fully.

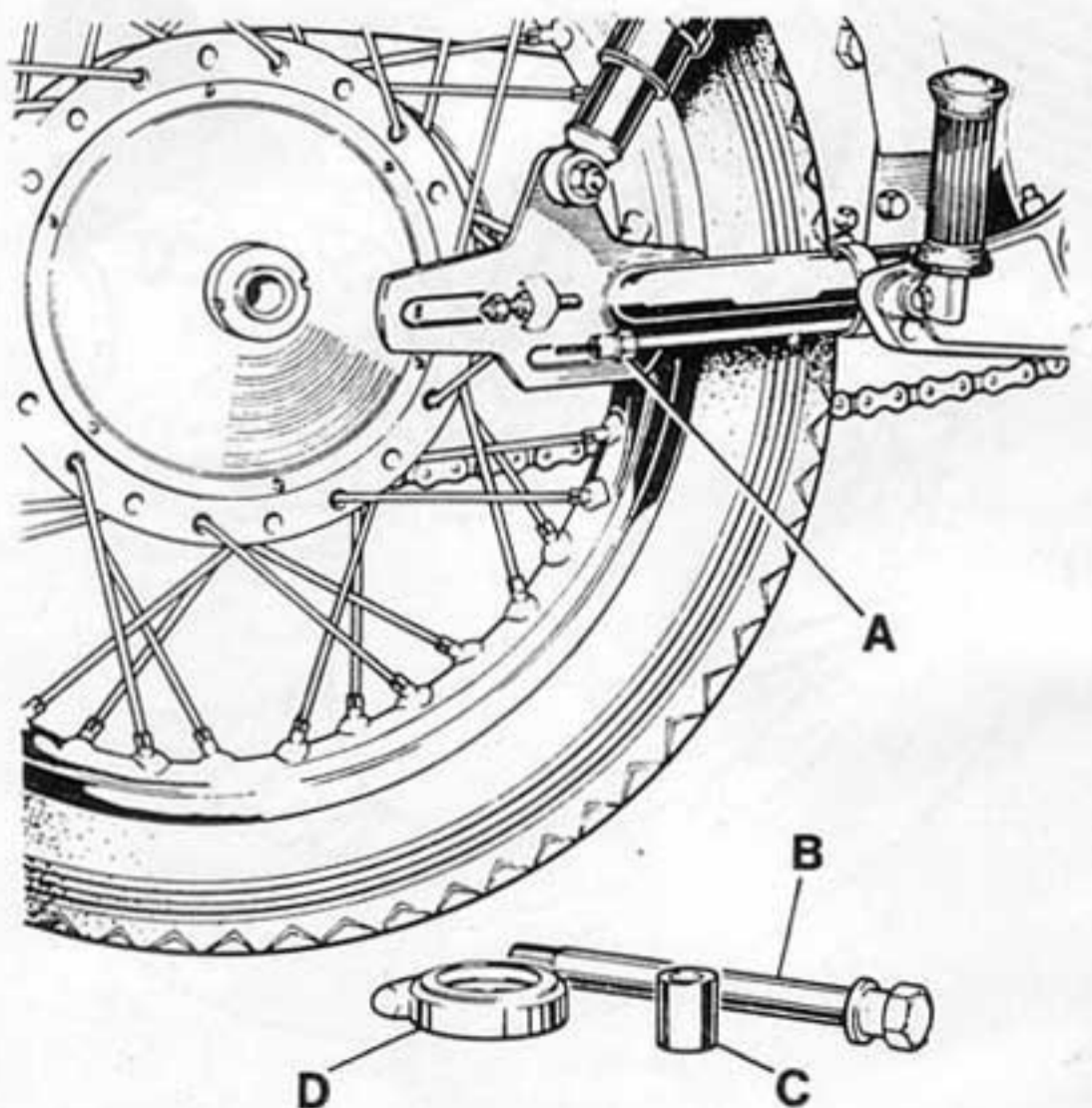


ILLUSTRATION 27

Brakes

Rear brake adjustment

(Illustration 28)

The rear brake is adjusted by means of the cable adjuster at the operating lever. When the brake is fully applied the operating lever should be approximately in the position shown in broken lines in the illustration. If excessive brake lining wear brings the lever past this position and there is no adjustment left, the brakes should be relined.

After adjustment the wheels should rotate freely. Any tendency to bind will dissipate power and promote heat which will adversely affect the efficiency of the brakes.

A rear brake cable is fitted instead of a brake rod to cope with the flexibility of the engine cradle and swinging arm relative to the main frame on which the rear brake pedal is mounted. For this reason, a rod should not be substituted under any circumstances.

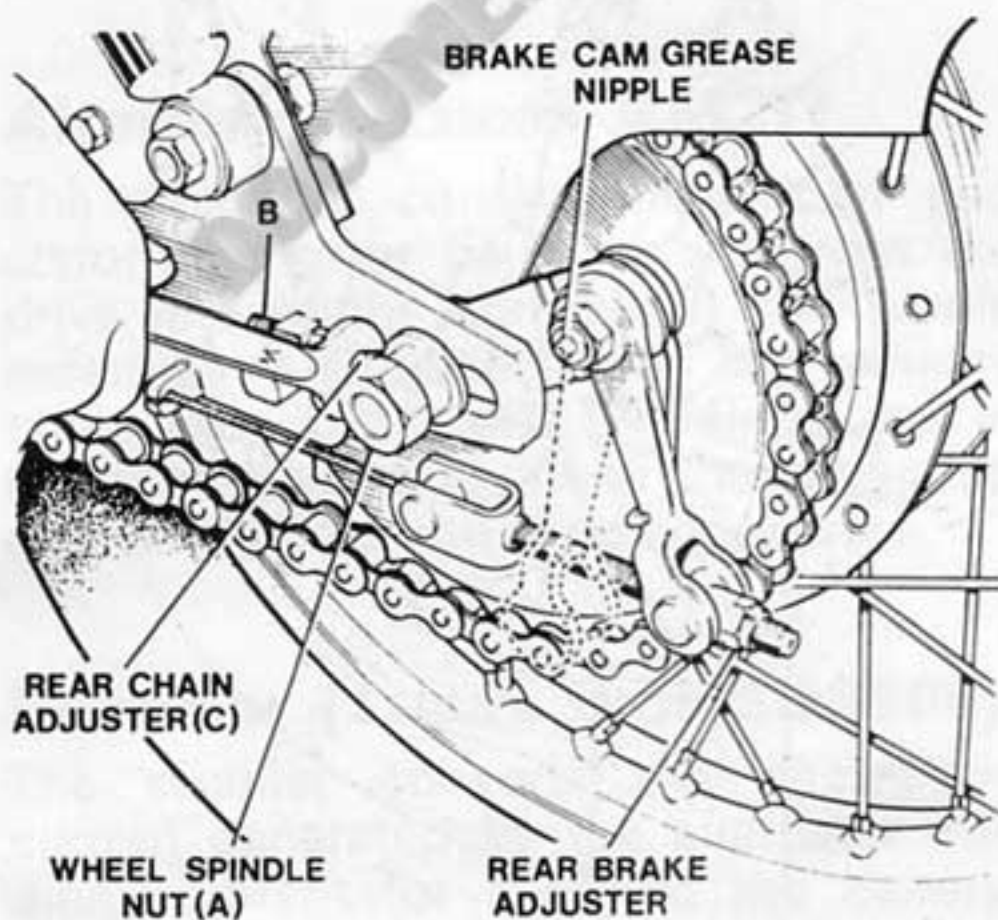


ILLUSTRATION 28

Disc brake maintenance

The disc brake functions by the pressure of friction pads against the disc attached to the front wheel hub. As the brake handlebar lever is applied, brake fluid from the master cylinder reservoir is forced through the brake line to the caliper to force the friction pads against the disc.

The brake requires no adjustment since wear on the pads is compensated for by extra brake fluid passing from the master cylinder reservoir into the system. Some conditions of operation may result in more severe pad wear than normal and it is essential for the condition of the pads to be checked visually at regular intervals. Replace the pads when the friction material is less than $\frac{1}{16}$ in. thick.

Should the brake become "spongy" in operation or have excessive lever travel, the brake hydraulic system should be examined and rectified by your Norton dealer.

Disc brake—bleeding and flushing

Bleeding procedure

Purging of air from a hydraulic system, commonly known as 'bleeding', should only be necessary when some part of the system has been disconnected, or after the fluid has been drained off and renewed. However, in normal service, should the presence of air in the system be indicated by a 'spongy' brake effect, the cause should be traced and rectified.

Braking system

Fill the master cylinder supply tank with Lockheed Series 329 brake fluid (Norton Part No. 063111), and keep topped up throughout the operation, otherwise air may be drawn into the system, necessitating a fresh start.

Attach a suitable length of clean rubber or plastic tubing to the bleeder screw of the hydraulic unit, and allow the other end of the tube to be submerged in a small quantity of new fluid contained in a glass jar. Open the bleeder screw half a complete turn (*Illustration 29*).

Apply the brake slowly, allowing it to return unassisted. Repeat the pumping action, with a slight pause between each stroke. When stopping the pumping action such as for refilling the master cylinder or when clear fluid, free of air bubbles, emerges from the tube, tighten the bleeder screw whilst the brake lever is fully pulled to the handlebar.

Verify that the master cylinder supply tank is replenished to the correct level.
FLUID BLED FROM THE SYSTEM MUST BE DISCARDED.

Flushing procedure

Every eighteen months, or after every 24 000 miles, whichever occurs first, the fluid in the hydraulic system should be renewed with the Lockheed series 329 brake fluid, Norton part number 063111.

Brake fluid, particularly disc brake fluid, absorbs water from the atmosphere; accordingly, fluid must only be exposed during the time taken to fill the system. It is also most important that the greatest care is taken to prevent dirt from entering the system during the filling operation.

Follow the 'bleeding' procedure until new clean fluid emerges from the flexible tube, thus establishing complete renewal of the fluid.

If the fluid in the system is contaminated by mineral oil (engine oil) or other spurious fluid, the complete hydraulic system must be stripped. Hydraulic assemblies must be renewed or overhauled as detailed in the workshop manual, and flexible hoses replaced. Furthermore, ensure that all metal fluid pipes are cleaned thoroughly before reassembling.

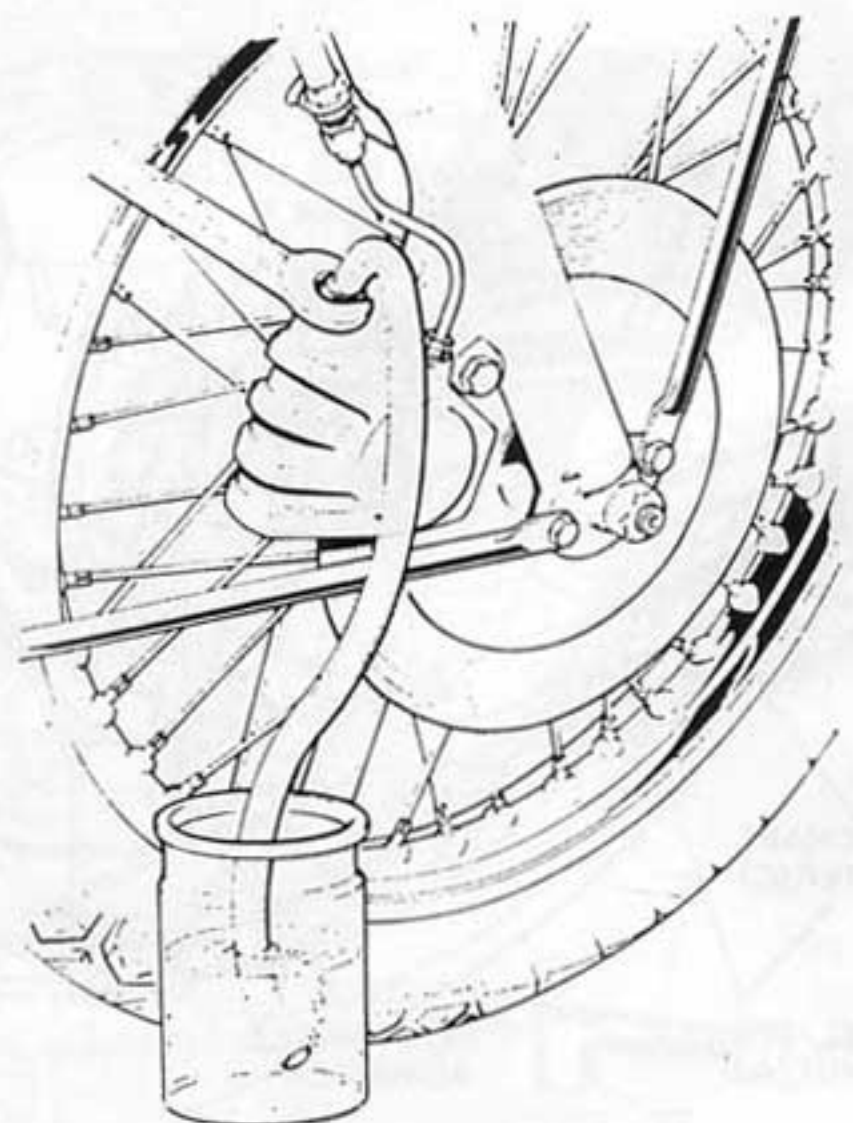


ILLUSTRATION 29

Electrical equipment

Ignition system

The Commando is equipped with a 12 volt electrical system but uses 6 volt ignition coils with a ballast resistor so that an adequate spark is available even under the most adverse conditions.

Should the battery fail completely the electrolytic capacitor will provide starting, running and direct lighting, supplementary accessories such as parking lights being excepted.

Capacitor (Lucas 2MC)

The capacitor is an electrolytic polarised type spring mounted to the rear of the battery and it is important that the correct wiring connections are made. The connections are dissimilar in size, the $\frac{3}{16}$ in. (4 mm) connector being the positive ground terminal with the connection rivet marked in red. The $\frac{1}{4}$ in. (6 mm) double terminal is the negative. The capacitor must always be fitted with the terminals downwards.

A faulty capacitor may not be apparent when the battery is connected in circuit and it is advisable to check periodically that it is serviceable by disconnecting the battery. The machine should start in the usual manner and full lights should be available with engine running.

Alternator (Lucas RM21)

The alternator consists of a rotor and stator, the rotor being driven from the drive end of the crankshaft. The whole assembly is housed within the primary chaincase. The stator windings are in bonded resin and need no attention except to check the snap connectors.

Rectifier (Lucas type 2DS506)

The rectifier converts the alternating current generated by the alternator into direct current for charging the battery. It requires no attention except to ensure that the fixing nut is tight. The nuts

holding the plates together must on no account be interfered with as their tension has been carefully set during manufacture to give the best possible rectifier performance. The rectifier is attached to the rear of the frame and is accessible when the seat is removed.

Ballast resistor

The ballast resistor is located across the front of the ignition coil mounting. Its function is to protect the 6 volt ignition coils from damage by an otherwise 12 volt system.

The resistor requires no maintenance other than an occasional check on the security and cleanliness of the terminals.

Battery (Part No. 063244)

The 12 volt positive-earthed battery has a capacity of 8 ampere/hours. At two week intervals, more frequently in hot climates, the level of the electrolyte should be checked. If necessary, add distilled water to maintain the level indicated on the side of the transparent battery case. Do not use tap water as this may contain impurities harmful to the battery. Never use a naked light when examining the cells. (*Illustrations 5 & 6, page 10*)

If the machine is to be out of use for a lengthy period, have the battery fully charged and give it a short refreshing charge at 1 ampere about every two weeks. This will suffice to keep the battery in serviceable condition. When the battery is fully charged, the specific gravity of the electrolyte should be 1.270/1.290 at 60°F (16°C).

The battery terminals (red positive earth: brown/blue live) must never be reversed otherwise the equipment will be damaged.

Norton Villiers Limited and its distributors cannot accept responsibility for damage to parts caused by overfilling with acid.

The vent pipe must be kept connected to the battery.

Running with battery disconnected

Before running the machine with the battery disconnected, the battery negative lead must be insulated to prevent it shorting to earth on any part of the machine.

Fuses

A 35 amp. fuse is fitted in the negative battery lead close to the battery terminal.

Zener diode

(Located on right side footrest plate).

When the battery is in a low stage of charge, the zener diode allows current from the alternator to reach the battery until it becomes fully charged, when the current is diverted to the zener diode.

If an electrical load such as the lighting system is switched on, a reduced amount of current flows through the diode, the balance being diverted to feed the load. If the load is heavy enough, the diode will become virtually non-conductive and the whole of the current generated by the alternator will go to meet the demands of the battery and equipment.

If the zener diode is disturbed it is important that the fixing nut is tightened to a torque loading of not more than 28 in/lb and not less than 24 in/lb. In addition the seating face must be true and free from burrs. It is most important that the earth lead is not fitted between the face of the zener diode and the footrest plate.

Direction indicator set

(All models as market requirement or at customer's option.)

Flashing direction indicators are provided front and rear, operated by the switch on the right handlebar control cluster.

The flasher unit (Lucas type 8FL) is located beneath the seat. The flasher unit requires no maintenance, being a sealed unit.

Capacitor pack

The two condensers are mounted in a rubber covered capacitor pack (Lucas type 2CP) which is mounted behind the ballast resistor on the coil cluster bracket. The rubber cover can be removed easily to gain access to the individual condensers.

Charge warning light assimilator

The assimilator is cylindrical in form and is mounted in an anti-vibrational spring beneath the frame rails. The unit is sealed and requires no attention though whenever the tank is removed or the throttle or clutch cables are changed, the security of the spade terminals should be checked.



Light Bulbs

Headlamp (SS700P or MCH 66)

The type of bulb fitted may be varied to suit the lighting regulations of different countries.

Bulbs:

Conventional filament bulbs:

UK, USA, Canada; Type 370.

Continental (not France): Type 410.

France only: Type 411.

Quartz-Halogen type bulbs:

UK, USA, Canada: Type 463.

Continental: Type 472.

CAUTION: Using quartz-halogen bulbs without the special light unit will give impaired lighting. See your Norton dealer for conversion details.

To gain access to the bulb, unscrew the front headlamp rim fixing screw at the top of the rim. Take off the front rim and light unit, removing the upper part first. Remove the adaptor by pressing inward and turning to the left. The bulb can now be taken out. On quartz-halogen and Continental headlamps, pull the adaptor free of the bulb and release the bulb retaining clip to remove the bulb.

Parking light

Lucas 12 volt 6 watt No. 989.

Remove the light unit assembly as described above. The bulb holder is a push fit in the reflector.

Indicator repeater light, Ignition warning light, Hi-beam warning light

Lucas 12 volt 2 watt No. 281.

Remove the light unit assembly as described above. The bulb holder is a push fit in its housing. To remove the bulb, press in and turn.

Stop/tail lamp

Bulb Lucas 12 volt 6/21 watts No. 380.

Remove the lens by unscrewing the two retaining screws. The bulb has offset securing pins to ensure correct location in the bulb holder. To remove the bulb, press in and turn.

Speedometer bulb

12 volt 2.2 watts No. 643.

After pulling down the PVC instrument case bottom cover, the bulb holder is merely a push-in fit to the bottom of the instrument and the bulb a bayonet fitting into the holder.

Tachometer bulb

12 volt 2.2 watts No. 643.

Bulb removal is similar to that for the speedometer.

Direction indicator bulb

Lucas 12 volt 21 watts.

Care must be taken when refitting the lenses that the screws are not over-tightened, resulting in splitting.

Tracing trouble

Engine fails to start, or is difficult to start, may be due to :

- Ignition not switched on.
- Electrical short.
- Water on high-tension coils or contact breaker.
- Moisture on spark plugs.
- Oiled up, or fouled, spark plugs.
- Throttle opening too large.
- Carburetor pilot jet choked.
- Air lever in open position or bad air leak at carburetor joints.
- Lack of fuel because of insufficient flooding.
- Lack of fuel because pipe, or tap, obstructed.
- Excessive flooding of carburetor (with hot engine only).
- Valve not seating properly.
- Contacts points dirty.
- Incorrect contact point gap.

Engine misfire may be due to :

- Defective or oiled spark plugs.
- Defective engine-to-frame earth wire.
- Defective spark plug wire.
- Incorrect contact point gap.
- Contact breaker points loose.
- Oil on contact breaker points.
- Rocker adjustment incorrect.
- Water in carburetor.
- Air filter clogged.
- Broken wire shorting on frame.
- Partially obstructed petrol supply.
- Disconnected carburetor balance pipe.

Loss of power may be due to :

- Faulty spark plugs.
- Lack of oil in tank.
- No rocker clearance, or too much clearance.
- Weak or broken valve spring.
- Sticky valve system.
- Valve not seating properly.
- Brakes adjusted too closely.
- Badly fitting or broken piston rings.
- Punctured carburetor float
- Engine carbonised.
- Retarded ignition.
- Clogged air filter.

Engine overheats may be due to :

- Lack of proper lubrication. (Quality or quantity of oil).
- Faulty spark plugs.
- Air control to carburetor out of order.
- Punctured carburetor float.
- Engine carbonised.
- Weak valve springs.
- Pitted valve seats.
- Worn piston rings.
- Ignition setting incorrect.
- Automatic timing control faulty.

Engine stops suddenly may be due to :

- Water on high tension coils or spark plugs.
- Loose coil connections
- No petrol in tank, or choked petrol supply. Vent hole in petrol tank filler cap choked.
- Choked main jet.
- Water in carburetor float chamber.
- Oiled up or fouled spark plugs.

Excessive petrol consumption

Excessive petrol consumption may be due to :

- Leaks in the petrol feed system. (Damaged fibre washers, loose union nuts on piping, defective float needle action).
- Incorrect ignition setting. (Ignition not advanced sufficiently).
- Defective valve action or burnt valves.
- Incorrect use of air control lever.
- Moving parts of carburetor badly worn. (Only possible after very considerable mileage).
- Bad air leak at carburetor junction or inlet manifold joint.
- Air filter clogged with dirt or oil.

Steering unsatisfactory

Wheels out of alignment.

Front and/or rear tire tread not correctly manipulated to run true with wheel (causes handlebar oscillation at low road speed).

Excessive luggage mounted too high or too far back.

Wheels out of balance.

Loose front or rear wheel spindle or wheel bearings.

Slackness of steering head bearings and swing arm spindle bushes.

Unequal suspension action caused by incorrect quantity or grade of oil in fork or dissimilar rear suspension unit settings.

Loose spokes — front and rear wheels.

Loose engine bolts.

Loose or broken engine head steady.

Isolastic mounting clearances in excess of 0.010 (your Norton dealer has Service Release 3/10 which details checking and rectification).

Disc brake "spongy"

Air in brake hydraulic system.

Brake requires bleeding.

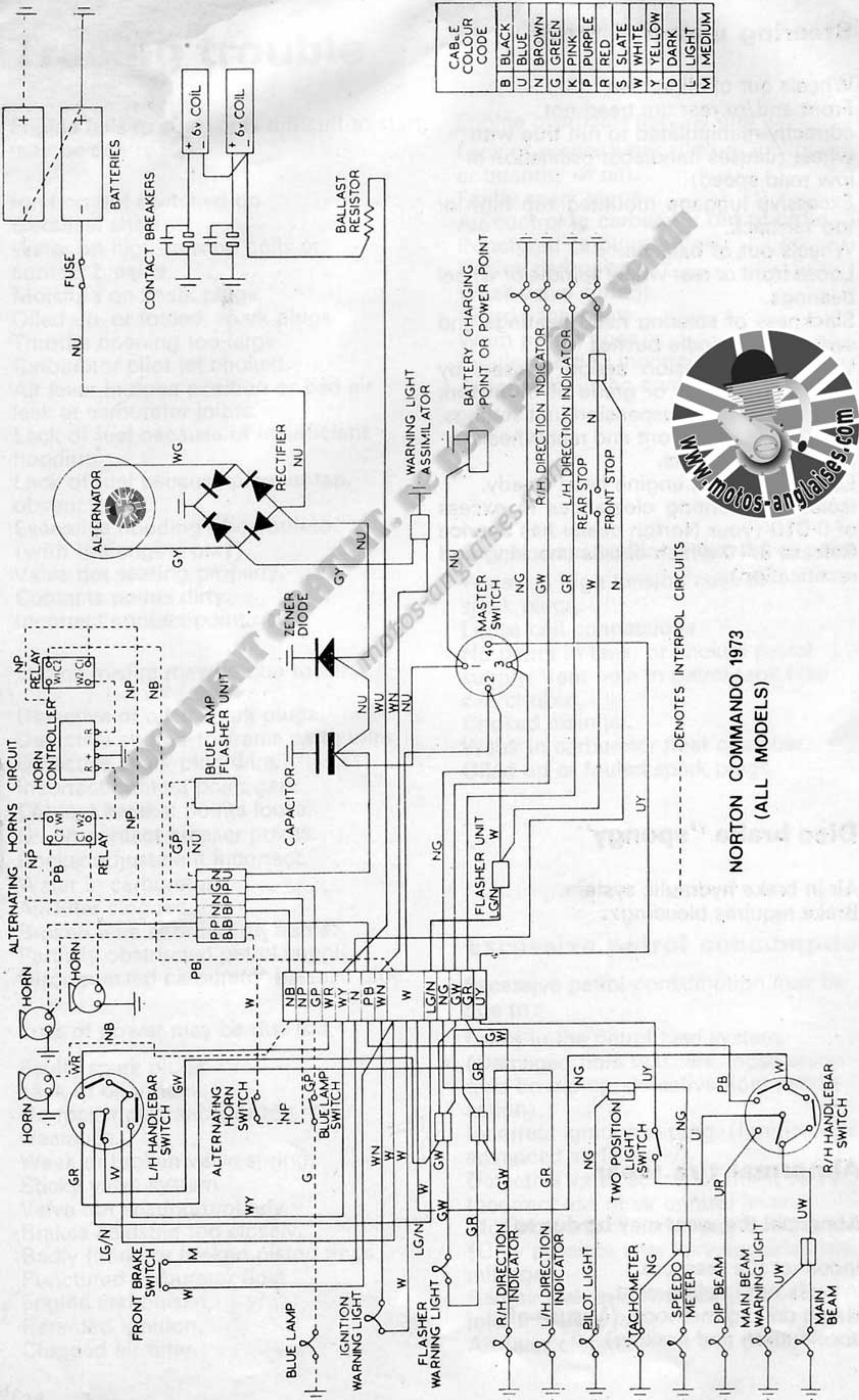
Abnormal tire wear

Abnormal tire wear may be due to :

Incorrect tire pressure.

Wheels not in alignment.

Harsh driving methods. (Misuse of acceleration and braking).



NORTON COMMANDO 1973
(ALL MODELS)