Maico Competition Models Owners Workshop Manual

by Stewart W. Wilkins
B. Tech.

Models covered

124 cc
247 cc
386 cc 1973 on
438 cc
501 cc

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Acknowledgements

The author wishes to thank Bryan Goss the U.K. Maico Concessionaire, for lending us the motor cycles on which this manual was based and also for supplying the necessary technical information. We also thank the Avon Rubber Company who kindly supplied the illustrations on tyre fitting. Brian Horsfall's assistance proved invaluable during the dismantling and reassembly sequences.

The photographic work and arrangements were organised by Les Brazier. The author is also indebted to Jeff Clew for his guidance and editorship.

About this manual

The author of this manual has the conviction that the only way in which a meaningful and easy to follow text can be written is first to do the work themselves, under conditions approximate to those found in the average household. As a result, the hands seen in most of the photographs are those of the author's. Unless specially mentioned, service tools have not been used. There is invariably an alternative means of loosening or dismantling some vital component, when service tools are not available, and risk of damage is to be avoided at all costs.

Each of the chapters is divided into numbered sections. Within the sections are numbered paragraphs. Cross-reference throughout this manual is quite straightforward and logical. When reference is made, 'See Section 6.10' – it means Section 6, paragraph 10 in the same chapter. If another chapter were meant it would say 'See Chapter 2, Section 6.10'.

All photographs are captioned with a section/paragraph number to which they refer, and are always relevant to the chapter text adjacent.

Figure numbers (usually line illustrations) appear in numerical order, within a given chapter. 'Fig. 1.1.' therefore refers to the first figure in Chapter 1.

Left hand and right hand descriptions of the machines and their components refer to the left and right of a given machine when normally seated facing the front wheel.

Whilst every care is taken to ensure that the information in this manual is correct, no liability can be accepted by the authors or publishers for loss, damage or injury, caused by any errors in or omissions from the information given.

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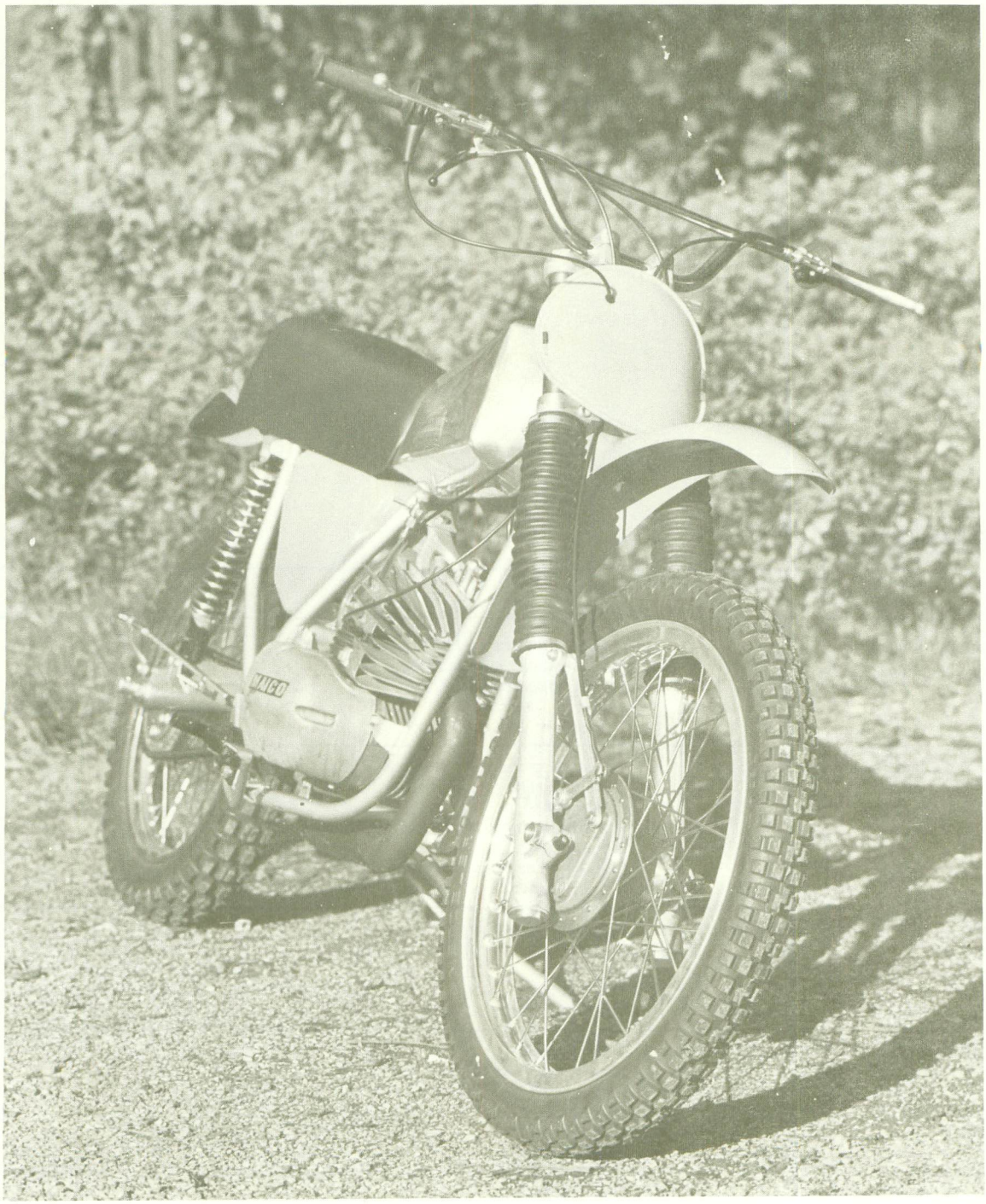
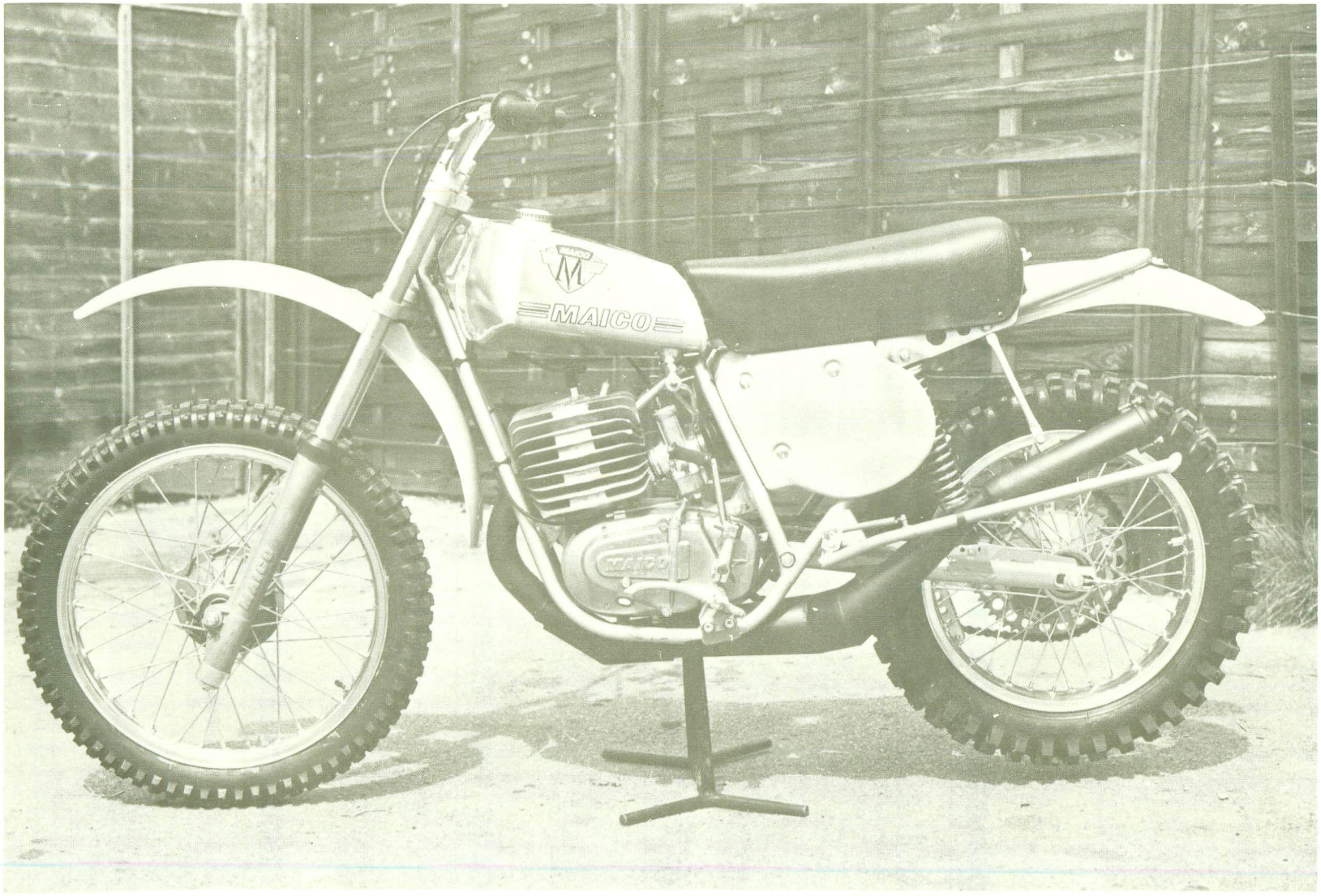


1974 125 cc Maico competition model



1975 250cc Maico competition model

Introduction to the Maico range

Although Maico is a name that has leapt into prominence during the past decade, the company commenced the manufacture of motor cycles as far back as 1932. Originally, they made small capacity machines only, of either 98 cc or 125 cc capacity, fitted with proprietary engine units of Sachs or Ilo manufacture. From 1945 onwards, they branched out into larger capacity mounts, fitted with engine units of their own design and manufacture.

As far as the UK is concerned, it was the Maicoletta scooter that first established the Maico name. Undoubtedly one of the best scooters manufactured during the fifties scooter boom it had an outstanding reputation for good workmanship, reliability and performance to match.

It is the competition models that have proved the most successful. Wins in motocross events started way back in the early fifties and since then the marque has gone from strength to strength to the extent that one of the best ways to ensure success in this type of event is to ride a Maico. They have been at the top for a long while and intend to stay there.

Modifications to the Maico range

Designed specifically for competition use, constant modifications are being made by the manufacturer in the never ending quest for improved performance and an even higher standard of reliability under such arduous use. Most of these modifications take the form of design dimensional changes, such as different port profiles or different disc valve cutaways, so that from the Workshop Manual aspect, the machines remain fundamentally similar.

Periodic maintenance

Drain and refill the gearbox/clutch after every meeting.
Drain and refill the forks every four meetings.
Renew the needle roller small end every 8-10 meetings.
Clean out and lubricate brakes every three to four meetings.
Pull the machine up by the handlebars and if there is a gap between the bottom yoke and the gaitor securing cup replace the fork springs.
N.B. To carry out any of the above checks and adjustments, see the appropriate Chapter.

Pre-race preparation

Since this Workshop Manual relates to a competition machine one cannot draw up a routine maintenance schedule such as that prepared for a normal road going machine. Below, are a few suggestions for a pre-race check and some guidance for maintenance on a regular basis.

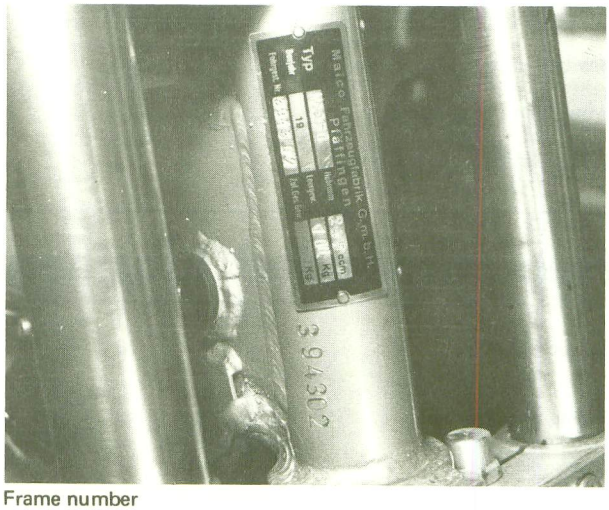
1 Tighten swinging arm pivot bolt (50 - 60 ft lb)
2 Check gearbox/clutch oil level
3 Check air cleaner
4 Check chain tension and wheel alignment
5 Tighten rear wheel sprocket bolts (screws)
6 Tighten front and rear spokes
7 Tighten footrest bolts
8 Tighten engine mounting bolts
9 Tighten expansion chamber bolts
10 Check steering head bearing adjustment
11 Check contact breaker points gap
12 Check the spark plug
13 Check tyre pressure
14 Check rear suspension units for leakage
15 Tighten handlebars
16 Check and oil all control cables
17 Tighten rear brake pivot bolt
18 Check tyre security bolts
19 Check gearbox final drive sprocket
20 Check wheel bearings
21 Tighten brake torque arms
22 Tighten front and rear wheel spindles
23 Adjust rear brake
24 Check rear brake clevis pin security clip

Ordering spare parts

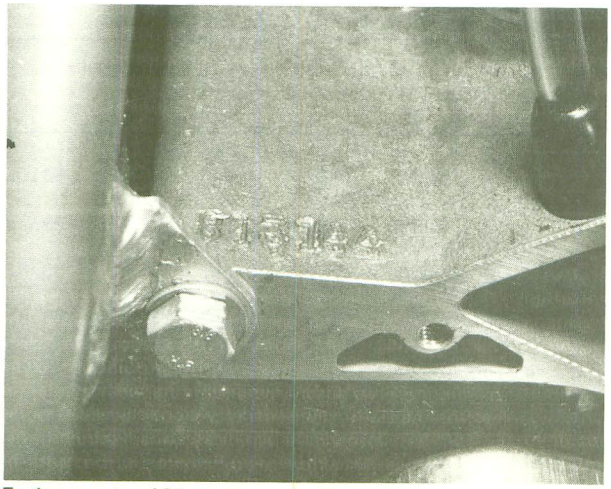
When ordering spare parts for any of the Maico range it is advisable to deal direct with an approved Maico agent or the Concessionaire which, for Great Britain, is Bryan Goss Limited of Westbury, Bradford Abbas, Nr. Yeovil, Somerset.

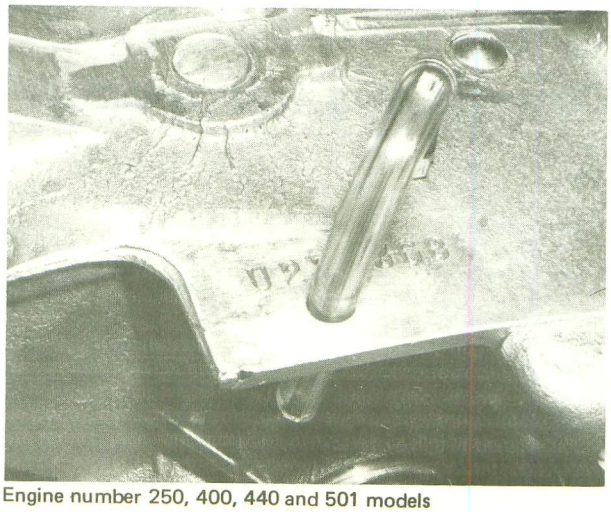
Always quote the engine and frame number in full. The frame number is stamped in the steering head of the frame below the model and specification plate. The engine number is stamped in the top rear right hand side of the crankcase.

Use only genuine Maico parts since pattern parts do not necessarily make satisfactory replacements, even if there is an initial price advantage. If they fail prematurely, it can mean a wasted meeting.



Frame number


Engine number 125 model


Engine number 250, 400, 440 and 501 models

Summary of routine maintenance adjustments and capacities

	125	250, 400, 440, 501
Contact breaker gap	0.014 in. (0.35 mm)	0.012 in. (0.30 mm)
Spark plug type	Beru 280/14S	Champion N2, N2G, 3 or N3, N3G depending on conditions
Spark plug gap	0.018 - 0.020 in. (0.45 - 0.50 mm)	0.018 - 0.020 in. (0.45 - 0.50 mm)
Gearbox/clutch: oil capacity	1 litre (1.71 Imp. pint)	1 litre (1.71 Imp. pint)
Front fork leg: oil capacity	230 cc (7.2 fl oz)	230 cc (7.2 fl oz)
Tyre pressure, front and rear	7 - 15 psi	7 - 15 psi

Recommended lubricants

Gearbox/clutch	**Castrol Hypoid 80 (summer)** **Castrol Grand Prix 50 (winter)**
Engine two stroke oil	**Castrol Grand Prix 50 (1/3 pint to a gallon)**
Telescopic forks	**Castrol TQF**
Grease	**Castrol LM Grease**
Control cables	**Castrol Everyman Oil**

Dimensions (all models)

Model	125	250	400	440	501
Weight (dry)	200 lb	215 lb	220 lb	220 lb	235 lb
Wheelbase	55 in.	55 in.	55 in.	55 in.	55 in.
Total length	79 in.	79 in.	79 in.	79 in.	79 in.
Seat height	30 in.	30 in.	30 in.	30 in.	30 in.
Overall height	43 in.	43 in.	43 in.	43 in.	43 in.
Overall width	33 in.	33 in.	33 in.	33 in.	33 in.
Ground clearance	6 in.	6 in.	6 in.	6 in.	6 in.

List of illustrations

Chapter 1 Engine, clutch and gearbox

Contents

Specifications

All models except 125 cc

Model	250 cc	400 cc	440 cc	501 cc
Type	Air cooled, piston port, two stroke engine			
Bore (mm)	67	77	82	91.6
Stroke (mm)	70	83	83	76
Capacity cc	247	386	438	501
Brake horsepower (Din)/rpm	33/7000	43/6700	47/6900	51/6900
Compression ratio	12 : 1	12 : 1	12 : 1	12 : 1
Gear ratio: 1	Moto Cross		Cross Country	
First	1.99		2.78	
Second	1.52		1.79	
Third	1.23		1.29	
Top	1		1	
Primary drive reduction	1.86 : 1			

Dimensions and wear limits:	
Cylinder liner to bore interference (new)	0.013 in.
Cylinder liner to bore interference (replacement)	0.004 - 0.006 in.
Cylinder bore wear limit	0.004 in.
Cylinder bore to piston clearance	0.002 in.
Piston ring end gap	0.010 in.
Piston ring end gap wear limit	0.016 in.
Piston oversizes	Approx. 0.15 mm (X8) intervals
Flywheel alignment: max. out of true	0.002 in.
Big end play (new)	0.001 - 0.0015 in.
Connecting rod side play	0.019 - 0.020 in.
Connecting rod side play wear limit	0.024 in.
Big end eye thickness (new)	0.665 - 0.670 in.
Distance across flywheels (reference only since the connecting rod side clearance is the determining factor)	2.475 - 2.490 in.
Crankshaft end float	0.004 - 0.012 in.
First gear side clearance	0.004 - 0.008 in.
Gear selector fork to camplate clearance	0.010 - 0.025 in.
Clutch cup spring height	0.075 in.
Clutch cup spring height wear limit	0.070 in.
Clutch plate thickness (plain driven)	0.050 in.
Clutch plate thickness (plain driven) wear limit	0.045 in.
Clutch plate thickness (driving with holes)	0.085 in.
Clutch plate thickness (driving with holes) wear limit	0.080 in.

Torque wrench settings in ft lbs:	
Cylinder head	18
Front and lower engine bolt	15 - 17
Rear engine bolt	30 - 38
Head steady to frame	15 - 17
Clutch centre nut	30
Engine sprocket nut	35 - 45
Final drive sprocket nut	40 - 45
Rotor bolt	6 - 8

125 cc model only

Type	Single cylinder two stroke with reverse scavenging and rotary inlet valve. Five or six speed gearboxes are available
Bore	54 mm
Stroke	54 mm
Swept volume	124 cc
Compression ratio	10 : 1
Maximum output	21.2 hp @ 8200 rpm
Maximum torque	1.48 mkg @ 7000 rpm
Piston clearance	0.0016 - 0.002 in.
Piston clearance wear limit	0.004 in.
Piston ring land wear limit early models (cast iron)	0.015 in.
Piston ring land wear limit late models (chromed steel)	0.018 in.
Piston ring gap	0.005 - 0.007 in.
Crankshaft end float	0.003 - 0.005 in.
Disc valve/crankcase clearance	0.003 - 0.005 in.
Clutch pushplate/pin clearance	0.020 in.
Clutch spring wear limit	1.540 in.

Gear ratios: 1	5 speed	6 speed
First	4.8	4.8
Second	2.87	3.14
Third	2.05	2.41
Fourth	1.59	1.9
Fifth	1.38	1.59
Top	—	1.42
Primary drive ratio: 1	2.91	2.91
Final drive ratio: 1	2.93	2.75

Torque wrench settings in ft lbs:

Disc valve nut	10
Disc valve cover bolts	2½
Selector key to shaft	6
Gear selector mounting block bolts (six speed)	5
Crankcase screws	5
Primary drive crankshaft nut	50 - 60
Clutch centre nut	20
Rotor bolt (five speed)	40

All models except 125cc

1 General description

All the models are conventionally designed two strokes fitted with a four speed transmission. The forged piston which uses a high silicon alloy has a single Dykes pattern ring and a needle roller small end is utilised. The clutch is a little unusual in that the spring pressure is supplied by a stack of saucer type springs. The engine features radial finning which is an aid to cooling, particularly beneficial in hot climates. The engine is lubricated by petroil mixture. The clutch and gearbox components are interconnected thus the clutch and gearbox share the same oil.

All models are fitted with a tuned expansion chamber exhaust system and a large capacity air filter. There are no lights on the competition models although the enduro models have a complete six volt system.

2 Operations requiring removal of the engine/gearbox unit from the frame

1 It is not necessary to remove the engine/gearbox unit from the frame unless repairs have to be made to the crankshaft assembly, the gearbox (including the gear change mechanism) or the kickstart. However if a great deal of work is envisaged it will probably be advantageous to remove the unit for ease of working.

3 Dismantling the engine/gearbox unit - general

1 Before undertaking any work on the engine it should be thoroughly cleaned with a proprietary degreaser to prevent the ingress of dirt and grit particles into the engine.

2 Some of the screws in the engine are very tight and it is strongly advisable to have an impact screwdriver available.

3 Do not use force to remove any part unless specific mention is made in the text. If any component is difficult to remove, first check that everything has been dismantled and/or loosened in the correct sequence.

4 All threads are right hand unless specific mention is made otherwise.

4 Preventing the engine from turning both for dismantling and reassembly purposes

1 It is often required to stop the engine from rotating so that a component can be removed or tightened e.g., engine sprocket nut or clutch centre nut. One way of achieving this that can be used for dismantling and reassembly is by placing a round metal bar through the small end boss and resting this bar on two pieces of wood placed on top of the crankcase mouth. On no account must the metal bar be allowed to bear directly on the jointing face of the crankcase mouth, otherwise damage will occur and cause a loss of primary compression.

5 Clutches: different types fitted

1 Three types of clutch are fitted to the various models. The 250 cc model has a 99 mm diameter clutch with a duplex chain. With the 400 cc and 440 cc models there is a choice of either a 99 mm or 119 mm diameter clutch, both using a triplex chain. The 501 cc model is supplied with the larger diameter triplex chain clutch as standard equipment.

2 *99 mm duplex and triplex clutch*

This clutch has six outer toothed plates, six inner toothed plates without any facing and one outside plate with a cork facing plus a pressure plate locked with two rolled wire circlips. Eighteen saucer type springs are used, stacked in pairs. If more spring pressure is required, twenty springs can be fitted.

3 *119 mm triplex clutch*

This clutch has six outer toothed plates with a cork facing and five inner toothed plates without any facing. Twenty saucer type springs are fitted, stacked singly.

6 Removing the engine/gearbox unit from the frame

1 Drain the gearbox oil by removing the drain plug located under the clutch cover, in front of the footrests.

2 Remove the footrests. Note the position of any spacers that are fitted.

3 Disconnect the throttle and clutch cables at the twist grip and clutch operating arm respectively.

4 Remove the carburettor by slackening the air filter hose clip on the rubber pipe and pulling the pipe off. Pull off the petrol pipe from the carburettor or alternatively, disconnect it at the petrol tap union nut. Slacken the carburettor clip bolt and pull the carburettor off the stub.

5 Remove the petrol tank which is held by one bolt at the front. Note the anti-vibration bush in the frame.

6 Remove the two bolts that retain the expansion chamber and pipe and unclip the retaining spring from the exhaust pipe. The exhaust system is now free to be removed.

7 Disconnect the spring link from the rear chain and remove the chain.

8 Disconnect the rear brake operating rod thus allowing the brake lever to drop down out of the way.

9 Remove the gear and kickstarter levers.

10 Disconnect the electrical wires at their respective connectors and remove the spark plug cap.

11 Remove the head steady by undoing the two cylinder head nuts and the bolt to the frame.

12 Remove the three engine bolts and lift the front of the engine up. Remove the engine from the left hand side of the frame.

7 Dismantling the engine/gearbox unit: removing the cylinder head, barrel and piston

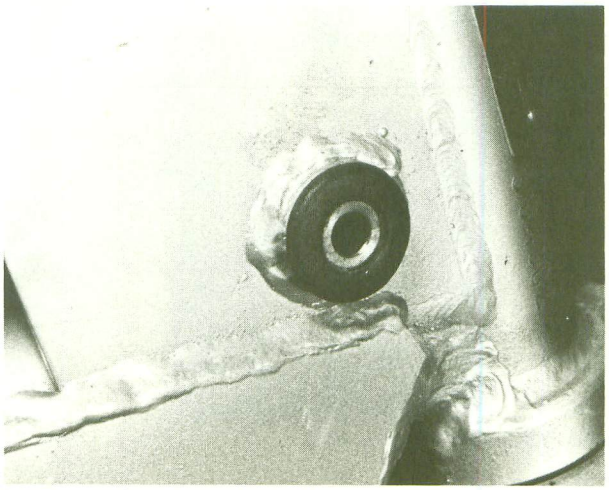
1 Remove the spark plug(s) and decompressor (where fitted).

2 Remove the remaining cylinder head nuts and lift off the cylinder head.

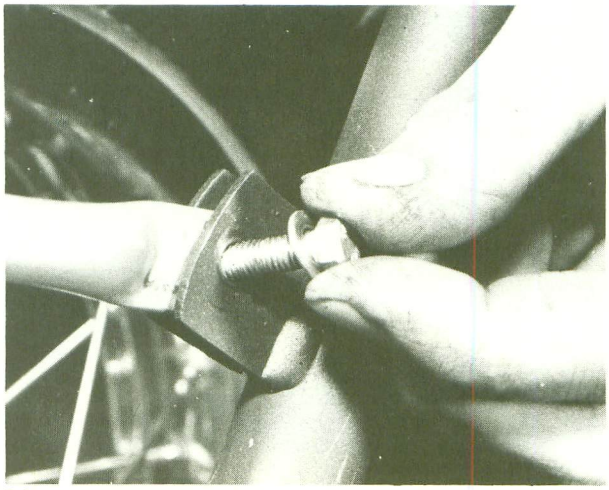
3 Unscrew the four cylinder base nuts and lift the cylinder barrel off whilst supporting the piston to prevent it or the con-rod from falling against the crankcase mouth and thereby causing damage. If the cylinder barrel is tight in the crankcase mouth try slackening the crankcase screw immediately behind the mouth. It is a good idea at this stage to place some rag in the crankcase mouth to prevent anything displaced from falling in.

4 Remove the piston circlips and push out the gudgeon pin. If the gudgeon pin is a tight fit gently warm the piston to facilitate removal. Remove the small end needle roller bearing.

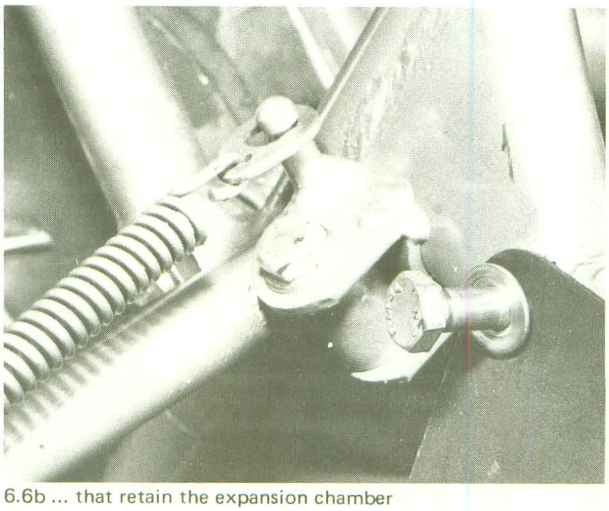
5 If required, the exhaust manifold can be removed by unscrewing the four Allen socket screws.



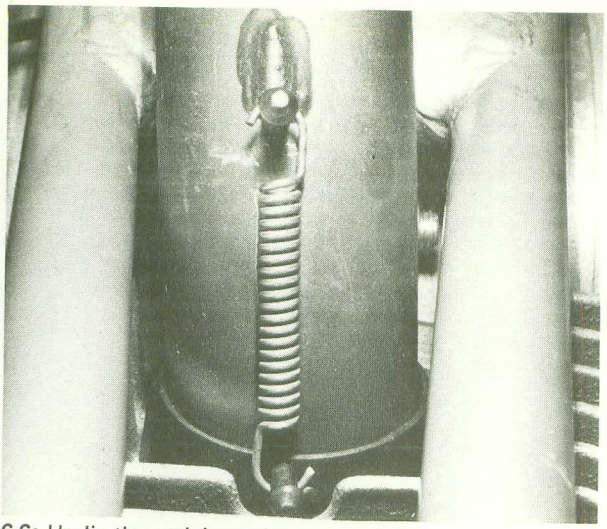
6.5 The tank's anti-vibration bush



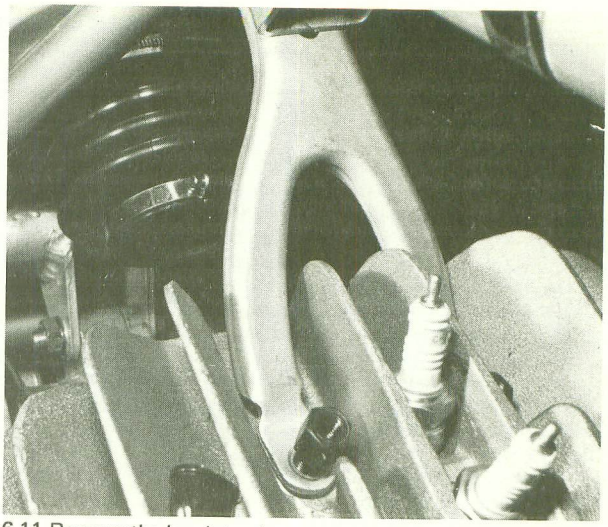
6.6a Remove the two bolts ...



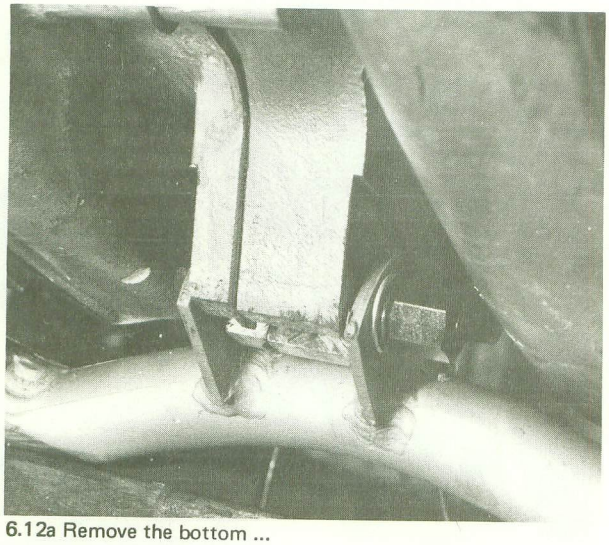
6.6b ... that retain the expansion chamber



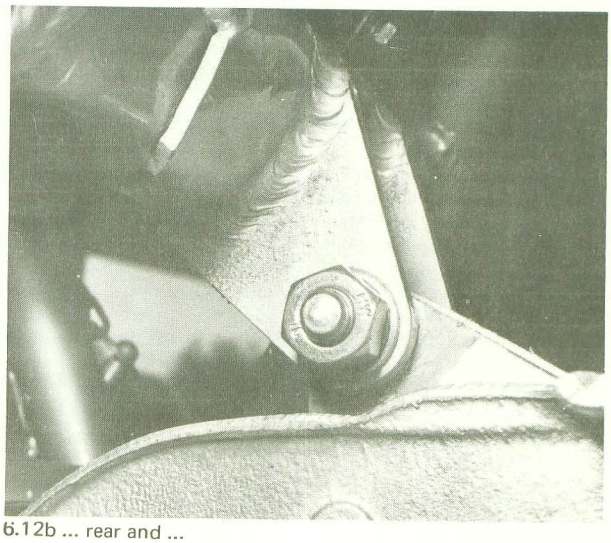
6.6c Unclip the retaining spring



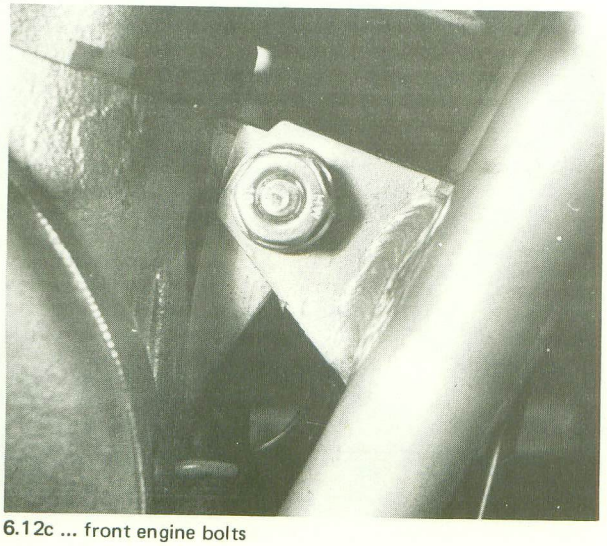
6.11 Remove the head steady nuts



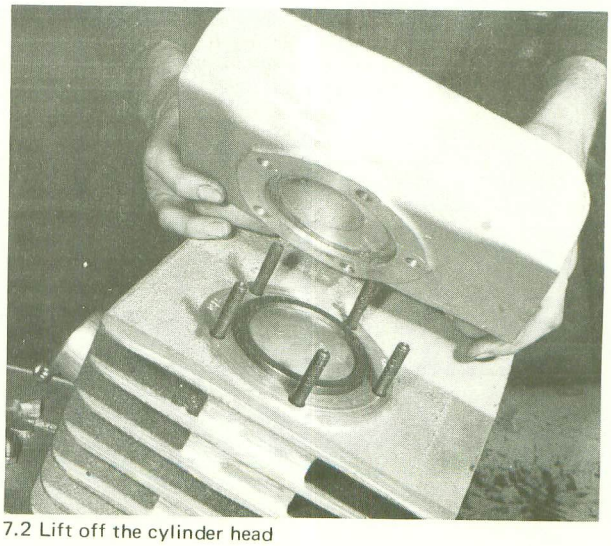
6.12a Remove the bottom ...



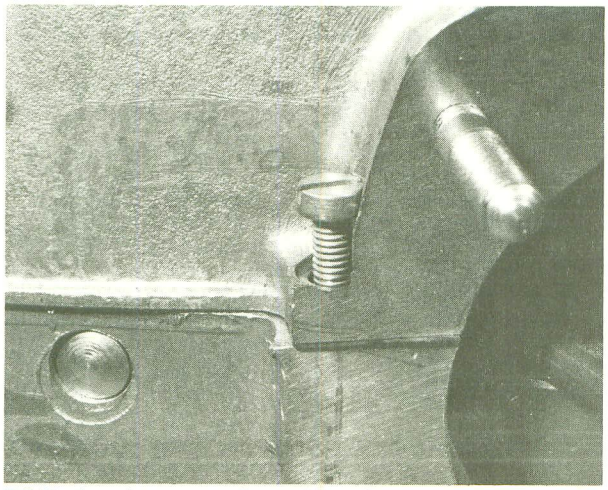
6.12b ... rear and ...



6.12c ... front engine bolts



7.2 Lift off the cylinder head



7.3 Slacken the screw to free a tight cylinder barrel

8 Cylinder head: removing the decompressor

1 Some models are fitted with a decompressor valve in the rear of the cylinder head. This is screwed in using a standard spark plug hole. If the valve malfunctions or leaks, obtain a replacement.
2 If a decompressor valve is not fitted, the hole is blanked off with a plug.
9 Dismantling the engine/gearbox unit: removing the final drive sprocket

9 Dismantling the engine/gearbox unit: removing the final drive sprocket

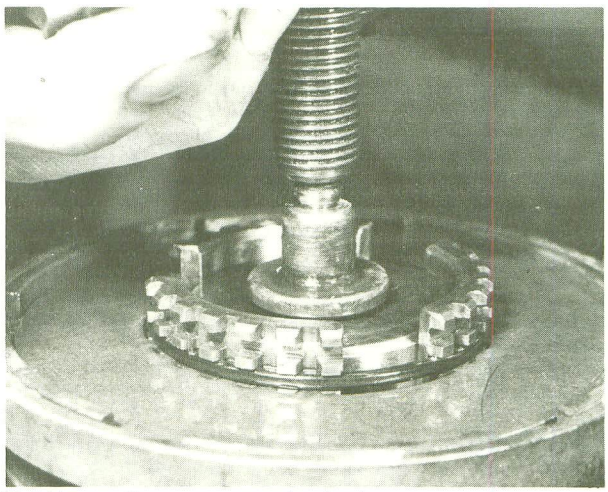
1 Knock down the tabs of the tab washer and unscrew the retaining nut. The engine may have to be locked first, as described in Section 4 of this Chapter and then placed in gear to remove the nut if it is very tight. Take the sprocket and tab washer off the splined shaft.

10 Dismantling the engine/gearbox unit: removing the left hand engine cover

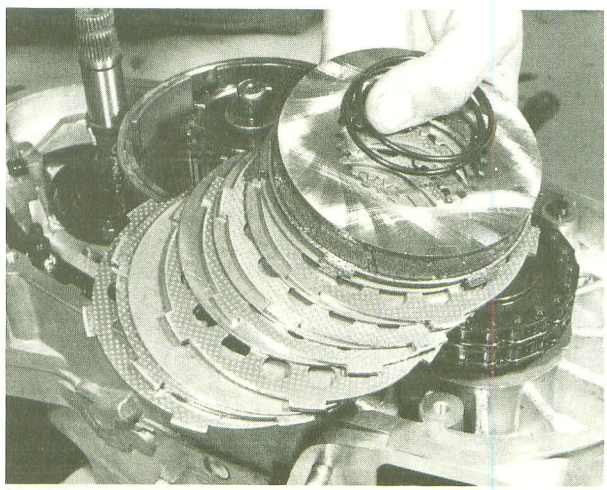
1 Remove the seven screws from the left hand side cover and lift it straight off. Note the oilseal for the gear lever shaft that is located in the cover.
2 If required, the clutch operating arm can be withdrawn from the cover. Note the rubber 'O' ring on the shaft.

11 Dismantling the engine/gearbox unit: removing the clutch, kickstart and primary drive

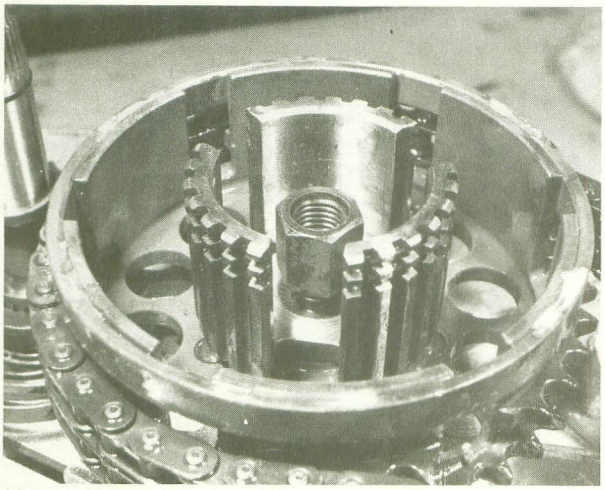
1 Knock down the tabs on the engine sprocket tab washer. Prevent the engine from turning and unscrew the engine sprocket nut. Remove the tab washer. (On 501 cc models the sprocket is an integral part of an external flywheel).
2 Before it is possible to remove the clutch, it has to be compressed to give access to the rolled wire circlip. A universal two or three legged puller can be utilised as a clutch compressing tool.
3 Compress the clutch centre and remove the circlip. Lift out the heavy lined clutch plate and remove the second circlip. Release the tension on the clutch centre and remove the puller.
4 Lift out the clutch plates complete with the backplate.
5 Lift out the saucer-like springs, noting their order from the clutch centre.
6 Lever up the tabs on the clutch centre tab washer and undo the nut. Lift out the clutch centre complete with its bronze bush.
7 The clutch outer, engine sprocket and primary chain can now be lifted out as a unit. Note the thrust washer behind the clutch centre and any shims that may be fitted on the crankshaft.
8 Pull out the kickstart spindle, gear and spring. Take care as the spring is under tension.
9 The kickstart ratchet gear is behind the clutch outer and can be dismantled by removing the wire circlip.



11.3 Use a puller to compress the clutch



11.4 The clutch plates removed



11.6 Remove the clutch centre nut

12 Dismantling the engine/gearbox unit: removing the gear selector linkage

1 Bend down the tab on the tab washer of the gear linkage pull rod plate, and remove the bolt. Lift off the plate.
2 Lift out the gear linkage pull rod.
3 Unhook the spring from the selector lever and lift it out from the crankcase.

13 Dismantling the engine/gearbox unit: removing the right hand side cover

1 Remove the three screws in the right hand side cover and lift it off.
2 Remove the wire to the contact breaker at the contact breaker and withdraw it, with its grommet, out of the crankcase.

14 Dismantling the engine/gearbox unit: removing the rotor and stator

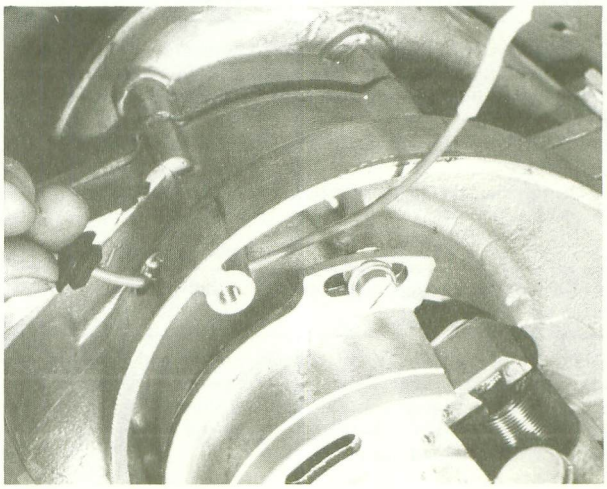
1 Remove the stator by unscrewing the three screws in the slots of the stator which allow it to be pulled off.
2 Remove the screw in the side of the rotor. Unscrew and remove the centre bolt from the rotor. Note the wave spring washer.
3 The rotor is retained on the crankshaft by a taper and a puller, preferably of the three jawed type should be used to draw it off the crankshaft.

15 Dismantling the engine/gearbox unit: separating the crankcase

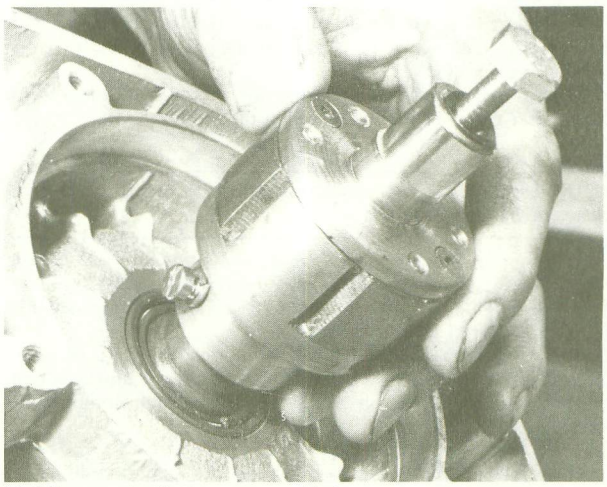
1 Unscrew the eight screws. Do not forget the one at the rear of the crankcase mouth.
2 Check that everything has been removed and then separate the crankcases, leaving the components in the right hand one. Careful use of a soft faced hammer may be required. On no account use a screwdriver to lever the crankcase halves apart since the gasket face will be damaged in the process. Do not use force if the crankcases do not want to part. First check that all the screws have been removed.
3 Note the position of any shims and/or thrust washers.

16 Dismantling the engine/gearbox unit: removing the crankshaft, gear selector and gear pinions

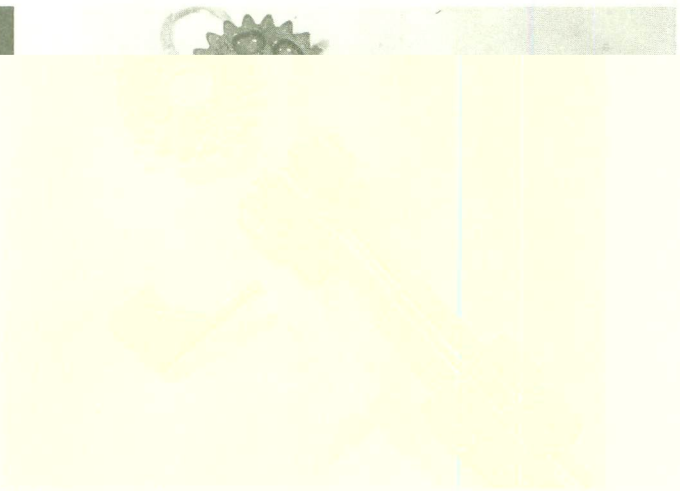
1 Lift the crankshaft assembly out of the crankcases and place on one side. Do not lose any shims, if fitted.
2 Using a bent piece of wire, lift out the gear selector forks pin and then lift out the complete gearbox assembly along with the selector forks. Note the spacer on the gearbox output shaft.
3 Pull the selector camplate out of the crankcase. It is held in position by the selector plate stop which is spring loaded from behind. The selector plate positive stop can be removed from its shaft after removing the retaining circlip.
4 The gear pinions can be removed from the gearbox shafts by sliding them off. One gear on each shaft is retained by a circlip which has to be removed before the gear can be slid off. Note any shims that may be fitted.



13.2 Pull out the lead and grommet



14.2 Remove both the screw and bolt



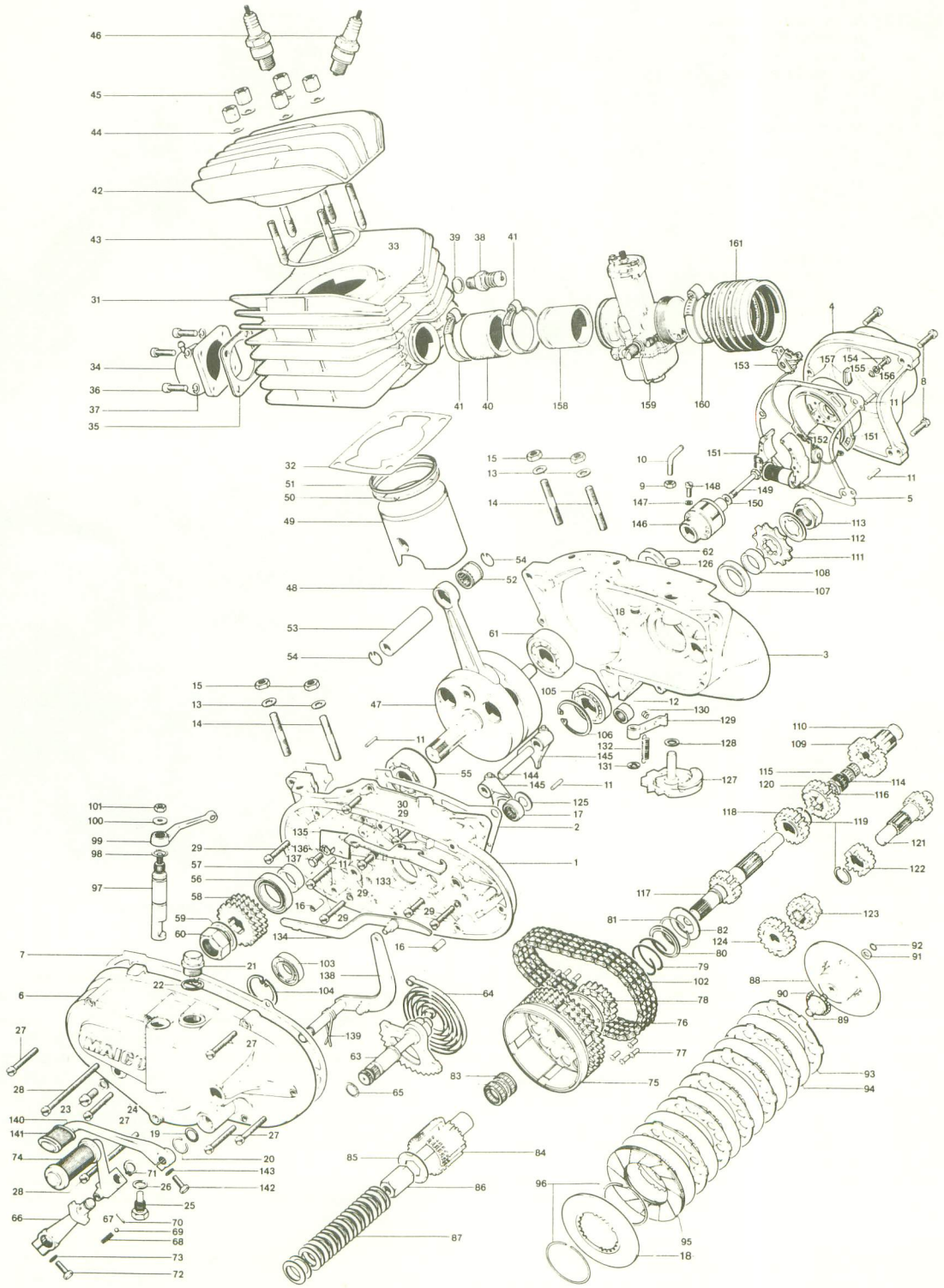

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Fig. 1.1. Engine/gearbox unit, 250, 400, 440 and 501 models

1 Left hand crankcase half
2 Gasket
3 Right hand crankcase half
4 Right hand engine cover
5 Gasket
6 Left hand engine cover
7 Gasket
8 Screw - 3 off
9 Nut
10 Breather tube
11 Dowel pin - 3 off
12 Bearing, needle roller
13 Washer - 4 off
14 Stud - 4 off
15 Nut - 4 off
16 Hollow dowel pin - 2 off
17 Bearing, needle roller
18 Clutch backing plate
19 Felt washer
20 Wire circlip
21 Oil filler bolt
22 Washer, fibre
23 Screw
24 Washer, fibre
25 Oil drain plug
26 Washer, fibre
27 Screw - 4 off
28 Screw - 2 off
29 Screw - 7 off
30 Screw
31 Cylinder barrel complete with liner
32 Gasket
33 Gasket
34 Exhaust manifold
35 Gasket
36 Screw - 4 off
37 Washer - 4 off
38 Decompressor
39 Washer
40 Induction hose
41 Hose clip - 2 off
42 Cylinder head
43 Stud - 5 off
44 Washer - 5 off
45 Nut - 5 off
46 Spark plug - 2 off
47 Flywheel assembly
48 Connecting rod
49 Piston
*50 Piston ring
*51 Piston ring
52 Bearing, needle roller
53 Gudgeon pin
54 Circlip
55 Bearing, ball
56 Oil seal
57 Spacing collar
58 Primary drive sprocket
59 Washer
60 Nut
61 Bearing, ball
62 Oil seal
63 Kickstart spindle and quadrant
64 Kickstart return spring
65 Oil seal
66 Kickstart lever
67 Kickstart swivel pedal
68 Spring
69 Ball bearing
70 Pin
71 Circlip
72 Bolt
73 Washer
74 Kickstart rubber
75 Clutch housing
76 Kickstart ratchet plate
77 Rivets - 8 off
78 Kickstart ratchet gear
79 Spring
80 Spring locating washer
81 Wire circlip
82 Thrust washer
83 Bearing, needle roller
84 Clutch centre
85 Washer, tab
86 Nut
87 Cup springs
88 Clutch pressure plate
89 Clutch thrust pin
90 Ball bearings - 14 off
91 Washer
92 Circlip
93 Clutch plate, driving
94 Clutch plate, driven
95 Clutch plate faced
96 Wire circlip
97 Clutch operating spindle
98 Oil seal
99 Clutch operating lever
100 Washer
101 Nut
102 Primary drive chain
103 Bearing, ball
106 Circlip
107 Oil seal
108 Spacer
109 Final drive gear
110 Blanking off plate
111 Gearbox final drive sprocket
112 Washer, tab
113 Nut
114 Bearing, needle roller - 2 off
115 Bearing, needle roller
116 Spacer
117 Mainshaft and gear
118 Gear
119 Circlip - 2 off
120 Gear
121 Layshaft and gear
122 Gear
123 Gear
124 Gear
125 Thrust washer
126 Blanking off plate
127 Selector cam plate
128 Thrust washer
129 Selector plate stop
130 Spring
131 Circlip
132 Spring
133 Hook selector lever
134 Selector pull rod
135 Plate
136 Tab washer
137 Bolt
138 Gear operating lever and spindle
139 Gear lever return spring
140 Gear lever
141 Gear lever rubber
142 Bolt
143 Washer
144 Gear selector fork spindle
145 Gear selector fork - 2 off
146 Rotor
147 Washer
148 Screw
149 Bolt
150 Washer
151 Stator
152 Condenser
153 Contact breaker
154 Screw
155 Washer
156 Washer
157 Felt oiler
158 Induction hose sleeve
159 Carburettor
160 Hose clip
161 Connecting rubber hose

* Current models have only one piston ring

3 Measure the bore with an internal micrometer, just below the limit of travel of the piston ring and between the front and rear of the bore. This is where the most wear occurs. Also measure the bore at the bottom of the cylinder barrel. A comparison of the two results will give the bore wear. If a micrometer is not available, measure the gap between the bore and the skirt of a new piston, at the top of the stroke. If it exceeds 0.006 in. a rebore is required.
4 Examine the cylinder barrel/head gasket faces and make sure they are flat and in good condition. If the faces are not in perfect condition, lap them to each other using a fine valve grinding compound followed by metal polish. Thoroughly wash the freshly ground surfaces afterwards to remove all traces of abrasive. The head studs will have to be removed on all models except the 125 cc to achieve this. Use two nuts tightened together on the stud thread to remove and replace each stud.

20 Examination and renovation: bearings and oilseals

1 Examine the bearings for wear and if in doubt renew them. To remove bearings from the crankcases heat the latter to approximately 250°F in an oven, after having first removed any oilseals. Drop the crankcase halves onto a wooden bench to shock the bearings out of position. Fit the new bearings whilst each crankcase is still hot.
2 Check all the oilseals and 'O' rings for damage, cracking, or general hardening. Renew if in doubt.
3 To remove a main bearing from the crankshaft requires the use of the appropriate bearing puller and/or separator.
4 If the big end is worn it is suggested that either a replacement flywheel assembly is obtained from a Maico dealer or the repair is entrusted to him. A press is required to separate the flywheels and they will have to be realigned on a lathe after the new big end assembly is fitted.
5 In particular, check the small end bearing for wear or damage since this is highly stressed and will cause much damage if it should break up.

21 Examination and renovation: gear pinions and clutch

1 Examine all the gear pinions, looking for signs of wear, chipped or broken teeth, or worn dogs or splines.
2 Check the condition of the friction lining on the clutch plates and renew if the grooves are no longer present.
3 Examine the plates for scoring; renew as necessary. Check that all the clutch plates are flat and not warped - use a surface plate or a sheet of plate glass.
4 Check the clutch plate tongues that locate in the clutch housing, are not worn and also examine the smaller teeth that locate with the clutch centre. Any serious indentations or burrs mean new replacements will have to be obtained. Very small burrs can be removed with an oilstone or a fine cut file. **Note:** Do not remove too much metal since the tongues will then be of unequal width and spacing and may not take up the drive evenly. This will cause them to wear quickly and may probably damage the clutch housing.
5 Examine the clutch housing and the centre grooves. Clean them up if their condition is not too bad.
6 On the 125 cc models, check the clearance between the clutch pressure pin and plate. Renew if necessary. Note that it may be possible to renew the ball bearings alone. To dismantle the unit, remove the circlip at the rear. Whilst the unit is stripped down check the condition of the raceways before fitting new balls.
7 On all except the 125 cc models, check the condition of the ball bearings that revolve on the pressure pin in the clutch centre. The pin is retained by a special nut at the rear of the clutch centre.
8 Measure the free length of the clutch springs and compare with the wear limit. Replace the springs only as a complete set.

125 cc model only

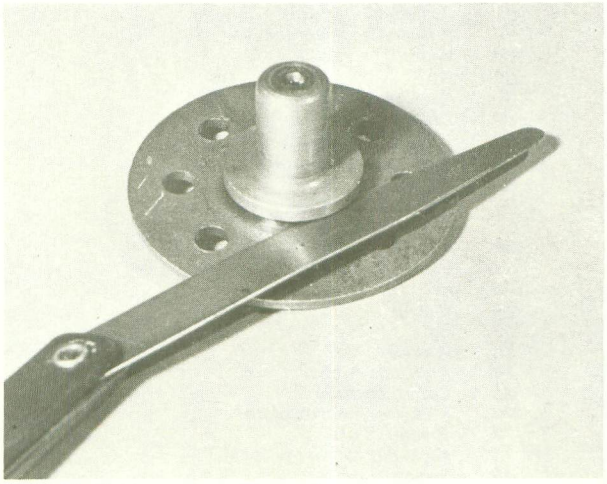
1 The gear selector mechanism should give little trouble. Clean and examine the camplate detents and the engaging sears for wear if necessary. The only component likely to break is the hairpin spring which should be carefully checked. Reassembly of the mechanism is covered in Chapter 1, Section 57. Setting the selector shaft is also covered in this Section.

22 Examination and renovation: shimming the crankshaft and layshaft

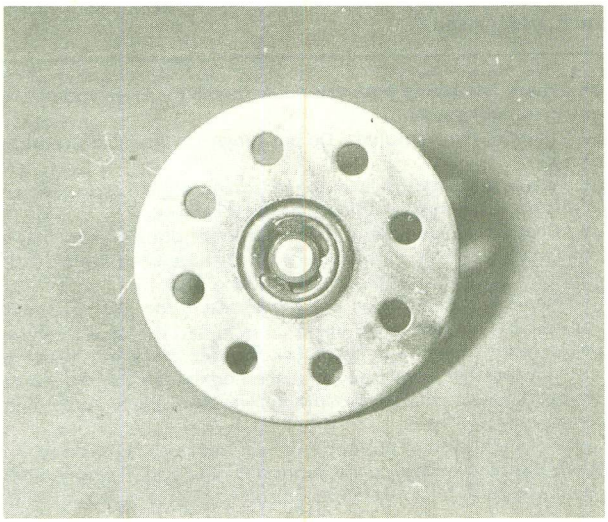
1 The easiest way of checking both the crankshaft endfloat and layshaft gear clearance is to assemble the layshaft gears and replace them and the crankshaft into the right hand crankcase. Fit the other crankcase and tighten the screws evenly in a diagonal sequence.
2 The layshaft should be checked using a dial test indicator as shown in the accompanying diagram, which is self explanatory. Reshim as necessary.
3 The crankshaft endfloat can be checked using a set of feeler gauges as shown in the diagram. Reshim as necessary.
4 Separate the crankcases when the correct tolerances have been obtained and proceed with the engine rebuild. Do not lose the shims.

125 cc models only

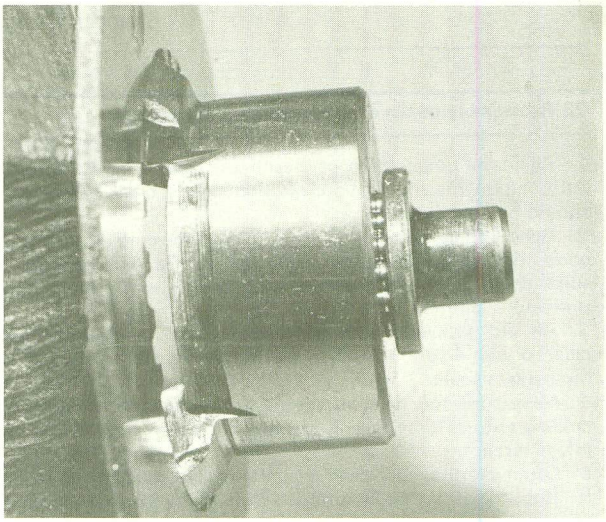
5 Assemble the crankshaft and bearings into the crankcase halves and temporarily clamp the crankcase together using six of the screws located in the holes around the crankshaft assembly (arrowed in photograph).
6 The crankshaft endfloat can be checked using a set of feeler gauges as shown in the accompanying diagram. Reshim as necessary.
7 Separate the crankcases when the correct endfloat has been obtained and proceed with the engine rebuild. Do not lose the shims.



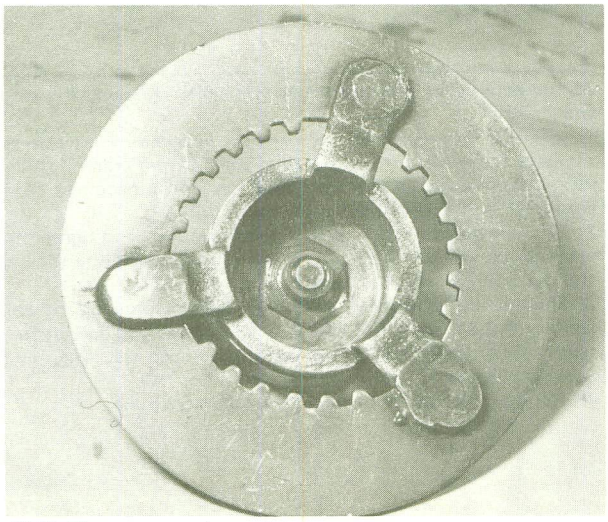
21.6a Check the pressure pin to plate clearance



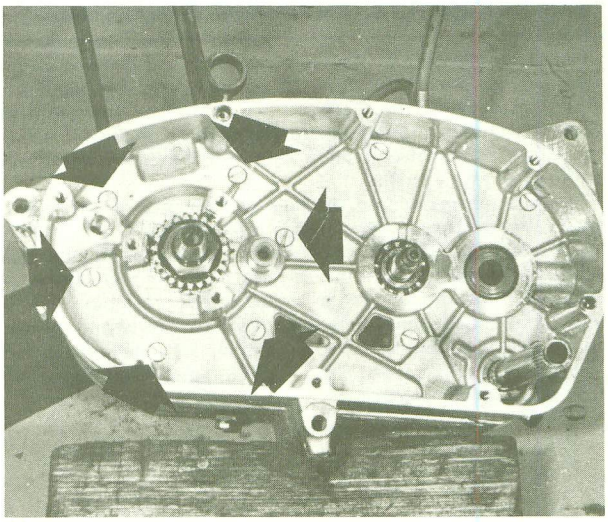
21.6b Remove circlip to dismantle the assembly



21.7a Check the condition of the balls



21.7b The pressure pin retaining nut



22.5 Tighten only the six arrowed screws when shimming up endfloat

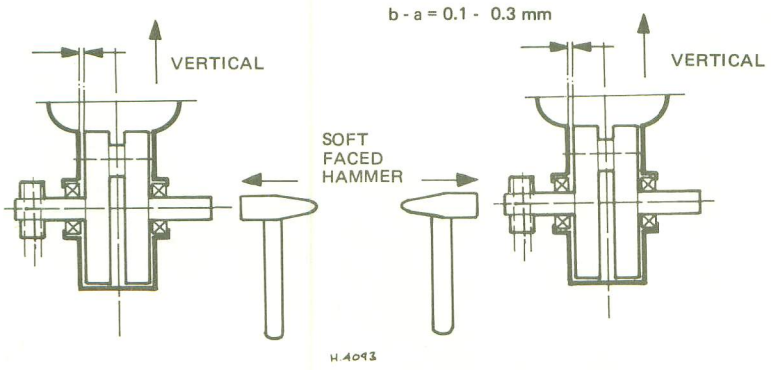


Fig. 1.2a. Shimming the layshaft

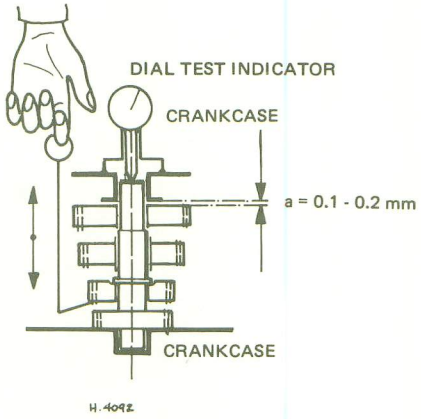


Fig. 1.2b. Shimming the crankshaft

23 Reassembly of the engine/gearbox unit: general

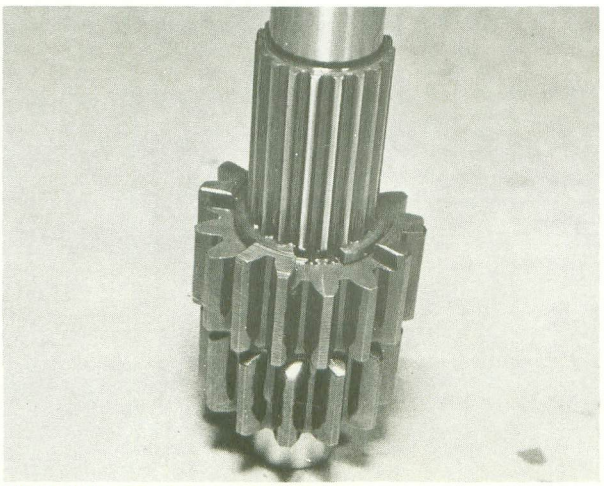
1 Again the importance of cleanliness cannot be overstressed. All components should be clean and lightly oiled. All bearings should be pre-lubricated.
2 Renew all gaskets and 'O' rings. When replacing oil seals it is a good idea to lightly grease their lips with a molybdenum disulphide or graphited grease to stop seizure and consequential premature failure.
3 All old gaskets should be removed and the jointing faces cleaned with a solvent such as methylated spirits to remove the old gasket cement.
4 Make sure you have all the necessary gaskets, 'O' rings and circlips etc., before starting the rebuild. **Note:** Always use new piston circlips.
5 Often overlooked - clean all tools before starting the rebuild to stop the grit that accumulates on them from entering the engine.

24 Reassembly of the engine/gearbox unit: replacing the gear pinions, selectors and crankshaft and joining the crankcases

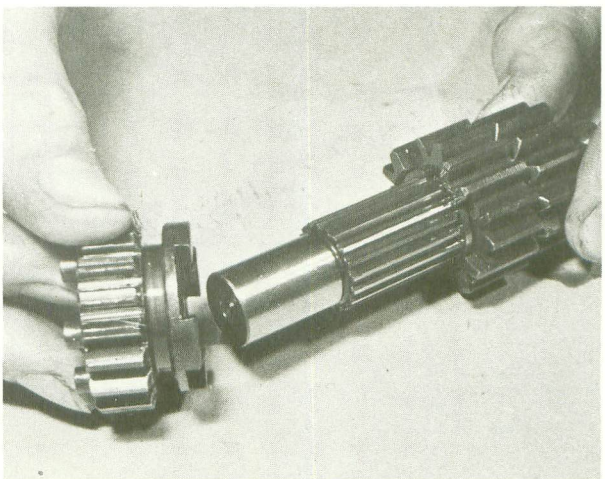
1 Having checked the layshaft clearance and crankshaft endfloat as described in Section 22, assemble the gear pinions on their respective shafts. Assemble the shafts and gears together with their selector forks as a unit and place on one side.
2 Replace the selector plate stop and hooked selector lever spring and fit the circlip.
3 Insert the spring into the hole and press down the selector plate stop so that the camplate can be replaced.
4 Replace the gear cluster previously assembled, into the right hand crankcase. Locate the selector forks in their respective grooves in the camplate and insert the selector fork pin.
5 Check the clearance between the selector forks and the camplate, which should be 0.010 - 0.025 in. Shim behind the camplate to give the correct clearance i.e., between the rear of the camplate and the crankcase.
6 Hook the spring onto the hooked selector lever and place it in an upright position.
7 Replace the crankshaft. Do not forget the shims, if previously fitted.
8 Check the jointing faces are clean and place a new gasket in position, retaining it with a little gasket cement.
9 Check that everything is in its correct position and that all the spacers and/or shims (where fitted) have been replaced. Fit the final drive sprocket spacer onto the oilseal.
10 Replace the left hand crankcase. Insert the eight crankcase screws and tighten them up in an even and diagonal sequence. When tightening the screws check that the crankcase halves are pulling together evenly and that the hooked selector lever is not trapped. Check that the crankshaft revolves freely, after tightening fully.
11 Place the selector pull rod in its correct working position, and then replace the cover plate, tab washer and bolt. Tighten up the bolt and lock it in position by bending up the tabs on the tab washer.
12 It is a good idea to stuff the crankcase mouths with rag to stop damage by the connecting rod, and also to prevent anything falling into the crankcase.

25 Reassembly of the engine/gearbox unit: replacing the rotor and stator

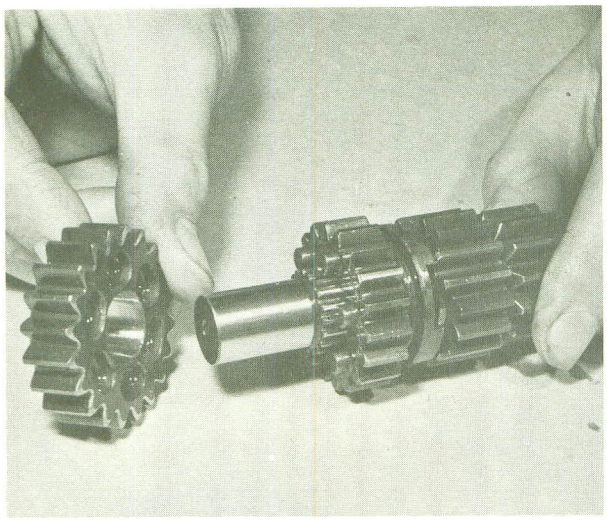
1 Place the rotor onto the tapered shaft of the crankshaft and locate the screw in the slot that has been machined for a Woodruff key. Do not tighten the screw fully.
2 Tighten the rotor bolt with a torque wrench and tighten the locating screw. Do not forget the wave spring washer on the bolt and the spring washer on the screw.
3 Replace the stator complete with contact breaker and condenser. Tighten the three screws finger tight, but do not fully tighten them since the engine has to be timed (see Chapter 3, Sections 7 to 9.
4 Replace the contact breaker wire and its grommet.



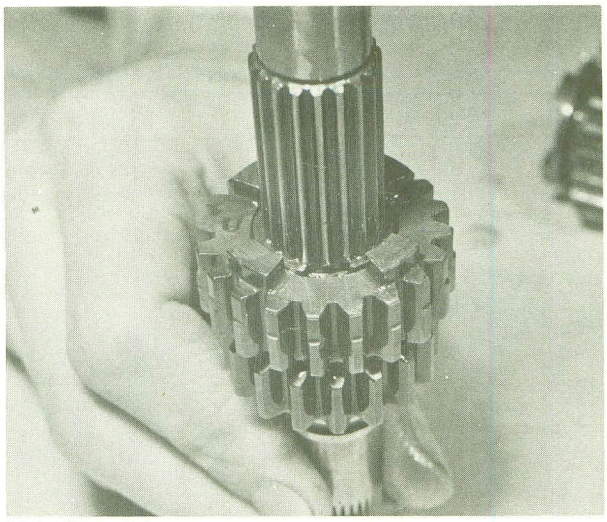
24.1a Slide gear pinion on layshaft



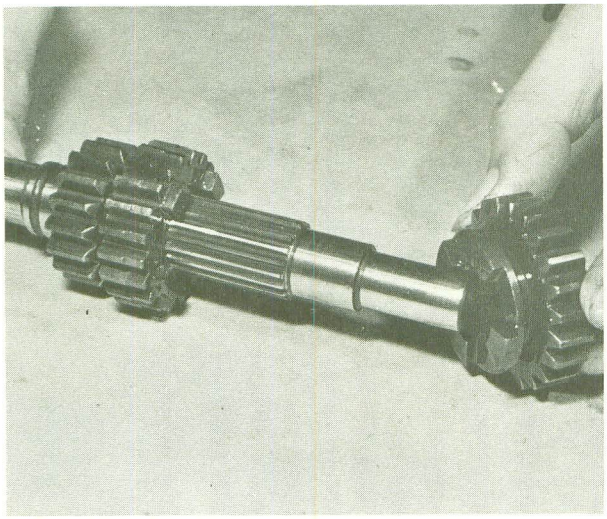
24.1b Pinion with selector channel follows next ...



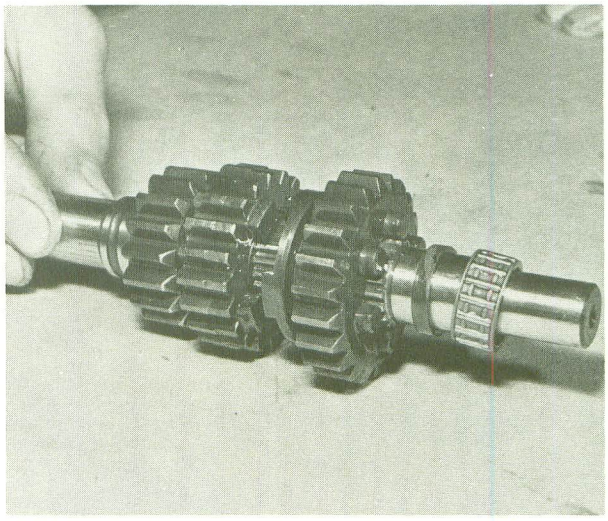
24.1c ... then pinion that engages with dogs



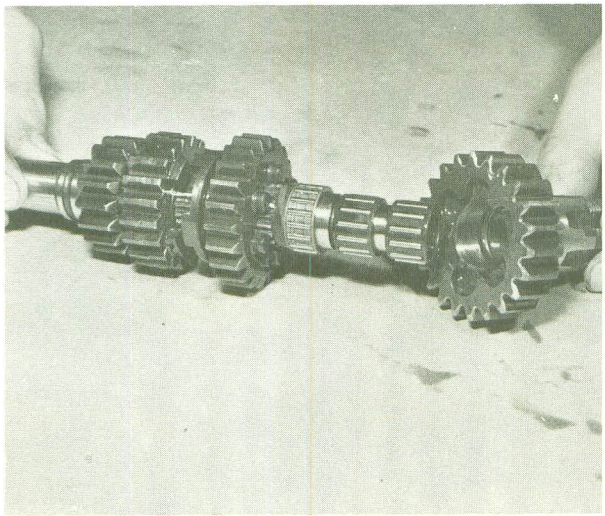
24.1d Slide pinion on mainshaft



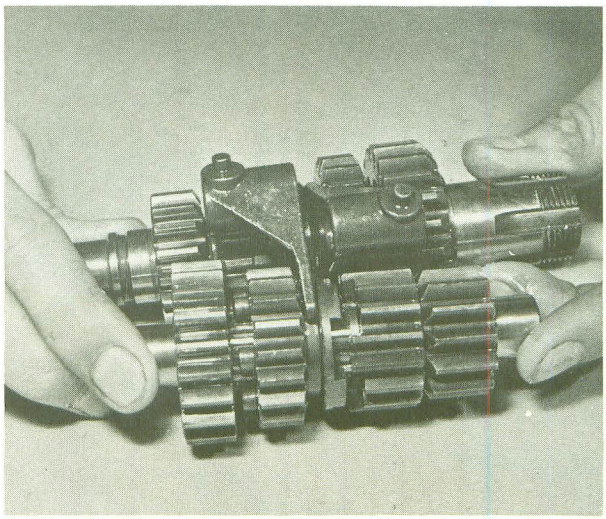
24.1e Follow with pinion having selector channel



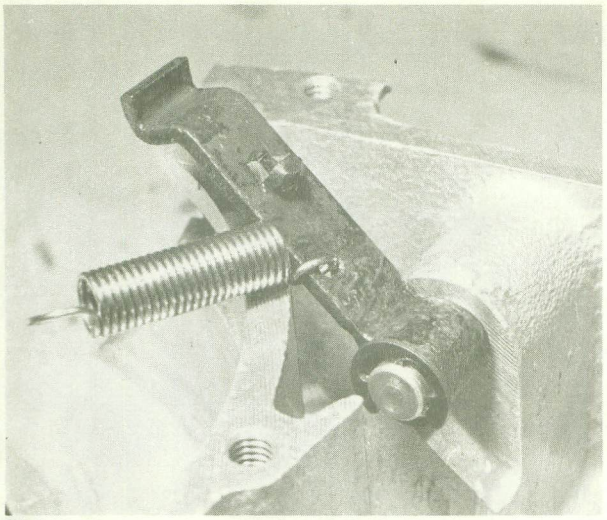
24.1f Needle roller bearings in centre of sleeve gear pinion



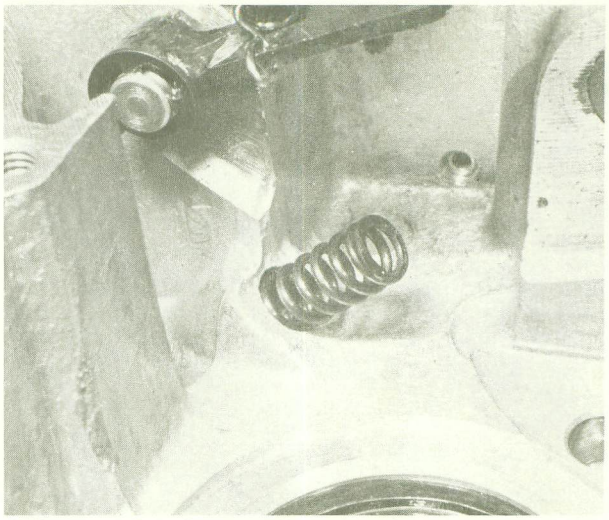
24.1g Check all three needle roller bearings are in place



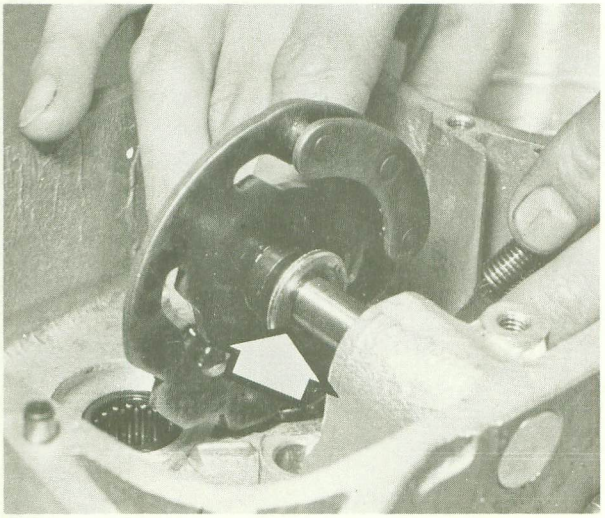
24.1h Assemble the gear cluster and selector forks



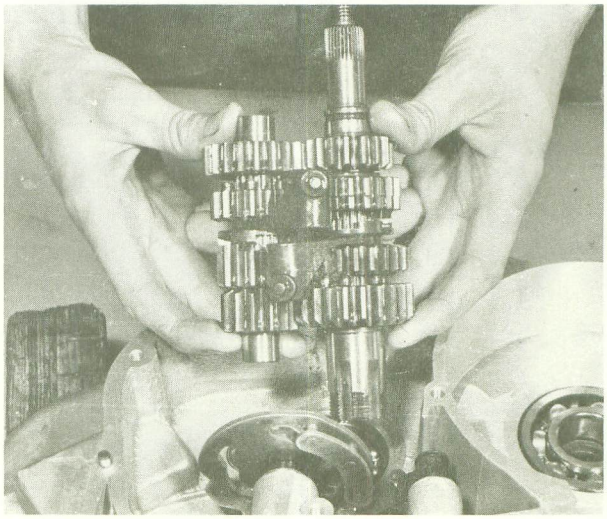
24.2 Replace the selector plate stop and hook selector lever spring



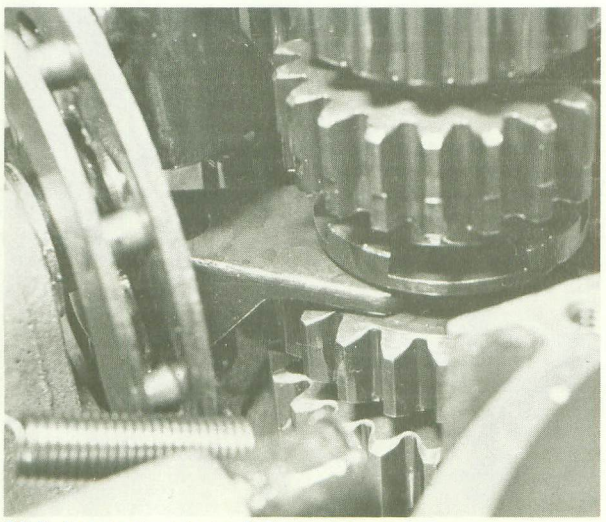
24.3a Insert the spring, press down the stop and ...



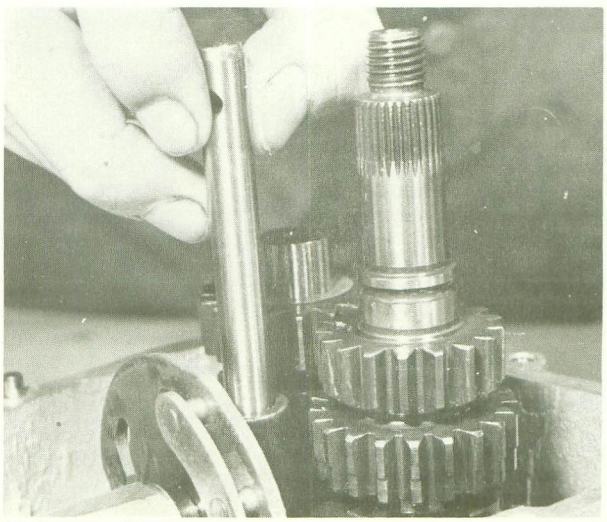
24.3b ... replace the camplate. Note the shim



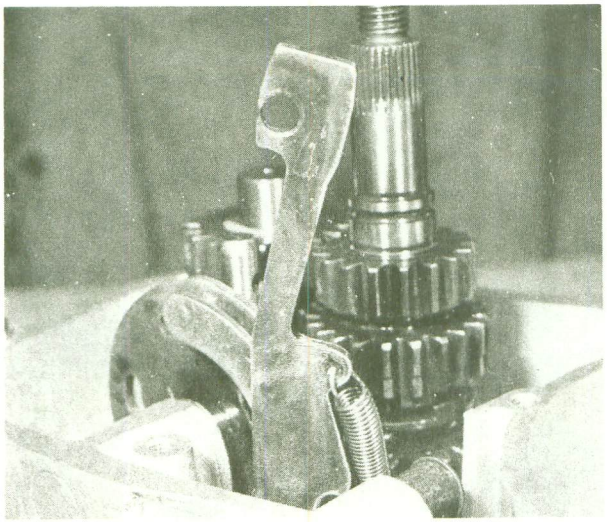
24.4a Replace the assembled gear cluster and ...



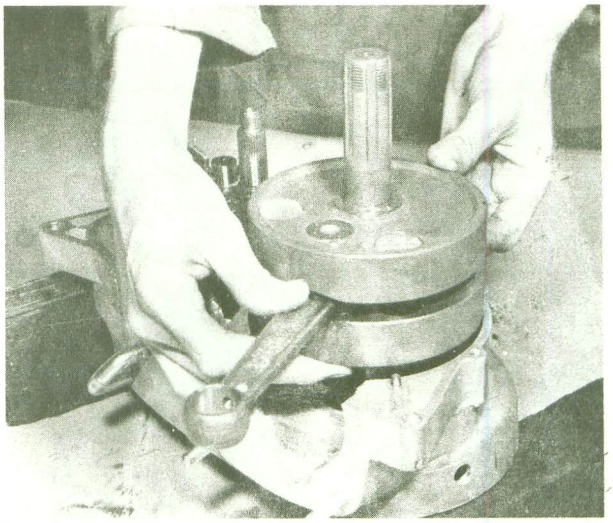
24.4b Locate the selector forks in the camplate grooves and ...



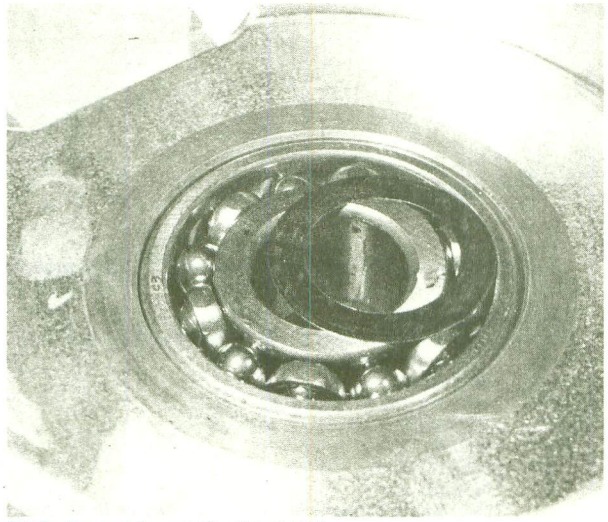
24.4c Insert the pin



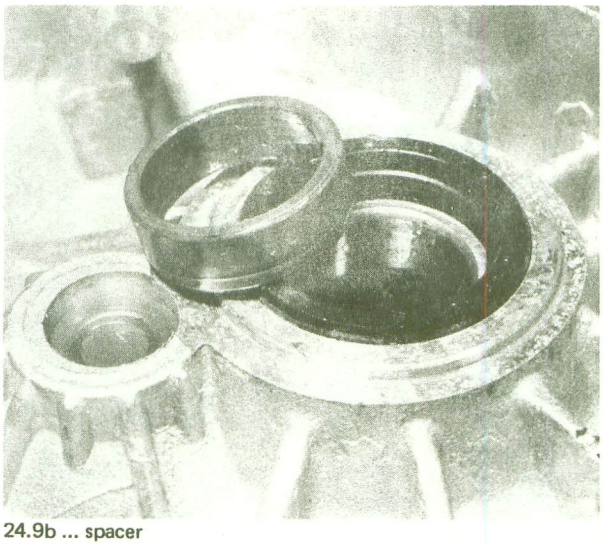
24.6 Position the hooked selector lever upright



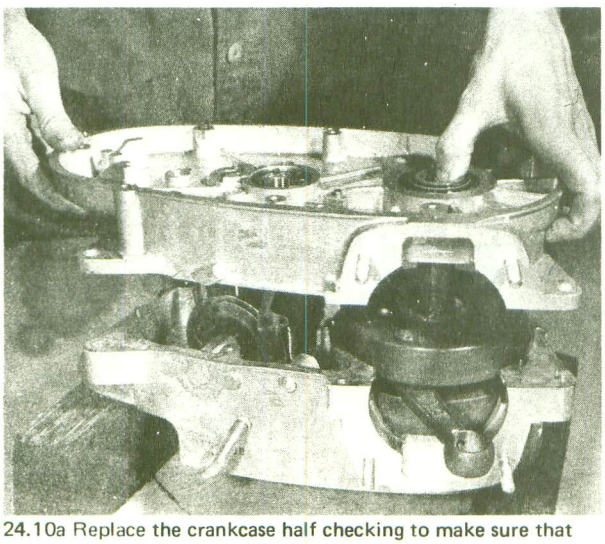
24.7 Replace the crankshaft



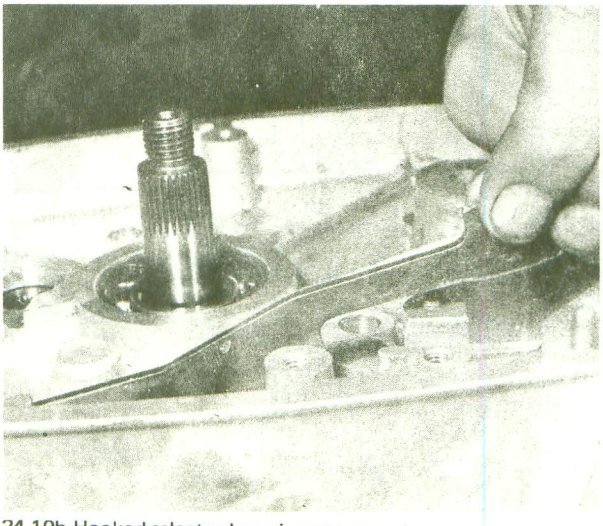
24.9a Do not forget the shims and ...



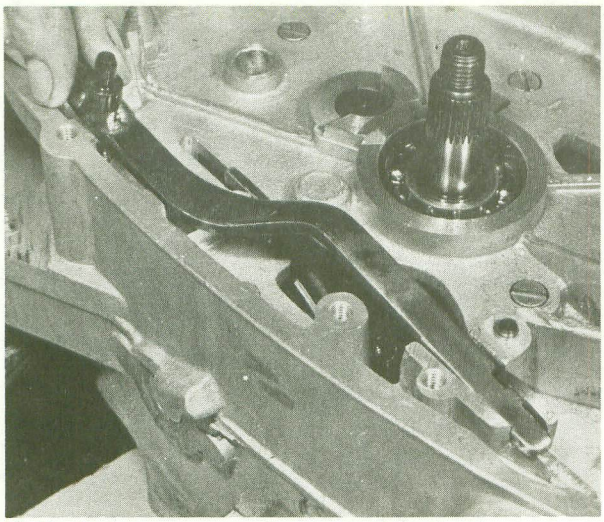
24.9b ... spacer



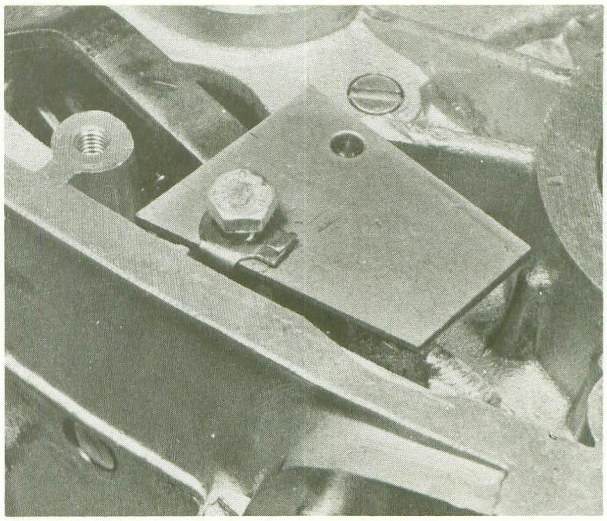
24.10a Replace the crankcase half checking to make sure that the ...



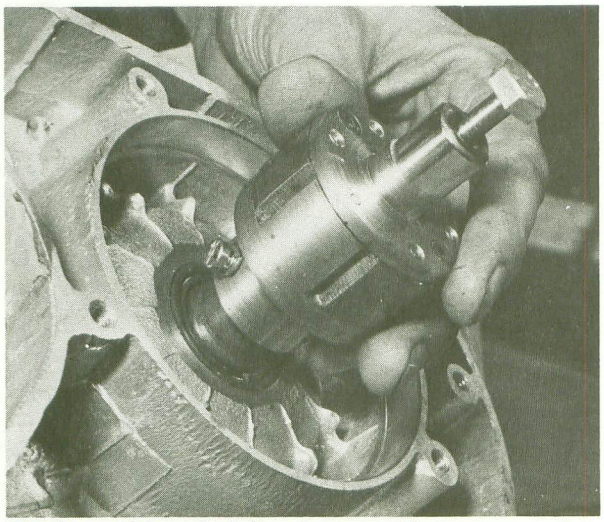
24.10b Hooked selector lever is not trapped



24.11a Replace and engage the selector pull rod and ...



24.11b ... refit the cover plate, bolt and tabwasher

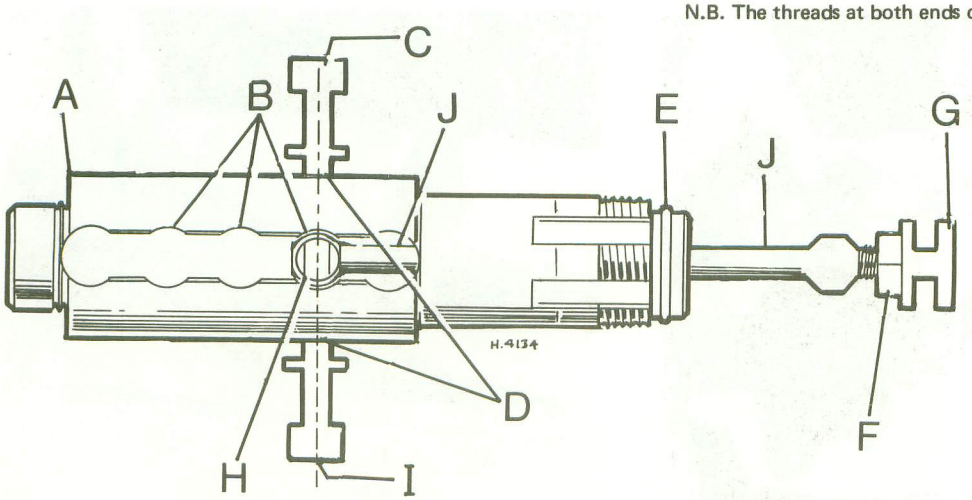


25.1 Do not tighten the bolt and screw at this stage

Fig. 1.3. Gearbox output shaft and selector - 125 cc model only

A	*Output shaft*
B	*Gear grooves (five for the five speed gearbox and six for the six speed gearbox)*
C	*Second gear*
D	*Second gear driving dogs*
E	*Rubber 'O' ring*
F	*Locknut*
G	*Selector shaft*
H	*Selector key*
I	*Centre line showing alignment of the key in the groove and the second gear driving dogs*
J	*Selector shaft*

N.B. The threads at both ends of the selector are left hand.

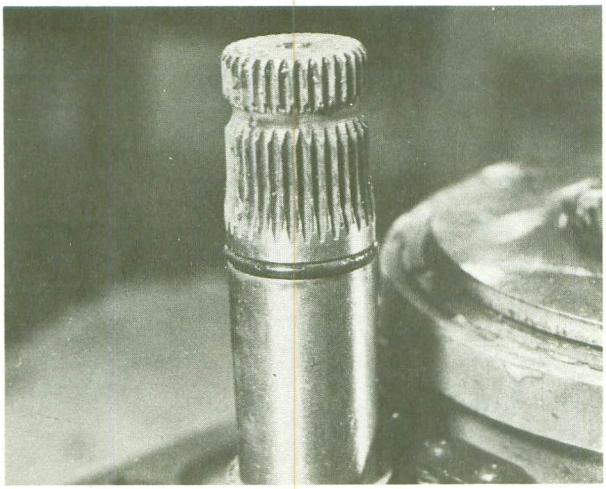


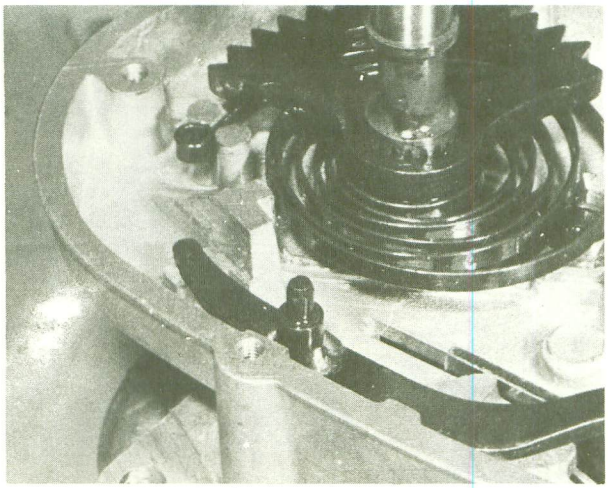
26 Reassembly of the engine/gearbox unit: replacing the right hand engine cover

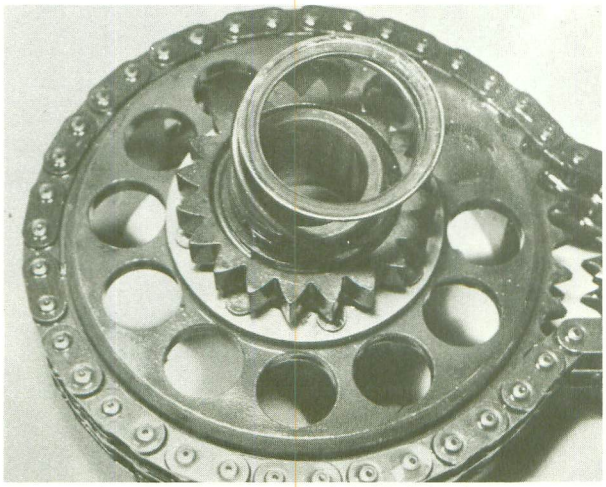
1 Do not replace the cover until the ignition timing has been set. Afterwards, it can be replaced and the three screws tightened.

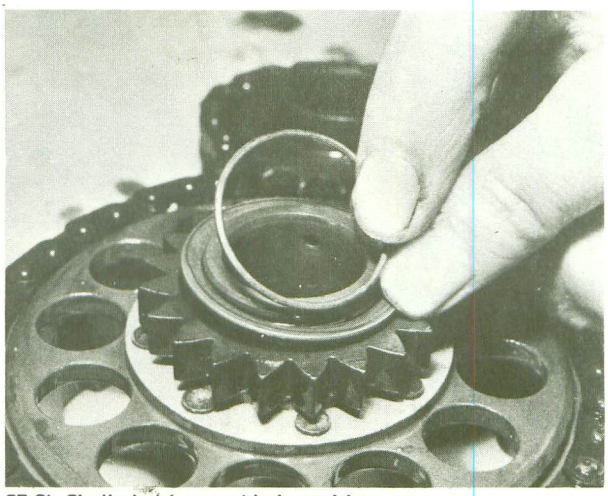
27 Reassembly of the engine/gearbox unit: replacing the kick-start, clutch and primary drive

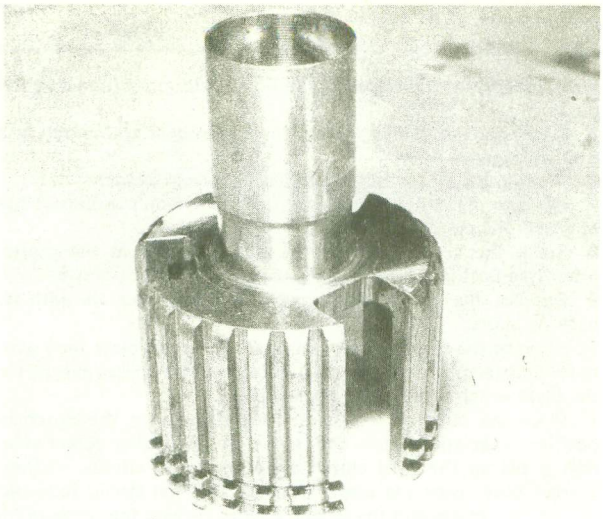
1 Renew the rubber 'O' ring on the kickstart shaft and replace the kickstart quadrant gear and shaft complete with its spring into the crankcase. Locate the end of the spring in the retaining lug and tension it 1 - 1½ turns. Use the kickstart lever to tension the spring.
2 Reassemble the kickstart ratchet behind the clutch housing and replace the retaining wire circlip.
3 Replace the bronze bearing on the clutch centre and the thrust washer on the gearbox shaft.
4 Replace the spacer fitted behind the engine sprocket and also the spacer behind the final drive sprocket, if this has not already been done. Both these spacers should be held in position by their oilseals.
5 Assemble the primary drive chain, sprocket and clutch as a unit and replace them.
6 Tighten the clutch centre nut with a torque wrench.
7 Replace the clutch centre nut tab washer and bend down the tabs over the clutch centre.
8 Stack the correct number of clutch springs in the proper order (see Section 5) and replace them in the clutch centre.
9 Replace the clutch centre pressure plate complete with its backing plate.
10 Replace the clutch plates starting with a drive plate (one with holes and tangs on the outside). Replace all the plates except for the plate which is lined and the last plate.
11 Place the puller that was used for dismantling the clutch in position over the clutch and screw up the puller screw after having placed the final clutch plates and wire circlips in their correct order over the screw. Replace the first circlip followed by the two plates and the second circlip. Release the pressure on the clutch.
12 Tighten the engine sprocket nut and bend over the tab washer.


27.1a Renew the rubber 'O' ring

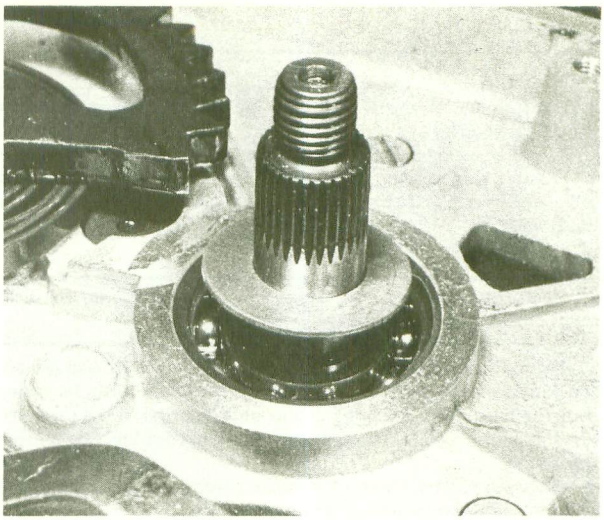

27.1b Locate the spring in the lug


27.2a Kickstarter ratchet assembly is behind clutch

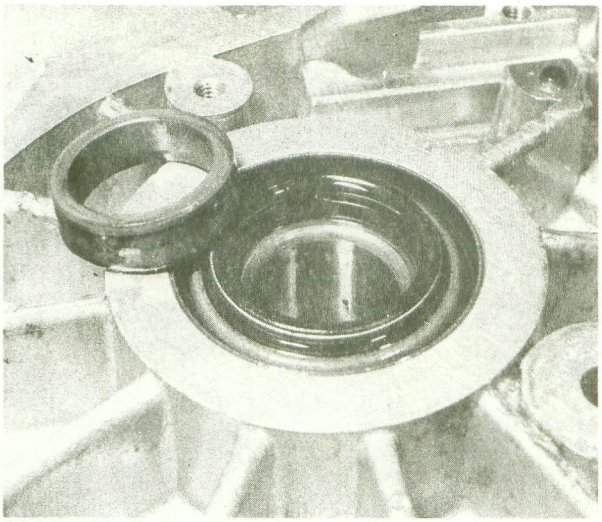

27.2b Circlip holds assembly in position



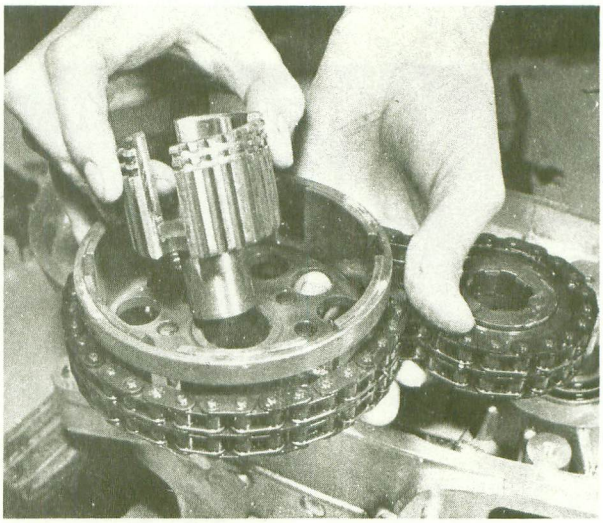
27.3a Replace the bronze bush on the clutch centre



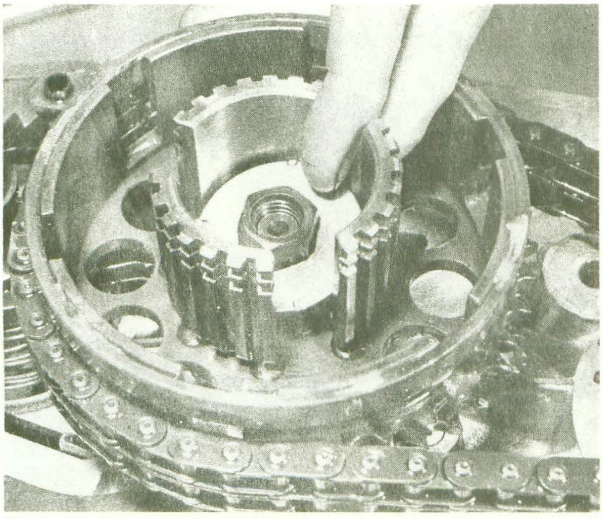
27.3b Don't omit thrust washer on gearbox mainshaft



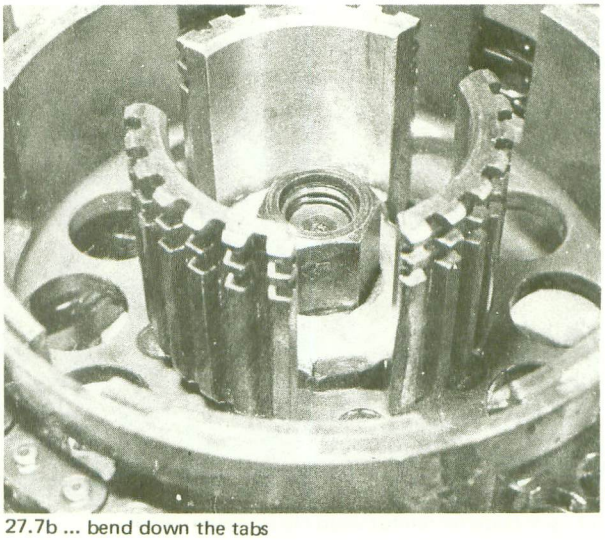
27.4 Replace the spacer



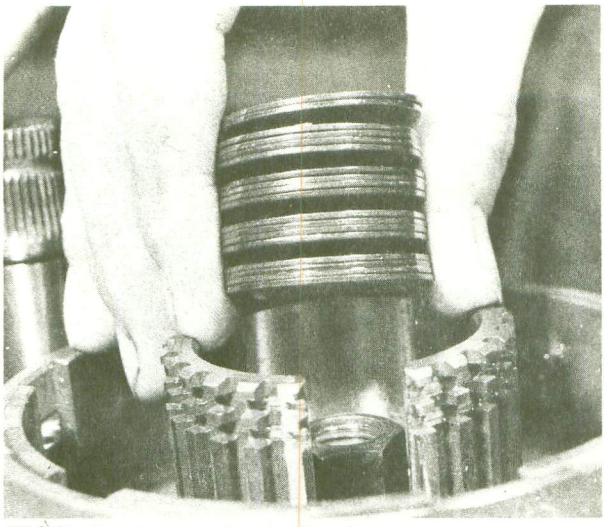
27.5 Replace the primary drive as a unit



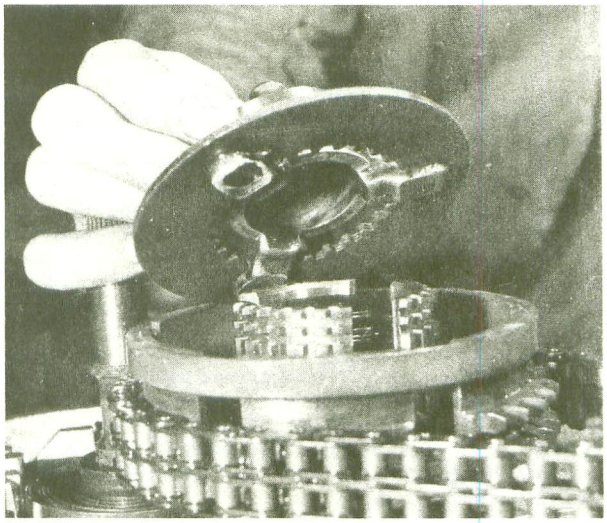
27.7a Replace the tabwasher and ...



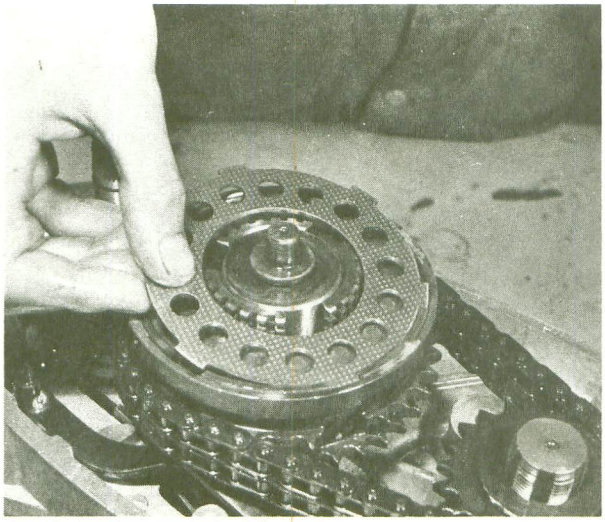
27.7b ... bend down the tabs



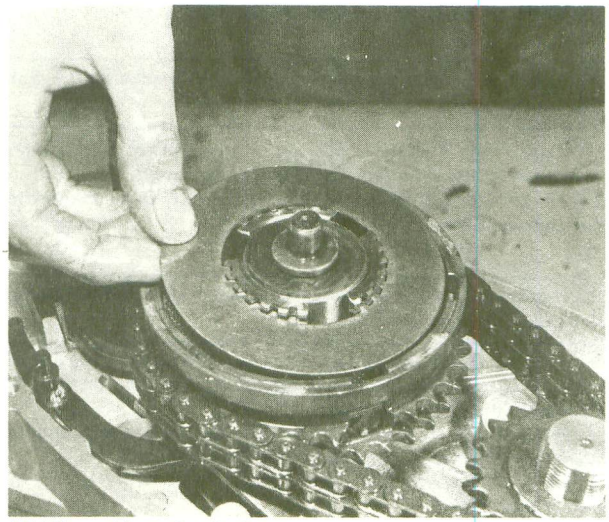
27.8 Stack and replace the clutch springs



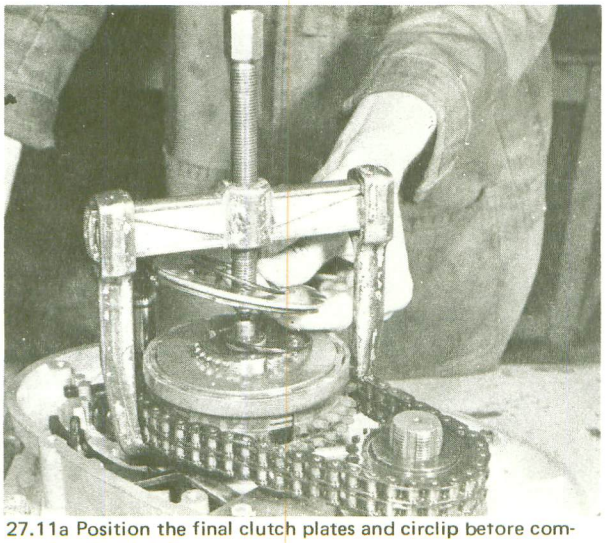
27.9 Replace the clutch centre pressure plate



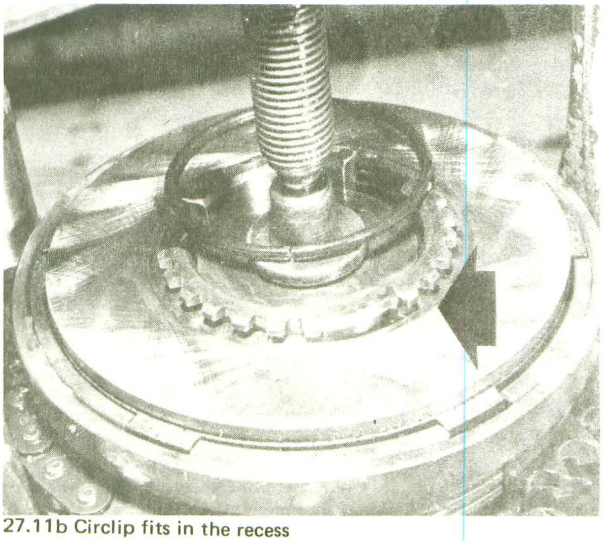
27.10a Replace both the drive and ...



27.10b ... driven clutch plates



27.11a Position the final clutch plates and circlip before compressing the clutch



27.11b Circlip fits in the recess

28 Reassembly of the engine/gearbox unit: replacing the left hand side engine cover

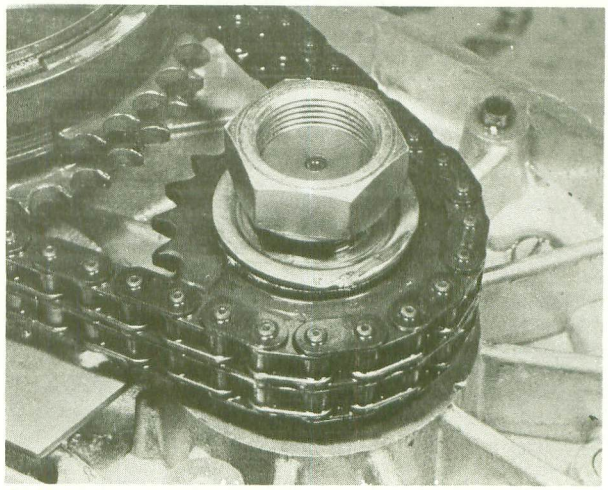
1 Renew the rubber 'O' ring on the gearbox shaft.
2 Renew the rubber 'O' ring on the clutch operating arm.
3 Check that the gasket faces are clean and fit a new gasket on the crankcase. If necessary hold it in position with a little gasket cement.
4 Position the gear linkage pull rod so that its operating pin is opposite the screw hole in the crankcase (see photo).
5 Replace the gear operating lever and spindle in the left hand side cover and position it in the downward position, so that it is exactly opposite the screw hole in the engine cover (see photo). Do not forget to fit the gear lever return spring onto the spindle.
6 Replace the left hand engine cover and push it home. Make sure that the gear operating lever hole engages with the pin of the gear linkage pull rod.
7 Replace and tighten the seven screws evenly, in a diagonal sequence.
8 Renew the rubber 'O' ring that seals the gearbox shaft. The 'O' ring is retained in the left hand side cover by a circlip.
9 Replace and tighten the drain plug.

29 Reassembly of the engine/gearbox unit: replacing the final drive sprocket

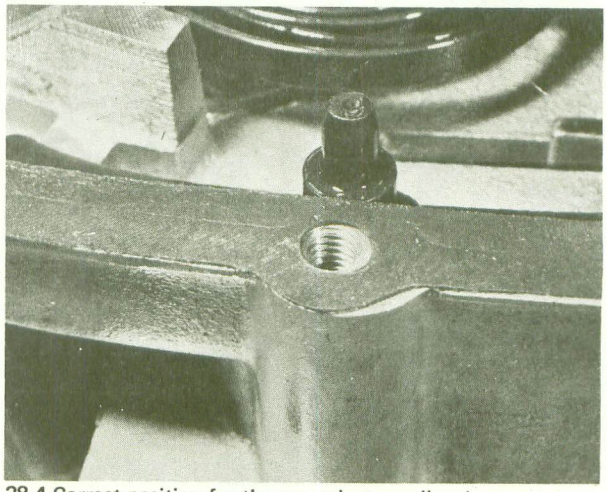
1 Replace the final drive sprocket on the gearbox shaft. Do not forget the spacer if this has not already been fitted.
2 Fit the tab washer and tighten up the nut. Bend the washer over in two places, over the flats on the nut.

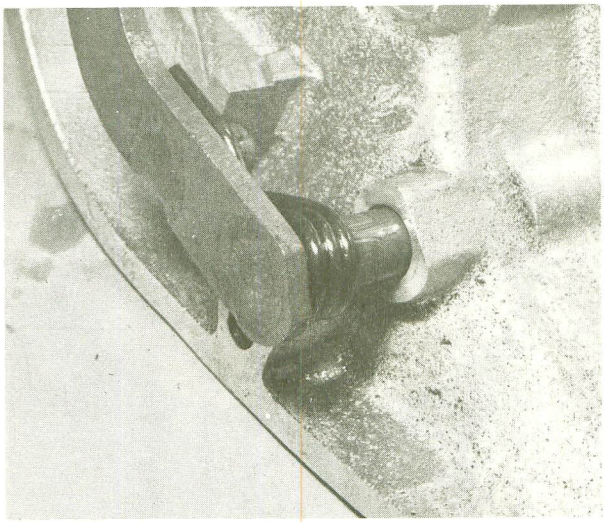
30 Reassembly of the engine/gearbox unit: replacing the piston, cylinder barrel and head

1 Replace the Dykes pattern ring onto the piston after having checked the end gap, see Specifications. Locate the ring gap over the peg in the piston groove.
2 Replace one of the piston circlips. Always use new circlips. Make sure the circlip is seated in its groove correctly.
3 Oil and replace the small end needle roller into the connecting rod.
4 If the gudgeon pin is a tight fit in the piston, pre-heat the piston in some hot water to facilitate refitting the pin.
5 Place the piston over the connecting rod the correct way round i.e., arrow on the crown pointing forwards to the exhaust and the hole in the skirt towards the inlet side. Insert the gudgeon pin. Replace the other piston circlip and make sure it is seated properly.
6 Fit a new cylinder base gasket. Make sure that the gasket does not protrude into the transfer ports. Cut with scissors if necessary.
7 Fit the exhaust manifold to the barrels and also the inlet stub. Check the rubber hose very carefully for signs of deterioration. Renew if in doubt.
8 Oil the piston ring. Check again that it is correctly positioned in relation to the end peg. Remove any rag that may have been placed in the crankcase mouth. Slide the barrel gently over the piston and ring whilst compressing the latter with the fingers. Locate the barrel over the studs and push it fully home. If it is tight in entering the crankcase mouth, slacken the crankcase screw behind the mouth. Do not forget to retighten this screw afterwards.
9 Replace the cylinder base nuts and washers and tighten them evenly and in a diagonal sequence.
10 If the engine has to be retimed, do not fit the head yet but set the ignition timing as described in Chapter 3, Section xx and then proceed with fitting the cylinder head (see next paragraph).
11 Check the head joint faces are clean and fit a new gasket. Do not use gasket cement. Tighten up all the head nuts evenly and in diagonal sequence to the recommended torque setting. It is

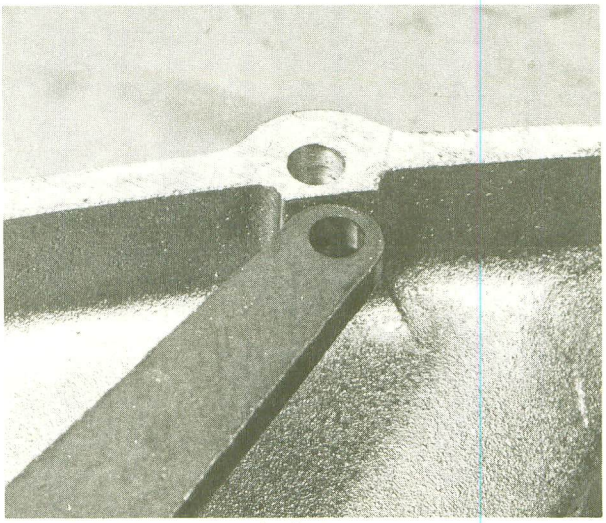

27.12 Tighten the engine sprocket nut


28.2 Renew the oil seal

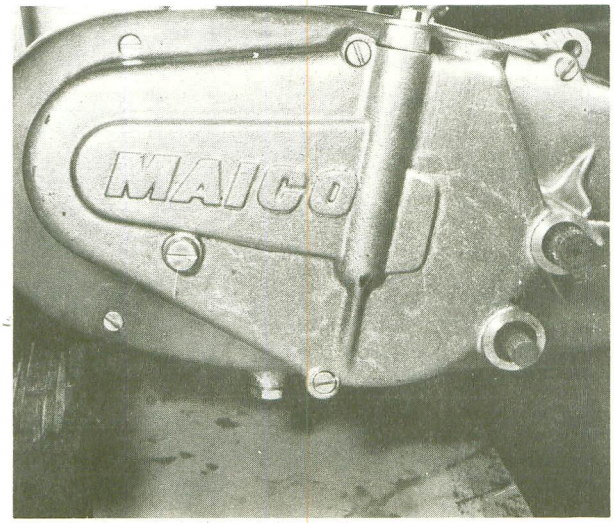

28.4 Correct position for the gear selector pull rod



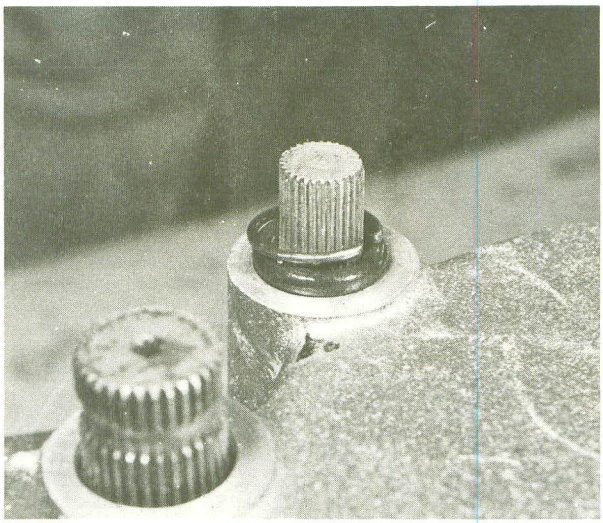
28.5a Do not forget the gear lever return spring



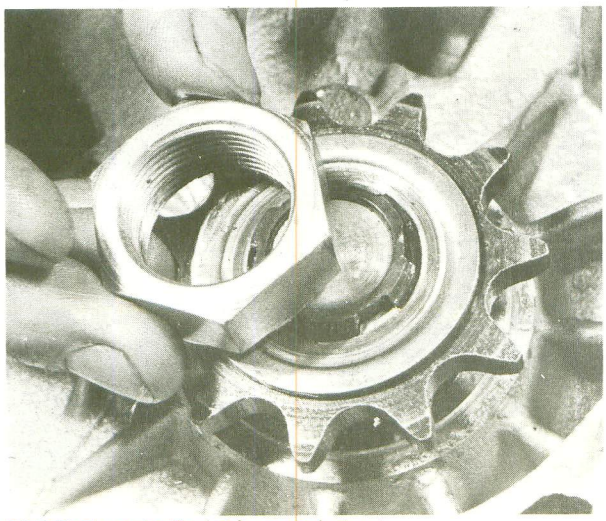
28.5b Align the gear operating lever



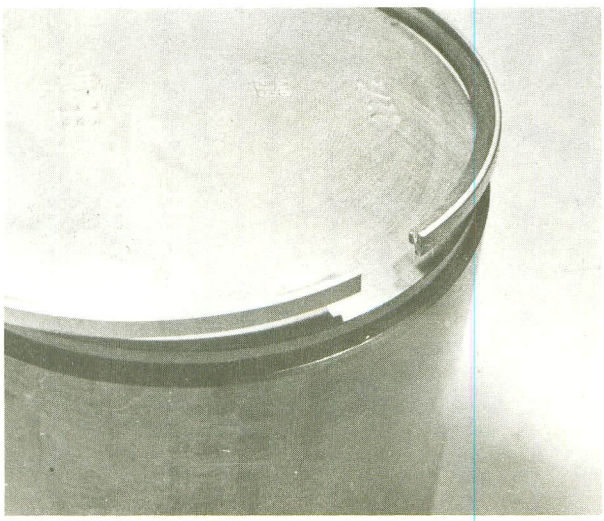
28.7 Replace the left hand side engine cover



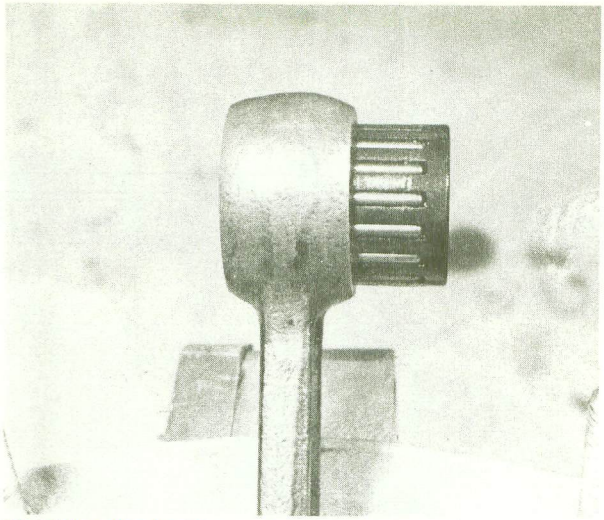
28.8 Renew the rubber 'O' ring



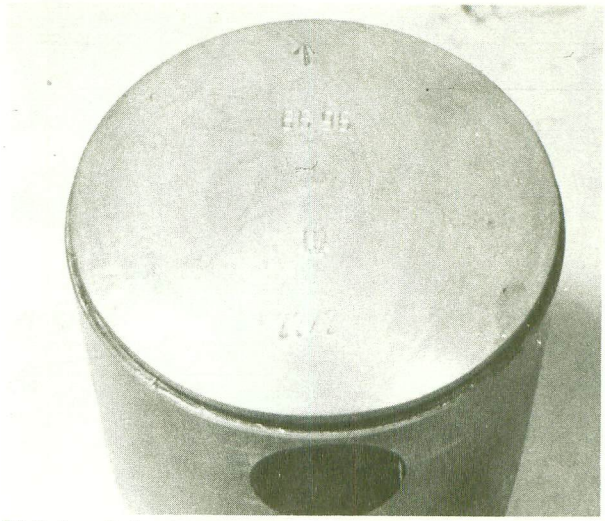
29.2 Replace the final drive sprocket nut



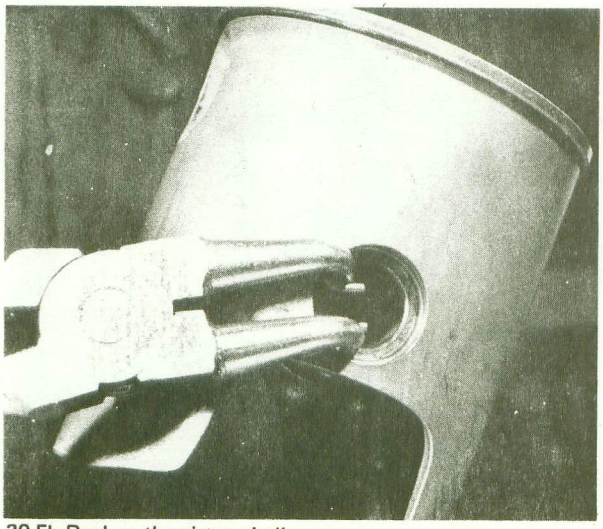
30.1 The single Dykes piston ring



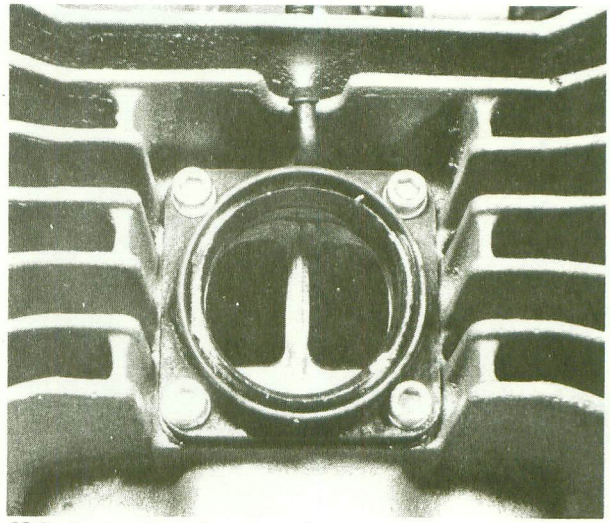
30.3 Oil and replace the small end bearing



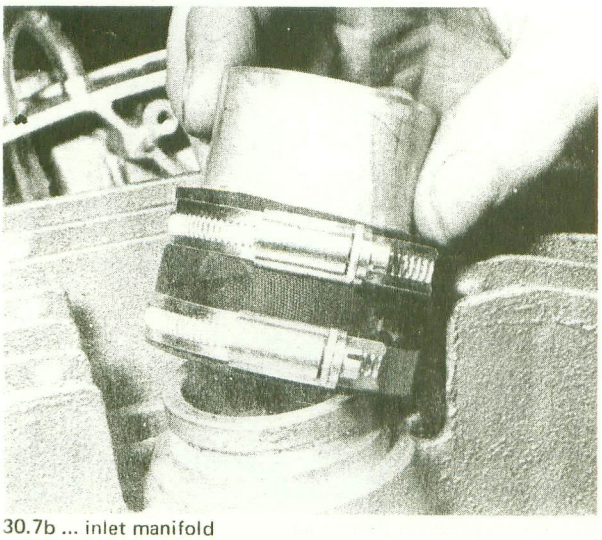
30.5a Install the piston with the arrow pointing forward



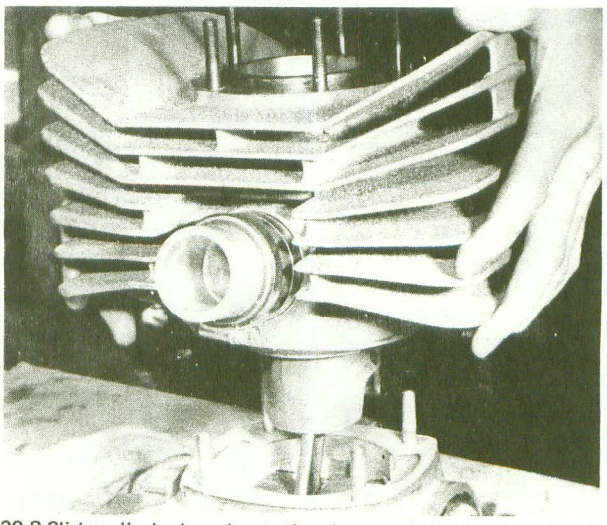
30.5b Replace the piston circlip



30.7a Replace the exhaust and ...



30.7b ... inlet manifold



30.8 Slide cylinder barrel over the piston and ring

best to tighten all the nuts even though two have to be removed later to fit the head steady, since this will help prevent the head from becoming distorted.
12 Refit the right hand engine cover.

31 Reassembly of the engine/gearbox unit: fitting the engine into the frame

1 Engine replacement is a reversal of Section 6 of this Chapter.
2 Do not forget to refill the gearbox/clutch with the correct quantity of oil.
3 Do not forget to connect the ignition wire from the contact breaker to contact number one of the HT coil.

32 Starting and running the rebuilt engine

1 Make sure everything is connected, replaced and tightened. Check the oil and petrol levels. Make sure the bike is not in gear and that the engine turns over freely, but with compression, when the kickstart is depressed.
2 Turn on the petrol and allow a few moments for it to flow into the carburettor. Start in the usual manner. Do not rev the engine at first.
3 Check the engine for blowing gaskets, oil and petrol leaks. Check that all the controls are functioning properly, i.e., gears, clutch, (lights) and most important, brakes.
4 Any rebuilt machine requires a time to settle down and for the usual performance to be obtained. Do not overwork the engine until it has bedded down.
5 If the engine has been rebored and/or a new crankshaft fitted, the engine will have to be run in, observing the usual running in procedures.
6 If anything seems to be wrong or there are any peculiar noises, stop the machine immediately and investigate.
7 After the machine has been run for a little time, re-torque the head down and check the various settings.

125cc model only

36 General description

The engine is a rotary disc valve two-stroke fitted with either a five or six speed gearbox. The profile of the disc valve and thus the timing is different for each of the two versions. The forged piston, which is made of a high silicon alloy, has a single Dykes pattern ring and a needle roller small end bearing is fitted.

The engine features radial finning which is an aid to cooling especially in hot climates. The engine itself is lubricated by means of a petrol/oil mixture. The gearbox and clutch compartments are interconnected and share the same oil.

The machine is fitted with a tuned expansion chamber exhaust system and a large capacity air filter. No lights are fitted to the competition models although the enduro model has a complete six volt electrical system.

37 Operations requiring removal of the engine/gearbox unit from the frame

Refer to Section 2.

38 Dismantling the engine/gearbox unit: general

Refer to Section 3.

39 Preventing the engine from turning both for dismantling and reassembly purposes

Refer to Section 4.

40 Removing the engine/gearbox unit

1 Remove the bolt at the rear of the seat and lift the seat rearwards.
2 Disconnect the petrol pipe at the petrol tap and remove the through bolt at the front of the petrol tank. Lift off the tank.
3 Drain the oil from the gearbox by removing the drain bolt located in the left hand engine cover.
4 Remove the expansion chamber which is held by a bolt at the rear and a 6 mm nut on the exhaust pipe adaptor of the cylinder barrel.
5 Remove the head steady by unscrewing the two cylinder head nuts and the bolt at the frame.
6 Remove the two bolts holding each footrest (note the spacer bar on the left hand footrest).
7 Remove the pinch bolts from both the kickstart and gear levers and pull the latter off their shafts. Note the rubber 'O' ring.
8 Disconnect the HT coil by pulling off the lead that goes to the contact breaker. Remove the spark plug cap.
9 Unclip the clutch cable. Remove the throttle cable at the twist grip. Release the choke cable by removing the screw that retains it in the lever.
10 Remove the rubber hose from the air filter.
11 Remove the rear chain spring link.
12 Remove the three engine mounting bolts and lift the engine out from the left hand side.

41 Dismantling the engine/gearbox unit: removing the right hand cover, carburettor and gear selector mechanism

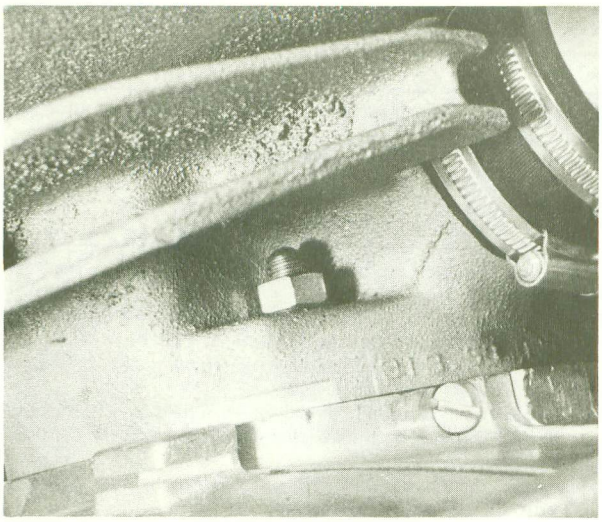
1 Remove the four 6 mm screws of the right hand crankcase cover and lift it off. Pull out the rubber connecting hose of the air filter.
2 Slacken the carburettor pinch bolt and pull the carburettor off its stub.
3 Remove the three mounting block bolts and pull the gear selector mechanism including the gear lever shaft clear. Place this on one side. Remove the selector protecting case.

42 Dismantling the engine/gearbox unit: removing the cylinder head, barrel and piston

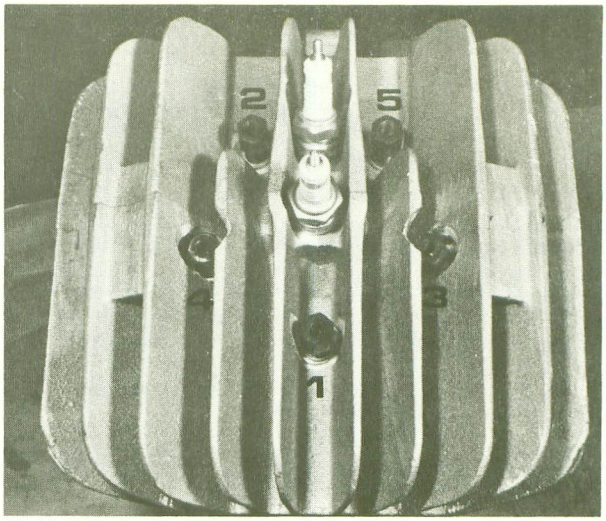
1 Remove the cylinder head nuts and lift off the cylinder head.
2 Lift and slide off the cylinder barrel from the studs. Support the piston and connecting rod, to prevent damage by them striking the crankcase mouth or the studs. **Note:** The cylinder head and/or barrel may be stuck and require the cautious use of a soft faced hammer. Do not use a screwdriver to lever them off.
3 Remove the piston circlips and push out the gudgeon pin. If the pin is a tight fit warm the piston. Remove the needle roller small end bearing from the connecting rod.

43 Dismantling the engine gearbox unit: removing the rotary disc valve

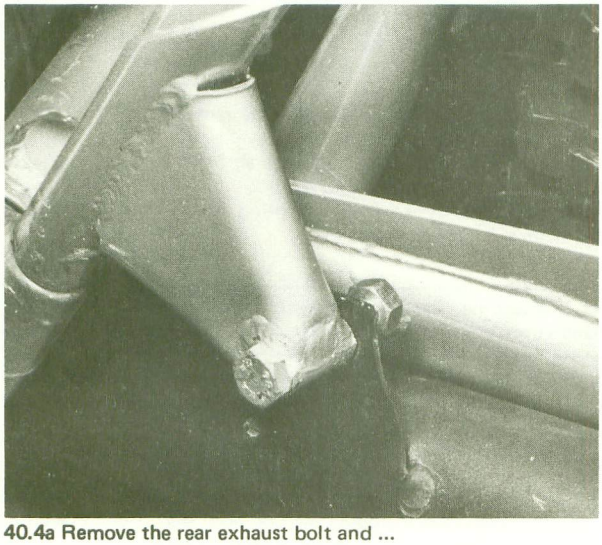
1 Remove the six bolts that retain the disc valve outer cover and pull off the cover. The cover is a tight fit and can be a little difficult to remove. Note the sealing 'O' ring.
2 Unscrew the crankshaft nut that retains the disc valve. Remove the washers, spacers, shims and disc valve. Make a particular note of the order of removal as the correct replacement of them is essential. Also note the position of the disc valve on the crankshaft square.



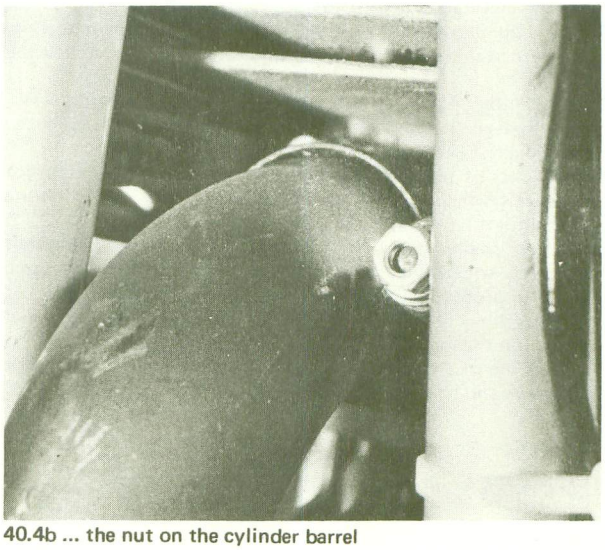
30.9 Tighten the cylinder base nuts diagonally



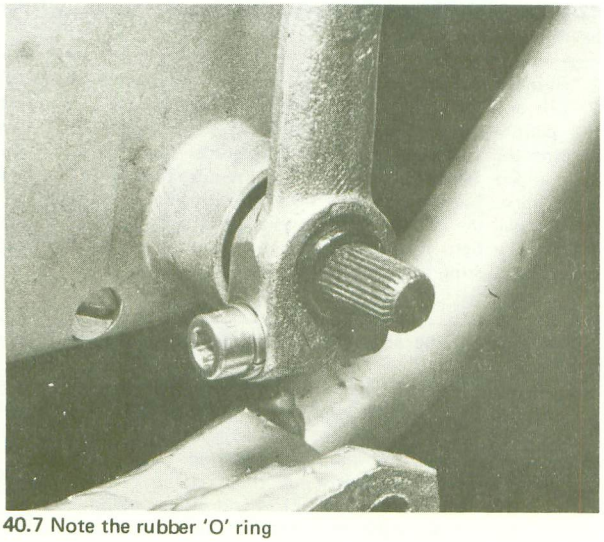
30.11 Cylinder head nut tightening order



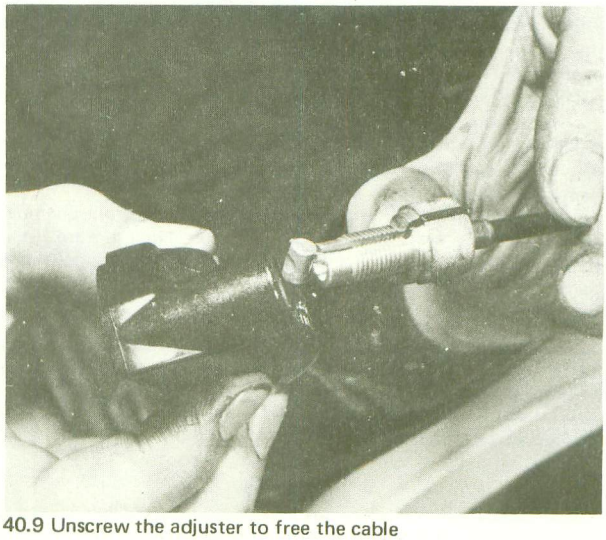
40.4a Remove the rear exhaust bolt and ...



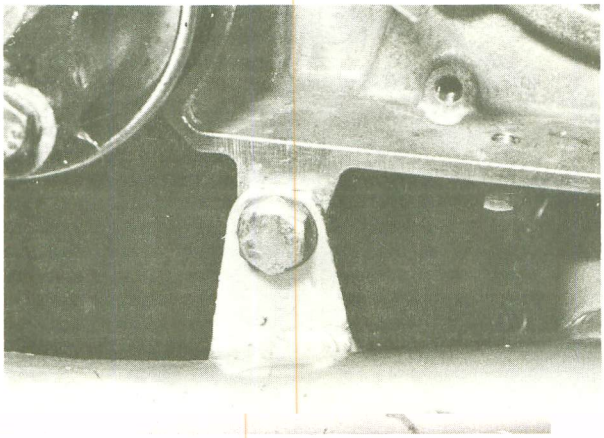
40.4b ... the nut on the cylinder barrel



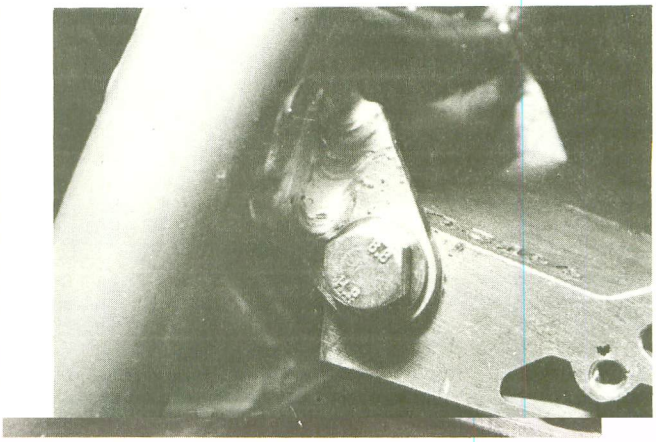
40.7 Note the rubber 'O' ring



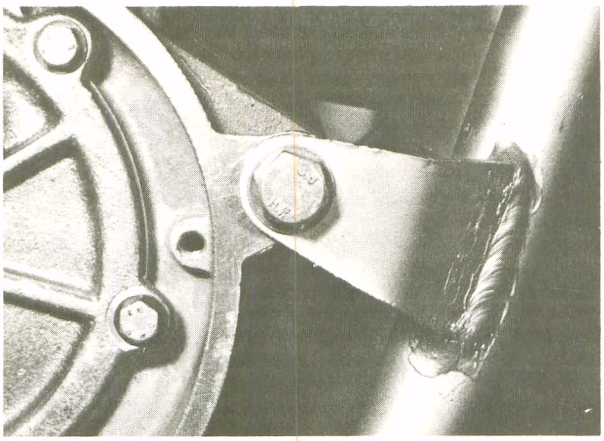
40.9 Unscrew the adjuster to free the cable



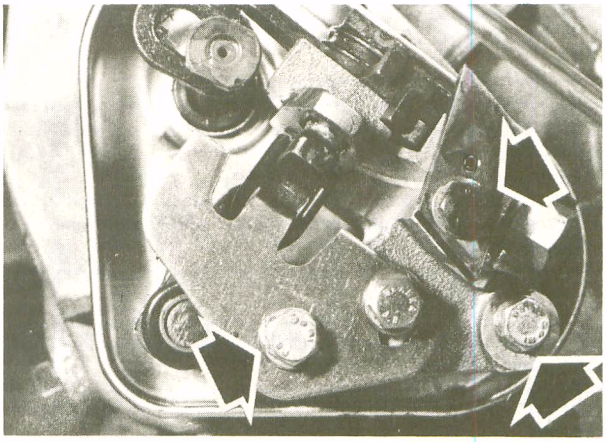
40.12a Remove the bottom ...



40.12b ... rear and ...



40.12c ... front engine bolt



41.3 Three bolts retain the gear selector

44 Dismantling the engine/gearbox unit: removing the left hand cover

1 Remove the eight screws from the left hand side cover. Rotate the clutch arm to lift the cover off its locating dowels. The ignition, clutch and primary drive are now exposed.
2 If required, the clutch operating arm can be removed by undoing the retaining screw and pulling it out from the cover.

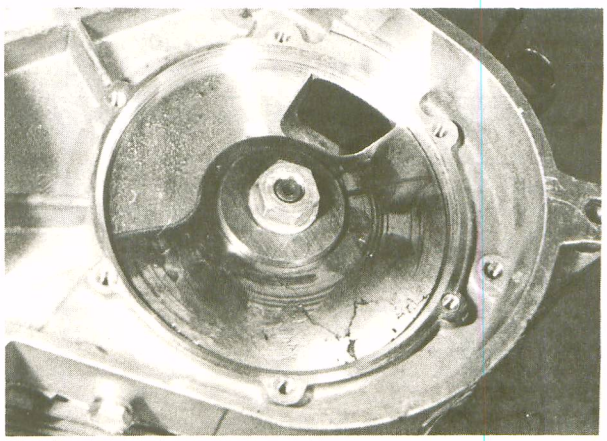
45 Dismantling the engine/gearbox unit: removing the generator, rotor and stator

Six speed model

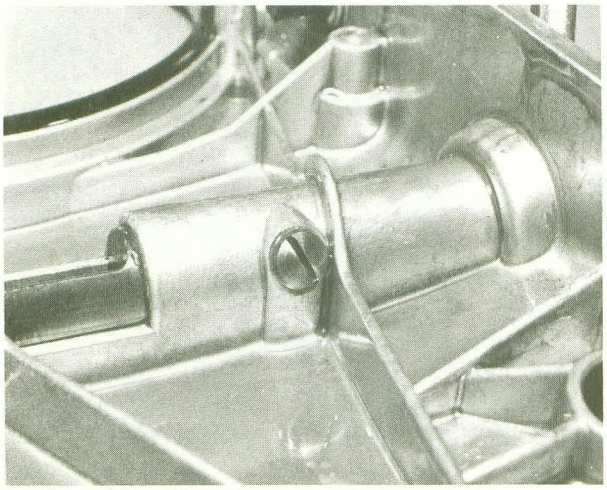
1 Remove the three nuts and washers that retain the stator. Remove the wire that connects with the coil from the contact breakers. Lift the stator off the studs.
2 Remove the rotor bolt. Insert a rod, ¼ in. x 1¾ in. long (an old bolt with the head cut off will suffice) into the crankshaft hollow hole and screw in the rotor bolt. Apply some pressure and give the rotor bolt a sharp tap with a hammer. The rotor should be forced off its taper.
3 Remove the three Allen screws in the outer cover of the stator. Lift the cover out. Note the sealing 'O' ring behind the cover.
4 Remove the contact breaker wire by pulling it out from the crankcase along with its rubber grommet.

Five speed model

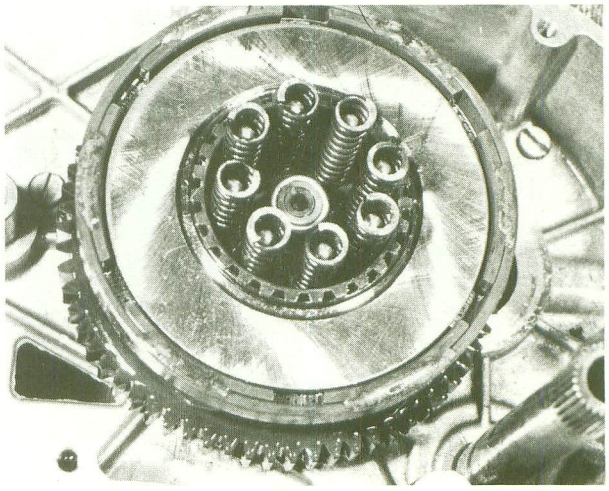
5 Slacken and remove the rotor nut. It has a left hand thread.
6 If a Maico puller is not available use a small universal three legged puller to remove the rotor from the shaft. Do not lose the Woodruff key.



43.2 Remove the disc valve nut



44.2 A screw retains the clutch operating arm



47.1 Remove the clutch springs

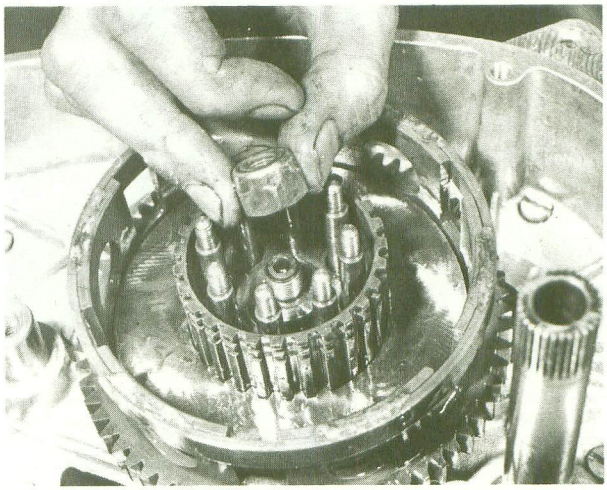
7 Remove the three screws from the stator plate and lift it out complete with the contact breaker, after disconnecting the leads. The Moto-Cross version has only one coil on the stator while the Enduro has two. The second coil is to provide the energy for the lights.

46 Dismantling the engine/gearbox unit: removing the final drive sprocket

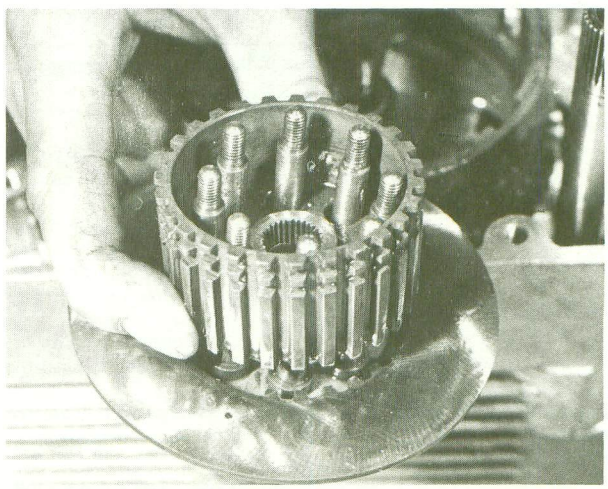
Refer to Section 9.

47 Dismantling the engine/gearbox unit: removing the clutch and primary drive

1 Remove the eight clutch nuts (screws are fitted to earlier models), by unscrewing them a little at a time to relieve the spring pressure evenly. Lift off the pressure pin and plate and also the eight clutch springs.
2 Remove the first circlip and lift out the first clutch plate. Remove the second circlip and lift out the remaining clutch plates. Note that the first clutch plate differs from the others.
3 Remove the clutch centre nut and lift out the centre and backplate. Lift the clutch housing and primary driven gear off the gearbox input shaft. Note the bush and shim.
4 Lift off the spacer on the primary drive intermediate gear, followed by the gear and needle roller bearing. On some models the gear is held in place by a mounting block retained by three screws, which will have to be removed first.
5 Remove the crankshaft nut. This has a left hand thread. Remove the washer, primary drive gear and Woodruff key.



47.3a Remove the clutch centre nut and ...



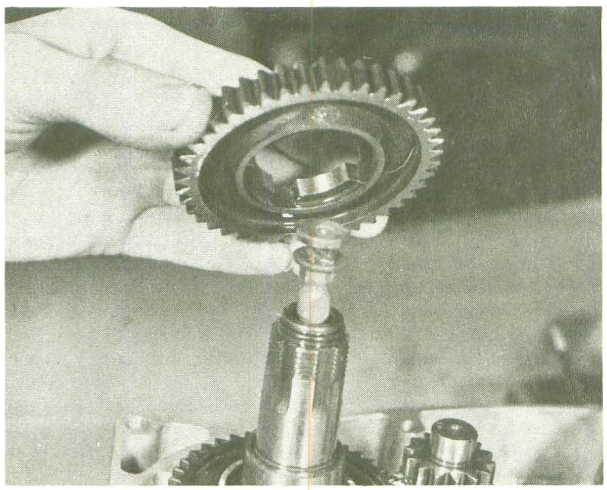
47.3b ... lift the centre and backplate out

48 Dismantling the engine/gearbox unit: separating the crankcases

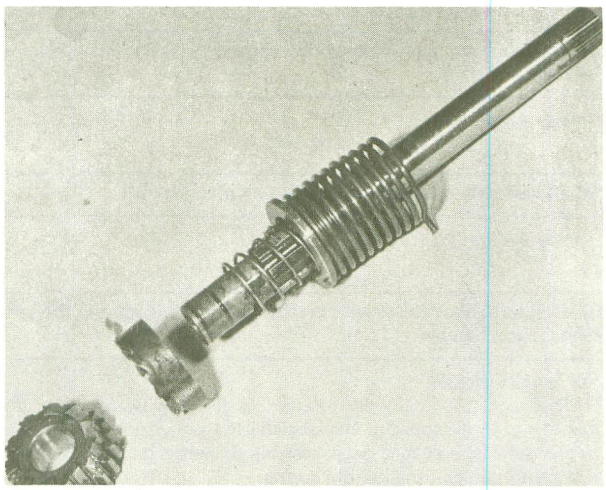
1 Remove the ten screws securing the crankcases together. Separate the crankcases, using a soft faced hammer if they are difficult to part. Do not use force or a screwdriver. Lift the right hand crankcase off, leaving the gears, kickstart and crankshaft in the left hand crankcase.

49 Dismantling the engine/gearbox unit: removing the gear pinions, kickstarter and crankshaft

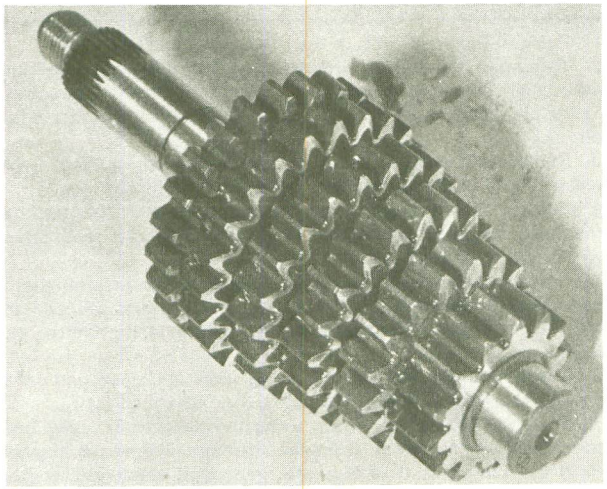
1 Lift the large gear off the output shaft. This enables the kickstarter mechanism and shaft to be removed, followed by gearbox output and input shafts complete with gears. Note the order of the gears and spacers.
2 Carefully lift out the crankshaft assembly and place it on one side.



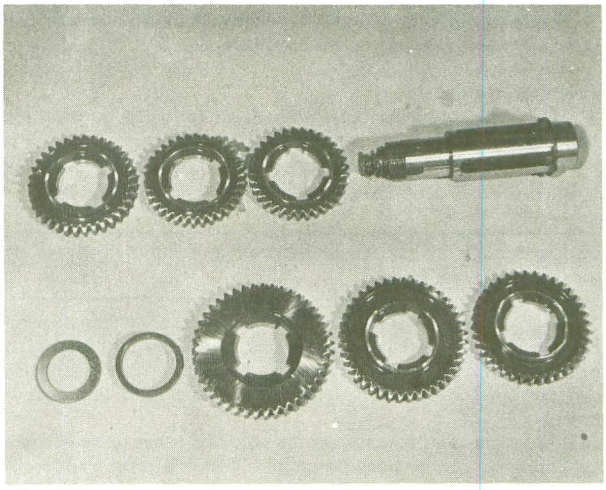
49.1a Lift off the first gear pinion



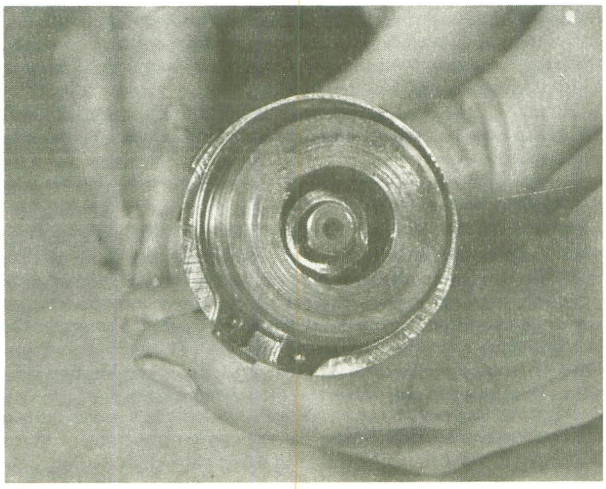
49.1b The kickstart assembly



49.1c The input shaft and gears are integral



49.1d The output shaft and gear pinions



49.3 Use a box spanner to undo the selector key

3 If it is required to strip the output shaft, note that all the threads are left handed. To remove the sliding gear selector key from the output shaft insert a screwdriver in the slot of the output shaft and turn the selector shaft clockwise by the locknut on the other end. Alternatively, use a box spanner directly on the selector key.

50 Examination and renovation: general

See Section 17.

51 Examination and renovation: decarbonising

See Section 18.

52 Examination and renovation: piston, cylinder bore and cylinder head

See Section 19.

53 Examination and renovation: bearings and oilseals

See Section 20.

54 Examination and renovation: gear pinions and clutch

See Section 21.

55 Examination and renovation: shimming the crankshaft and layshaft

See Section 22.

56 Reassembly of the engine/gearbox unit: general

See Section 23.

57 Reassembly of the engine/gearbox unit: reassembling the gear selector mechanism

Six speed model

1 Replace the camplate detent side downwards on the mounting block spindle. Replace the hairpin spring stop screw. Replace the gear change pawl, cast lug upwards, on the mounting block and reinstall the hairpin spring.
2 Insert the serrated spindle, making sure that the short dowel aligns with the hole in the pawl. Replace the link on the splined end of the serrated spindle. Make sure that the link is positioned at 90° from the pawl dowel.
3 Replace the circlip on the serrated shaft and fit the ball, spring and hollow bolt into the mounting block.

Five speed models

4 Insert the spring into the hollow bolt followed by the 7 mm ball bearing. Replace the camplate on the spindle.
5 Compress the ball and spring and turn the camplate so that it engages with the ball. Replace the camplate retaining circlip.

58 Reassembly of the engine/gearbox unit: adjustment of the gear selector mechanism

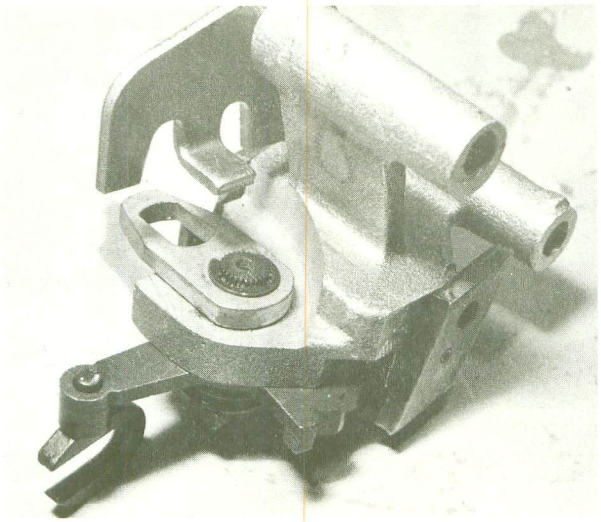
1 If any component of the selector shaft or mechanism has been renewed it will be necessary to adjust the mechanism. If, however, nothing has been renewed, the gear selector mechanism can be replaced as a complete unit and the following Section omitted.
2 Before the gear selector can be adjusted it has to be partially assembled in the engine. Paragraphs 7 and 8 refer to the five speed model and paras. 9 and 10 to the six speed model. The adjustment of the selector key is covered by paragraph 11 onwards. The adjustment of the key is critical, since if incorrect, the machine will jump out of gear.
3 Renew the rubber 'O' ring on the gearbox output shaft and insert the shaft into the crankcase. Replace the final drive sprocket, tab washer and nut. Lock the sprocket with a chain wrench, tighten the nut and bend over the tab washer. If a chain wrench is not available jam the sprocket against the crankcase with a wedge but be very careful not to crack the crankcase, when tightening.
4 Renew the rubber 'O' ring in the gear lever shaft hole.
5 Insert the selector key into the slot in the gearbox output shaft. Apply Loctite (or a similar compound) to the thread of the selector shaft and pass it through the bore of the gearbox output shaft. Thread the selector shaft in the selector key and tighten it to the recommended torque setting. Note that both ends of the selector shaft have left hand threads.
6 Replace the gear selector shroud over the gear selector mechanism locating dowels. Do not forget to renew the rubber 'O' ring behind it.
7 In the case of the five speed gearbox, instal the horseshoe yoke, open end forward, onto the selector shaft spool and insert the yoke pin through the hole in the camplate. Replace the mounting block, making sure that it seats down over the dowels.
8 Replace the three screws, the shortest one being located in the uppermost position.
9 For the six speed version, place the thickest pawl stop in the vertical position and then replace the horseshoe yoke, open end forward. Replace the mounting block, making sure that the inner pawl stop is properly aligned.
10 Replace the outer pawl and bolt. The pawl stop must be forward enough to clear the camplate and rearward enough to clear the top of the pawl actuator (later models have roll pins to locate the pawl stop and no adjustment is necessary). Replace the remaining two bolts and tighten them after positioning the camplate in the first gear position.
11 Whenever a gear is changed the selector mechanism moves the selector shaft into the next groove. If the key does not align with the groove, the machine will jump out of gear. To adjust the position of the selector key, place the camplate in the first gear position which gives easier access to the spool and locknut. Check the position of the key in the groove; it should be central. If adjustment is required, loosen the locknut and turn the spool whilst holding the selector shaft, until the correct position has been obtained. Tighten up the locknut and recheck the alignment. Also check that the alignment is correct in the other grooves. Readjust as necessary. Refer to Fig. 1.xx which shows the output shaft and selector assembly.

59 Reassembly of the engine/gearbox unit: replacing the crankshaft, gear pinions, kickstarter and joining the crankcases

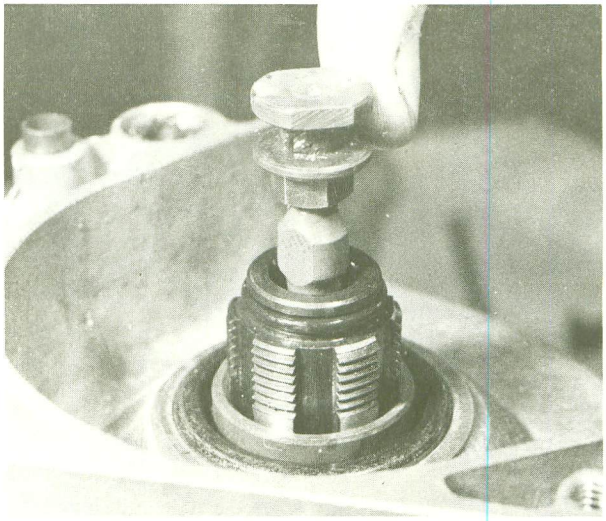
1 Position the crankshaft in the left hand crankcase.
2 Assemble the gearbox output shaft and gears. Replace the input shaft/gear assembly and the gearbox output shaft assembly in the crankcase, except for first gear which is the large diameter pinion.
3 Replace the kickstarter spring, locating the spring tang in the recess. Fit the kickstarter shaft, washer and ratchet spring.
4 Replace the first gear pinion on the output shaft followed by the collar and shims (note that the first gear should be replaced with the flat face outwards).
5 Replace the ratchet and ratchet gear on the kickstarter shaft, making sure the ratchet gear engages with the first gear pinion when it is depressed. Temporarily fit the kickstarter lever to the shaft.
6 Check that the crankcase jointing faces are clean and fit a new gasket. Hold it in position with a little gasket cement.
7 Turn the kickstarter shaft, using the kickstarter lever, one turn clockwise as viewed from the left hand side of the engine. Hold the tension and replace the right hand crankcase, gently tapping it home over the locating dowels. Do not use force; the crankcase halves should align and fit together with ease. If not, check that nothing is obstructing them. Replace the kickstarter stop bolt. Tighten the ten crankcase screws in a diagonal sequence.
8 It is a good idea to place some rag in the crankcase mouth at this stage to prevent anything from falling in and to stop damage caused to and by the connecting rod.

60 Reassembly of the engine/gearbox unit: replacing and timing the disc valve

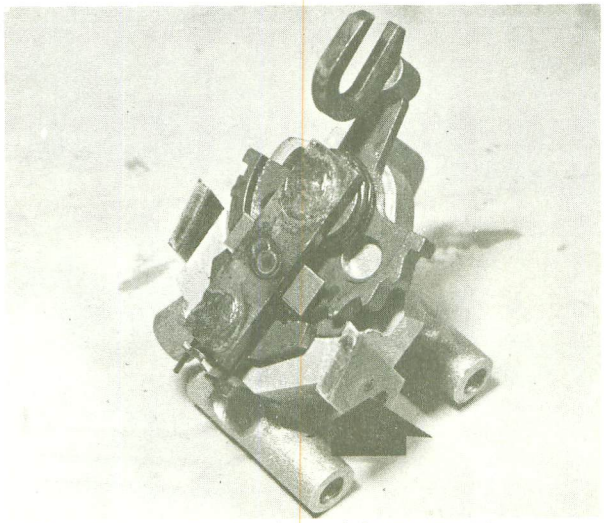
1 Replace the disc valve, washers and shims in exactly the reverse order of removal. The chamfer on the back spacing washer faces downwards. If the crankshaft assembly and/or bearings have been renewed, the disc valve will probably need re-shimming. Check the clearance by placing a straight edge on the large chamfered washer and check the clearance between the straight edge and the crankcase. Adjust as required, with shims until the correct clearance is obtained. See Specifications. The shims should be placed under the chamfered washer.
2 With the connecting rod at T.D.C. replace the disc valve onto the crankshaft. See photograph for the correct position.
3 Replace the other chamfered washer with the chamfer outwards, followed by the wave lock washer and nut. Tighten the retaining nut (lock the engine as described in Section xx of this Chapter).
4 Replace the disc valve cover using a new rubber 'O' ring. Tighten the bolts in a diagonal sequence.



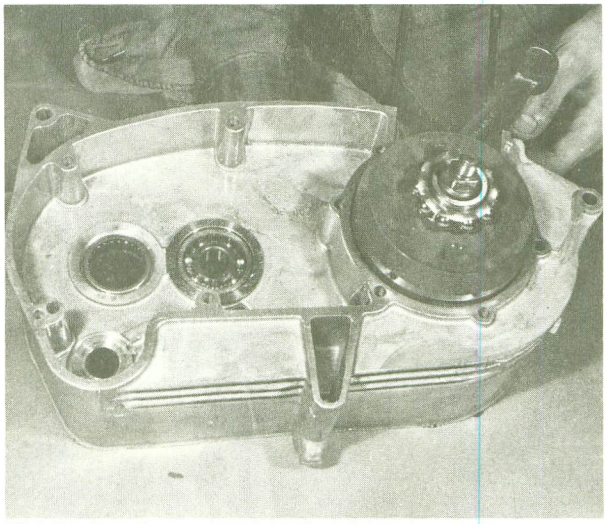
57.3 Replace the circlip



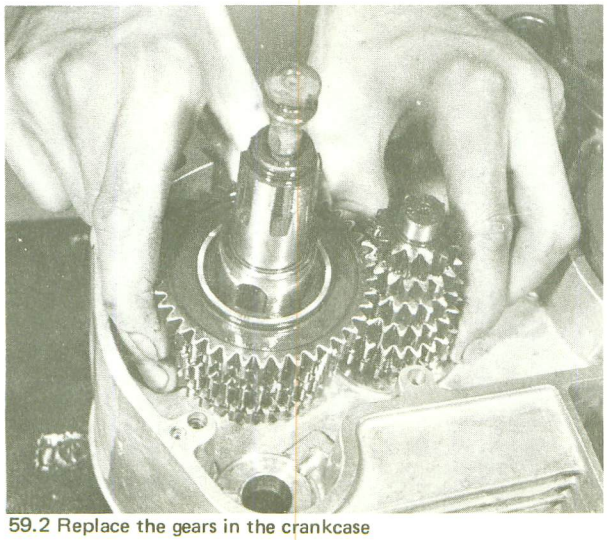
58.3 Renew the rubber 'O' ring. Note the spool locknut



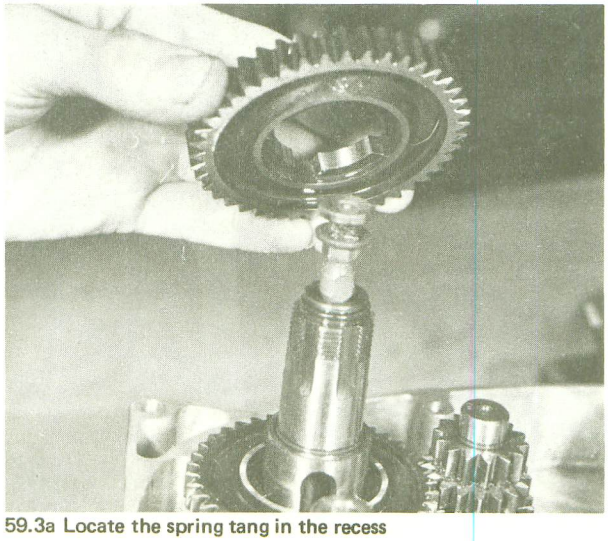
58.10 Roll pins are fitted to the pawls in later models



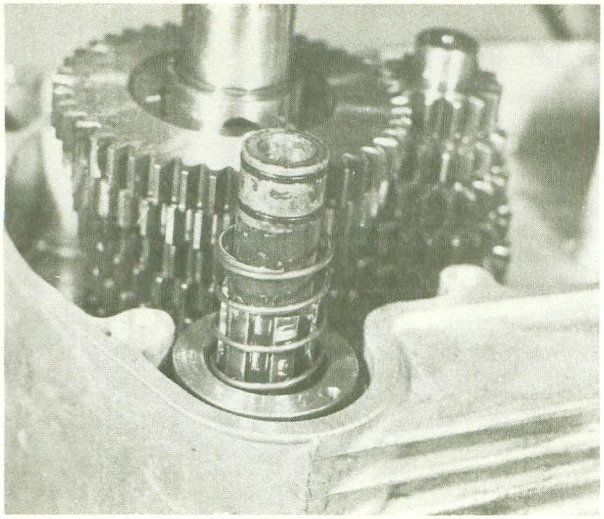
59.1 Replace the crankshaft in the left hand crankcase



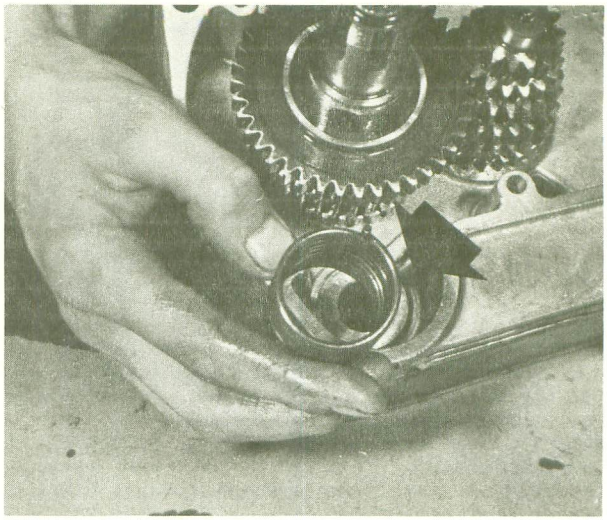
59.2 Replace the gears in the crankcase



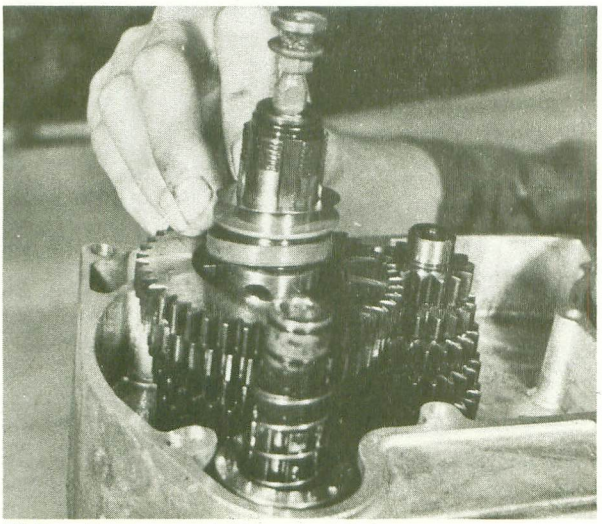
59.3a Locate the spring tang in the recess



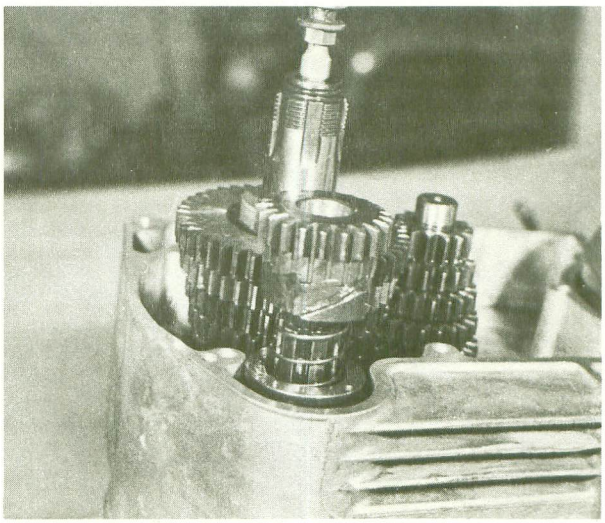
59.3b Replace the washer and spring



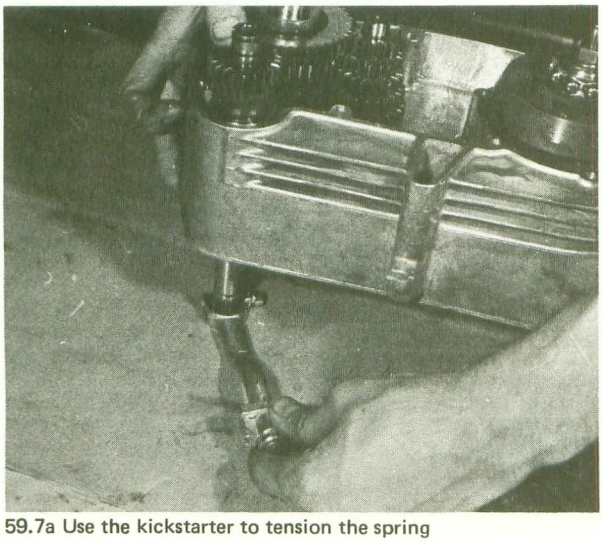
59.4a Replace the first gear pinion and ...



59.4b ... its spacers and shims

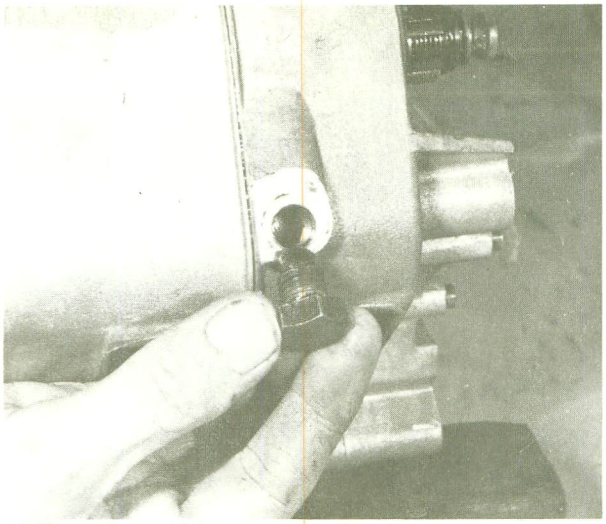


59.5 Replace the kickstarter ratchet gear

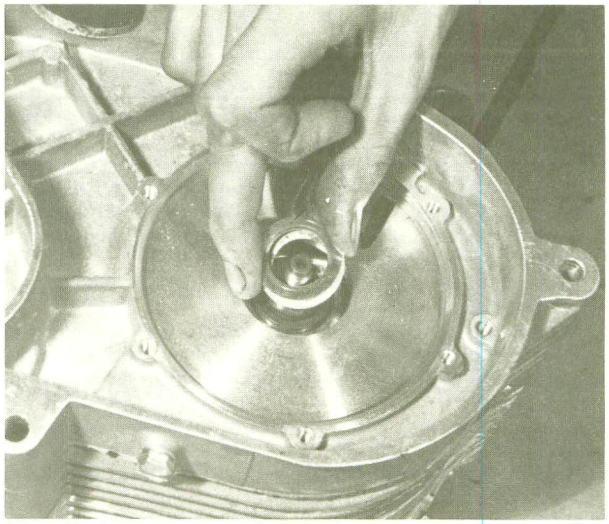


59.7a Use the kickstarter to tension the spring

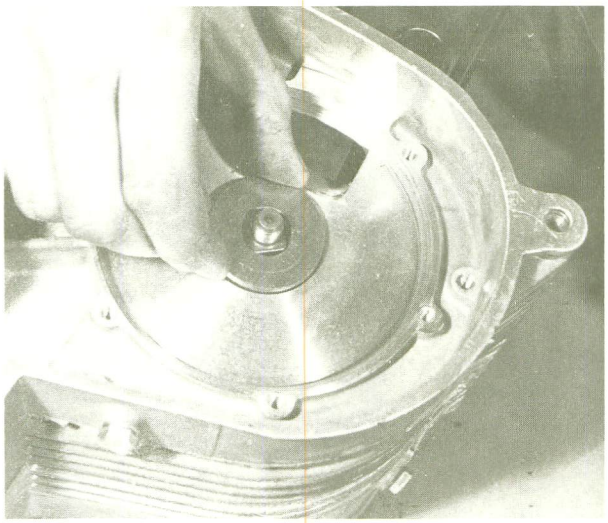
59.7b Replace the right hand crankcase and ...



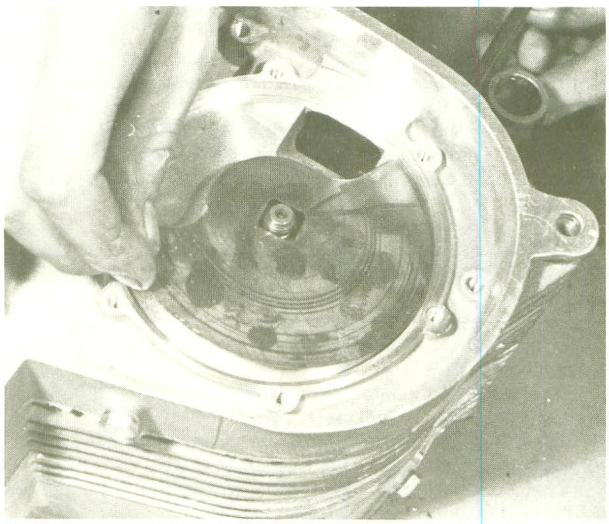
59.7c ... refit the kickstarter stop bolt



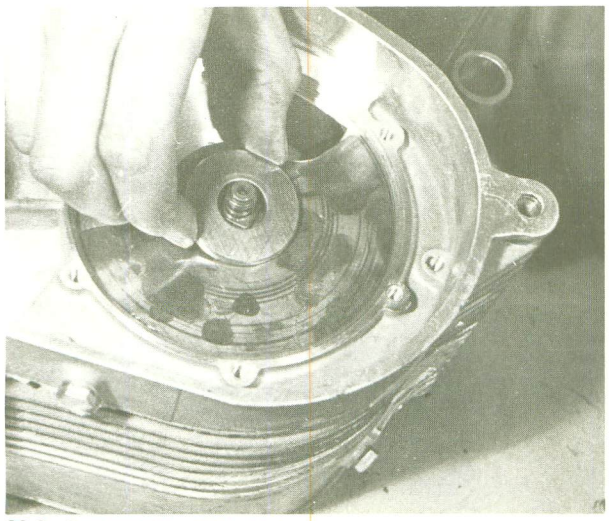
60.1a Replace the spacer, shims and ...



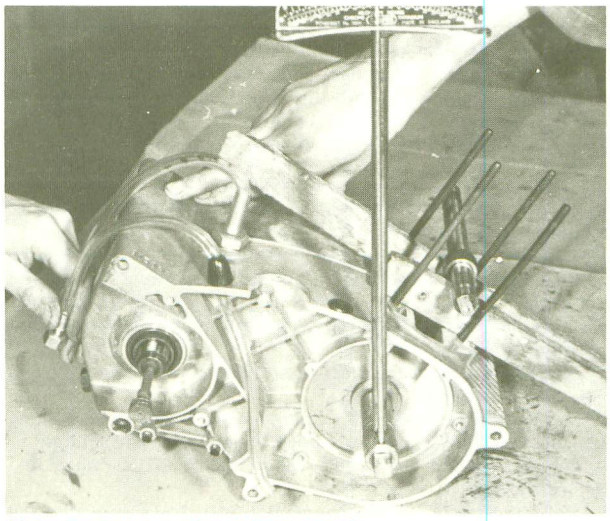
60.1b ... washer



60.2 Correct position of disc valve with engine at T.D.C.



60.3a Replace the washer and ...



60.3b Tighten nut with torque wrench

61 Reassembly of the engine/gearbox unit: replacing the primary drive and clutch

1 Replace the primary drive gear, washer and nut on the crankshaft and tighten the nut up. Note that the thread is left handed.
2 Replace the thrust washer on the gearbox input shaft, followed by the bearing bush.
3 Replace the clutch housing followed by the backplate and clutch centre. Tighten the clutch centre nut.
4 Replace the clutch plates, lined one first, then alternatively plain and lined. When replacing the lined plates make sure that the grooves are positioned so that the oil is centrifugally thrown out (see photo).
5 When all the lined plates have been installed, replace the rolled circlip on the clutch centre.
6 Replace the final clutch plate with the central counterbore facing outwards. Replace the second rolled circlip.
7 Replace the clutch springs and position the pressure plate/pin assembly on the springs so that when the springs are compressed the studs will enter the holes in the plate.
8 Compress the springs using a two or three legged universal puller. Replace the self locking nuts (use new nuts) and tighten them right home. Remove the puller.
9 Replace the intermediate gear needle roller bearing, followed by the gear with its flange upwards and the spacing collar. Some models are fitted with a gear carrier which is assembled by inserting the needle roller bearing into the gear, which is then placed in the carrier with a thrust washer either side. Replace the unit in the crankcase and align it on the locating dowels, making sure that the gears are in mesh and fit the three screws.

62 Reassembly of the engine/gearbox unit: replacing the left hand cover

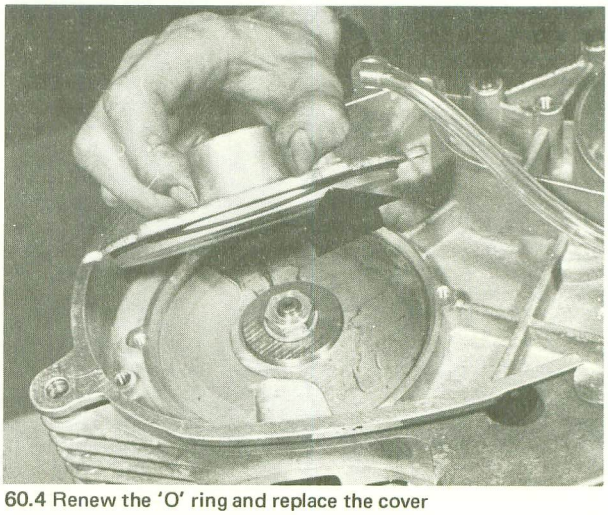
1 Replace the clutch operating lever into the cover and tighten the retaining screw.
2 Renew both the stator cover seal and the kickstarter gear lever shaft 'O' ring.
3 Check that the jointing faces are clean. Fit a new gasket, holding it in position with a little gasket cement.
4 Replace the left hand cover on the crankcase and tighten the eight screws in an even and diagonal sequence.

63 Reassembly of the engine/gearbox unit: replacing the final drive sprocket

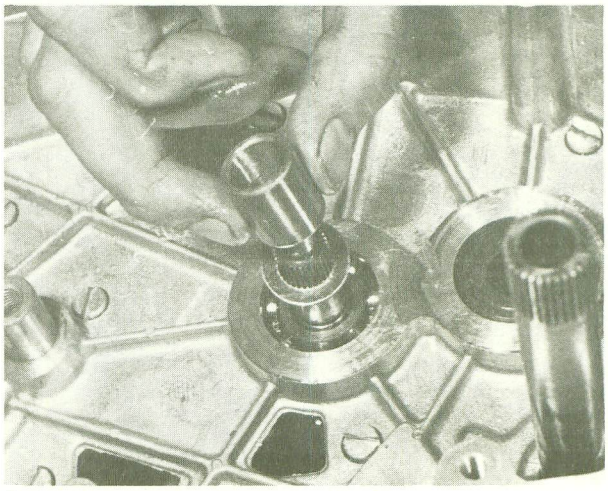
1 Replace the final drive sprocket with the counter bore upwards. Fit the tab washer and nut with its raised side downwards. Tighten the nut and bend over the tab washer to lock it in position.
2 Fit a new rubber 'O' ring on the gearbox shaft.

64 Reassembly of the engine/gearbox unit: replacing the piston, cylinder barrel and head

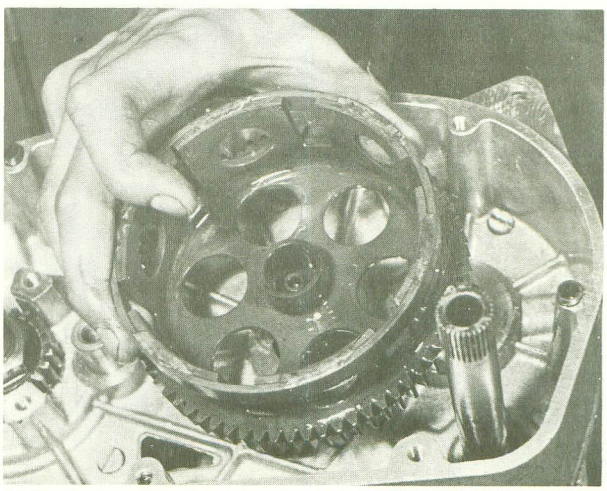
1 Check that the jointing faces on the cylinder barrel and crankcase mouth are clean. Fit a new cylinder base gasket and trim off any excess gasket that protrudes into the crankcase mouth or ports.
2 Replace the Dykes piston ring on the piston, aligning the gap with the locating peg.
3 Replace one of the piston circlips in the piston boss, making sure that it is located with its groove. Always use new circlips.
4 Oil and replace the needle roller small end bearing in the connecting rod.
5 Refit the piston to the connecting rod. Make sure that the arrow on the piston crown points forwards, towards the exhaust port. Replace the other circlip, making sure that it is seated properly. If the gudgeon pin is a tight fit in the piston pre-heat



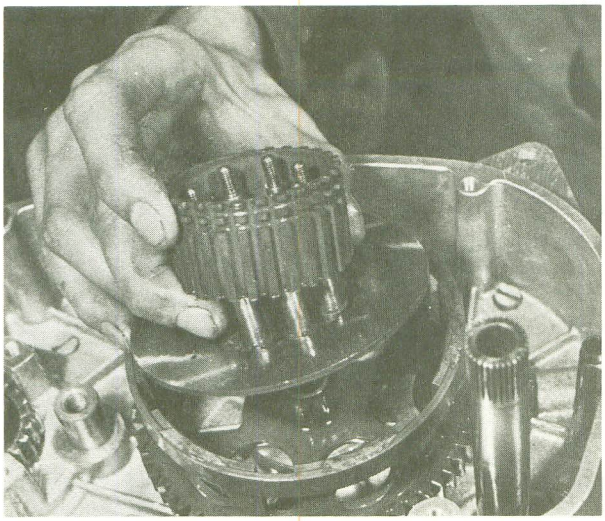
60.4 Renew the 'O' ring and replace the cover



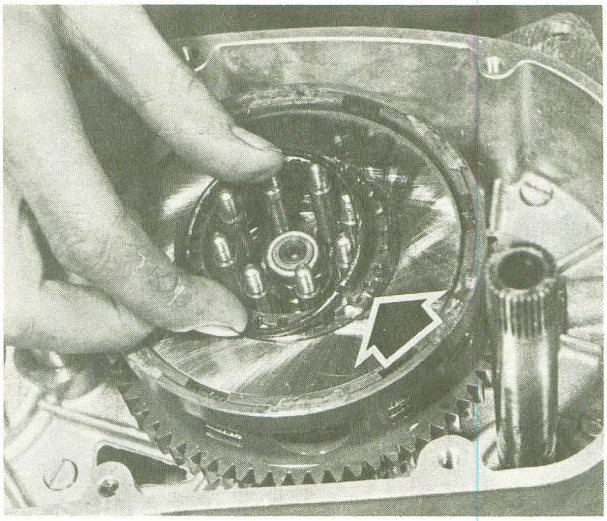
61.2 Replace the thrust washer and bearing



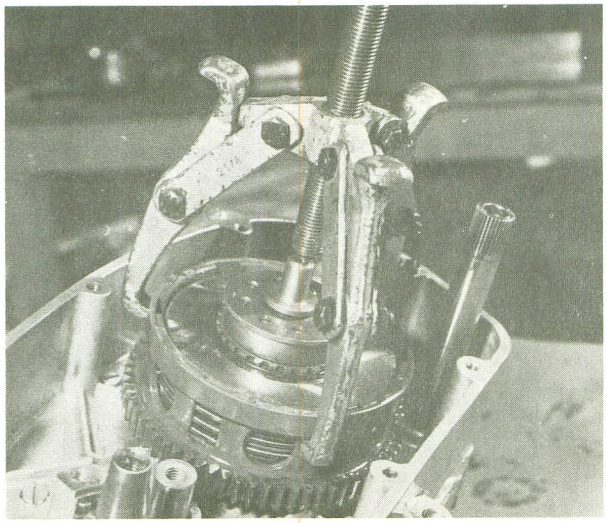
61.3a Replace the clutch housing followed by ...



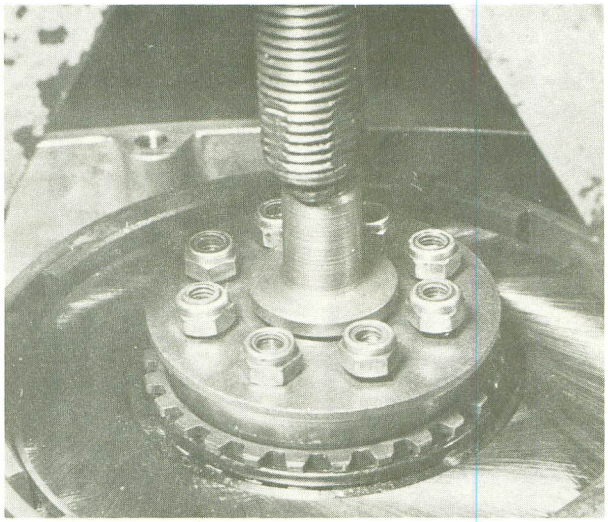
61.3b ... the clutch centre and backplate



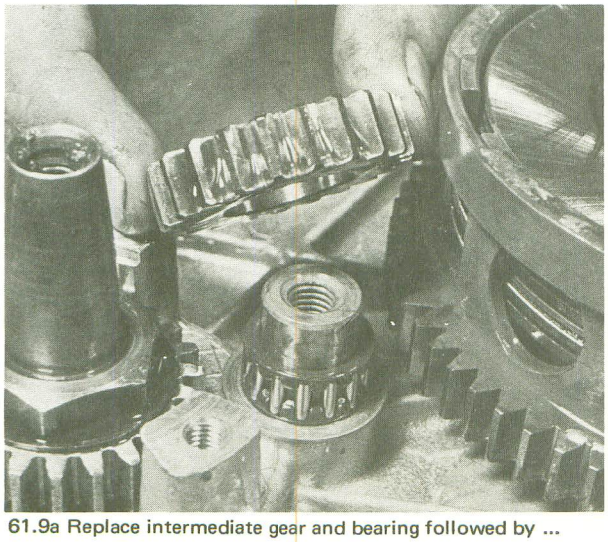
61.4 Fit the rolled circlip



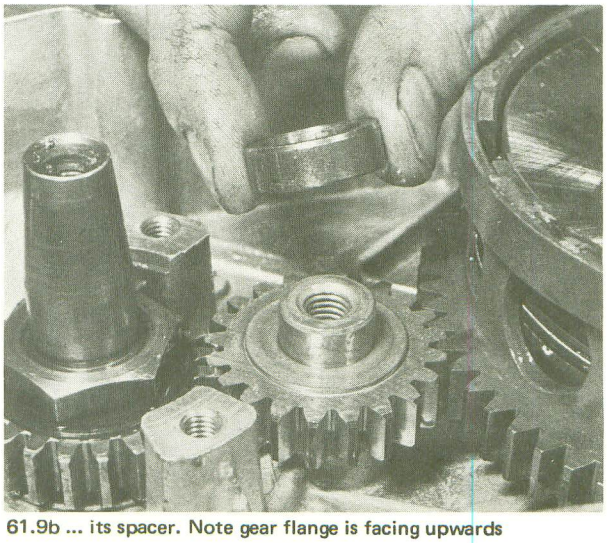
61.8a Use a universal puller to compress the clutch springs



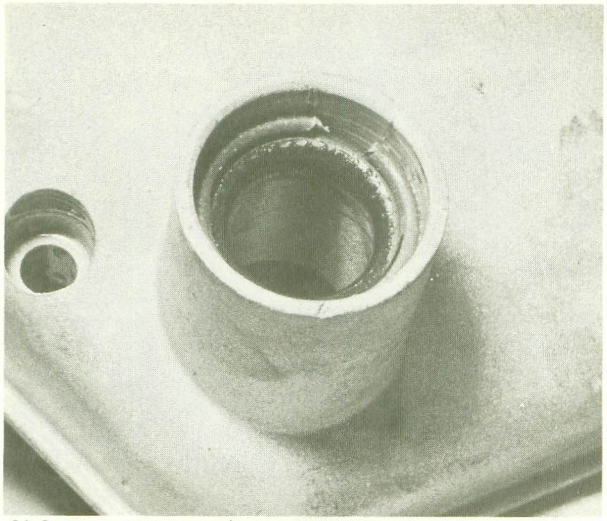
61.8b Renew and tighten clutch nuts



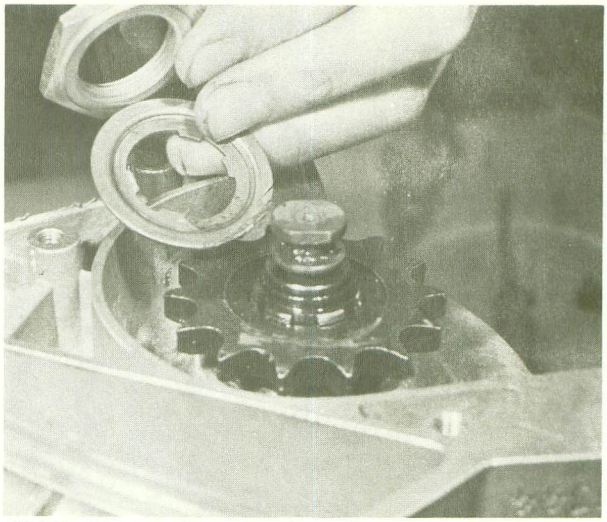
61.9a Replace intermediate gear and bearing followed by ...



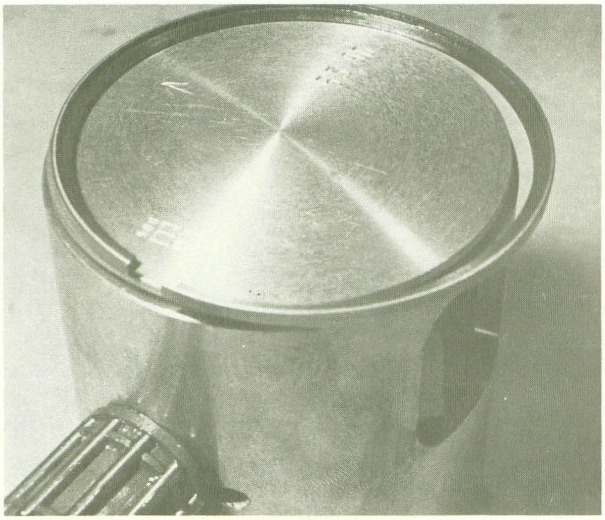
61.9b ... its spacer. Note gear flange is facing upwards



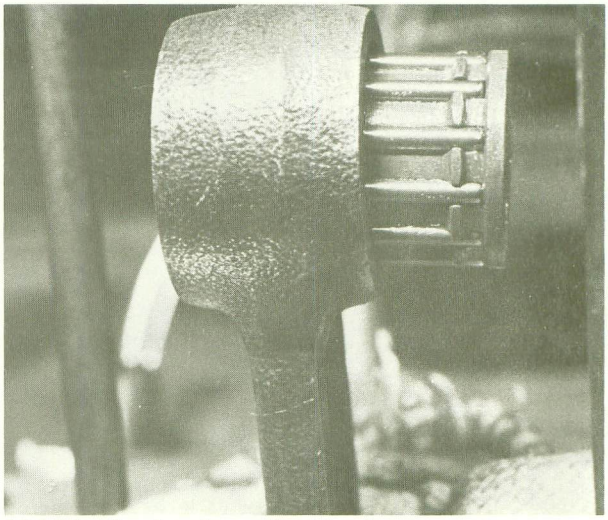
62.2 Renew kickstarter/gear lever shaft oil seal



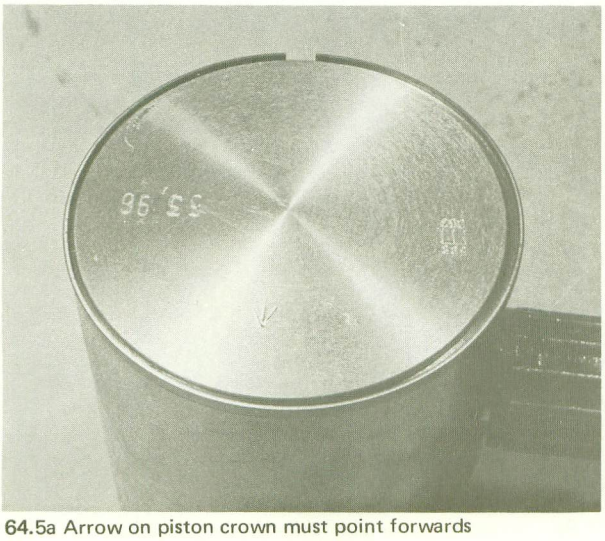
63.1 Replace sprocket, tabwasher and nut



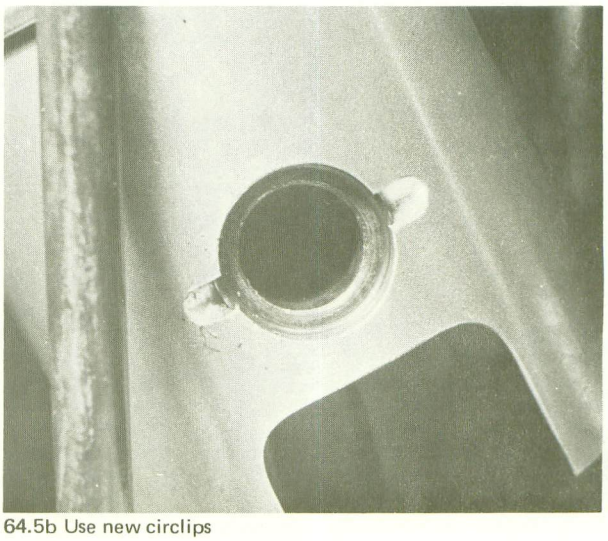
64.2 Align Dykes piston ring with end peg



64.4 Oil and replace the small end bearing

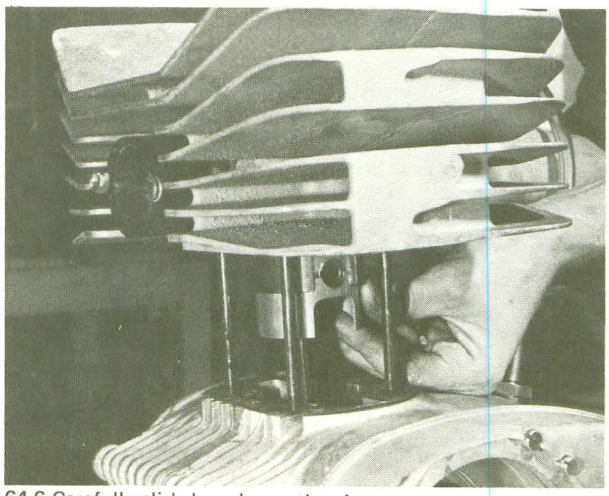


64.5a Arrow on piston crown must point forwards



64.5b Use new circlips

the piston in some boiling water.
6 Slide the cylinder barrel over the studs with the exhaust port facing forwards. Enter the piston into the barrel whilst compressing the piston ring with your fingers. Do not use force. Remove any rag that may be in the crankcase mouth and slide the cylinder barrel home.
7 Do not replace the cylinder head at this stage if it is required to set or check the ignition timing.
8 Replace the exhaust pipe adaptor, using a new gasket and tighten the four Allen screws.
9 Check that the jointing faces are clean. Fit a new cylinder head gasket and do not use gasket cement. Replace the cylinder head, tightening the nuts in a diagonal sequence.


64.6 Carefully slide barrel over the piston

65 Reassembly of the engine/gearbox unit: replacing the stator cover

1 Renew the oilseal fitted in the centre of the stator cover.
2 Fit a new rubber 'O' ring into the recess in the crankcase through which the contact breaker wire is fed.
3 Replace the stator cover and tighten the three Allen screws evenly.

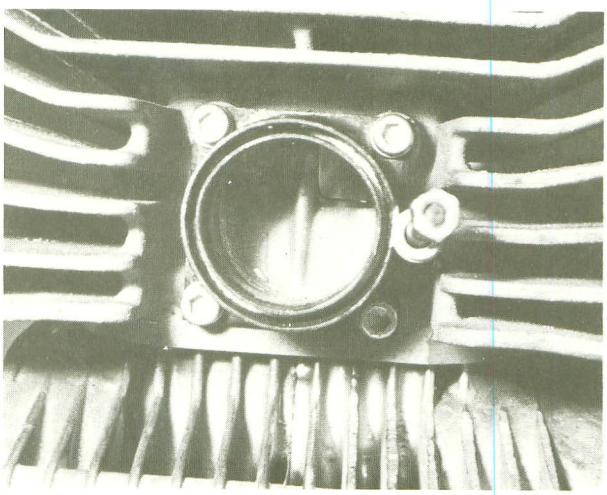
66 Reassembly of the engine/gearbox unit: replacing the rotor and stator

Six speed model

1 Replace the rotor and bolt but do not tighten the bolt since the engine has to be timed. For ignition timing and setting the contact breaker gap, see Chapter 3, Section xx.
2 Feed the wire(s) through the crankcase and insert the rubber grommet. Replace the stator complete with the contact breaker and condenser. Connect the wire(s). Finger tighten the three stator retaining nuts.

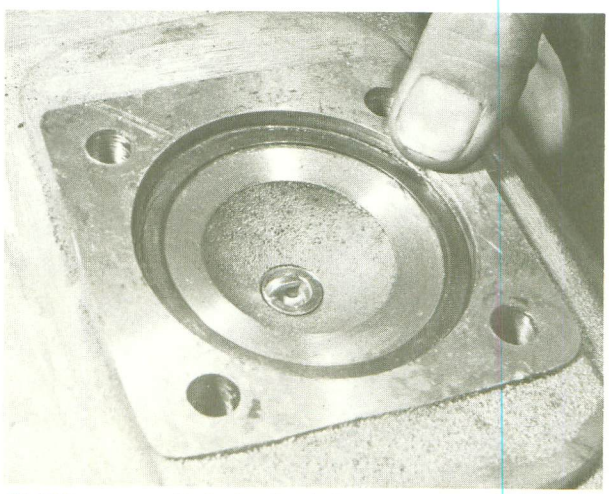
Five speed model

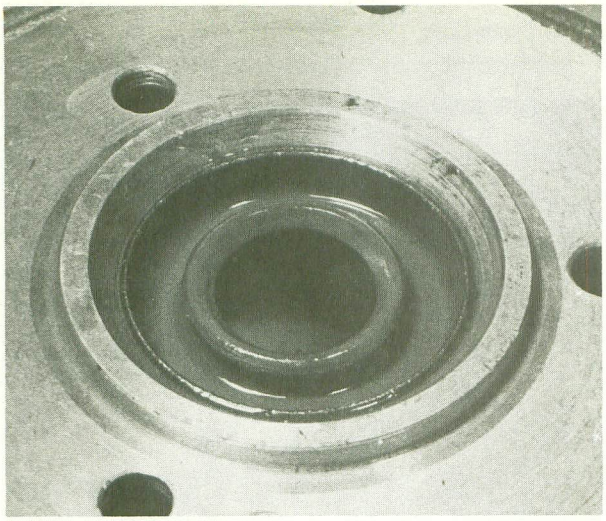
3 Feed the wire(s) through the crankcase and replace the rubber grommet.
4 Replace the stator complete with the contact breaker and condenser. Connect the wire(s). Replace and lightly tighten the three 4 mm screws securing the stator.
5 Fit the Woodruff key into the crankshaft and replace the rotor, making sure that its keyway aligns with the Woodruff key. Tighten the rotor bolt, which has a left hand thread. For ignition timing and setting the contact breaker gap, see Chapter 3, Section xx.


64.8 Replace the exhaust pipe adaptor

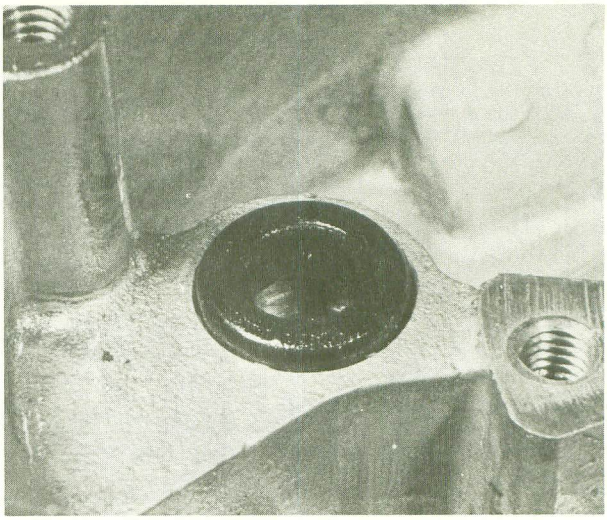
67 Reassembly of the engine/gearbox unit: replacing the gear selector mechanism

1 The gear selector mechanism can be replaced as an assembled unit. If it has been stripped down follow the procedure given in Sections 57 and 58 of this Chapter.
2 Replace the final drive sprocket as described in Section 63 of this Chapter.
3 Replace the pressed gear selector shroud. Do not forget to fit a new rubber 'O' ring behind the shroud.
4 Replace the hairpin spring onto the gear lever shaft and grease the shaft. Insert the gear lever shaft into the hole through the crankcase. Fit the gear selector mechanism and engage the horseshoe yoke. Position the unit on its locating dowels. Check that the gear lever shaft and spring are correctly positioned and replace the plate and bolt. Replace and tighten the three mounting block bolts. Check that the selector is operating correctly, and all the gears can be selected (turning the final drive sprocket whilst changing gear will make gear selection easier.
5 Thoroughly grease the mechanism and replace the rubber band around the selector shroud.

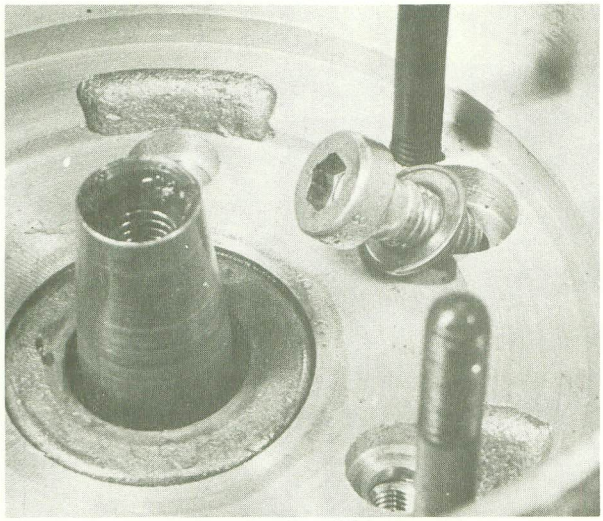

64.9 Use a new cylinder head gasket



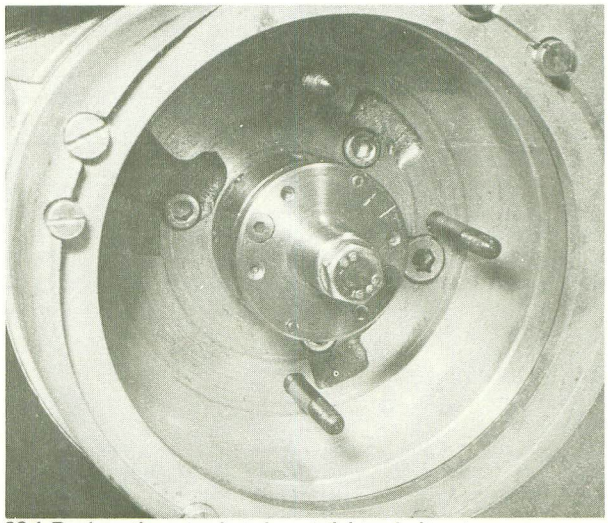
65.1 Renew the central oil seal



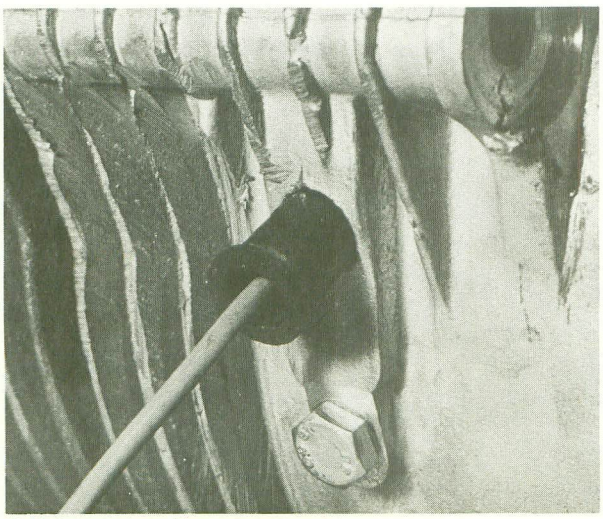
65.2 Renew the rubber 'O' ring



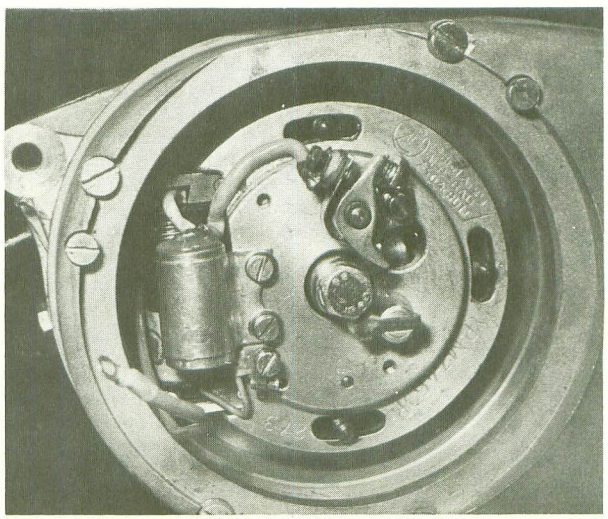
65.3 Replace and tighten the three Allen screws



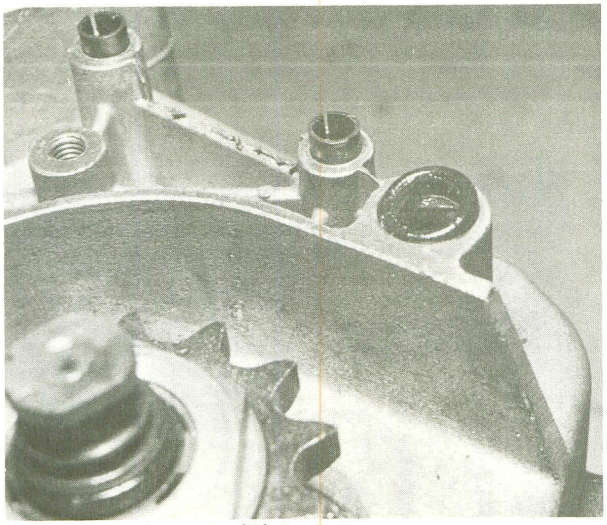
66.1 Replace the rotor but do not tighten bolt yet



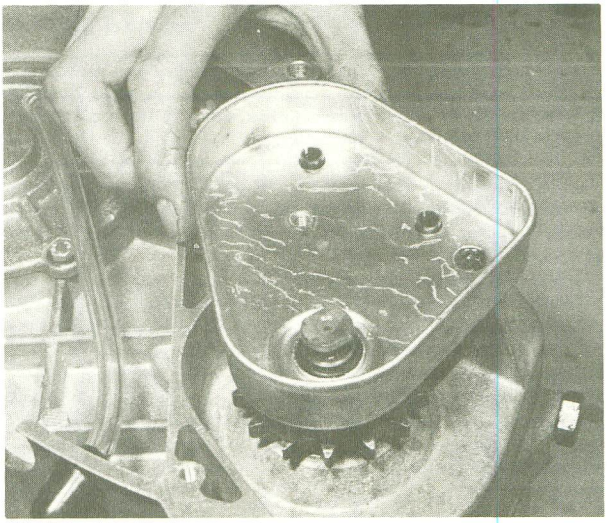
66.2a Insert the rubber grommet and ...



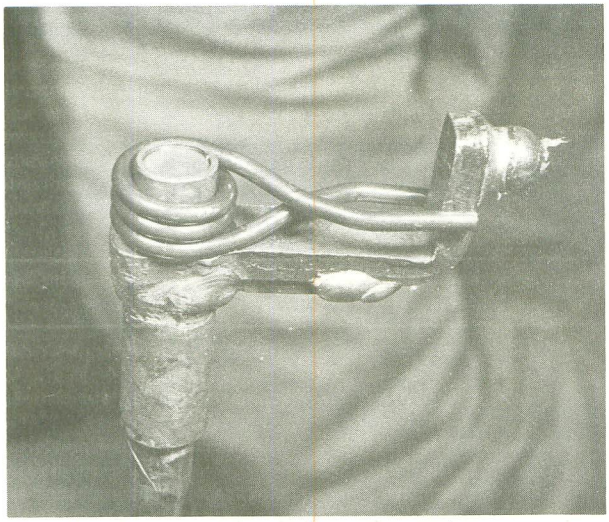
66.2b ... connect up the contact breaker wire



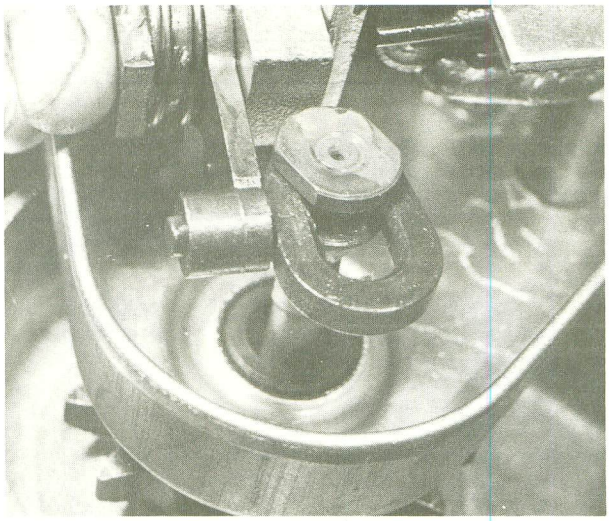
67.3a Renew the rubber 'O' ring and ...



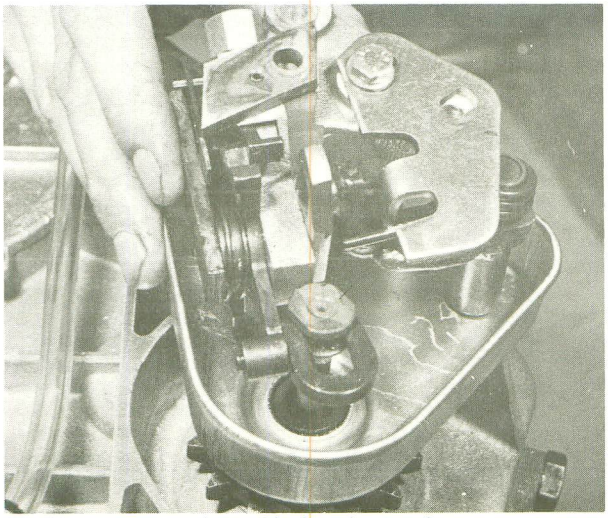
67.3b ... replace the shroud



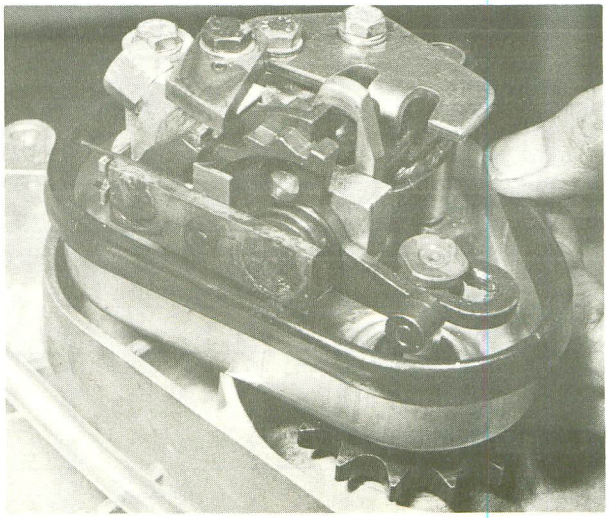
67.4a Correct fitting of the gear lever return spring



67.4b Engage the horseshoe yoke and ...



67.4c ... locate the selector block on its dowels



67.5 Replace the rubber sealing band

68 Reassembly of the engine/gearbox unit: replacing the carburettor and right hand cover

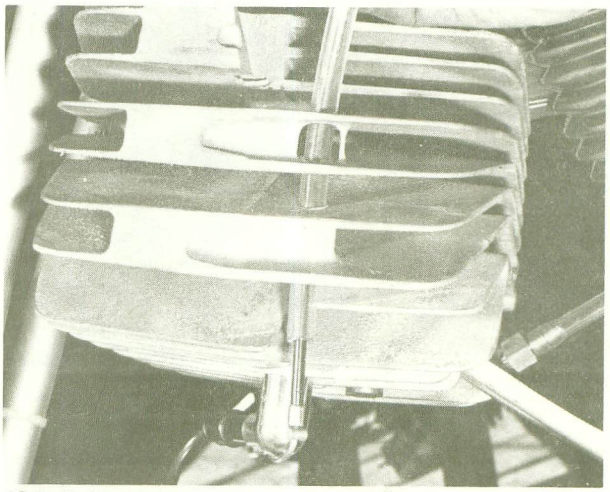
1 It is often more convenient to fit the carburettor and right hand cover after the engine has been installed into the frame. Refitting the engine into the frame is covered in the next Section.
2 Refit the carburettor onto the inlet stub and tighten the pinch bolt. The carburettor should be mounted so that it attains a vertical position when the engine is installed in the frame. Do not forget to fit both the cables and the petrol pipe.
3 Replace the right hand cover, making sure that the rubber seal around the top of the carburettor is correctly located (if the engine is in the frame fit the air filter rubber hose), and final drive chain. Replace the four retaining screws and tighten them.

69 Reassembly of the engine/gearbox unit: fitting the engine into the frame

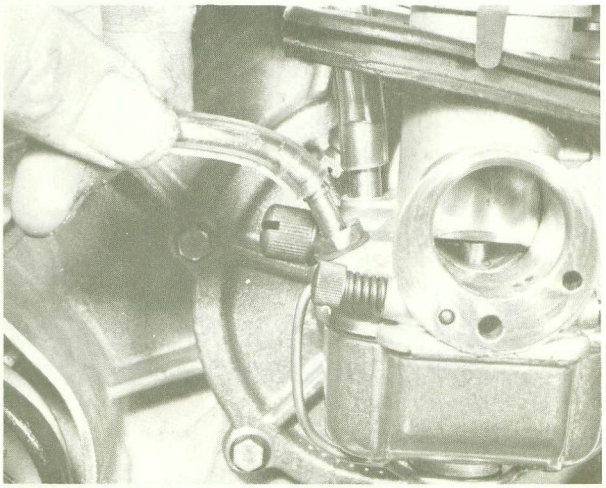
See Section 31.

70 Starting and running the rebuilt engine

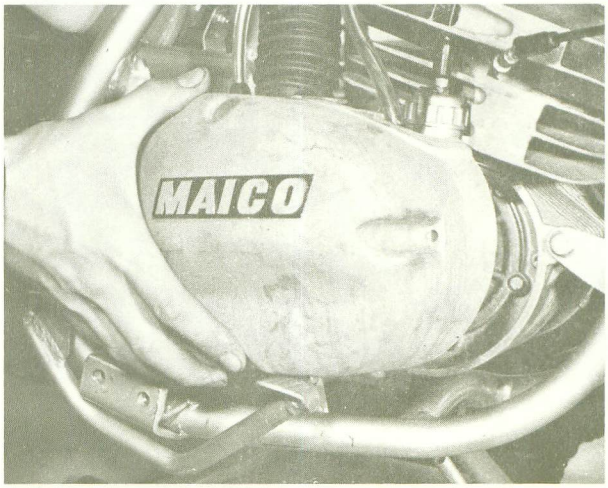
See Section 32.



68.2a Refit the carburettor cables and ...



68.2b ... petrol pipe



68.3 Replace the left hand side cover

71 Fault diagnosis: engine

Refer to Section 33.

72 Fault diagnosis: gearbox

Refer to Section 34.

73 Fault diagnosis: clutch

Refer to Section 35.

33 Fault diagnosis - engine

Symptom	Reason/s	Remedy
Engine will not start	Defective spark plug	Remove the plug and lay it on cylinder head. Check whether a good spark occurs when

		(ignition is switched on) the engine is rotated.
	Dirty or closed contact breaker points	Check condition of points and whether gap is correct.
	Faulty or disconnected condenser	Replace condenser if evidence of arcing, or if a weak spark is obtained and the plug is in good condition.
	Defective oil seals	Replace.
Engine runs unevenly	Ignition and/or fuel system fault	Check each system independently, as though engine will not start.
	Blowing cylinder head or base gasket	Leak should be evident from leakage where gas escapes. Replace.
	Incorrect ignition timing	Check accuracy and if necessary reset.
	Defective oil seals	Replace.
Lack of power	Fault in fuel system or incorrect ignition timing	See above.
Excessive mechanical noise	Worn cylinder barrels (piston slap)	Rebore and fit oversize pistons.
	Worn big end bearings (knock)	Fit replacement crankshaft assembly.
	Worn main bearings (rumble)	Fit new journal bearings and seals. Replace crankshaft assembly if centre bearings are worn.
	Worn small end bearing	Replace.
Engine overheats and seizes	Lubrication failure	Check petrol/oil mixture is correct.

34 Fault diagnosis - gearbox

Symptom	Reason/s	Remedy
Difficulty in engaging gears	Selector forks bent	Replace.
	Gear clusters not assembled correctly	Check gear cluster arrangement and position of thrust washers.
Machine jumps out of gear	Worn dogs on ends of gear pinions	Replace worn pinions.
	Incorrect setting or alignment	Check as applicable.
Gear change lever does not return to original position	Broken return spring	Replace spring.
Kickstarter does not return when engine is turned over or started	Broken or poorly tensioned return spring	Replace spring or re-tension.
Kickstarter slips	Ratchet assembly worn	Part crankcase and replace all worn parts.

35 Fault diagnosis - clutch

Symptom	Reason/s	Remedy
Engine speed increases but machine does not respond	Clutch slip	Check clutch adjustment for free play at handlebar lever. Check thickness of fibre plates.
Difficulty in engaging gears. Gear changes jerky and machine creeps forward when clutch is withdrawn. Difficulty in selecting neutral	Clutch drag	Check clutch adjustment for too much free play. Check clutch drums for indentations in slots and clutch plates for burrs on tongues. Dress with file if damage not too great.
Clutch operation stiff	Damaged, trapped or frayed control cable	Check cable and replace if necessary. Make sure cable is lubricated and has no sharp bends.

Chapter 2 Fuel system and lubrication

Contents

Specifications

Fuel tank capacity	9½ or 15 pints (5.5 or 8.5 litres)				
Gearbox/clutch oil capacity	1.7 pints (1 litre)				
Carburettor					
Make	Bing				
Engine capacity c.c.	125	250	400	440	501
Choke size m.m	26	36	36	36	38
Main jet	125	175-180	185	185	185
Needle jet	235	280-285	285	285	285
Pilot jet	50	35	40	40	40
Needle position (numbered from bottom groove)	2	As required			
Mixture adjustment screw (turns off seat)	¾	1½	1½	1½	1½
Throttle needle	5	–	–	–	–
Throttle slide	B-22-570	–	–	–	–

1 Fuel system: general

1 The fuel is gravity fed to the Bing carburettor which is of a fixed venturi type with a sliding throttle valve and needle controlling the mixture. A separate choke control is fitted to the 125 cc model.

2 A paper element (and/or foam or gauge) air filter is fitted to all models.

2 Petrol tank and tap: removal and replacement

1 Remove the bolt at the rear of the seat and lift the seat off rearwards.

2 The tank is held by one through bolt at the front which has to be removed. Disconnect the petrol pipe unscrewing the union nut after having firstly turned off the petrol.

3 Check the tank for leaks and splits particularly at the rear where it can chafe the frame.

4 The petrol tap should give little trouble but if it is required to strip it down, it should be unscrewed out of the tank (after having drained the tank) and the split pin removed. The tap can then be pulled apart. If the tap has been leaking check that the taper and/or bore is not scored and also that the spring is in good condition. Reassembly is straight forward; use a new split pin.

3 Carburettor: removal

125cc model only

1 The carburettor is located on the right-hand side of the engine and access to it is gained by the removal of the right-hand engine cover which is retained by four screws. Disconnect the petrol pipe. Remove the throttle cable and the choke cable from the twist grip and choke lever respectively. Slacken the carburettor pinch bolt and pull the carburettor off its stub.

All models except 125 cc

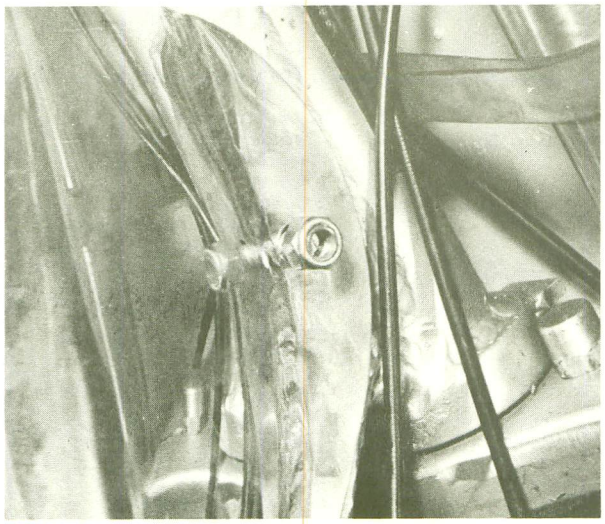
2 Release the throttle cable at the twist grip and undo the petrol pipe at either the petrol tap or pull if off its "tail" at the carburettor.

3 Slacken the hose clip on the air filter hose and also slacken with a screwdriver or spanner, the clamp that holds the carburettor onto the inlet manifold stub. The carburettor is now free to be pulled off the inlet manifold stub.

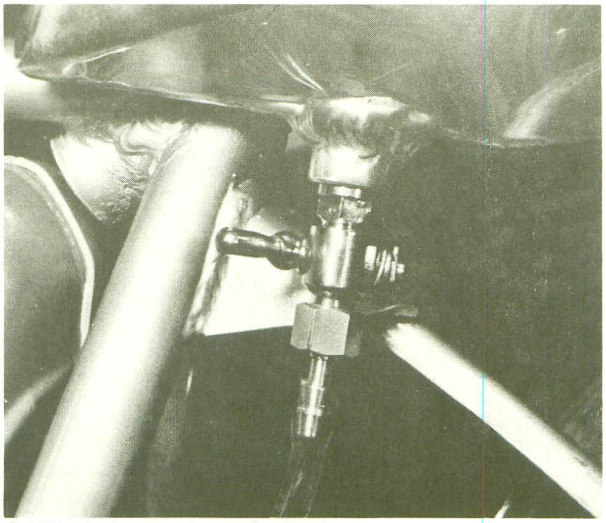
4 Carburettor: dismantling and reassembly

125 cc models only

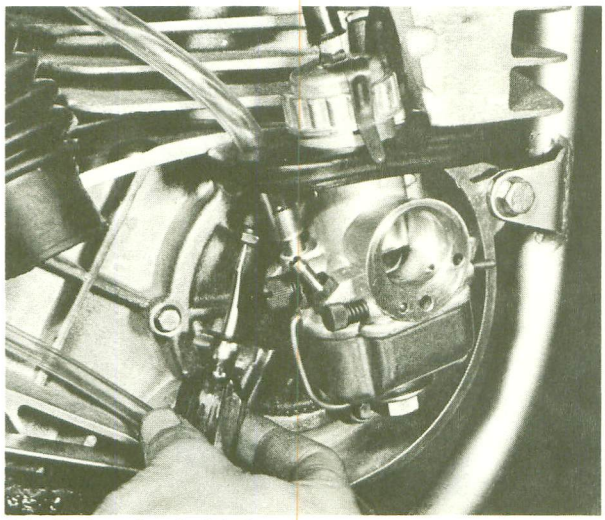
1 Unscrew the complete choke assembly from the right-hand



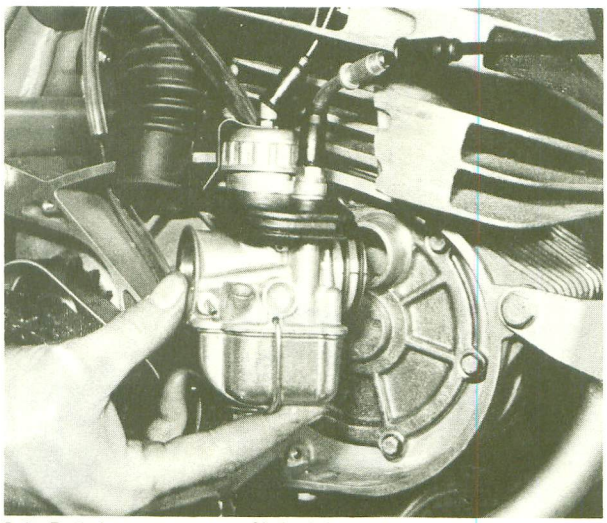
2.2 Undo the tank bolt



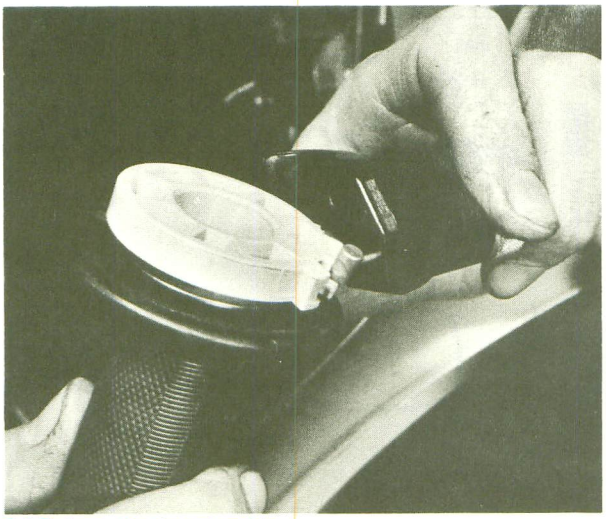
2.4 The fuel tap spring and split pin



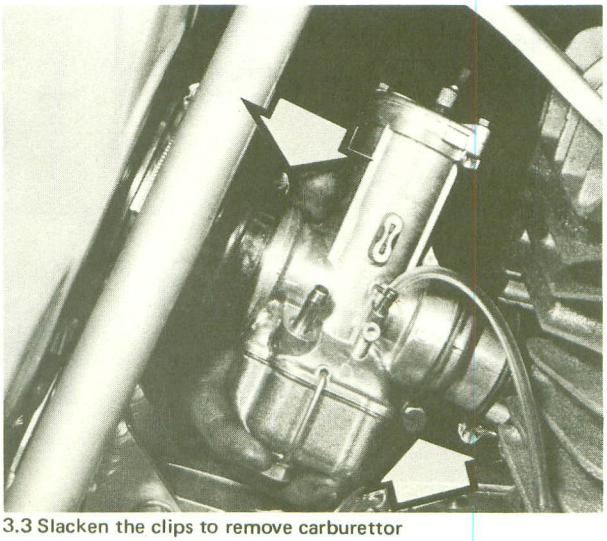
3.1a Slacken the pinch bolt



3.1b Pull the carburettor off the inlet stub



3.2 Release the throttle cable



3.3 Slacken the clips to remove carburettor

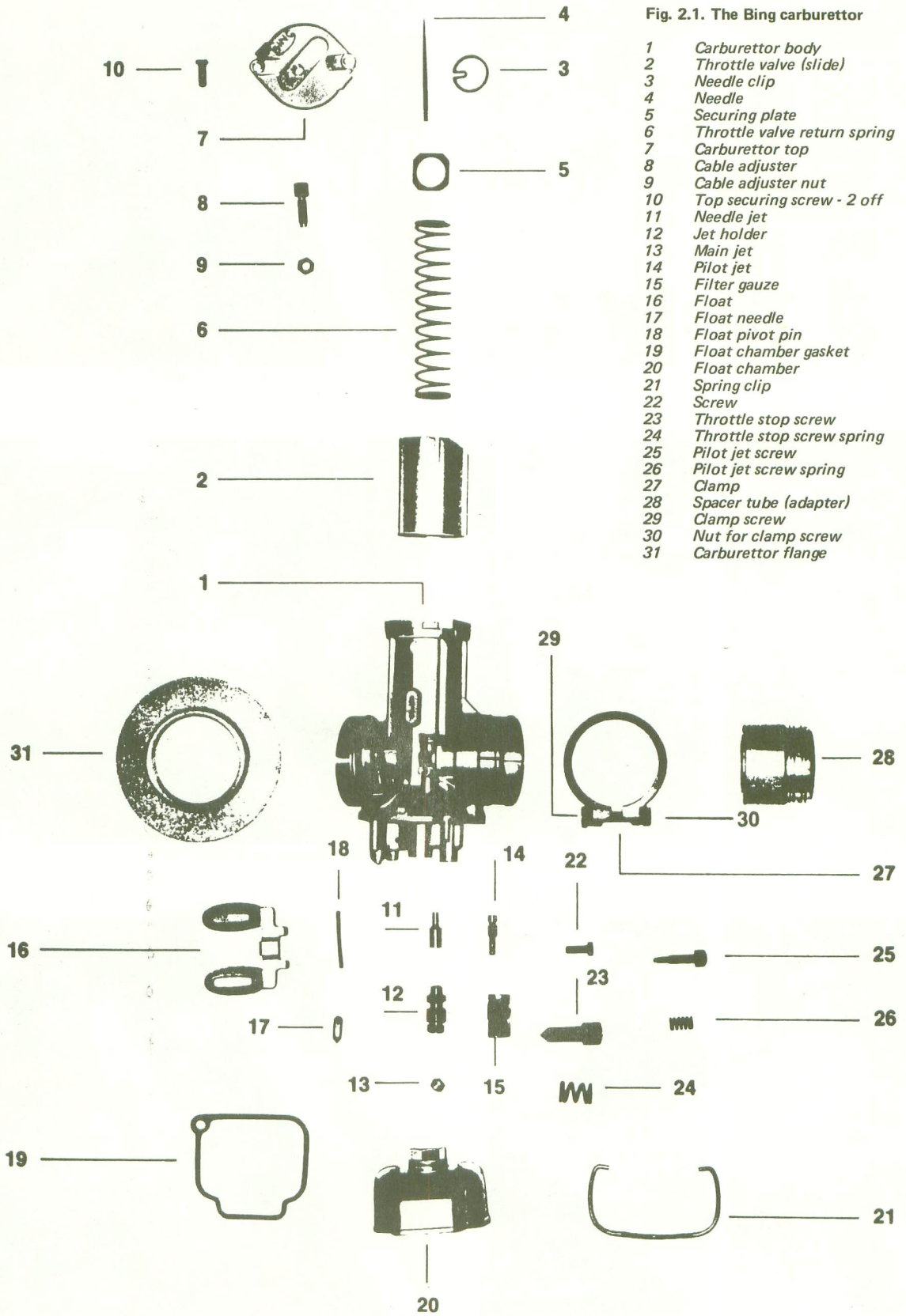


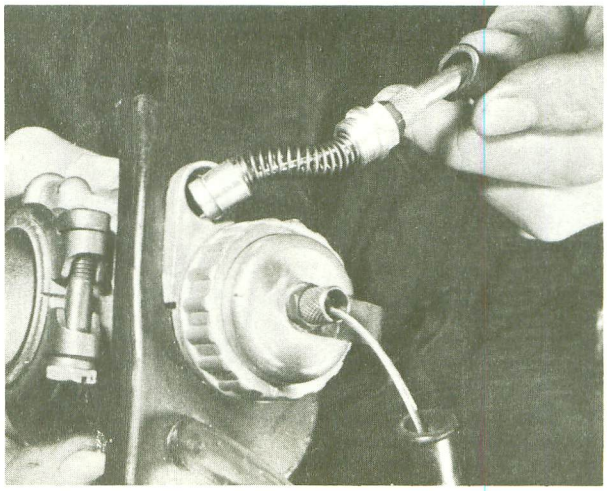
Fig. 2.1. The Bing carburettor

1 *Carburettor body*
2 *Throttle valve (slide)*
3 *Needle clip*
4 *Needle*
5 *Securing plate*
6 *Throttle valve return spring*
7 *Carburettor top*
8 *Cable adjuster*
9 *Cable adjuster nut*
10 *Top securing screw - 2 off*
11 *Needle jet*
12 *Jet holder*
13 *Main jet*
14 *Pilot jet*
15 *Filter gauze*
16 *Float*
17 *Float needle*
18 *Float pivot pin*
19 *Float chamber gasket*
20 *Float chamber*
21 *Spring clip*
22 *Screw*
23 *Throttle stop screw*
24 *Throttle stop screw spring*
25 *Pilot jet screw*
26 *Pilot jet screw spring*
27 *Clamp*
28 *Spacer tube (adapter)*
29 *Clamp screw*
30 *Nut for clamp screw*
31 *Carburettor flange*

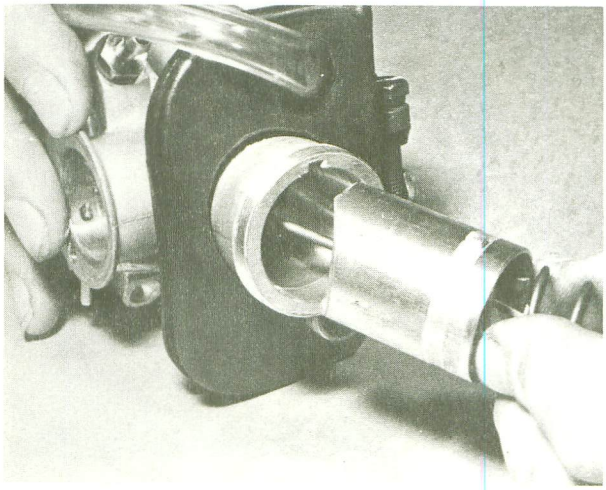
side of the carburettor. This unit should give little trouble but check that the plunger moves freely in the carburettor body.
2 Unscrew the carburettor top ring nut and lift out the throttle valve assembly. Push in the throttle cable and move it to one side and then lift it out. The needle is retained by a shaped clip which can be lifted out to free the needle.
3 Access to all the jets and the float is obtained by prising off the float bowl clip and lifting off the float bowl. If access to only the main jet is required it removal of the bolt in the bottom of the float bowl will suffice.
4 To remove the main jet, needle jet and emulsion tube unscrew them with either a ring spanner or a socket spanner to avoid damage. Note the position of the jet assembly components.
5 The pilot jet is recessed down into the carburettor body and can be removed with a screwdriver.
6 When replacing any of the jets DO NOT OVERTIGHTEN THEM' Make sure the emulsion tube cutaway which protudes into the venturi is the correct way round ie; with the cutaway facing the engine.
7 The float can be removed by gently drifting out its pivot pin. The float needle can now also be lifted out.
8 The throttle stop screw and mixture adjustment screw are removed by unscrewing them. When replacing them screw the mixture screw right home but DO NOT USE FORCE, then slacken it off the correct amount. Do not screw the throttle stop screw home as adjustment will be required when the engine is running.
9 Reassemble the carburettor in the reverse order to dismantling using new gaskets throughout. Make sure the needle clip is in the correct groove and the retaining overclip is fitted. Als mo make sure that the fibre sleeve that fits over the inlet manifold slab is in good condition. Do not forget to clean and replace the gauge in the float bowl bolt.

All models except 125 cc

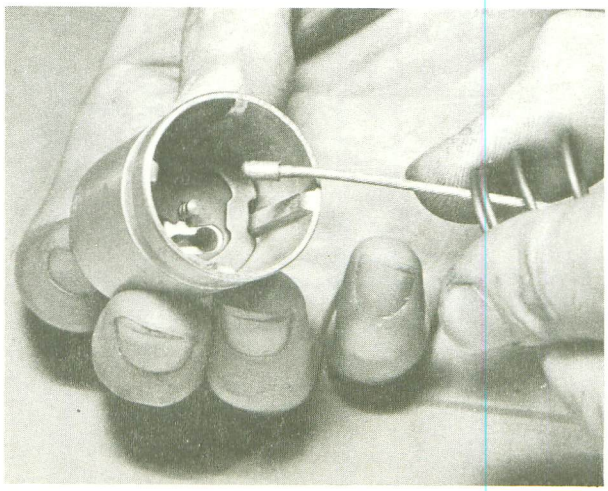
10 To release the throttle slide unscrew the two bolts in the carburettor top and carefully pull out the throttle slide complete with needle. Push the cable into the slide and move it towards the outside of the slide and then pull it out. Note the plastic spring seat. The needle can now be slid out of the throttle slide. When replacing the carburettor top check the condition of the rubber O-ring and renew as necessary.
11 Access to all the jets and float is obtained by prising off the float bowl clip and lifting off the float bowl. If access to only the main jet is required then it will suffice to remove the bolt in the bottom of the float bowl.
12 To remove the main jet, needle jet and emulsion tube unscrew them with either a ring spanner or a socket spanner to avoid damage. Note the position of the jet assembly components.
13 The pilot jet is recessed into the carburettor body and can be removed with a screwdriver.
14 When replacing any of the jets DO NOT OVERTIGHTEN THEM. Make sure that the emulsion tube cutaway, which protudes into the venturi, is the correct way around ie; with the cutaway facing the engine.
15 The float can be removed by gently drifting out its pivot pin and lifting it up complete with the float needle, which is retained to it by a wire clip.
16 The throttle stop screw and mixture adjustment screw are removed by unscrewing them. When replacing them screw the mixture screw right home but DO NOT USE FORCE then slacken it off the correct amount. Do not screw the throttle stop screw home since it must be adjusted when the engine is running.
17 Reassemble the carburettor in the reverse order of dismantling using new gaskets throughout. Make sure that the needle clip is in the correct groove and the spring seat is correctly fitted. Also make sure that the fibre sleeve that fits over the inlet manifold stub is in good condition. Do not forget to clean and replace the float bowl bolt.



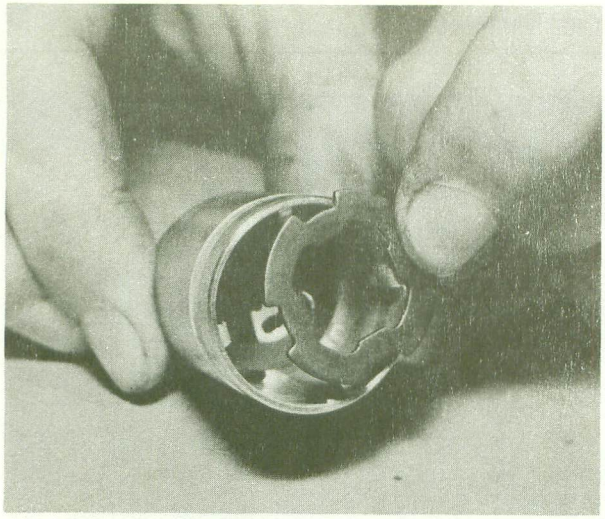
4.1 Unscrew choke assembly



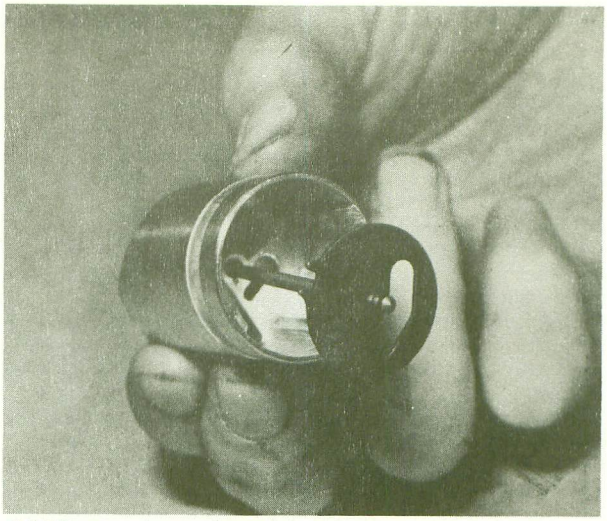
4.2a Pull out the throttle slide



4.2b Remove the throttle cable

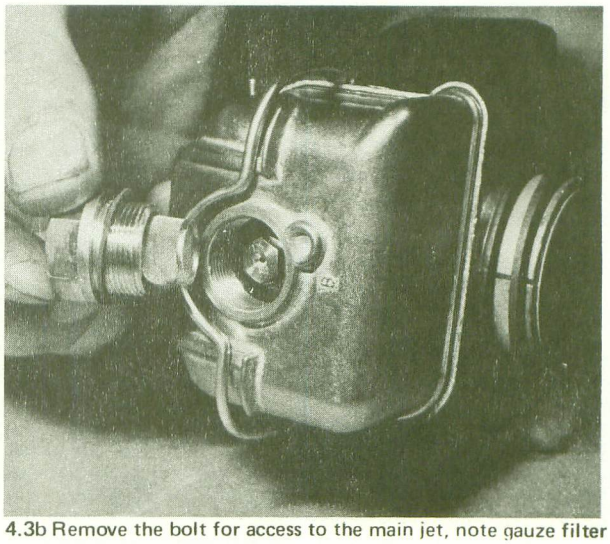


4.2c Lift out the retaining clip

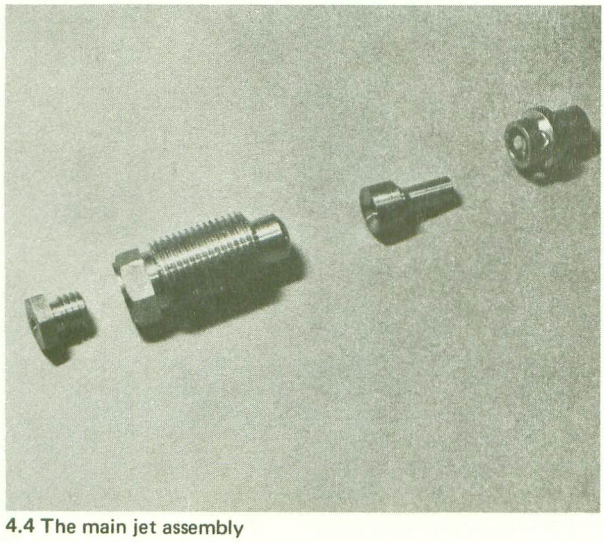


4.2d Remove the needle and clip

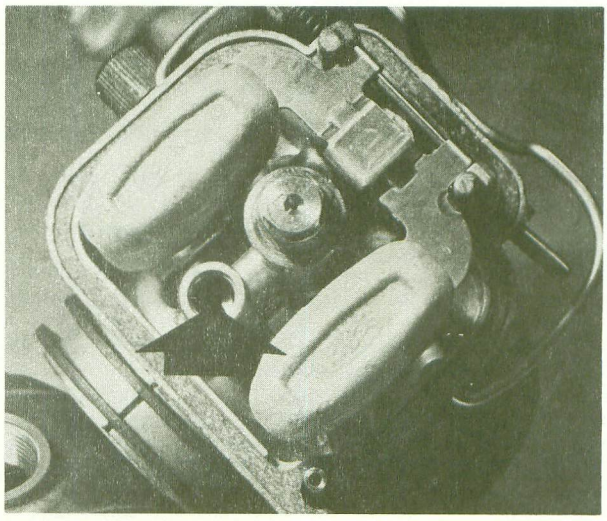
4.3a Slide off the float bowl clip



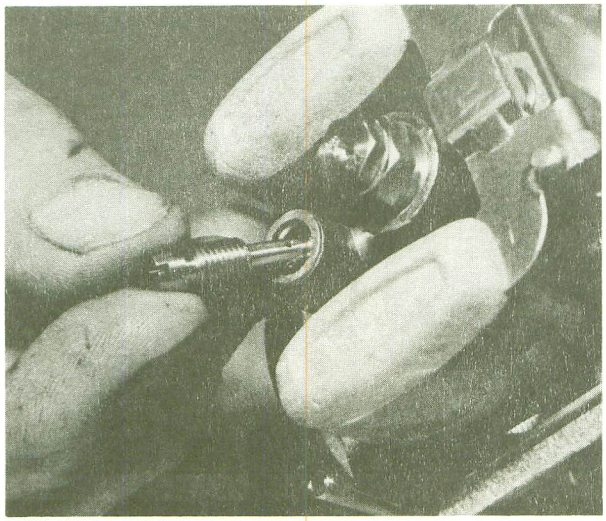
4.3b Remove the bolt for access to the main jet, note gauze filter



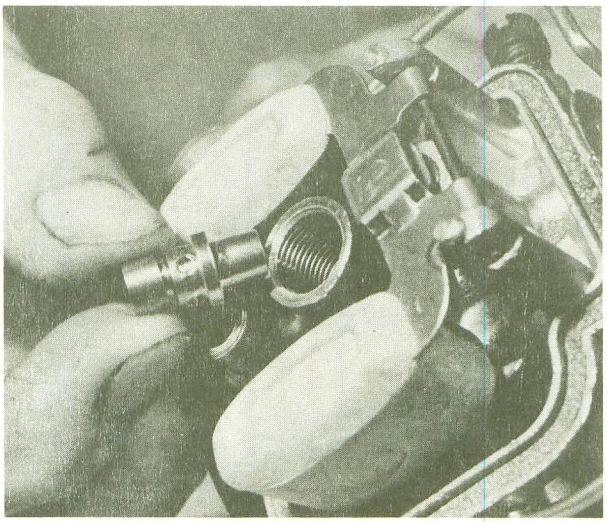
4.4 The main jet assembly



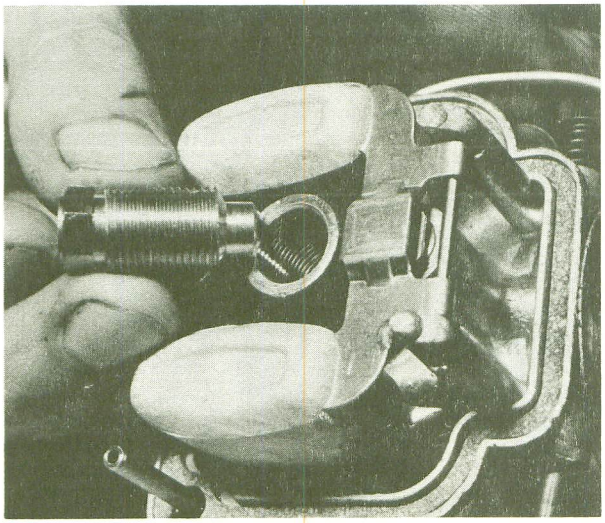
4.5a Pilot jet position



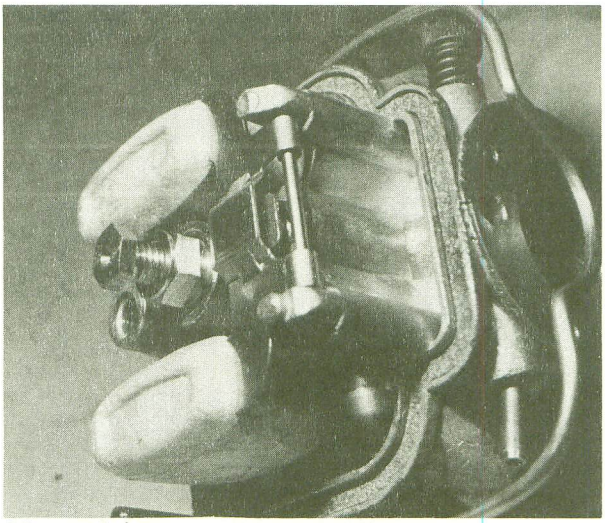
4.5b Removing the pilot jet



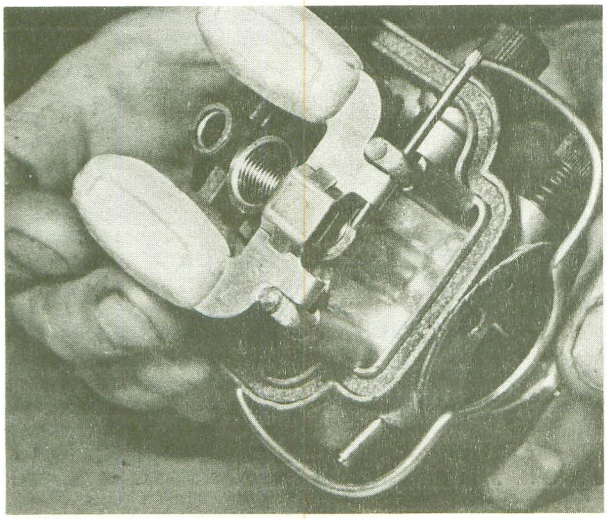
4.6a Needle jet first, followed by ...



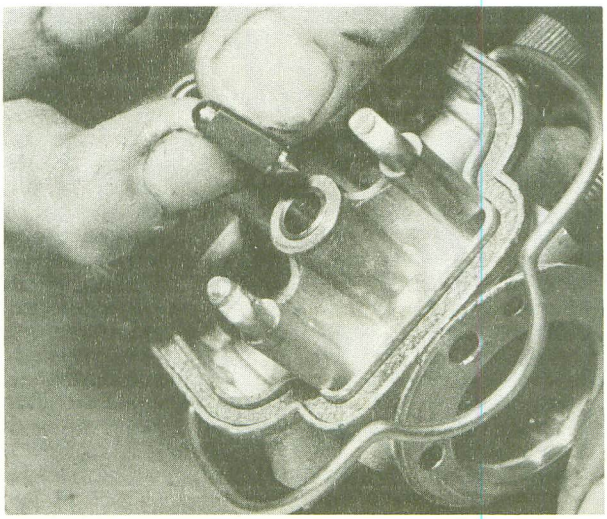
4.6b ... emulsion jet, then



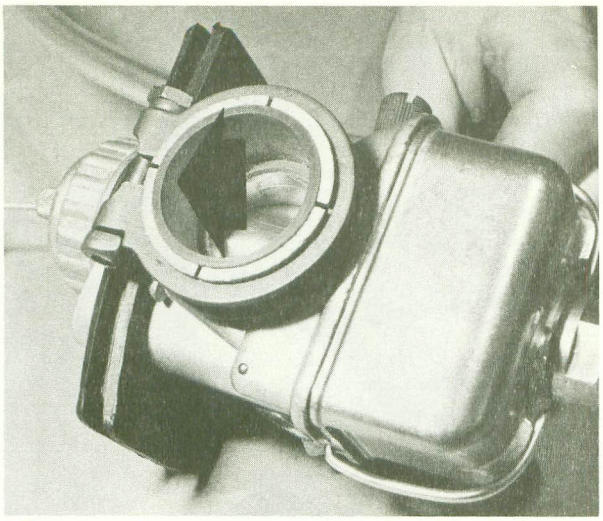
4.6c ... main jet



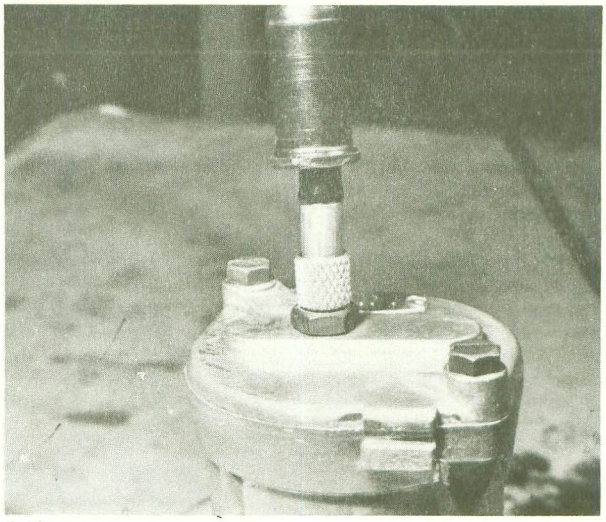
4.7a Remove the float pivot pin



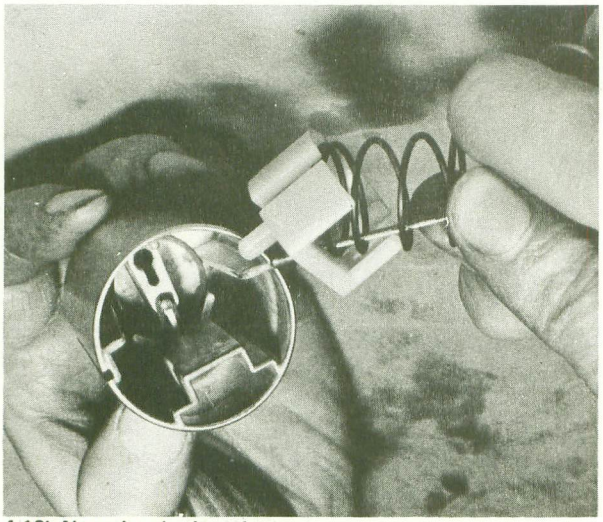
4.7b Lift out the float needle



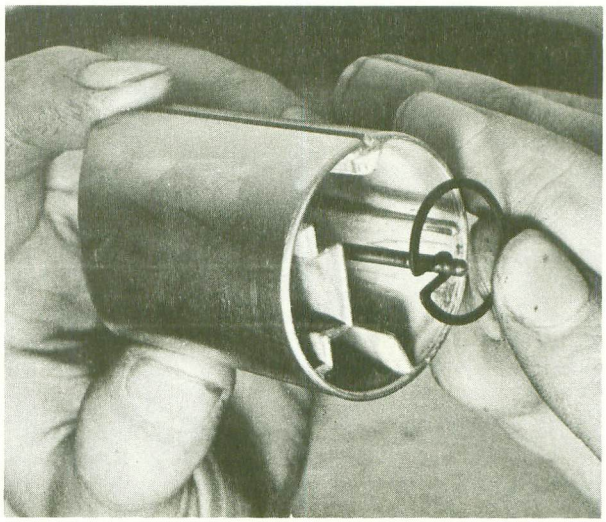
4.9 Check the fibre sleeve for damage



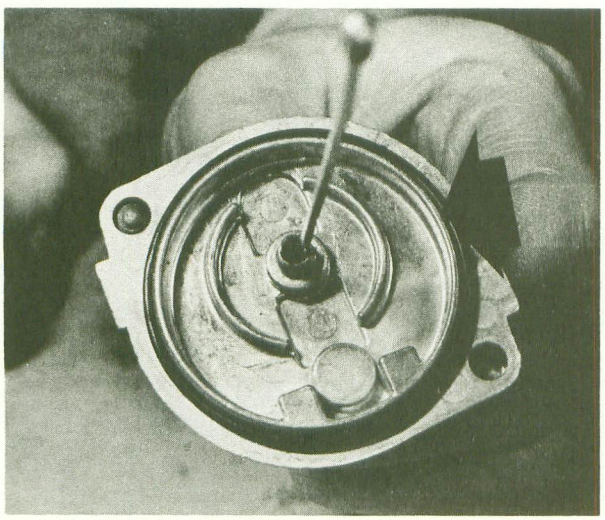
4.10a Remove the two bolts



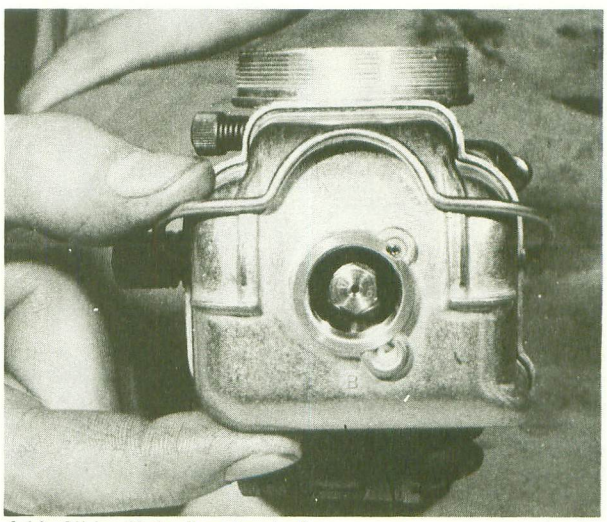
4.10b Note the plastic spring seat



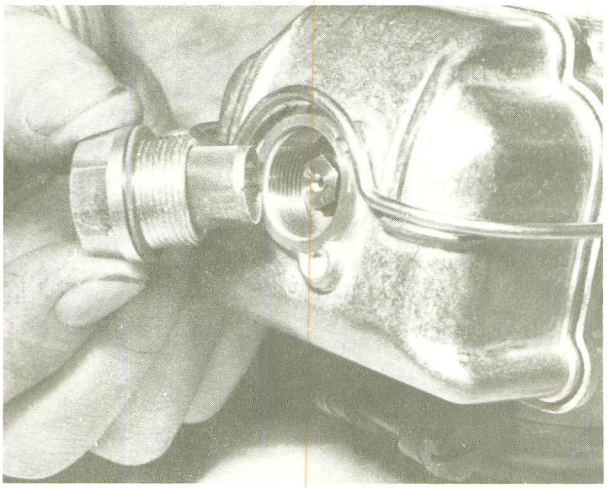
4.10c Remove the needle and clip



4.10d Renew the rubber O-ring



4.11a Slide off the float bowl clip



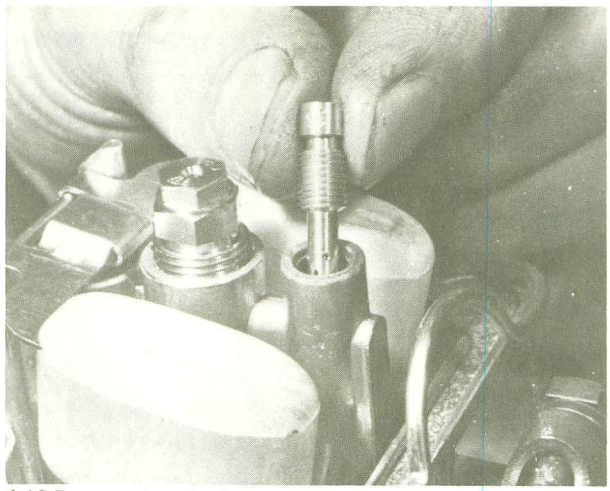
4.11b Note the gauze filter

5 Carburettor: checking the components, all models

1 Inspect the throttle slide valve to see that it is not scored or worn. Check the sliding fit of the valve in the carburettor body and also whether the body is scored. Renew as necessary.
2 Check the needle for wear especially in the region where it slides in the needle jet. Check also that it is not bent by rolling it on a surface plate (or a piece of plate glass). Renew as necessary. If the needle is badly worn and needs replacement it is most probable that the needle jet is also worn and should also be replaced.
3 Check that the throttle stop screw has not worn where it contacts the throttle slide. Also check that the taper on the mixture screw is in good condition and not damaged. Renew as necessary.
4 Clean the jets with an air line (or a bicycle pump). Never use anything metallic or hard since the hole size and shape are very critical. Do not overtighten the jets when replacing them in the carburettor.
5 Inspect the condition of the float needle particularly its seating surface. Also check the needle seat in the carburettor body. Any damage will cause flooding or richness in the carburation.
6 Inspect the floats to see that they are not leaking-shake them; if there is petrol inside it will be evident on shaking them. If the float is leaking, obtain a replacement since it cannot be repaired satisfactorly. If its weight is altered it will affect the petrol level and thus the carburation.
7 Check the condition of the throttle cable particularly at the point where it comes out of the twist grip. This is the most likely place for wear to occur.
8 Check that the throttle slide spring has plenty of tension by ensuring that the throttle slide snaps down onto the carburettor body when the throttle is closed.

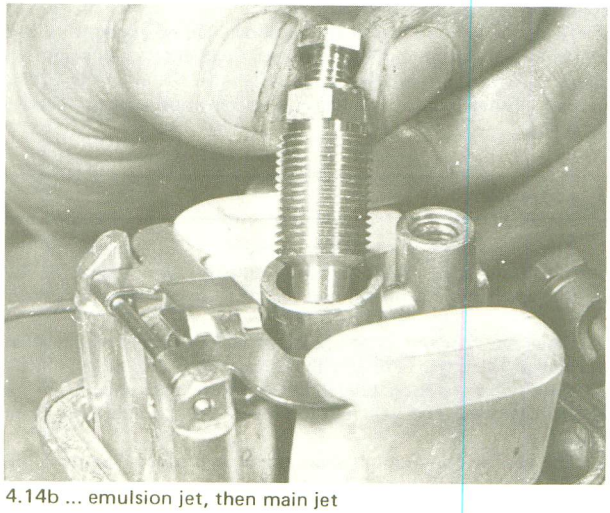
6 Carburettor adjustment: tickover speed and mixture

1 Set the mixture adjustment screw at approximately the correct position (see Specifications) and warm the engine up.
2 Screw in the throttle stop screw until a fast tickover is obtained. Adjust the mixture screw so that the fastest tickover is obtained. Then back off the throttle stop screw to reduce the engine speed to the required final tickover.
3 The mixture screw controls the amount of air thus screwing it inwards makes the mixture richer and outwards weaker.
4 When setting the tickover speed and mixture on the 125 cc model, it should be born in mind that when the right-hand engine cover and air filter are replaced the air flow will be slightly restricted and thus the mixture will be richer. Compensate for this richness as necessary.

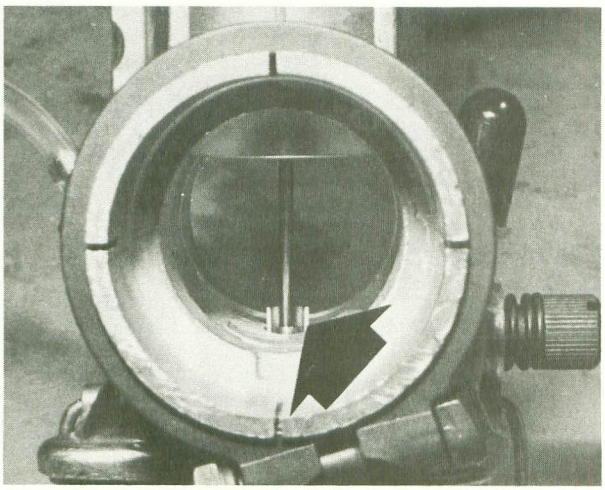


4.13 Remove the pilot jet

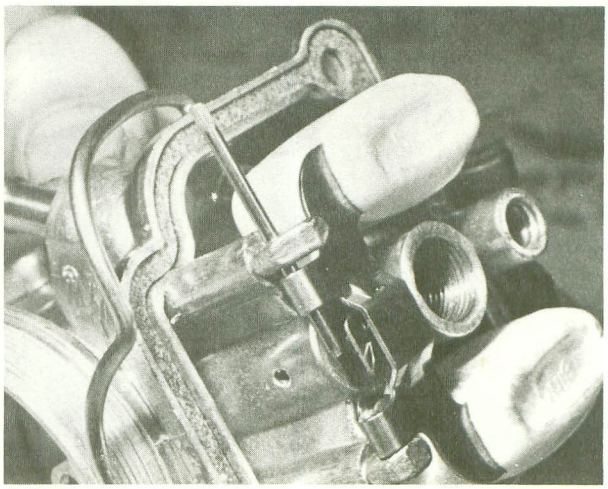
4.14a Needle jet first, followed by ...



4.14b ... emulsion jet, then main jet



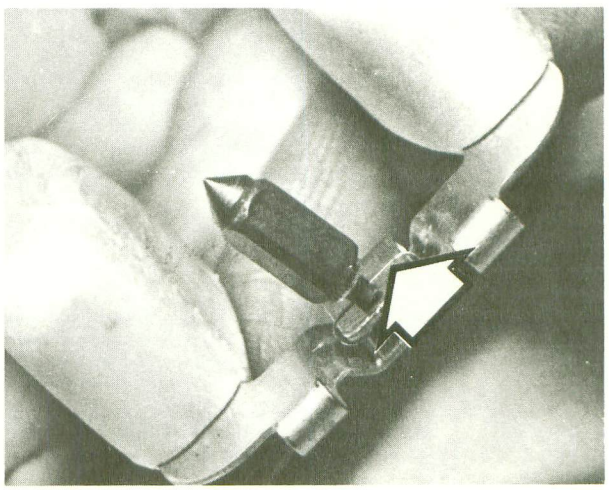
4.14c Cutaway must face engine



4.15a Remove the pivot pin

7 Carburettor adjustment: jet settings

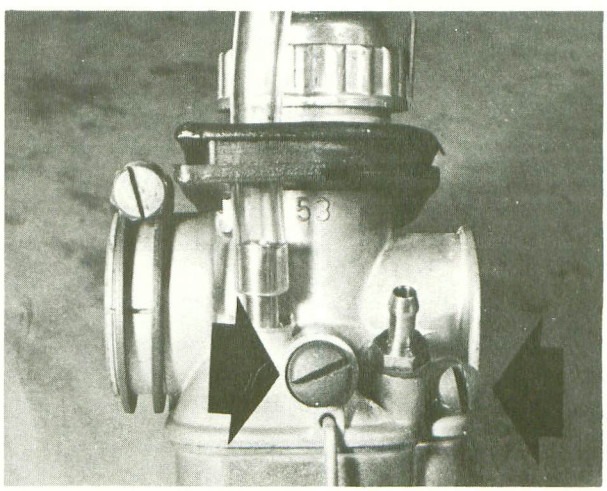
1 The size of the jets and needle are set by the manufactures and under normal circumstances should not require any alteration.
2 If it is considered that an alteration is required, firstly check that the correct jets have been fitted (see Specification) and then check the engine for other faults which might give the same indications, eg; a weak mixture resulting from an air leak in the inlet manifold.
3 When making any adjustments it is best to err slightly on the rich side, since a weak mixture can cause an engine seizure as the result of overheating.



4.15b Note the wire clip

8 Air filter

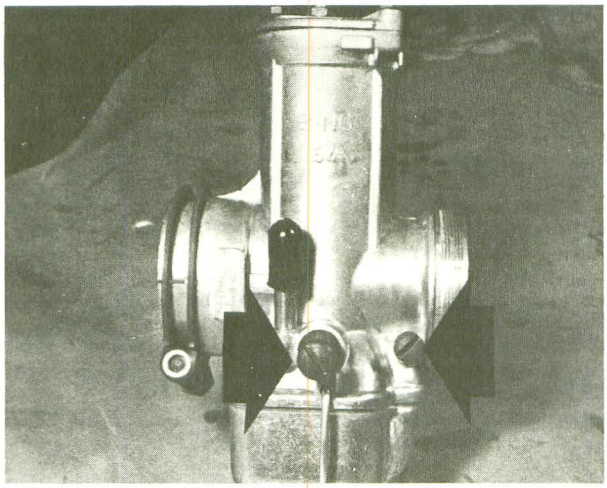
1 The air filter is located in a box underneath the seat which has to be removed (by undoing the bolt at the rear) to give access.
2 The filter is removed by undoing the nut and withdrawing to the rear and upwards.
3 Paper elements can be cleaned with compressed air; other types should be cleaned with petrol.
4 Reassembly is a reversal of the above. On no account use the machine without an air filter since grit will enter the engine and cause damage (particularly to the disc valve fitted to the 125 cc model). There is also risk that the carburation will be severely weakened.



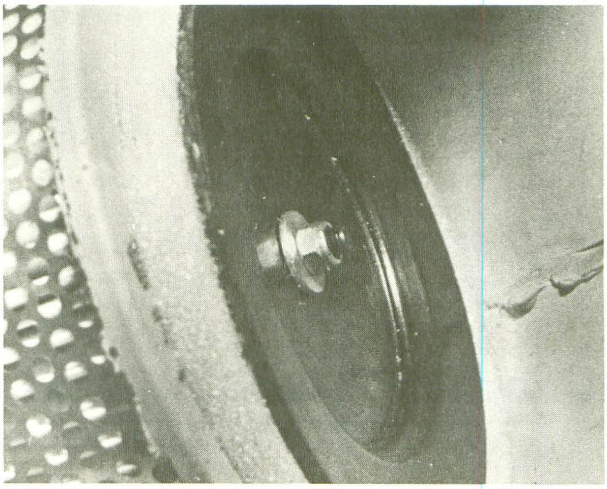
6.1a Carburettor: 125 c.c. model

9 Lubrication

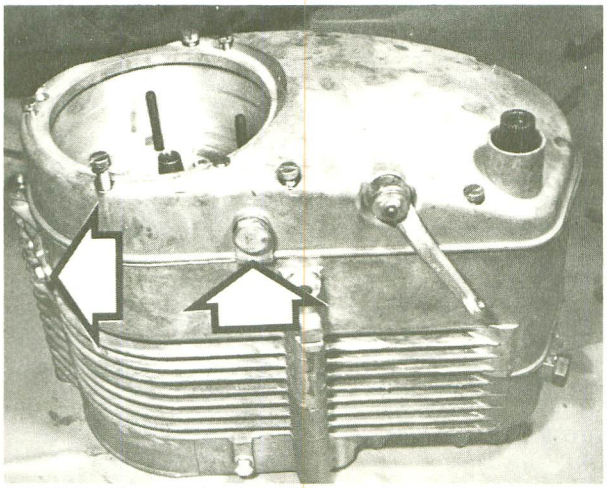
1 The crankshaft and piston assembly is lubricated by the petrol/oil mixture. Use only good quality two stroke oil. Be careful when mixing the oil and petrol to have the correct ratio of oil.
2 When the machine is not going to be used for a while, drain the petrol from the tank and the carburettor. Also squirt a little oil down the sparking plug hole and turn the engine over a couple of times. This will help to prevent the cylinder bore from rusting.
3 The gearbox and clutch share the same separate supply of oil which ideally should be renewed after every meeting. Do not forget to clean off the magnetic sump plug and to refill the engine unit with oil before running the engine. Refill until the oil commences to flow out of the level screw hole and/or with 1 litre of oil.



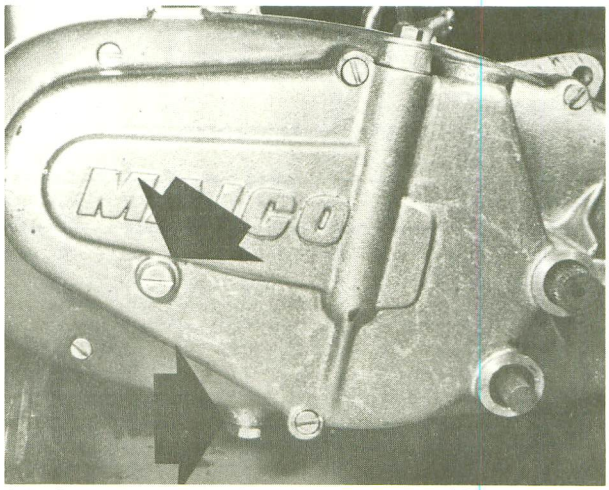
6.1b Carburettor: all mdoels except 125 c.c.



8.2 Air filter has self-locking nut



9.3a Oil level and drain plug: 125 cc model



9.3b Oil level and drain plug: all models except 125 cc

10 Fault diagnosis

Symptom	Reason/s	Remedy
Engine gradually fades and stops	Fuel starvation	Check vent hole in filler cap. Sediment in filter bowl or sticking float needle. Dismantle and clean
Engine runs badly, black smoke from exhaust	Carburettor flooding	Dismantle and clean carburettor. Check for punctured float or sticking float needle
	Blocked air filter	Clean or renew air filter
Engine lacks response and overheats	Weak mixture	Check for partial blockage in carburettors
	Air cleaner disconnected	Reconnect. Check hoses for splits
	Unsuitable silencer has upset carburation	Replace with original
Engine spits back into carburettor	Weak mixture	Check and adjust carburettor settings
Engine backfires when shut off	Air leakage around exhaust port	Check exhaust pipe/cylinder head gasket and tightness of exhaust pipe retaining flange

Chapter 3 Ignition and electrical systems

Contents

Specifications

Model	125 cc	250 cc
Spark plug		
Make	Beru	Champion
Type	280/14S	N2 or N2G (Use N3 or N3G for moist or cold conditions)
Thread size	14 mm	14 mm
Reach	¾ in	¾ in
Gap	0.018-0.020 in.	0.018-0.020 in.
*Ignition timing B.T.D.C.	0.110-0.118 in.	0.110-0.126 in.
Contact breaker gap	0.014 in.	0.012 in.

*For 400,440 and 501 cc models all the 250 cc specifications are applicable except for the ignition advance which is as follows:-

Model	400 cc	440 cc	501 cc
Ignition timing B.T.D.C.	0.138-0.146 in.	0.138 in.	0.118 in.

1 General description

1 On the competition models the electrical system is very simple since there is only need for ignition. Electricity is generated in the coil mounted on the stator plate when the rotor is rotated. The stator coil supplies the energy required by the coil to produce the spark. The timing of the spark is controlled by the contact breaker.

On the models fitted with lights there is an extra coil on the stator plate which supplies the energy to charge the battery via a rectifier.

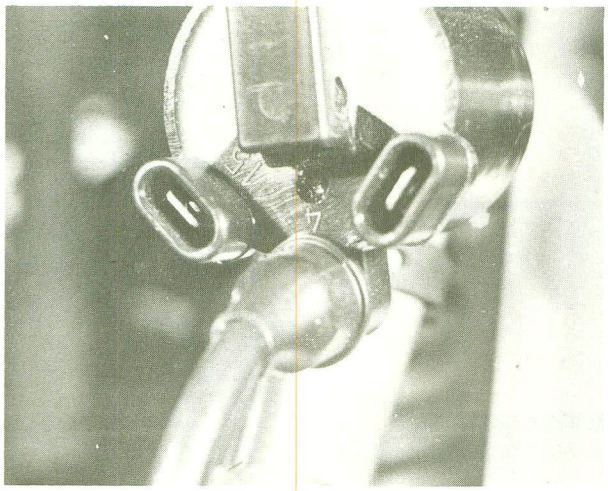
2 Ignition coil: function

The ignition coil consists of primary and secondary windings wound around a soft iron core. It operates in conjunction with the contact breaker to convert low voltage from the stator coil into the high voltage necessary for the spark, to ignite the mixture of petrol and air in the cylinder.

3 Ignition coil: checking

1 The ignition coil is a sealed unit, designed to give long service without need for attention. It is located within the top frame tube, immediately to the rear of the steering head assembly. If a weak spark and difficult starting causes the performance of the coil to be suspect, it should be tested by a Maico agent or an auto-electrical expert who will have the appropriate test equipment. A faulty coil must be replaced; it is not possible to effect a satisfactory repair.

2 A defective condenser in the contact breaker circuit can give the illusion of a defective coil and for this reason it is advisable to investigate the condition of the condenser before condemning the ignition coil.



3.1 The numbered connections on the H.T. coil

4 Condenser: function and location

1 The condenser has two functions. Firstly it reduces sparking at the contacts (and hence prevents rapid wear of the points). Its second and most important function is to greatly increase the induced voltage in the secondary windings of the coil and hence the strength of the high tension spark at break. In practice, without the condenser the spark is very weak and the machine does not run smoothly.
2 The condenser is located on the stator plate next to the contact breaker, and is held in position by two screws.
3 If the condenser is suspected of malfunctioning, it should be removed and replaced with a new spare. There is no easy means of checking a condenser without the appropriate test equipment and it is more convenient to cross-check by substitution, especially in view of the low cost of this component.
4 The usual signs of a defective condenser are arcing across the contact breaker whilst the engine is running, and the blackened and burnt appearance of the faces of the points as a result. A small amount of arcing is inevitable, at irregular intervals, but never with an intense spark at almost every opening and closing of the points.

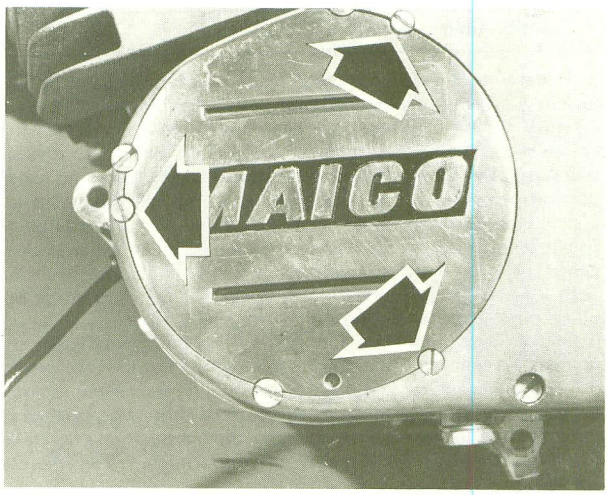
5 Contact breaker: removal and replacement

125 cc models
1 Remove the left-hand circular cover by undoing the three screws. The stator and contact breaker assembly is thus exposed.

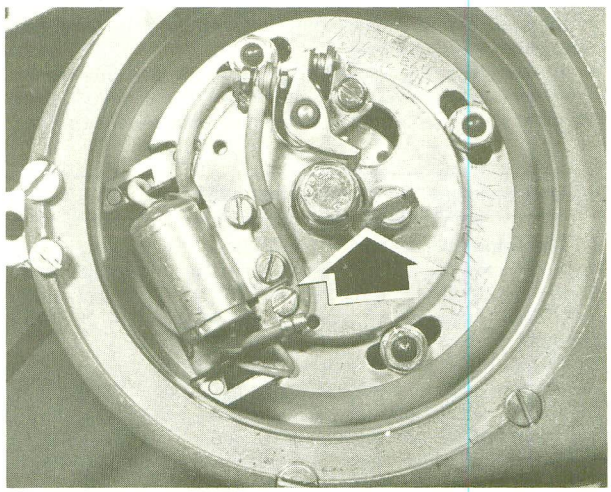
All models except 125 cc
2 Remove the right-hand side engine cover which is retained by three screws. The stator and contact breaker assembly is thus exposed.

6 Contact breaker: examination, renovation and adjustment

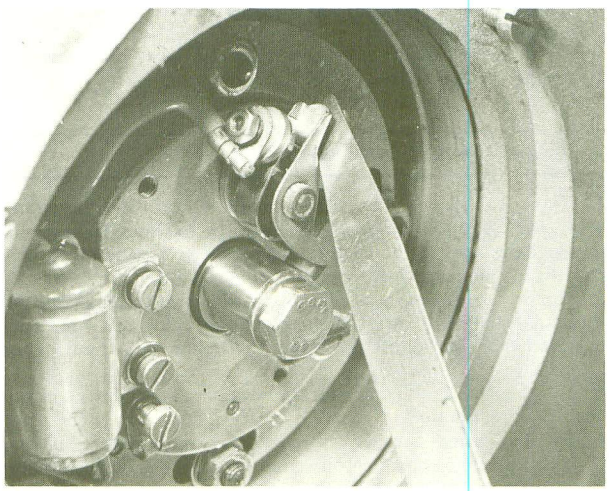
All models
1 Check the contact breaker points for pitting and/or burning. If this is only slight it can be removed by the use of a needle, file or an oilstone. If severe or if the contacts do not meet squarely then renew the contact breaker assembly.
2 Check the condition of the felt lubricating pad and oil it sparingly with a light machine oil.
3 Check the contact breaker gap with the correct size feeler gauge and adjust it as necessary by slackening the one fixing screw to move the fixed contact either nearer or further away. The gap should be measured at the widest opening of the contact breaker cam, and the feeler gauge should be a good sliding fit. The correct gap is within the range 0.012 - 0.014 inch.



5.1 Undo screws to remove ignition coverplate



6.2 Oil the felt pad sparingly



6.3 Set the contact breaker cam to give the widest opening

7 Ignition timing: general

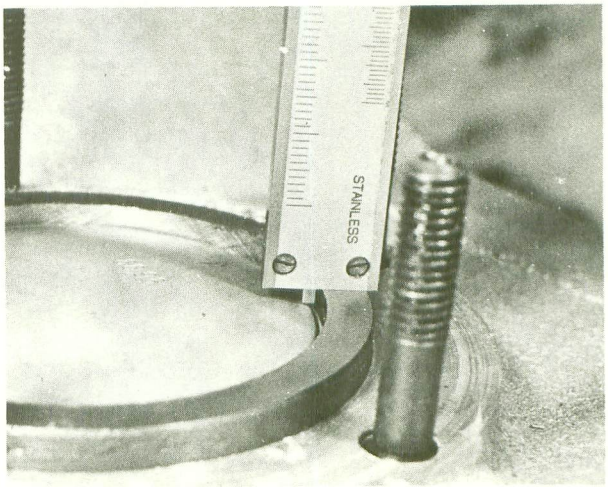
1 Ideally a dial test indicator (d.t.i.) should be used in conjunction with a low wattage light bulb and a battery to set the ignition timing. The cylinder head need not be removed if a suitable spark plug hole adaptor is available for the d.t.i. When measuring the movement of the piston the d.t.i. must be in the vertical plane ie., the d.t.i. stem must be at right angles to the piston crown, to obtain accurate measurements. It is possible to use a vernier caliper to measure the distance before top dead centre (T.D.C.) and to judge the opening of the contact breaker with a feeler gauge although these latter two methods are not to be recommended as the results will not be sufficiently accurate.
2 When using the light and battery method, disconnect the contact breaker lead that goes to connection number one on the HT coil and connect this in series with a low wattage bulb and a battery. The other terminal of the battery should be earthed to the frame. When the points separate, the light will go out. Refer to the Specifications Section of this Chapter for the recommended settings.
3 When using the feeler gauge method to check the opening of the points, select the smallest one available, probably 0.0015 in., and insert this in between the contacts. Pull lightly on the feeler gauge which should be gripped by the contacts. When the engine or stator is rotated and the points begin to open the feeler gauge will suddenly become free.
4 If a vernier caliper is used to measure the ignition advance it is advisable to remove the cylinder head. The calipers can then be rested on the top of the cylinder liner, as a reference point.

8 Ignition timing: All models except 125 cc

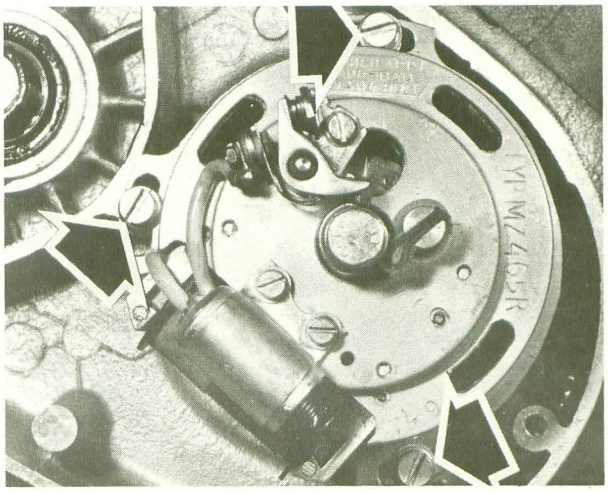
1 The rotor is located in a set position on the crankshaft with a screw (or a key) and thus does not have to be positioned.
2 Set the contact breaker gap at 0.012 in. with the piston at T.D.C. and slacken the three screws that retain the stator assembly.
3 Rotate the crankshaft approximately 45° anti-clockwise (as viewed from the contact breaker (right-hand side), then rotate it clockwise until the dial test indicator shows the correct reading. See Specifications Section at the beginning of this Chapter.
4 Rotate the whole stator plate assembly until the points are just open, separating, as described in the previous Section, then tighten up the three stator screws in an even manner.
5 Check the timing by repeating the procedure but leaving the stator screws locked up unless readjustment is required. Readjust by rotating the stator again as necessary. The setting is critical for optimum performance.
6 Rotating the stator plate anti-clockwise gives more advance and clockwise less advance.

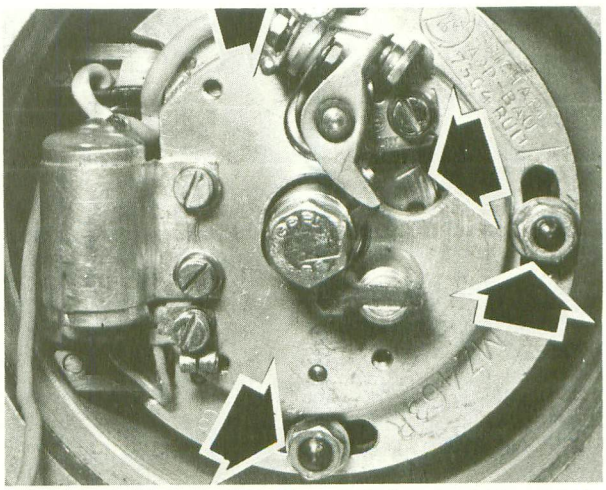
9 Ignition timing: 125 cc models

1 The rotor on the five speed models is keyed to the crankshaft, therefore the procedure given in the previous Section will apply. Note that in the case of the six speed 125 cc model the contact breaker gap must be set at 0.014 in.
2 On the six speed model the rotor will have to be placed on the crankshaft but not tightened. If the rotor has not been removed then follow the procedure in Chapter 1, Section xx for removal.
3 Set the stator plate so that the retaining studs are centrally positioned in the slots.
4 Set the contact breaker gap to 0.014 in. at its widest opening (T.D.C.). Slacken the three nuts that retain the stator assembly. Rotate the engine approximately 45° anti-clockwise as viewed from the contact breaker (left-hand side), and then rotate the engine clockwise until the dial test indicator shows the correct reading (0.110 - 0.118 in.).



7.4 Rest the caliper on the top of the cylinder liner


8.2 Slacken the stator screws


9.4 Slacken the stator nuts. The rotor's line should be central in the inpsection window.

5 Whilst holding the clutch to stop the engine rotating turn the rotor until the line inscribed on it is central in the round viewing hole of the stator. Tap the rotor with a soft faced hammer to hold it on the taper and tighten the rotor bolt to the recommended torque setting.
6 Check the setting on the d.t.i. Rotate the whole stator until the points are just open and then tighten the three nuts in an even manner.
7 Check the timing by repeating the procedure, but leaving the three nuts locked up unless readjustment is required. Readjust by rotating the stator again as necessary. The setting is critical for optimum performance.
8 Rotating the stator plate anti-clockwise gives more advance and clockwise less advance.

10 Spark plugs: checking and resetting the gaps

1 All models except the 125 cc are fitted with Champion N2 or N24 type spark plugs as standard, gapped within the range 0.018 - 0.020 in. The 125 cc model has a Beru spark plug, similarly gapped. Certain operating conditions may indicate a change in spark plug grade: the type recommended by the manufacturer gives the best all round service.
2 Check the gap of the plug points after every two or three meetings. To reset the gap bend the outer electrode to bring it closer to the centre electrode and check that the correct feeler gauge can be inserted. Never bend the central electrode or the insulator will crack, causing engine damage if the particles fall in whilst the engine is running.
3 With some experience, the condition of the spark plugs electrode and insulator can be used as a reliable guide to engine operating conditions. See accompanying diagram.
4 Beware of overtightening the spark plugs, otherwise there is risk of stripping the threads from the aluminium alloy cylinder heads. The plug should be sufficiently tight to sit firmly on the copper sealing washers, and no more. Use a spanner which is a good fit to prevent the spanner slipping and breaking the insulator.
5 If the threads in the cylinder head strip as a result of overtightening the spark plugs, it is possible to reclaim the head by use of a Helicoil thread insert. This is a cheap and convenient method of replacing the threads; most motorcycle dealers operate a service of this kind.
6 Make sure that the plug insulating cap is a good fit and it also must be kept clean to prevent tracking.
7 Note that some of the models have two spark plugs fitted, which should be of the same grade, unless starting difficulties are encountered. Under these latter circumstances, a 'soft' plug can be fitted to make cold starting easier, provided the plug lead is transferred to the normal running plug when the engine is warm.

11 Engine cut-out switch: function and faults

1 A cut-out switch is fitted to some models. The switch is connected to the LT lead from the contact breaker to the HT coil. It operates by shorting the contact breaker to earth.
2 If there is no spark, check that the switch or its lead is not earthing. Make sure the lead is not trapped or chaffed, giving rise to an intermittent short.
3 If the switch fails to work it is probably because it is not making a good earth with the frame (via the handlebars). Dirty or broken contacts in the switch may also be responsible, in which case a replacement will have to be obtained; the switch is not repairable.

12 Rectifier: function (Enduro model only)

The function of a rectifier is to convert the A.C. output from the alternator to D.C. in order to charge the battery. This it does by offering a very low resistance to current flow in one direction and a very high resistance in the reverse. As the ratios of these resistances is about 1000 : 1 one can generalize by saying that an effective current will only flow in one direction.

13 Rectifier: checking (Enduro model only)

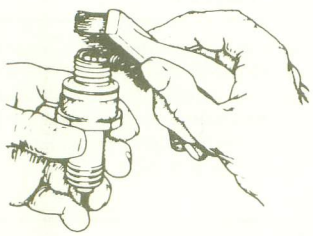
1 The rectifier is unlikely to cause trouble. It can be checked using either a multi-test meter or alternatively a low wattage bulb and a battery.
2 Disconnect the rectifier from the wiring harness. The rectifier is only of the half wave type so there are only two leads. Set the multi-meter to the ohms range and connect its test leads to the rectifier leads. Note the reading, if any, on the scale. Reverse the test lead connections and note the reading, if any, on the scale. In one direction the meter should give a low reading and in the other, very high (in thousands of ohms).
3 To check the rectifier with a bulb and battery connect them in series across the rectifier terminals and note whether the bulb lights. Reverse the polarity of the battery and again note whether the bulb lights. The bulb should light in one direction but not in the other.
4 If, in either of the above two tests, the rectifier conducts in both directions, or does not conduct at all in either direction, it is faulty and a replacement should be obtained, assuming there is output from the generator.

14 Battery: examination and maintenance (Enduro model only)

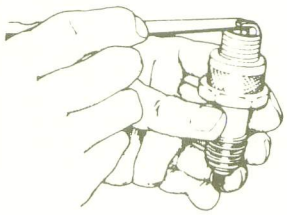
1 The electrolyte level of the battery should be maintained between the upper and lower limits marked on the case by topping up with distilled water (unless spillage has occurred when it should be topped up with acid of the correct specific gravity). If when the battery is in a fully charged condition, (corresponding to approximately 6.6 volts) the specific gravity lies much below 1.26 - 1.28 at 20° C, it should be replaced by fresh sulphuric acid of the correct specific gravity (1.26 - 1.28 at 20° C).
2 If the machine has not been used for sometime, to prevent deterioration, the battery should be recharged every six weeks or so. If the battery is left in a discharged condition for any length of time the plates will sulphate and render it inoperative.
3 A normal charging rate of 1 amp should be used when charging the battery off the machine.

15 Battery - spillage (Enduro model only)

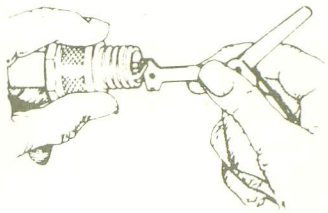
1 If acid is spilt from the battery over the machine (or yourself) it should be washed off immediately with plenty of water to stop corrosion. Even better, wash off with an alkali such as a solution of washing soda or dilute ammonia, which will neutralise the acid.
2 When refilling the battery use acid of the correct specific gravity, see the preceding Section.



Clean deposits from electrodes and surrounding area using a fine wire brush

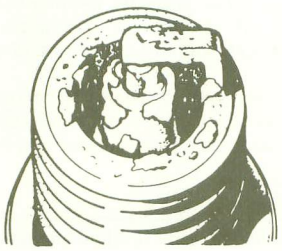


Checking plug gap with feeler gauges

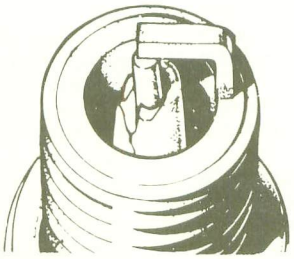


Altering the plug gap. Note use of correct tool

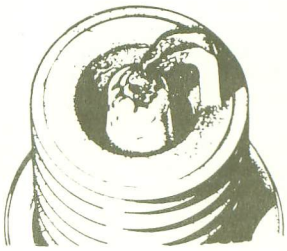
Fig. 3.1a. Spark plug maintenance



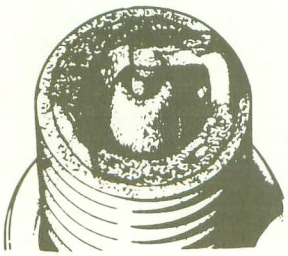
White deposits and damaged porcelain insulation indicating overheating



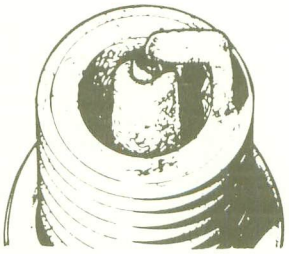
Broken porcelain insulation due to bent central electrode



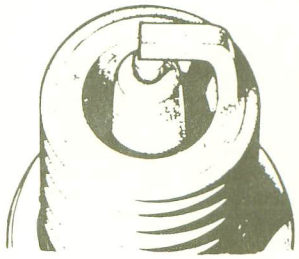
Electrodes burnt away due to wrong heat value or chronic pre-ignition (pinking)



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

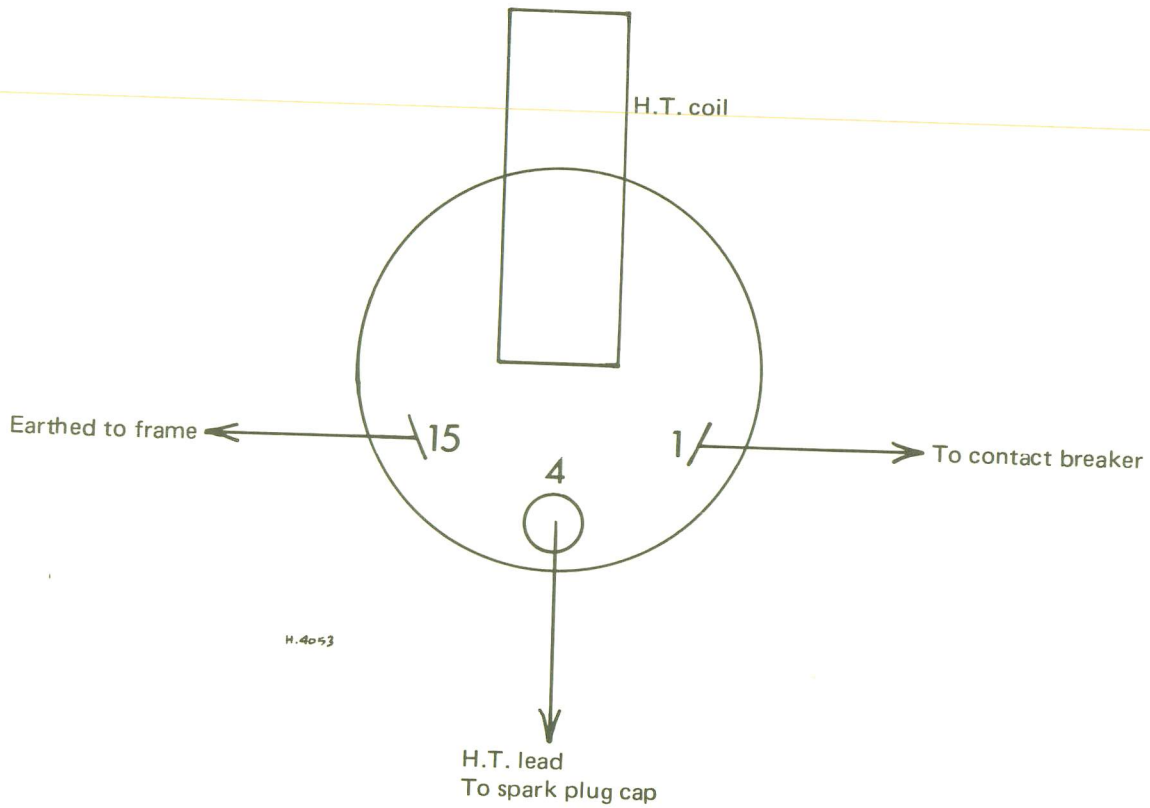


Mild white deposits and electrode burnt indicating too weak a fuel mixture



Plug in sound condition with light greyish brown deposits

Fig. 3.1b. Spark plug electrode conditions



Wiring diagram - all models without lights

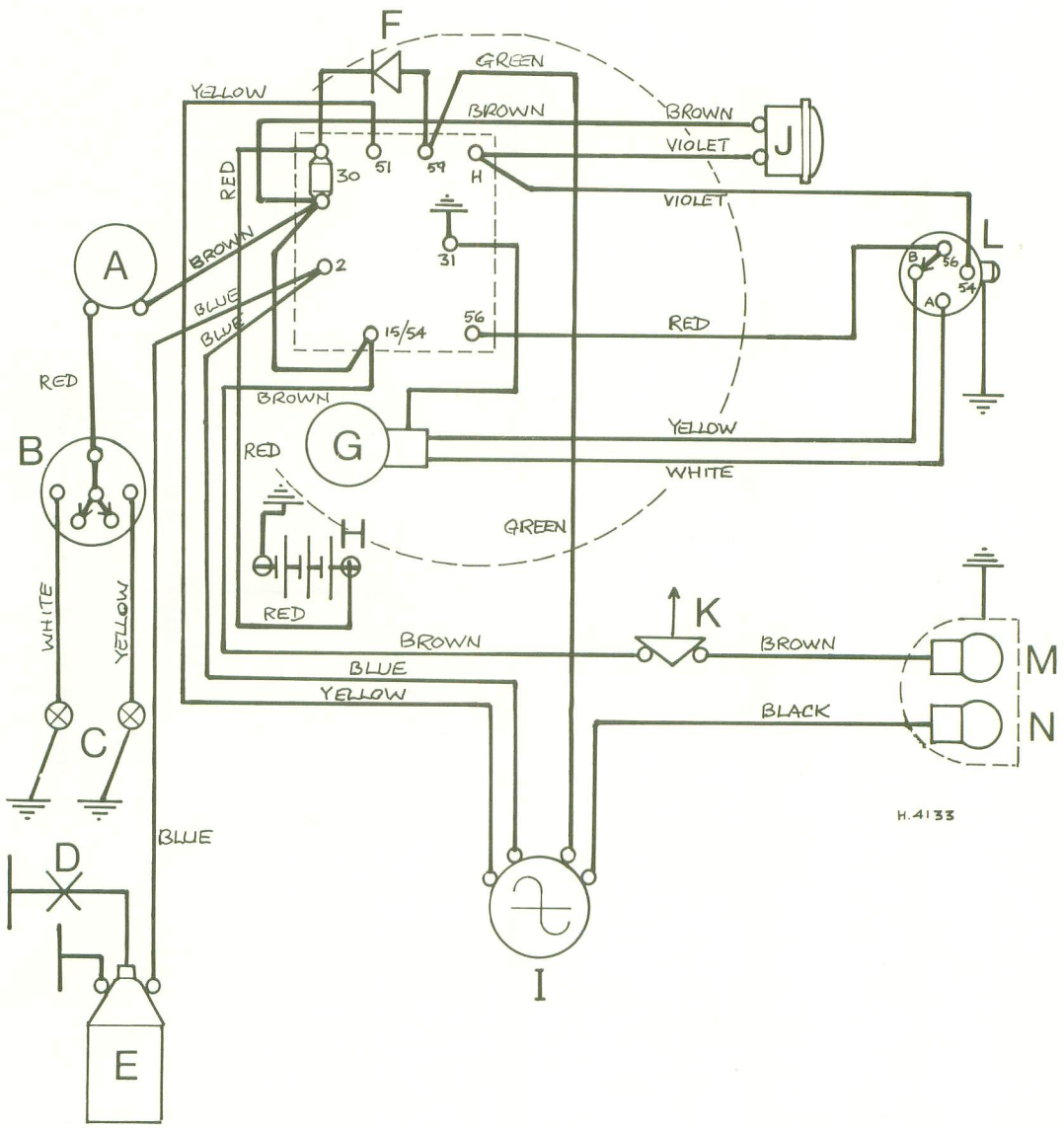


Fig. 3.3. Wiring diagram for Enduro models

A	*Flasher unit*
B	*Turn signal switch*
C	*Flashing indicator lamps*
D	*Spark plug*
E	*Ignition coil*
F	*Rectifier*
G	*Headlamp*
I	*Flywheel magneto*
J	*Horn*
K	*Stop lamp switch*
L	*Horn and dip switch*
M	*Brake light*
N	*Tail light*

16 Fault diagnosis: ignition system

Symptom	Cause	Remedy
Engine will not start	Faulty cut out switch	Operates switch several times in case contacts are dirty.
	Short circuit in wiring	Eliminate fault before switching in again.
Engine misfires	Faulty condenser in ignition circuit	Replace condenser and re-test.
	Fouled spark plug	Replace plug and have original cleaned.
	Poor spark due to generator failure and discharging battery.	Check output from generator. Remove and recharge battery.
Engine lacks power and overheats	Retarded ignition timing	Check timing and also contact breaker gap. Check whether auto-advance mechanism has jammed.
Engine 'fades' when under load	Pre-ignition	Check grade of plugs fitted: use recommended grades only.
	Lack of lubrication	Check petrol ratio.
Engine misfires on high loads and/or high speeds.	Weak spark	Check whole ignition system.
	Faulty plug	Replace with new plug.

Chapter 4 Frame and forks

Contents

1 General description

The frame is of duplex construction using chrome-molybdenum tubing, fabricated by using either helium arc or oxy-acetylene welding techniques. The front forks are hydraulically damped and have 180 mm of travel. The rear fork swinging arm is mounted to the frame with Silentbloc metallastic bushes. Either Girling or Koni adjustable hydraulically damped shock absorbers are fitted.

2 Frame

1 The frame should give little trouble unless involved in an accident after which it should be thoroughly checked for cracks and straightness. Pay particular attention to the welds and other stress areas e.g., footrest brackets, which are most prone to crack. This inspection can easily be carried out whilst cleaning.
2 If a welding repair is required, warn the welder that the frame is constructed of chrome-molybdenum tubing so that he can use a low heat bronze welding rod. Excessive heat must be avoided when welding.

3 Front forks: draining and filling with oil

1 Remove the fork tube top nuts. If necessary detach the handlebars by unscrewing the four Allen screws in the two handlebar U-clamps.
2 Place a suitable receptacle underneath each fork leg in turn and remove the large nut in the bottom of the fork slider. Allow the forks to drain thoroughly.
3 Tighten the nut in the slider and fill each fork leg with 230 cc (7.2 fl oz) of oil.
4 Replace and tighten the fork tube top nuts. Refit the handlebars if applicable.

4 Front forks: removal as a complete unit

1 It is not often that the complete front forks will have to be removed from the frame. If it is required only to service the legs, follow the procedure given in Section 6 of this Chapter.
2 Support the bike so that the front wheel is well clear of the ground and unclip the front brake cable.
3 Remove the handlebars complete with levers and controls by unscrewing the four Allen screws in the handlebar U-clamps. Disconnect any cable that will interfere with their removal.
4 Slacken the top hose clip of each rubber gaiter and pull the gaiter down. (This is a precautionary procedure to stop the gaiter being torn if the bottom yoke is removed later).
5 Undo the two fork tube nuts and also the two steering column nuts.
6 Slacken the two Allen screw pinch bolts in the top yoke. Lift off the top yoke.
7 The forks with the front wheel are now free to be slid out from the frame. Do not lose the steering head bearings.

5 Front forks: refitting as a complete unit

1 Refit the forks using the reverse procedure to that of removal. Adjust the steering head bearings as described in Section 12 of this Chapter.
2 When refitting, slacken the Allen screw pinch bolts in the bottom yoke before tightening the fork tube top nuts. Operate the forks several times to align them correctly before finally tightening the four pinch bolts.

6 Front fork legs: removal

1 When servicing the forks it is usually only necessary to

remove the fork legs and thus the following procedure can be used. It does not involve dismantling the steering head.
2 Support the machine so that the front wheel is clear of the ground and remove the front wheel as described in Chapter 5, Section 2.
3 Remove the top fork tube nuts; the handlebars will probably prevent the removal of the nuts from the top yoke. It is not necessary to remove the nuts completely, only to completely unscrew them from the fork tube. If it is necessary to remove the nuts completely, detach the handlebars by unscrewing the four Allen screws in the two U-clamps.
4 Slacken the top hose clip on each rubber gaiter and pull the gaiter downwards.
5 Slacken the Allen screw pinch bolts in both the top and bottom yokes. The fork legs are now free to be withdrawn from the yokes.
6 Turn the fork leg upside down and drain the oil into a suitable receptacle.

7 Front fork legs: replacement

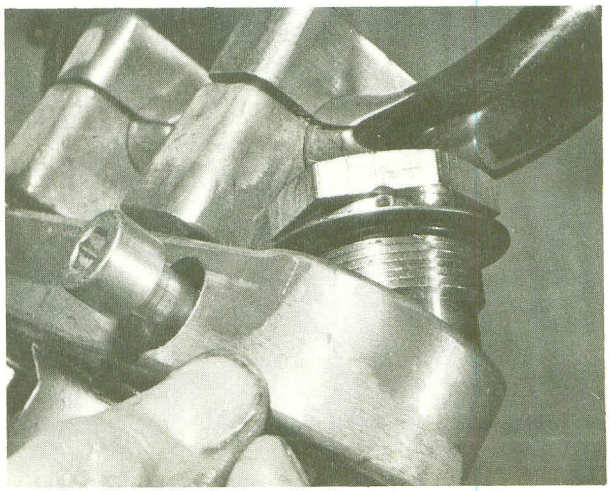
1 After assembling the fork leg fill it with 230 cc (7.2 fl oz) of oil.
2 Slide the tubes into the yokes and tighten the top nuts.
3 Refit the front wheel as described in Chapter 5, Section 2.
4 Check the adjustment of the steering head bearings as described in Section 12 of this Chapter.
5 Operate the forks several times and tighten the four Allen screw pinch bolts. Operate the forks again and tighten the pinch stud nut in the fork slider. This procedure will ensure the forks are correctly aligned.

8 Front fork legs: dismantling and reassembly

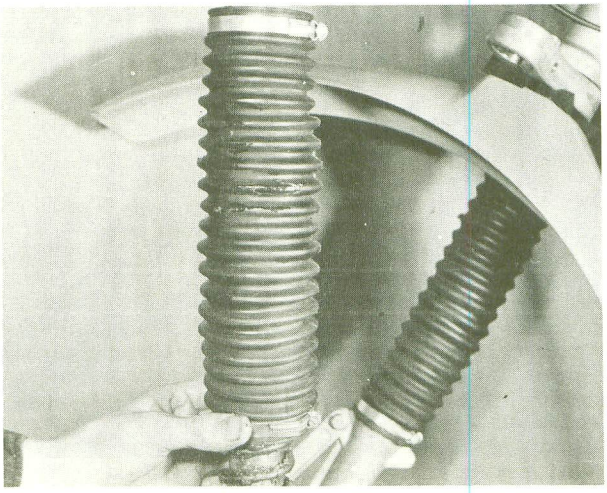
1 Slacken the bottom hose clip on each rubber gaiter and remove the gaiter.
2 Remove the gaiter securing cap and spring seat. Lift off the spring and remove the lower seat.
3 Unscrew the fork slider bottom nut and remove the slider from the tube.
4 The damper tube assembly is retained in the fork tube by a circlip which, when removed, allows the whole assembly to be pulled free.
5 If it is required to dismantle further, remove the split pin and unscrew the castellated nut. Make a note of how far you unscrew the nut so that it can be replaced in the same position. A final circlip on the damper tube has to be removed to free the valve.
6 The damping rate of the front forks is controlled by the viscosity of the oil and the clearance given to the valve by the position of the castellated nut. When reassembling, it is imperative that both nuts are adjusted to give the same damping.
7 Reassemble in the reverse order of dismantling. Do not forget to grease the springs inside the rubber gaiters.

9 Front forks: examination and renovation

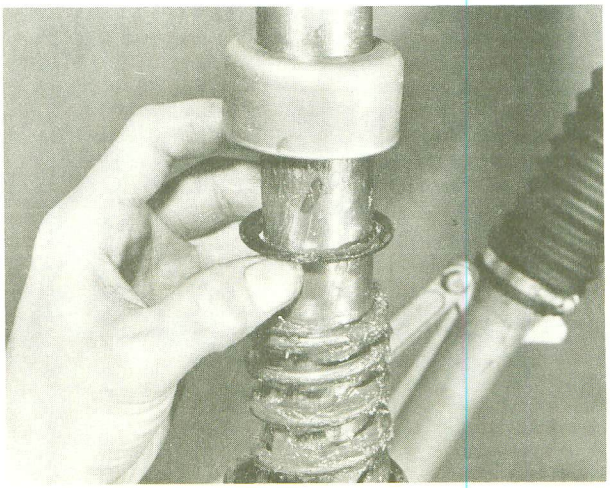
1 The front forks do not contain bushes. The hard chromed surface of the fork leg bears directly in the alloy slider. If wear occurs, indicated by slackness, the fork leg complete will have to be replaced, possibly also the fork tube. Wear on the fork tube is indicated by scuffing and penetration of the chromed surface.
2 Examine the damper piston for wear or score marks and renew if necessary.
3 Check the fork tubes for straightness by rolling them on a flat surface where any imperfections will become evident. If the tube is not badly bent your dealer, if suitably equipped, should be able to straighten them.
4 A further check for straightness and roundness of the fork tubes is to ensure that the slider slides freely up and down the tube. Check this when the spring is removed.
5 Check the fork springs against each other. If there is any



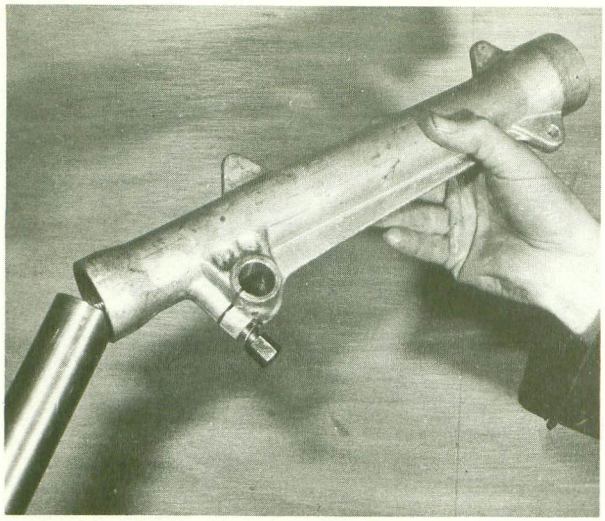
6.3 Slacken the pinch bolt and fork tube top nut



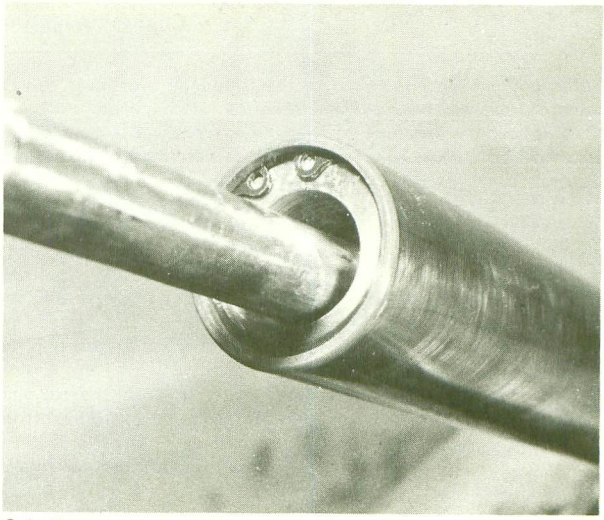
8.2a Lift off the gaiter followed by ...



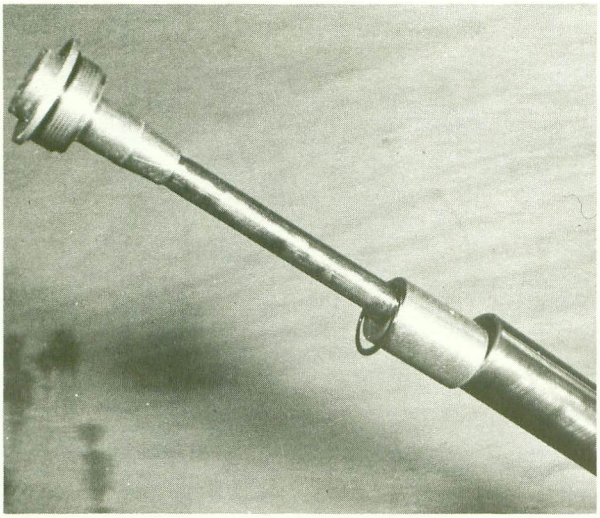
8.2b ... the securing cup and spring seat



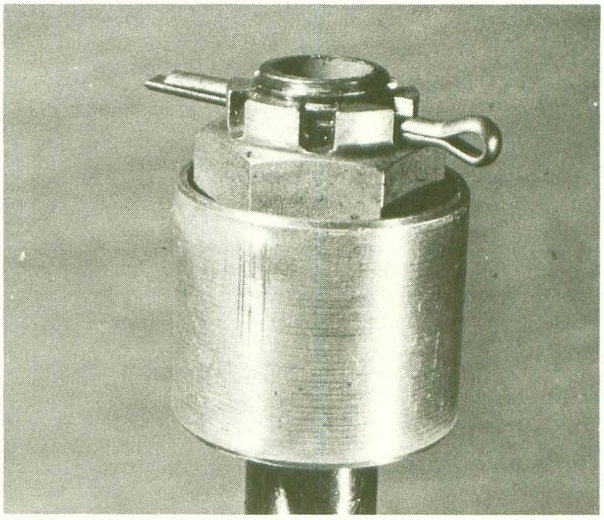
8.3 Pull slider from fork tube



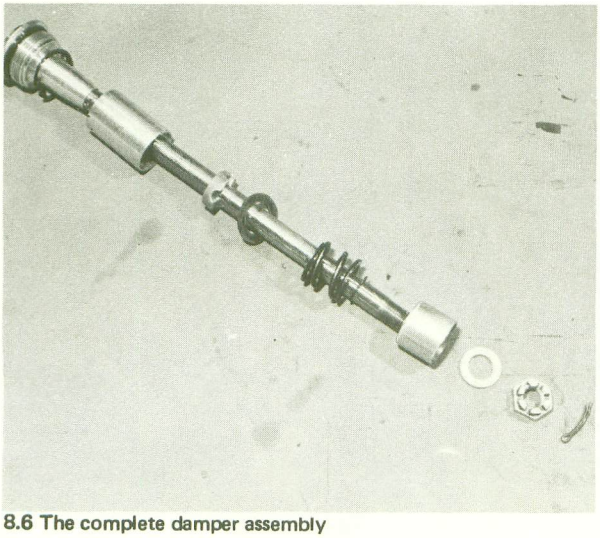
8.4a Remove the circlip and ...



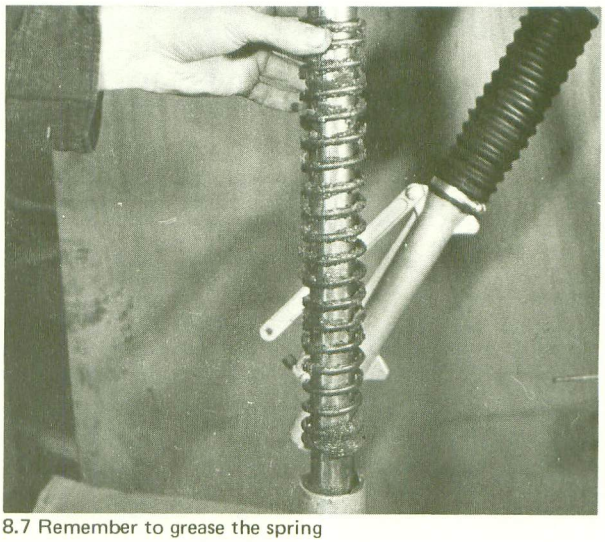
8.4b ... pull out the damper assembly



8.5 Remove the split pin after marking position of nut



8.6 The complete damper assembly



8.7 Remember to grease the spring

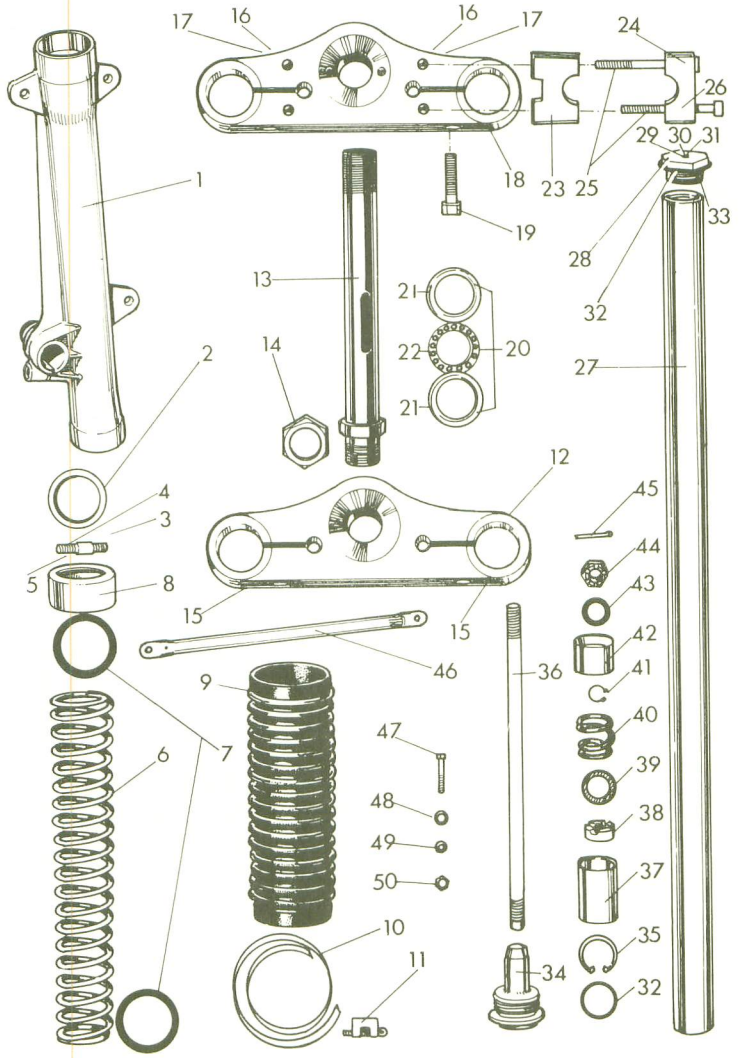


Fig. 4.1. Front forks

1 *Slider - 2 off*
2 *Oil seal - 2 off*
3 *Stud - 2 off*
4 *Nut - 2 off*
5 *Washer, spring - 2 off*
6 *Spring - 2 off*
7 *Spring seat - 4 off*
8 *Gaiter securing cap - 2 off*
9 *Rubber gaiter - 2 off*
10 *Hose, clip - 4 off*
12 *Bottom yoke*
13 *Steering column tube*
14 *Nut - 3 off*
15 *Allen screw - 2 off*
16 *Steering stop screw - 2 off*
17 *Rubber buffer - 2 off*
18 *Top yoke*
19 *Allen screw - 2 off*
20 *Bearing assembly complete 2 off*
21 *Bearing cups - 4 off*
22 *Ball bearings, caged - 2 off*
23 *Handlebar clamp, lower - 2 off*
24 *Handlebar clamp, upper - 2 off*
25 *Allen screw - 4 off*
26 *Washer, spring - 4 off*
27 *Fork tube - 2 off*
28 *Top nut - 2 off*
29 *Ball - 2 off*
30 *Spring - 2 off*
31 *Stud - 2 off*
32 *'O' ring - 2 off*
33 *Washer - 2 off*
34 *Bottom nut and damper cone - 2 off*
35 *Circlip - 2 off*
36 *Damper tube - 2 off*
37 *Damper collar - 2 off*
38 *Valve - 2 off*
39 *Washer - 2 off*
40 *Damper spring - 2 off*
41 *Circlip - 2 off*
42 *Damper piston - 2 off*
43 *Washer - 2 off*
44 *Castle nut - 2 off*
45 *Split pin - 2 off*
46 *Front brake torque arm*
47 *Bolt*
48 *Washer - 2 off*
49 *Washer, spring*
50 *Nut - 2 off*

difference, renew them.
6 There is an air release valve located in the fork tube top nut. With the fork leg assembled, check its function by compressing the forks, which should produce a release of air pressure through the valve. Also, the fork slider should return to its original position. If the valve is not functioning correctly reseat the ball by tapping it lightly into its seat with a small drift and check that the hole is not blocked.
7 Check the condition of the oil seal in the top of the fork slider. It will be evident, if replacement is required, due to the leaking oil found around the top of the seal.
8 The seal is held in place by the tension of the spring via its lower seat. To remove the old seal carefully prise it out with a screwdriver. Press in a new seal, being careful not to damage its sealing lip.
9 Renew the rubber 'O' ring on the slider bottom nut.

10 Fork travel stops

1 The fork travel stops consists of two special bolts screwed into the bottom yoke which hit a tab welded onto the steering head column. Being made of alloy it is possible after considerable usage, for the fixed stop to cut into the alloy and thus give extra fork movement. Check the condition of the stops and renew as necessary.
2 If the forks are forced severely towards one side, the fixed tab stop on the frame can break off thus allowing the forks complete freedom of travel which is very dangerous. It is worthwhile checking this stop occasionally to make sure it is not beginning to break off.

11 Steering head bearings: examination and renovation

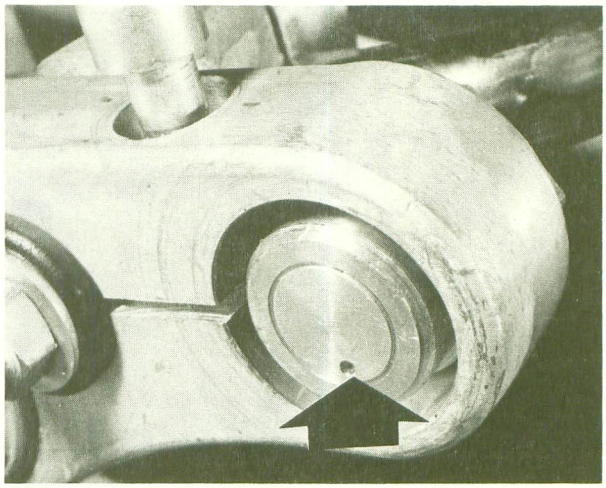
1 Clean and examine the raceways of the steering head bearing cups. They should have a polished appearance and show no signs of indentations. Renew as a set, if necessary.
2 Clean and examine the caged ball bearing which should also be polished and show no signs of surface cracks or blemishes. Also check that the cage is in good condition and not cracked. Renew as necessary.

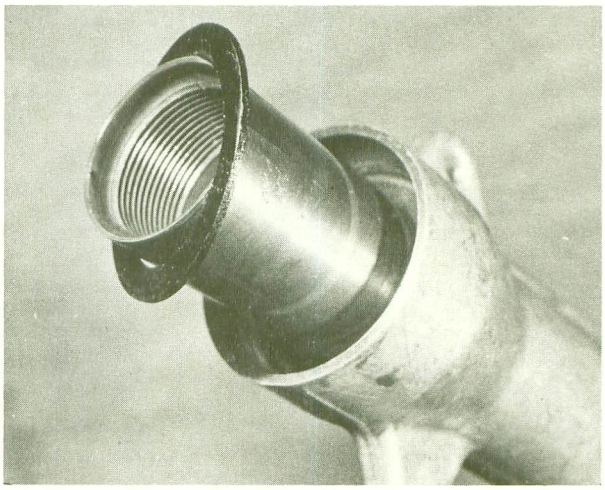
12 Steering head bearings: adjustment

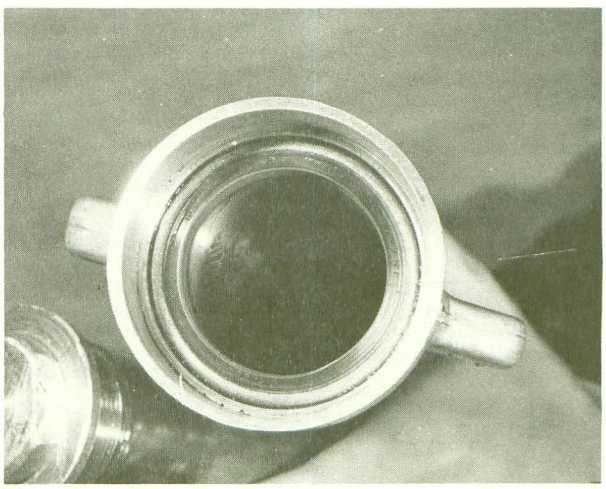
1 Correct adjustment of the steering head bearings must be achieved for positive steering. If they are too tight, the balls will damage the races and cause the steering to be jerky; if too loose, judder will occur when braking and this will also damage the race. For correct adjustment follow the procedure given below.
2 Slacken both the nuts on the steering column stem.
3 Slacken the two Allen screw pinch bolts in the bottom yoke.
4 Screw down the first nut on the steering column stem until there is no slackness whilst pulling the forks backwards and forwards. In addition, the forks should swing from lock to lock with only a slight pressure being required. Hold this nut in position and tighten down the locknut. Recheck the adjustment. Do not forget to retighten the two pinch bolts in the bottom yoke.

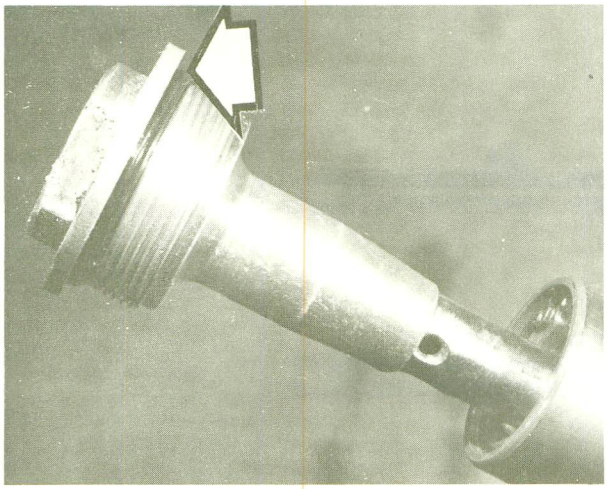
13 Swinging arm rear fork: removal and replacement

1 Remove the rear wheel as described in Chapter 5, Section xx. In the case of the 125 cc model the brake assembly will also have to be removed. See Chapter 5, Section xx.
2 Remove the two suspension units as described in Section 15.2 of this Chapter.
3 Unscrew the pivot bolt nut and pull it out whilst supporting the swinging arm to stop it from dropping.
4 Reassemble in the reverse order, but replace the rear suspen-

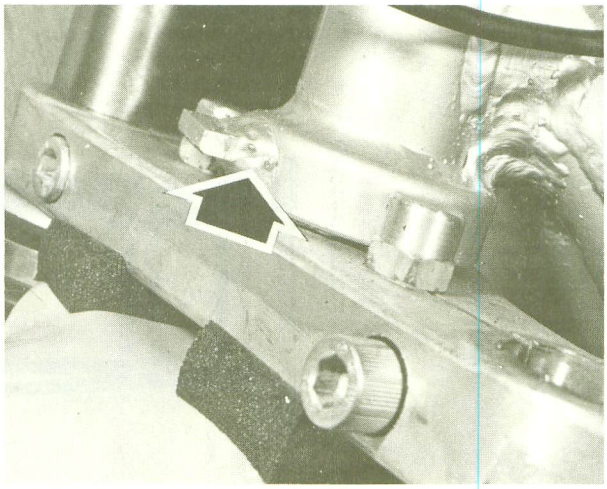

9.6 Check the air release hole is clear


9.8a Remove the spring seat giving access to ...

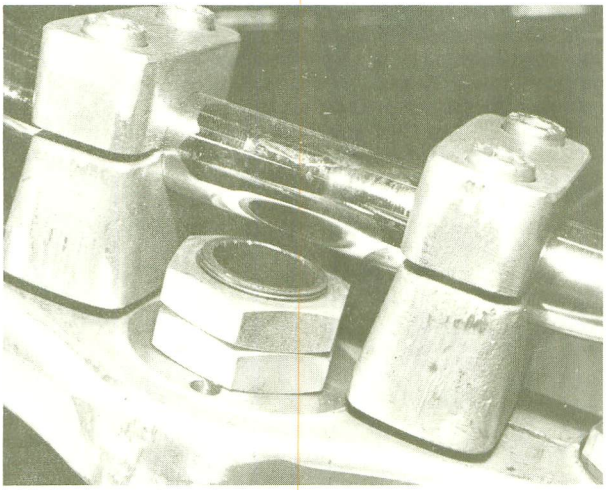

9.8b ... the oil seal



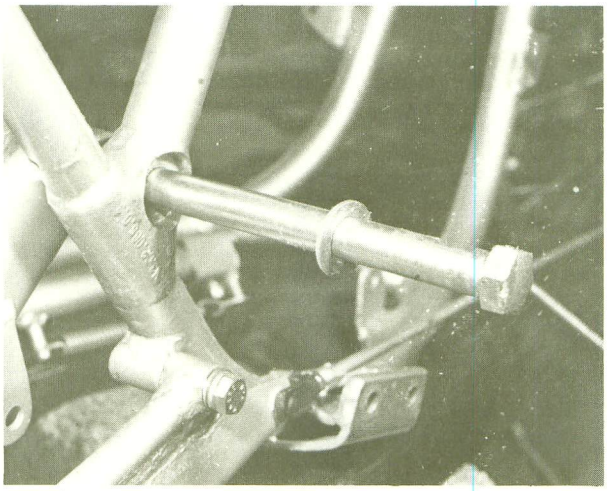
9.9 Renew the rubber 'O' ring



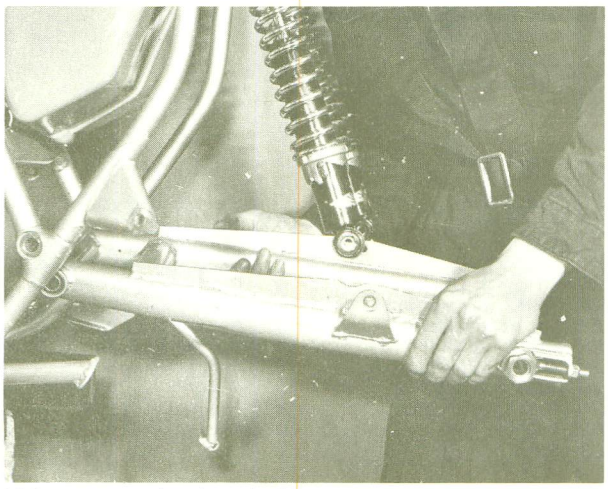
10.2 Check the weld on the fork stop tab



12.2 Slacken both the fork stem nuts



13.3a Pull out the pivot bolt whilst ...



13.3b ... supporting the swinging arm

sion units before tightening the pivot bolt nut. This procedure ensures that the Silentbloc bushes are not under a constant torque load when in the 'at rest' position.

14 Swinging arm rear fork: renovation

1 Check the bushes for any sign of deterioration or perishing and renew as necessary.
2 Remove the bushes by drifting them out. Insert the new bushes preferably with the aid of a press. Do not forget the spacer tube.
3 Check the pivot bolt for trueness on V-blocks or roll it on a piece of plate glass. Renew the bolt if it is found to be bent.
4 Visually check the swinging arm for distortion and renew if required.

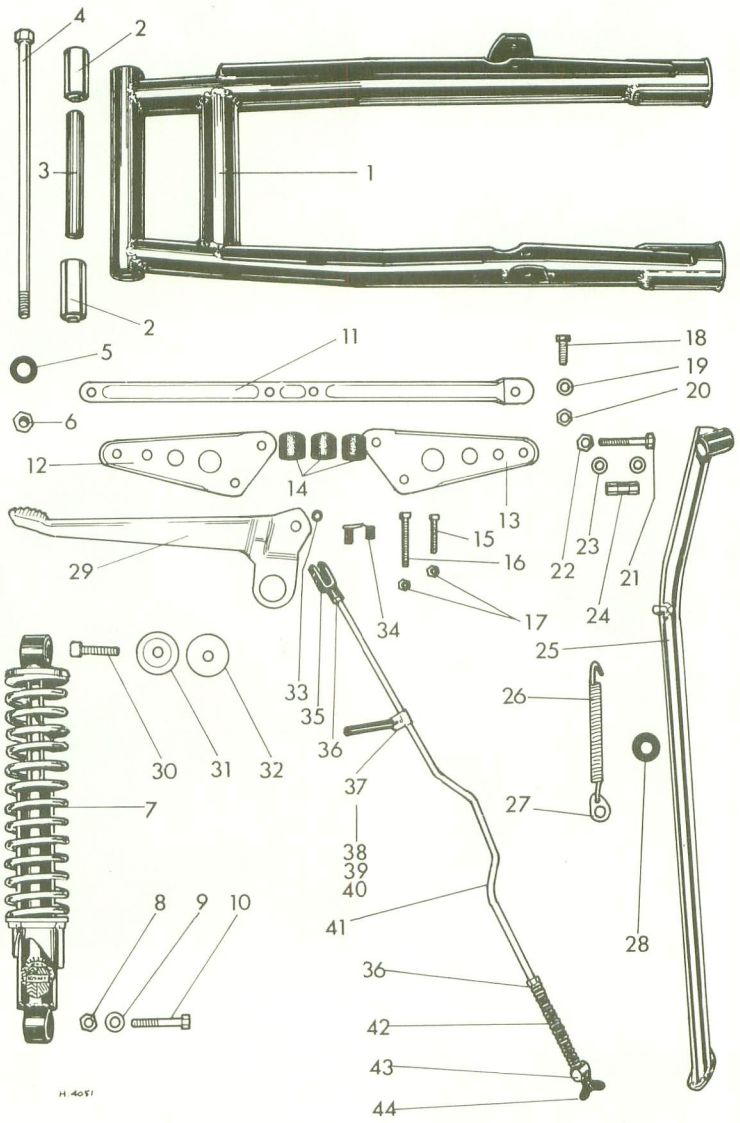


Fig. 4.2. Swinging arm and prop stand

1 *Swinging arm rear fork*
2 *Silentbloc bushes - 2 off*
3 *Spacing tube*
4 *Swinging arm pivot bolt*
5 *Washer*
6 *Swinging arm pivot nut*
7 *Rear suspension unit - 2 off*
8 *Nut 8 mm*
9 *Washer - 8 off*
10 *Bolt 8 mm - 4 off*
11 *Torque arm*
12 *Right hand chain guard halve*
13 *Left hand chain guard halve*
14 *Sliding rollers - 3 off*
15 *Screw 6 mm - 2 off*
16 *Screw 6 mm*
17 *Nut 6 mm - 2 off*
18 *Bolt 8 mm*
19 *Washer - 2 off*
20 *Nut 8 mm - 2 off*
21 *Bolt 8 mm*
22 *Nut 8 mm*
23 *Washer*
24 *Spacer bush*
25 *Prop stand*
26 *Stand return spring*
27 *Spring shackle*
28 *Rubber washer*
29 *Rear brake pedal*
30 *Allen screw 8 mm*
31 *Brake pedal collar*
32 *Washer*
33 *Bush*
34 *Security clip*
35 *Yoke*
36 *Nut 6 mm - 2 off*
37 *Brake rod return spring*
38 *Brake rod return spring clamp*
39 *Nut 4 mm - 2 off*
40 *Washer, spring*
41 *Rear brake rod*
42 *Spring*
43 *Trunnion*
44 *Nut, wing*

15 Rear suspension units: removal, renovation and replacement (including adjustment of damping rate)

1 Either Girling or Koni rear suspension units are fitted. On both these two types of units the spring pre-load can be adjusted (three positions) to suit the requirements of the individual. To adjust, rotate the bottom spring collar with an appropriate C-spanner. Do not forget to adjust both the suspension units to the same setting. The damping rate of the Koni units can also be adjusted, see paragraphs 7 to 12 below.

2 To remove the suspension units, support the machine so that the back wheel is clear of the ground. Unscrew both the top and bottom nuts and remove the bolts. Knock the units towards the rear.

3 To remove the spring, the unit should be held in a vice by its bottom eye and the spring tension adjusting collar rotated to the position placing the least tension on the spring. With one person pushing down from the top a second person should remove the split collets (or a single collar with a slot) from the top. The spring can then be lifted off.

4 Check the length of the spring against a new one. Renew if there is any difference. Both springs must be matched and the same length otherwise there will be uneven tension that will result in poor handling.

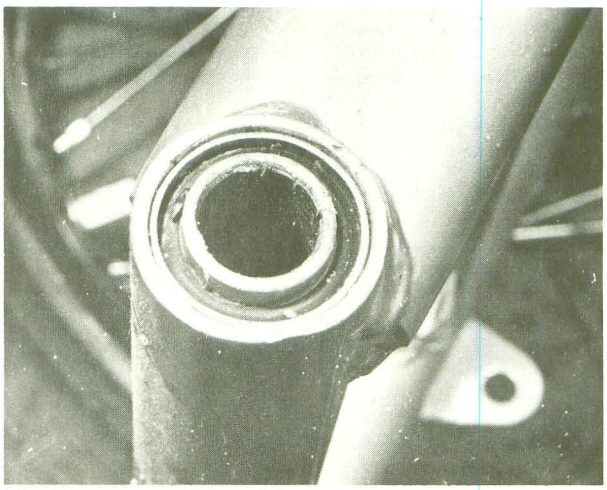
5 Check the damper unit for leakage of fluid and also the damping action by pulling and pushing the damper rod in and out of the unit whilst holding it in a vertical position. An even resistance should be felt with no sudden easy movement.

6 There are two rubber bushes with steel sleeves in each suspension unit, one at the top and one at the bottom. These require replacement if they show signs of wear or have perished. Press out the old bushes if a press is available; if not use a drift. A vice and a socket of the appropriate size can be utilized as a press.

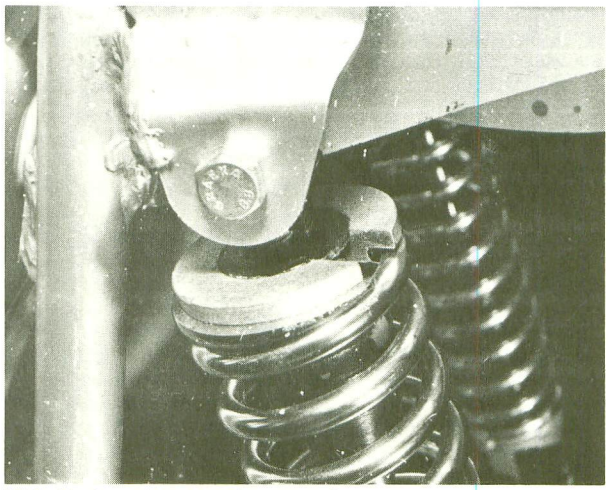
7 As stated above, the Koni units also have provision for adjusting the damping rate. To accomplish this, first remove the unit and release its spring.

8 Extend the damper rod completely and push the rubber bump stop to the bottom. If the rubber stop is stuck to the rod carefully prise it free with a screwdriver. Hold the top eye in a vice and loosen the retaining nut. The eye, retainer nut and rubber stop can now be removed. Also remove the aluminium spacer. Do not re-install this item since its omission will result in 1/3 more travel being available.

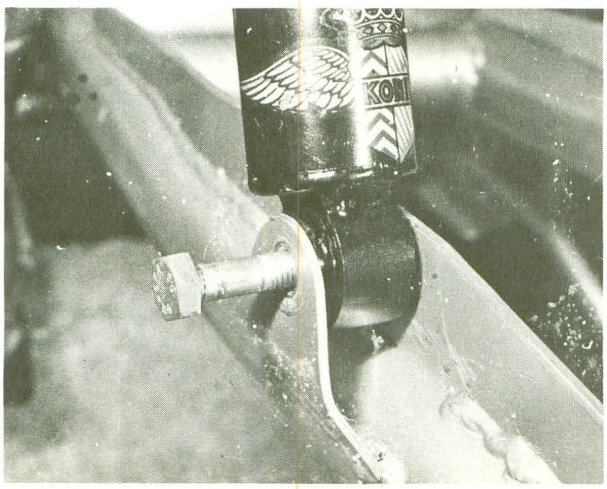
9 Replace the retainer nut and eye. Push the damper rod right down to the bottom and rotate it clockwise until it engages and drops into the damping adjustment slots inside the unit. When the rod is rotated to the extreme anticlockwise position the damping is at its lightest setting.



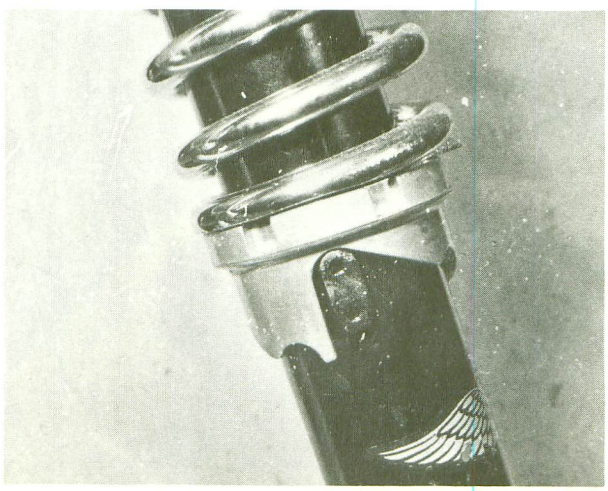
14.1 Check the condition of the bushes



15.2a Undo and remove the top and ...



15.2b ... bottom rear suspension bolts



15.3 Position of the collar for least tension on the spring

10 There are five, half revolution settings possible. It is suggested that for the first adjustment the rod is turned only two or three half turns clockwise. To achieve this adjustment, rotate the rod clockwise whilst it is still engaged in the adjustment slots.
11 The damper rod must be pulled out without rotating it to release it from the adjustment slots.
12 Reassemble the unit and do not forget to replace the rubber stop. Make sure that both the units are adjusted to the same setting.
13 Replace the suspension units in the reverse order of removal.

16 Rear brake lever: height adjustment and maintenance

1 The rear brake lever requires little attention except for the occasional oil or greasing. Its height can be adjusted to suit the individual by the adjustment screw - do not forget to tighten the locknut afterwards. When altering the height of the rear brake lever it will also alter the adjustment of the rear brake which should be rechecked as described in Chapter 5, Section xx.

17 Mudguards

1 Both the mudguards are made of fibreglass and a check should be kept to see that they have not split. Pay particular attention around the mounting holes and check the condition of the mounting rubbers. When replacing either of the mudguards do not omit the spacing rubbers since they are essential to help stop cracks forming.
2 If the mudguards become damaged it is possible to repair them with fibreglass and polyester resin repair kit. Follow the maker's instructions when carrying out the repair.

18 Seat

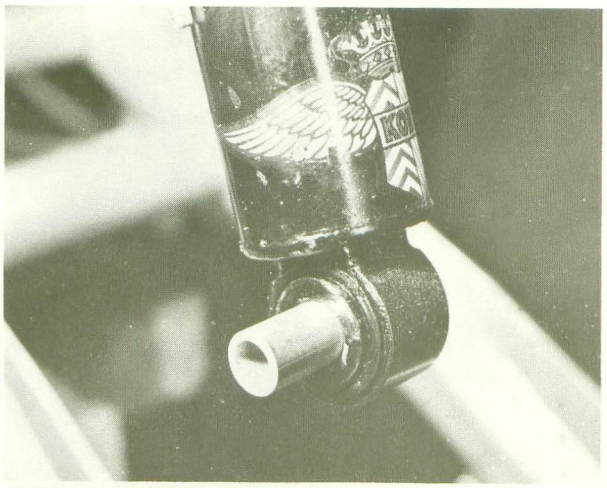
1 The seat is held in position by one bolt at the rear which when removed allows the seat to be lifted up and off the bike in a rearwards direction.

19 Handlebars

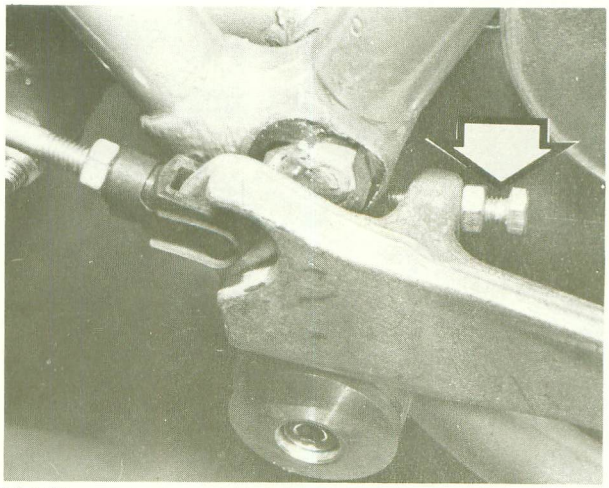
1 The handlebars are retained by two U-clamps secured by two Allen screws in each.
2 The bottom half of each clamp is rubber mounted to the top yoke. To remove the clamp, unscrew the self locking nut under the top yoke. Use a new nut when replacing.

20 Stand, footrests and kickstart lever: examination and maintenance

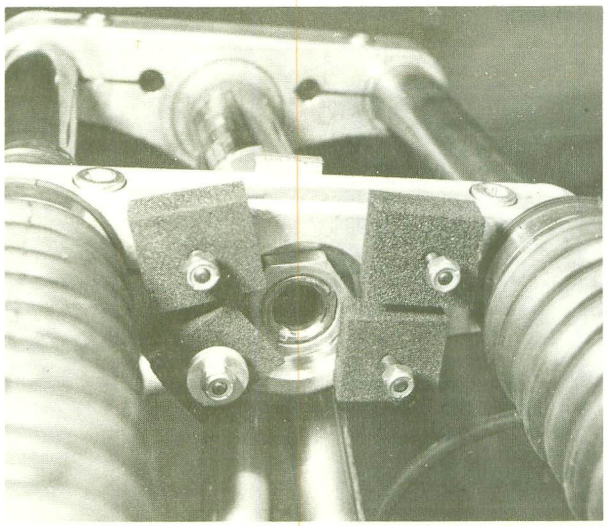
1 A single prop stand is fitted to all models. This requires little maintenance except for occasionally lightly greasing of the pivot point. Check the condition of the return spring and renew if in any doubt since if the stand drops down whilst the machine is in motion, it may cause an accident.
2 The footrests are spring loaded and require little attention except for the occasional greasing of the pivot.
3 A folding kickstart is fitted to all models; the pattern varies with the different models. The pivot requires occasional greasing. If required, the kickstart lever can be removed from the arm by removing the circlip. The ball and spring are retained by a roll pin. It should hold in either the extended or retracted position.



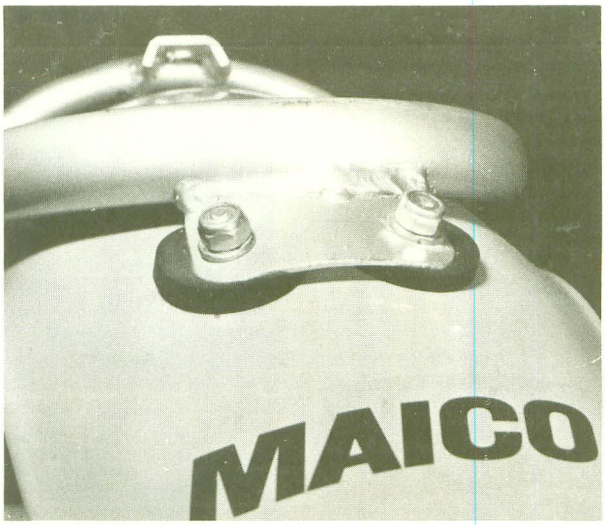
15.6 The loose steel sleeve in the bottom bush



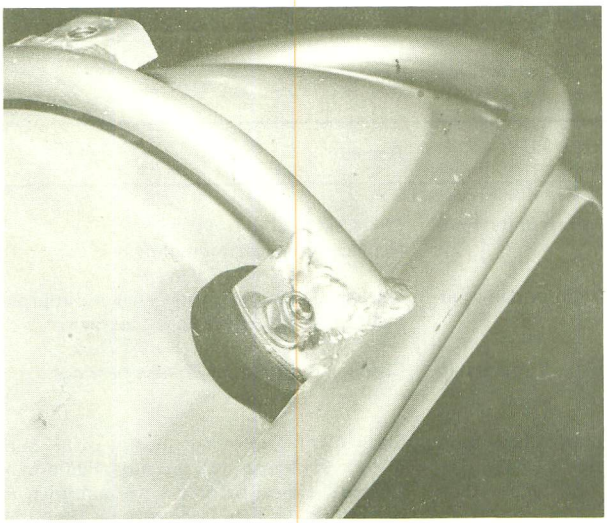
16.1 The rear brake pedal height adjustment screw



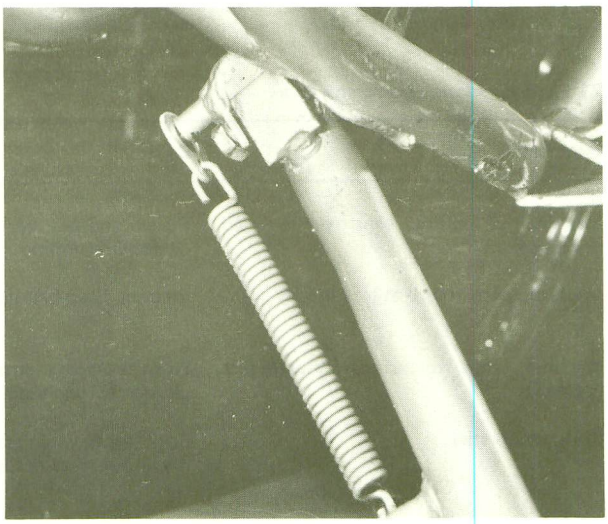
17.1a Always replace the foam between the front mudguard and top yoke



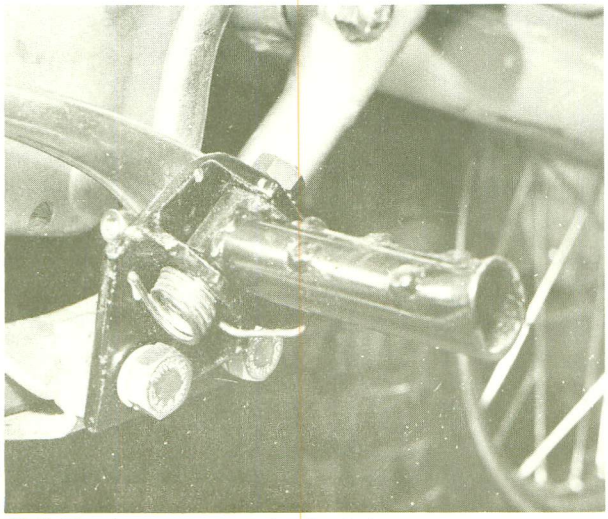
17.1b Do not omit the mounting rubbers here



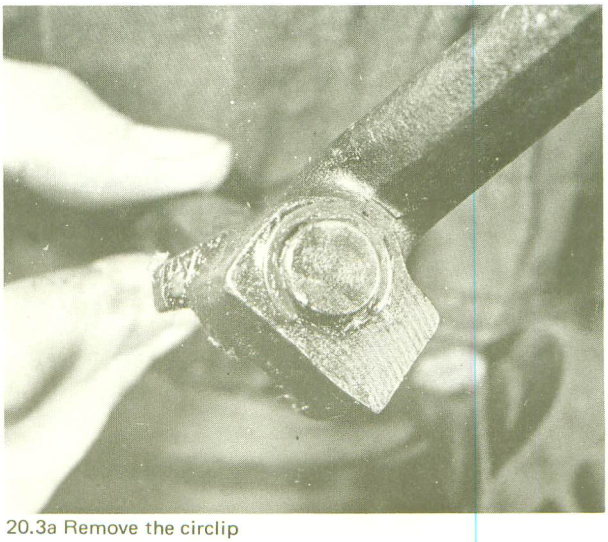
17.1c...and here



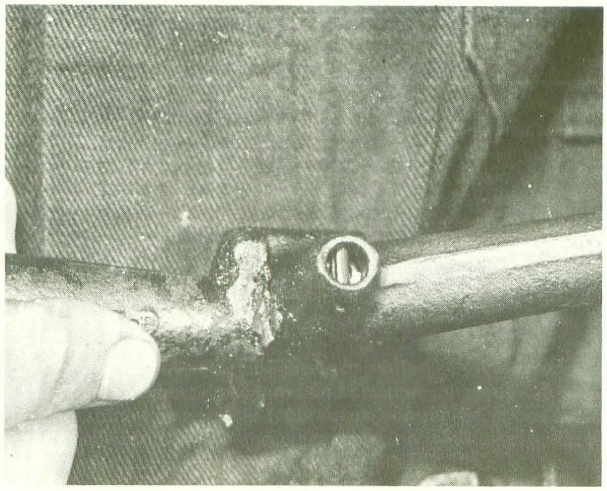
20.1 Check the condition of the prop stand return spring



20.2 The footrests are spring loaded



20.3a Remove the circlip



20.3b A roll pin retains the ball and spring

21 Fault diagnosis - frame and forks

Symptom	Cause	Remedy
Machine is unduly sensitive to road conditions	Forks and/or rear suspension units have defective damping	Check oil level in forks. Replace rear suspension units.
Machine tends to roll at low speeds	Steering head bearings overtight or damaged	Slacken bearing adjustment. If no improvement, dismantle and inspect bearings.
Machine tends to wander, steering is imprecise	Worn swinging arm bearings or sliders in plunger sprung models	Check and if necessary renew bearings.
Fork action stiff	Fork legs have twisted in yokes or have been drawn together at lower ends	Slacken off spindle nut clamps pinch bolts in fork yokes and fork top nuts. Pump forks several times before retightening from bottom. Is distance piece missing from fork spindle?
Wheels out of alignment	Frame distorted as a result of accident damage	Check frame alignment after stripping out. If bent, specialist repair is necessary.

Chapter 5 Wheels, brakes and tyres

Contents

Specifications

Model	125 cc	250, 400, 440 and 501 cc
Front wheel	Chromed steel or aluminium alloy rim with alloy hub and steel brake drum insert	
Brake dia	136 mm	136 mm
Spokes	18 x M4 x 125 mm	18 x M4 x 125 mm
	18 x M4 x 230 mm	18 x M4 x 230 mm
Rear wheel	Chromed steel or aluminium alloy rim with alloy hub and steel brake drum insert	
Brake dia	136 mm	160 mm
Spokes	—	18 x M4 x 143 mm
	—	18 x M4 x 208 mm
Tyre size: front	2.50 - 3.00 x 21 in.	3.00 - 3.25 x 21 in.
rear	3.50 - 4.00 x 18 in.	4.00 - 4.50 x 18 in.
Tyre pressure	7 - 15 lb/sq. in. as required	
Chain size	1/2 x 5/16 in.	5/8 x 1/4 in.
Sprocket size: gearbox (teeth)	14 - 16	11 - 14
rear wheel	44 - 48	52 or 59

1 General description

1 All models use the same front wheel which is 21 in. in diameter. The rear wheel is 18 in. in diameter on all models but of a different design on the 125 cc which also has a smaller diameter brake.

2 Varying section tyres are fitted to all models.

3 The rear wheel complete with sprocket has to be removed on all models except the 125 cc which has a quickly detachable (q.d.) rear wheel. The q.d. rear wheel allows the wheel to be removed whilst leaving the brake, sprocket and chain assembly in position, bolted to the swinging arm.

2 Front wheel: removal, examination and renovation

1 Support the machine under the engine so that the front wheel is clear of the ground. Spin the front wheel and check the rim for trueness. Small defects can be corrected by tightening the spokes (see next paragraph) although some experience is necessary.

2 Check for loose and broken spokes. Tapping the spokes with a screwdriver gives a good guide since the loose spoke does not ring but gives a different, dull sound. To tighten, turn the nipple in an anti-clockwise direction when looking along the spoke towards the rim. If the spokes have to be tightened, the tyre and

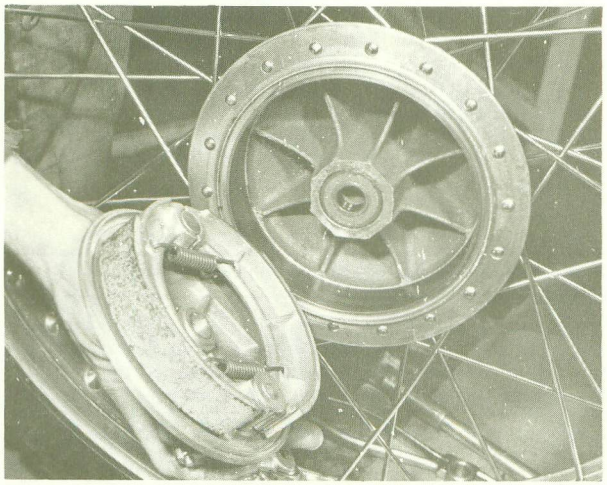
tube must be removed (see Section 16 of this Chapter) so that the protruding spoke end can be ground off to prevent it from causing punctures.
3 Check the wheel bearings by twisting the wheel while it is in the forks. If there is evidence of play the bearings will have to be renewed (see Section 4 of this Chapter). Also check that the wheel turns smoothly. If not, the condition of the wheel bearings is suspect, providing the brake is not binding.
4 To remove the front wheel, first unclip the front brake cable. Loosen the pinch stud nut on the sleeve nut side of the wheel and unscrew the wheel spindle. The wheel is now free to be removed. Note the spring collar fitted on the left-hand side.

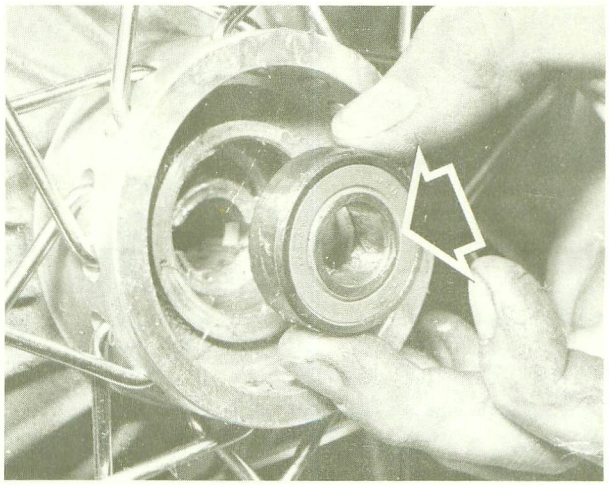
3 Front brake: examination and renovation

1 The front brake is of the single leading shoe pattern and can be lifted out of the brake drum once the front wheel has been removed. See previous Section.
2 The brake linings are bonded to the shoes and thus separate linings are not available. If the linings have worn thin, renew the shoes as a pair.
3 To remove the shoes, pull them both upwards and at the same time push their outside edge towards the middle of the brake plate. The shoes should snap clear from the brake plate.
4 Brush all the dust from the brake plate and out of the drum.
5 To remove the operating cam and spindle, undo and remove the pinch bolt in the operating lever and pull the lever off the splined spindle. The cam and spindle can now be pushed out from the brake plate. Note the rubber 'O' ring seal between the operating lever and the brake plate. Check the cam for wear where it contacts the brake shoes and on the spindle. Renew as necessary.
6 Check the condition of the brake shoe return springs and renew them if they seem stretched or if the brake was sluggish in pulling off. (If the brake is sluggish in action, first check that everything else is operating freely before blaming the springs).
7 When replacing the brake operating lever on the splined spindle it should be positioned so that an angle of 90° or slightly less is made between it and the brake cable, when the brake is fully applied. In this position the brake will work at its greatest efficiency. Lubricate the spindle with a little high melting point grease before replacing. Do not forget the rubber 'O' ring seal between the lever and brake plate.
8 Lightly grease the operating cam and fixed pivot before replacing the brake shoes. Use high melting point grease sparingly.

4 Front wheel bearings: removal, examination and replacement

1 Access to the front wheel bearings is obtained once the brake plate has been removed. Both the bearings have integral oil seals, on both sides, and are sealed for life. On some models it is possible that the bearings only have one oil seal, facing outwards.
2 The bearings are a drift fit in the hub. The left-hand bearing is positively located by a circlip, which must be removed first.
3 The spacer between the bearings has a cutaway to allow a drift to be inserted to knock the bearings outwards from the inside of the hub. Drift the bearings out gently and with great care, particularly if it is intended to use them again. The drift is being used on the inner ring of the bearing which is not very satisfactory. (A suitable shaped drift is shown in Fig. 5.1).
4 Remove all the old grease from the hub and bearings. Examine the bearings for wear eg., roughness when they are rotated, or play. Renew, if in any doubt.
5 Replace the left-hand bearing first followed by its circlip. Turn the wheel over and insert the spacer. Knock in the right-hand bearing. When drifting in the bearings, use a soft metal drift eg., brass or copper. Always use the drift on the *outside* ring of the bearing.
6 If only one oil seal is fitted to the bearing, this should face outwards. Pre-pack the bearing with a high melting point grease, also partially pack the hub with the same grease. Allow plenty of space for expansion of the grease when it becomes hot.


3.1 Lift out the front brake assembly


4.1 Note bearing has integral oil seal

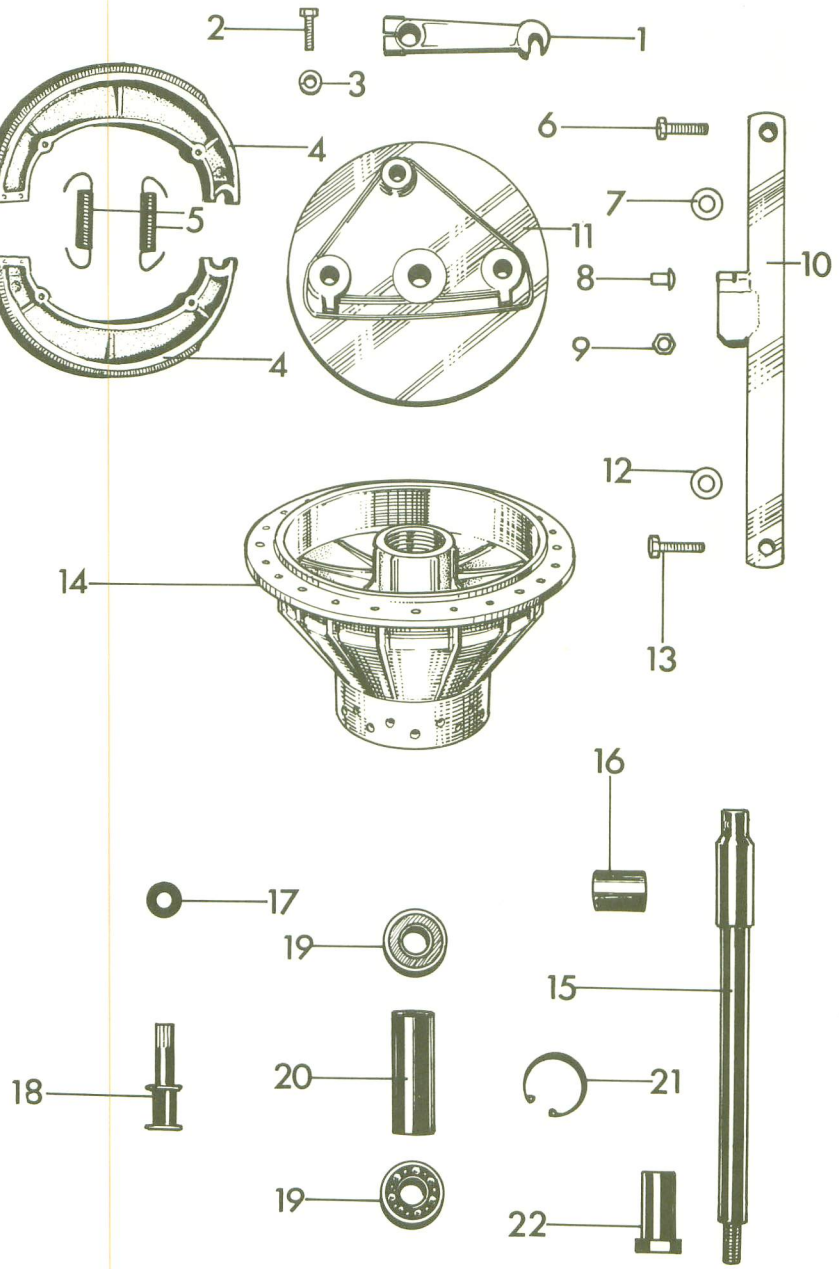


Fig. 5.1. Front hub and brake - all models

1	*Brake lever*	*12*	*Washer*
2	*Bolt 6 mm*	*13*	*Bolt 8 mm*
3	*Washer, spring*	*14*	*Front hub*
4	*Brake shoe - 2 off*	*15*	*Wheel spindle*
5	*Brake shoe spring - 2 off*	*16*	*Spacer*
6	*Bolt 8 mm*	*17*	*'O' ring*
7	*Washer*	*18*	*Operating cam*
8	*Cable outer holder*	*19*	*Bearing - 2 off*
9	*Nut 8 mm*	*20*	*Spacer tube*
10	*Torque arm*	*21*	*Circlip*
11	*Brake plate*	*22*	*Wheel spindle nut*

5 Front wheel: reassembly, replacement and adjusting the front brake

1 Replace the brake plate assembly into the drum and place the wheel between the fork legs.
2 Insert the wheel spindle but do not tighten it fully. Do not forget the spacing collar on the left-hand side.
3 Replace, but do not tighten, the torque arm bolt and hook the nipple of the front brake cable into the brake operating arm. Spin the wheel and operate the front brake several times, this centralises the brake shoes in the drum.
4 Tighten the torque arm bolt and wheel spindle. Do not forget to tighten the pinch stud nut on the fork leg.
5 Adjust the front brake cable to suit individual requirements. Check that the brake is not binding by spinning the wheel. Also check that the lever returns smartly, when released. The handlebar lever must not come into contact with, or be in close proximity to, the handlebars when the brake is applied fully.

6 Rear wheel: removal, examination and renovation

125 cc model only

1 Since the rear wheel is of a quickly detachable type the chain, sprocket and brake do not have to be removed.
2 Check the spokes and bearings as described in Section 2 of this Chapter. When checking the bearings by spinning the wheel, it is advisable to remove the chain so that the wheel is free to spin. **Note:** there is another bearing in the rear brake drum assembly in addition to the two in the wheel. For removal, examination and replacement of this bearing see Section 12 of this Chapter.
3 After supporting the machine, remove the domed nut on the left-hand end of the wheel spindle. Withdraw the spindle from the wheel. A hole is provided in the spindle end for a tommy bar to hold it whilst undoing the nut and also to facilitate withdrawal.
4 Lift the wheel out from the swinging arm. Note the spacers fitted on the left-hand side.

All other models

5 Support the machine so that the rear wheel is clear of the ground. Unclip and remove the spring link, also unhook the chain from the sprocket.
6 Check the spokes and bearings as described in Section 2 of this Chapter.
7 Remove the wing nut on the rear brake operating rod and unhook the return spring. Pull the rod clear from the brake arm.
8 Detach the torque arm either at the swinging arm end or, preferably, at the brake plate.
9 Unscrew and withdraw the wheel spindle. Lift the complete wheel out of the swinging arm. Be careful not to let the brake plate fall out.

7 Rear brake: removal

125 cc model only

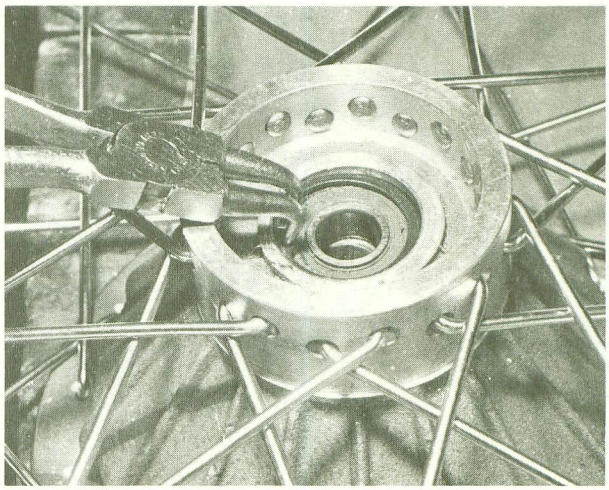
1 Follow the procedure for the removal of the rear wheel sprocket given in Section 10 of this Chapter. The brake plate assembly can be lifted out from the drum, when the assembly is clear of the swinging arm.

All other models

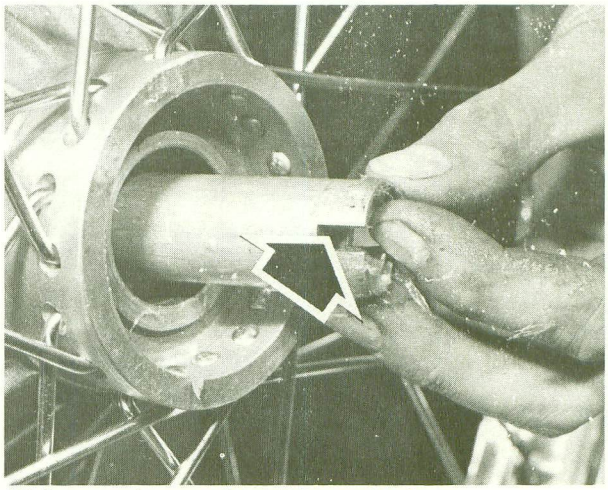
2 Follow the procedure for the removal of the rear wheel given in Section 6 of this Chapter. The brake assembly can be lifted out from the drum, after the wheel has been pulled clear of the frame.

8 Rear brake: examination and renovation

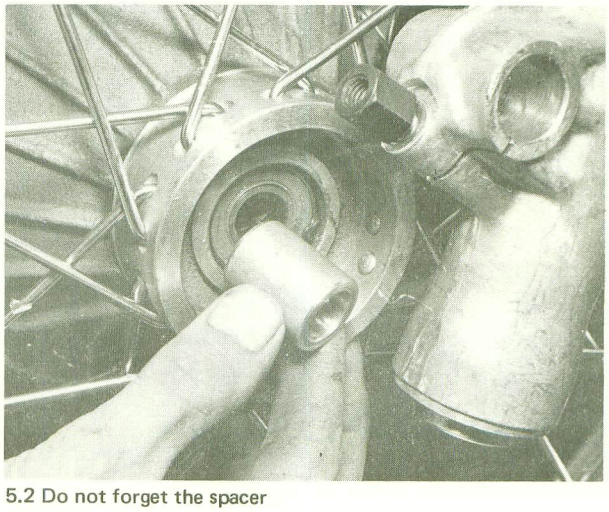
1 The rear brake is of a similar pattern to that fitted to the



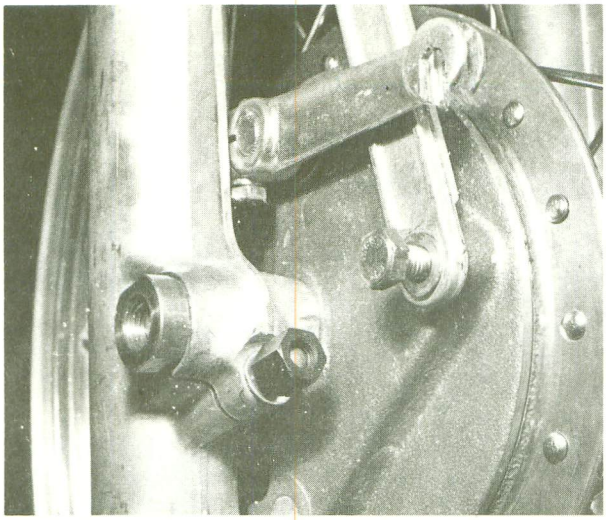
4.2 Remove the circlip to release bearing



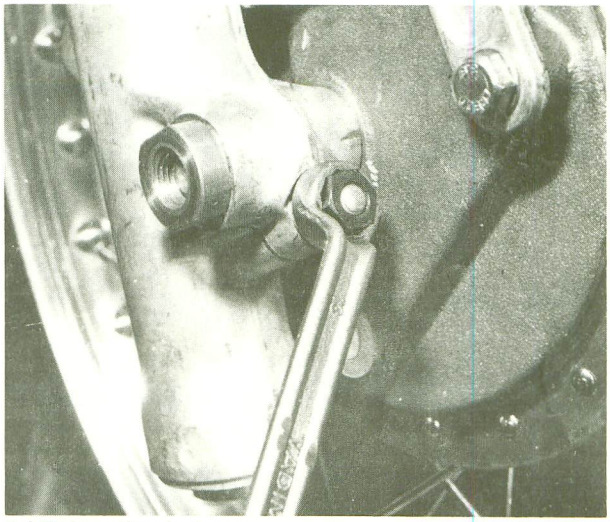
4.3 Cutaways in spacer for drifting out bearings



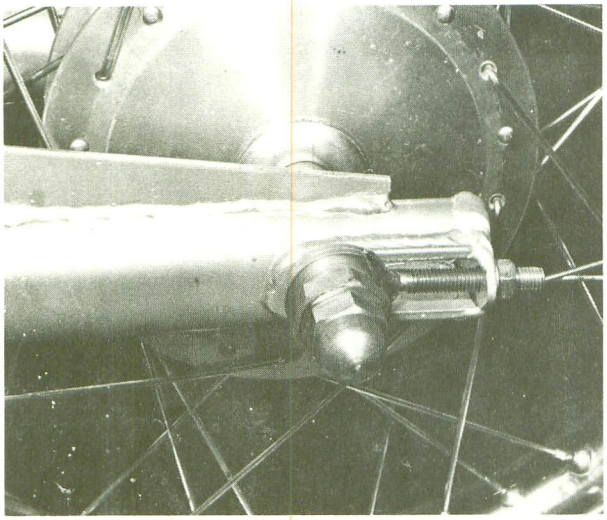
5.2 Do not forget the spacer



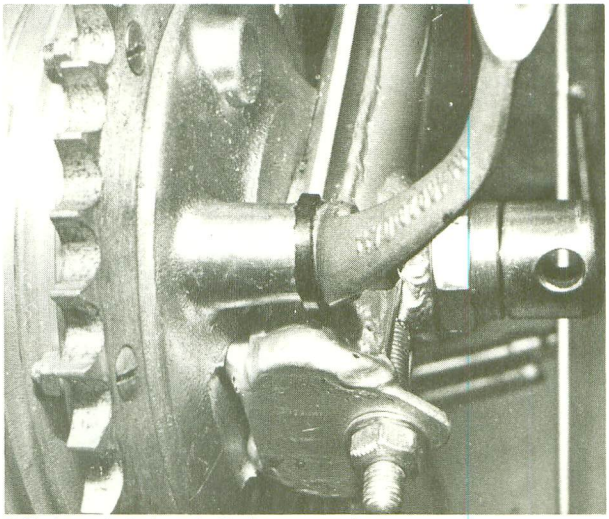
5.3 Replace and tighten the torque arm bolt



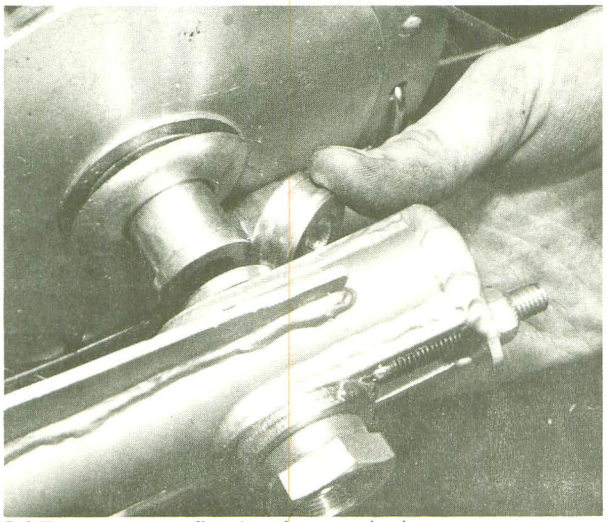
5.4 Tighten the pinch nut



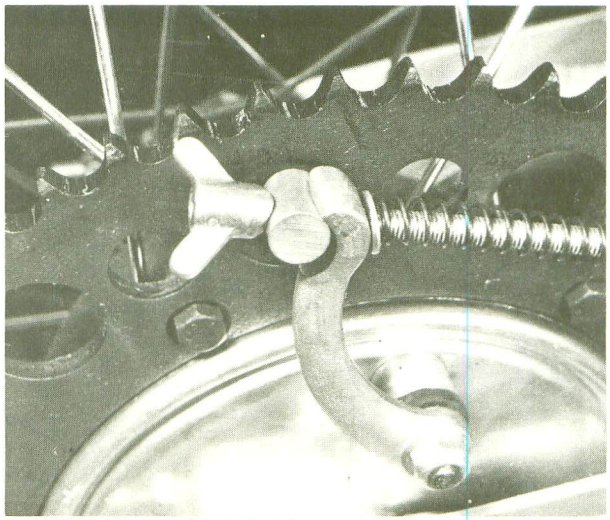
6.3a Remove the domed nut



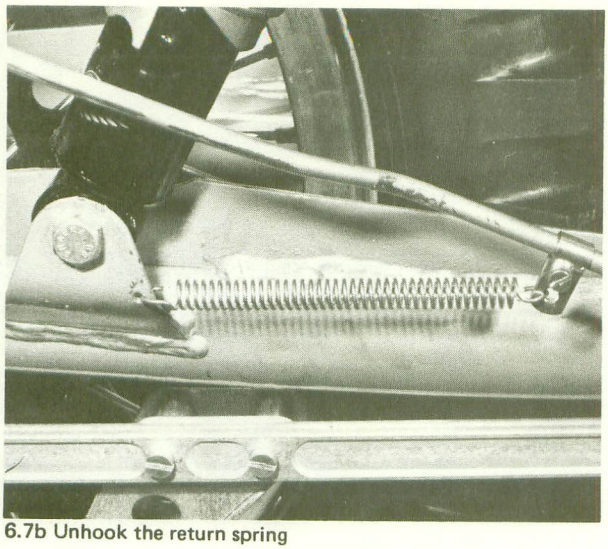
6.3b Note hole in spindle for tommy bar



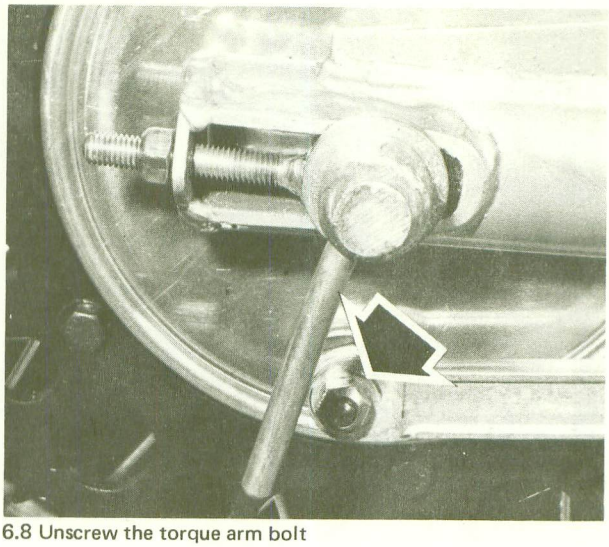
6.4 Two spacers are fitted to the rear wheel



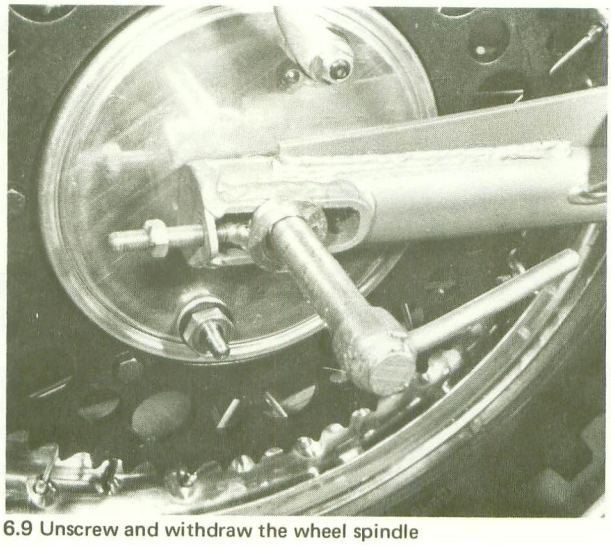
6.7a Unscrew the wing nut and...



6.7b Unhook the return spring



6.8 Unscrew the torque arm bolt



6.9 Unscrew and withdraw the wheel spindle

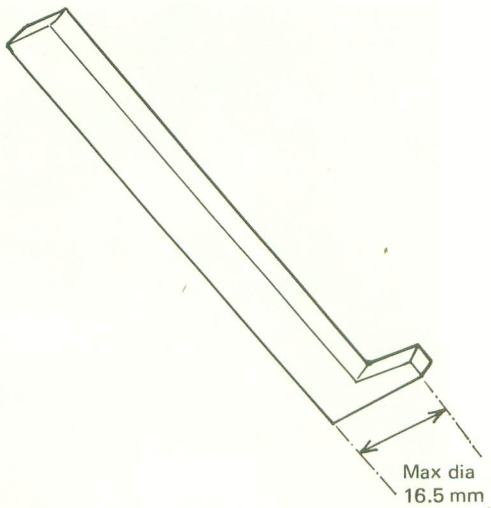


Fig. 5.2. Drift for removing wheel bearings

MAX. DIA.
16.5 mm

front and thus the information given for the front brake, in Section 3 of this Chapter, is applicable.
2 The angle between the brake operating lever and rod should be 90° or slightly less when the brake is applied fully.

9 Rear wheel bearings: removal, examination and renovation

1 Follow the procedure relating to the front wheel bearings given in Section 4 of this Chapter. The arrangement is identical.
2 Note that a felt oilseal is fitted to the left-hand side of the hub on some models.
3 Note that a special reducing collar is inserted in the left-hand bearing of all but the 125 cc models.

10 Rear wheel sprocket: removal and replacement

125 cc models only

1 Remove the rear wheel as described in Section 6 of this Chapter. Detach the spring link of the chain.
2 Remove the rear brake rod and detach the torque arm at one end.
3 Unscrew the large nut retaining the brake and sprocket assembly, and remove the assembly from the swinging arm.
4 The sprocket is removed by withdrawing the eight retaining screws.
5 When replacing the sprocket do not forget to tighten all the screws.
6 When refitting the brake assembly, do not forget to attach and tighten the torque arm and to adjust the rear brake.
7 Fit the spring link with its closed end facing the direction of travel of the chain.

All other models

8 Remove the rear wheel as described in Section 6 of this Chapter.
9 Remove the sprocket by withdrawing the six retaining bolts.
10 When replacing the sprocket do not forget to tighten all the bolts.
11 When refitting the wheel do not forget to attach and tighten the torque arm and to adjust the rear brake.
12 Fit the spring link with its closed end facing the direction of travel of the chain.

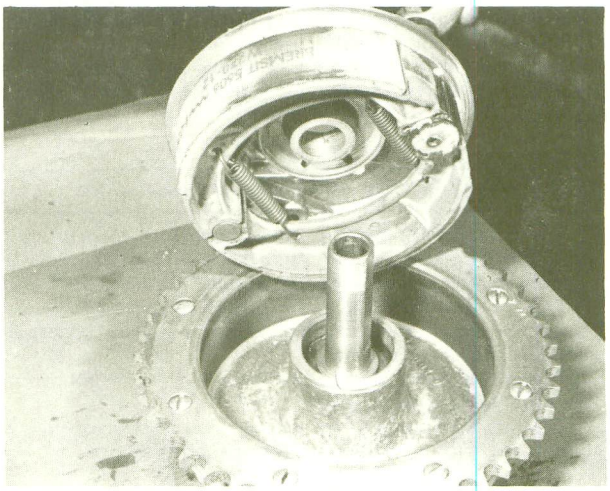
11 Rear wheel sprocket: examination

1 Examine the sprocket for chipped, hooked or worn teeth. Renew as necessary.
2 If a new rear sprocket is required the final drive sprocket will almost certainly be worn as well and it is good practice to replace both the sprockets and the rear chain at the same time.

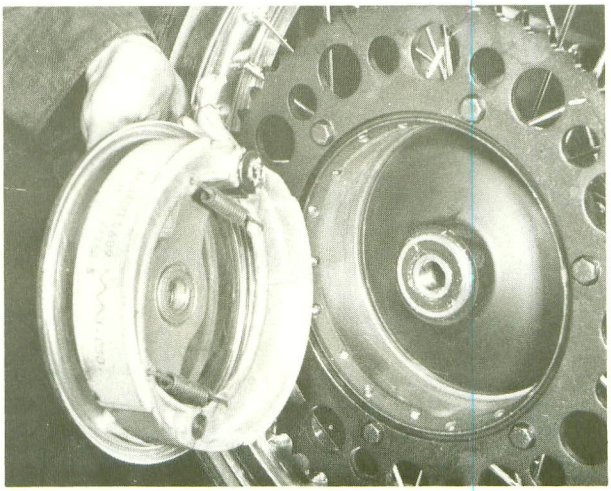
12 Brake drum bearing and seal: removal and replacement

125 cc models only

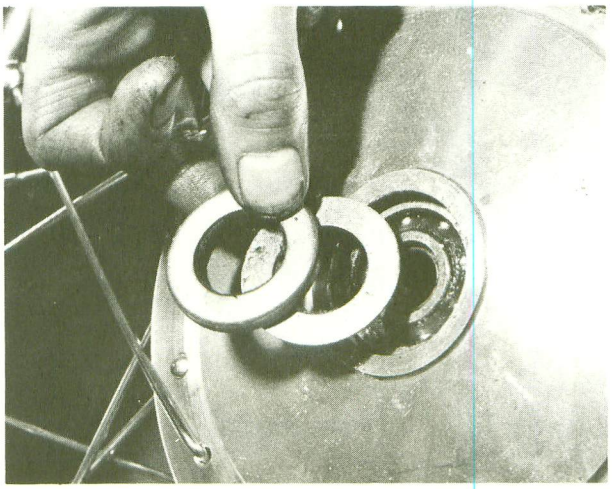
1 Remove the brake plate assembly as described in Section 7 of this Chapter.
2 Remove the circlip and drift out the bearing and hollow shaft from the rear of the drum. Do this gently and with great care, particularly if it is required to use the bearing again. The drift is being used in the inner ring of the bearing which is not very satisfactory.
3 Note the position of the spacing collar. The bearing can be drifted off the hollow shaft, if required.
4 Remove all the old grease from the drum, spindle and bearing. Examine the bearing for wear eg., roughness when it is rotated or play. Renew, if in any doubt.
5 When replacing the bearing, do not forget the washer and to pack the bearing with high melting point grease.
6 Once the bearing has been removed from the drum, the felt



7.1 Lift out the rear brake after releasing the brake assembly



7.2 Lift out the rear brake from wheel hub

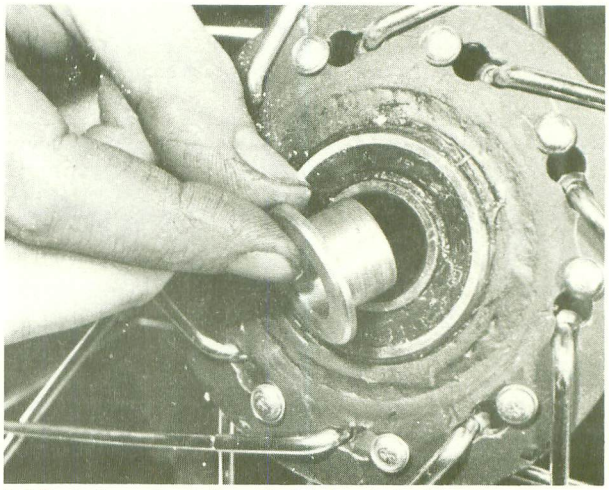


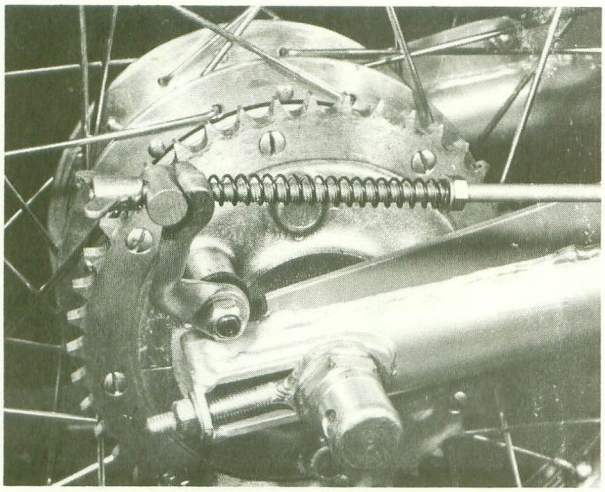
9.2 The felt seal in the hub

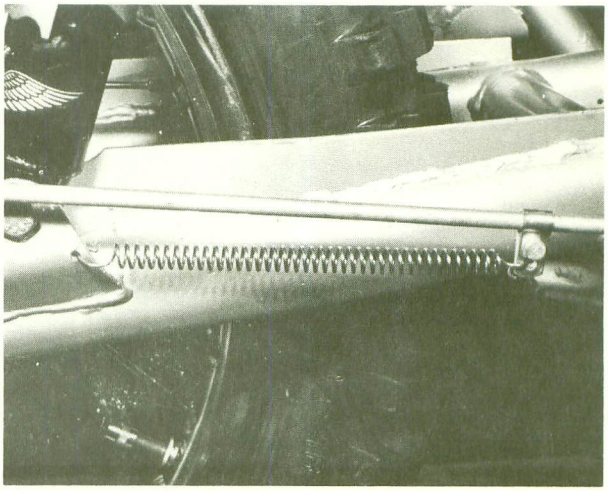
seal can be extracted by drifting it out from the drum side. Renew the felt as required. Do not forget to pre-grease the felt.
7 Check the condition of the fibre ring that acts as a seal between the hub and brake drum. Renew as necessary. If a replacement is required remove the old fibre ring by breaking it up.

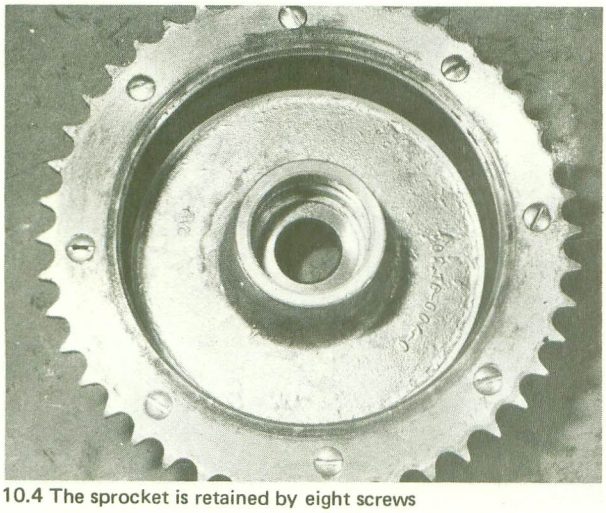
13 Rear wheel cush drive: examination and replacement

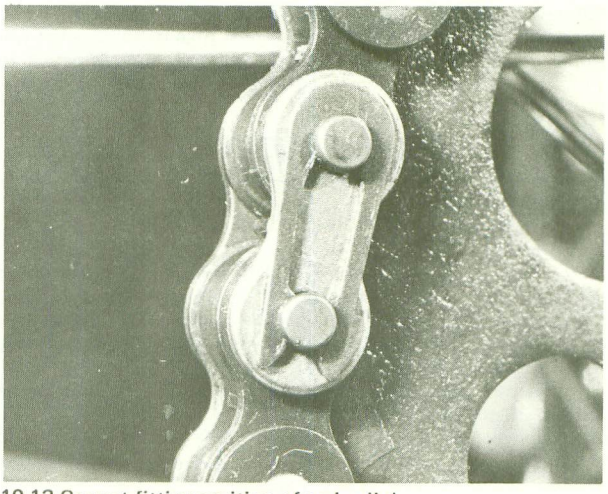
1 The cush drive is fitted to only the 125 cc models and is located behind the brake drum/sprocket assembly which can be removed as described in Section 10 of this Chapter.
2 The cush drive consists of six shaped rubber bushes which absorb the shock loads from the transmission. The rubbers are held in position by split pins.
3 Access to the split pins is obtained by levering the rubbers up (see accompanying photograph).
4 Check the condition of the rubbers, particularly for signs of softening or splitting. Always renew the rubbers as a set.

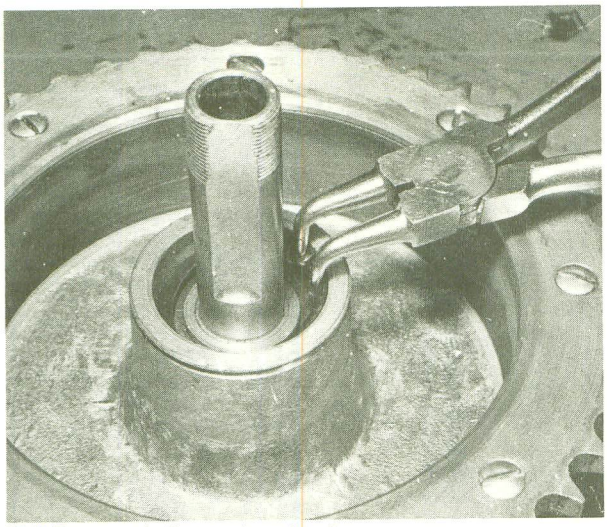

9.4 Reducing collar is fitted in left-hand wheel bearing


10.2a Unscrew the wing nut and...

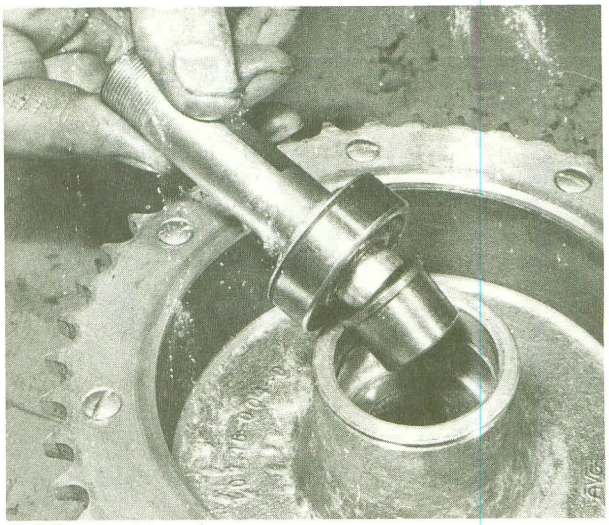

10.2b Unhook the brake rod return spring


10.4 The sprocket is retained by eight screws

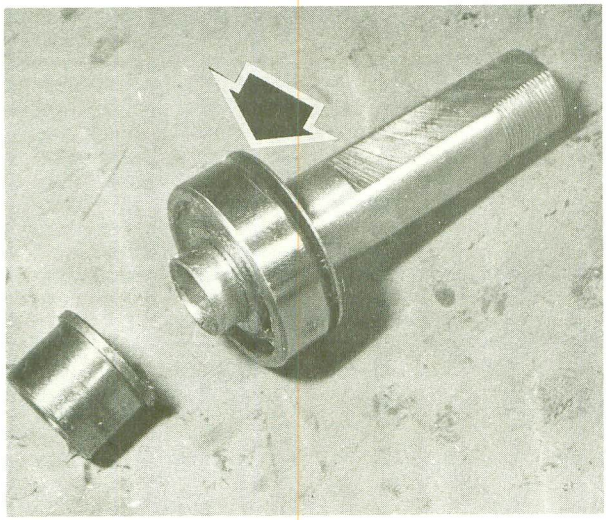

10.12 Correct fitting position of spring link



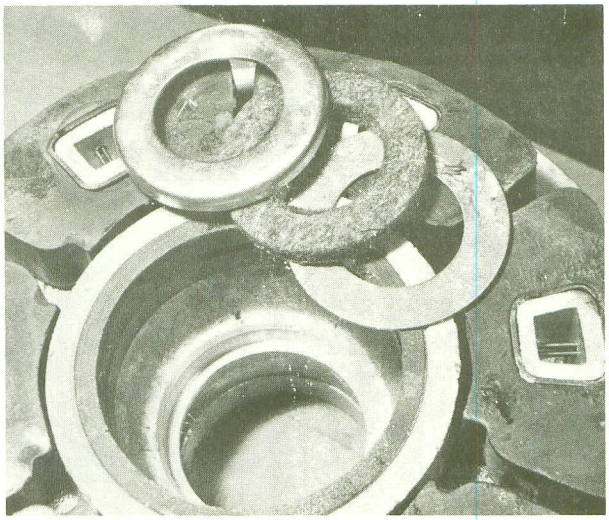
12.2 Remove circlip to release bearing



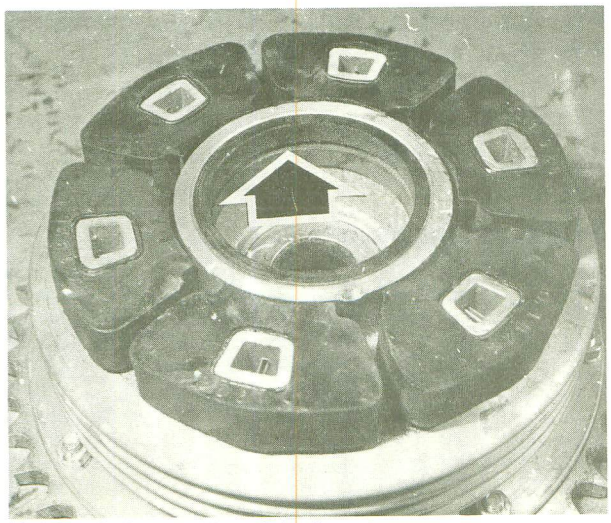
12.3 Note position of components



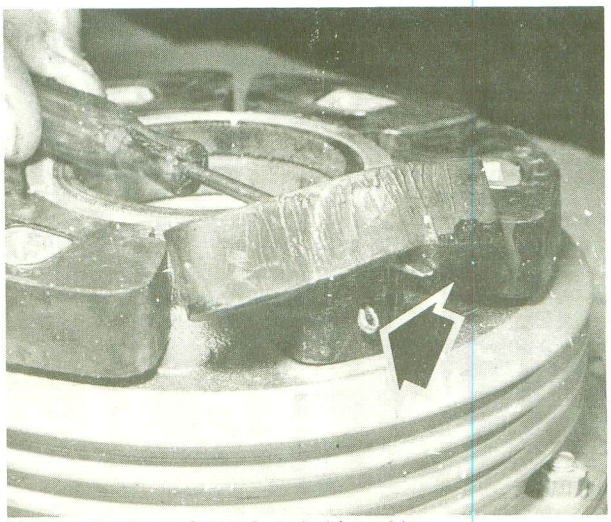
12.5 Do not forget the backing washer



12.6 The felt oil seal located in the brake drum



12.7 Check the condition of the fibre ring



13.3 A split pin retains each cush drive rubber

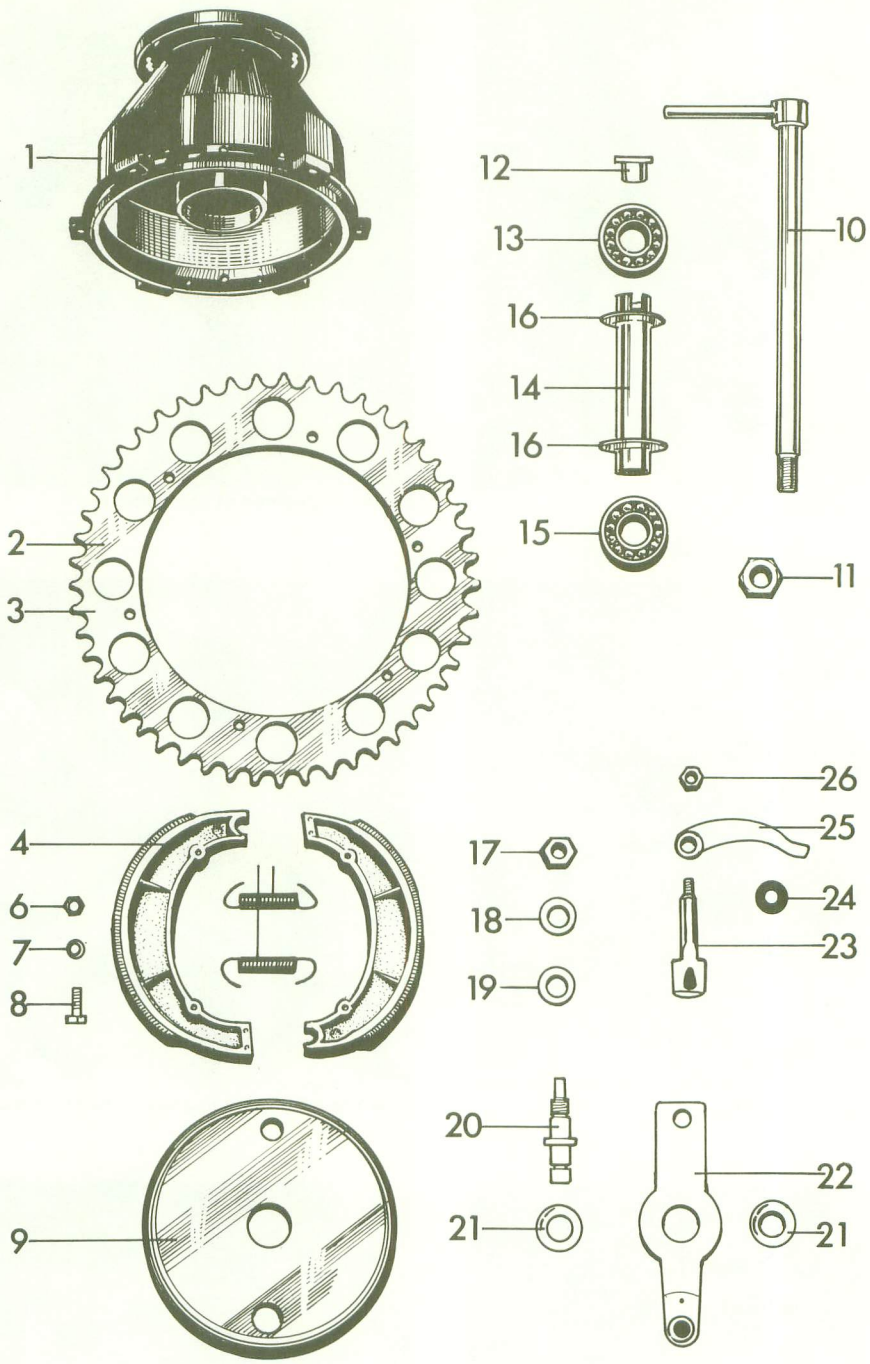


Fig. 5.3. Rear hub and brake, 250, 400, 440 and 501

1	*Rear hub*	14	*Spacer tube*
2	*Sprocket, 52T or 59T*	15	*Bearing, 6303RS*
3	*Sprocket, 52T or 59T*	16	*Shim - 2 off*
4	*Brake shoe - 2 off*	17	*Nut - 12 mm*
5	*Brake shoe spring - 2 off*	18	*Washer, spring*
6	*Nut 7 mm - 6 off*	19	*Washer*
7	*Washer, spring - 6 off*	20	*Brake shoe pivot*
8	*Bolt 7 mm - 6 off*	21	*Spacer*
9	*Brake plate cover*	22	*Brake plate*
10	*Wheel spindle*	23	*Operating cam*
11	*Wheel spindle nut*	24	*'O' ring - 2 off*
12	*Reducing collar*	25	*Brake lever*
13	*Bearing, 6204RS*	26	*Nut 8 mm*

14 Rear wheel: reassembly, replacement and adjustment of the rear brake

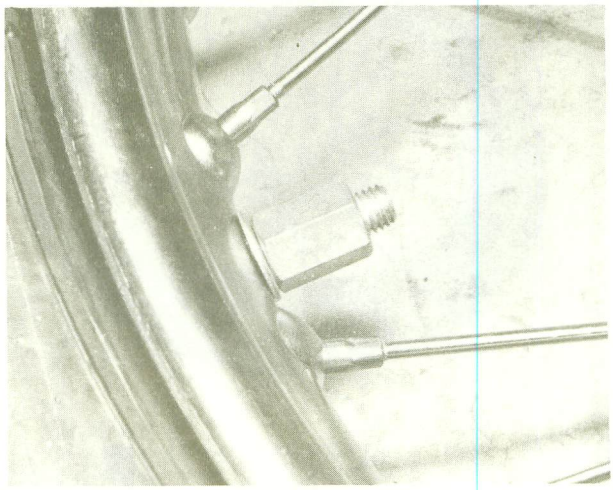
1 Reassemble the rear wheel (and brake) in the reverse order of dismantling.
2 Where it is necessary to refit the final drive chain, make sure the closed end of the spring link is facing the direction of travel of the chain.
3 Adjust the rear brake by turning the nut on the end of the rear brake rod, to suit individual requirements. Adjust the rear brake only after tensioning the rear chain.
4 Check that the rear chain is not binding by spinning the wheel. Also check that the rear brake pedal returns smartly when released. If not, after checking that everything is free, apply more tension to the brake rod spring by positioning the clip on the rod nearer the front of the machine.

15 Final drive chain: examination, lubrication and adjustment

1 The final drive chain is fully exposed and if not properly maintained will have a short life. A worn chain will also cause rapid wear of the sprockets and thus they will also have to be renewed. A new chain tends to stretch by a relatively large amount at first and must be checked more frequently for the correct tension than a chain which has bedded in.
2 To adjust the rear chain, slacken the wheel spindle (and also the large sprocket retaining nut, 125 cc models). Slacken also the torque arm bolt. Screw the two adjuster nuts in or out until the correct chain tension is achieved, approximately 1½ in. total movement in the middle of the chain run. When moving the adjuster nuts make sure that they are moved by an equal amount. Retighten all the nuts and recheck the chain tension by turning the wheel into different positions. Do not overtighten the chain.
3 To check that the rear wheel is in alignment with the front place a long straight edge (eg. a piece of wood) against both sides of the rear wheel. The front wheel should lie in the middle and be pointing straight forward if all is correct. The straight edge will not touch the front tyre since a smaller cross section tyre is used on the front.
4 To check the chain for wear, first clean off all the old oil and grease and lay the chain lengthwise in a straight line before compressing it endwise. Fix one end and pull the chain out in the opposite direction to see the extent of play. If it is greater than ¼ inch per foot, the chain should be renewed. An indication of chain wear is given by the amount a chain can be bent sideways.
5 Although a chain can be lubricated with engine oil this is not very satisfactory and chain lubricant such as Linklyfe or Chainguard should be used. Never run a new chain on worn sprockets since it will accentuate the rate of wear.
6 When replacing the chain, make sure the spring link is fitted the correct way round ie., with the closed end facing the direction of travel.

16 Tyres: removal and replacement

1 Tyre changing will be required either due to wear or puncture. To repair a puncture follow the instructions of the manufacturers of the repair outfit. It is, however, good practice to renew an inner tube when it becomes punctured.
2 Remove the wheel as described in this Chapter; see Section 2 for the front wheel, or 6 for the rear wheel.
3 Deflate the tyre by removing the Schrader valve. Unscrew any security bolts that may be fitted and push them in. Push the beads of the tyre away from the wheel rim and into the well. Remove the locking ring of the inner tube valve and push the valve right into the tyre.
4 Insert a tyre lever close to the valve and lever the edge of the tyre over the outside of the wheel rim. Very little force should be necessary; if resistance is encountered it is probably due to



16.3 Unscrew the security bolt(s)

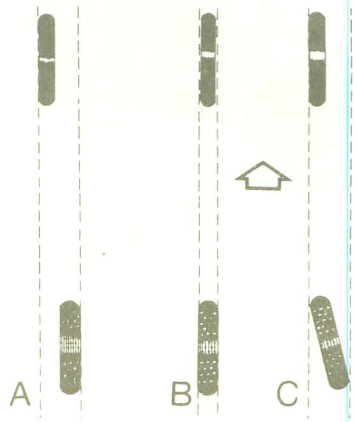
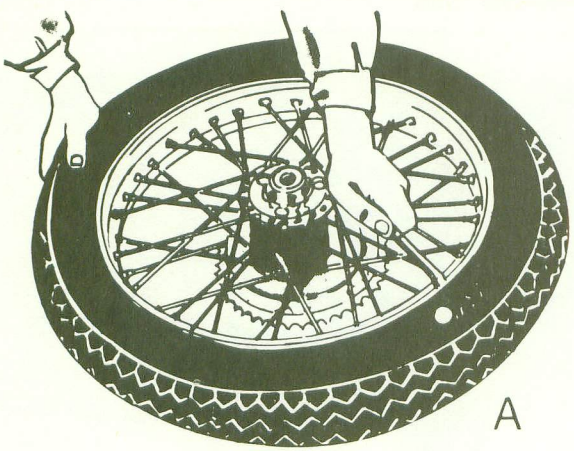
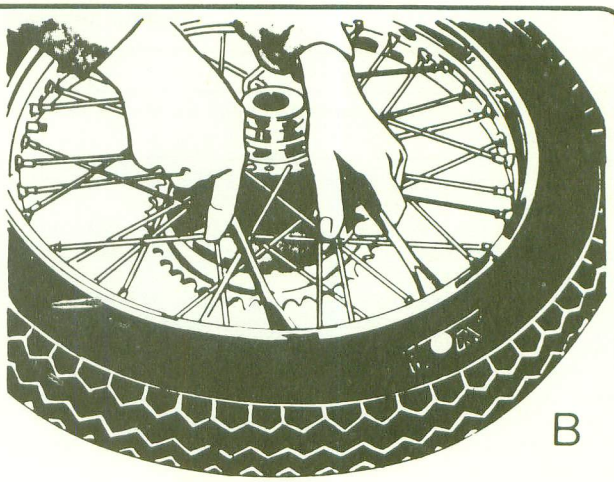


Fig. 5.4. Checking wheel alignment

A and C — Indicate necessity to re-align rear wheel
B — Indicate correct alignment with smaller section front tyre

the fact that the tyre beads have not entered the well of the wheel rim all the way round the tyre.
5 Once the tyre has been edged over the wheel rim, it is easy to work around the wheel rim so that the tyre is completely free on one side. At this stage, the inner tube can be removed.
6 Working from the other side of the wheel, ease the other edge of the tyre over the outside of the wheel rim that is furthest away. Continue to work around the rim until the tyre is free completely from the rim.
7 If a puncture has necessitated the removal of the tyre, re-inflate the inner tube and immerse it in a bowl of water to trace the source of the leak. Mark its position and deflate the tube. Dry the tube and clean the area around the puncture with a petrol-soaked rag. When the surface has dried, apply the rubber solution and allow this to dry before removing the backing from the patch and applying the patch to the surface.
8 It is best to use a patch of the self-vulcanising type, which will form a very permanent repair. Note that it may be necessary to remove a protective covering from the top surface of the patch, after it has sealed in position. Inner tubes made from synthetic rubber may require a special type of patch and adhesive, if a satisfactory bond is to be achieved.
9 Before replacing the tyre, check the inside to make sure the agent that caused the puncture is not trapped. Check also the





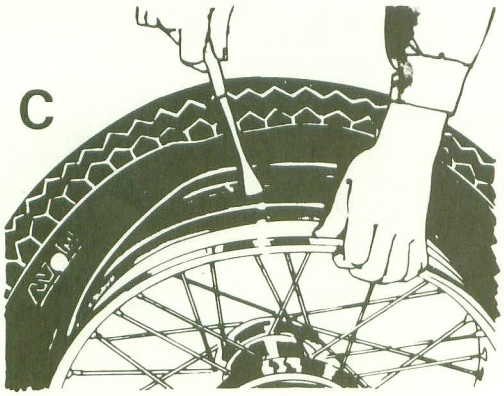


Fig. 5.5a. Tyre removal

A Deflate inner tube and insert lever in close proximity to tyre valve
B Use two levers to work bead over the edge of rim
C When first bead is clear, remove tyre as shown

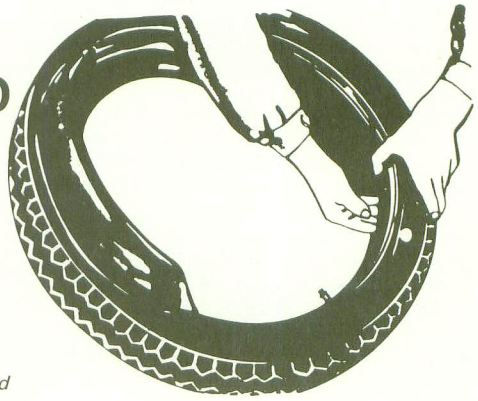
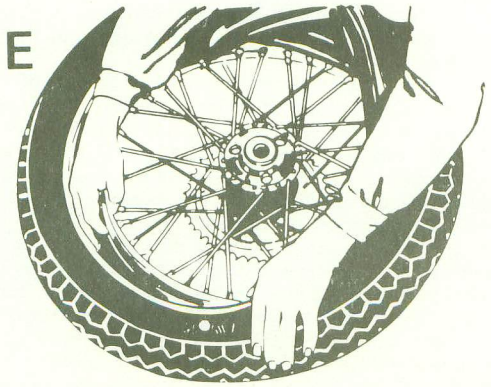


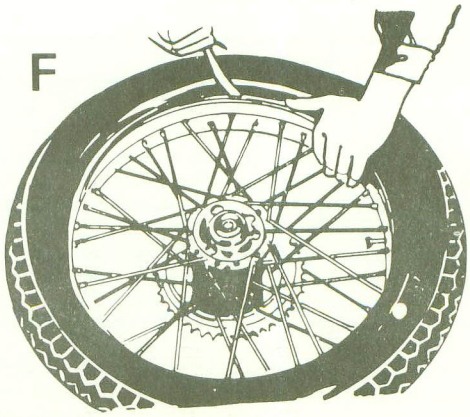
Fig. 5.5b. Tyre fitting

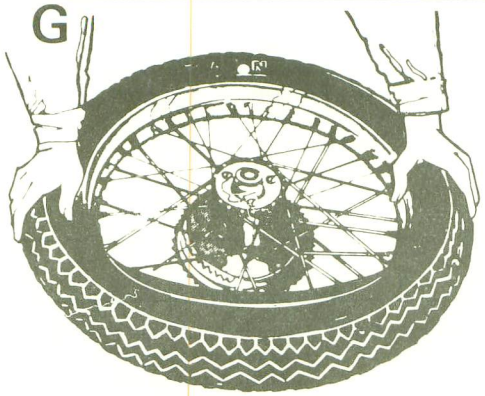
D Inflate inner tube and insert in tyre
E Lay tyre on rim and feed valve through hole in rim
F Work first bead over rim, using lever in final section
G Use similar technique for second bead. Finish at tyre valve position
H Push valve and tube up into tyre when fitting final section, to avoid trapping

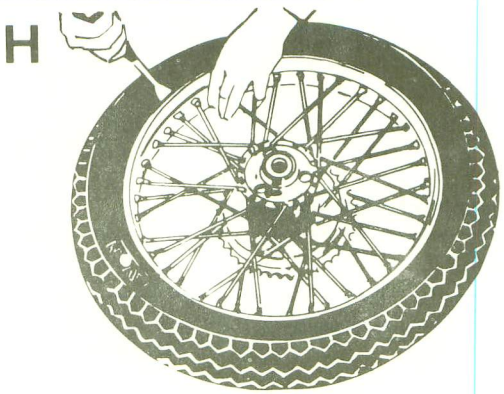
Security bolts

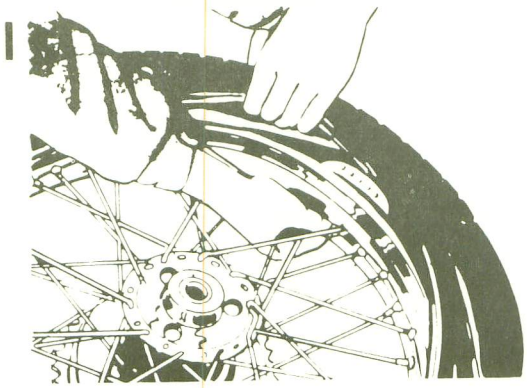
I Fit the security bolt very loosely when one bead of the tyre is fitted
J Then fit tyre in normal way. Tighten bolt when tyre is properly seated

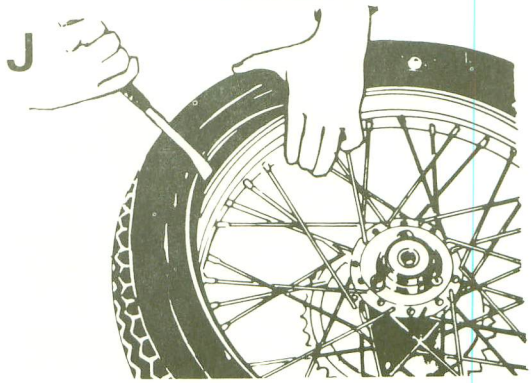












outside of the tyre, particularly the tread area, to make sure nothing is trapped that may cause a further puncture.

10 If the inner tube has been patched on a number of past occasions, or if there is a tear or large hole, it is preferable to discard it and fit a replacement. Sudden deflation may cause an accident, particularly if it occurs with the front wheel.

11 To replace the tyre, first replace the security bolts where fitted, then inflate the inner tube sufficiently for it to assume a circular shape but only just. Then push it onto the tyre so that it is enclosed completely. Lay the tyre on the wheel at an angle and insert the valve through the rim tape and the hole in the wheel rim. Attach the locking cap on the first few threads, sufficient to hold the valve captive in its correct location.

12 Starting at the point furthest from the valve, push the tyre bead over the edge of the wheel rim until it is located in the central well. Continue to work around the tyre in this fashion until the whole of one side of the tyre is on the rim. It may be necessary to use a tyre lever during the final stages.

13 Make sure there is no pull on the tyre valve and again commencing with the area furthest from the valve, ease the other bead of the tyre over the edge of the rim. Finish with the area close to the valve, pushing the valve up into the tyre until the locking cap touches the rim. This will ensure the inner tube is not trapped when the last section of the bead is edged over the rim with a tyre lever.

14 Check that the inner tube is not trapped at any point. Re-inflate the inner tube, and check that the tyre is seating correctly around the wheel rim. There should be a thin rib moulded around the wall of the tyre on both sides, which should be equidistant from the wheel rim at all points. If the tyre is unevenly located on the rim, try bouncing the wheel when the tyre is at the recommended pressure. It is probable that one of the beads has not pulled clear of the centre well.

15 Tyre replacement is aided by dusting the side walls, particularly in the vicinity of the beads, with a liberal coating of french chalk. Washing-up liquid can also be used to good effect, but this has the disadvantage of causing the inner surfaces of the wheel rim to rust.

16 Never replace the inner tube and tyre without the rim tape in position. If this precaution is overlooked there is good chance of the ends of the spoke nipples chafing the inner tube and causing a crop of punctures.

17 Never fit a tyre that has a damaged tread or side walls, since there is a very great risk of a blow-out, which can have serious consequences on any two-wheel vehicle.

18 Tyre valves rarely give trouble, but it is always advisable to check whether the valve itself is leaking before removing the tyre. Do not forget to fit the dust cap, which forms an effective second seal.

17 Tyre valve dust caps

1 Tyre valve dust caps are often left off when a tyre has been replaced, despite the fact that they serve an important two-fold function. Firstly, they prevent dirt or other foreign matter from entering the valve and causing the valve to stick open when the tyre pump is next applied. Secondly, they form an effective second seal so that in the event of the tyre valve sticking, air will not be lost.

2 Isolated cases of sudden deflation at high speeds have been traced to the omission of the dust cap. Centrifugal force has tended to lift the tyre valve off its seating and because the dust cap is missing, there has been no second seal. Racing inner tubes contain provision for this happening because the valve inserts are fitted with stronger springs, but standard inner tubes do not, hence the need for the dust cap.

3 Note that when a dust cap is fitted for the first time, the wheel may have to be rebalanced.

18 Wheel balance

1 On any high performance machine it is important that the front wheel is balanced, to offset the weight of the tyre valve. If this precaution is not observed, the out-of-balance wheel will produce an unpleasant hammering that is felt through the handlebars at speeds from approximately 50 mph upwards.

2 To balance the front wheel, place the machine on the centre stand so that the front wheel is well clear of the ground and

check that it will revolve quite freely, without the brake shoes rubbing. In the unbalanced state, it will be found that the wheel always comes to rest in the same position, with the tyre valve in the six o'clock position. Add balance weights to the spokes diametrically opposite the tyre valve until the tyre valve is counterbalanced, then spin the wheel to check that it will come to rest in a random position on each occasion. Add or subtract weight until perfect balance is achieved.

3 Only the front wheel requires attention. There is little point in balancing the rear wheel (unless both wheels are completely interchangeable) because it will have little noticeable effect on road holding and general handling.

19 Fault diagnosis: wheels, brakes and tyres

Symptom	Cause	Remedy
Handlebars oscillate at low speeds	Buckle or flat in wheel rim, most probably front wheel	Check rim alignment by spinning wheel. Correct by retensioning spokes or having wheel rebuilt on new rim.
	Tyre not straight on rim	Check tyre alignment.
Machine lacks power and accelerates poorly	Brakes binding	Warm brake drums provide best evidence. Re-adjust brakes.
Brakes grab when applied gently	Ends of brake shoes not chamfered	Chamfer with file.
	Elliptical brake drum	Lightly skim in lathe (specialist attention needed).
Brake pull-off sluggish	Brake cam binding in housing	Free and grease.
	Weak brake shoe springs	Replace, if brake springs not displaced.
	Weak rear brake rod return spring	Check spring and apply more tension if necessary.
Harsh transmission	Worn or badly adjusted chains	Adjust or replace as necessary.
	Hooked or badly worn sprockets	Replace as a pair, together with chain.
Pulls to one side	Rear wheel misalignment	Adjust rear wheel alignment.

Metric conversion tables

Inches	Decimals	Millimetres
1/64	0.015625	0.3969
1/32	0.03125	0.7937
3/64	0.046875	1.1906
1/16	0.0625	1.5875
5/64	0.078125	1.9844
3/32	0.09375	2.3812
7/64	0.109375	2.7781
1/8	0.125	3.1750
9/64	0.140625	3.5719
5/32	0.15625	3.9687
11/64	0.171875	4.3656
3/16	0.1875	4.7625
13/64	0.203125	5.1594
7/32	0.21875	5.5562
15/64	0.234375	5.9531
1/4	0.25	6.3500
17/64	0.265625	6.7469
9/32	0.28125	7.1437
19/64	0.296875	7.5406
5/16	0.3125	7.9375
21/64	0.328125	8.3344
11/32	0.34375	8.7312
23/64	0.359375	9.1281
3/8	0.375	9.5250
25/64	0.390625	9.9219
13/32	0.40625	10.3187
27/64	0.421875	10.7156
7/16	0.4375	11.1125
29/64	0.453125	11.5094
15/32	0.46875	11.9062
31/64	0.484375	12.3031
1/2	0.5	12.7000
33/64	0.515625	13.0969
17/32	0.53125	13.4937
35/64	0.546875	13.8906
9/16	0.5625	14.2875
37/64	0.578125	14.6844
19/32	0.59375	15.0812
39/64	0.609375	15.4781
5/8	0.625	15.8750
41/64	0.640625	16.2719
21/32	0.65625	16.6687
43/64	0.671875	17.0656
11/16	0.6875	17.4625
45/64	0.703125	17.8594
23/32	0.71875	18.2562
47/64	0.734375	18.6531
3/4	0.75	19.0500
49/64	0.765625	19.4469
25/32	0.78125	19.8437
51/64	0.796875	20.2406
13/16	0.8125	20.6375
53/64	0.828125	21.0344
27/32	0.84375	21.4312
55/64	0.859375	21.8281
7/8	0.875	22.2250
57/64	0.890625	22.6219
29/32	0.90625	23.0187
59/64	0.921875	23.4156
15/16	0.9375	23.8125
61/64	0.953125	24.2094
31/32	0.96875	24.6062
63/64	0.984375	25.0031

Millimetres to Inches

mm	Inches
0.01	0.00039
0.02	0.00079
0.03	0.00118
0.04	0.00157
0.05	0.00197
0.06	0.00236
0.07	0.00276
0.08	0.00315
0.09	0.00354
0.1	0.00394
0.2	0.00787
0.3	0.01181
0.4	0.01575
0.5	0.01969
0.6	0.02362
0.7	0.02756
0.8	0.03150
0.9	0.03543
1	0.03937
2	0.07874
3	0.11811
4	0.15748
5	0.19685
6	0.23622
7	0.27559
8	0.31496
9	0.35433
10	0.39370
11	0.43307
12	0.47244
13	0.51181
14	0.55118
15	0.59055
16	0.62992
17	0.66929
18	0.70866
19	0.74803
20	0.78740
21	0.82677
22	0.86614
23	0.90551
24	0.94488
25	0.98425
26	1.02362
27	1.06299
28	1.10236
29	1.14173
30	1.18110
31	1.22047
32	1.25984
33	1.29921
34	1.33858
35	1.37795
36	1.41732
37	1.4567
38	1.4961
39	1.5354
40	1.5748
41	1.6142
42	1.6535
43	1.6929
44	1.7323
45	1.7717

Inches to Millimetres

Inches	mm
0.001	0.0254
0.002	0.0508
0.003	0.0762
0.004	0.1016
0.005	0.1270
0.006	0.1524
0.007	0.1778
0.008	0.2032
0.009	0.2286
0.01	0.254
0.02	0.508
0.03	0.762
0.04	1.016
0.05	1.270
0.06	1.524
0.07	1.778
0.08	2.032
0.09	2.286
0.1	2.54
0.2	5.08
0.3	7.62
0.4	10.16
0.5	12.70
0.6	15.24
0.7	17.78
0.8	20.32
0.9	22.86
1	25.4
2	50.8
3	76.2
4	101.6
5	127.0
6	152.4
7	177.8
8	203.2
9	228.6
10	254.0
11	279.4
12	304.8
13	330.2
14	355.6
15	381.0
16	406.4
17	431.8
18	457.2
19	482.6
20	508.0
21	533.4
22	558.8
23	584.2
24	609.6
25	635.0
26	660.4
27	685.8
28	711.2
29	736.6
30	762.0
31	787.4
32	812.8
33	838.2
34	863.6
35	889.0
36	914.4

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