Kawasaki 900 and 1000 Fours Owners Workshop Manual

by George Collett

With an additional Chapter on the Z900 and Z1000 models

by Pete Shoemark

Models covered:

Z1	903cc	Four cylinder DOHC	1972/73
Z1A	903cc	Four cylinder DOHC	1973/74
Z1B	903cc	Four cylinder DOHC	1974/75
Z900	903cc	Four cylinder DOHC	1975/76
Z1000	1015cc	Four cylinder DOHC	1976/on

above dates importation into UK

ISBN 085696 222 X

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Printed in England

HAYNES PUBLISHING GROUP
SPARKFORD YEOVIL SOMERSET ENGLAND
distributed in the USA by
HAYNES PUBLICATIONS INC
861 LAWRENCE DRIVE
NEWBURY PARK
CALIFORNIA 91320
USA

Acknowledgements

The author wishes to thank Kawasaki Motors (UK) Limited for the technical assistance given so freely whilst this manual was being prepared, and for permission to reproduce their drawings. The model used for the photographic sequences was supplied by Davick Motique of Long Eaton Nottinghamshire, who also provided the new parts and gaskets used in the rebuild. Brian Horsfall assisted with the dismantling and rebuilding of the machine and also devised various ingenious methods for overcoming the lack of service tools. Les Brazier arranged and took all the photographs. The author would also like to thank Jeff Clew for his guidance and editorship.

Finally thanks to NGK Spark Plugs (UK) Limited for the provision of spark plug photographs, Avon Rubber Company Limited for their advice on tyre fitting and to the Bristol Kawasaki Centre for permitting us to photograph the Z1000 model featured on the front cover.

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 to first do the work himself, under conditions similar to those found in the average home. As a result, the hands seen in the photographs are sometimes the hands of the author together with another engineer who assisted. The machine photographed was a used model that had covered three thousand miles, so that the conditions encountered would be similar to those found by the average rider.

Unless specially mentioned, and therefore considered essential, Kawasaki service tools have not been used. There is invariably some alternative means of slackening or removing some vital component when service tools are not available and the risk of damage has to be avoided at all costs.

Each of the seven Chapters is divided into numbered Sections. Within the Sections are numbered paragraphs. In consequence, cross reference throughout this manual is both straightforward and logical. When a reference is made 'See Section 1.6' it means see Section 1, paragraph 6 in the same Chapter. If another Chapter were meant, the text would read 'See Chapter 4, Section 1.6'. All the 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. Figure 1.2 therefore refers to the first figure in Chapter 1.

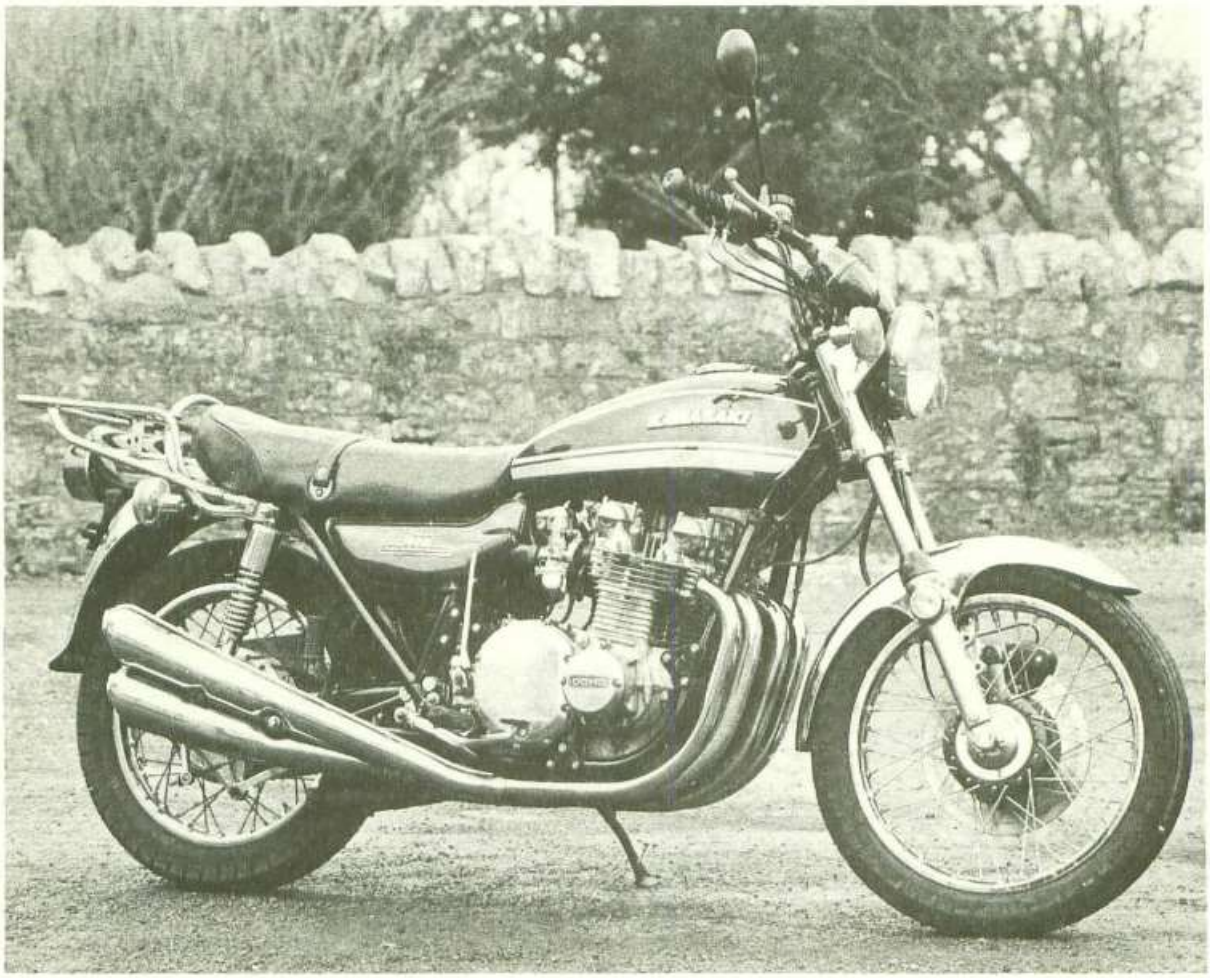
Left hand and right hand descriptions of parts of the machine or the machine itself, refer to the right and left side of the machine, with the rider seated in the normal riding position.

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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General descriptions and specifications are given in each Chapter immediately after the list of Contents
Fault diagnosis is given at the end of each appropriate Chapter



Right-hand view of the Kawasaki 900cc series Z1

Model dimensions

Overall length	86.8 in (2.205 mm) US models 88.5 in (2.250 mm) European models
Overall width	31.5 in (800 mm) US models 32.3 in (820 mm) European models
Overall height	45.3 in (1.150 mm) US models 46.3 in (1.175 mm) European models
Wheelbase	58.7 in (1.490 mm)
Ground clearance	6.3 in (160 mm)
Dry weight	506 lb (230 kg)

Introduction to the Kawasaki Z1 series

When the 900 cc Z1 model was first introduced in 1972 it was obvious that Kawasaki had scored a huge success. The growth of the company had been little short of phenomenal, perhaps causing some people to wonder how it was achieved. The answer lay in the vast resources of the firm and the extent of their technological know-how, which extended into railroad, shipping, and aircraft transportation on a grand scale. All these activities rolled into one form Kawasaki Heavy Industries, a giant manufacturing complex that produces an astonishing variety of products and markets them all over the world.

This is just a bare outline of the industrial might of Kawasaki. It is the Motorcycle Division of Kawasaki Heavy Industries that has attracted most interest, the meteoric rise of this section being equal to that of the parent company being as a whole. In just a few years Kawasaki has become the fourth largest motorcycle manufacturer in the world and that in itself is quite an accomplishment when it is recalled that some European companies have been manufacturing machines for over 60 years. Kawasaki has now become seriously involved with racing, to such an extent that they field factory teams in trials, road racing and motocross, and were the only Japanese manufacturer to participate in the 48th I.S.D.T. held in Berkshire, U.S.A. More important is the readiness of Kawasaki to incorporate the hard learned lessons learnt at the race track, into their road going machines. In this way they have successfully capitalised on their competition successes, putting the knowledge they have gained at the disposal of all those who purchase their high quality products.

Ordering spare parts

When ordering spare parts for a Kawasaki it is advisable to deal direct with an official Kawasaki agent who should be able to supply most of the parts from stock. Parts cannot be obtained direct from Kawasaki U.K.; all orders must be routed via an approved agent as is common with most other makes.

Always quote the frame and engine numbers in full. The frame number is stamped on the left hand side of the steering head and the engine number on top of the crankcase to the rear of the cylinder block, on the right hand side.

It is always best to quote the colour scheme for any of the cycle parts that have to be ordered. Use only genuine Kawasaki parts. Pattern parts should be avoided as they are usually inferior in quality. Some of the more expendable parts such as bulbs, spark plugs, chains, tyres, oils and greases etc., can be obtained from accessory stores and motor factors, who have convenient opening hours, charge lower prices and can often be found nearer home. It is also possible to obtain parts on a Mail Order basis from a number of specialists who advertise regularly in the motorcycle magazines.



Frame number location



Engine number location

Routine maintenance

The importance of maintaining a motorcycle conscientiously and carefully cannot be overstressed. Apart from the obvious benefits of safety and economy, a well-maintained motorcycle will generally be ridden with more care and consideration than one that is unkempt or out-of-tune. Therefore it becomes all the more important that necessary tasks be carried out exactly when prescribed and with great care. Not only is a rider risking a great deal more than just money with a badly kept machine, he also runs great risks in safety both to himself and to the machine.

Keeping a machine properly serviced need not be excessively time consuming, although services should be performed regularly and in a professional manner. The various maintenance tasks are described in detail, under their respective mileage and calender headings. It should be remembered that the interval between the various maintenance tasks serves only as a guide. As the machine gets older, is driven hard or is used under particularly adverse conditions, it is advisable to reduce the interval between each check.

If a specific item is mentioned but not described in detail, it will be found in the appropriate Chapter. No special tools are required for the routine maintenance tasks, apart from those found in machine's toolkit. A good set of open ring metric spanners are also very useful, especially for items such as the sump drain plug etc. Their purchase will represent a good investment.

Daily

Check the oil level of the engine-gear unit. This can be done through the sight 'window' at the bottom of the right hand crankcase cover. The correct level is between the two lines marked at the side of the window.

Check the tyre pressures. Always check when the tyres are cool, using an accurate tyre pressure gauge.

Make sure the lights, horn, flashing indicators and speedometer function correctly. The efficient working of these is a statutory requirement by law.

Check that the mirrors are positioned correctly, and that the locknuts are fully tightened.

Make sure the rear chain is correctly adjusted.

Check that the handlebars turn to the right and left smoothly, also that both brakes are working effectively.

Weekly or every 200 miles

In addition to the items already mentioned in the daily check, inspect and adjust the final drive chain.

Check and if necessary adjust both brakes, also the level of the brake fluid in the master cylinder. Top up if necessary.

Check the level of electrolyte in the battery. Examine the wheel spokes for looseness and retension them with a spoke key, if necessary.

Make sure the clutch cable is adjusted correctly and has the necessary free play. Check the oil content of the chain oiler (if fitted).

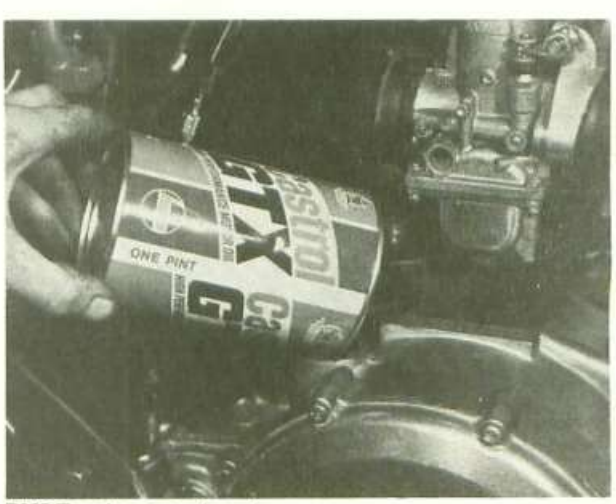
Monthly or every 1,000 miles

Complete all the previous checks mentioned in the daily and weekly service, then attend to the following items.

Change the engine oil. Note that the oil filter element must be changed every 2,000 miles or, if the engine has been rebuilt, after the first 1,000 miles. This should be accomplished whilst the engine is drained of oil. Wipe off any metal filings that may be attached to the sump drain plug, replace and tighten the plug.



RM1 Filling master cylinder



RM2 Topping up engine oil

Check all the nuts and bolts on the machine, including the cylinder head bolts and the exhaust pipe clamps.

Check and if necessary lubricate the control cables.

Six monthly or every 3,000 miles

Complete all the checks listed in the daily, weekly and 200 mile monthly services and then the following:

Remove the spark plugs, clean and adjust the points gap. If the electrodes are badly eroded or the insulators cracked or badly fouled, the plugs should be renewed.

Check and, if necessary, adjust the contact breaker points. There are two sets of points; when the points have been reset verify the accuracy of the ignition timing.

Check the valve clearances with the engine cold and adjust if necessary.

Check also the tension of the camshaft chain.

Remove and clean the air filter element.

Remove the filter bowl from the petrol tap and clean both the bowl and the filter. Check also that the fuel lines are free from sediment.

Check the clutch cable for adjustment and readjust if required.

Remove and clean the final drive rear chain, then lubricate before replacement if not of the pre-lubricated type. Check also the condition of both gearbox and rear wheel sprockets.

Make sure all four carburettors are clean and adjusted correctly; check that they are synchronized with each other.

Yearly or every 6,000 miles

Complete all the checks under the daily, weekly, monthly, and six monthly headings, then carry out the following additional tasks:

Remove and clean the engine oil filter at the oil pump pick-up. It is retained by three screws.

Renew the air cleaner element.

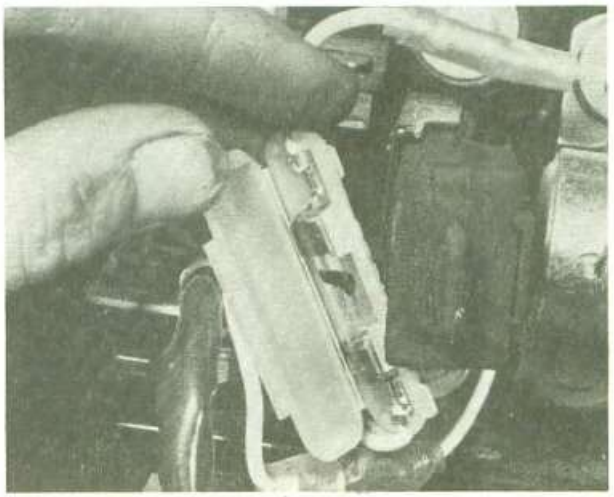
Remove the rear wheel and check the condition of the brake shoes.

Remove the front wheel, and if the disc pads are down or close to the red danger line, they should be renewed.

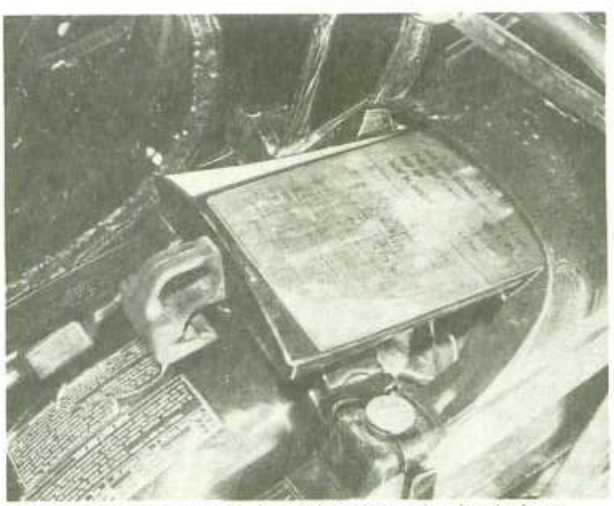
Measure the oil level in the front forks and top up if necessary.

Check and adjust the steering head bearings, also check the action of the steering lock. Lubricate it with a few drops of oil.

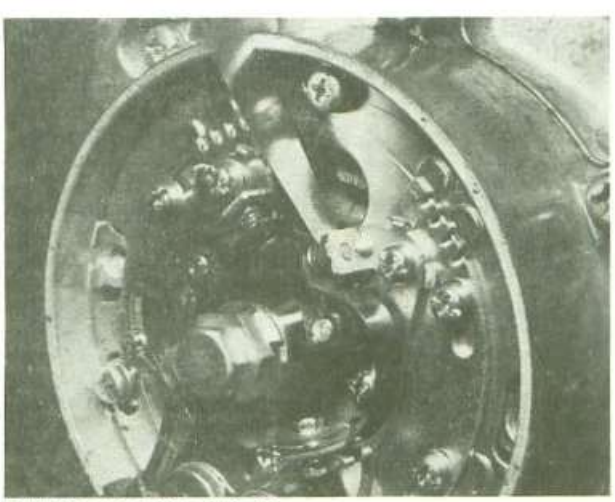
Check also the tyres for wear; use a tread gauge to measure the depth of tread. Check the tyres for cracks in the sidewalls, and replace if found, in the interests of safety.



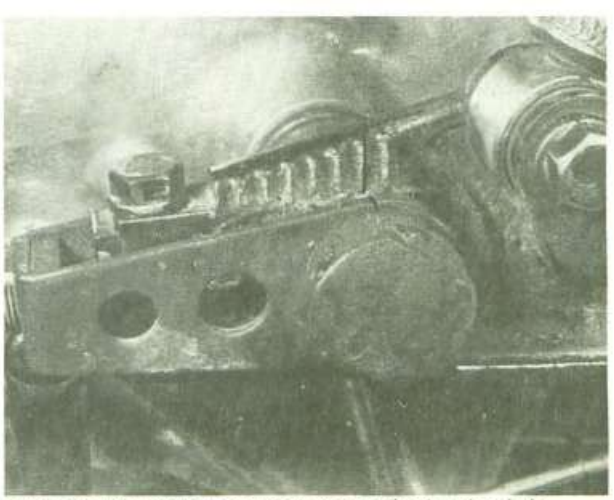
RM3 Check fuse if lights won't work



RM4 Engine maintenance data is located under the dualseat



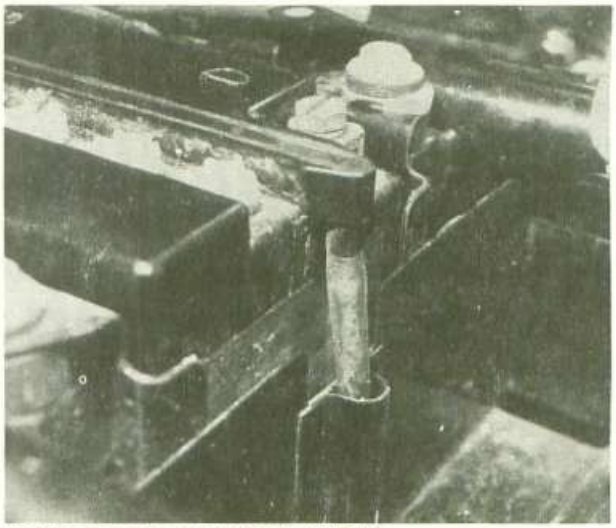
RM5 Checking the points gap



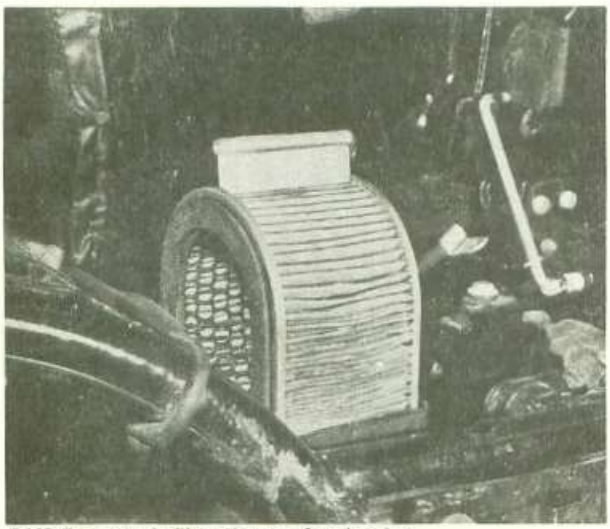
RM6 Use guide lines on rear fork when adjusting the chain



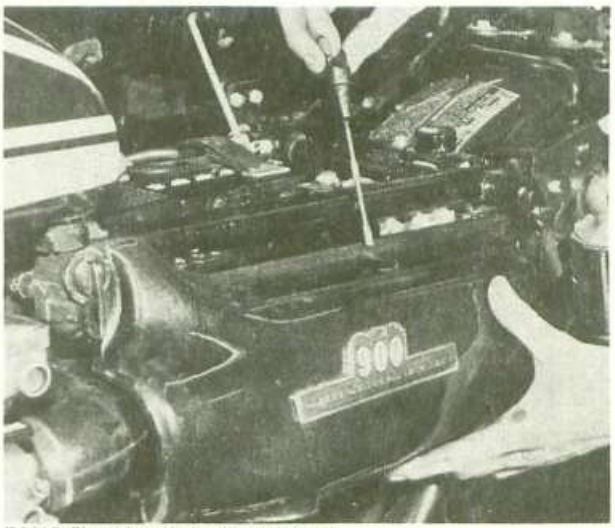
RM7 Checking stop and tail lamp



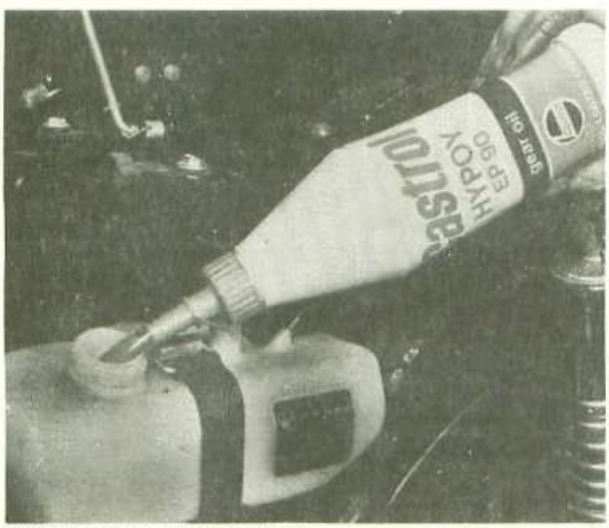
RM8 Remove battery to check acid level



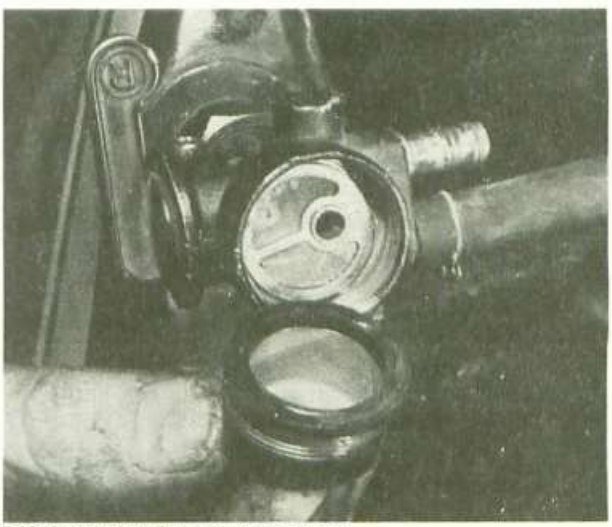
RM9 Remove air filter element for cleaning



RM10 Checking chain oil tank level



RM11 Topping up chain oil tank



RM12 Cleaning filter gauge and bowl

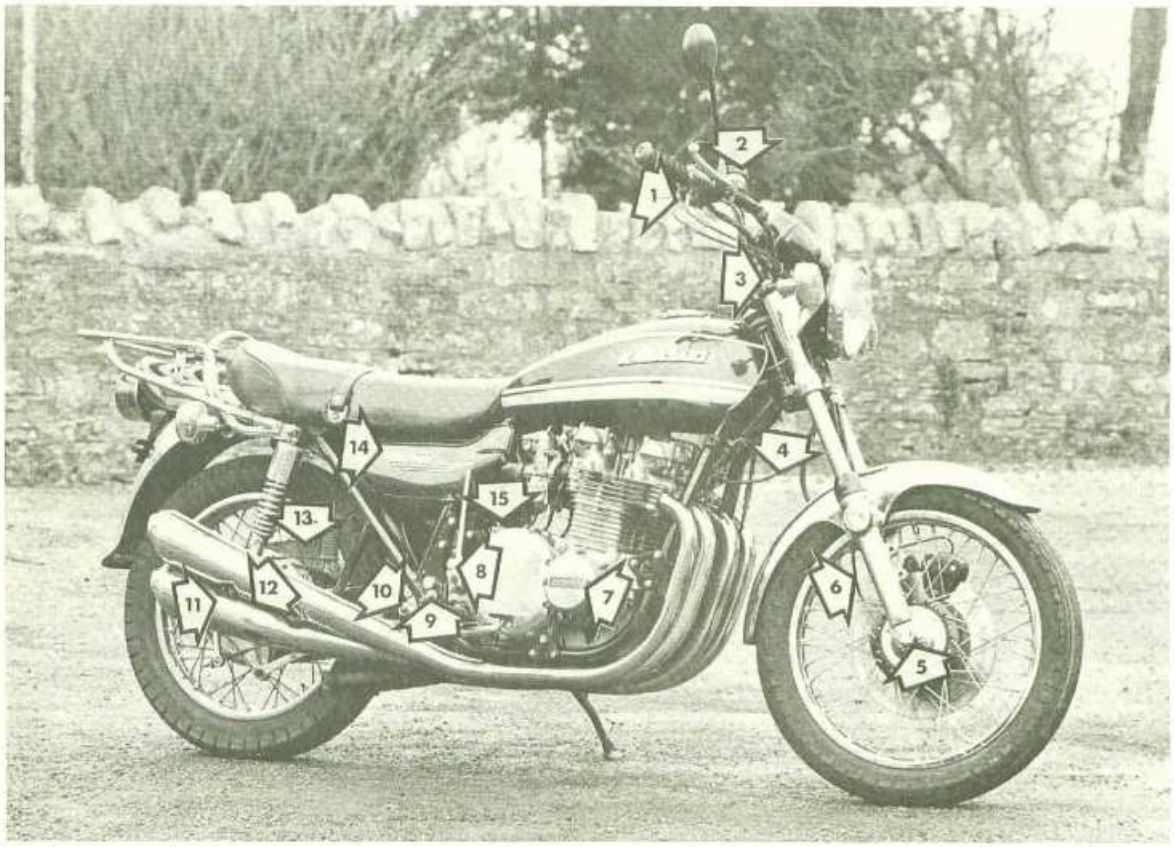
Quick glance routine maintenance, adjustments and capacities

Contact breaker points	0.012 - 0.016 in. (0.3 to 0.4 mm)
Spark plug gaps	0.028 - 0.031 in. (0.7 to 0.8 mm)
Spark plugs	(Normal use) N.G.K. B-8 E.S.) 14 mm (Very high speed) N.G.K. B-9 E.S.) ¾" Reach.
Fuel tank capacity	3.5 Imp. gallons. (4.2 US gallons) (18 litres)
Front fork oil capacity	169 cc per leg
Engine/gearbox oil capacity	4 litres
Oil Tank (rear chain) capacity	7 Imp. pints (1 US gallon) 0.9 litre (Z1 model only)
Tyre pressures	26 P.S.I. Front) 31 P.S.I. Rear) Solo rider
	26 P.S.I. Front) 36 P.S.I. Rear) with pillion rider

Recommended lubricants

Engine/gearbox unit	Castrol GTX
Chain oil tank	Castrol ST 90
Telescopic forks	Castrol TQF
Hydraulic, front brake master cylinder	Castrol Universal Girling Brake and Clutch Fluid
Control cables	Castrol Everyman oil
Grease nipples	Castrol LM Grease

Lubrication points



1 CONTROL CABLES
2 HYDRAULIC BRAKE RESERVOIR
3 FRONT FORKS
4 SPEEDOMETER AND TACHOMETER CABLES
5 WHEEL BEARINGS
6 SPEEDOMETER DRIVE
7 CONTACT BREAKER CAM
8 KICKSTART PIVOT
9 SWINGING ARM PIVOT
10 BRAKE PEDAL
11 REAR BRAKE OPERATING ARM
12 WHEEL BEARINGS
13 FINAL DRIVE CHAIN
14 CHAIN OILER (Z1 MODEL)
15 ENGINE/GEARBOX OIL

Chapter 1 Engine, clutch and gearbox

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Specifications

Engine	
Type	4 cylinder transverse D.O.H.C. in-line 4 stroke air cooled
Bore and stroke	66 x 66 mm
Displacement	903 cc.
Compression ratio	8.5 to 1.
Maximum horsepower	82 h.p. @ 8,500 r.p.m.
Maximum torque	54.3 ft lb @ 7,000 r.p.m. (7.5 kg m @ 7,000 r.p.m.)
Cylinder block	Aluminium alloy, steel liners.
Cylinder head	Aluminium alloy, angled plug threads.
Pistons	
Type	Aluminium alloy
Oversizes available	0.5 mm (0.020 inch) and 1.0 mm (0.040 inch)
Piston rings:	
Number per piston	Two compression and one oil control
End gap	0.008 – 0.016 in. (0.2 – 0.4 mm) wear limit 0.028 in.

Groove clearance:	
Top ring	0.0018 – 0.0031 in. (0.045 – 0.080 mm)
Second ring	0.0004 – 0.0020 in. (0.010 – 0.050 mm)
Oil ring	Same

Cylinder block

Bore wear limit	1 mm (0.03937 inches) If cylinder rebore exceeds 1 mm cylinder block will have to be replaced with a new one.

Valves:

Valve stem diameter: Inlet	6.965 – 6.880 mm. (0.2742 – 0.2748 in.)
Valve stem diameter: exhaust	6.955 – 6.970 mm. (0.2738 – 0.2744 in.)
Wear limit inlet:	6.86 mm (0.270 in.)
Wear limit exhaust:	6.85 mm (0.270 in.)

Valve springs:

Free length inner	36.0 mm (1.42 inch)
Free length outer	39.3 mm (1.55 inch)
Wear limit inner	35.0 mm (1.38 inch)
Wear limit outer	38.0 mm (1.50 inch)
Valve clearance engine cold	0.002 – 0.004 inch (0.05 – 1.0 mm)
Valve timing: Inlet opens	30° BTDC
Inlet closes	70° ABDC
Exhaust opens	70° BBDC
Exhaust closes	30° ATDC

Clutch

Number of inserted plates	8
Number of plain plates	7
Thickness of the inserted plates	3.7 mm – 3.9 mm (0.146 – 0.154 in.)
Wear limit of inserted plates	3.4 mm (0.134 in.)
Clutch springs - free length	33.8 mm (1.33 in.)
Clutch springs - wear limit	32.3 mm (1.27 in.)

Torque wrench settings	lb ft	kg m
Cylinder head nuts	25	3.5
Exhaust manifold nuts	100 ins - lbs	1.2
Cylinder head bolts	105 ins - lbs	1.2
Cylinder head cover bolts	102 ins - lbs	1.2
Crankshaft cap bolts	18	2.5
Crankcase nuts (6 o mm)	70 ins - lbs	0.8
Crankcase nuts (8 o mm)	18	2.5
Camshaft cap bolts	13.5 ft - lbs	1.5
Clutch centre hub nut	87 – 108	12 – 15
Generator rotor to crankshaft	18	2.5
Engine oil pump bolts	70 ins - lbs	0.8
Engine sprocket nut	87 - 108	12 - 15

1 General description

The engine unit fitted to the Kawasaki Z1 series is of the 4 cylinder in-line type, fitted transversely across the frame. The valves are operated by double overhead camshafts driven off the crankshaft by a centre chain. The two camshafts are located in the cylinder head casting, and the camshaft chain drive operates through a cast-in tunnel between the four cylinders. Adjustment of the chain is effected by a chain tensioner, fitted to the rear of the cylinder block.

The engine/gear unit is of aluminium alloy construction, with the crankcase divided horizontally.

The Z1 series have a wet sump, pressure fed lubrication system, which incorporates a gear driven oil pump, an oil filter, a safety by-pass valve, and an oil pressure switch.

Oil vapours created in the crankcase are vented through an oil breather to the air cleaner hose where they are recirculated into the crankcase, providing an oil tight system.

The oil pump is a twin shaft dual rotor unit, which is driven off the crankshaft by a gear.

An oil strainer is fitted to the intake side of the oil pump, which serves to protect the pump mechanism from any impurities in the oil that might cause damage.

The oil filter unit which is housed in the sump is an alloy canister with a paper element. As the oil filter becomes clogged with impurities, its ability to operate efficiently is reduced, and when it becomes so clogged that it begins to impede the oil flow, the by-pass valve opens and routes the oil around the filter. This of course results in unfiltered oil being circulated throughout the engine, a condition that will be avoided if the filter element is changed at the prescribed intervals.

The lubrication flow is as follows: Oil is drawn from the sump through the oil strainer to the pump, then it passes through the oil filter (or around it if the by-pass valve is in operation) to the pipe in which the oil pressure switch is mounted. It is then routed through three branch systems. The first system lubricates the crankshaft main bearings and crankpins. The oil is thrown by the crankshaft's rotating motion onto the cylinder walls providing the splash lubrication for the pistons. The oil then drips down into the sump, to be recirculated.

The second system lubricates the cylinder head assembly. Oil flows up through passages in the cylinder block, through the

camshaft bushes, down over the cams, through the cam lifters or (tappets) and back to the sump by way of holes in the base of the tappets, and the cam chain tunnel in the cylinder head.

The third system feeds the transmission bearings and then drains back to the sump for recirculation.

The engine is built in-unit with the gearbox. This means that when the engine is completely dismantled, the clutch and gearbox are dismantled too. This task is made easy by arranging the crankcase to separate horizontally.

2 Operations with the engine/unit in the frame

1 It is not necessary to remove the engine from the frame to carry out certain operations; in fact it can be an advantage. Tasks that can be carried out with the engine in situ are as follows;

a) Removal and replacement of the clutch.
b) Removal and replacement of the flywheel generator.
c) Removal and replacement of the generator rotor.
d) Removal and replacement of the carburettors.
e) Removal and replacement of the starter motor.
f) Removal and replacement of the rear chain oil pump.

2 When several tasks have to be undertaken simultaneously, it will probably be advantageous to remove the complete engine unit from the frame, an operation that should take about an hour and a half. This gives the advantage of much better access and more working space.

3 Operations with the engine/gearbox unit removed from the frame

a) Removal and replacement of the cylinder head unit.
b) Removal and replacement of the cylinder block.
c) Removal and replacement of the pistons.
d) Removal and replacement of the crankshaft assembly.
e) Removal and replacement of the main bearings.
f) Removal and replacement of the gear clusters and selectors.
g) Removal and replacement of the kickstart mechanism, gearbox bearings, and gear change mechanism.

4 Method of engine/gearbox removal

As mentioned previously, the engine and gearbox are built in-unit and it is necessary to remove the complete engine unit to gain access to either component.

The engine unit is secured to the frame with three long bolts and twelve short mounting bolts. After these have been removed, and the necessary electrical connections disconnected, together with the carburettor fuel pipes, plug leads and exhaust system, the engine is ready for removal. Dismantling of the engine unit can only be accomplished after the engine unit has been removed from the frame and refitting cannot take place until the engine unit has been reassembled.

5 Removing the engine/gearbox unit

1 Place the machine firmly on its centre stand so that it stands on a smooth, level surface. The ideal position for working is to place the machine on a stout wooden stand about 18 inches high, resting on its centre stand.

2 Make sure you have a clean, well-lit place to work in and a good set of tools. You will need at least three sizes of crosshead (Phillips) screwdrivers, small, medium and large, and plenty of clean lint free rag.

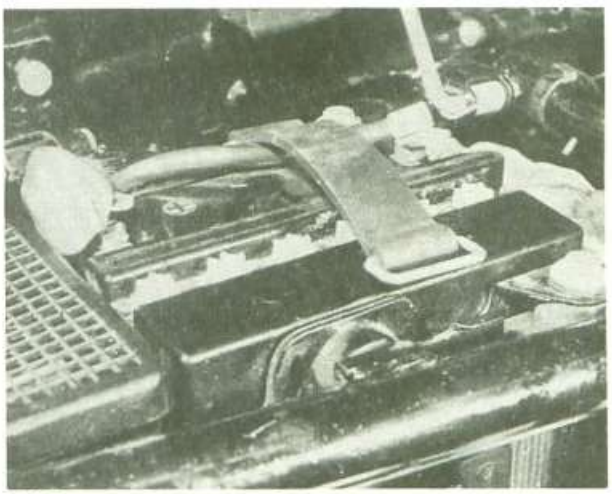
3 Remove the oil sump plug, also the oil filter drain plug, and drain the oil into a suitable tray. Approximately one gallon of oil will drain off.

4 Disconnect and remove the battery. The battery is located beneath the dualseat, in a cradle compartment. It should be lifted straight up, being careful not to spill the contents.

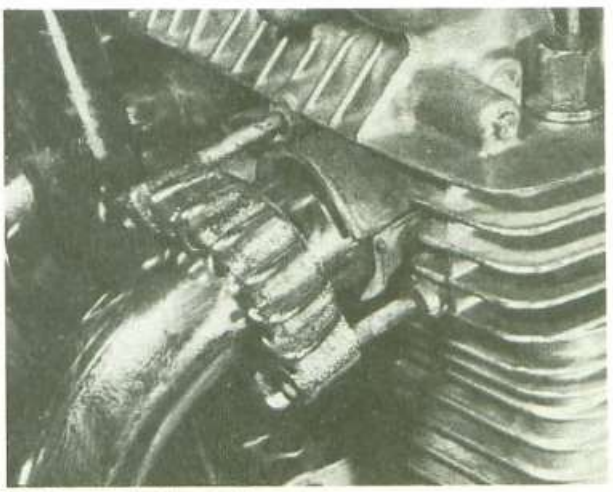
5 Drain and remove the petrol tank. The tank is held by a rubber clip at the rear that engages in a lip welded onto the rear of the tank. Unhook the rubber band and pull the fuel tank off, toward the rear.

6 Remove the finned clips from all four exhaust pipes. They are held by two nuts per clamp, secured to studs fitted into the cylinder head. It is a good idea to soak these nuts in penetrating oil before undoing them, to safeguard against breakage of the studs in the cylinder head. Remove the mounting bolts at the rear of the silencers and push the silencers forward, removing them as a pair from each side. Remove the right hand rider's footrest by removing the two retaining bolts.

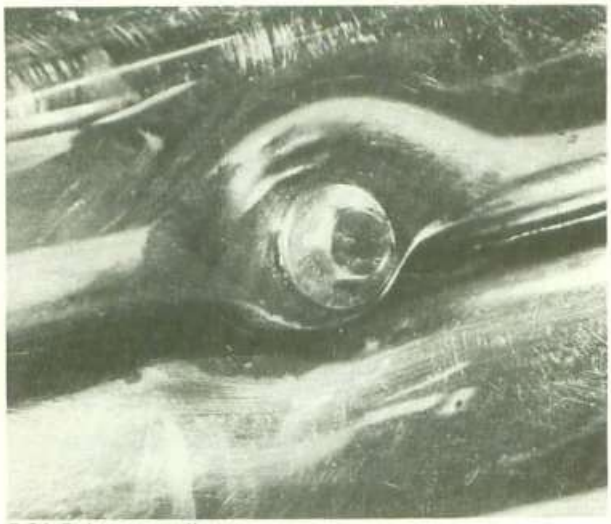
7 Detach the rear brake cable from its anchor point near to the rear of the brake pedal.



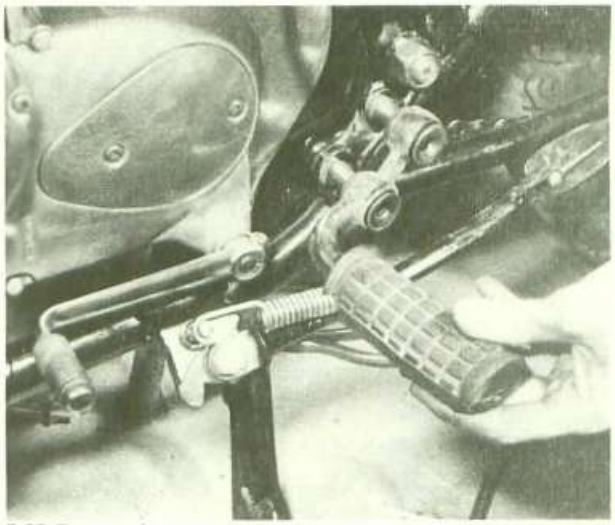
5.4 Disconnect and remove the battery



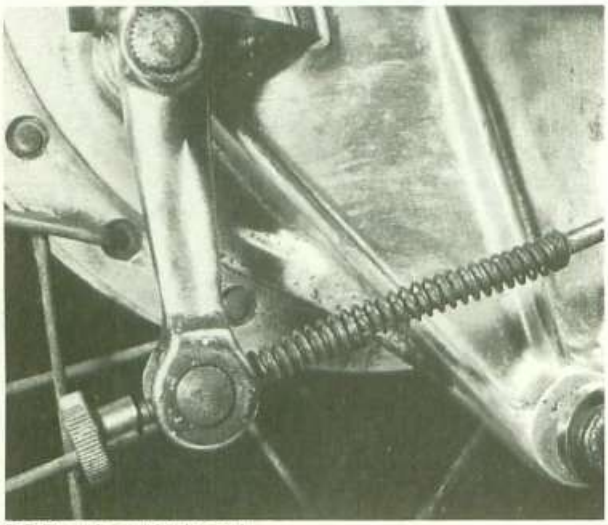
5.6 Remove the finned clips



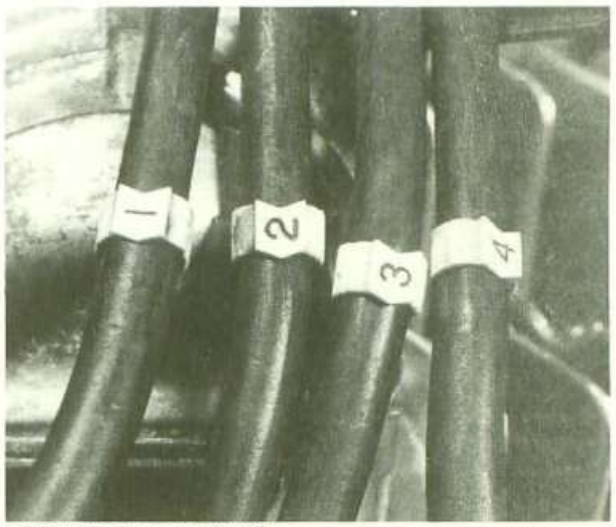
5.6A Bolt secures silencers



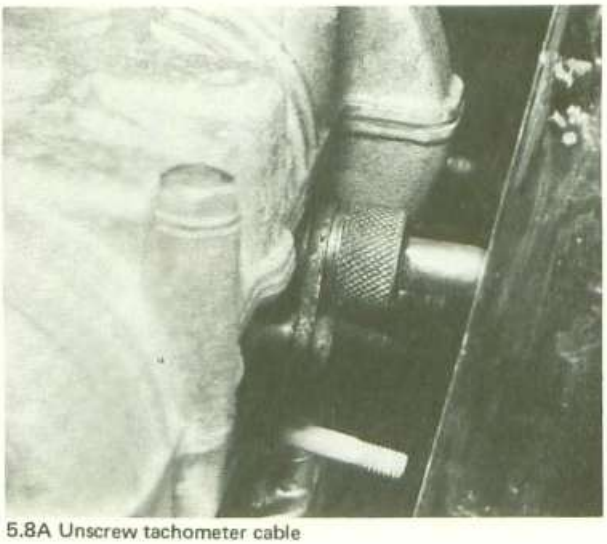
5.6B Remove footrests



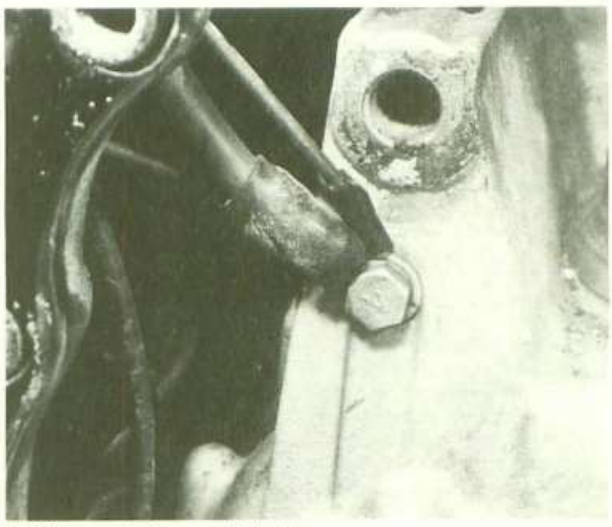
5.7 Detach rear brake rod



5.8 Plug leads are numbered



5.8A Unscrew tachometer cable



5.9 Remove battery earth lead


5.9A Unplug the blue connector

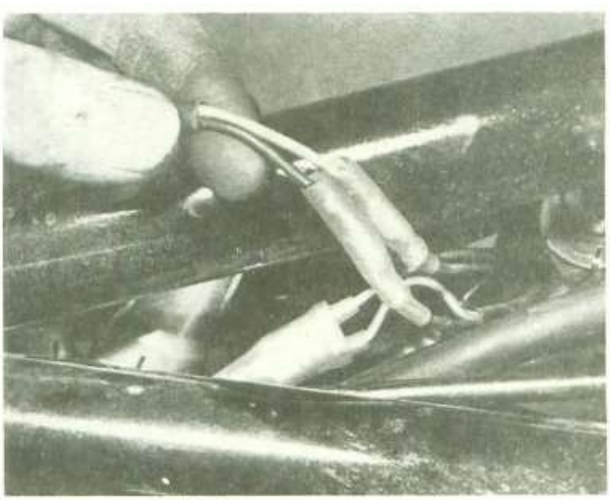
8 Take off the spark plug leads, and tuck them out of the way. Remove the tachometer cable from directly in front of the cylinder head by undoing the knurled nut.

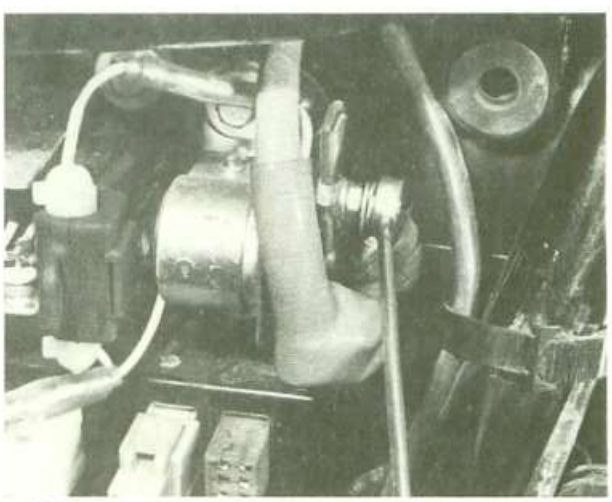
9 Remove the negative battery lead from its earth on the engine, unplug the blue connector (note you have to squeeze this connector as the sides are spring loaded, this is a safeguard to hold them tight when assembled).

10 Disconnect the black wire and the green wire that join the ignition coils to the contact breaker points. Remove the starter wire from the relay terminal in front of the electrical panel and near to the rear right hand frame tube. Remove the air cleaner assembly by undoing the crossheaded screws on the carburettor hoses.

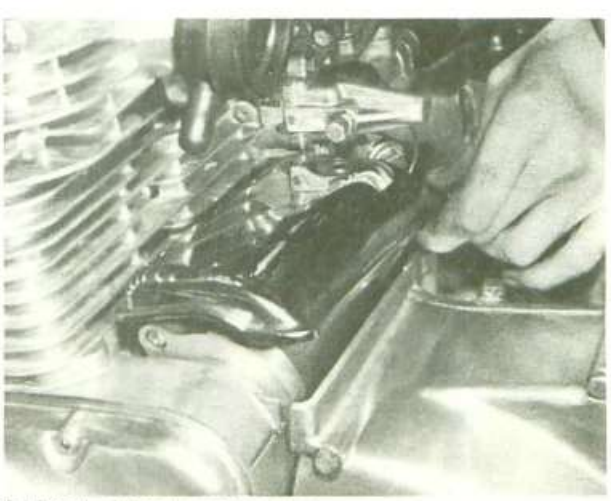
11 Loosen all eight clamps on the carburettors and pull the carburettor assembly off to the rear. Loosen the adjusters on the two throttle cables and unhook the throttle cables from the pulley.

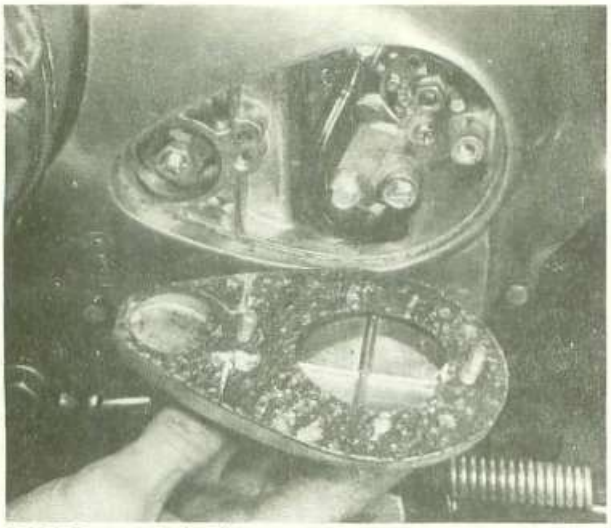
12 Remove the rubber hose from the oil breather assembly situated at the rear of the engine, and remove the oil breather assembly. Take off the left hand rider's footrest, and remove the gear change pedal complete.


5.10 Disconnect coil wires

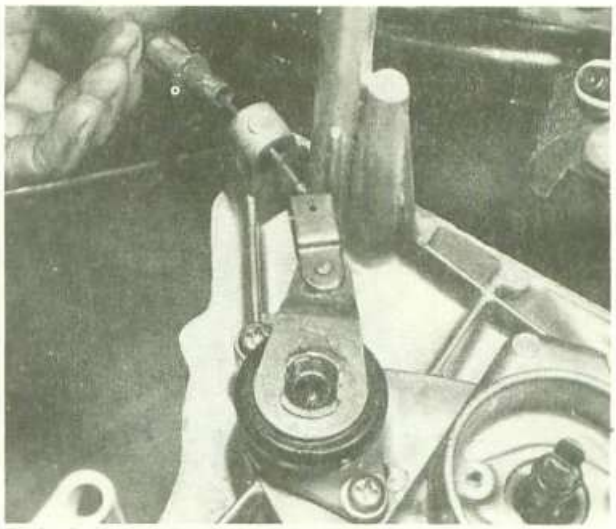

5.10A Remove starter cable at solenoid


5.10B Remove air cleaner assembly

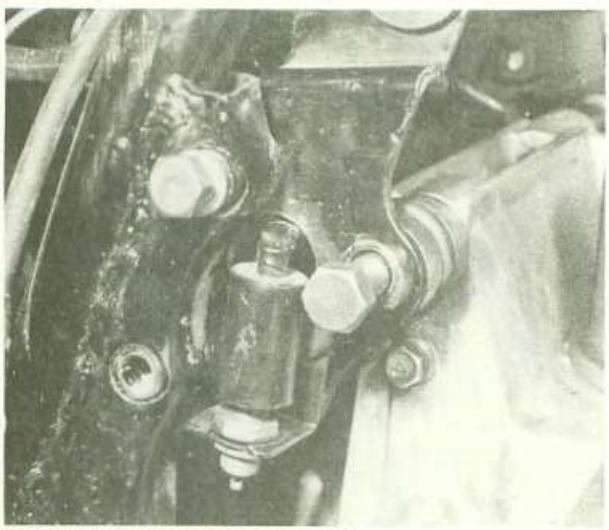

5.13 Take off starter motor cover



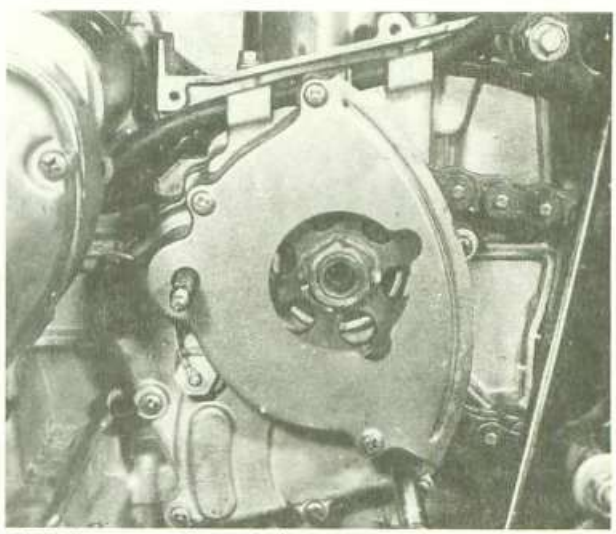
5.13A Remove chain oil pump cover



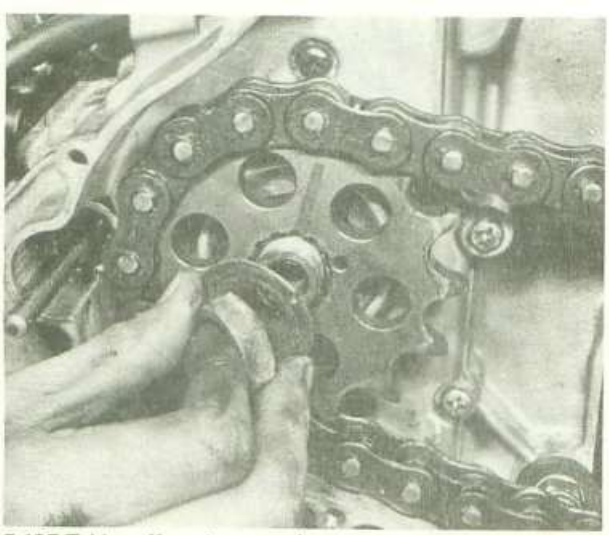
5.13B Pull out split pin on clutch nipple



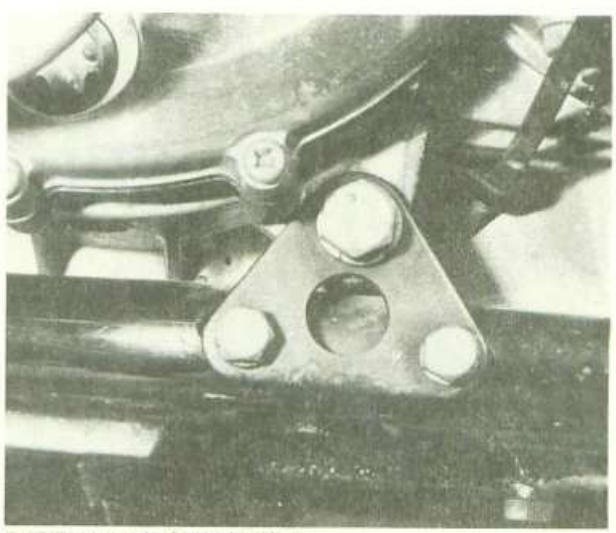
5.13C Unhook spring from stopswitch



5.13D Remove gearbox sprocket cover



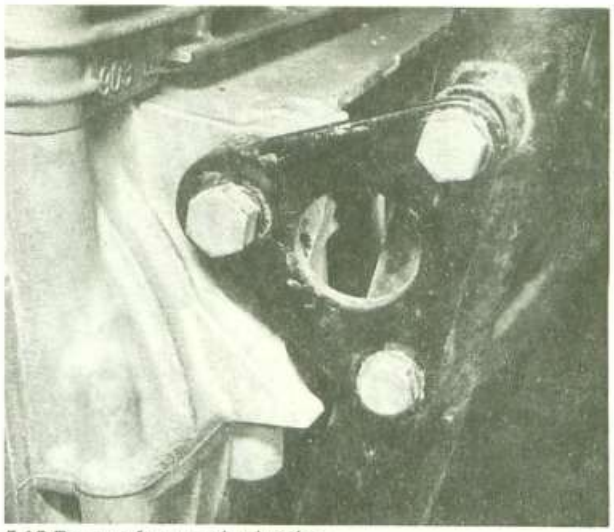
5.13E Taking off gearbox sprocket



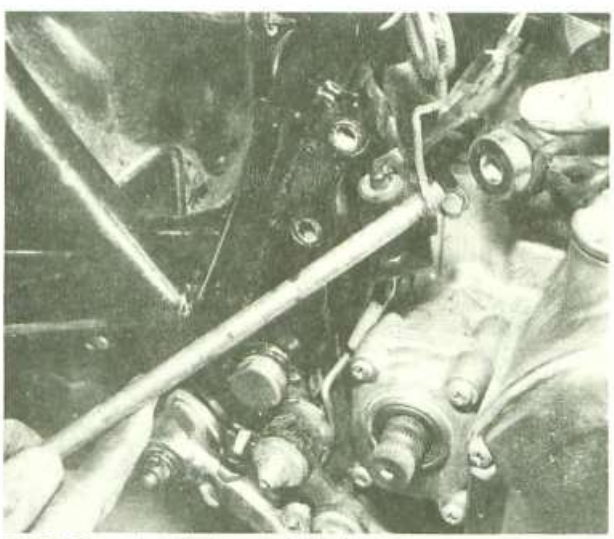
5.15 Remove the lower brackets



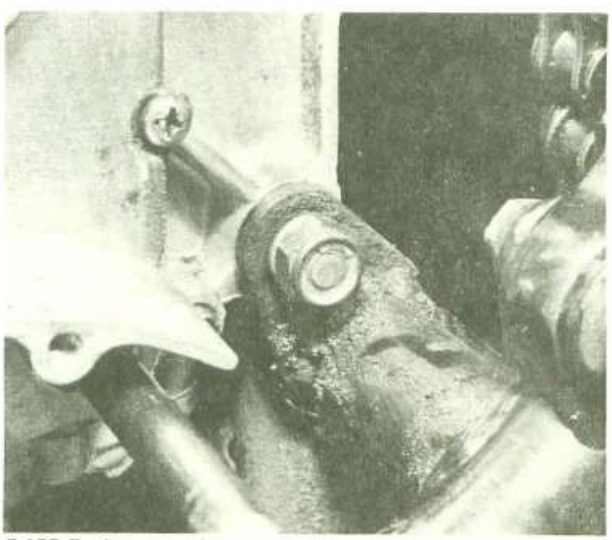
5.15A Threaded plates fit up into crankcase



5.16 Remove front engine bracket



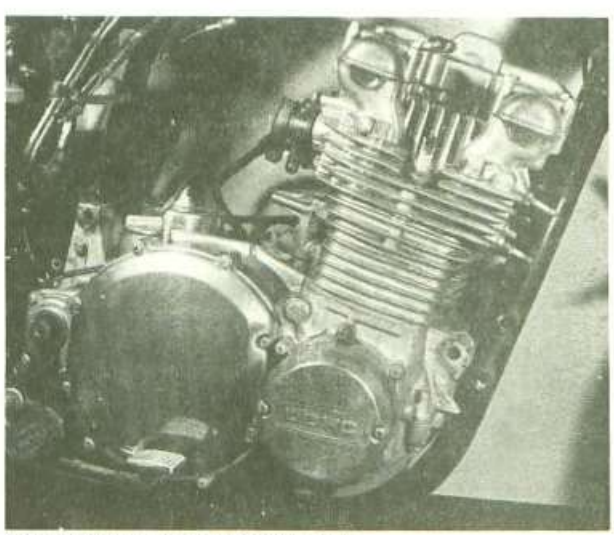
5.16A Removing the long engine bolt



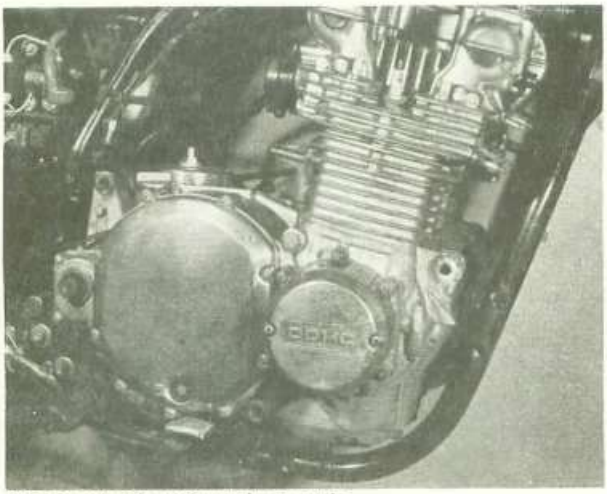
5.16B Engine mounting at rear



5.16C Note spacer at top rear mounting



5.16D Engine unit ready for removal



5.17 Slowly lift engine unit upwards



5.17A Engine unit is very heavy

13 Take off the starter motor and gasket. Remove the rear chain oil pump cover (if fitted), pull the hose off the pump and plug the hose with a screw to prevent oil leakage. Remove the chain cover, pull the split pin out from the clutch release lever and unhook the clutch cable. Unhook the spring from the stopswitch and take off the switch. Remove the gearbox sprocket cover and remove the gearbox sprocket nut after preventing rotation by applying the rear brake. Disengage the sprocket from the rear chain and allow the latter to hang in position. It need not be removed completely.

14 Loosen the locknut on the rear brake pedal position adjusting bolt and turn the bolt downwards until it holds the brake pedal well out of the way.

15 Use a small jack or alternatively a block to put under the crankcase to take the weight off the engine bolts. Remove the nuts off the three long engine bolts and completely remove the short engine mounting bolts from the lower centre mounting on each side of the machine. These are bolted to threaded plates that fit up into the bottom of the crankcase.

16 Remove the right hand rear engine mounting bolts, remove the centre and front right hand side engine mounting brackets, then remove the three long engine mounting bolts one at the front and two at the rear of the engine.

17 Level the engine and slowly lift it straight up about 1 inch (25 mm), then move it to the right slightly so that the rear of the engine slips over the rear lower mounting bracket. Raise the front of the engine a little at this stage, so that it will clear the frame, then lower the left hand side of the engine and pull the engine out of the frame cradle, lifting diagonally upwards towards the right hand side. It should be noted that two persons are needed to handle an engine of this size.

6 Dismantling the engine/gearbox: general

1 Before commencing work on the engine unit, the external surfaces should be cleaned thoroughly. A motorcycle engine has very little protection from the hazards of road grit and other foreign matter, due to it having to be constructed to take advantage of air cooling.

2 There are a number of proprietary cleaning solvents on the market including Jizer and Gunk. It is best to soak the parts in one of these solvents, using a cheap paint brush. Allow the solvent to penetrate the dirt, and afterwards wash down with water, making sure not to let water penetrate the electrical system or get into the engine, as many parts are now more exposed.

3 Have a good set of tools ready, including a set of open ring metric spanners (these have a ring one end and are open ended at the other end), a few metric socket spanners of the smaller sizes, and an impact screwdriver with a selection of bits for the crosshead screws. If one is not available, a crosshead screwdriver with a T handle fitted can sometimes be used as a substitute. Work on a clean surface and have a supply of clean lint free rag available.

4 Never use force to remove any stubborn part unless specific mention is made of this requirement in the text. There is invariably good reason why a part is difficult to remove, often because the dismantling procedure has been taken out of sequence.

7 Dismantling the engine and gearbox: removing the camshafts, the cylinder head, and cylinder block

1 Place the engine on the bench and remove the camshaft cover. To remove the camshafts, slacken the camshaft chain tensioner and undo the bolts holding the camshaft cover. Remove the chain guide sprocket located at the top of the engine, unbolt the camshaft caps, and mark the split bushes under each cap to show their location. This is important as any bushes that have to be re-used must go back in their original locations.

2 The camshafts can now be removed by slipping them under the camshaft chain. Unscrew the tachometer cable and take out the tachometer pinion, so that it does not cause damage to the camshaft worm during camshaft installation at a later stage.

3 The cylinder head is now ready for removal. Start by removing the two bolts at each end of the cylinder head, then undo the twelve cylinder head nuts with a suitable socket wrench.

4 Remove all the valve tappets and shims. Keep them separate for installation in their original locations. This is most important. Remove the cylinder head with a soft headed mallet to break it free from its seat, if necessary.

5 The cylinder block can now be removed by tapping upwards with a soft headed mallet. As the cylinder block is raised it is best to pad the crankcase mouths with clean rag to eliminate any foreign particles from falling into the crankcase, especially if a bottom end overhaul is not contemplated. Catch the pistons as they emerge from the cylinder bores, and lower the camshaft chain through the centre tunnel on a piece of wire.

8 Dismantling the engine and gearbox: removing the pistons and piston rings

1 Remove the circlips from the pistons by inserting a screwdriver (or a piece of welding rod chamfered one end), through the groove at the rear of the piston. Discard them. Never

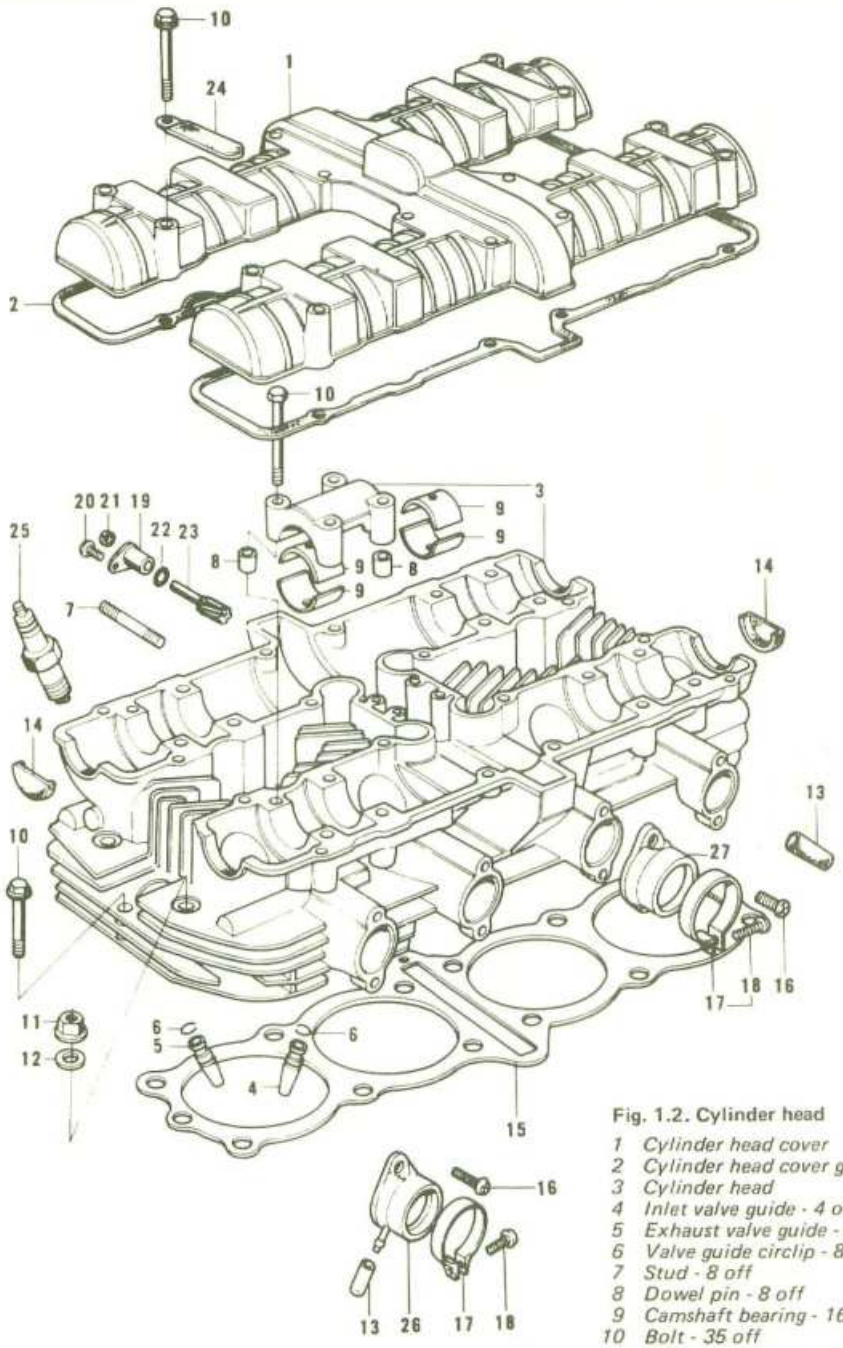


Fig. 1.2. Cylinder head

1 *Cylinder head cover*
2 *Cylinder head cover gasket*
3 *Cylinder head*
4 *Inlet valve guide - 4 off*
5 *Exhaust valve guide - 4 off*
6 *Valve guide circlip - 8 off*
7 *Stud - 8 off*
8 *Dowel pin - 8 off*
9 *Camshaft bearing - 16 off*
10 *Bolt - 35 off*
11 *Cylinder head nut - 12 off*
12 *Plain washer - 12 off*
13 *End plug - 4 off*
14 *Cylinder head cover plug - 4 off*
15 *Cylinder head gasket*
16 *Pan head screw - 8 off*
17 *Carburettor holder clamp - 4 off*
18 *Pan head screw - 4 off*
19 *Tachometer cable guide*
20 *Pan head screw*
21 *Oil seal*
22 *'O' ring*
23 *Tachometer gear*
24 *Ignition cord clamp - 4 off*
25 *Spark plug - 4 off*
26 *Carburettor holder - rh*
27 *Carburettor holder - lh*

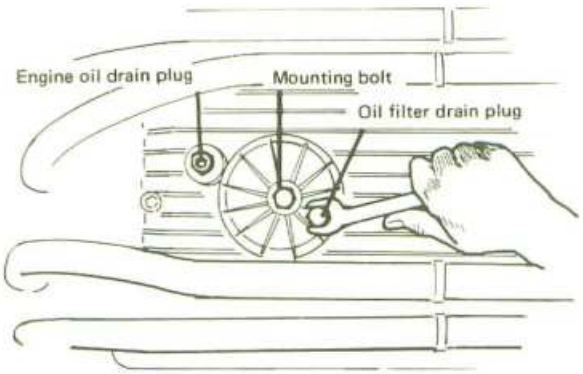


Fig. 1.1. Location of drain plugs

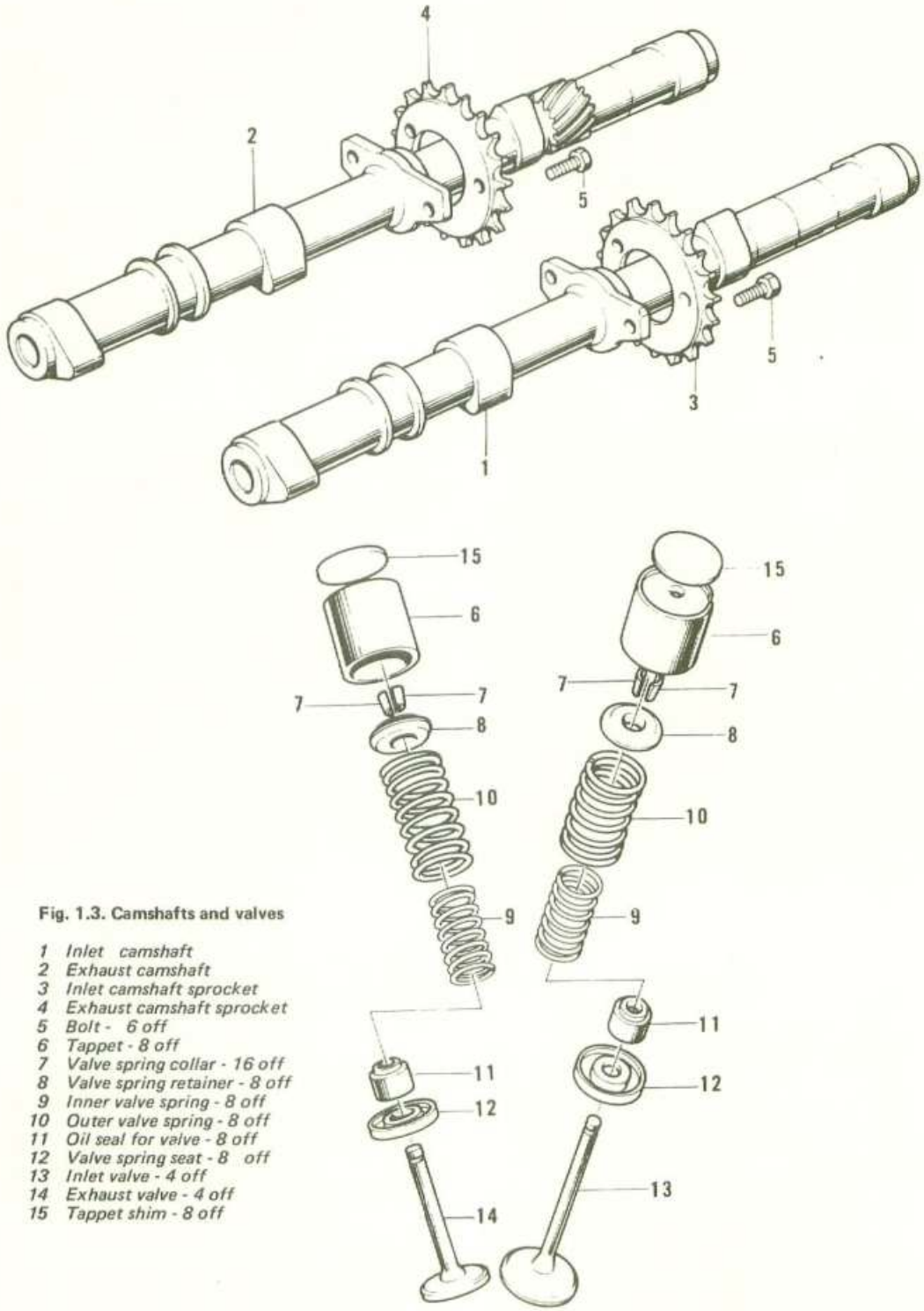
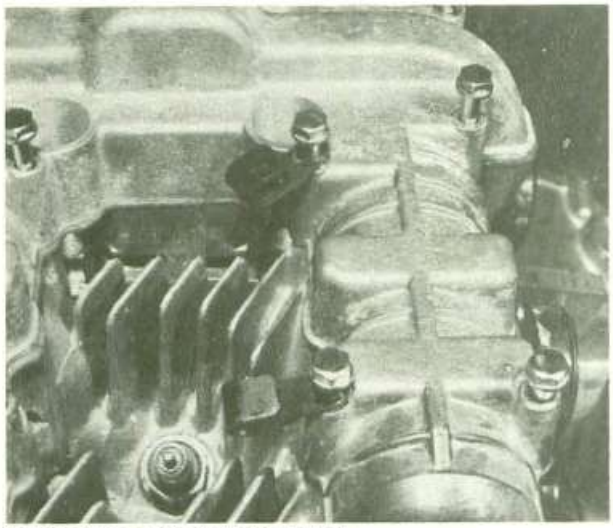


Fig. 1.3. Camshafts and valves

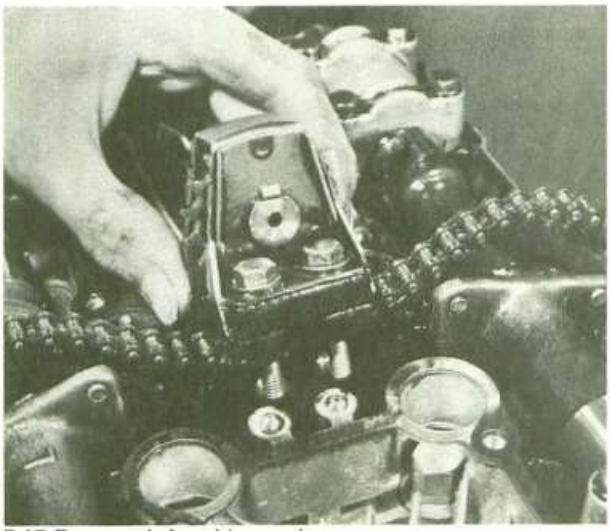
1 *Inlet camshaft*
2 *Exhaust camshaft*
3 *Inlet camshaft sprocket*
4 *Exhaust camshaft sprocket*
5 *Bolt - 6 off*
6 *Tappet - 8 off*
7 *Valve spring collar - 16 off*
8 *Valve spring retainer - 8 off*
9 *Inner valve spring - 8 off*
10 *Outer valve spring - 8 off*
11 *Oil seal for valve - 8 off*
12 *Valve spring seat - 8 off*
13 *Inlet valve - 4 off*
14 *Exhaust valve - 4 off*
15 *Tappet shim - 8 off*



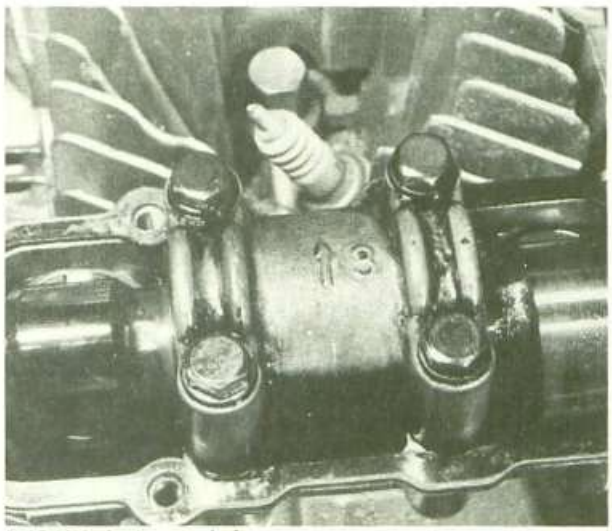
7.1 Remove the camshaft cover bolts



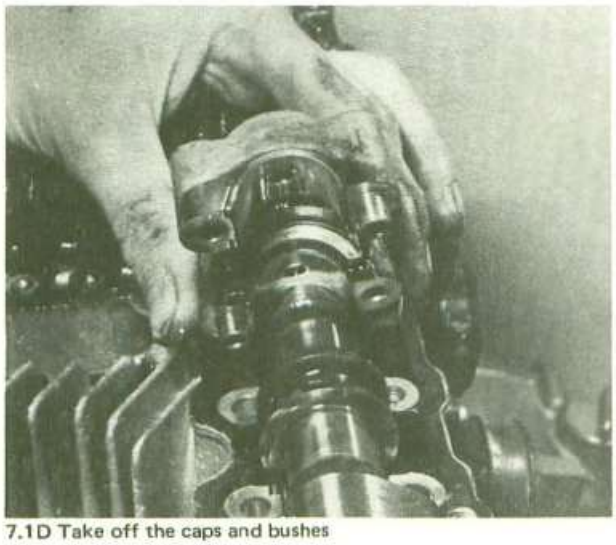
7.1A and lift off the cover



7.1B Remove chain guide sprocket



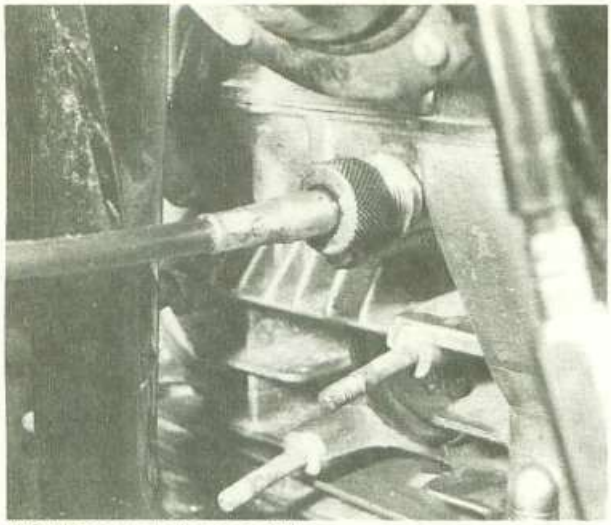
7.1C Unbolt the camshaft caps



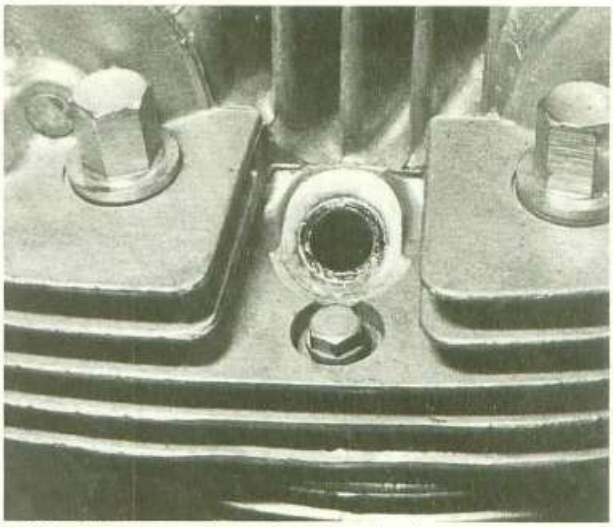
7.1D Take off the caps and bushes



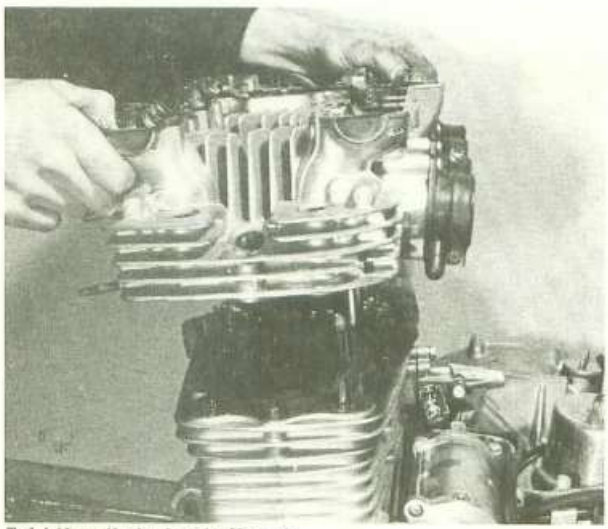
7.2 Removing camshaft, exposes tappets



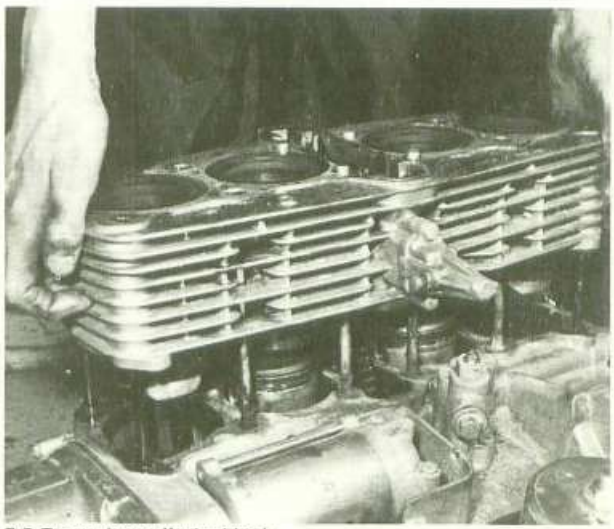
7.2A Unscrew tachometer cable



7.3 Small bolts at each end of cylinder head



7.4 Lift cylinder head off studs



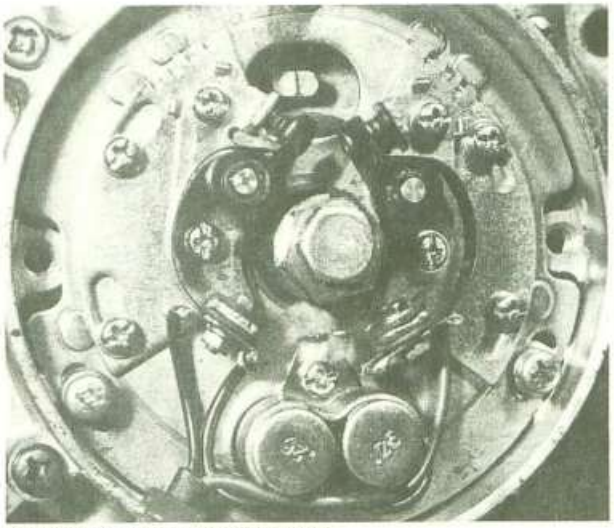
7.5 Removing cylinder block



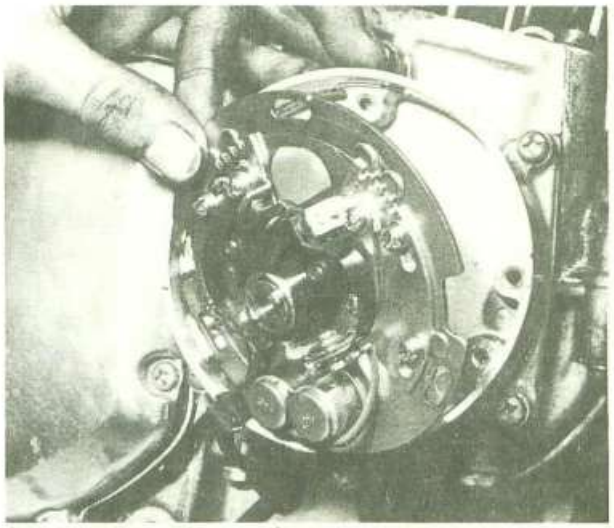
8.1 Prise in groove to release circlip



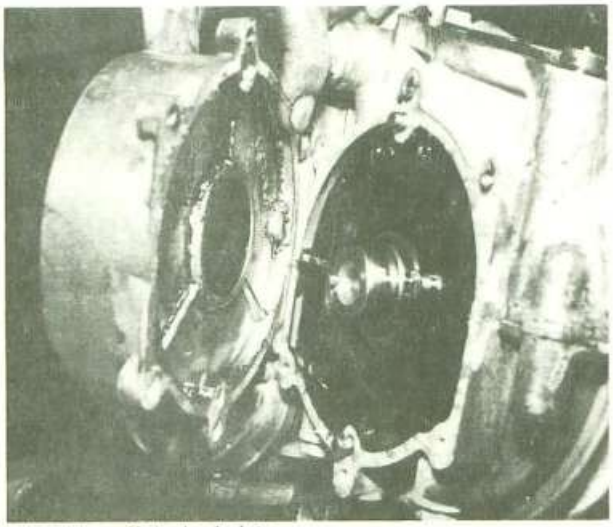
8.2 Tap gudgeon pin out lightly



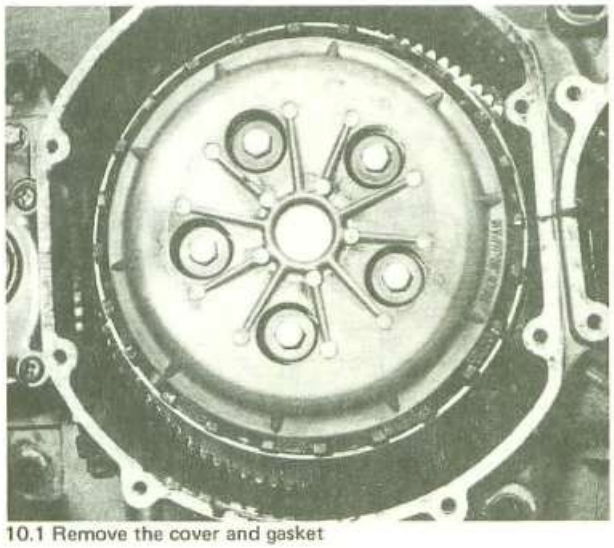
9.1 Remove contact breaker cover



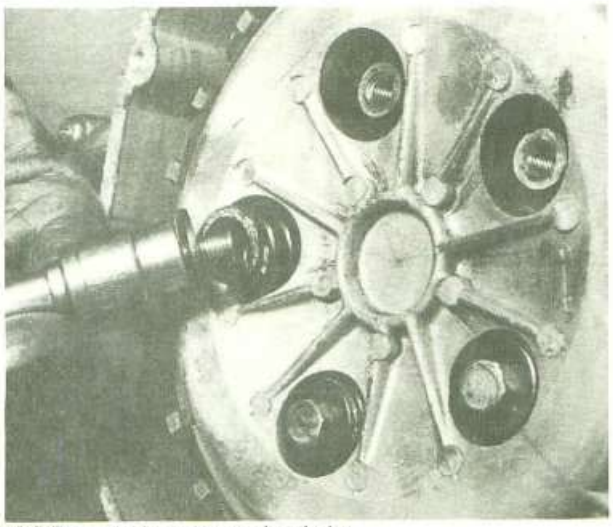
9.1A Lift off assembly complete



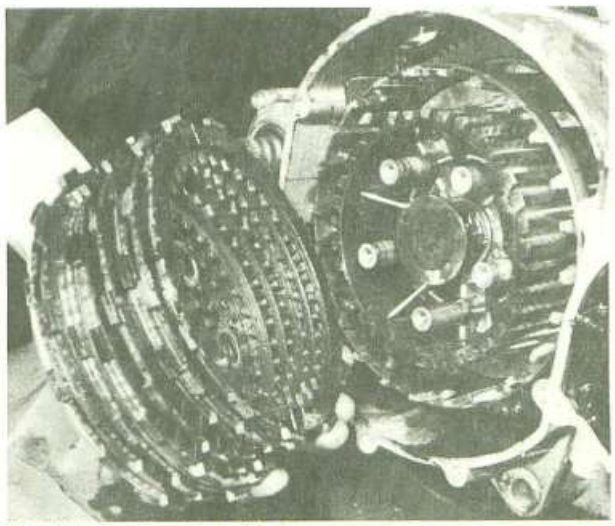
9.2 Taking off the backplate



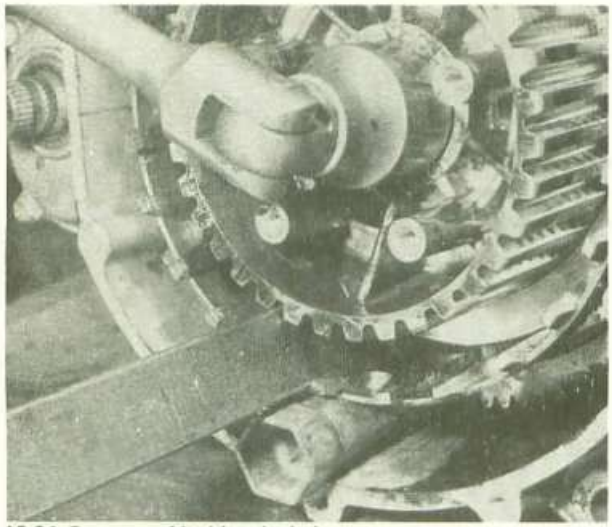
10.1 Remove the cover and gasket



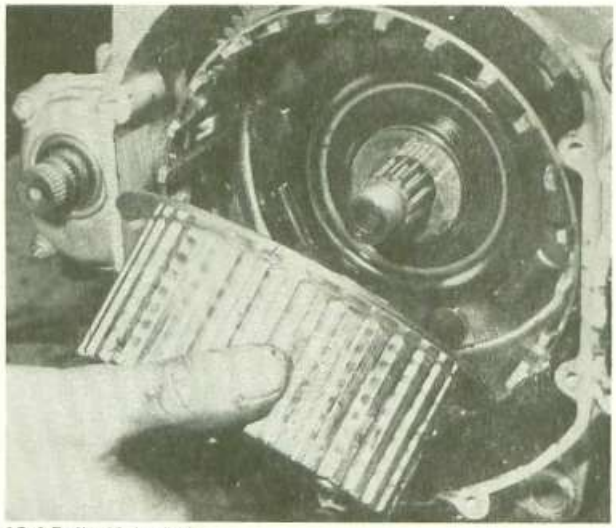
10.2 Remove the pressure plate bolts



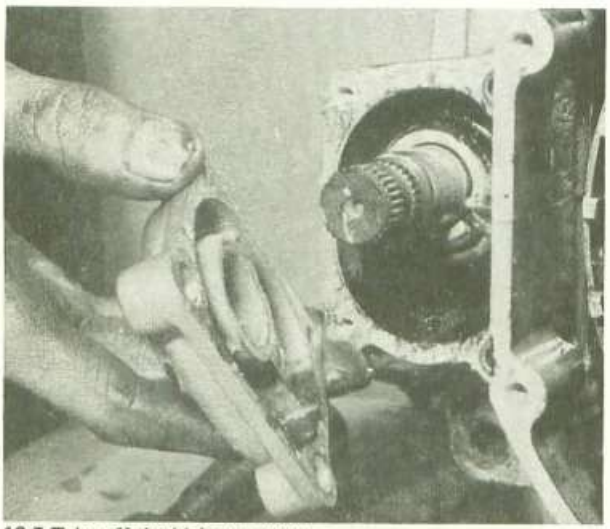
10.3 Lift out the clutch plates



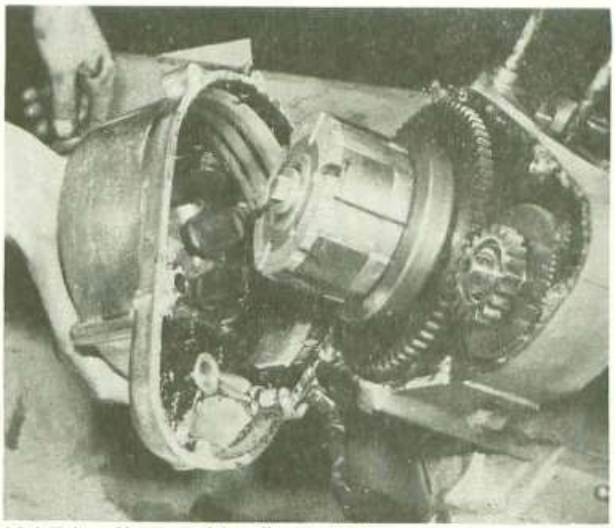
10.3A One way of locking the hub



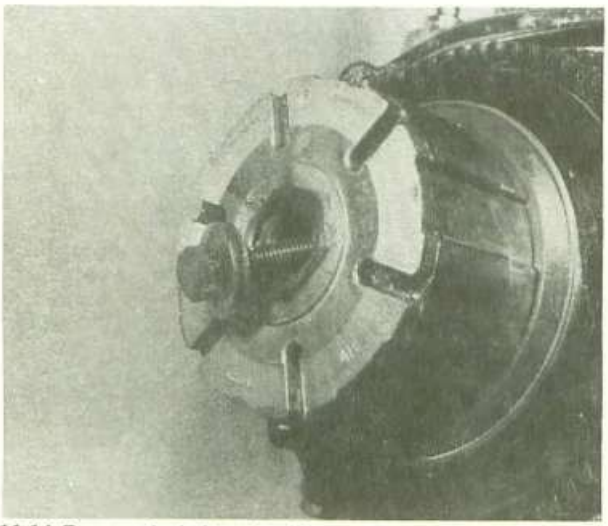
10.4 Pull off the hub



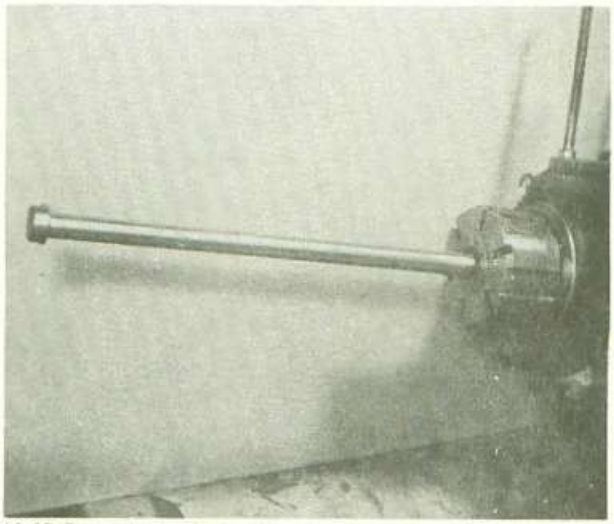
10.5 Take off the kickstart cover



11.1 Take off cover with coils attached



11.1A Remove the bolt and washer



11.1B Rear wheel spindle will remove rotor

re-use old circlips during the rebuild.
2 Using a drift of suitable diameter, tap each gudgeon pin out of position by supporting each piston and connecting rod in turn. Mark each piston inside the skirt so that it is replaced in the same position. If the gudgeon pins are a tight fit into the connecting rods, it is advisable to warm the pistons. One way is to soak a rag in very hot water, wring the water out and wrap the rag round the piston very quickly. The resultant expansion should ease the grip of the piston bosses.

9 Dismantling the engine and gearbox: removing the contact breaker assembly

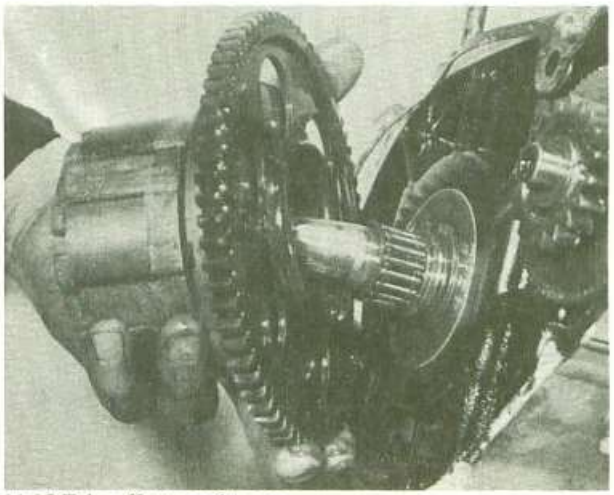
1 Remove the contact breaker cover by undoing the two screws that hold the cover on the front right hand side of the engine. This cover has D.O.H.C. stamped on it. Then remove the three screws holding the contact breaker assembly with condensers attached, lift off the plate, separating the wires by pulling them out of the connector.
2 Remove the bolt that holds the auto-advance mechanism to the shaft, and remove the advance mechanism with the cam. Now undo the six screws holding the backplate. Note there are two dowels that locate into the side of the crankcase. After this plate is removed, the crankshaft is exposed.

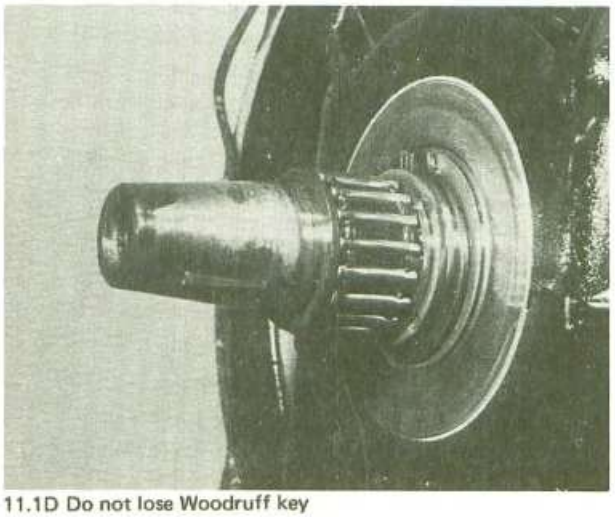
10 Dismantling the engine and gearbox: removing the clutch

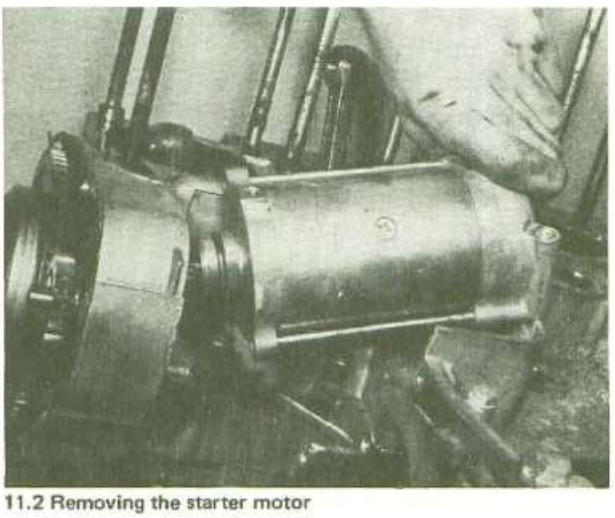
1 After making sure that all the oil has been drained from the clutch housing, as previously mentioned at the beginning of this Chapter, undo the eight crosshead screws that retain the clutch cover, and remove both cover and gasket.
2 Remove the five pressure plate bolts, the clutch springs, and the pressure plate. Take out the clutch mushroom pushrod, and tilt the engine over, so that the steel ball will fall out (otherwise known as the release bearing).
3 Remove the clutch plates (there are eight friction, and seven plain plates). The clutch plates can be removed by using a hooked piece of wire to lift them out. Then remove the clutch hub centre nut by either using the special tool that holds the hub still, or a suitable substitute.
4 Remove the outer washer, the hub, and the inner washer. The clutch outer case cannot be removed until the crankcases are separated.
5 The kickstart cover can now be removed from the rear of the clutch case, by undoing the four crosshead screws. The kickstart spring can be pulled out with a pair of long nosed pliers.

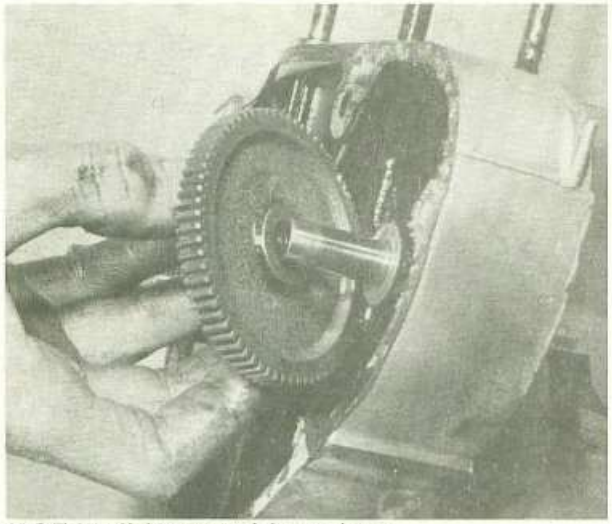
11 Dismantling the engine and gearbox: removing the alternator and starter motor

1 Turn to the opposite side of the engine (left hand), remove the six crosshead screws that hold on the outer cover. The maker's name ('KAWASAKI') is stamped on the cover. After this cover is removed together with its gasket, the rotor will be exposed. If a rotor extractor is not available, the rear wheel spindle can be screwed into the thread of the rotor, after the rotor securing bolt and washer have been removed. By tapping outwards under the head of the spindle after it has been tightened, the rotor should come off, with the starter pinion attached. **Note: On no account hammer the rotor.**
2 Take out the two long bolts that fit vertically in the end of the starter motor bracket, unscrew the starter cable from the terminal, and release the cable from the clamp. The starter motor can now be pulled out from the crankcase.
3 The starter pinion with gear can now also be removed.

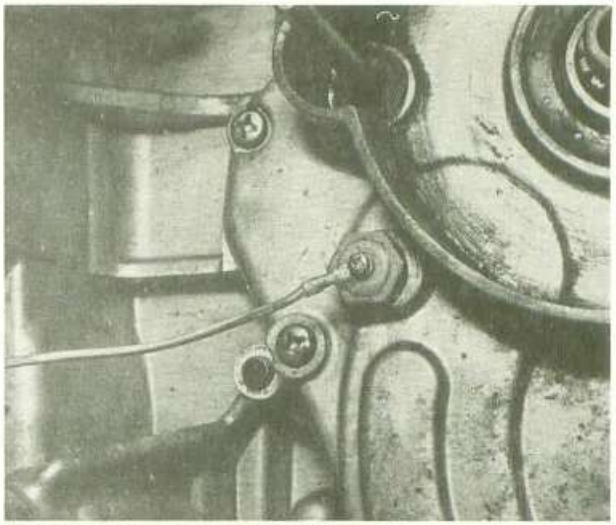

11.1C Take off rotor with gear


11.1D Do not lose Woodruff key

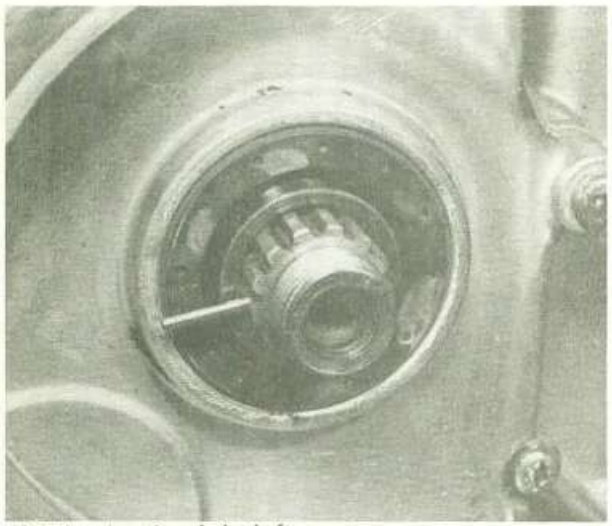

11.2 Removing the starter motor



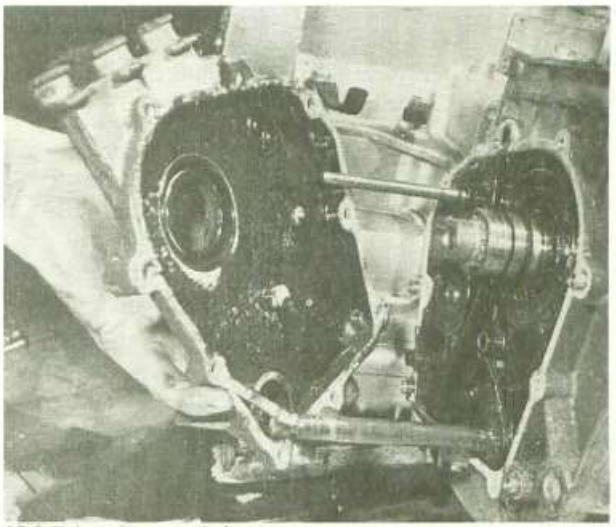
11.3 Take off the starter pinion, and gear



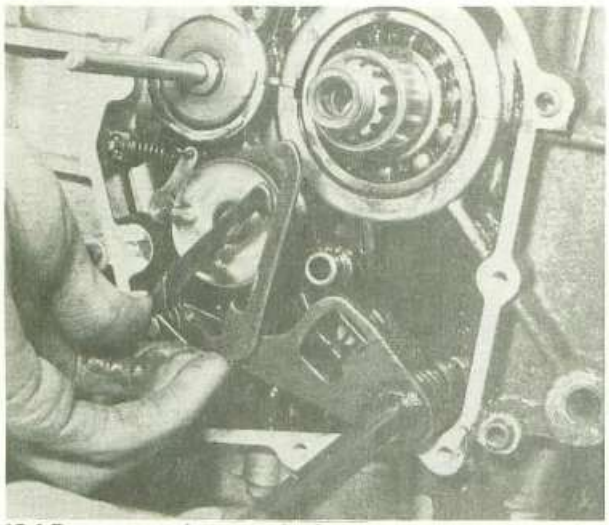
12.1 Disconnect the neutral switch wire



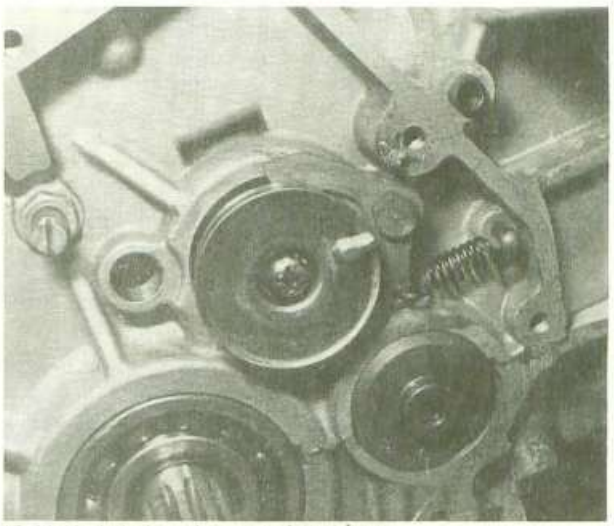
12.2 Note locating pin in shaft



12.3 Take off transmission cover



12.4 Remove gear change mechanism



12.4A Undo bolt and remove detent lever

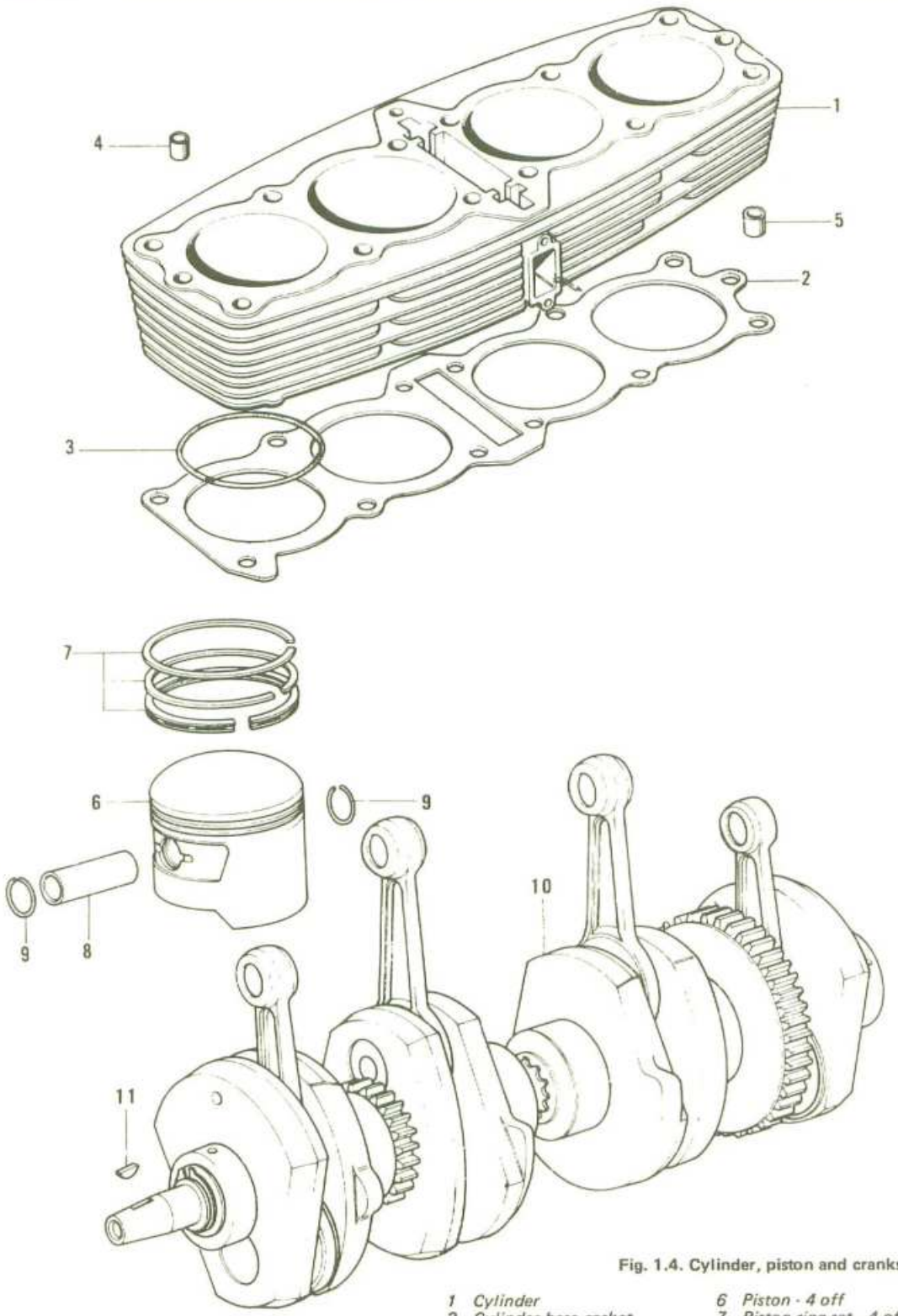


Fig. 1.4. Cylinder, piston and crankshaft

1 *Cylinder*
2 *Cylinder base gasket*
3 *'O' ring - 4 off*
4 *Dowel pin - 2 off*
5 *Dowel pin - 2 off*
6 *Piston - 4 off*
7 *Piston ring set - 4 off*
8 *Gudgeon pin - 4 off*
9 *Circlip - 8 off*
10 *Crankshaft assembly*
11 *Alternator Woodruff key*

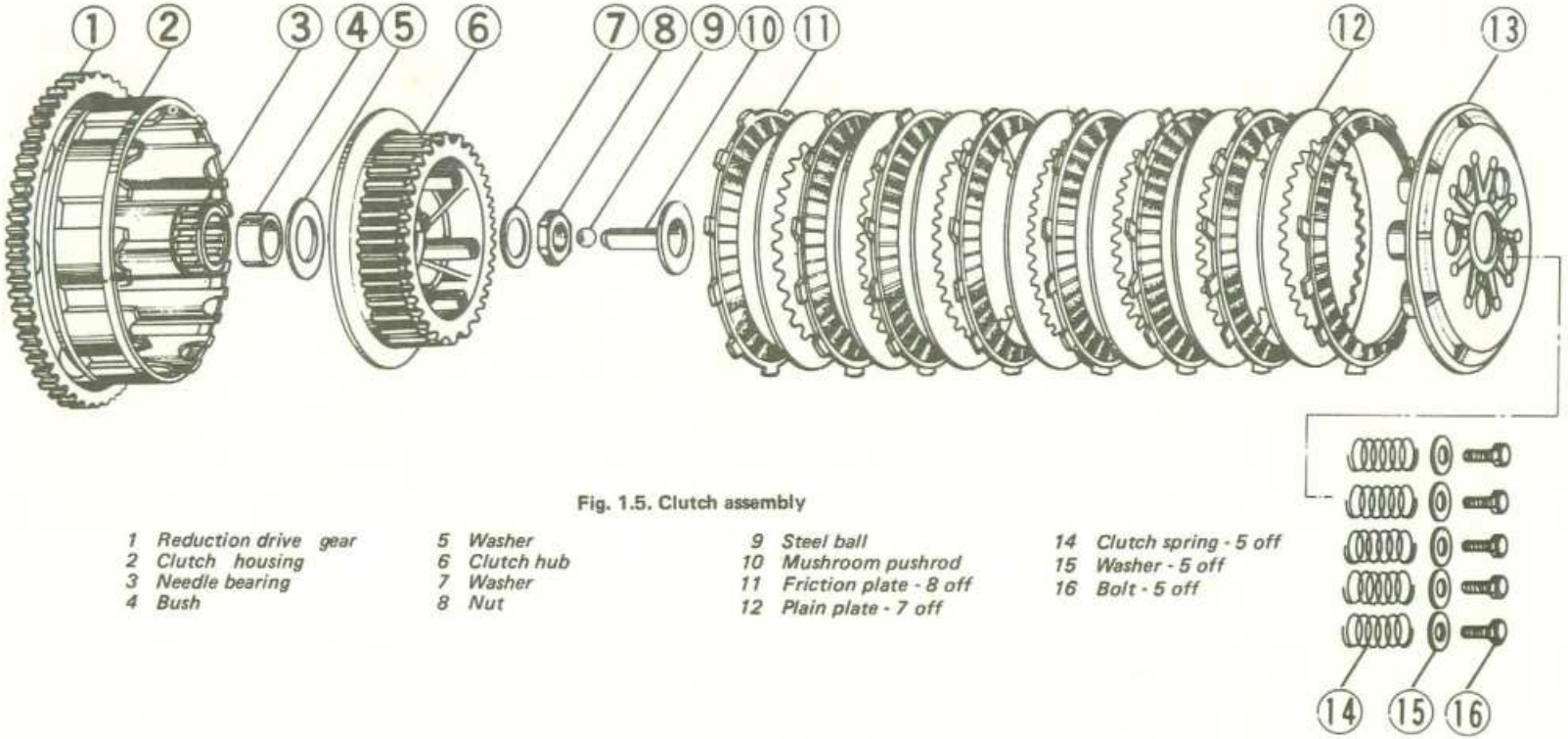


Fig. 1.5. Clutch assembly

1 *Reduction drive gear*
2 *Clutch housing*
3 *Needle bearing*
4 *Bush*
5 *Washer*
6 *Clutch hub*
7 *Washer*
8 *Nut*
9 *Steel ball*
10 *Mushroom pushrod*
11 *Friction plate - 8 off*
12 *Plain plate - 7 off*
14 *Clutch spring - 5 off*
15 *Washer - 5 off*
16 *Bolt - 5 off*

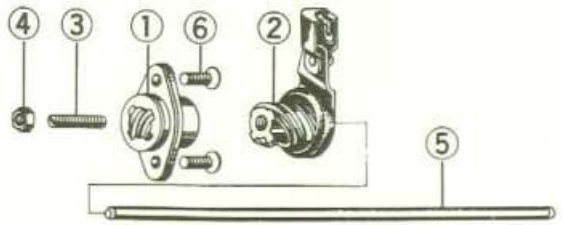


Fig. 1.5A Clutch release mechanism

1 *Outer release gear*
2 *Inner release gear*
3 *Adjusting screw*
4 *Lock nut*
5 *Push rod*
6 *Screw*

12 Dismantling the engine and gearbox: removing the final drive sprocket

1 Pull out the clutch pushrod, disconnect the neutral switch situated at the bottom of the sprocket guard, unscrew the three crosshead screws and remove the sprocket guard.
2 Flatten the bent up ear of the tab washer locking the sprocket nut, undo the sprocket nut while stopping the sprocket from turning (one way of doing this is to put a piece of chain onto the sprocket and then to hold both ends of the chain in a vice). Remove the sprocket.
3 Take off the transmission cover and gasket, remove the sprocket distance collar and take off the 'O' ring that fits behind the collar. **Note:** The 'O' ring is to stop oil leakage from the crankcase.
4 Remove the gear change detent lever mounting bolt, unhook the lever spring, and remove the lever.

13 Dismantling the engine and gearbox: removing the oil filter

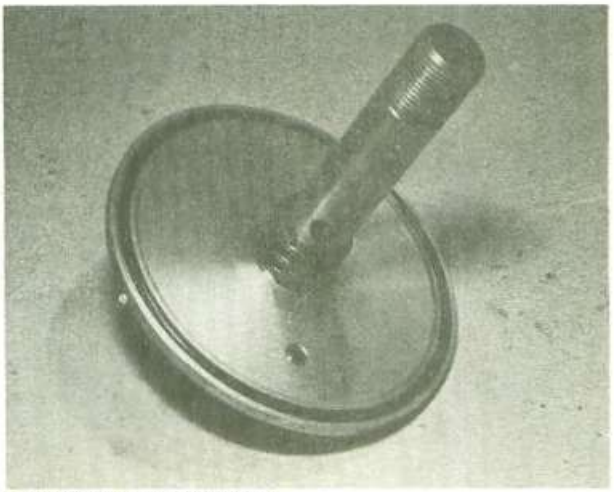
1 The oil filter is located underneath the sump. The filter has a drain plug, that should normally be removed when changing the engine oil. However, as we are taking the filter out complete it can be left in and the whole filter plate removed by undoing the centre mounting bolt. The filter assembly with the element will then come down from the crankcase. Take off the rubber gaskets and remove the filter element.

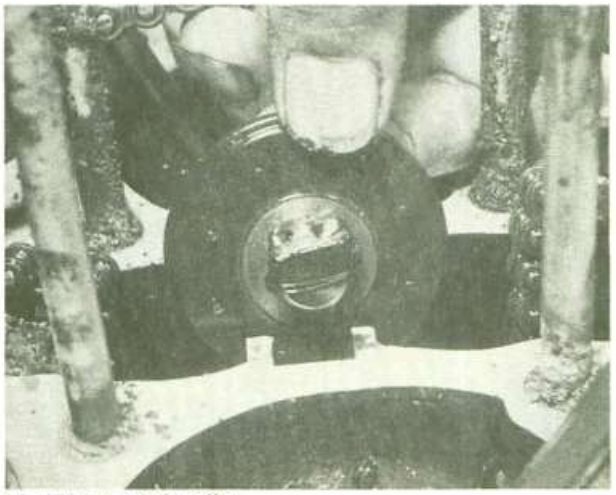
14 Dismantling the engine and gearbox: separating the crankcases

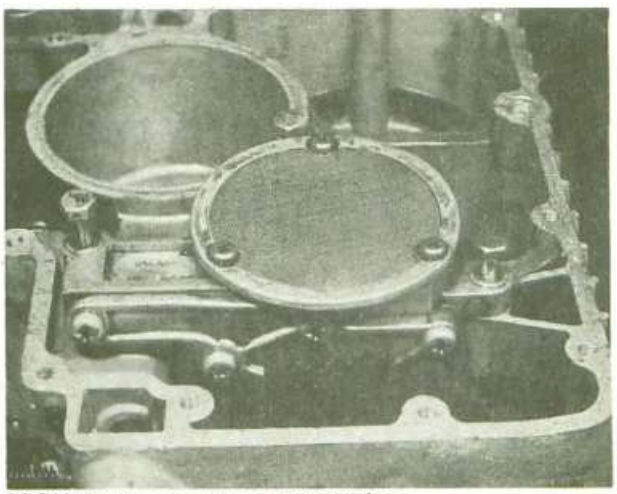
1 Take out the crankcase bolts from the top side of the engine (two of them at the centre position just behind the crankshaft have cable clips attached). Remove the centre camchain guide roller.
2 Turn the engine upside down on the bench, and remove the oil strainer, oil pan, and gasket. Undo the two bolts that retain the oil pump. The pump can now be removed. Remove the seventeen 6 mm and the eight 8 mm bolts from the crankcase bottom half. Do not remove the four bolts that hold the crankshaft.
3 There are three jack bolt positions in the lower crankcase. To separate the crankcases, screw three 8 mm bolts into these holes (two at the front and one at the rear position of the engine), and the crankcases will separate. Take care to screw in the bolts evenly, half a turn at a time, to make sure the crankcase separates evenly.

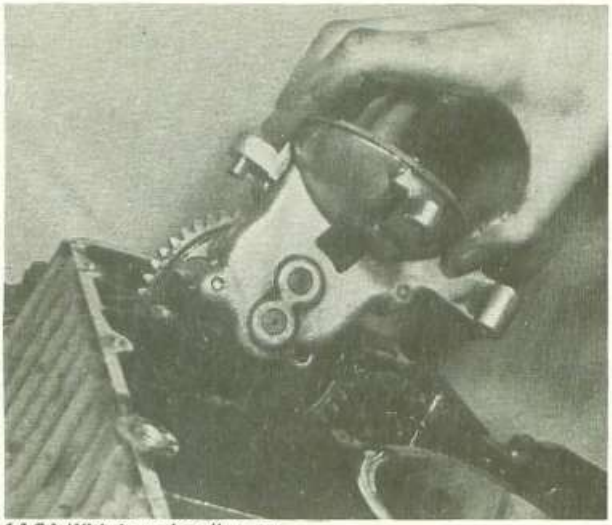
15 Dismantling the engine and gearbox: removing the crankshaft assembly and gear clusters

1 To remove the crankshaft assembly undo the four bolts that hold the centre crankshaft bearing cap. This bearing cap is bored 'in line' with the crankcase. There is only one position for it, with the arrow pointing towards the front of the engine.
2 Take out the crankshaft assembly from the upper crankcase half and slip off the cam-chain.
3 The gearbox mainshaft complete with gear cluster, and the clutch housing can now be removed.
4 Lift out the layshaft with gear cluster, also the kickstart shaft and pinion.
5 Lightly tap out the selector fork rod and remove the two selector forks. Remove the detent arm, bend back the locking tab of the lockwasher, and remove the gear change fork pin.
6 Bend back the locktab on the selector drum bolt, then unscrew and remove the selector drum positioning bolt. The cap bolt need not be removed from the top of the positioning bolt.
7 Pull the selector drum out of the crankcase along with the third gear selector fork.

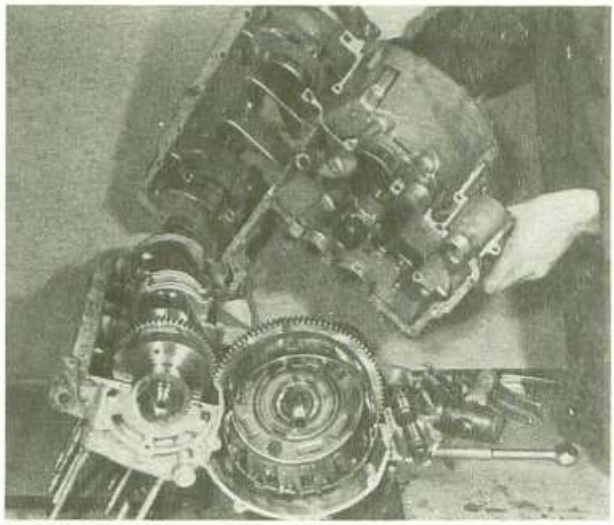

13.1 Take off cover with bolt


14.1 The camchain roller

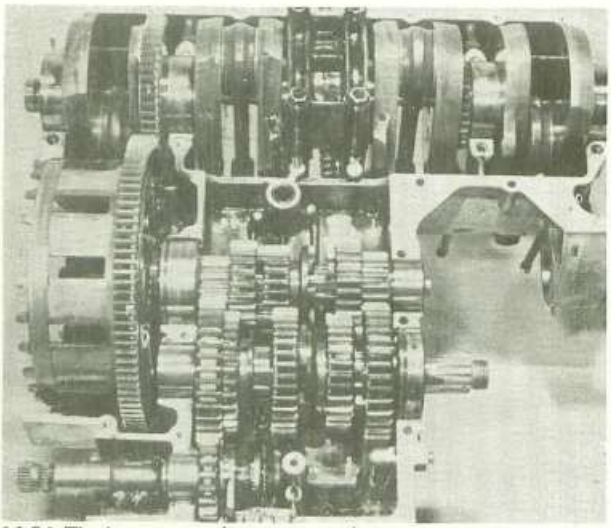

14.2 Undo three screws to remove strainer



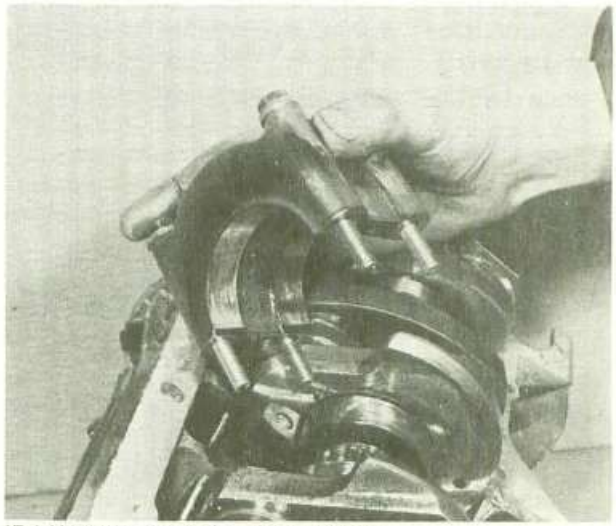
14.2A Withdraw the oil pump



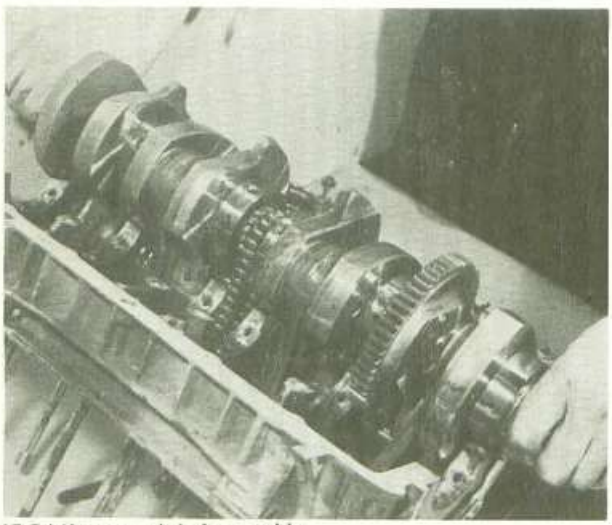
14.3 Separating the crankcases



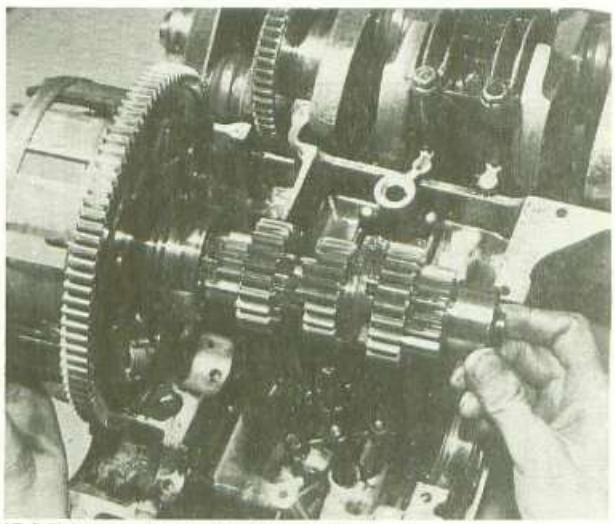
14.3A The bottom crankcase removed



15.1 Undo the four bolts, to remove cap



15.2 Lift up crankshaft assembly



15.3 Take out gear cluster and clutch

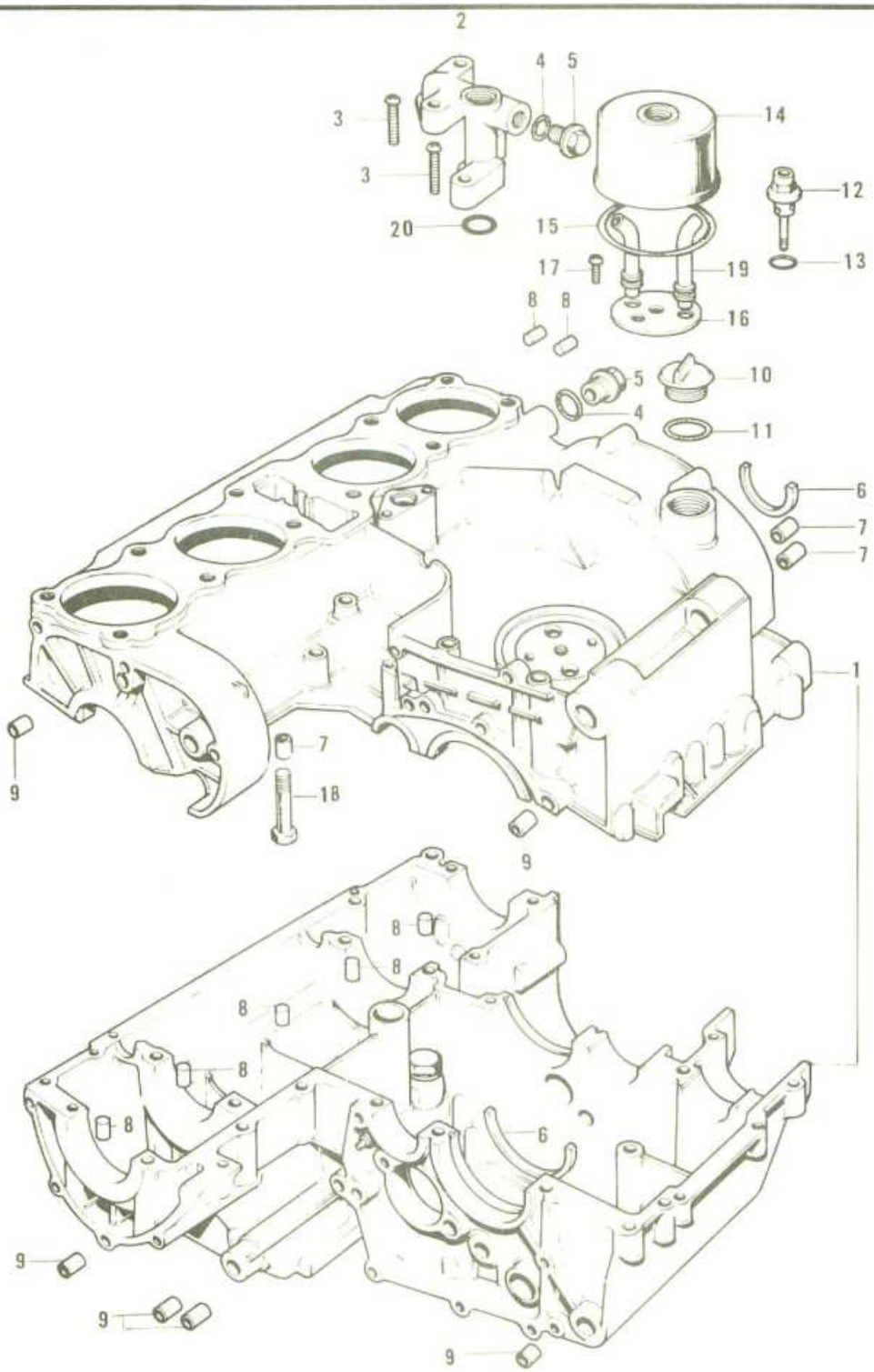


Fig. 1.6. Crankcase assembly

1 *Crankcase complete*	6 *Bearing set ring - 2 off*	11 *'O' ring*	16 *Breather plate*
2 *Oil pressure switch body*	7 *Dowel pin - 4 off*	12 *Bolt*	17 *Pan head screw - 2 off*
3 *Pan head screw - 4 off*	8 *Dowel pin - 8 off*	13 *'O' ring*	18 *Bolt - 4 off*
4 *'O' ring - 2 off*	9 *Dowel pin - 6 off*	14 *Breather body*	19 *Tube - 2 off*
5 *Plug - 2 off*	10 *Oil filler plug*	15 *'O' ring for breather body*	20 *'O' ring - 2 off*

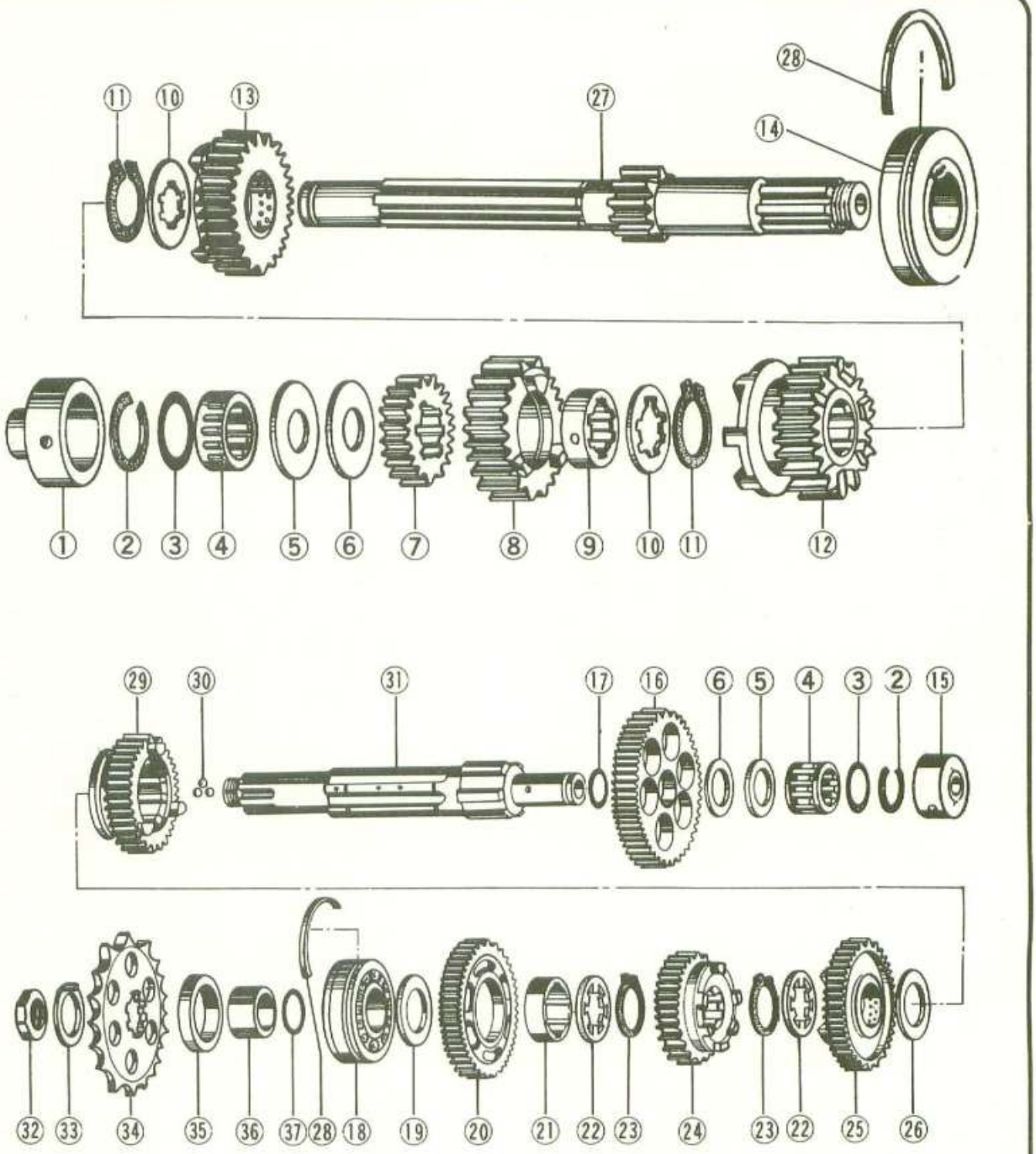
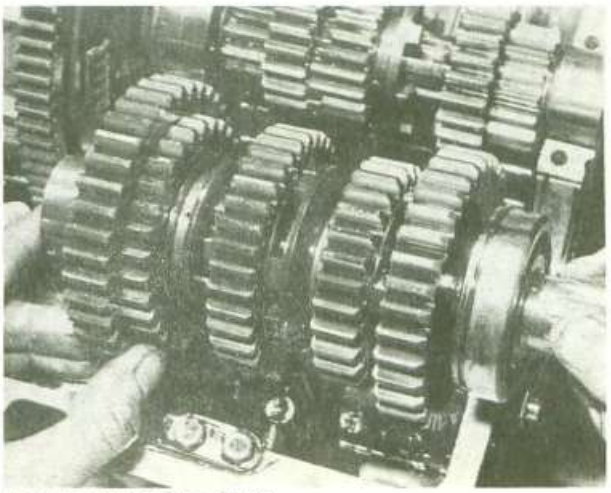
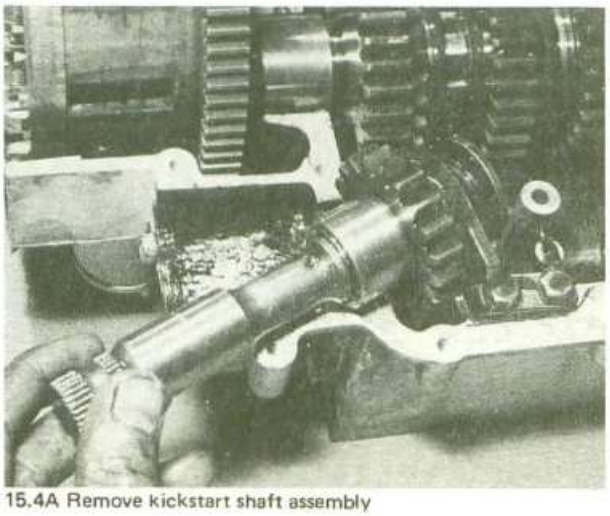


Fig. 1.7 Gearbox components

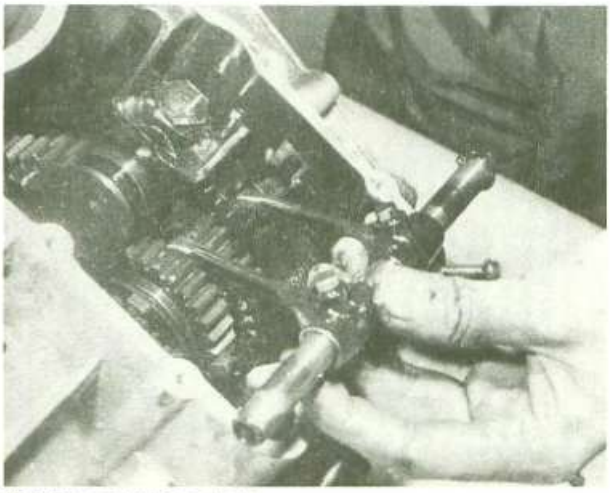
1 Bush
2 Retaining ring
3 Shim
4 Needle roller bearing
5 Washer
6 Washer
7 Mainshaft 2nd gear
8 Mainshaft 5th gear
9 Bush 5th gear
10 Washer
11 Retaining ring
12 Mainshaft 3rd gear
13 Mainshaft 4th gear
14 Bearing
15 Bush
16 Layshaft 1st gear
17 Shim
18 Bearing
19 Washer
20 Layshaft 2nd gear
21 Bush 2nd gear
22 Splined washer
23 Retaining ring
24 Layshaft 5th gear
25 Layshaft 3rd gear
26 Washer
27 Mainshaft
28 Set ring
29 Layshaft 4th gear
30 Steel balls
31 Layshaft
32 Nut
33 Lock washer
34 Engine sprocket
35 Oil seal
36 Engine sprocket collar
37 'O' ring



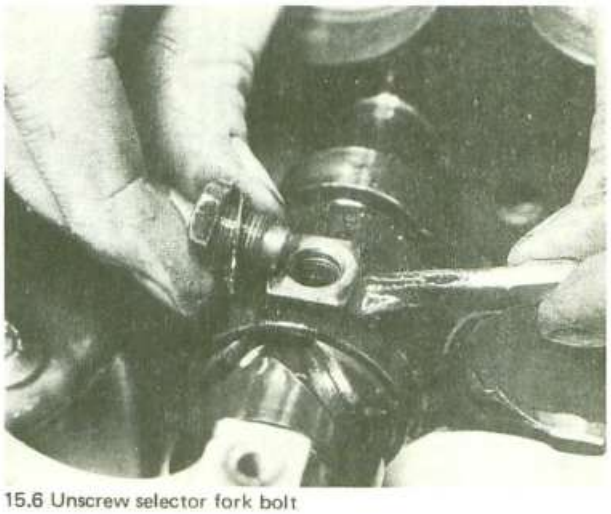
15.4 Lift out layshaft cluster



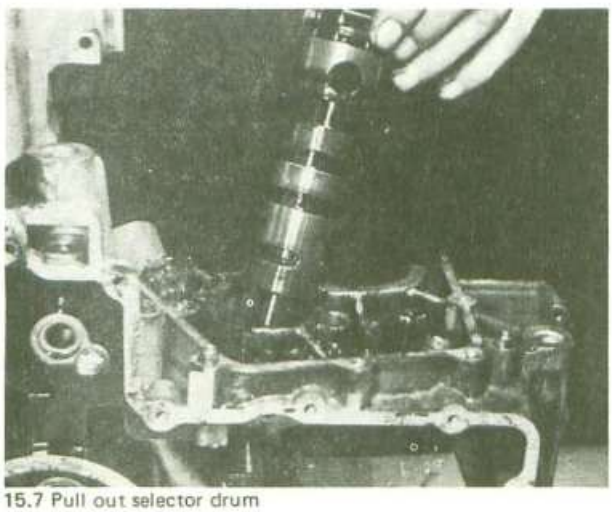
15.4A Remove kickstart shaft assembly



15.5 Remove selector forks



15.6 Unscrew selector fork bolt



15.7 Pull out selector drum

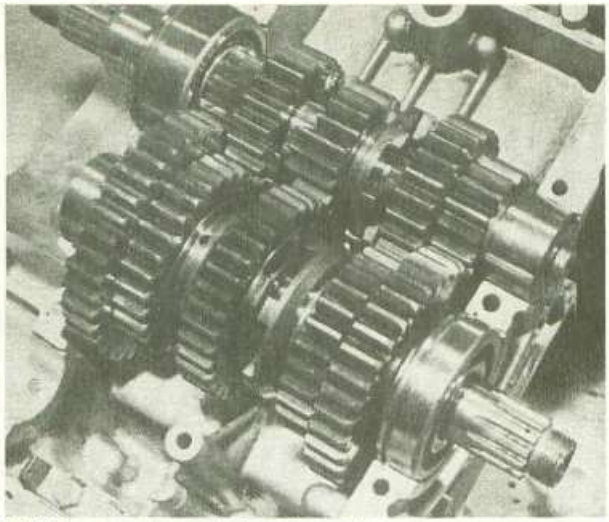
16 Dismantling the gearbox: dismantling the gear clusters

1 To dismantle the mainshaft, first remove the outer bush, then the retaining ring and shim and next the needle roller bearing and the two spacers. After this take off the 2nd gear pinion and the 5th gear pinion with the 5th gear bush, the splined washer and external circlip. Next remove the sliding 3rd gear, the circlip and splined washer, and the 4th gear with bush. On the opposite end of the shaft, next to the fixed pinion, is a roller bearing. This can be removed if it has to be renewed, using a bearing puller. Take off the split set ring halves.

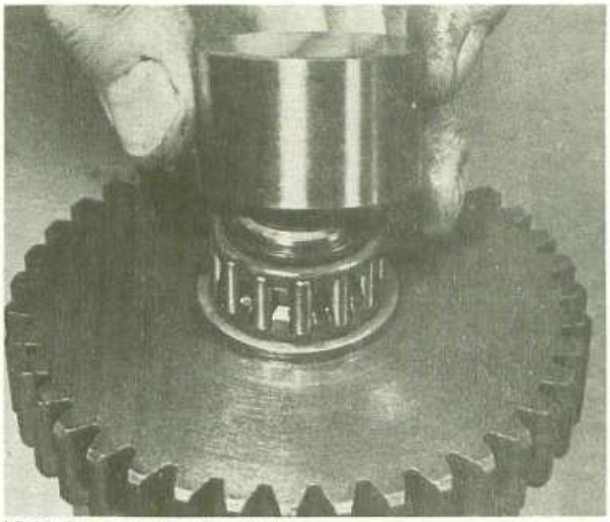
2 Start to dismantle the layshaft gears by first removing the bush, retaining ring and shim, and then the needle roller bearing and two spacing washers. Next remove the large 1st gear and the shim located behind the gear pinion.

3 Rotate the layshaft while removing the 4th gear, so that the three balls will move. Then pull the bearing from the shaft with a bearing puller, not forgetting to remove the bearing set rings halves first. Remove the washer and the large 3rd gear pinion, then remove the 2nd gear bush, the splined washer and the external circlip.

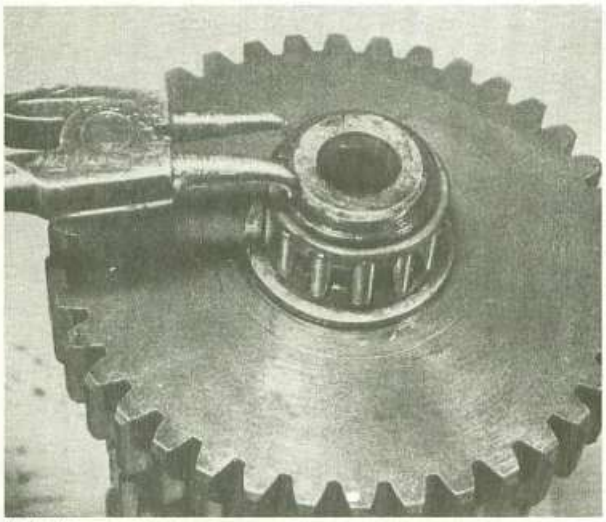
4 Take off the sliding 5th gear pinion, the external circlip, and the second splined washer. Remove the large 3rd gear with the bush and lastly, remove the washer.



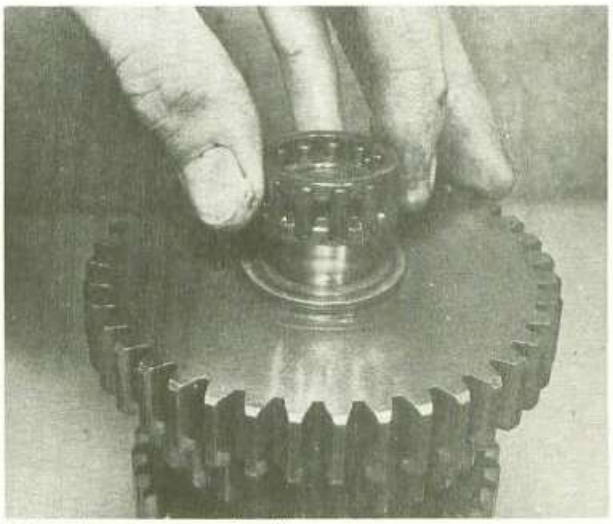
16.1 The gear clusters, before dismantling



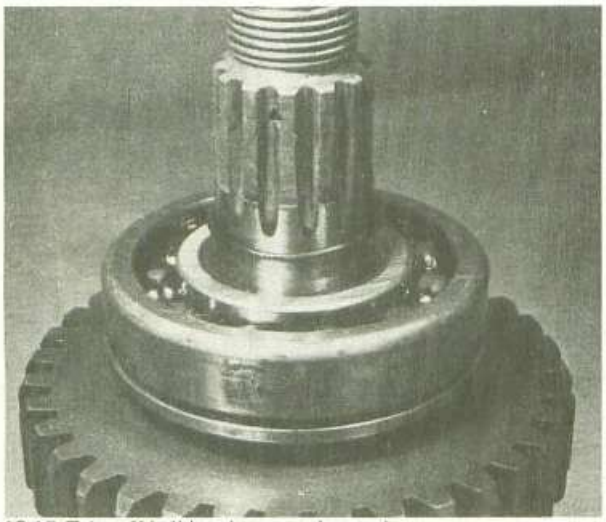
16.1A First remove outer bush



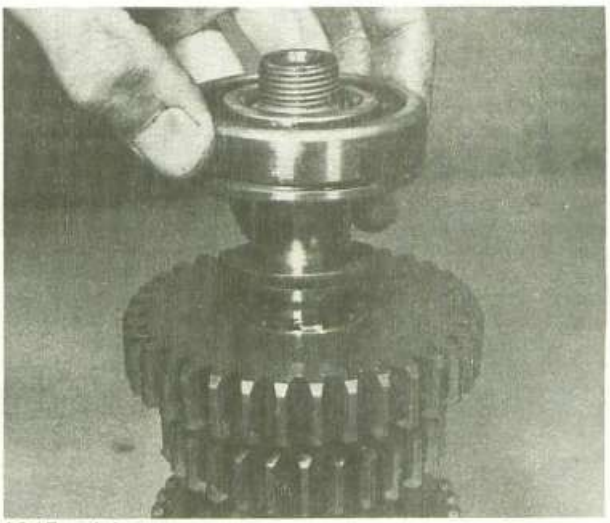
16.1B Use circlip pliers on retaining ring



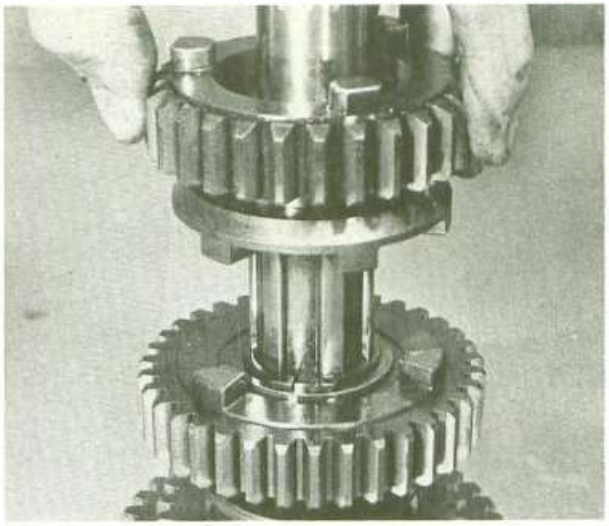
16.1C Then remove needle roller



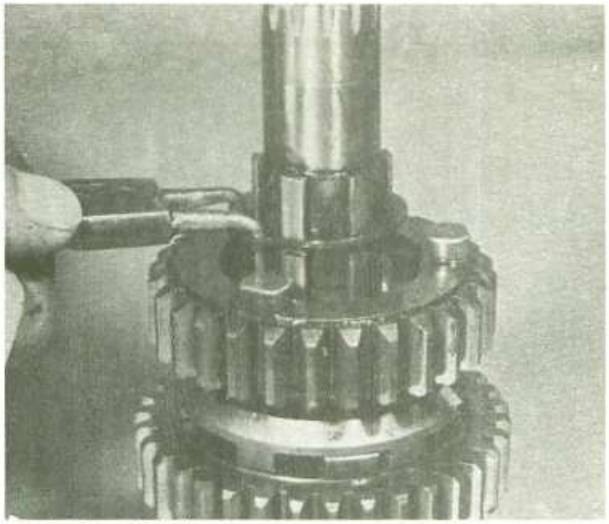
16.1D Take off ball bearing, on other end



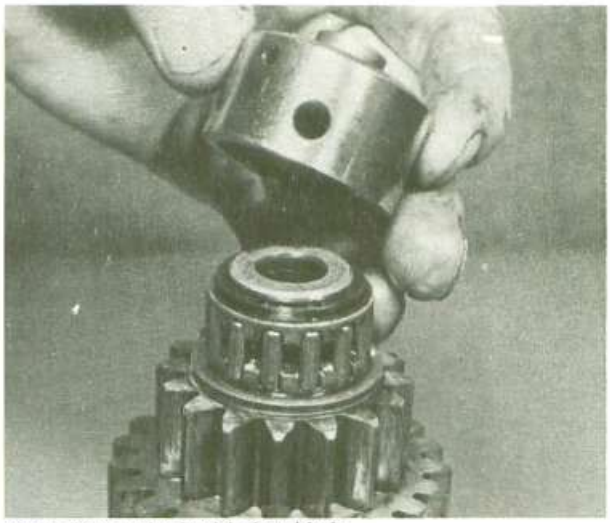
16.1E and then spacer



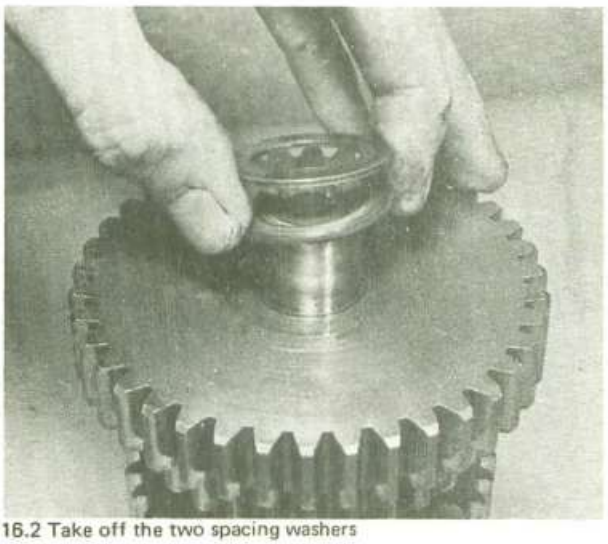
16.1F Remove snap ring



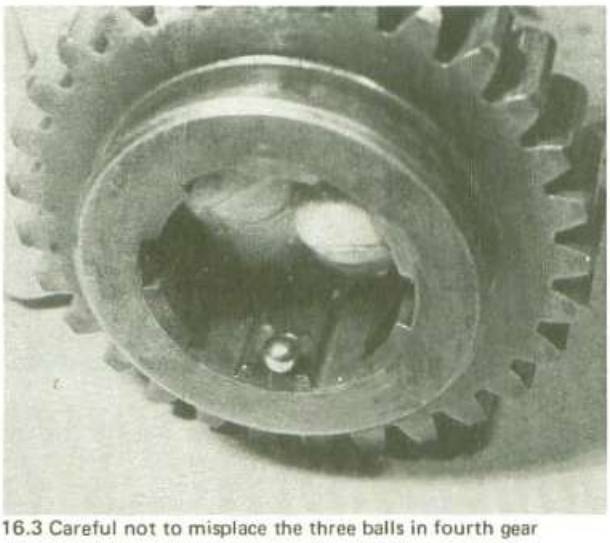
16.1G Take off sliding gear



16.1H Remove bush with dowel hole



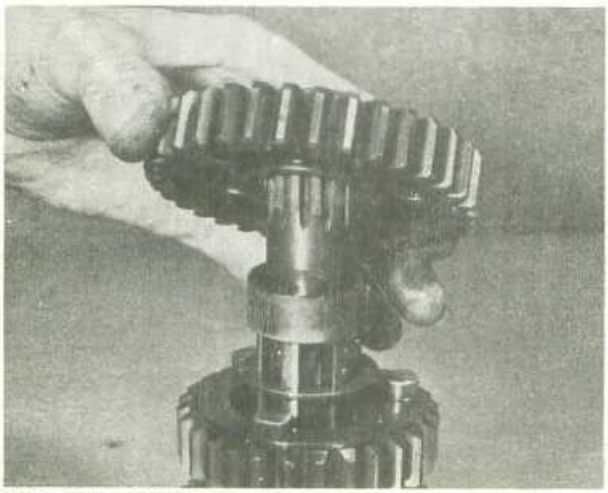
16.2 Take off the two spacing washers



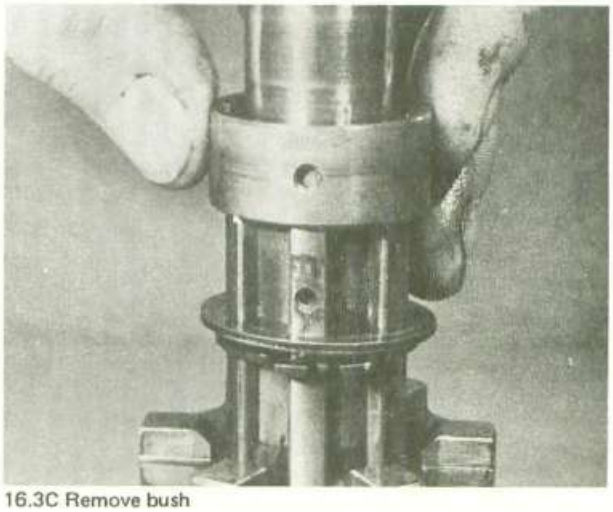
16.3 Careful not to misplace the three balls in fourth gear



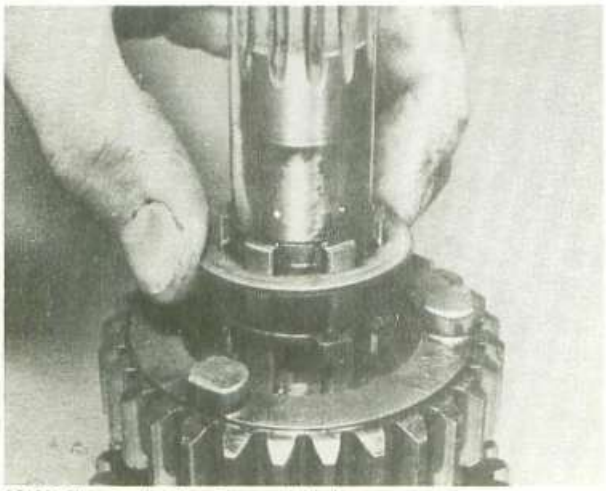
16.3A Pull off ball bearing



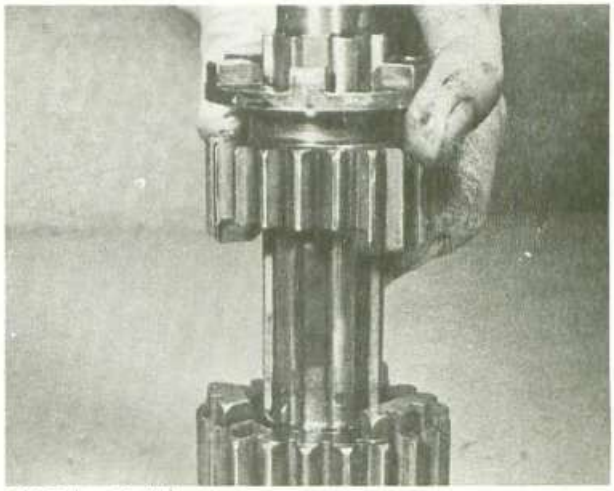
16.3B Take off third gear pinion



16.3C Remove bush



16.3D Then splined washer and circlip



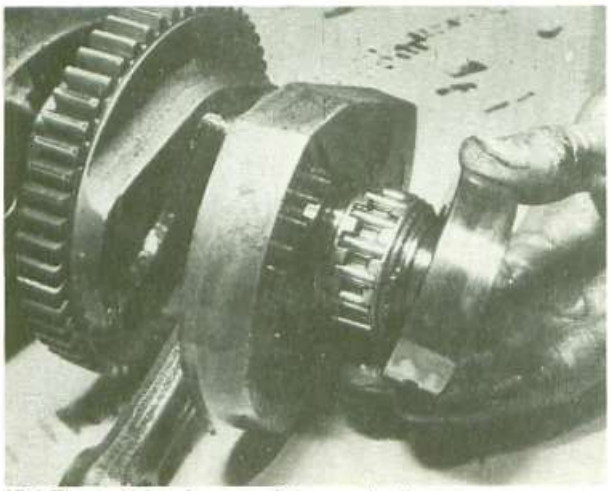
16.4 Take off sliding gear

17 Examination and renovation: general

1 Before examining the parts of the dismantled engine unit for wear, it is essential that they should be cleaned thoroughly. Use a petrol/paraffin mix to remove all traces of old oil and sludge which may have accumulated within the engine.
2 Examine the crankcase castings for cracks or other signs of damage. If a crack is discovered it will require a specialist repair.
3 Examine carefully each part to determine the extent of wear, checking with the tolerance figures listed in the Specifications section of this Chapter. If there is any question of doubt play safe and renew.
4 Use a clean lint free rag for cleaning and drying the various components. This will obviate the risk of small particles obstructing the internal oilways, and causing the lubrication system to fail.

18 Crankshaft big ends and main bearings: examination and renovation

1 Failure of the big end bearings is invariably accompanied by a knock within the crankcase which progressively becomes worse. Some vibration will also be experienced.
2 There should be no vertical play whatsoever in the big end bearings, after the oil has been washed out. If even a small amount of vertical play is evident, the bearings are due for replacement. (A small amount of endfloat is both necessary and acceptable). Do not continue to run the machine with worn big end bearings, for there is a risk of breaking the connecting rods or crankshaft.
3 The construction of the crankshaft assembly precludes the possibility of a repair by the private owner or even most agents. In the majority of cases it will be necessary to obtain a replacement assembly complete, from a KAWASAKI agent.
4 Failure of the main bearings is usually evident in the form of an audible rumble from the crankcase, accompanied by vibration, which is felt through the footrests and handlebars in extreme cases.
5 The crankshaft main bearings are of the caged roller type. If wear is evident in the form of play or if roughness is indicated when they are rotated, replacement is necessary. Always check for wear when the old oil has been washed out of the assembly. Whilst it is possible to remove the outer bearings at each end of the crankshaft, it is probable that the centre bearings are also worn. Here again, it will be necessary to obtain a replacement crankshaft assembly.



18.1 The main bearings are of the caged roller type

6 Failure of both the big end bearings and the main bearings may not necessarily occur as the result of high mileage covered. If the machine is used infrequently or for a succession of short journeys, it is possible that condensation within the engine may cause premature bearing failure. The condition of the flywheels is usually the best guide. When condensation troubles occur, the flywheels will tend to rust and become discoloured.

19 Oil seals: examination and replacement

1 Oil seal failure is difficult to define precisely. Usually it takes the form of oil showing on the outside of the machine, and there is nothing worse than those unsightly patches of oil on the ground where the machine has been standing. One of the most crucial places to look for an oil leak is behind the gearbox final drive sprocket. The seal and 'O' ring that fits on the shaft should be renewed if there is any sign of a leak.
2 Another seal to watch is the clutch pushrod seal that fits into the crankcase in front of the gearbox sprocket. This seal can be replaced from the outside.

20 Cylinder block: examination and renovation

1 The usual indication of badly worn cylinder bores and pistons is excessive smoking from the exhausts. This usually takes the form of a blue haze tending to develop into a white haze as the wear becomes more pronounced.
2 The other indication is piston slap, a form of a metallic rattle which occurs when there is little load on the engine. If the top of the bore is examined carefully, it will be found that there is a ridge on the thrust side, the depth of which will vary according to the rate of wear which has taken place. This marks the limit of travel of the top piston ring.
3 Measure the bore diameter just below the ridge using an internal micrometer, or a dial gauge. Compare the reading you obtain with the reading at the bottom of the cylinder bore, which has not been subjected to any piston wear. If the difference in readings exceeds 0.005 mm (0.002 in.) the cylinder block will have to be bored and honed, and fitted with the required oversize pistons.
4 If a measuring instrument is not available, the amount of cylinder bore wear can be measured by inserting the piston (without rings) so that it is approximately ¾ inch from the top of the bore. If it is possible to insert a 0.005 inch feeler gauge between the piston and cylinder wall on the thrust side of the piston, remedial action must be taken.
5 Kawasaki supply pistons in two oversizes: 0.020 inch (0.5 mm) and 0.040 inch (1.0 mm). If boring in excess of 1.0 mm becomes necessary, the cylinder block must be renewed since new liners are not available from Kawasaki.
6 Make sure the external cooling fins of the cylinder block are free from oil and road dirt, as this can prevent the free flow of air over the engine and cause overheating problems.

21 Pistons and piston rings: examination and renovation

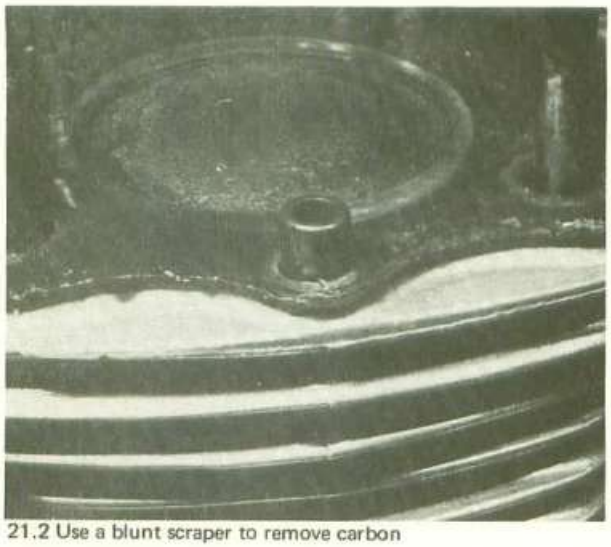
1 If a rebore becomes necessary, the existing pistons and piston rings can be disregarded because they will have to be replaced by their new oversizes.
2 Remove all traces of carbon from the piston crowns, using a blunt ended scraper to avoid scratching the surface. Finish off by polishing the crowns of each piston with metal polish, so that carbon will not adhere so rapidly in the future. Never use emery cloth on the soft aluminium.
3 Piston wear usually occurs at the skirt or lower end of the piston and takes the form of vertical streaks or score marks on the thrust side of the piston. Damage of this nature will necessitate renewal.
4 The piston ring grooves may become enlarged in use, allowing the rings to have a greater side float. If the clearance exceeds 0.005 inch the pistons are due for replacement.
5 To measure the end gap, insert each piston ring into its cylinder bore, using the crown of the bare piston to locate it about 1 inch from the top of the bore. Make sure it is square in the bore and insert a feeler gauge in the end gap of the ring. If the end gap exceeds 0.028 inch (0.7 mm) the ring must be renewed. The standard gap is 0.008 - 0.016 inch (0.2 - 0.4 mm).

When refitting new piston rings, it is also necessary to check the end gap. If there is insufficient clearance, the rings will break up in the bore whilst the engine is running and cause extensive damage. The ring gap may be increased by filing the ends of the rings with a fine file.

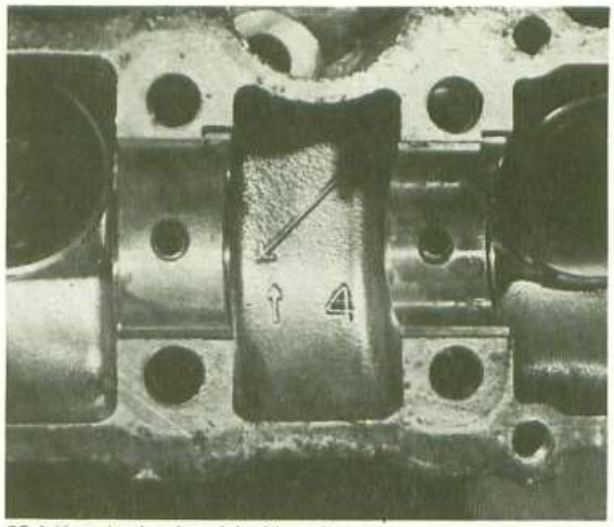
The ring should be supported on the end as much as possible to avoid breakage when filing, and should be filed square with the end. Remove only a small amount of metal at a time and keep rechecking the clearance in the bore.

22 Cylinder head: examination and renovation

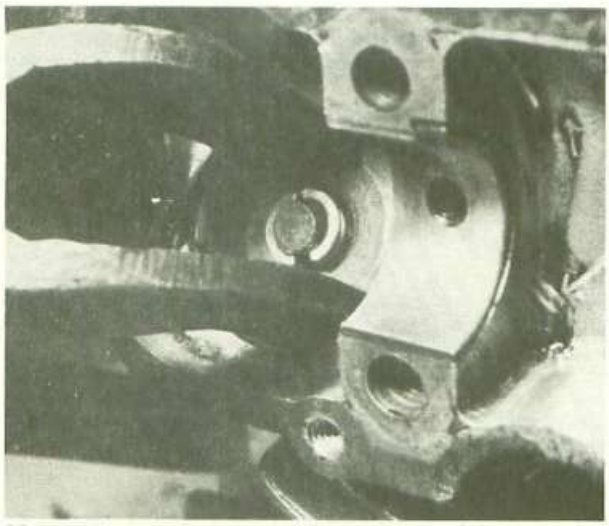
1 Remove all traces of carbon from the cylinder head using a blunt ended scraper (the round end of an old steel rule will do). Finish by polishing with metal polish to give a smooth shiny surface. This will aid gas flow and will also prevent carbon from adhering so firmly in the future.
2 Check the condition of the spark plug hole threads. If the threads are worn or crossed they can be reclaimed by a Helicoil insert. Most motorcycle dealers operate this service which is very simple, cheap, and effective.
3 Clean the cylinder head fins with a wire brush, to prevent overheating, through dirt blocking the fins.
4 Lay the cylinder head on a sheet of ¼ inch plate glass to check for distortion. Aluminium alloy cylinder heads distort very easily, especially if the cylinder head bolts are tightened down unevenly. If the amount of distortion is only slight, it is permissable to rub the head down until it is flat once again by wrapping a sheet of very fine emery cloth around the plate glass base and rubbing with a rotary motion.
5 If the cylinder head is distorted badly (one way of determining this is if the cylinder head gaskets have a tendency to keep blowing), the head will have to be machined by a competent engineer experienced in this type of work. This will, of course, raise the compression of the engine, and if too much is removed can adversely affect the performance of the engine. If there is risk of this happening, the only remedy is a new replacement cylinder head.



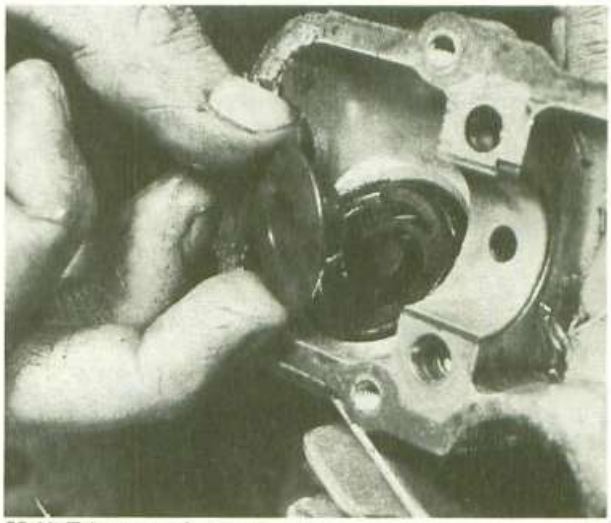
21.2 Use a blunt scraper to remove carbon



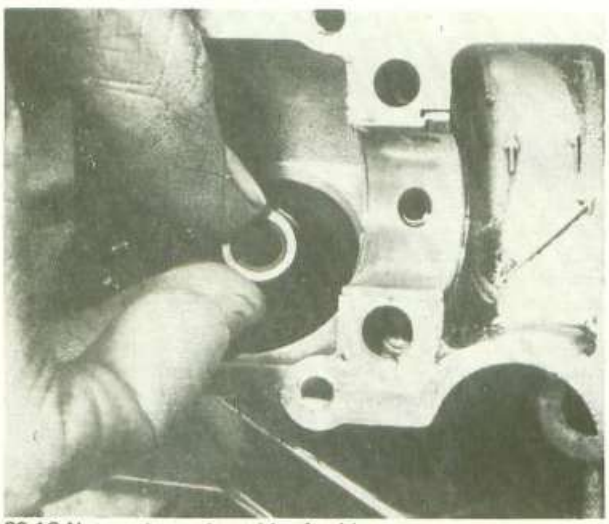
23.1 Keep bushes in original locations



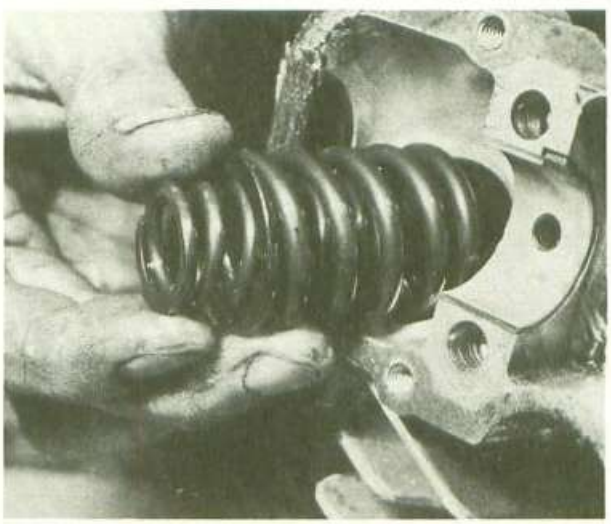
23.1A Using the spring compressor, to remove valve



23.1B Take out spring caps



23.1C Note seal round outside of guides



23.2 Remove valve springs

23 Valves, valve seats and valve guides: examination and renovation

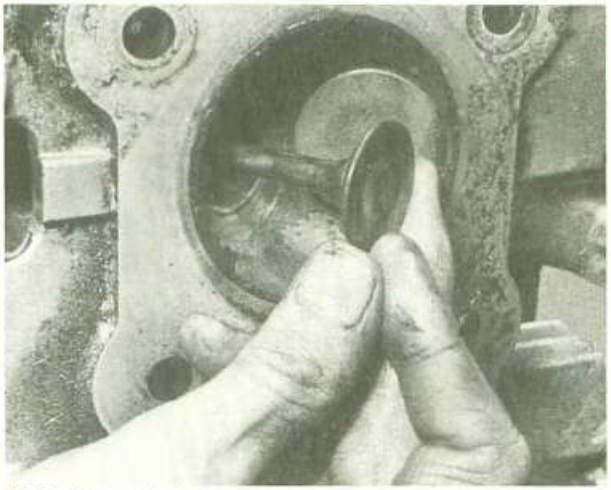
1 Remove the valve tappets and shims, keeping them separate for installation in their original locations. Compress the valve springs with a valve spring compressor, and remove the split valve collets, also the oil seals from the valve guides, as it is best to renew these latter components.
2 Remove the valves and springs, making sure to keep to the locations during assembly. Inspect the valves for wear, overheating or burning, and replace them as necessary. Measure the head of the valve using vernier calipers. The standard measurement of the head is: 0.034 - 0.020 inch (0.85 - 1.15 mm). Replace when the measurement is below 0.020 inch (0.5 mm). Carefully inspect the face of the valve for pitting. This can sometimes be taken out by using a coarse grinding paste first and finishing off with a fine grinding paste, using a suction grinder with a rotary action, keep lifting the suction grinder to distribute the paste on the valve face evenly. The valve surface angle is 45°.
3 Carefully inspect the valve seat for pitting, if this is slight it may be possible to grind this out by hand, using the suction grinder and valve technique, as in the preceding paragraph. If the pitting is too bad, the seat will require recutting with a seat cutter.
4 Measure the bore of each valve guide in at least four places using a small bore gauge and micrometer. The standard measurement for the guide (internal diameter) is 0.2756 - 0.2762 inch (7.000 - 7.015 mm). If the measurement exceeds 0.280 inch (7.10 mm) the guide should be replaced with a new one.
5 If a small bore gauge and micrometer are not available, insert a new valve into the guide, and set a dial gauge against the valve stem. Gently move the valve back and forth in the guide and measure the travel of the valve in each direction. The guide will have to be renewed if the clearance between the valve and guide exceeds 0.004 inch (0.10 mm) inlet and exhaust.
6 To install new valve guides, first fit the circlip into the groove round the guide then heat the area around the guide hole to 250° - 300°F (120° - 150°C) and drive the guide in from the top of the cylinder head using a suitable drift, until the circlip reaches its seat. Use a 7 mm reamer to ream the guides. This must be done even if the old guides are used. **Note:** always rotate the reamer to the right, and keep rotating it until it is withdrawn.
7 Inspect the valve springs for tilt or a collapsed condition. Measure the free length of the springs with a vernier gauge and renew the springs as a complete set if there is any variation in length between the springs. The measurements are as follows:

Inner spring:	*1.42 inch*	*(36.0 mm)*	*Standard*
Inner spring:	*1.38 inch*	*(35.0 mm)*	*Wear limit*
Outer spring:	*1.55 inch*	*(39.3 mm)*	*Standard*
Outer spring:	*1.50 inch*	*(38.0 mm)*	*Wear limit*

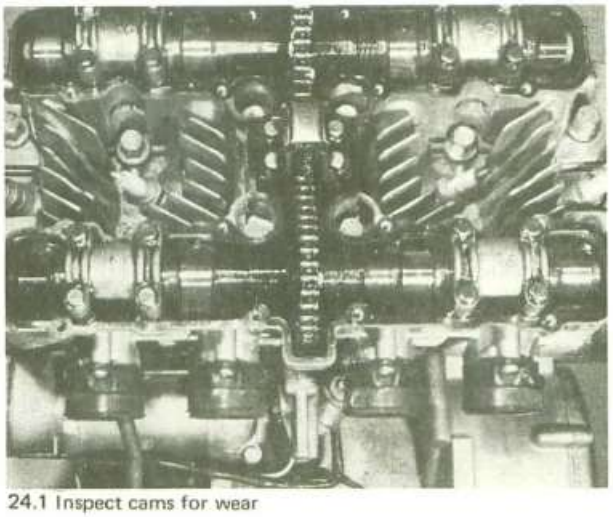
The valve springs should always be replaced as a complete set, to ensure maximum performance.

24 Camshafts, tappets and camshaft sprockets: examination and renovation

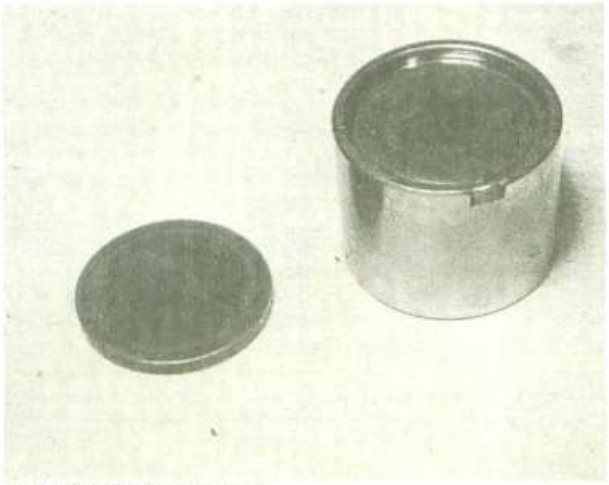
1 Inspect the cams for signs of wear such as scored lobes, scuffing, or indentation. The cams should have a smooth surface. The complete camshaft must be replaced if any lobes are worn or indented, through lubrication failure etc.
2 Inspect the valve tappets for damage or fracture, also the shims. Measure the shims with a micrometer gauge. **Note:** The type of valve tappet used on all machines up to engine number Z1.E.08979 has caused some fracturing of the shims. These tappets were of the concave type, whereas the new type tappets are level. It is advisable to use new shims when replacing these tappets, as the old ones that have been in use may already have started to fracture.
3 Examine the camshaft chain sprockets for worn, broken or chipped teeth. This is important, to keep the cam chain at the



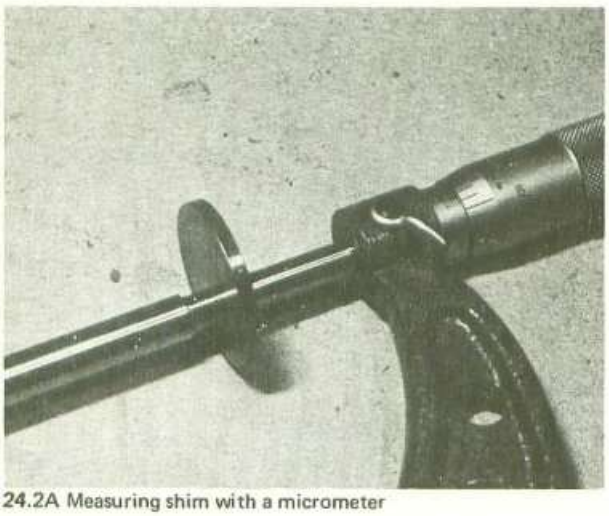
23.2A Take out valves



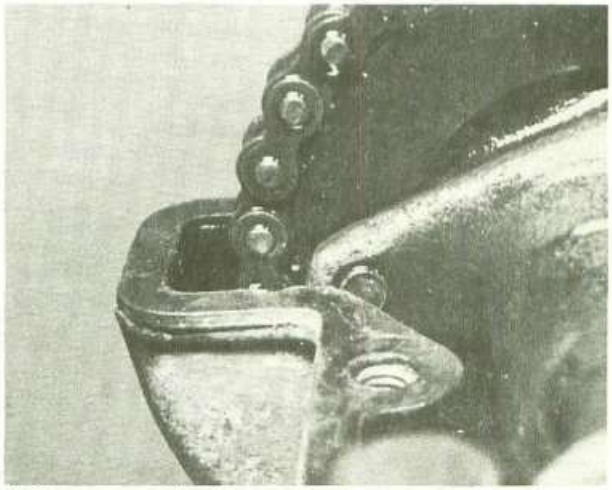
24.1 Inspect cams for wear



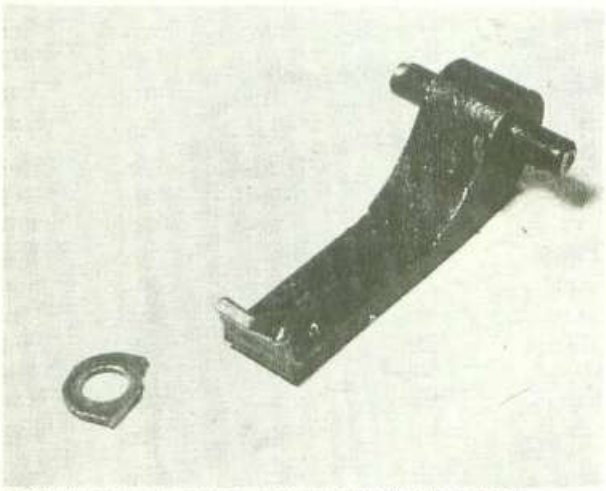
24.2 This shim has fractured



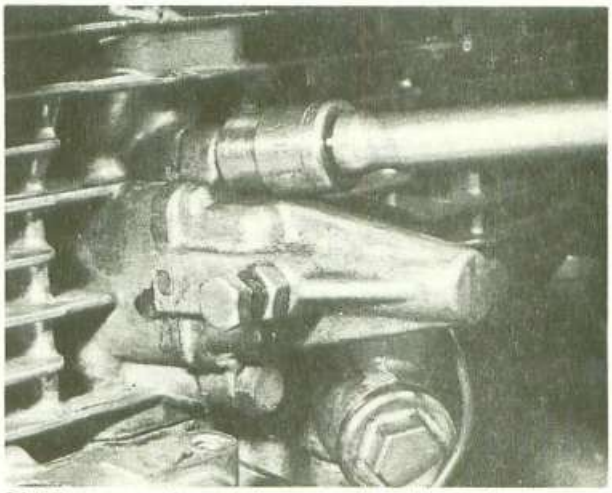
24.2A Measuring shim with a micrometer



24.3 Inspect sprockets for worn teeth



24.3A A broken tensioner, caused through a slack chain



24.5 Remove tensioner body, to examine rubber pad

correct tension at all times. Indeed, the machine featured in this manual had the cam chain tensioner wrongly adjusted, which in turn had broken the cam chain guide through the slackness of the cam chain in operation.

4 A worn camshaft chain will cause a distinctive rattle that will not disappear, even when the tensioner is readjusted. Some indication of the amount of wear that has taken place is given if the chain is held at both ends and twisted sideways. A badly worn chain will bend into a pronounced arc. If there is any doubt about a chain, it should be renewed without question. If a chain breakage occurs, serious engine damage will result.

5 Examine the rubber pad on the end of the chain tensioner push bar. If it is worn or damaged, it should be replaced. The push bar is a push fit into the holder.

25 Clutch and rear chain oil pump: examination and renovation

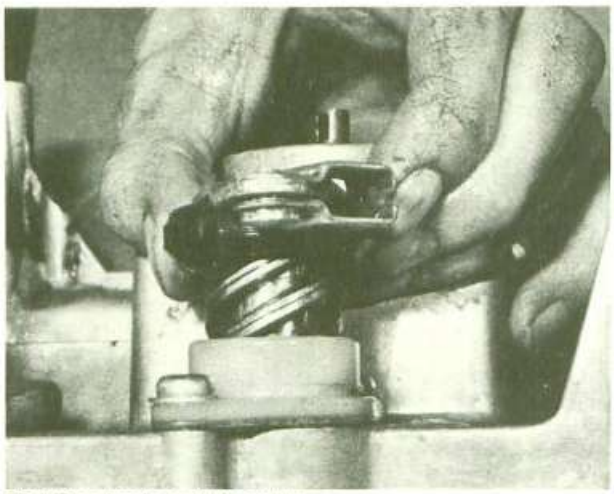
1 The clutch assembly contains eight friction plates and seven steel plates. The friction plates are steel with bonded cork. The clutch housing incorporates rubber dampers and springs, these are to reduce clutch vibration and snatch. The clutch release outer operating worm gear is made of nylon, and the inner gear is made of steel. There is a clutch adjusting screw located in the inner release gear which, when turned, adjusts the clutch pushrod clearance. When the clutch needs adjustment, always get this adjustment correct first, before finishing with the operating cable.

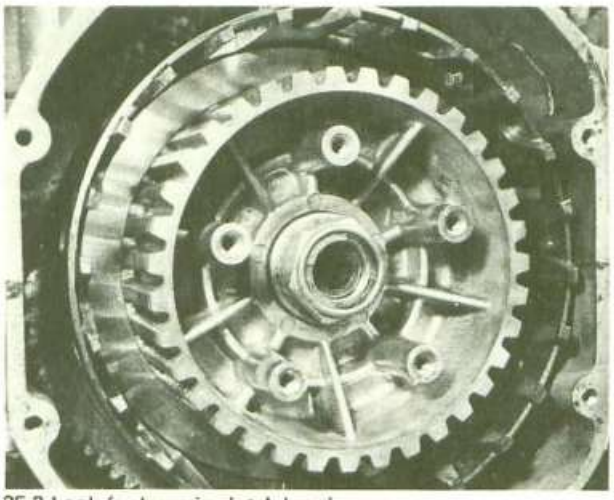
2 Check the condition of the clutch drive, to ensure none of the teeth are chipped, broken or badly worn. Give the plain and friction plates a wash with a petrol/paraffin mix and check that they are not buckled or distorted. Remove all traces of friction dust, otherwise a gradual build up of this material will occur and affect clutch action.

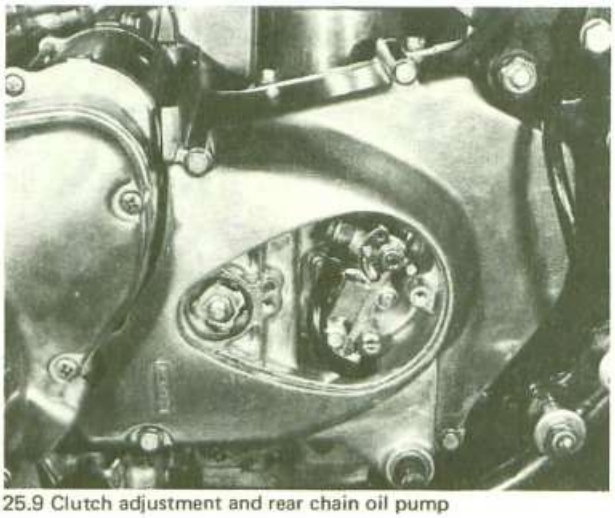
3 Visual inspection will show whether the tongues of the clutch plates have become burred and whether corresponding indentations have formed in the slots with which they engage. Burrs in the clutch housing should be removed with a file, also the plates, provided the indentations are not too great.

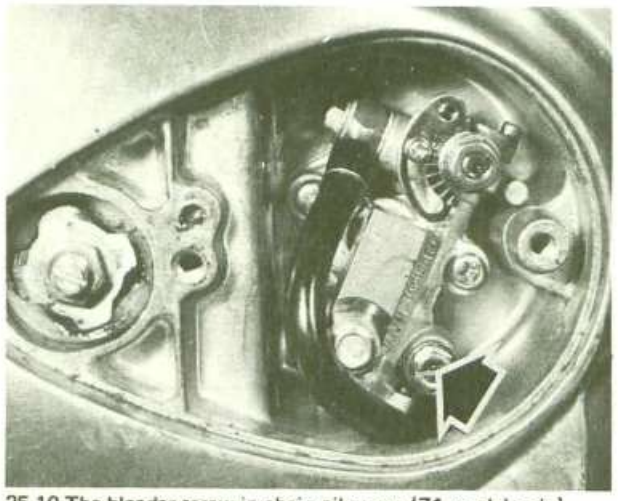
4 Check the thickness of the friction plates. The standard thickness is: 0.146 - 0.154 inch (3.7 - 3.9 mm). The wear limit is 0.134 inch (3.4 mm).

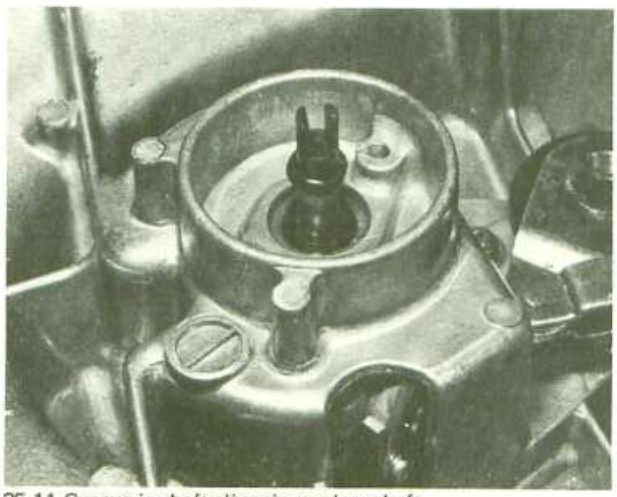
5 Inspect the clutch plates for warpage by placing them on a sheet of glass or similar flat surface. Place a feeler gauge underneath the plate and the surface. The standard tolerable warpage for the friction plates is under 0.006 inch (0.15 mm) with a service limit of 0.012 inch (0.30 mm). Plain steel plates have a standard tolerable warpage of under 0.008 inch (0.20 mm) with


25.1 The clutch operating worm


25.3 Look for burrs in clutch housing


25.9 Clutch adjustment and rear chain oil pump


25.10 The bleeder screw in chain oil pump (Z1 model only)


25.11 Groove in shaft aligns in gearbox shaft

a service limit of 0.016 inch (0.40 mm).

6 Inspect the clutch springs by standing them together on a flat surface. If they vary in height, the complete set should be renewed.

7 Roll the clutch pushrod on a sheet of glass to check for trueness. Also make sure the clutch operating worm gear is greased for easy action.

8 Make sure that the needle roller bearing is free and not damaged. The whole clutch assembly rotates on this bearing and there should be no undue wobble.

9 The early Z.1. models are fitted with a rear chain oil pump, driven by the layshaft and fed from a separate oil tank located behind the left hand cover under the dualseat. The oil pump is located in the outer chain cover fitted over the rear chain final drive sprocket. To gain access, unscrew the two crosshead screws that hold the pump to the cover, and remove the pump. The 'O' rings and the check valve are the only parts that are likely to wear, and consequently are the only available replacement parts. If any other parts of the pump are worn or damaged, the entire pump assembly will have to be replaced.

10 Check that the check valve will pass oil only in one direction and that it is not clogged. The valve can be cleaned with petrol or solvent in a syringe. Whenever the oil pump is dismantled, or if the pump runs dry while the pump is in operation, air will

enter the pump. The pump must then be bled of air by turning the bleeder bolt until oil flows from the hole and then re-tightening it.
11 Lubricate all the parts of the pump when reassembling, then rotate the rear wheel until the pin in the layshaft (located through the gearbox sprocket) is brought into alignment with the groove in the oil pump shaft. This is essential for correct installation, otherwise the pump will not seat correctly. Bleed the pump and make sure the level in the oil tank is correct.

26 Gearbox components: examination

1 Give all the gearbox components a close visual examination for signs of wear or damage, such as chipped or broken teeth, worn dogs or worn splines and bent selector arms. If the machine has shown a tendency to jump out of gear, look especially for worn dogs on the back of the gear pinions or wear in the selector tracks of the gear selector drum. In the former case, wear will be evident in the form of rounded corners or even a wedge - shaped profile in an extreme case. The corners of the selector drum tracks will wear first, all such wear is evident by the appearance of a brightly polished surface.
2 In the selector arms wear usually occurs across the fork that engages with the sliding gear pinions, causing a certain amount of sloppiness in the gear change movement. A bent selector will immediately be obvious, especially if overheating has blued the surface.
3 All gearbox components that prove faulty will have to be replaced with new ones, as there is no satisfactory method of reclaiming them.

27 Reassembling the cylinder head

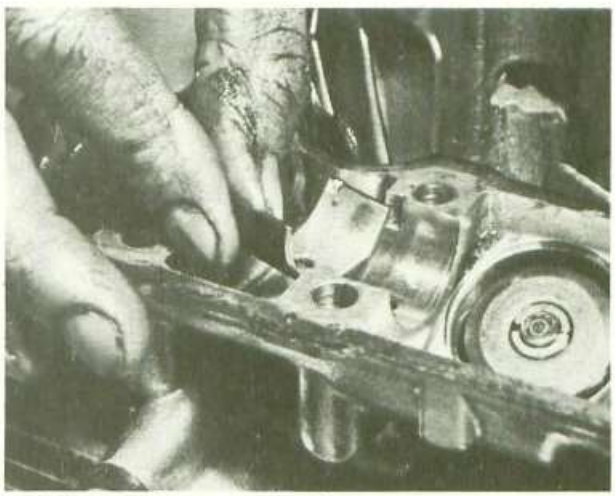
1 Commence reassembly by replacing the eight valves (four inlet and four exhaust). Do not omit to lubricate the valve stems with engine oil before inserting them into the guides, and make sure that the valve collets are seated correctly. A light tap on the end of the valve stem, after assembly, is a good check. Make sure new oil seals are fitted to the valve guides.
2 Replace the bearing halves for the camshafts, making sure that their notches locate into the cylinder head casting, and cylinder head cover, then install the tappets and shims to their correct locations. Any shims or tappets that show signs of fracture (inspect under a magnifying glass) must be replaced with new ones. Shims are supplied in different thicknesses to facilitate valve clearance adjustment on an individual basis.

28 Engine and gearbox reassembly: general

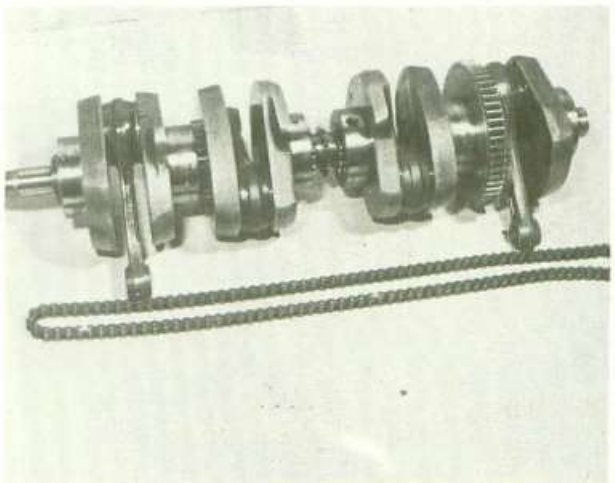
1 All the engine and gearbox components should be cleaned thoroughly before they are replaced, and be placed close to the working area.
2 The castings and covers that have all had gaskets attached should be cleaned, preferably with a clean rag soaked with methylated spirits. This will act as a solvent for the gasket cement. This is a far better method than reverting to scraping, with the risk of damage to the mating surfaces.
3 Have available all the necessary tools and a can filled with clean engine oil. Make sure all the new gaskets and any replacement parts required are available and to hand. There is nothing more frustrating than having to stop in the middle of a reassembly sequence because a vital gasket or part has been overlooked. Always use genuine 'Kawasaki' parts.
4 Make sure the working area is well lit and clean, with plenty of space, as the Kawasaki engine is very big and fairly heavy, although easy to work on. Refer to the torque and clearance settings wherever they are given. Many of the smaller bolts are easily sheared if overtightened. Always use the correct size screwdriver bit for the crosshead screws and NEVER an ordinary flat blade screwdriver or worse still a punch. Any screws having heads that are badly damaged will prove almost impossible to remove on the next occasion.

29 Engine and gearbox reassembly: replacing the crankshaft

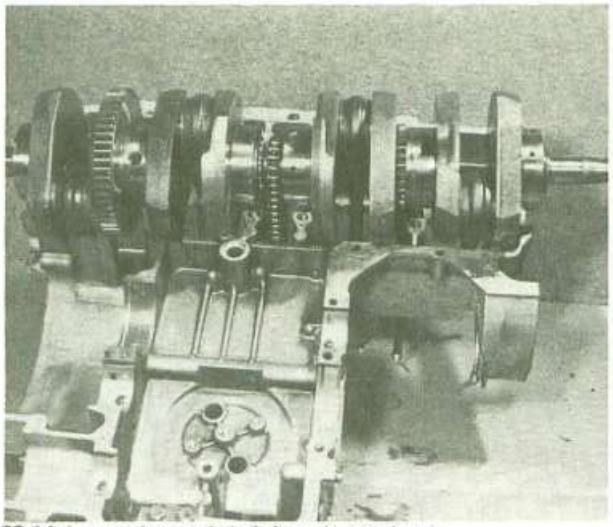
1 Invert the upper crankcase and place it on the workbench. Commence reassembly by lowering the crankshaft assembly into position, taking care to locate all the holes in the outer tracks of the main bearings with the corresponding dowels located in the crankcase. Make sure the cam drive chain is looped over the crankshaft at this stage. Feed the connecting rods through the apertures in the crankcase and once the crankshaft is in position, rotate it to make sure all the main bearings revolve freely, and that the six main bearings are located correctly with the six dowels.
2 Refit the crankshaft centre bearing cap into position. The bearing cap is bored in line with the crankcase, and must be installed with the arrow on the cap pointing towards the front of the engine. Secure the four bolts with 18 ft lbs (2.5 kg m) torque in the numbered sequence shown.



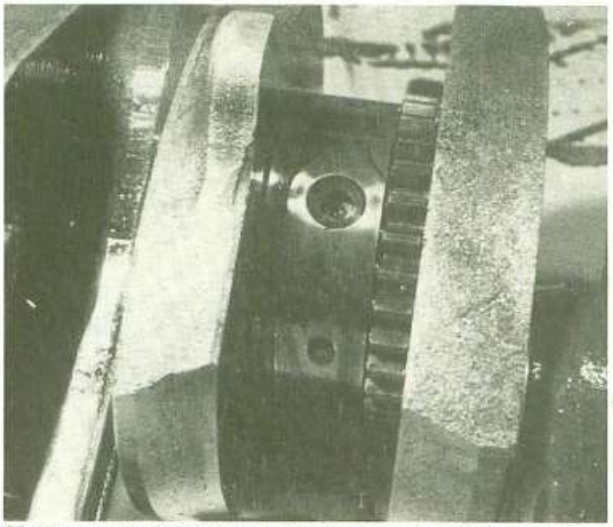
27.2 Fit bushes into correct location



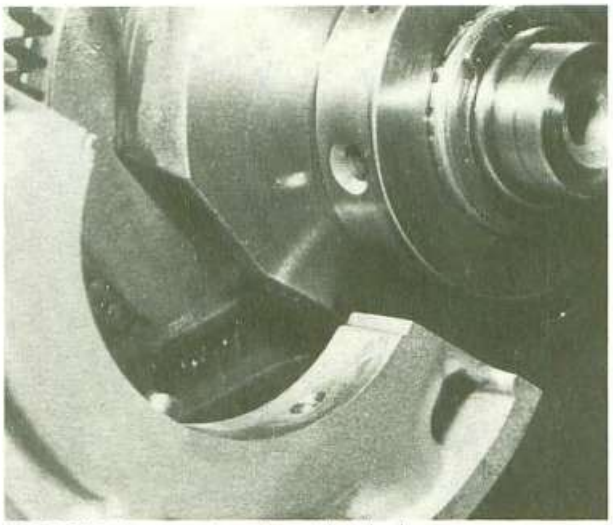
29.1 The crankshaft and camchain. Note white marks for timing purposes



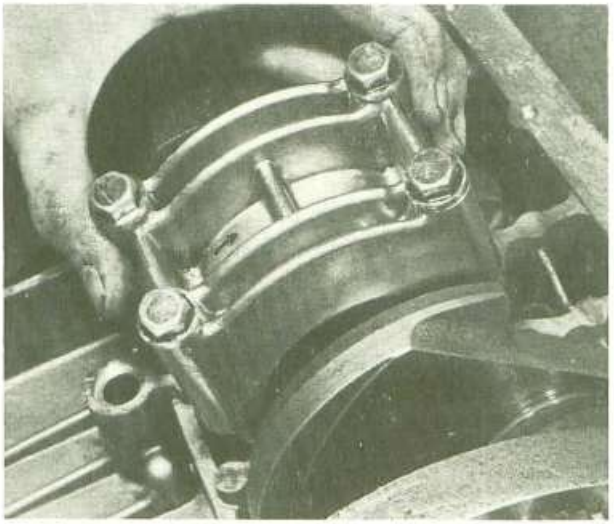
29.1A Lower the crankshaft into the crankcase



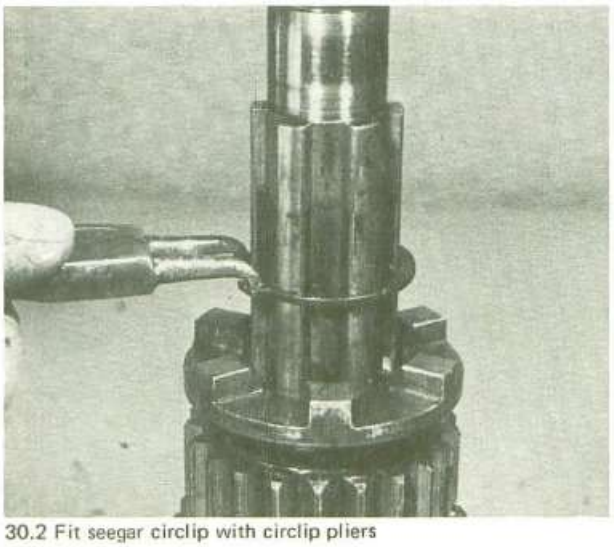
29.1B Location holes in main bearings mate up with dowels in crankcase



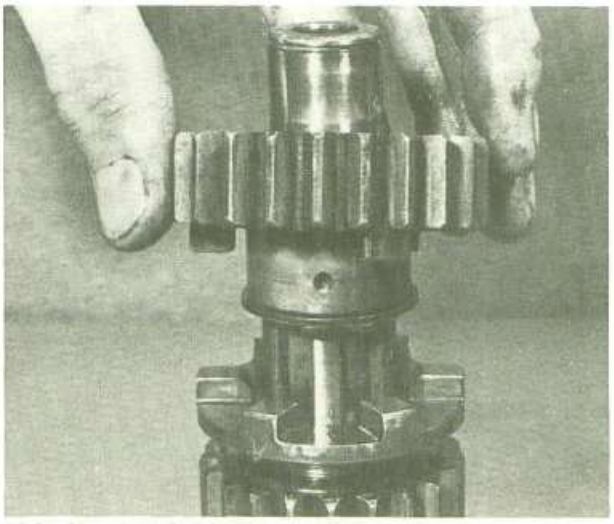
29.1C Oil holes must also align with holes in case



29.2 Arrow on cap must point to front of engine



30.2 Fit seegar circlip with circlip pliers



30.2A Note bush inside fifth gear 23T

30 Engine and gearbox reassembly: rebuilding the gearbox

1 With the upper crankcase still inverted on the bench and with the crankshaft assembly installed, start to rebuild the gearbox by assembling the mainshaft gear cluster.

2 Replace the 4th gear with bush 21T. The splined washer, with the external seegar circlip follows and then the 3rd gear (21T) seegar circlip, splined washer, the bush that fits inside the 5th gear and the 5th gear (23T). Next replace the small 2nd gear (16T), the two spacers, the needle roller bearing together with the shim and seegar circlip, and the end bush. Place the bearing on the opposite end of the shaft, and make sure the set rings that locate the bearings are in position.

3 To rebuilt the layshaft cluster replace the shim behind the large 1st gear (38T). This is the only gear with the six large holes bored in it. Follow up with the two spacers, the needle roller bearing, the shim, seegar circlip and the outer bush. Next replace the three steel balls inside the 4th gear (29T) and refit the gear to the shaft. The reason for the steel balls inside the gear pinion is to facilitate the selection of neutral when changing from 1st gear.

4 Replace the distance washer, the 3rd gear (35T) the splined washer, seegar circlip and the 5th gear (28T). Then replace the seegar circlip, the distance splined washer and the 2nd gear bush together with the 2nd gear (35T). This is the large gear with the six large elongated holes. Next replace the distance washer and the gearbox main bearing. Place the set ring in position.

5 The layshaft cluster can now be assembled into the inverted upper crankcase making sure to locate the main bearing with set ring into the groove and the dowel in the crankcase with the hole in the bush at the opposite end of the shaft.

6 Replace the mainshaft cluster, again making sure that the main bearing engages with the set ring in the crankcase, also that the crankcase dowel engages with the bush at the opposite end of the shaft.

7 The kickstart shaft assembly can now be replaced, making sure to position the ratchet onto the stop, which is located on the crankcase.

8 The clutch housing with needle roller bearing, and thrust washer, positioned on the shaft behind the housing, can now be replaced. This must be carried out before the crankcase halves are joined.

9 Replace the gear selector drum with the selector fork into the lower crankcase half, and locate the drum with the indent pin. Bend over the tab washer on the pin. The indent pin locates in the end track of the drum and is spring loaded.

10 Locate the selector forks with the sliding 4th and 5th gear pinions, then enter the selector fork shaft through the side of the crankcase. When assembled with the forks in the correct position, fit the external circlip over the end of the rod to locate the rod.

11 Before joining the crankcase halves make sure the 'O' ring is located in the centre of the crankcase. This seals the main oil passage for the whole of the engine. Thoroughly clean the crankcase mating surfaces, and apply a liquid jointing cement to the surface of the lower half. Secure the eight 8 mm bolts in the lower crankcase half to 18 ft lbs (2.5 kg m). Tighten evenly following the order of the numbers stamped on the lower crankcase half. The threads of bolts number 6 and 8 should be coated with sealer, to prevent oil seepage.

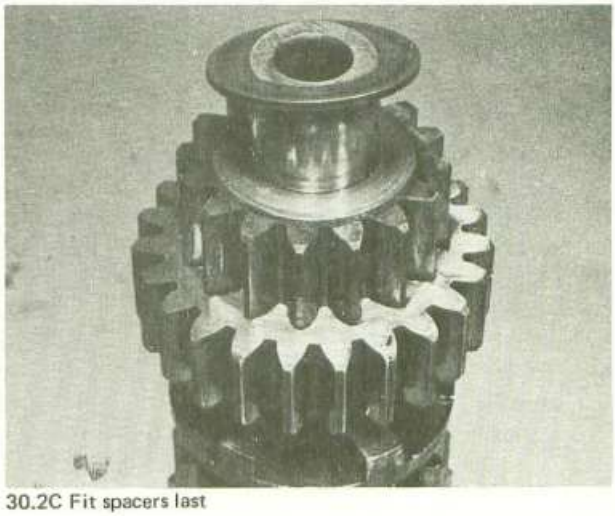
12 Now secure the twenty-two 6 mm bolts to a torque of 70 inch lbs or (0.8 kg m) and coat the thread of the remaining bolt with a liquid sealant.

13 Install the oil pump with the 'O' ring inserted in the crankcase, the pump is located by two dowels. Check that the oil pump drive gear meshes correctly with the crankshaft gear when installing the oil pump. Tighten the two mounting bolts to a torque setting of 70 inch lbs (0.8 kg m).

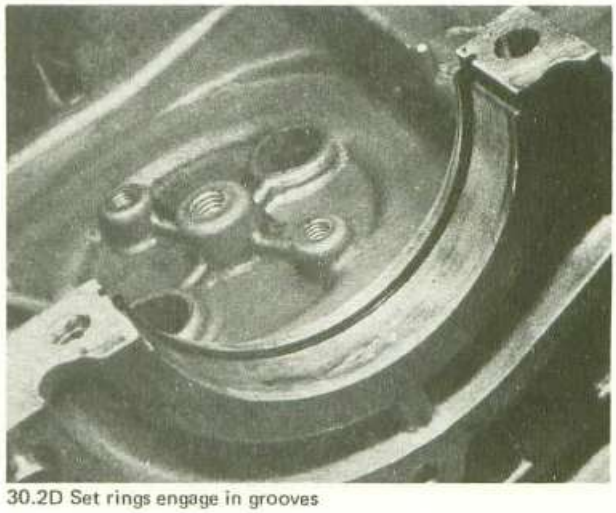
14 Replace the 'O' ring on the layshaft before installing the transmission cover, to prevent oil leaks. Use a guide to protect the oil seal when replacing the transmission inner cover, and



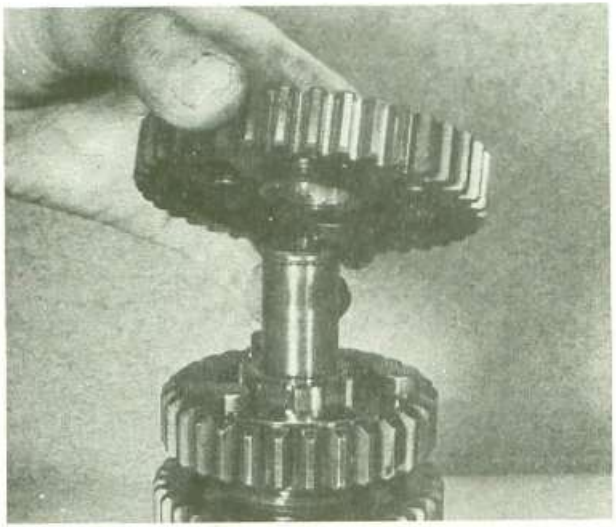
30.2B Replace second gear 16T



30.2C Fit spacers last



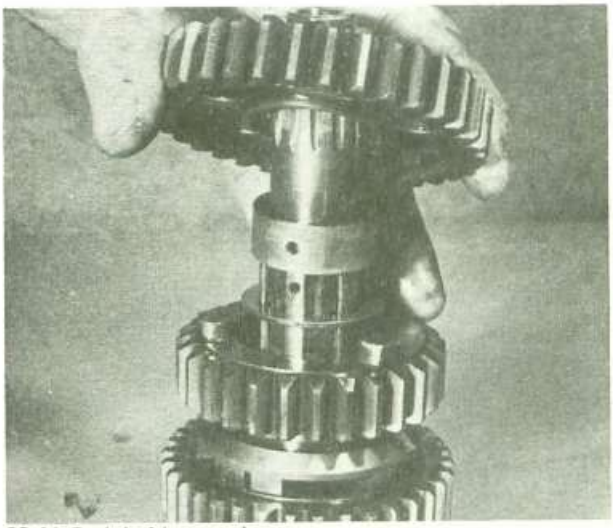
30.2D Set rings engage in grooves



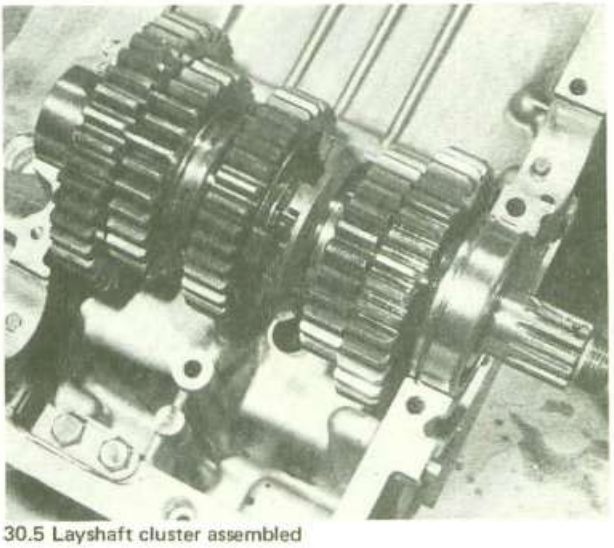
30.3 Replacing layshaft gears



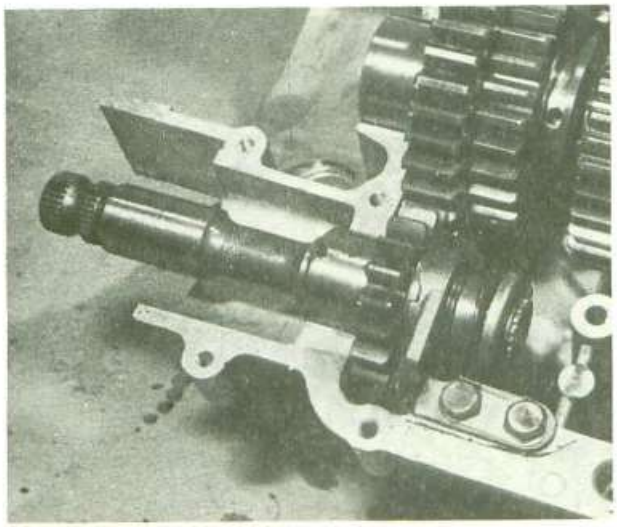
30.4 Fit splined washer before third gear



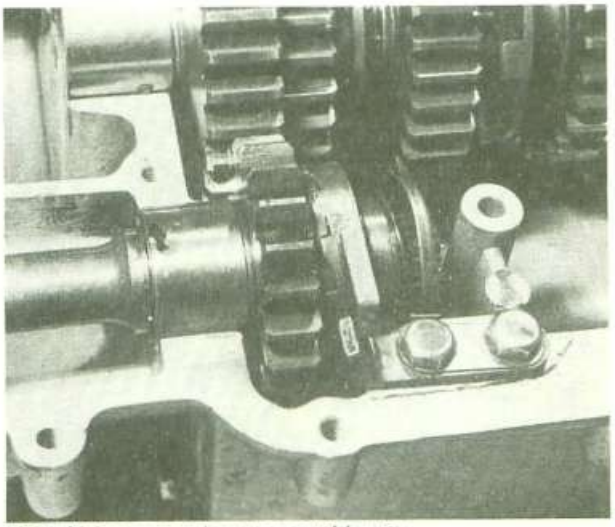
30.4A Bush inside second gear



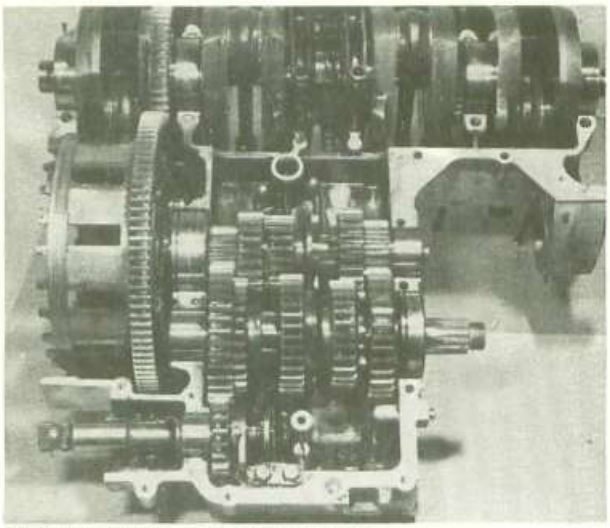
30.5 Layshaft cluster assembled



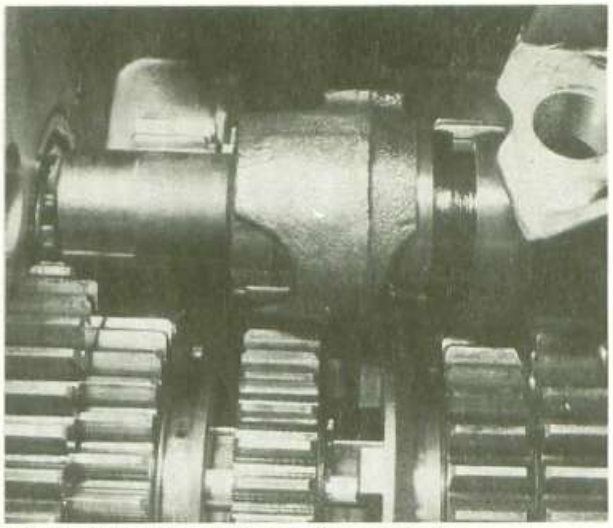
30.7 Replace assembled kickstart shaft



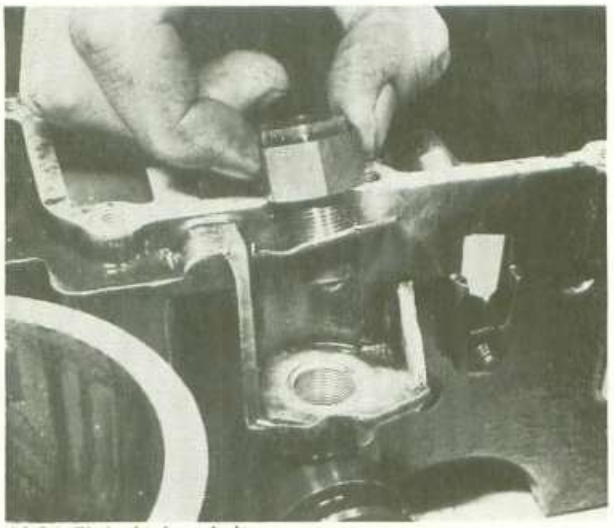
30.7A Make sure ratchet engages with stop



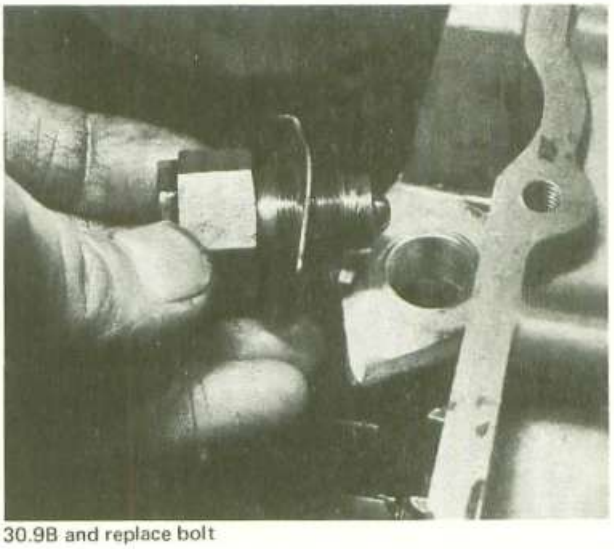
30.8 Gear clusters and clutch in position



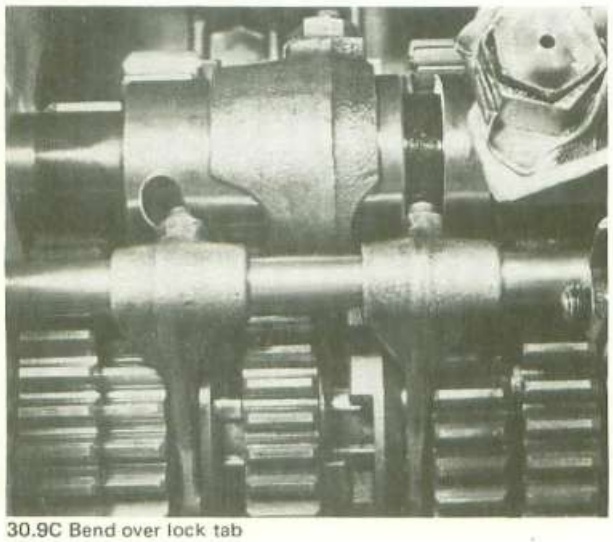
30.9 Make sure groove in drum is in line with bolt



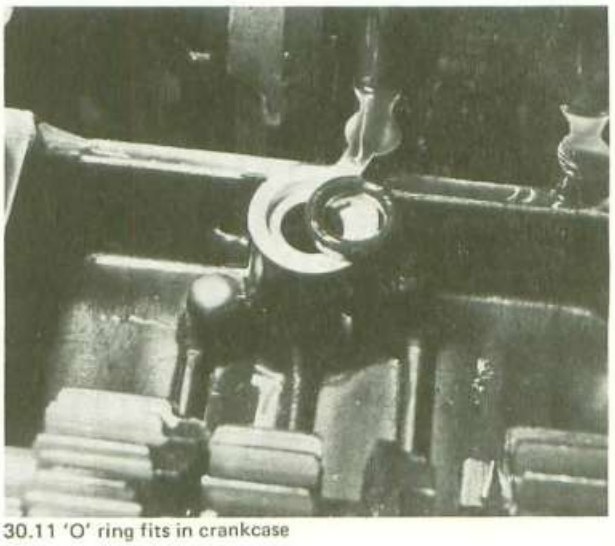
30.9A Fit locktab on bolt



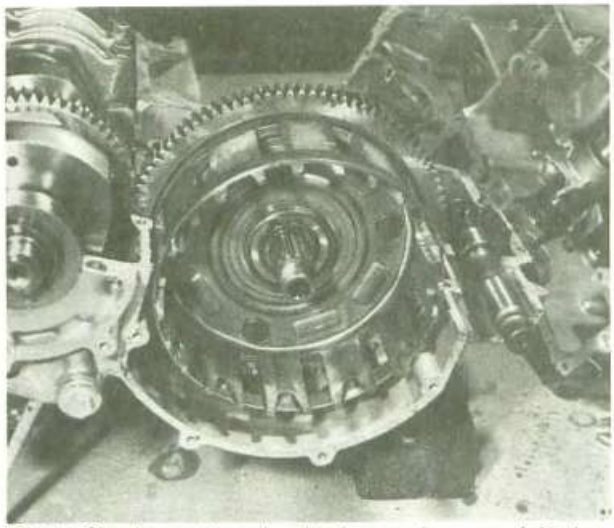
30.9B and replace bolt



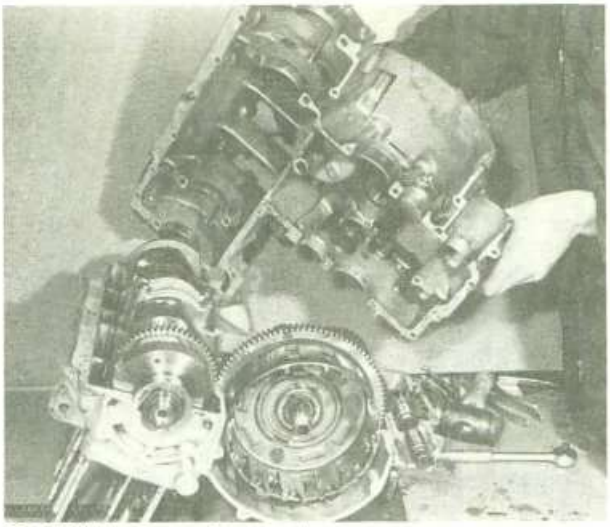
30.9C Bend over lock tab



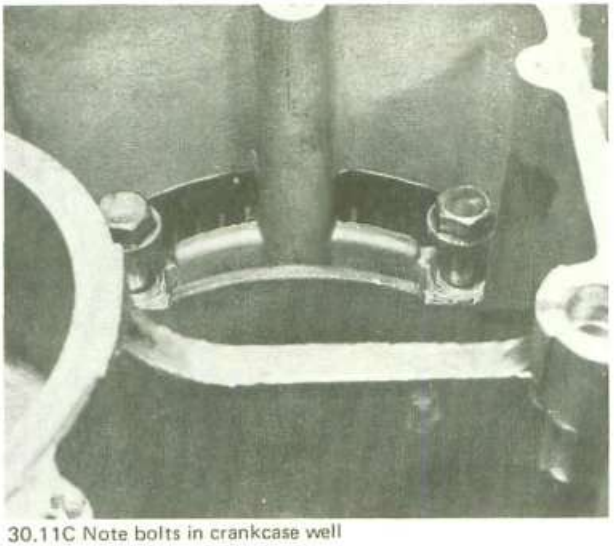
30.11 'O' ring fits in crankcase



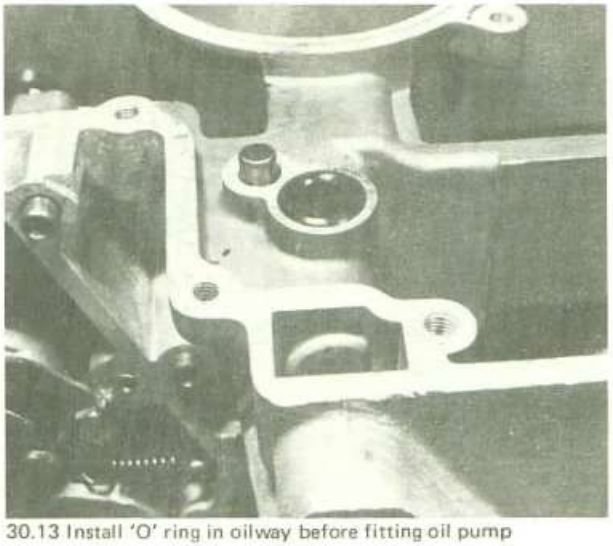
30.11A Clutch must be replaced before crankcases are joined



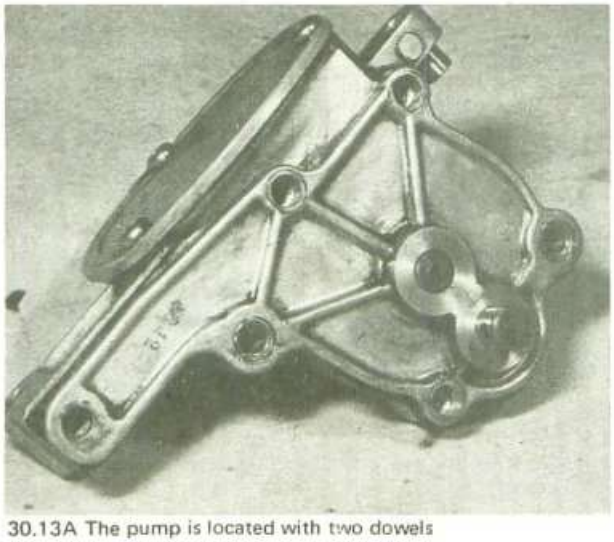
30.11B Make sure surfaces are clean



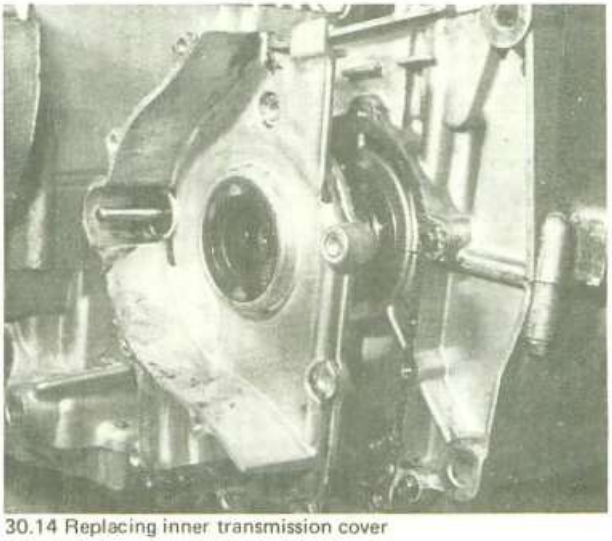
30.11C Note bolts in crankcase well



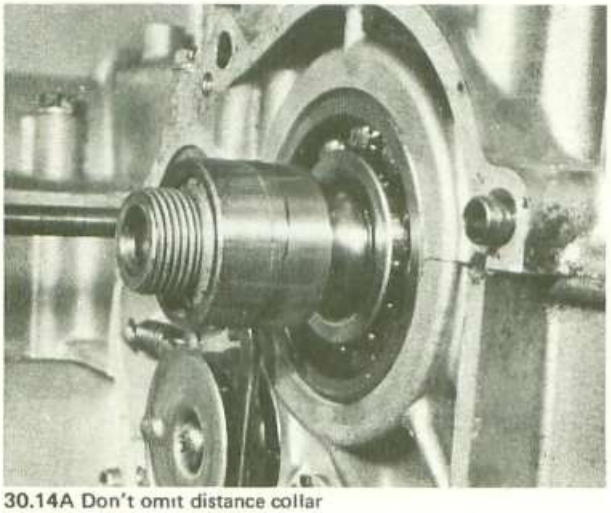
30.13 Install 'O' ring in oilway before fitting oil pump



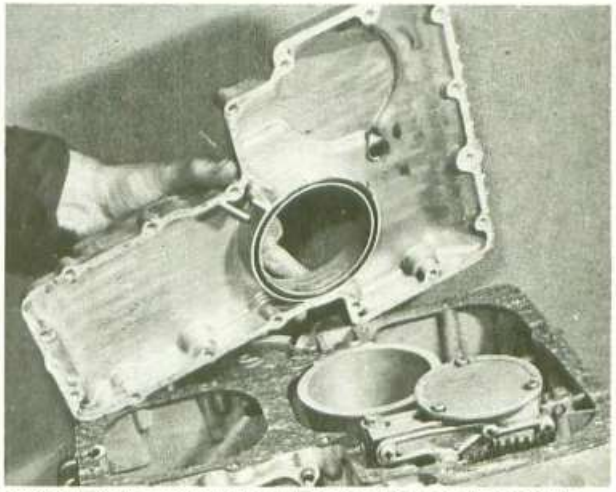
30.13A The pump is located with two dowels



30.14 Replacing inner transmission cover



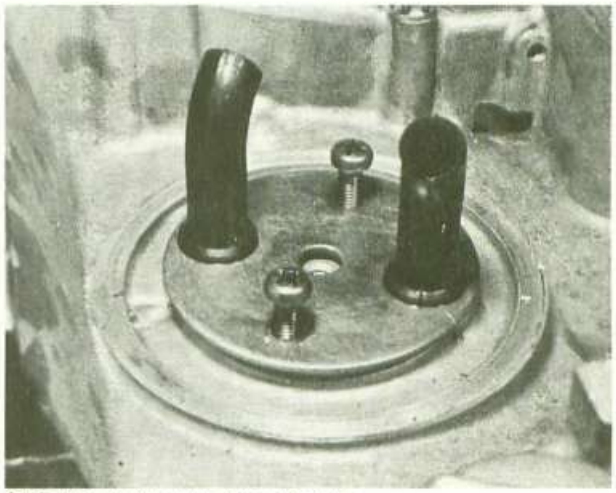
30.14A Don't omit distance collar



30.15 Refit 91 mm 'O' ring with a new gasket to sump cover



30.15A Make sure oil filter is clean



31.1 Two screws secure breather base

install the distance collar over the layshaft when the cover is in place, otherwise the seal will be damaged.

15 Replace the oil sump cover when the 91 mm 'O' ring is in place and use a new gasket. When the sump is bolted up, fit a new oil filter element to the filter unit, not omitting the spring and 'O' ring. When the sump bolts have been tightened up and the drain plug secured, the engine unit can be turned over to its correct position, with the crankcase apertures facing upwards.

31 Engine and gearbox: rebuilding the clutch, alternator and contact breaker

1 Replace the breather assembly on top of the upper crankcase with the two crosshead screws, and the polished alloy cover with the entire fixing and pipe for the breather tube. The oil pressure switch can now be replaced. Make sure the two 'O' rings are in position first. Replace the rubber cap.

2 Rotate the kickstart shaft all the way round to the right before hooking the return spring into the hole in the shaft, this gives the spring the correct tension. The kickstart cover can now be replaced with the four screws.

3 Replace the detent lever with the bolt, and locate the return spring, with the pin. The detent lever engages behind the shroud, on the selector drum.

4 The footchange lever shaft complete with the selector pawls and spring can now be inserted into the crankcase, the sprocket distance collar and transmission cover can also be fitted.

5 The rotor and starter clutch gear can now be fitted. Make sure the rollers are free to move in the starter clutch. The idler gear can be replaced, after checking to ensure the starter clutch gear meshes correctly with the idler gear, and that the spacer is fitted behind the starter gear with the oil guides facing outward. Inspect the rotor needle roller bearing to ensure free running. The Woodruff key should be a tight fit in the taper shaft. To tighten the rotor securing bolt, place a round bar through a connecting rod small end and hold tight on the downward stroke of the connecting rod. The bar will lock the crankshaft assembly, enabling the rotor bolt to be tightened.

6 The rotor cover with coils attached can now be fitted, making sure that the wiring is located through the grommet in the side of the cover.

7 Fit the starter motor with a little oil on the 'O' ring to facilitate its assembly into the aperture.

8 Replace the clutch hub centre. Install the distance washer first, then the hub, reset the outside washer (so named) with

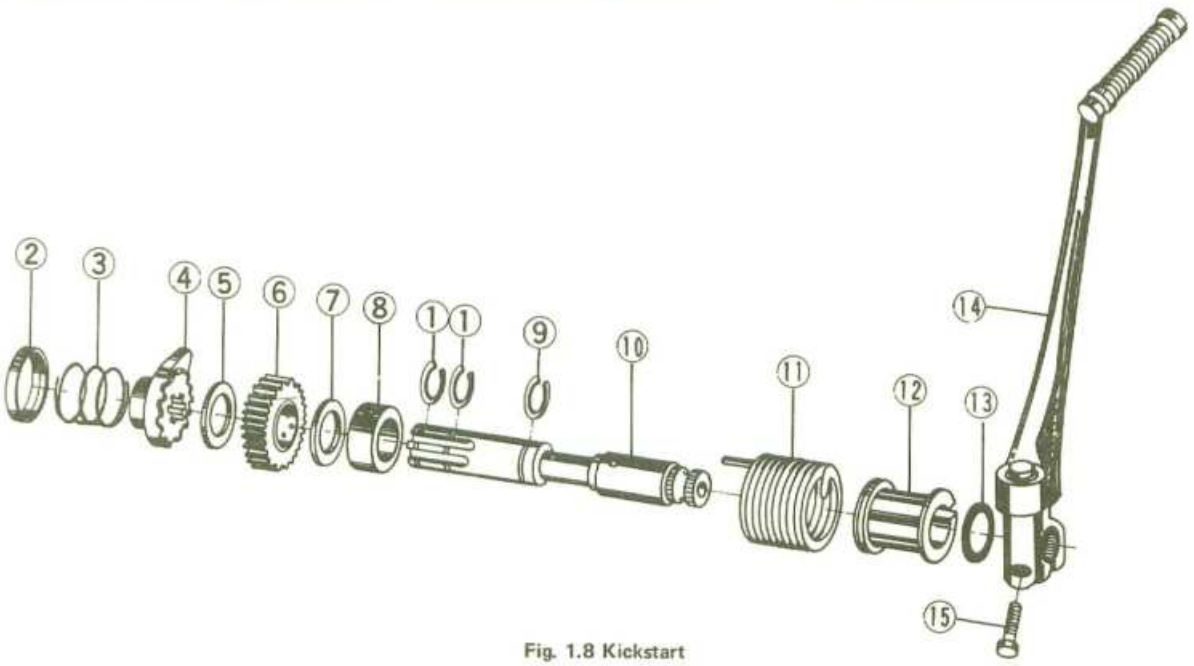


Fig. 1.8 Kickstart

1 Retaining ring
2 Cap
3 Coil spring
4 Ratchet
5 Washer
6 Kickstart gear pinion
7 Washer
8 Bushing
9 Retaining ring
10 Kickstart shaft
11 Return spring
12 Return spring guide
13 Oil seal
14 Kickstart lever
15 Lever clamp bolt

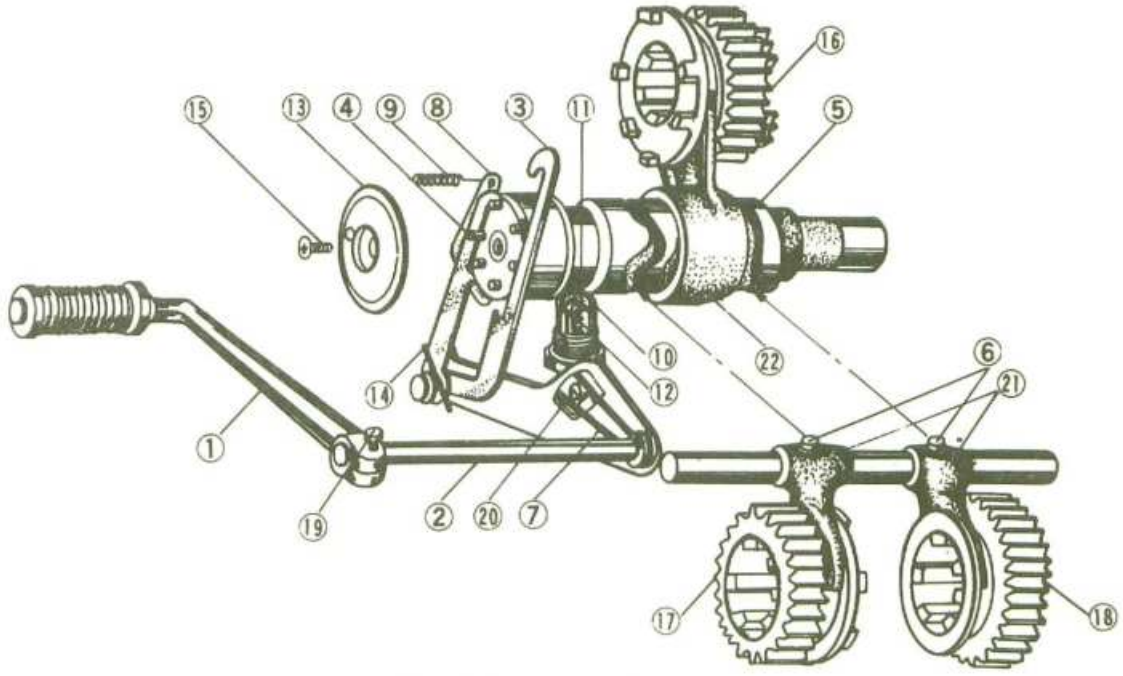


Fig. 1.9 Gear change mechanism

1 Gear change deal
2 Shaft
3 Selector pawl
4 Selector drum pin - 6 off
5 Selector drum
6 Selector fork pin
7 Return spring
8 Detent arm
9 Detent arm spring
10 Selector drum positioning pin
11 Neutral detent pin
12 Spring
13 Selector drum pin holder
14 Pawl spring
15 Screw
16 Mainshaft 3rd gear
17 Layshaft 5th gear
18 Layshaft 4th gear
19 Bolt
20 Return spring pin
21 Selector fork
22 Selector fork

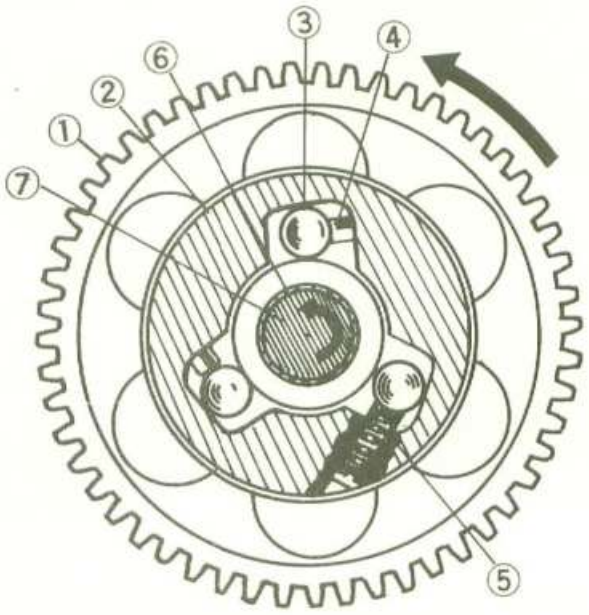


Fig. 1.10 Starter clutch

1	*Gear*	5	*Spring - 3 off*
2	*Clutch body*	6	*Needle roller bearing*
3	*Roller - 3 off*	7	*Crankshaft*
4	*Spring cap*		

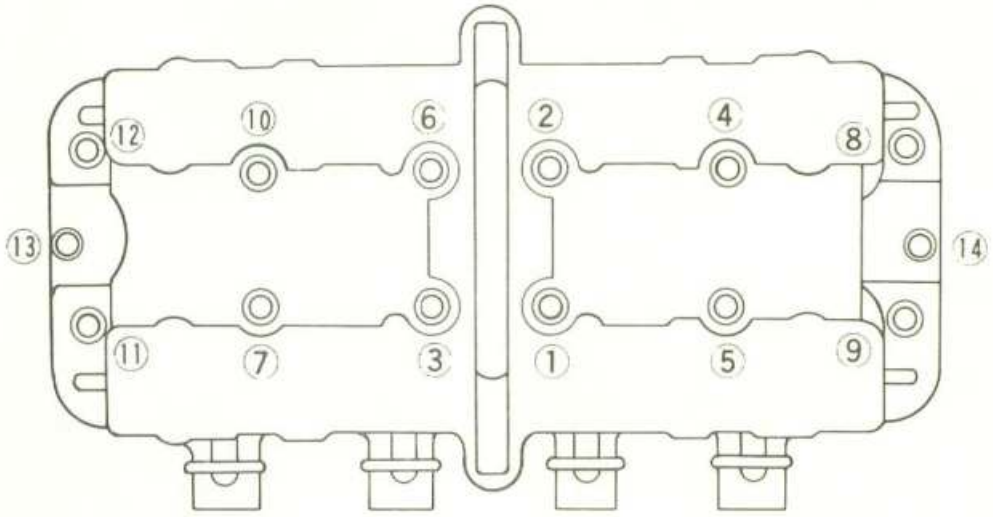
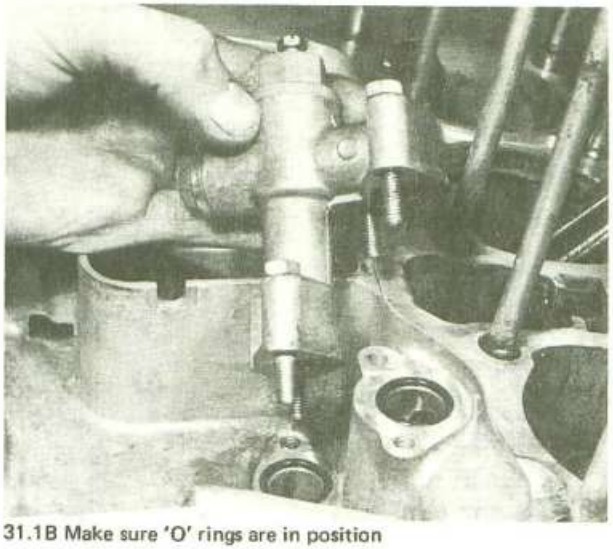


Fig. 1.11 Cylinder head nut tightening sequence



31.1A Replacing the crankcase breather



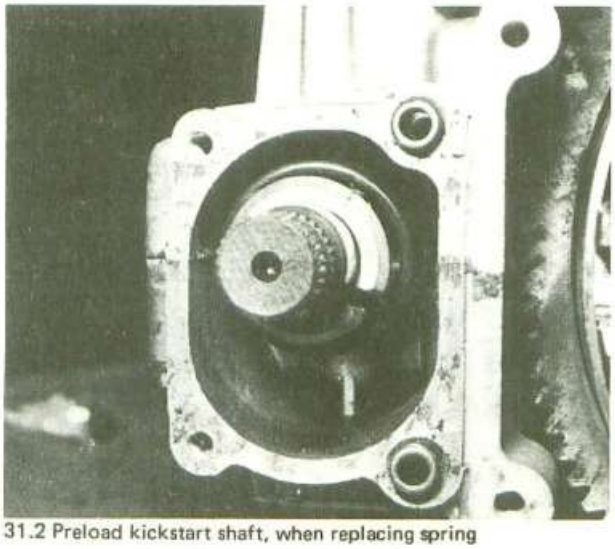
31.1B Make sure 'O' rings are in position



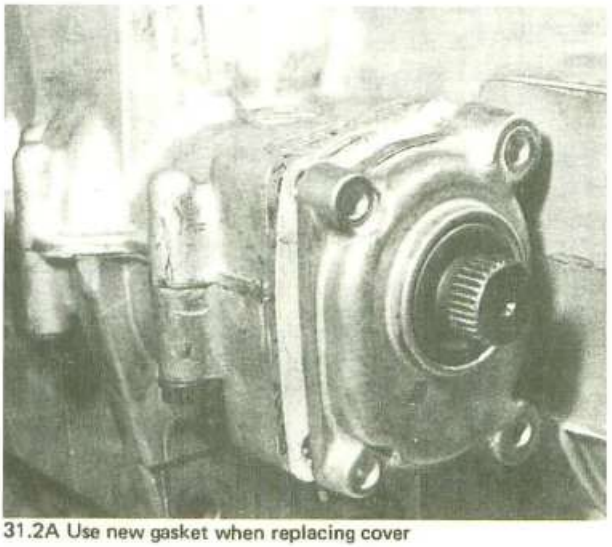
31.1C When replacing oil switch body



31.1D Replace protective rubber cap on switch



31.2 Preload kickstart shaft, when replacing spring



31.2A Use new gasket when replacing cover

'outside' facing outwards, and then the Simmonds type clutch centre locknut. Tighten the nut with a socket spanner and bar. If no clutch tool is available, it is possible to jam the hub with a large tyre lever and box spanner to give just enough pressure to tighten the nut. Great care is necessary, however, otherwise damaged hub splines will result.

9 Grease and replace the clutch pushrod, the steel ball, and the mushroom pressure piece. Replace the clutch plates starting with a friction plate first and alternating with a plain plate and then a friction plate, to finish with a friction plate and lastly the pressure end plate. Replace the clutch pressure springs, the spring washers and the five bolts. The bolts can then be fully tightened.

10 Fit a new gasket to the clutch cover base, and fit the clutch cover, making sure that the dowels in the crankcase register with the holes in the cover. Secure the cover with the nine crosshead screws.

11 Refit the contact breaker case cover with a new gasket, first making sure the oil seal is in good condition, otherwise oil will get through to the contact breaker assembly.

12 Assemble the advance and retard mechanism making sure the pin on the end of the crankshaft engages with the slot in the advance mechanism. Refit the cam and align the mark on the cam with the mark on the advance mechanism body.

13 Mount the contact breaker assembly base plate with the points and condensers in situ, and secure with the three crosshead screws. Do not put the contact breaker cover on yet, since it will be necessary to adjust the points gap and time the ignition at a later stage.

32 Engine and gearbox reassembly: replacing the pistons and cylinder block

1 Before replacing the pistons, pad the mouths of the crankcase with rag in order to prevent any displaced component from accidentally dropping into the crankcase.

2 Fit the pistons in their original order with the arrow on the piston crown pointing toward the front of the engine.

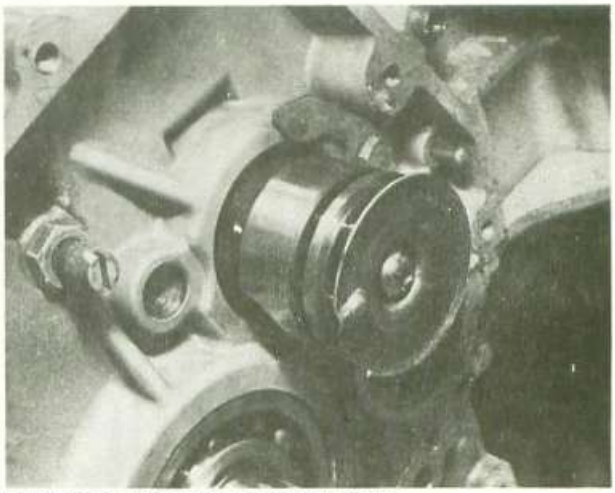
3 If the gudgeon pins are a tight fit, first warm the pistons to expand the metal. Oil the gudgeon pins and small end bearing surfaces, also the piston bosses, before fitting the pistons.

4 Always use new circlips never the originals. Always check that the circlips are located properly in their grooves in the piston boss. A displaced circlip will cause severe damage to the cylinder bore, and possibly an engine seizure.

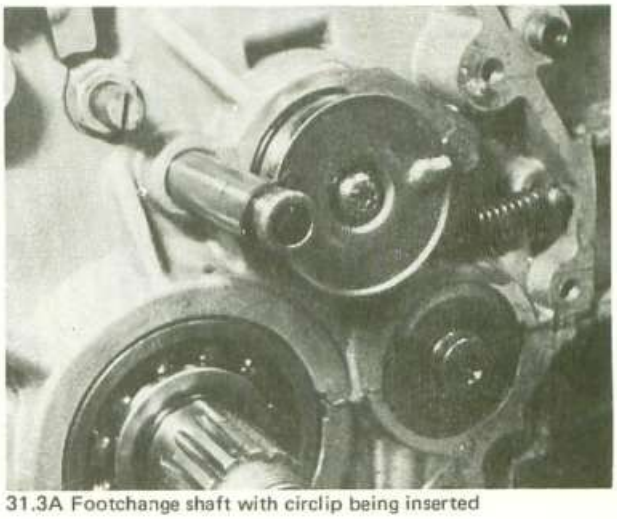
5 Place a new cylinder base gasket (dry) over the crankcase mouth. Note the extra hole in the gasket must be on the right hand side of the engine. Refit the bottom guide roller. Now place the cylinder block over the cylinder studs (make sure the four 'O' rings are fitted to the base of the cylinders), support the cylinder block whilst the camshaft chain is threaded through the tunnel between the bores. This task is best achieved by using a piece of stiff wire to hook the chain through, and pull up through the tunnel. The chain must engage with the crankshaft drive sprocket.

6 The cylinder bores have a generous lead in for the pistons at the bottom, and although it is an advantage on a large engine such as this to use the special Kawasaki ring compressor, in the absence of this, it is possible to gently lead the pistons into the bores, working across from one side. Great care has to be taken NOT to put too much pressure on the fitted piston rings. Do not omit to fit the two dowels to the front outside studs. When the pistons have finally engaged, remove the rag padding from the crankcase mouths and lower the cylinder block still further until it seats firmly on the base gasket.

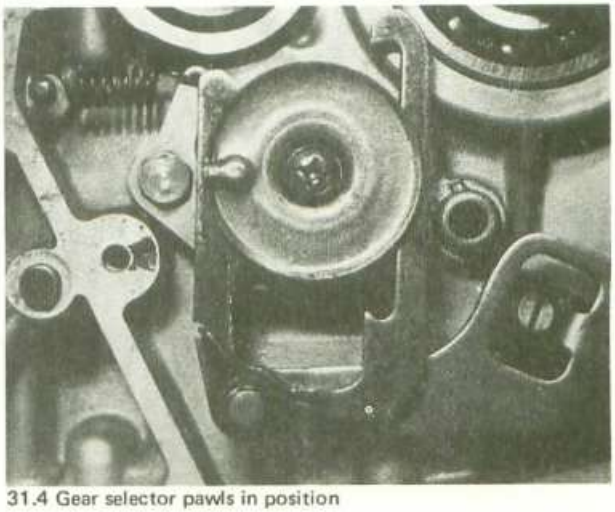
7 Take care to anchor the camshaft chain throughout this operation to save the chain dropping down into the crankcase. The two idler assembly sprockets that guide the cam chain, can now be replaced, with their shafts and rubbers, into the top of the cylinder block, and the chain guide screwed into position.



31.3 Fitting detent lever in selector drum



31.3A Footchange shaft with circlip being inserted



31.4 Gear selector pawls in position

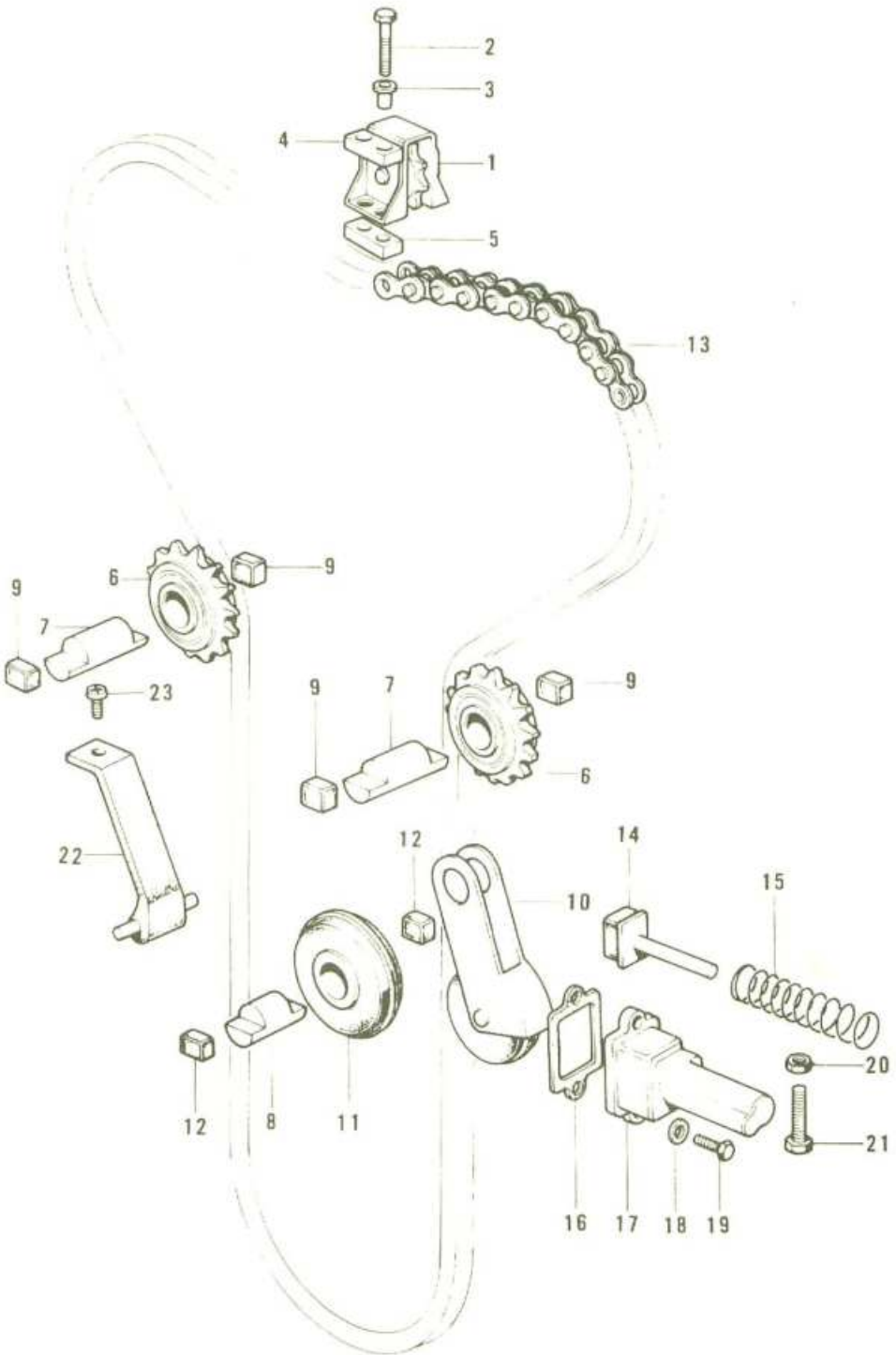


Fig. 1.12 Cam chain and tensioner

1 *Cam chain idler assembly*
2 *Bolt - 4 off*
3 *Idler collar - 4 off*
4 *Idler rubber - 2 off*
5 *Idler rubber - 2 off*
6 *Cam chain idler sprocket - 2 off*
7 *Idler sprocket shaft - 2 off*
8 *Guide roller shaft*
9 *Rubber guide roller - 4 off*
10 *Cam chain tensioner assembly*
11 *Roller*
12 *Roller rubber - 2 off*
13 *Cam chain*
14 *Pushrod assembly*
15 *Tensioner spring*
16 *Gasket*
17 *Tensioner holder*
18 *Washer - 2 off*
19 *Bolt - 2 off*
20 *Nut*
21 *Bolt*
22 *Cam chain guide*
23 *Pan head screw*

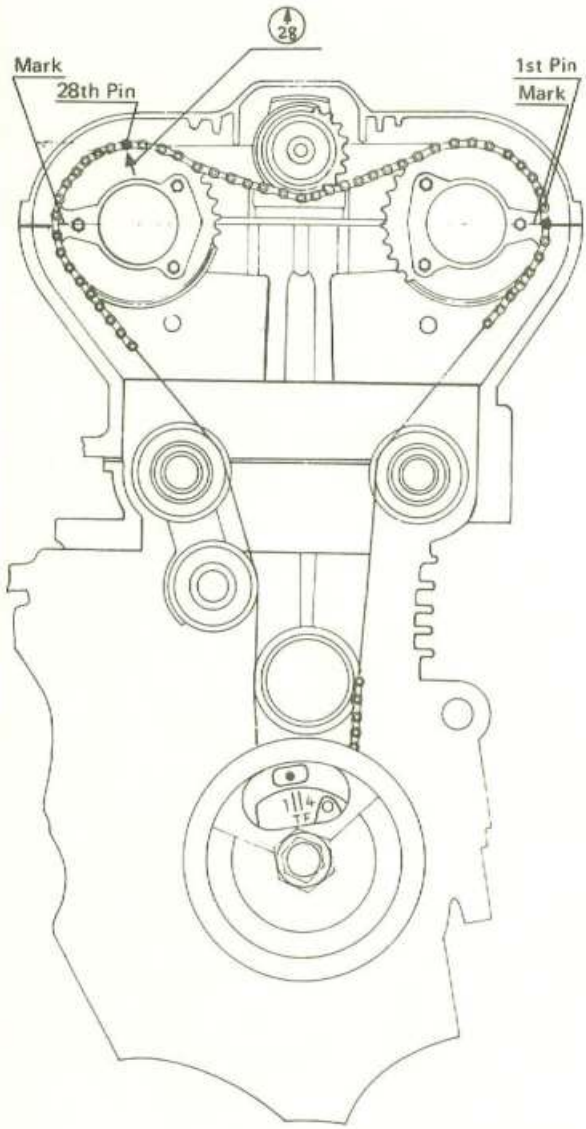


Fig. 1.13 Timing the overhead camshafts

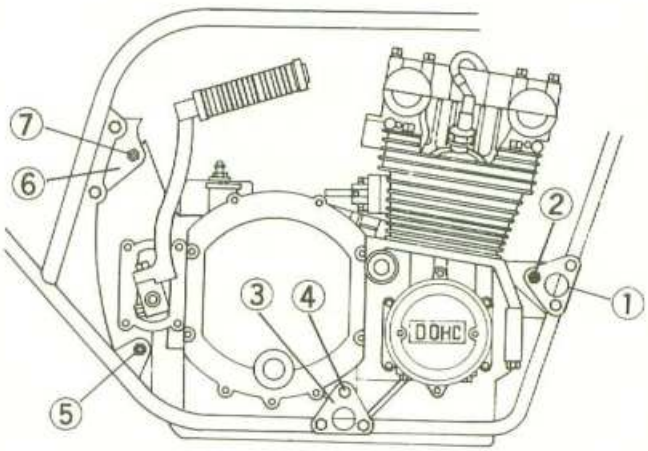


Fig. 1.14 Engine mountings

1 *Front bracket*
2 *Front bolt*
3 *Lower centre bracket*
4 *Lower centre bolt*
5 *Rear lower bolt*
6 *Rear upper bracket*
7 *Rear upper bolt*

33 Engine and gearbox reassembly: replacing the cylinder head and camshafts

1 Rotate the crankshaft until the 'T' mark on the advance and retard mechanism is aligned with the timing mark as shown in the accompanying photograph. At this position, number one and four pistons are at top dead centre.
2 Replace the valve tappets and the shims in their original locations and use a new cylinder head gasket to prevent any compression leakage. The side of the gasket with the wider turned over metal edge faces upwards. The cylinder head can now be bolted down, tightening the nuts diagonally.
3 After the cylinder head has been secured, the next operation is to fit the camshafts. Start by fitting the exhaust camshaft first. To fit the camshaft, feed the camshaft through the cam chain, and turn the camshaft so that mark on the sprocket is aligned with the cylinder head surface, as shown in the accompanying photograph.
4 Now pull the cam chain taut and fit the chain on to the camshaft sprocket. Starting with the next chain link pin above the one that coincides with the sprocket mark, count the pins, until you reach the 28th pin and slide the inlet camshaft into position so that the 28th pin coincides with the number 28 on the rubber portion of the inlet camshaft sprocket.
5 Having assembled the camshafts and replaced the cam chain, the next task is to bolt the camshafts down.
6 Assemble all the split bush halves back into their original positions, and replace the camshaft caps. The caps are machined 'in line' with the cylinder head, and so it is very important that they are replaced with the number on the cap corresponding to the number on the cylinder head. Also the arrows marked on the caps must point to the front.
7 Partially tighten the left hand caps first, to seat the camshafts in place. All the bolts can now be fully tightened down to 105 in lbs torque or (1.2 kg m). They should be tightened down in sequence.
8 Make sure all the camshaft bearings and valve tappets are lubricated with clean engine oil. The top chain guide sprocket can now be installed. Adjust the cam chain tension by refitting the tensioner. When this is installed loosen the locknut on the adjuster so that the plunger rod is free to move, rotate the engine slowly a couple of times to make sure the spring loaded tensioner takes up the slack in the chain evenly, and then tighten the bolt first and reset the locknut. It will adjust to the correct tension automatically.
9 To make double sure the timing is right rotate the engine until pistons numbers one and number four are at T.D.C. and check that both the mark on the exhaust camshaft sprocket and the mark on the metal part of the inlet camshaft sprocket are aligned level with the cylinder head surface. This will indicate that the cam timing is correct. **CAUTION.** Always use a spanner on the large nut on the crankshaft when turning the engine over for timing purposes. **DO NOT** turn the engine by turning the camshaft sprockets.

34 Engine and gearbox reassembly: adjusting the valve clearances

1 To adjust the valve clearances it is advisable to use the Kawasaki special lifter tool. This consists of a small piece of metal with a turned up edge. When clamped to the side of the cylinder head camshaft cover, it holds down the valve in question and permits the removal and replacement of the shims as the correct adjustment is achieved. The special tool part number is 57001 - 109.
2 Commence adjusting the valves by checking one valve at a time. Turn the crankshaft so that the cam lobe (this is the highest part of the cam) is pointing directly upwards, away from the tappet and insert a .004 inch (0.10 mm) feeler gauge. If the clearance is too small or there is no clearance at all, use the special tool to push down the valve tappet and remove the shim. To use the tool correctly rotate the engine so that the cam lobe is pushing the tappet down and opening the valve. When the valve is fully open, clamp the tool to the side of the lower cover with the screw provided, and turn the engine so that the cam lobe points upward away from the tappet. This will give access to the tappet shim which can be removed and replaced as required, by using a pair of ordinary eyebrow tweezers, as these are a very thin gauge. There is a notch in the tappet so that the shim can be grasped.
3 Insert a new shim to bring the tappet clearance within the specified limits. Shims are available in sizes from 2.00 to 3.00 mm in increments of .05 mm.
4 If the valve clearance is greater than 0.10 mm (0.004 in.) use a thicker shim to correct to the specified clearance. If the valve clearance is less than 0.05 mm (.002 in.) select a thinner shim. Note: If there is no clearance between the shim and the cam, select a shim which is several sizes smaller and then remeasure the gap.
5 When checking valve clearances always check with the cam lobe pointing upwards directly away from the valve. Checking valve clearances in any other position may result in a false reading.
6 Install the tachometer drive pinion in the front of the cylinder head and screw in the tachometer cable.
7 The camshaft cover can now be replaced and tightened down to a setting of 70 inch lbs (.8 kg m).
8 The spark plugs can now be replaced and the plug leads refitted. The leads are numbered from one to four. The firing order is 1, 2, 4, 3. Number one cylinder for timing purposes is the extreme left hand cylinder.

35 Engine and gearbox reassembly: replacing the carburettors

1 Make sure the holding plate is secured tightly to the four carburettors with the eight countersunk screws before replacing the whole carburettor bank. Also check that the throttle control cable wheel operates and returns freely on the return spring, and that the choke lever operates the chokes of all four carburettors.
2 Secure the carburettors to the intake hoses on the cylinder head by the securing clips fitted round the intake hoses. Make sure these clips are tight, otherwise leakage will occur on the intake side of the carburation and cause irregular running.
3 Channel the four rubber overflow pipes through the retaining band at the rear of the engine, adjacent to the oil filler cap. The engine is now sufficiently complete for installation into the frame.

36 Replacing the engine and gearbox into the frame

1 The task of replacing the engine requires three people, two to lift the engine and one to hold the frame steady while the engine is lowered into position.
2 Lift the complete engine unit into the frame from the right hand side and mount but do not secure the three engine mounting brackets, before inserting the engine bolts. Insert the three long bolts from the left hand side of the machine and fit the two spacers on the rear upper bolt. The long spacer is on the left hand side of the engine and the short spacer on the right hand side. Secure the bracket bolts and brackets to the frame. Refit the air cleaner base stay.
3 Install the final drive sprocket to the engine with the chain already fitted to the sprocket, fit the lockwasher and tighten the locknut to 108 ft lbs (15 kg m) torque.
4 An oil seal guide or a suitable substitute should be used when installing the chain cover and chain oil pump. Make sure that the groove in the oil pump lines up with the slot in the driveshaft. When replacing the cover, great care must be taken to avoid damaging the oil seal when replacing the cover (Z1 models only).
5 Remake the electrical connections from the generator wiring harness by means of the various connectors provided. Thread the starter motor cable through to the starter motor and reconnect the cable with the solenoid at the side of the frame. Attach the

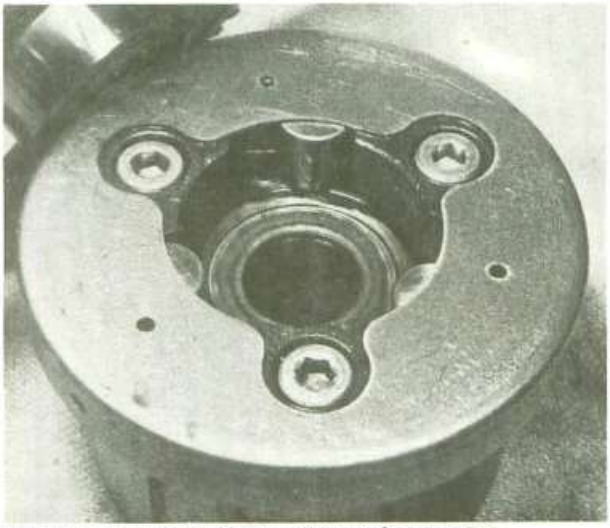
positive lead to the battery terminal, and connect the spark plug leads with the spark plugs by means of the push on covers.
6 Refit the two throttle cables to the wheel type control lever (one cable opens the throttles, and one cable closes them), making sure that the opening cable is fitted to the rear, and the closing cable is fitted to the front of the operating wheel.
7 Replace the air cleaner, which is a push on fit to the carburettor air intakes. Tighten the clips that hold the air cleaner to the intakes, by means of the crosshead screws. Connect the crankcase breather tube, also the clutch cable.
8 Lower the petrol tank into position and reconnect the fuel pipes with the petrol tap.
9 Replace the exhaust pipes and silencers by installing the inside silencers first, and then the outside silencers. Fit new manifold gaskets into the cylinder head. The finned manifold clamp can be used to hold the split collars while installing the exhaust pipes. Secure the silencer connecting hose clamp to prevent exhaust leaks, then tighten the rear silencer mounting bolts first, followed by the bolts at the cylinder head, in that order.
10 Refit the footchange lever and kickstart levers in their original positions as denoted by the punch marks and tighten them on their splines by means of the clamp bolts.
11 Refit the riders footrests and tighten them securely, also the pillion footrests.
12 Check that the crankcase drain plug has been secured, and then refill the engine with the correct amount of engine oil. The level can be checked through the sight window in the clutch cover which should be between the two marks.
13 Refill with SAE 10W/40 engine oil, 1 US gallon including the filter or (4.0 litres). The oil tank fitted beneath the left hand side of the dualseat for the rear chain oil pump should be refilled with SAE 90 gear oil, and the capacity is 0.95 U.S. quart or (0.9 litres). (Z1 model only).
14 Check the ignition timing as described in Chapter 3 and when the timing is correct, replace the contact breaker end cover, also the rotor cover, with their respective crosshead screws.

37 Starting and running the rebuilt engine unit

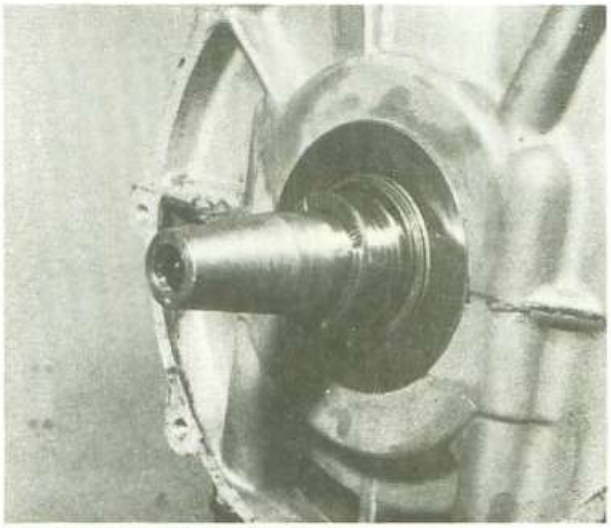
1 Make sure that all the components are connected correctly. The electrical connectors can only be fitted one way, as the wires are coloured individually. Make sure all the control cables are adjusted correctly. Check that the fuse is in the fuse holder, try all the light switches and turn on the ignition switch. Close the choke lever to start.
2 Switch on the ignition and start the engine by turning it over a few times with the kickstart or the electric starter, bearing in mind that the fuel has to work through the four carburettors. Once the engine starts, run at a fairly brisk tick-over speed to enable the oil to work up to the camshafts and valves.
3 Before taking the machine on the road, check that the brakes are correctly adjusted, with the required level of hydraulic fluid in the handlebar master cylinder.
4 Make sure the rear chain is correctly tensioned to 3/8 inch up and down play. Also that the front forks are filled with the correct amount of oil.
5 Check the exterior of the engine for signs of oil leaks or blowing gaskets. Before taking the machine on the road for the first time, check that all nuts and bolts are tight and nothing has been omitted during the reassembling sequence.

38 Taking the rebuilt machine on the road

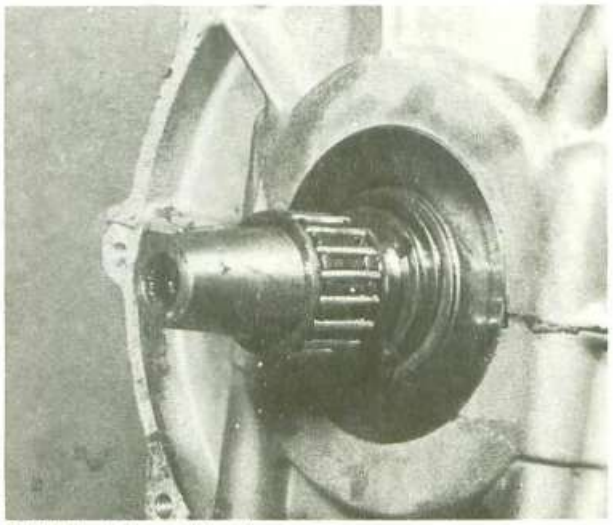
1 Any rebuilt engine will take time to settle down, even if the parts have been replaced in their original order. For this reason it is highly advisable to treat the machine gently for the first few miles, so that the oil circulates properly and any new parts have a reasonable chance to bed down.
2 Even greater care is needed if the engine has been rebored or if a new crankshaft and main bearings have been fitted. In the case of a rebore the engine will have to be run-in again as if the machine were new. This means much more use of the gearbox and a restraining hand on the throttle until at least 500 miles have been covered. There is not much point in keeping to a set speed limit; the main consideration is to keep a light load on the engine and to gradually work up the performance until the 500 mile mark is reached. As a general guide, it is inadvisable to exceed 4,000 rpm during the first 500 miles and 5,000 rpm for the next 500 miles. These periods are the same as for a rebored engine or one fitted with a new crankshaft. Experience is the best guide since it is easy to tell when the engine is running freely.
3 If at any time the oil feed shows sign of failure, stop the engine immediately and investigate the cause. If the engine is run without oil, even for a short period, irreparable engine damage is inevitable.



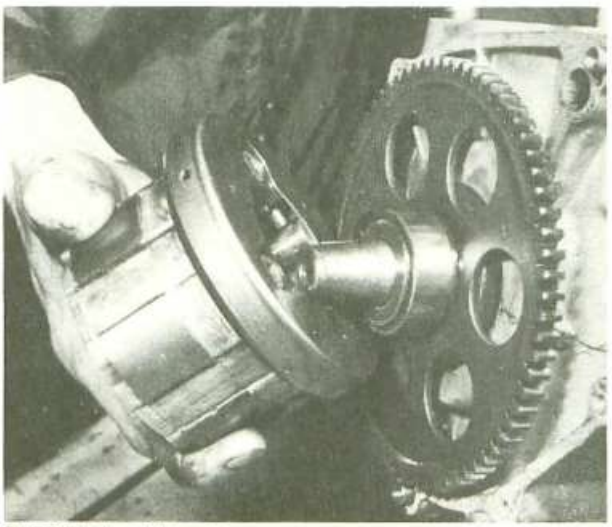
31.5 Make sure starter clutch rollers are free to move



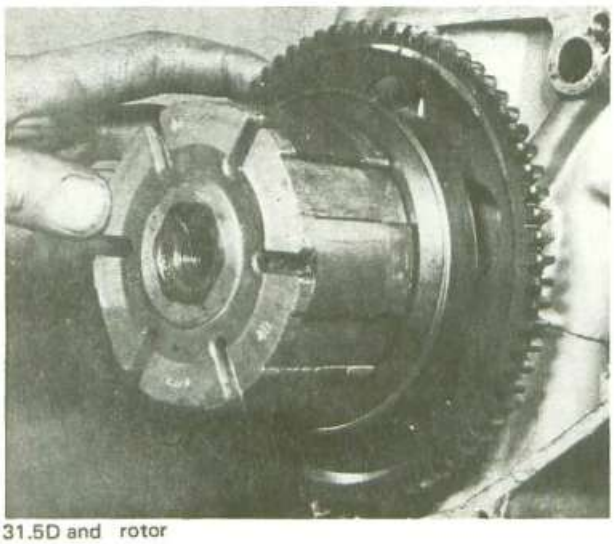
31.5A Thrust washer fits behind rotor



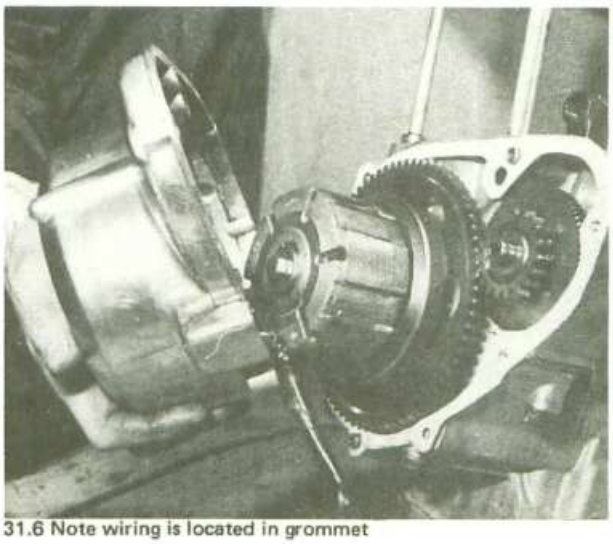
31.5B Next the needle roller



31.5C Replace idler gear



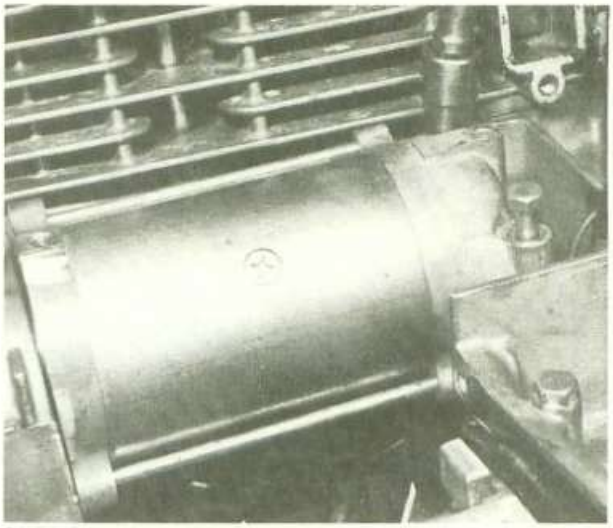
31.5D and rotor



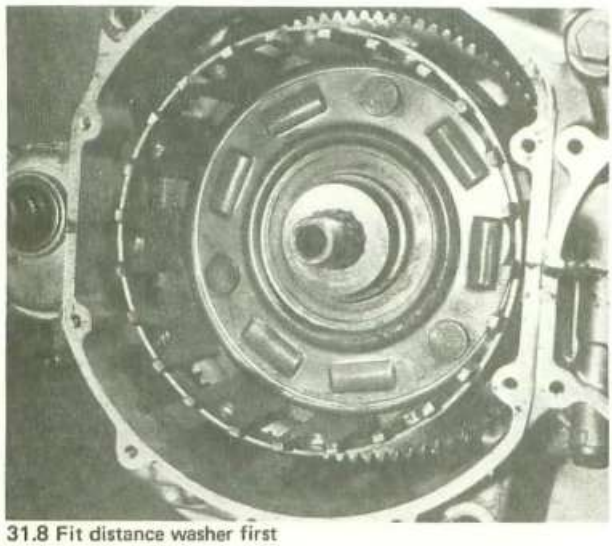
31.6 Note wiring is located in grommet



31.7 Place a little oil on 'O' ring



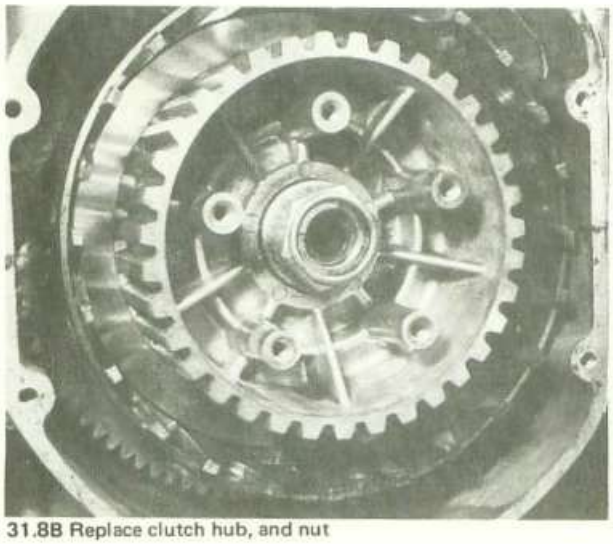
31.7A Secure two bolts in starter end bracket



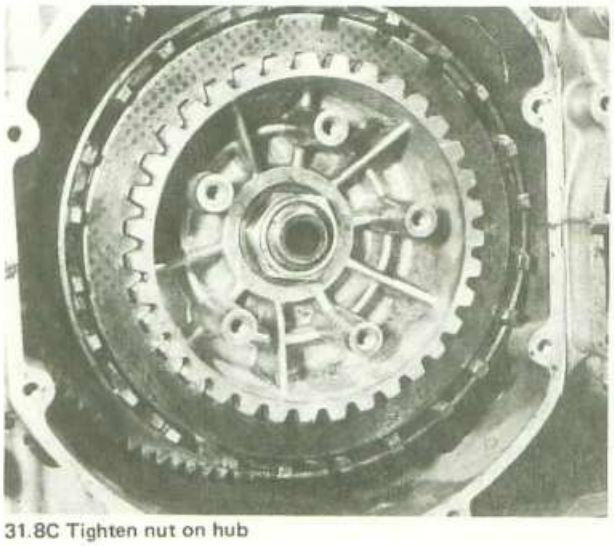
31.8 Fit distance washer first



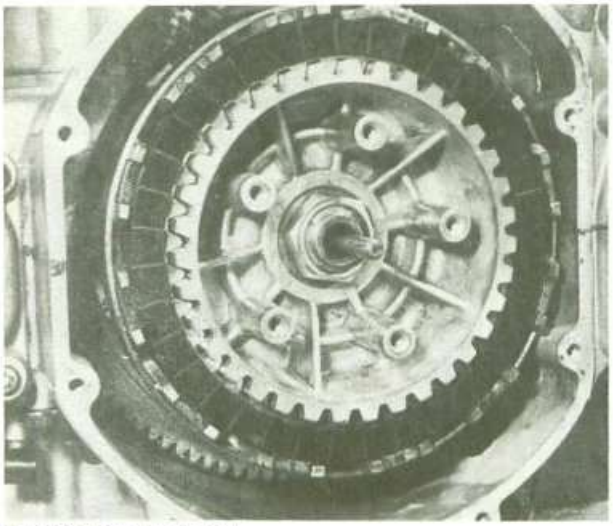
31.8A Note washer has 'outside' mark



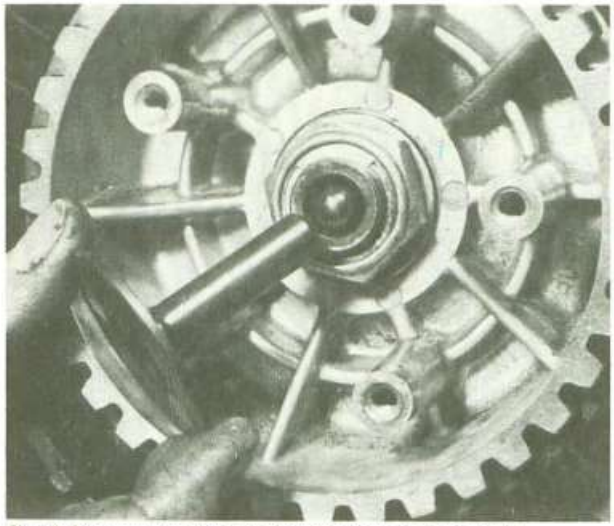
31.8B Replace clutch hub, and nut



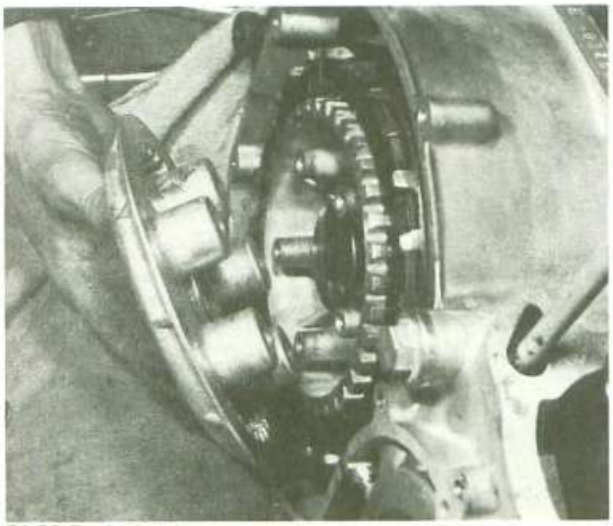
31.8C Tighten nut on hub



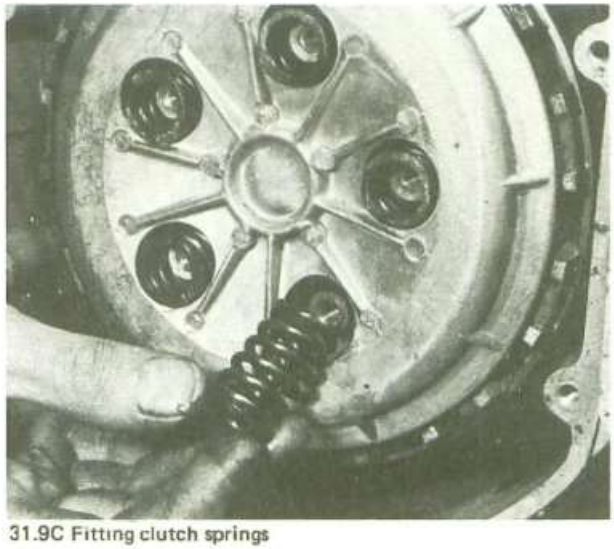
31.9 Replace clutch rod



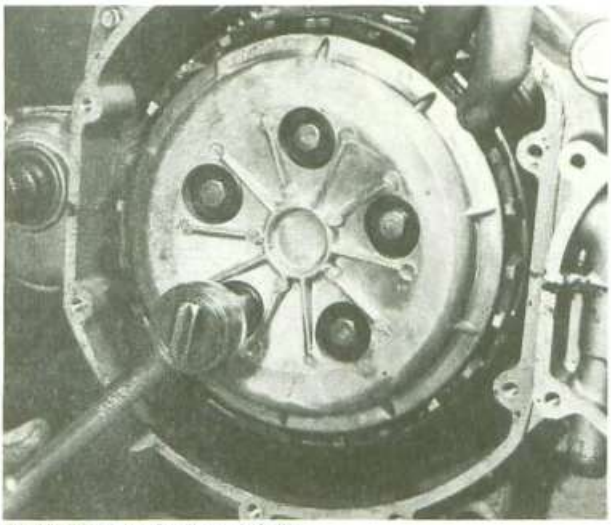
31.9A Note steel ball behind mushroom pressure piece



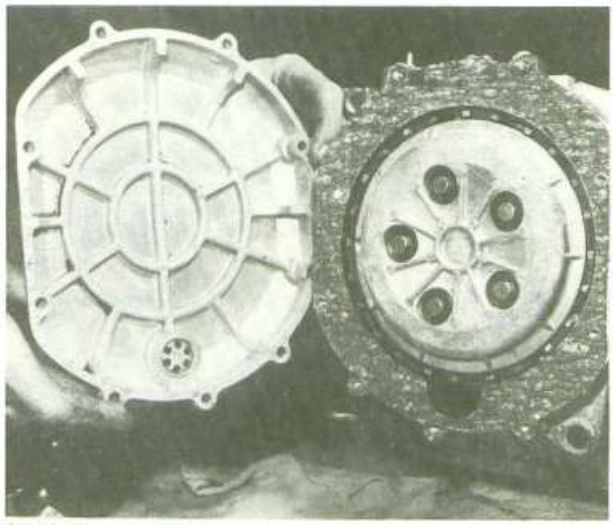
31.9B Replacing the pressure plate



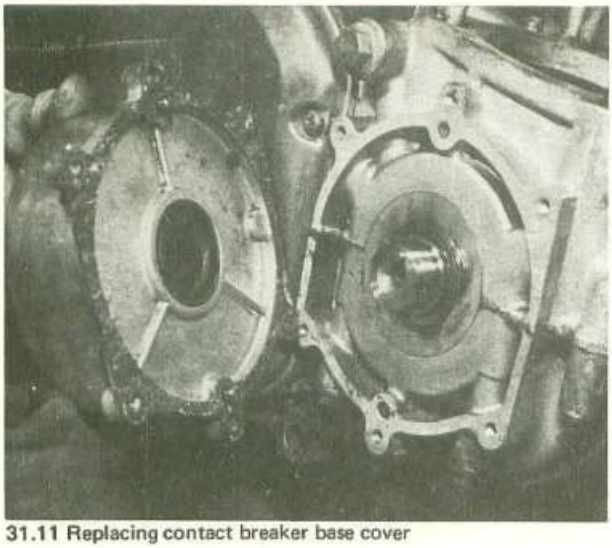
31.9C Fitting clutch springs



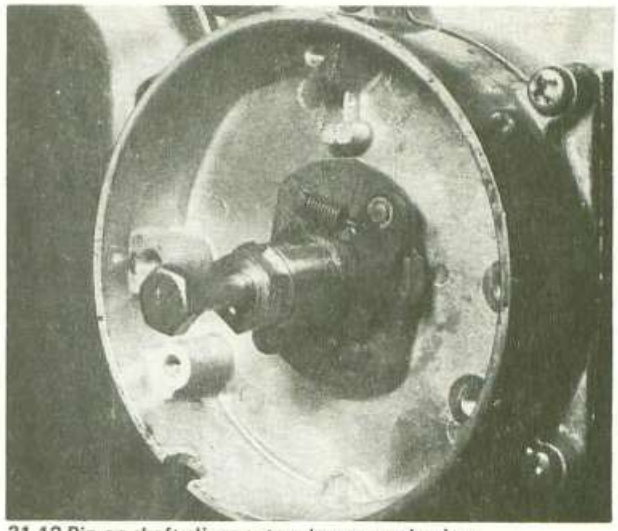
31.9D Tighten clutch nuts fully



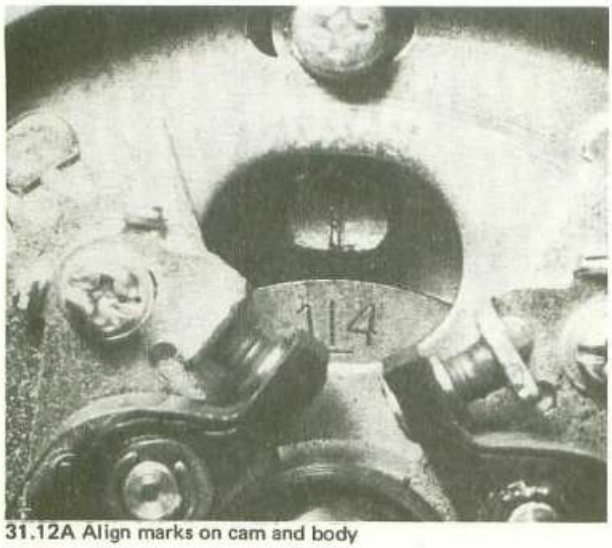
31.10 Fit new gasket



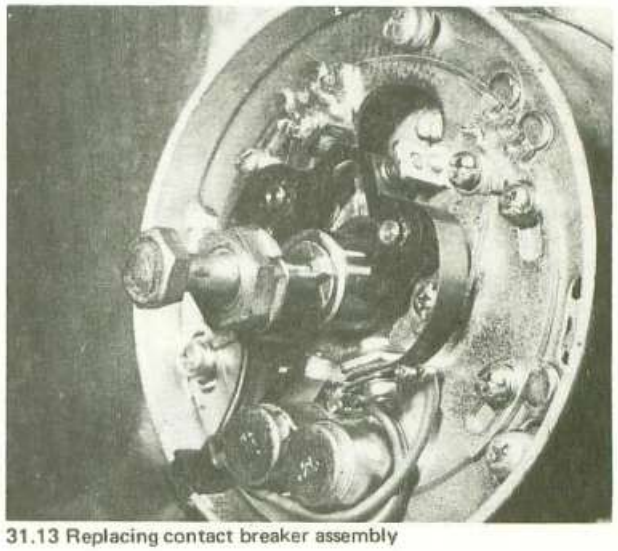
31.11 Replacing contact breaker base cover



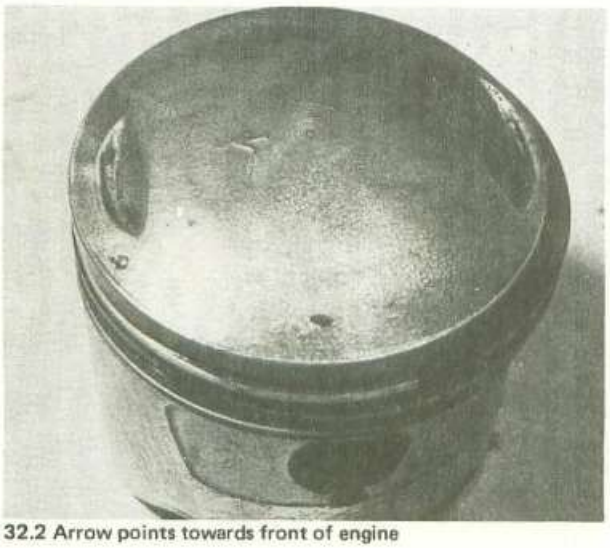
31.12 Pin on shaft aligns auto advance mechanism



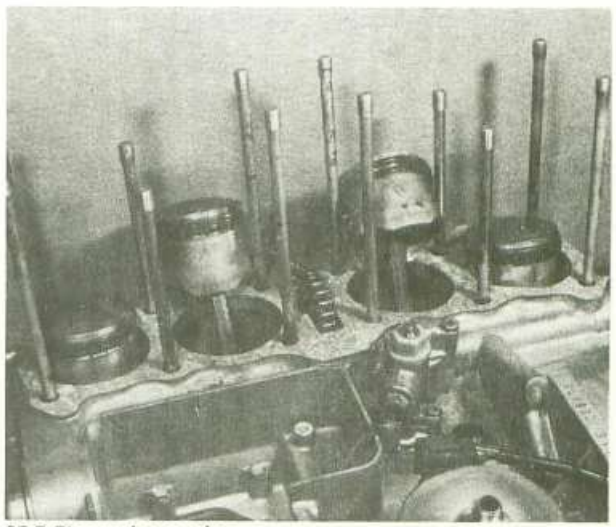
31.12A Align marks on cam and body



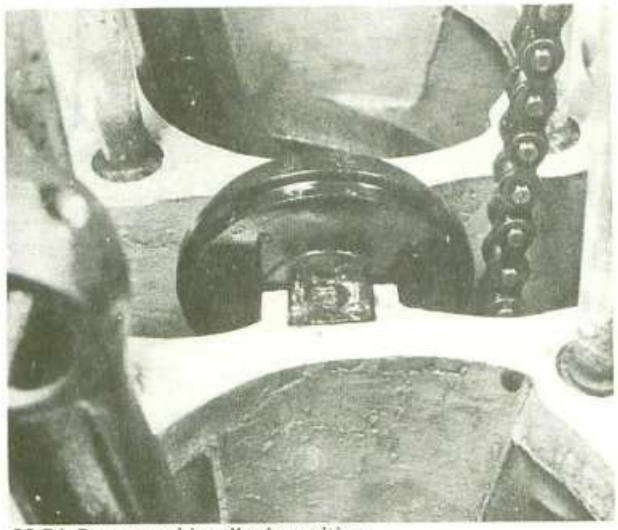
31.13 Replacing contact breaker assembly



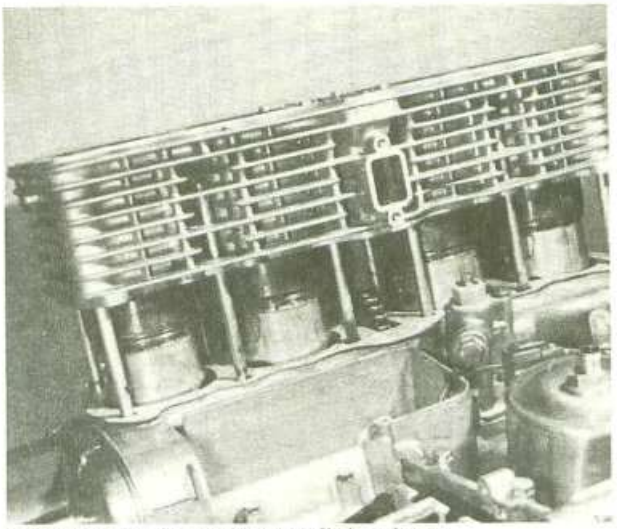
32.2 Arrow points towards front of engine



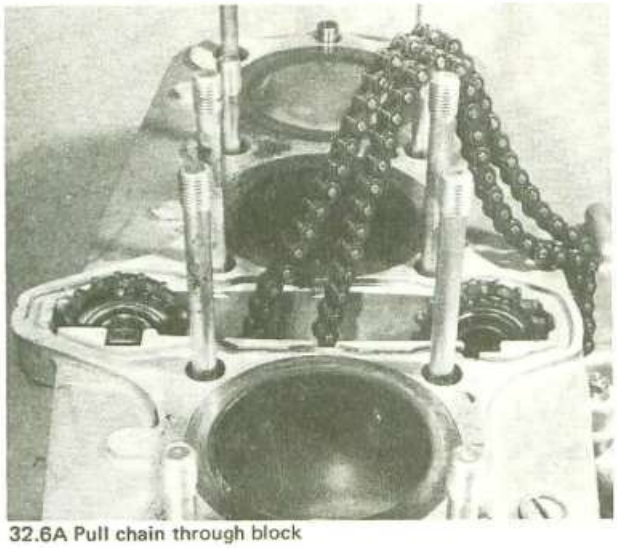
32.5 Fit new base gasket



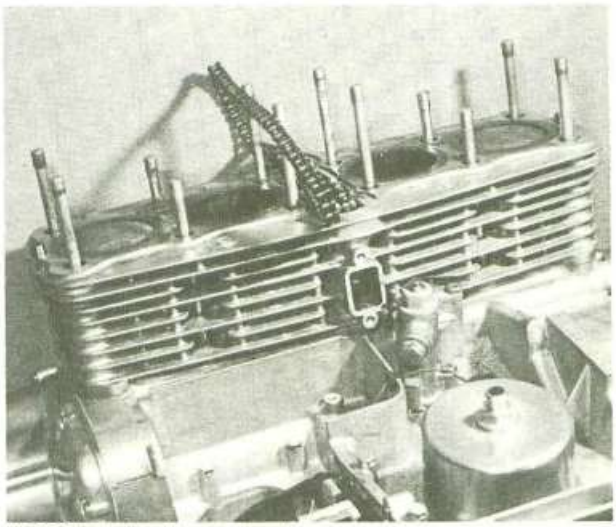
32.5A Bottom guide roller in position



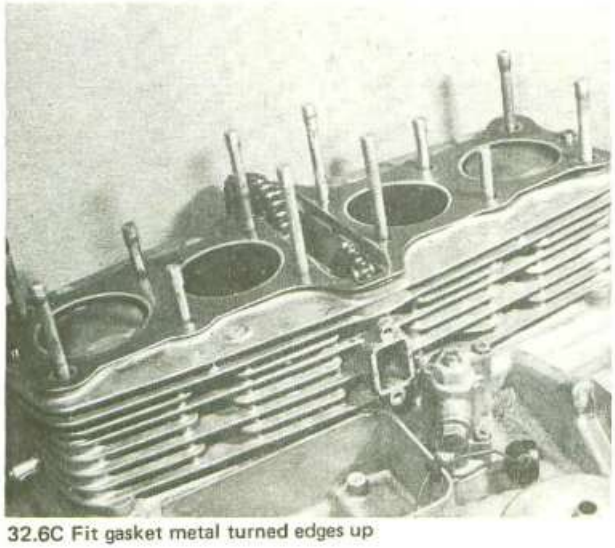
32.6 Rest block over studs when fitting pistons



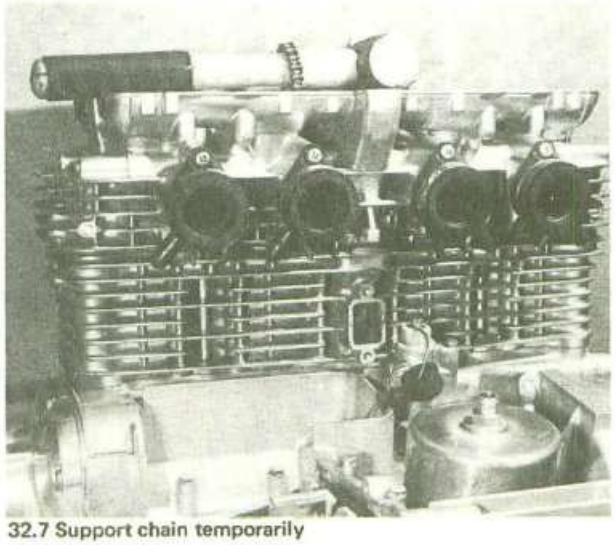
32.6A Pull chain through block



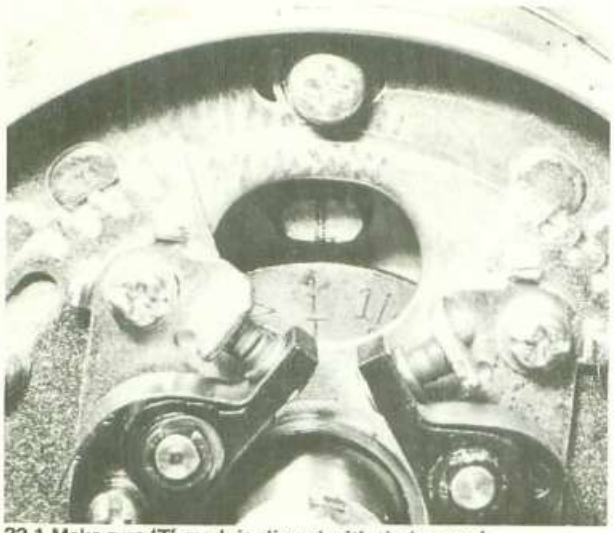
32.6B Settle block over dowels



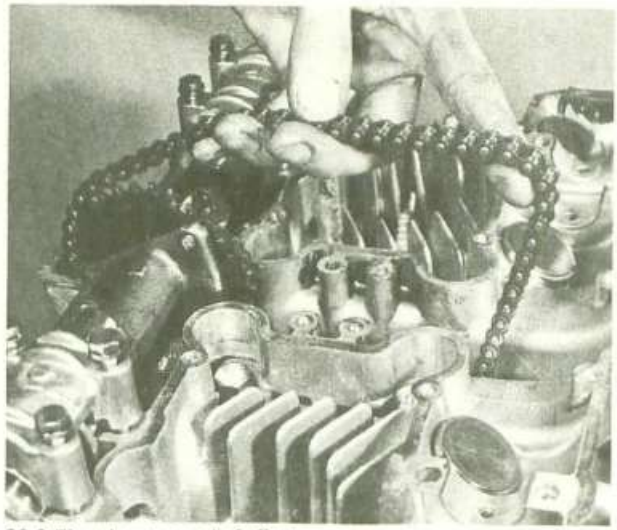
32.6C Fit gasket metal turned edges up



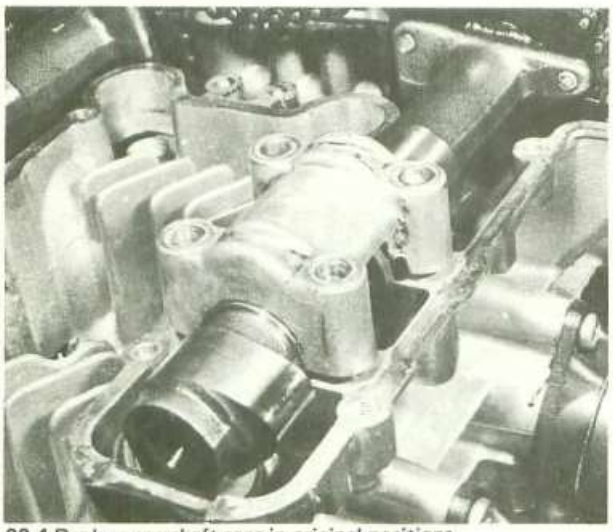
32.7 Support chain temporarily



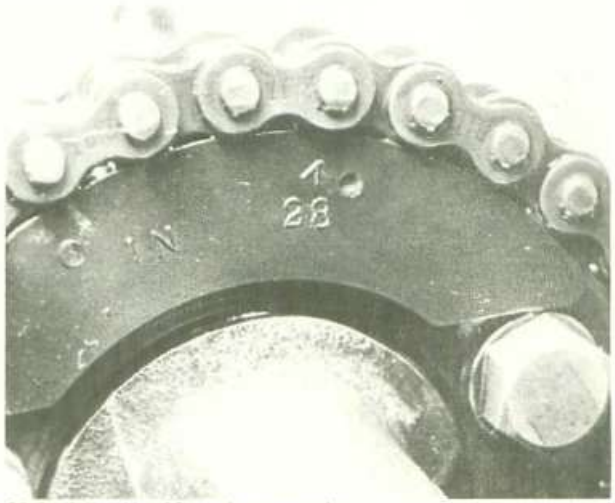
33.1 Make sure 'T' mark is aligned with timing mark



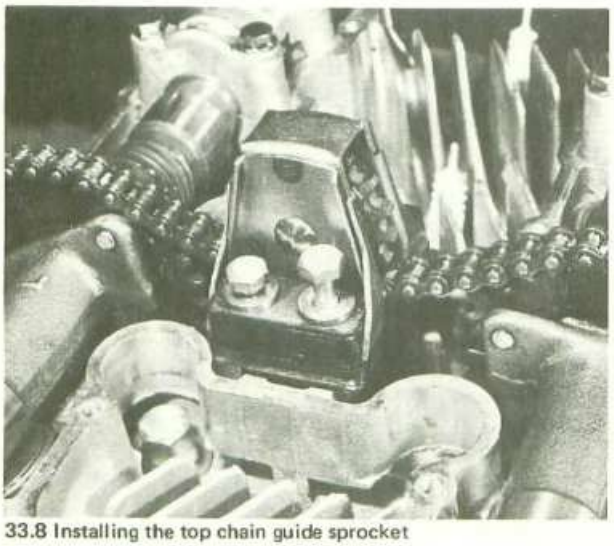
33.3 Fit exhaust camshaft first



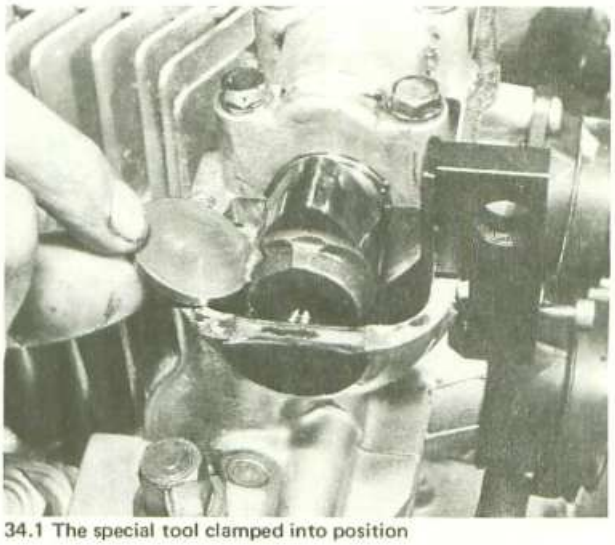
33.4 Replace camshaft caps in original positions



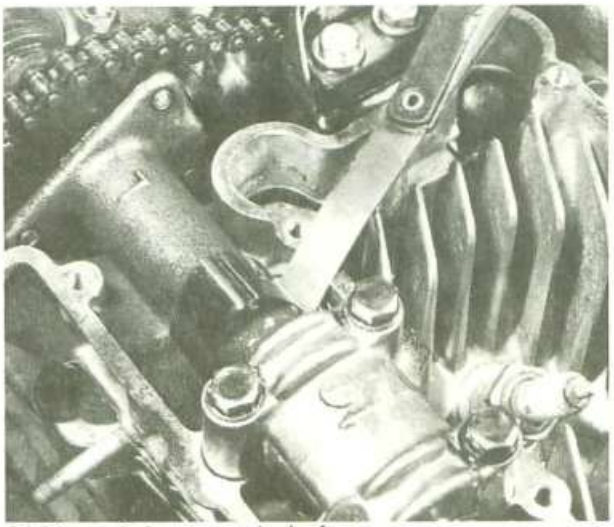
33.4A Note No. 28 mark on sprocket



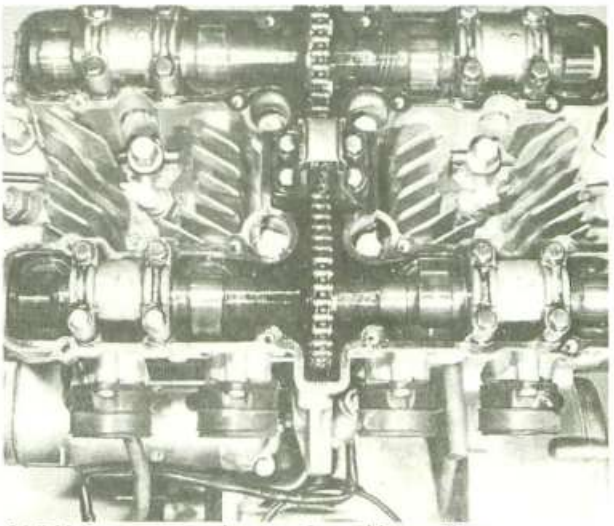
33.8 Installing the top chain guide sprocket



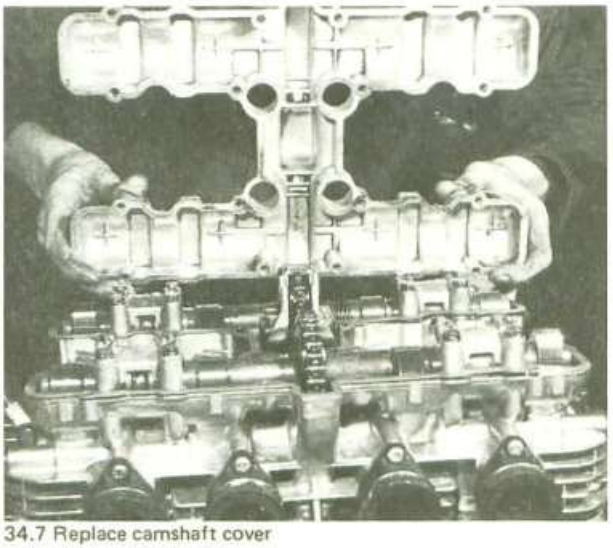
34.1 The special tool clamped into position



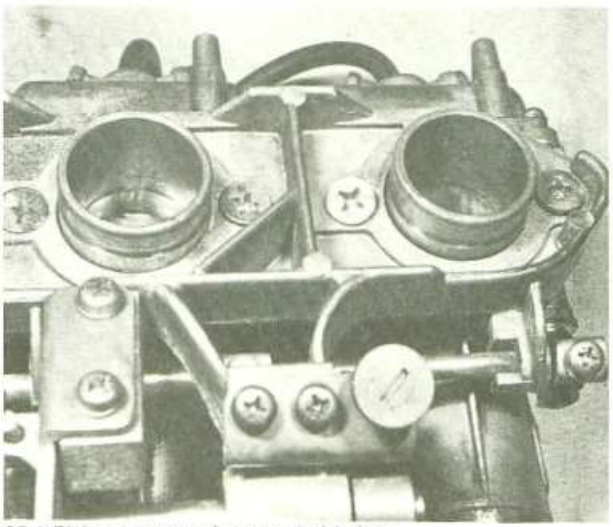
34.2 Insert feeler gauge at back of cam



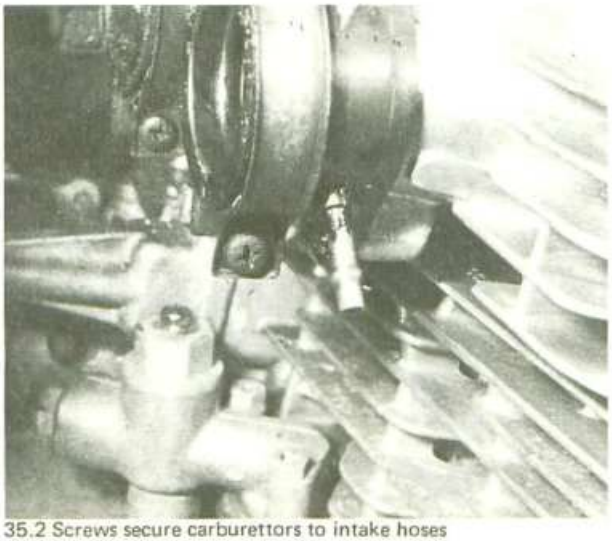
34.5 Make sure cam points up when taking readings



34.7 Replace camshaft cover



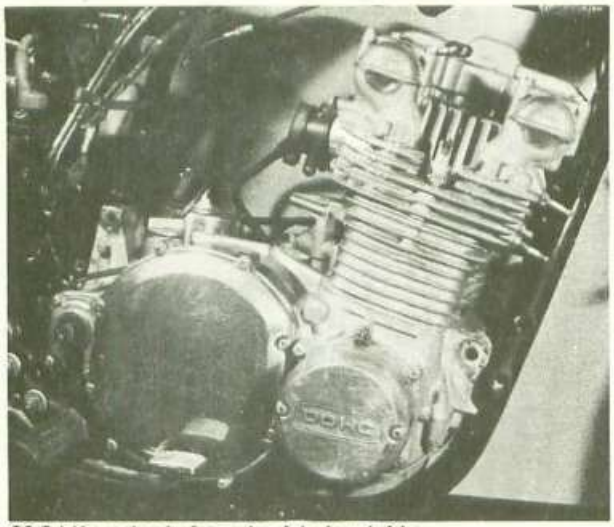
35.1 Eight countersunk screws hold plate



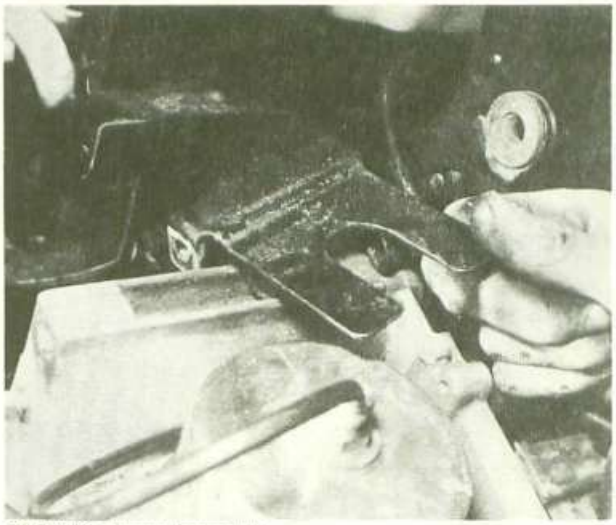
35.2 Screws secure carburettors to intake hoses



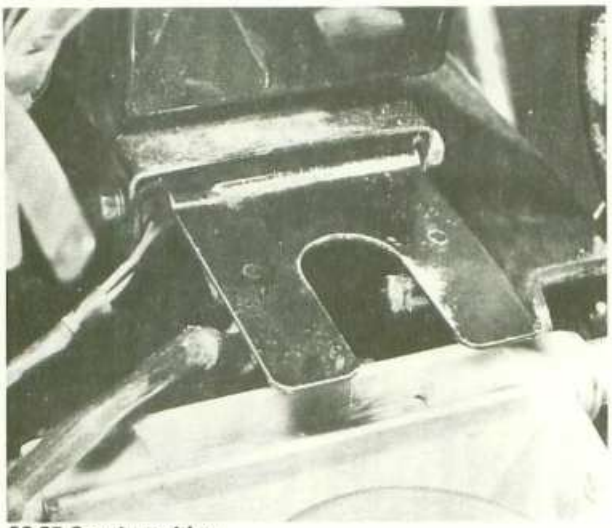
35.3 Overflow pipes retained by rubber band



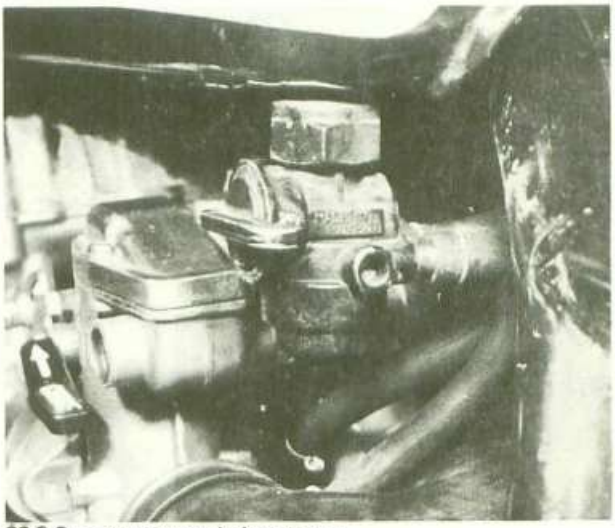
36.2 Lift engine in from the right hand side



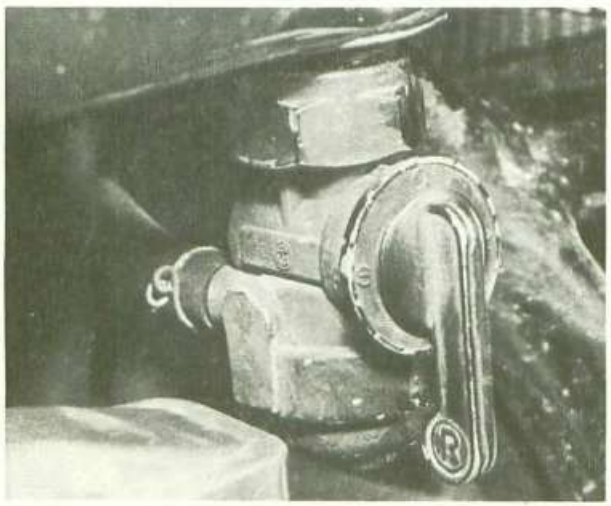
36.2A Air cleaner base stay



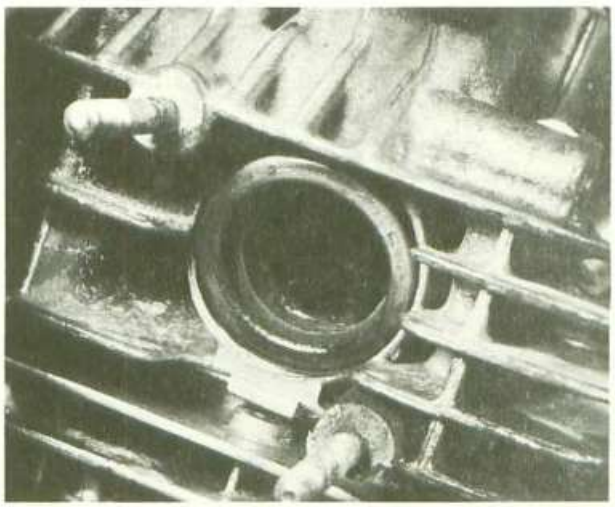
36.2B Stay in position



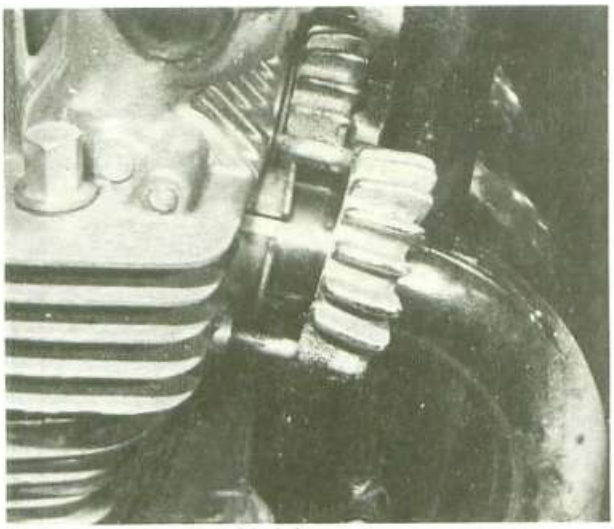
36.8 Connect up petrol pipes to tap



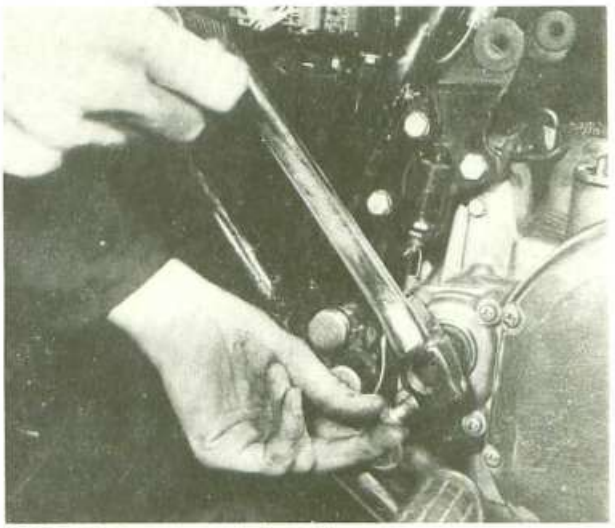
36.8A Union nut must be tight



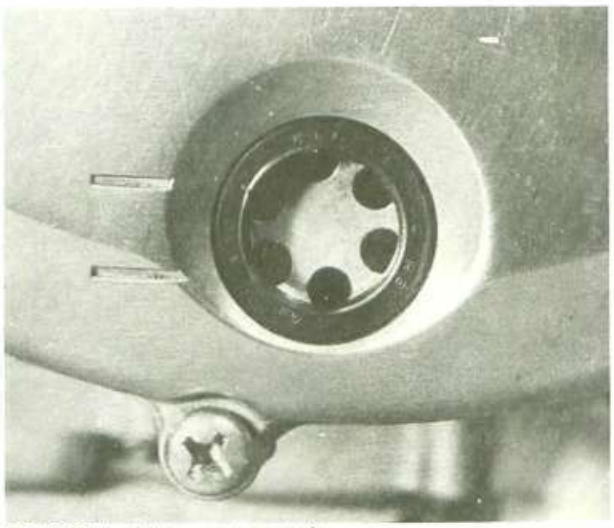
36.9 Fit new manifold gaskets



36.9A Split collars fit behind clamp



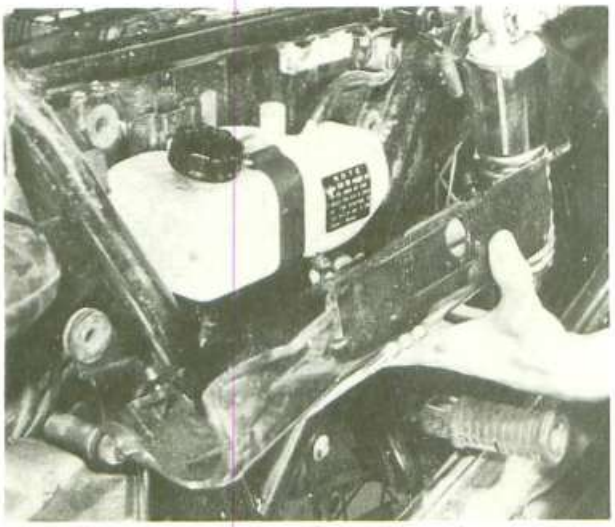
36.10 Refit levers in original position



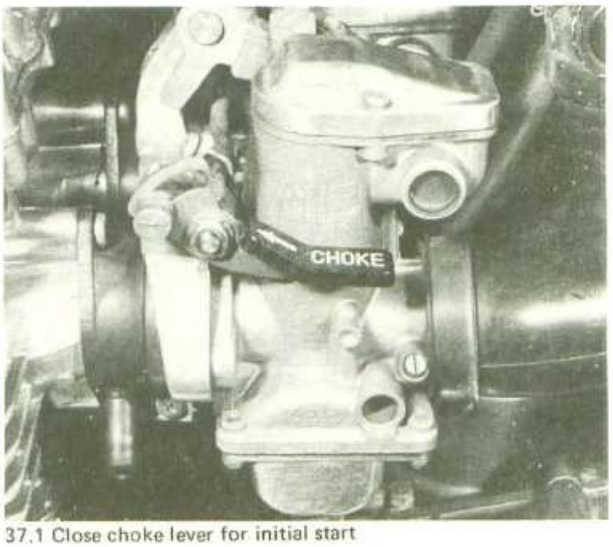
36.12 Oil level between two marks



36.13 Filling sump with oil



36.13A The rear chain oil tank (Z1 model only)



37.1 Close choke lever for initial start

39 Fault diagnosis : Engine

Symptom	Cause	Remedy
Engine will not start	Defective spark plugs	Remove the plugs and lay on the cylinder head. Check whether spark occurs when engine is on and engine rotated.
	Dirty or closed contact breaker points	Check the condition of the points and whether the points gap is correct.
	Faulty or disconnected condenser	Check whether the points arc when seperated. Replace the condenser if there is evidence of arcing.
Engine runs unevenly	Ignition or fuel system fault	Check each system independently, as though engine will not start.
	Blowing cylinder head gasket	Leak should be evident from oil leakage where gas escapes.
	Incorrect ignition timing	Check accuracy and reset if necessary.
Lack of power	Fault in fuel system or incorrect ignition timing	Check fuel lines or float chambers for sediment. Reset ignition timing.
Heavy oil consumption	cylinder block in need of rebore	Check bore wear, rebore and fit oversize pistons if required.

40 Fault diagnosis: Clutch

Symptom	Cause	Remedy
Engine speed increases as shown by tachmeter but machine does not respond	Clutch slip	Check clutch adjustment for free play, at handlebar lever, check thickness of inserted plates.
Difficulty in engaging gears, gear changes jerky and machine creeps forward when clutch is withdrawn difficulty in selecting neutral	Clutch drag	Check clutch for too much free-play, Check plates for burrs on tongues or drum for indentations. 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

41 Fault diagnosis gearbox

Symptom	Cause	Remedy
Difficulty in engaging gears	Selector forks bent Gear clusters not assembled correctly	Replace with new forks. Check gear cluster for arrangement and position of thrust washers.
Machine jumps out of gear.	Worn dogs on the ends of gear pinions	Replace worn pinions.
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 wrongly tensioned. Return spring	Replace spring or retension
Kickstarter slips	Ratchet assembly worn	Dismantle engine and replace all worn parts

Chapter 2 Fuel system and lubrication

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Specifications

Fuel tank capacity	3.5 Imp gallons (16 litres) UK spec. 4.7 US gallons (18 litres) USA spec.
Engine/gearbox oil capacity	1.25 Imp gallons/ 4.2 US quart (4 litres)
Rear chain oil tank capacity	1 Imp quart. (0.95 US quart. (0.9 litre)

Carburettors

	Z1	Z1-B
Make	Mikuni	Mikuni
Type	VM.28.S.C.	–
Main jet	112.5	–
Pilot jet	20	17
Needle jet	P.8	P6
Jet needle	5 J 9-3	–
Needle position	Number 3 Notch	–

1 General description

1 The fuel system comprises a petrol tank, from which petrol is fed by gravity to the carburettors, via a petrol tap that incorporates a filter. There are three positions, ON, RESERVE, and STOP.

2 If the fuel in the tank is too low to be fed to the carburettors in the ON position, turn the lever to the RESERVE position, which provides a further one gallon of reserve supply. The fuel tank cap is the quick action filler type, and incorporates an air vent that must be kept clear for normal fuel flow to occur. If it becomes clogged, it must be blown out with compressed air.

3 A large capacity air cleaner, with a filter element, serves the dual purpose of supplying clean air to the carburettors and effectively silencing the intake roar.

4 The oil content for the engine is contained in a sump at the bottom of the engine. The gearbox is also lubricated from the same source, the whole engine unit being pressure fed by a mechanical oil pump that is driven off the crankshaft gear. The oil pump intake extends into the sump to pump the oil up to the engine. A screen at the pump inlet point prevents foreign matter from entering the pump before it can damage the mechanism. From the pump the oil firstly goes to the oil filter to be cleaned. If the filter becomes clogged, a safety by-pass valve routes the oil around the filter. It next goes through a pipe in which an oil pressure switch is mounted, and through an oil hole in the crankcase, from which point it is sent in three different directions. One direction is to the crankshaft main bearings and crankshaft pins. After lubricating the crankshaft parts, the oil is thrown out by centrifigal force and the spray lands on the cylinder walls and the pistons and piston pins to lubricate those parts. The oil eventually drops down from all these points and accumulates in the bottom of the crankcase sump to be recirculated.

The second passageway for oil from the pump is through the oil passage at each end of the cylinder block and up into the cylinder head. After passing through holes into the camshaft bearings, the oil flows out over the cams and down around the valve tappets to lubricate these areas. The oil returns to the sump via the oil holes at the base of the tappets, and the cam chain tunnel in the centre of the cylinder head and cylinder block.

The third passageway for the oil to flow is to the gearbox bearings where it is pumped to the gearbox main bearing on the mainshaft and also to the bearing on the layshaft. After this the oil drops down back into the oil sump, to be recirculated again through the engine.

2 Petrol tank: removal and replacement

1 The petrol tank fitted to the Z1 models is secured to the frame by means of a short channel that projects from the nose of the tank that engages with a rubber buffer surrounding a pin welded to the frame, immediately behind the steering head. This arrangement is duplicated either side of the nose of the tank and the frame. The rear of the tank is secured by a rubber clip that locates round a lip welded on to the back of the tank. The tank also has two rubber buffers on which it rests at the rear. A petrol tap is fitted with a reserve pipe that is switched over, when the fuel reaches the level of the main petrol pipe. There is no balance pipe.

2 The petrol tank can be removed from the machine without draining the petrol, although the rubber fuel lines to the carburettors will have to be disconnected. The dualseat must be lifted up to release the rubber clip at the rear of the tank then raise the tank at the rear and pull upwards and backwards to pull the tank off of the front rubbers. When replacing the fuel tank, lift at the rear and push down onto the front rubber buffers, then secure the rubber clip at the rear and reconnect the fuel lines.

3 Petrol tap and filter: removal, dismantling and replacement

1 It is not necessary to drain the petrol tank, if the tank is only half or under half full, as the tank can be laid on its side on a clean cloth or soft material (to protect the enamel), so that the petrol tap is uppermost. The petrol tap pipes should be removed, before removing the petrol tap. To remove the tap and filter, first undo the large hexagon union nut next to the tank, the tap body can then be detached complete with the filter. When the filter bowl is removed this will reveal the rubber 'O' ring gasket and the filter gauze. Remove the gauze and clean in petrol. When reassembling the tap, fit a new gasket between the body and the tank and a new rubber 'O' ring to the filter bowl if the old one is noticeably compressed. On no account overtighten the bowl, as it is made of soft metal and the threads will easily strip.

2 There is no necessity to remove either the tap or the petrol tank if only the filter bowl has to be detached for cleaning.

4 Carburettors: description and removal

1 The method of mounting the four carburettors is on a holding plate with eight countersunk screws, the whole bank of carburettors being connected to the intake side of the engine on short induction hoses. The four butterfly type throttle valves are operated by a single shaft, likewise the manually operated choke also has a single shaft operating four levers, one to each carburettor.

2 The throttles are operated by two cables from the handlebar, one to open the throttles and the other to close them. A heavy return spring is incorporated in the throttle return system. When closing the throttles the use of a separate return cable helps to close the throttle more positively. This ensures smooth throttle action.

3 A vacuum gauge fitting is incorporated on each inlet manifold as an aid to balancing manifold pressure, and when used in conjunction with a vacuum gauge array, allows the carburettors to be accurately synchronized.

4 Starting in extreme cold weather is aided by a separate starter system which acts by vacuum pressure and serves in place of a choke. The starter system takes the form of four plunger valves situated at the sides of the carburettors. The four plungers are operated in unison by a lever on the end of the shaft marked 'CHOKE'.

5 With the choke lever raised, and the throttles fully closed, a high intake vacuum is created when the engine is turned over. Fuel flow is metered by the starter jet, and fuel is drawn up

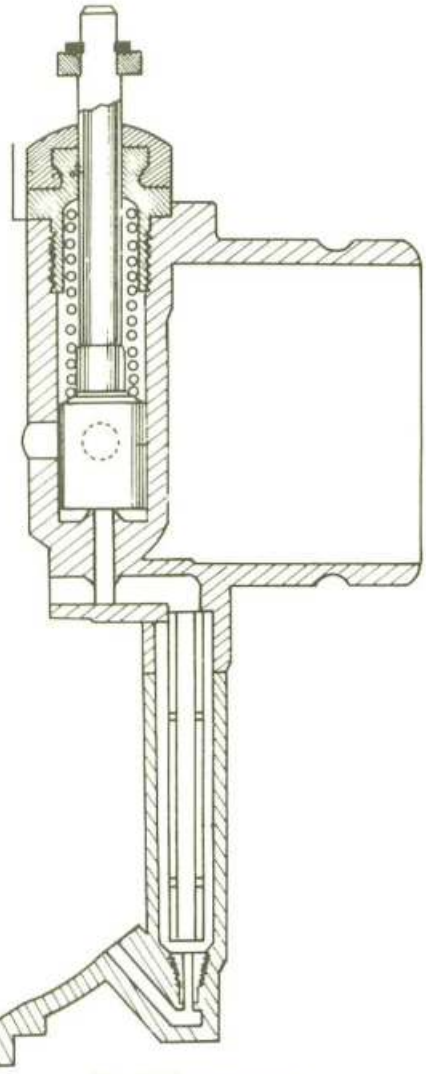


Fig. 2.1 Starter system

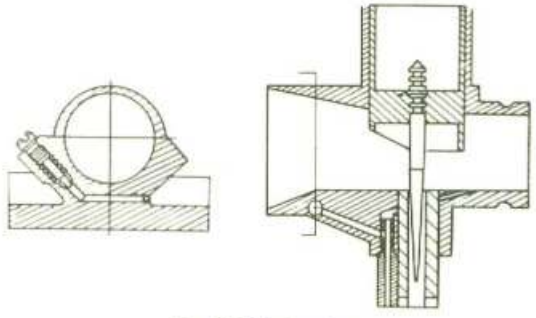


Fig. 2.2 Pilot system

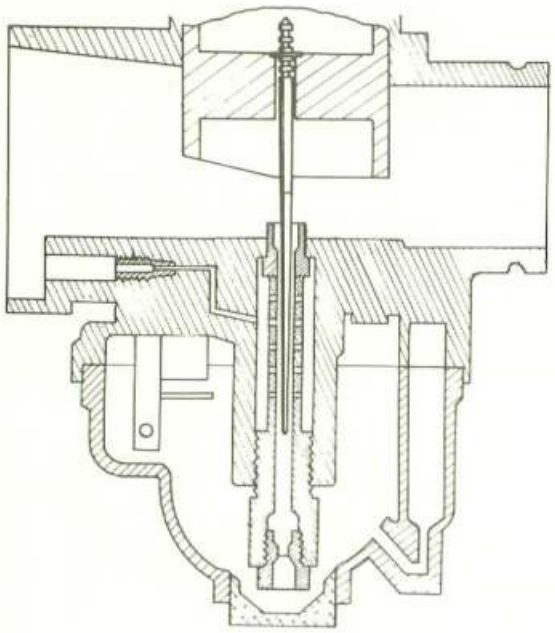
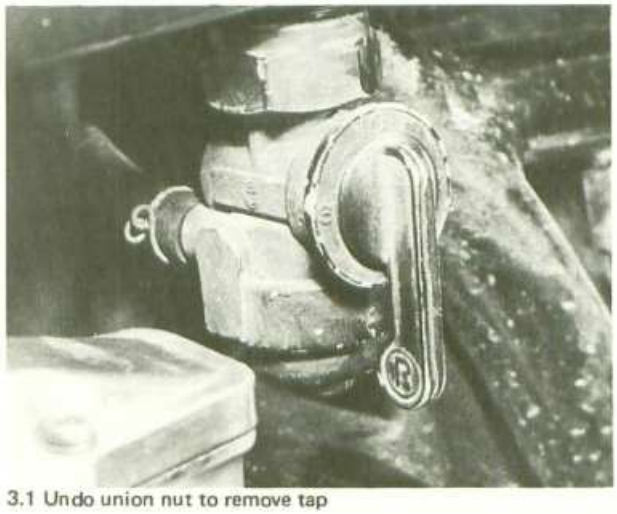


Fig. 2.3 Main system

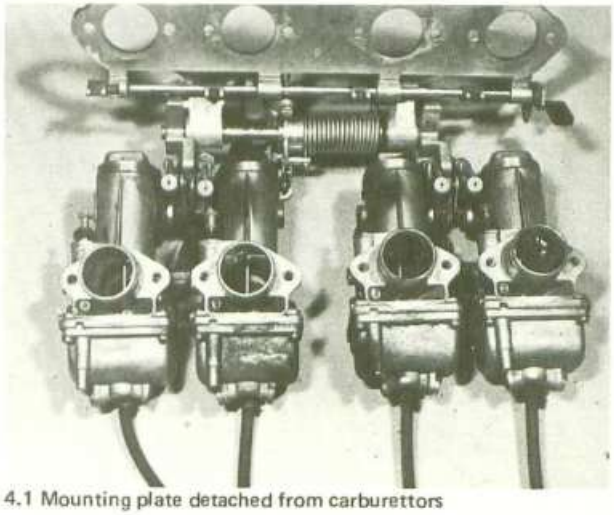


3.1 Undo union nut to remove tap

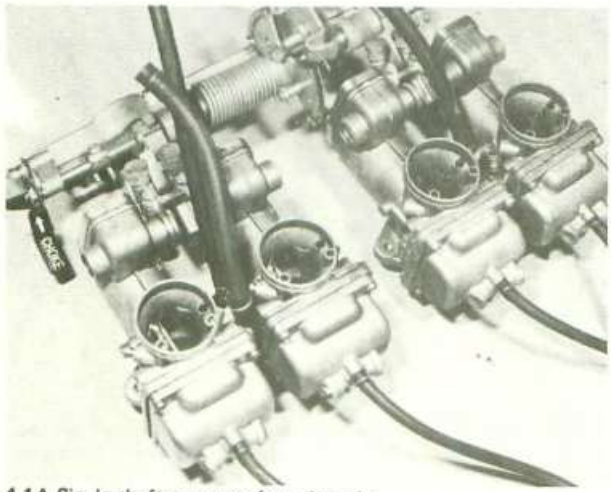
through the starter pipe to the starter plunger chamber where it is atomized. The rich mixture is then sprayed into the carburettor bore where a small fuel/air spray from the pilot system is mixed with it. The final mixture is then delivered to the engine.

It is essential that the starter plungers be fully raised by the choke lever and the starter jet, pipe, and the air bleed hole completely free of any blockage. The throttle must be fully closed so that sufficient vacuum is developed for efficient atomization to take place.

6 The pilot system is made up of the pilot jet, the pilot air screw, and the pilot outlet. It controls carburation from the idle position to approximately one eighth throttle opening. The pilot



4.1 Mounting plate detached from carburettors



4.1A Single shaft connects four throttles



4.2 Pulley operates two cables

mixture strength is determined by the amount of fuel passed through the pilot jet, and also by the amount of air which is allowed to pass the pilot air screw. If the screw is turned in, this richens the mixture, and when the screw is turned out this weakens the mixture. The correct position for the air screws is normally one and a quarter turns out from the fully closed position.

7 The main carburation system comprises the main jet, the bleed pipe, the jet needle, the throttle valve, and the air jet. The main system comes into operation after the throttle is opened beyond one eighth of a turn of the throttle. It is only after this that sufficient vacuum is created at the jet needle to draw fuel up through the main jet. The fuel flows up through the main jet and bleed pipe, then between the needle jet and jet needle, and into the main bore where it is fully atomized. The fuel in fact is partially atomized before it reaches the bore, because the air bleed hole in the bleed pipe admits air to the fuel as it passes through the pipe.

8 When the throttle is opened, the slide rises up the bore of the carburettor. The jet needle is connected to this slide and because the needle is tapered, the more it is raised the more the fuel is allowed to flow. This is how engine speed increases. The cutaway on the slide regulates the air flow and the vacuum pressure into the carburettor bore. Finally, when the throttle slide is raised to its limit, the flow of fuel is dictated by the size of the main jet rather than the space between the jet needle and needle jet. The machine is then running on the main jet.

9 The float system is made up of the float, the float needle valve, and the valve seat. The fuel is maintained by the float assembly at a constant level in the float bowl, to meet the engines needs. As fuel flows into the bowl the float rises which in turn raises the float valve. When the float reaches a pre-determined height, the valve closes onto its seat and this shuts off the flow of fuel to the carburettor. Consequently as the engine uses the fuel, the level in the bowl drops, causing the valve to leave its seat and admit more fuel to flow into the float chamber. Cleanliness is the most important thing when working on the carburettors. To remove the carburettors loosen the four intake manifolds by undoing the crosshead screws in the clamps and remove the air cleaner hoses at the rear. Then pull the whole bank of four carburettors off.

10 To separate the carburettors, loosen the throttle cable mounting nuts, and disconnect the cables from the pulley. Remove the throttle stop screw locknut from both the carburettor to be removed and its companion, then detach the link piece. Remove the throttle stop screw and the screw spring, together with the spring seat. Remove the cap nut from the carburettor linkage of the carburettor that is to be removed, and then remove the spring and seat. **Note:** Be careful not to lose the spring that will rise up when the cap nut is removed.

11 Unscrew the four mounting screws from the mounting plate and remove the first pair of carburettors. It is easier to remove the carburettors in pairs as they are joined by a link. After all the carburettors have been removed from the mounting plate they are ready for dismantling.

5 Carburettors: dismantling and reassembly

1 The crossover lever and pulley, and the throttle return spring, need not be removed from the mounting plate, when dismantling the carburettors. The fuel may be drained from the float bowl by removing the drain plug and washer. Remove the top cover screws, then remove the cover and gasket, bend flat the locktab washer and unscrew the bolt from the operating arm. The operating arm can now be removed. Undo the two screws that secure the bracket assembly to the throttle slide, and lift the bracket complete with the operating arm and connector assemblies out of the carburettor bore.

2 Remove the throttle valve and the needle from the bore, taking care not to bend the needle. Remove the plunger assembly after first removing the lever, cap, and guide screw. Undo the float bowl screws, remove the bowl and the gasket, then take out the hinge pin and remove the float and the float needle valve. Remove the main jet, the air bleed pipe. Invert the carburettor, and gently press out the needle jet with a wooden dowel. Remove the float valve seat, the pilot jet and the pilot air screw with spring.

3 Clean all the components in clean petrol and then blow them dry with compressed air, taking care to clear all passages. Inspect all the jets and the needle valve and seat, and renew them if they are worn, especially if there is a bright ridge round the needle valve and seat. It is best to renew these as a pair.

4 Inspect the float for leakage. Check whether petrol has entered the float by the weight of the float. If the float assembly is punctured it must be renewed.

5 Remove the main jet with a wide blade screwdriver, also inspect the needle jet for wear. After lengthy service the needle jet should be renewed along with the needle as these components are in continuous use. If not renewed petrol consumption will increase.

6 The carburettor slide should be able to slide down the carburettor bore by its own weight. If it will not do this even when lightly oiled, it will not function correctly.

7 Assembly of the carburettors is the reverse order of dismantling. Use new gaskets and 'O' rings. Do not overtighten the jets when installing into the carburettor body.

8 Make certain that the carburettor jet needle is replaced back in the same position as when it was removed. The needle clip should be in the third groove from the top.

6 Carburettors: adjustment

1 To check the float height adjustment with the carburettors in situ, first turn the fuel tap to 'OFF'. Then remove the carburettor vent tube. (Be prepared to catch the fuel that will run out). Remove the float bowl drain plug. Install the Kawasaki fuel measuring device (Part number 57001-122) in place of the drain plug and hold the plastic tube against the carburettor body. Turn the fuel tap to the 'ON' position. The petrol level in the tube should be 0.10 - 0.18 inch (2.5 - 4.5 mm) below the edge of the carburettor body. If the petrol level is incorrect the float must be adjusted in the following manner. Drain the fuel from the float chamber and remove the chamber bowl. Be prepared to catch the float and float hinge pin, also the float needle. Bend the tang on the float slightly to adjust the float height. Bending the tang up will lower the fuel level. **Note:** When checking the fuel level of the two inside carburettors, the outside carburettor base may be used as a reference point for the measuring gauge.

2 Adjust the throttle cables by starting with the opening cable first. Loosen the locknut on the throttle opening cable, and use the adjuster to take up any slack in the cable before securing the locknut again. Loosen the locknut on the closing cable, and adjust it so there is about 1/16 inch (2 mm) of play in the throttle grip, then secure the locknut.

3 Perform the following tasks as a prelude to the actual adjustment of the carburettors at any time they are rebuilt or replaced, and especially if the engine idles roughly.

4 Remove the carburettors as described in Section 4 of this Chapter. Turn the throttle stop screw so that there is 3/8 inch (10 mm) between the bracket and the underside of the screw head. Loosen the closed throttle stopper locknut, and rotate the eccentric stopper screw until there is about 1/16 inch (1.5 - 2.0 mm) clearance between the stopper and the top of the pulley.

5 Locate the notch that is cut into the bottom of the throttle slide, then loosen the locknut and rotate the adjusting screw until there is about 0.024 - 0.028 inch (0.6 - 0.7 mm) clearance between the notch and the bottom of the bore, then secure the locknut. **Note:** This is a very delicate operation and it must be carried out on each of the carburettors, so that the adjustment is exactly the same for all four.

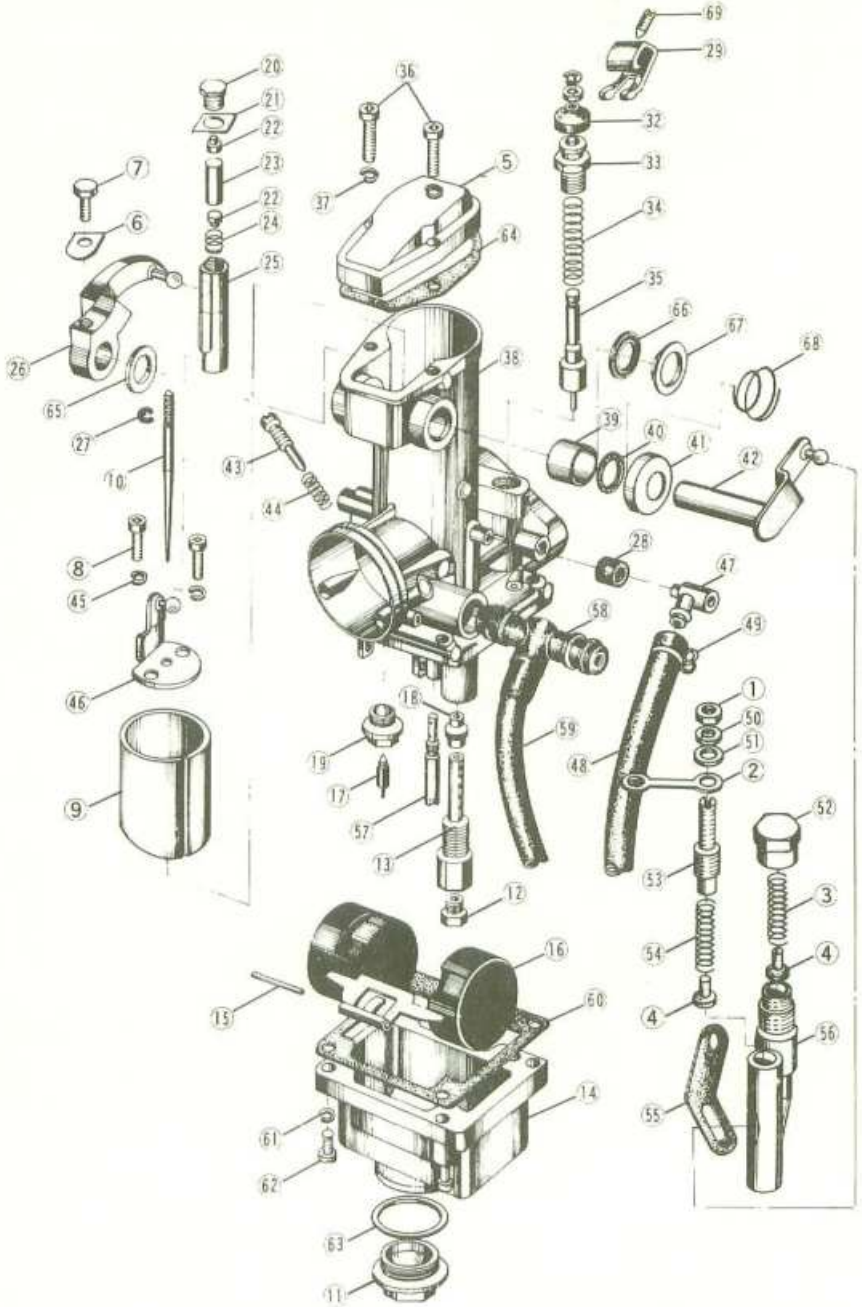
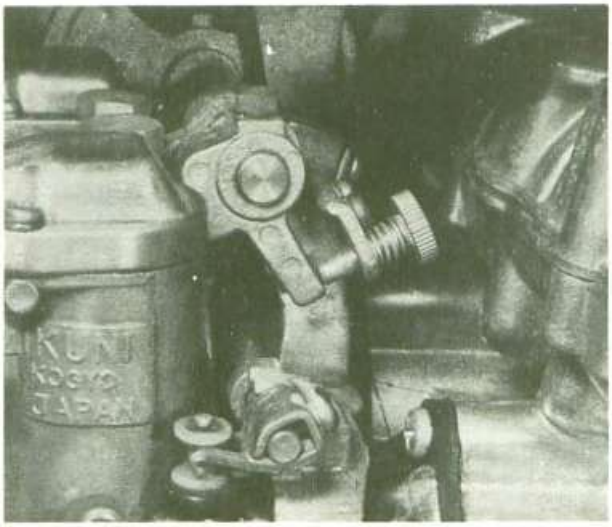
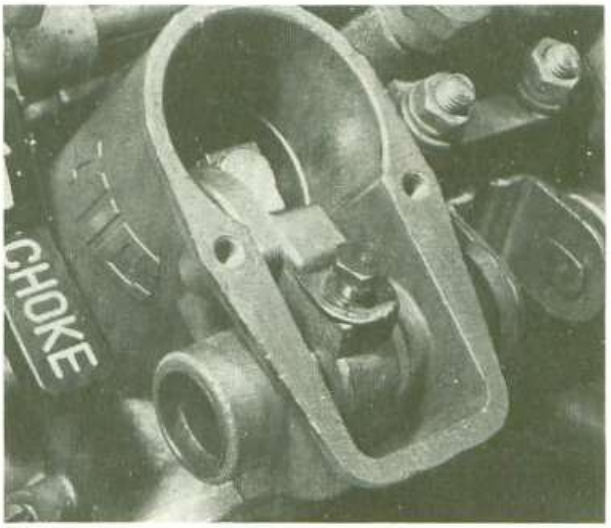


Fig. 2.4 Carburettor assembly

1 Throttle stop screw locknut
2 Double washer link
3 Spring
4 Spring seat
5 Top cover
6 Lock washer
7 Bolt
8 Screw
9 Throttle valve
10 Jet needle
11 Drain plug
12 Main jet
13 Air bleed pipe
14 Float bowl
15 Pin
16 Float
17 Float valve needle
18 Needle jet
19 Valve seat
20 Guide screw
21 Lock washer
22 Spring seat
23 Pin
24 Spring
25 Connector
26 Lever assembly
27 Circlip
28 Hose
29 Lever
30 Circlip
31 Ring
32 Cap
33 Guide screw
34 Spring
35 Plunger assembly
36 Bolt
37 Lockwasher
38 Mixing chamber
39 Hose
40 Washer
41 Cup
42 Lever assembly
43 Air screw
44 Spring
45 Lockwasher
46 Bracket assembly
47 Air vent pipe fitting
48 Air vent pipe
50 Lock washer
51 Washer
52 Cap nut
52 Cap nut
53 Throttle stop screw
54 Spring
55 Dust plate
56 Connector
57 Pilot jet
58 Fuel pipe fitting
59 Fuel pipe
60 Gasket
61 Lock washer
62 Bolt
63 'O' ring
64 Gasket
65 Spacer
66 Oil seal
67 Collar
68 Spring
69 Screw



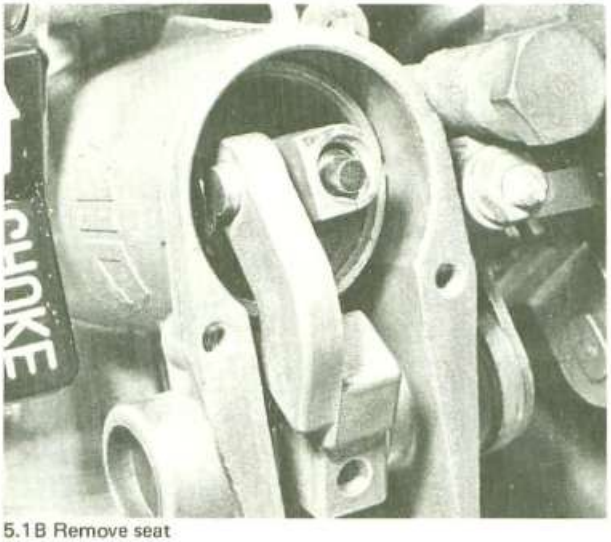
4.10 Throttle stop screw



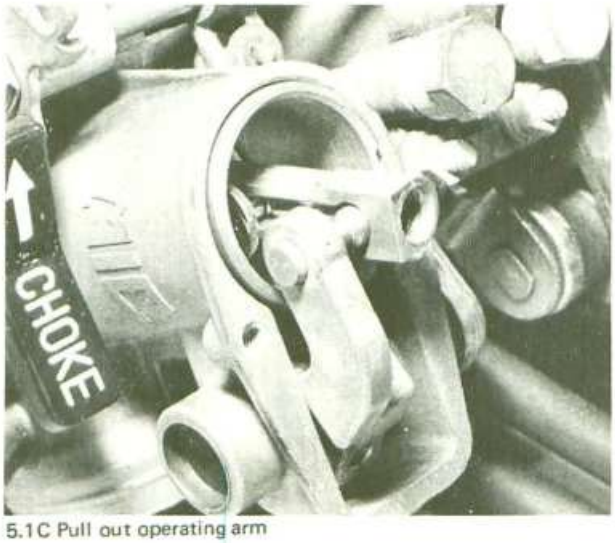
5.1 Remove top cover screws



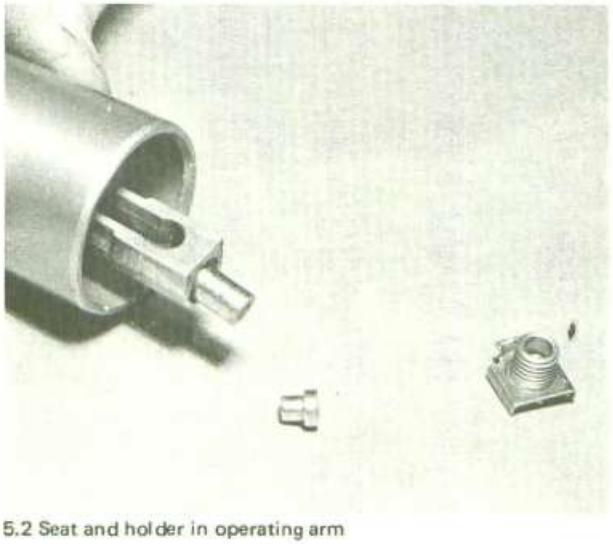
5.1A Bend back locktab

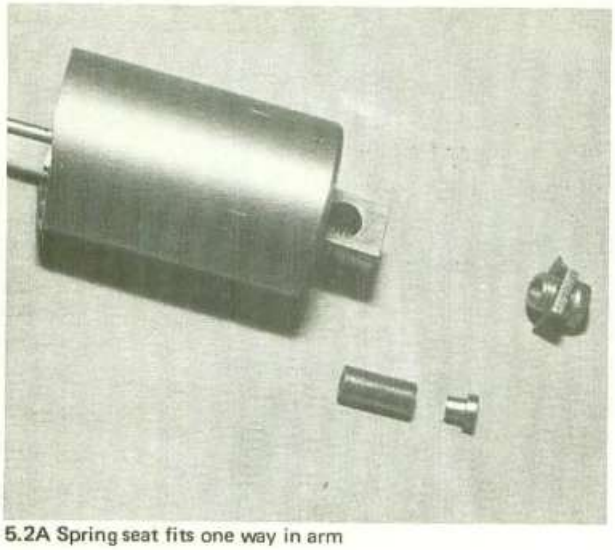


5.1B Remove seat

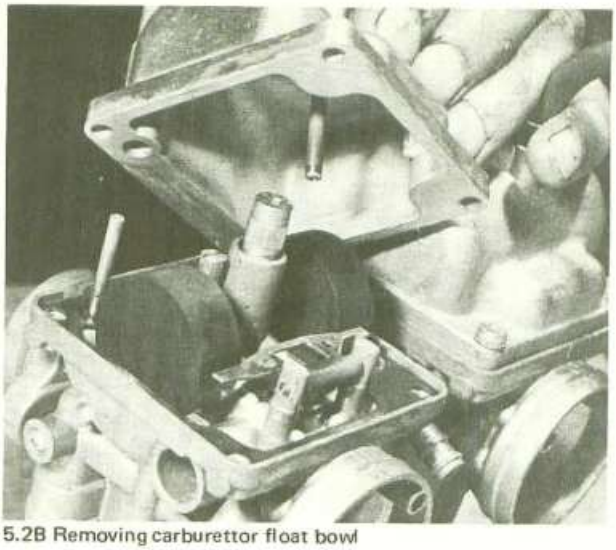


5.1C Pull out operating arm

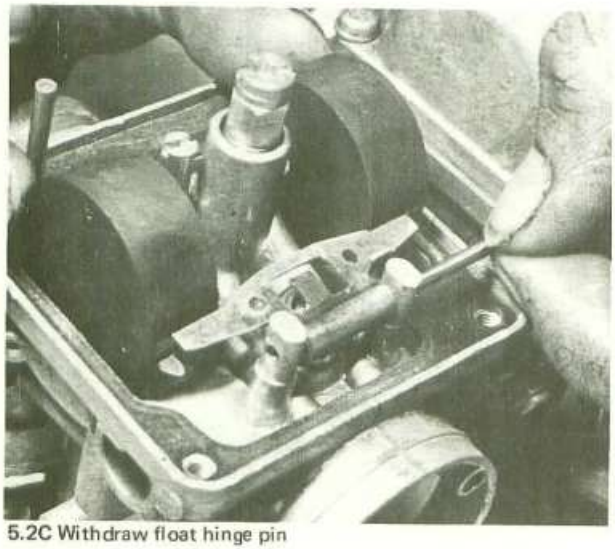

5.2 Seat and holder in operating arm



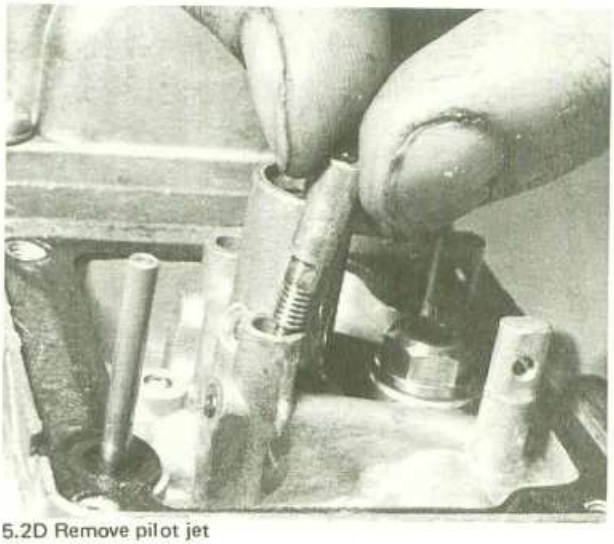
5.2A Spring seat fits one way in arm



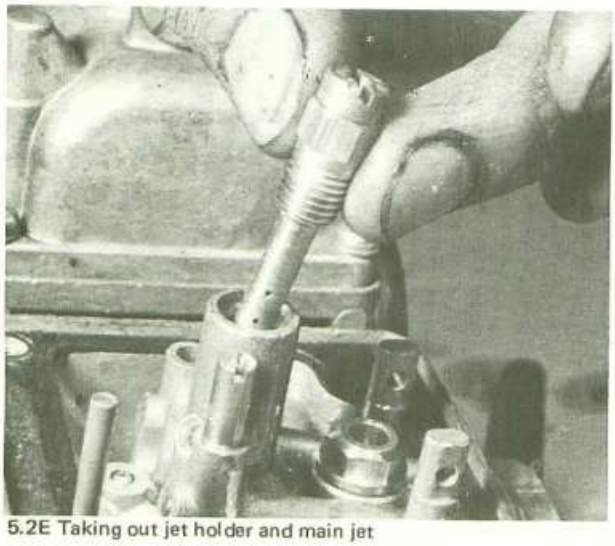
5.2B Removing carburettor float bowl



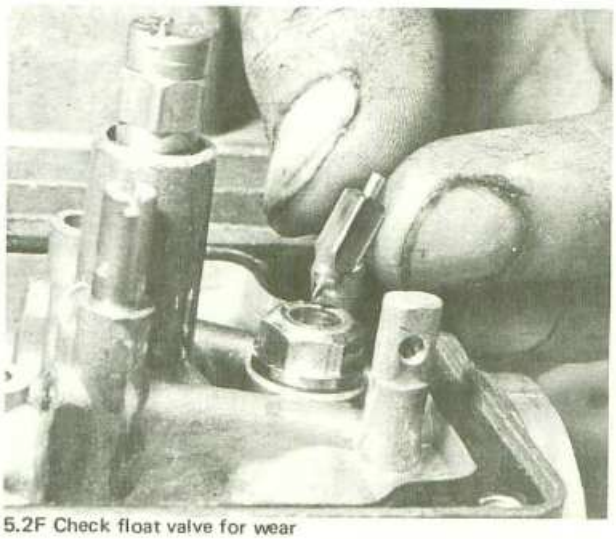
5.2C Withdraw float hinge pin



5.2D Remove pilot jet



5.2E Taking out jet holder and main jet

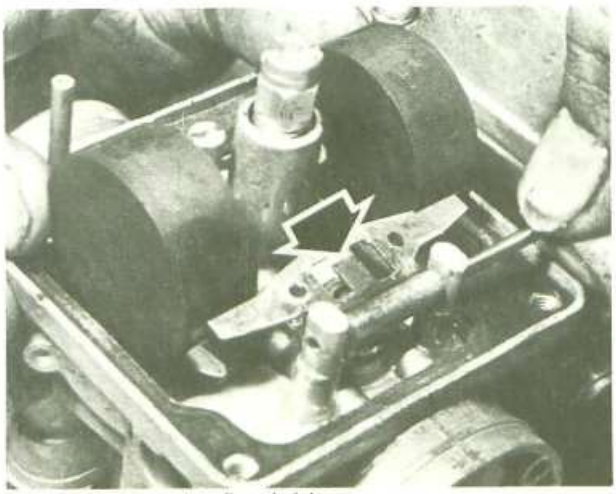


5.2F Check float valve for wear

6 Open the throttle by rotating the pulley until the bottom edge of the lowest of the four throttle valves is even with the top of the carburettor bore, then rotate the open throttle stop screw so that the pulley is stopped at this point.
7 Screw the pilot air screws into their seats gently and then turn each one out 1½ turns on all four carburettors, so that they are all equally adjusted.
8 To adjust the idling speed, start the engine and run for about five minutes until the normal operating temperature is reached, then adjust the engine idle speed using the throttle stop screw until the idle speed is about 800 - 1,000 rpm, registered on the tachometer. Adjust the pilot air screw on each carburettor to the position where the highest idle speed is reached. If the idle speed exceeds the limits given in the previous step, lower the speed to within the limits using the idling stop screw.
9 Turn in each air screw evenly only a fraction of a turn at a time, a quarter or half turn on each occasion, and then readjust the idle speed to 800 - 1,000 rpm.



5.6 Slide should be easy in bore



6.1 Bend tang to alter float height

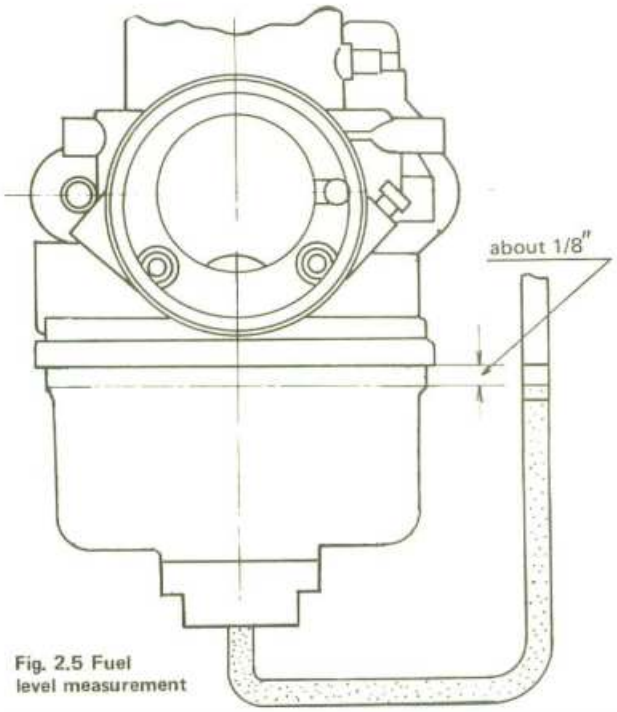


Fig. 2.5 Fuel level measurement

7 Carburettors: synchronising

1 Adjust the inlet manifold vacuum of each carburettor using the following method. This is a method that does not involve the use of vacuum gauges. The machine should be standing in a good airflow to keep the engine operating temperature down. Pay careful attention to the exhaust note, and place your hands behind the silencers to feel the exhaust pressure. Compensate for any variations in exhaust pressure by making adjustments to the throttle valve adjusting screw for the carburettor in question. A box spanner and a small screwdriver can be used to slacken the throttle adjuster locknut and rotate the adjusting screws. The task is made easier by raising the petrol tank at the rear, and propping it up with a suitable stay.
2 Readjust the air screws on any of the carburettors that have to be readjusted, then readjust the idling speed to within 800 - 1,000 rpm, by adjusting the throttle stop screw.
3 To adjust the carburettors with vacuum gauges, first remove the rubber caps from the vacuum fittings on the cylinder head on the early models, or on the carburettor intake manifolds on the later models. The vacuum gauges can now be attached, one hose to each of the four pipes, so that the four cylinders can all be read on the corresponding gauges. With the engine running at idle speed, close down the vacuum gauge intake valve until the gauge needle flutters less than 2 cm h.g. (0.8 in. h.g.).
4 The normal manifold vacuum gauge reading is 20 - 23 cm h.g. (8.9 in. h.g.) for each cylinder. If any gauge reads less than 15 cm h.g. (6 in. h.g.) recheck the pilot air screw adjustment, also make sure that the carburettor hose clamps and spark plugs are secure.
5 Balance the carburettors by adjusting the throttle valve adjusting screws as described in this Chapter, paragraph 6, Section 10. All the carburettors should be adjusted to within 2 cm h.g. (0.8 in. h.g.) of each other.
6 Open the throttle fairly rapidly and allow it to snap shut several times, while watching to see if the vacuum gauge readings remain the same. Readjust any carburettors whose readings have changed.
7 The vacuum gauges can now be removed. Replace the protective rubber covers on the adapters. Readjust any carburettor by the pilot screw and adjust the idle speed to about 800 - 1,000 rpm.

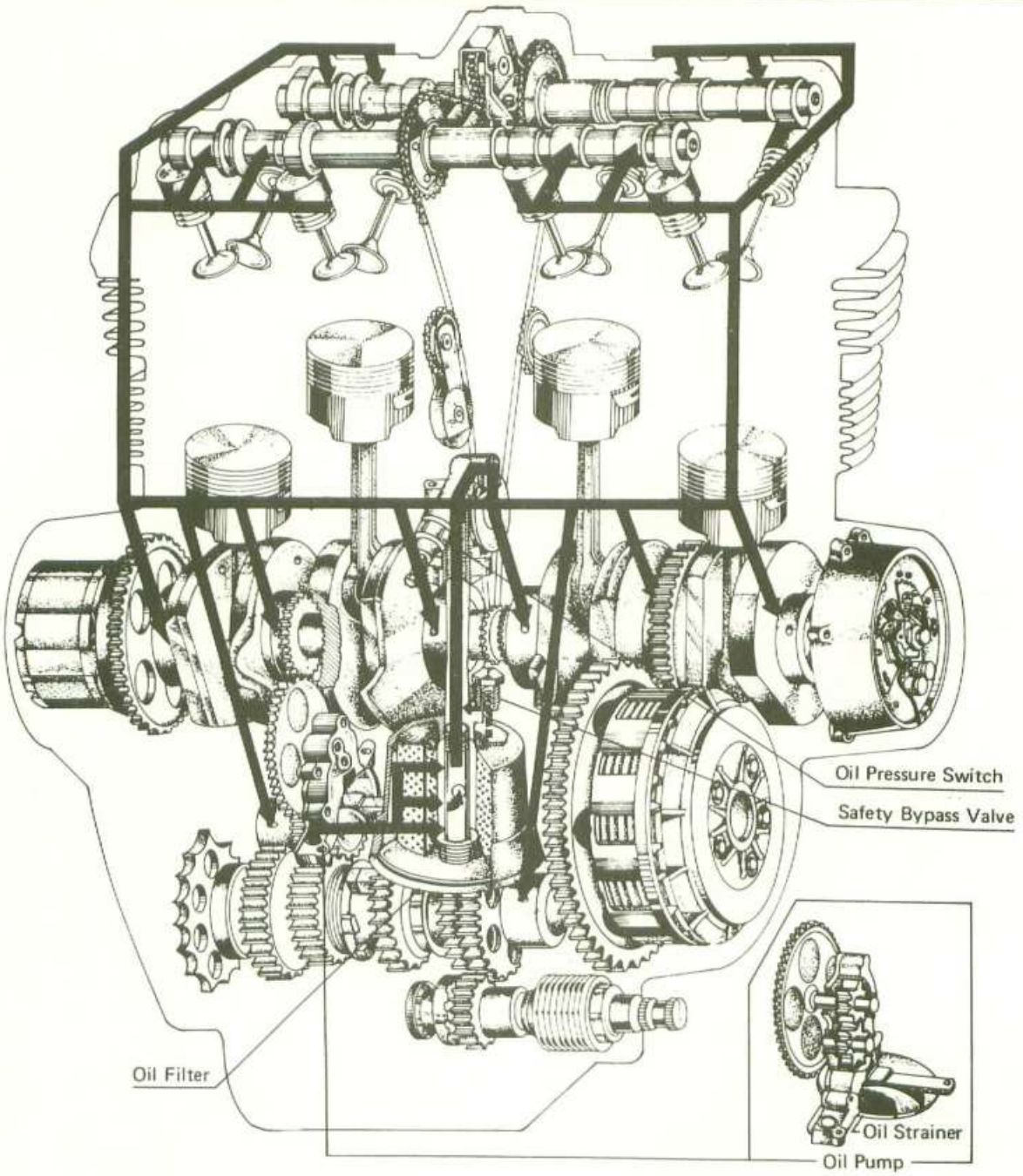


Fig. 2.6 The lubrication system

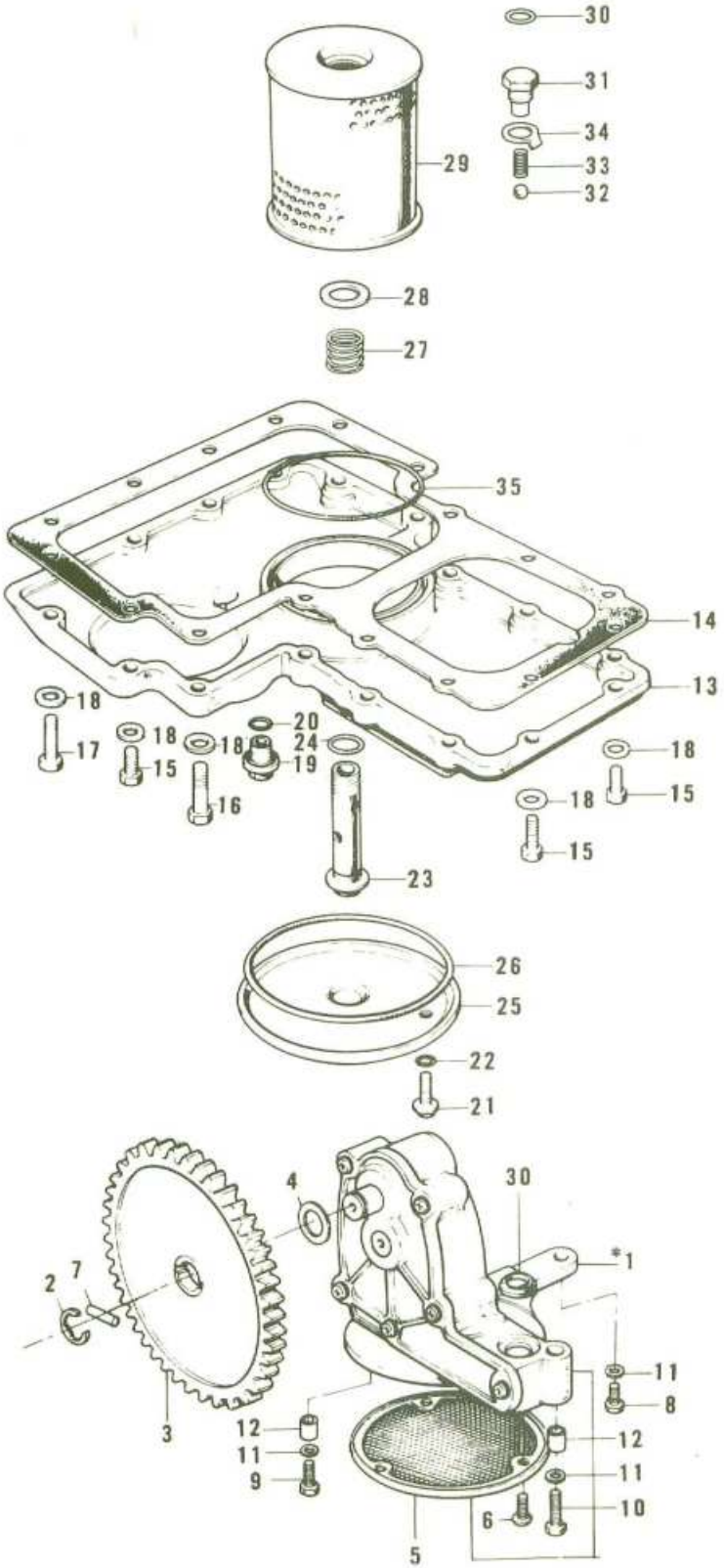


Fig. 2.7 Oil pump, oil filter and sump

1 Oil pump assembly
2 Circlip
3 Oil pump gear 49.7.
4 Oil pump washer
5 Oil pump gauze filter
6 Pan head screw - 3 off
7 Dowel pin
8 Bolt
9 Bolt
10 Bolt
11 Plain washer - 3 off
12 Dowel pin - 2 off
13 Oil sump cover
14 Oil sump cover gasket
15 Bolt for sump - 13 off
16 Bolt for sump - 3 off
17 Bolt for sump
18 Plain washer - 17 off
19 Oil drain plug for sump
20 'O' ring
21 Oil drain plug for filter
22 'O' ring
23 Oil filter bolt
24 'O' ring
25 Oil filter cover
26 'O' ring
27 Oil filter spring
28 Plain washer
29 Oil filter element
30 'O' ring - 2 off
31 Check valve bolt
32 Steel ball 3/8 inch
33 Check valve spring
34 Lock washer
35 'O' ring

8 Carburettors: settings

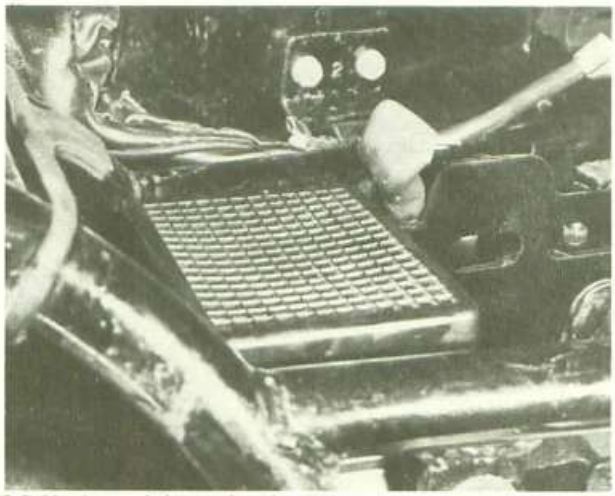
1 Some of the carburettor settings, such as the sizes of the needle jets, main jets, and needle positions are pre-determined by the manufacturer. Under normal riding conditions it is unlikely that these settings will require modification. If a change appears necessary, it is often because of an engine fault, or an alteration in the exhaust system eg: a leaky exhaust pipe connection or silencer.
2 As an approximate guide to the carburettor settings, the pilot jet controls the engine speed up to 1/8th throttle. The throttle slide cut-away controls the engine speed from 1/8th to 1/4 throttle and the position of the needle in the slide from 1/4 to 3/4 throttle. The size of the main jet is responsible for engine speed at the final phase of 3/4 to full throttle. These are only guide lines; there is no clearly defined demarkation line due to a certain amount of overlap that occurs.
3 Always err slightly towards a rich mixture as one that is too weak will cause the engine to overheat and burn the exhaust valves. Reference to Chapter 3 will show how the condition of the spark plugs can be interpreted with some experience as a reliable guide to carburettor mixture strength.

9 Air cleaner: dismantling, servicing and reassembly

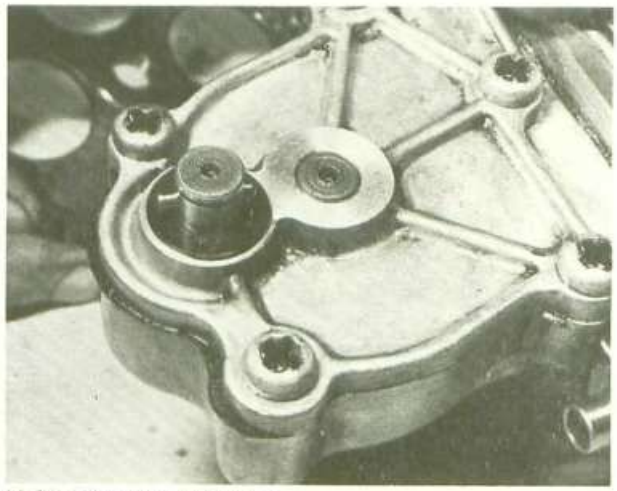
1 The air cleaner is mounted immediately behind the four carburettors into which the carburettor intakes fit. The air filter housing contains the element that is removable for cleaning or replacement, when necessary.
2 To gain access to the air filter element, lift up the dualseat and remove the screen that covers the top of the housing. The element can now be pulled out from the top.
3 Clean the element with petrol or a cleaning solvent and then blow it dry with compressed air from the inside. Do not use any cleaner that will not completely evaporate.
4 Inspect the element and also the sponge gaskets for signs of wear or damage, and replace the element if either are damaged. The sponge gaskets can be glued back on if they are loose and in good condition. Be careful, when installing the element, not to crimp the gaskets.
5 The average useful life span of one of these elements is approximately 8,000 miles or 12 months, whichever the sooner, also if it has been cleaned three or four times due to use in very dusty conditions.
6 **Never** run the machine without the air cleaner element, otherwise the permanently weak mixture that results will cause severe engine damage.

10 Engine and gearbox lubrication

1 As previously described at the beginning of the Chapter the lubrication system is of the wet sump type, with the oil being forceably pumped from the sump to positions at the gearbox bearings, the main engine bearings, and the cam box bearings, all oil eventually draining back to the sump. The system incorporates a gear driven oil pump, an oil filter, a safety by-pass valve, and an oil pressure switch. Oil vapours created in the crankcase are vented through a breather to the air cleaner box, where they are recirculated to the crankcase, providing an oil-tight system.
2 The oil pump is a twin shaft, dual rotor unit which is gear driven off the crankshaft. An oil strainer is fitted to the intake side of the pump, which serves to protect the pump mechanism from impurities in the oil which might cause damage.
3 An oil filter unit is housed in the bottom of the sump, in an alloy canister containing a paper element. As the oil filter unit becomes clogged with impurities, its ability to function correctly is reduced, and if it becomes so clogged that it begins to impede the oil flow, a by-pass valve opens, and routes the oil flow around the filter. This results in unfiltered oil being circulated


9.2 Air cleaner is located under dualseat


11.2 Remove circlip retaining gear


11.2A Alignment pin for gear

throughout the engine, a condition which is avoided if the filter element is changed at regular intervals.

4 The oil pressure switch, which is situated at the top of the crankcase behind the cylinder block, serves to indicate when the oil pressure has dropped due to an oil pump malfunction, blockage in an oil passage, or a low oil content. The switch is not intended to be used as an indication of the correct oil level.

5 As previously mentioned an oil breather is incorporated into the system. It is mounted in the top of the crankcase, and is essential for an engine of this size with so many moving parts. It serves to minimise crankcase pressure variations due to piston and crankshaft movement, and also helps lower the oil temperature, by venting the crankcase. The breather tube carries the crankcase vapours to the air cleaner housing where they become mixed with the air drawn into the carburettors. If the breather hose or the ports inside the breather become blocked, pressure may build up to such a level in the crankcase that oil leaks will occur. If the oil level is too high in the sump, this may result in oil misting severe enough to cause the air cleaner to become oil saturated. This will lead to poor carburation. Avoid overfilling the sump.

6 Excessive oil consumption as indicated by a blue smoke emitting from the exhaust pipes, coupled with a poor performance and fouling of spark plugs, is caused by either an excessive oil buildup in oil breather chamber, or by oil getting past the piston rings. First check the oil breather chamber and air cleaner for oil build up. If this is the fault, check the passageway from the air/oil separator in the oil breather chamber to the lower half of the crankcase. Blockage here will prevent oil flowing back into the crankcase, resulting in oil build-up in the breather chamber and air cleaner tube.

7 Be sure to check the oil level in the sump before starting the engine. If the oil level is not seen between the two marks adjacent to the sight 'window' at the bottom of the clutch cover, replenish with the correct amount of oil (8 pints) of the correct viscosity.

11 Engine and gearbox lubrication: the oil pump

1 The engine oil pump is driven by gear from the crankshaft. The pump works on the gear principal, with a pair of gears running in unison.

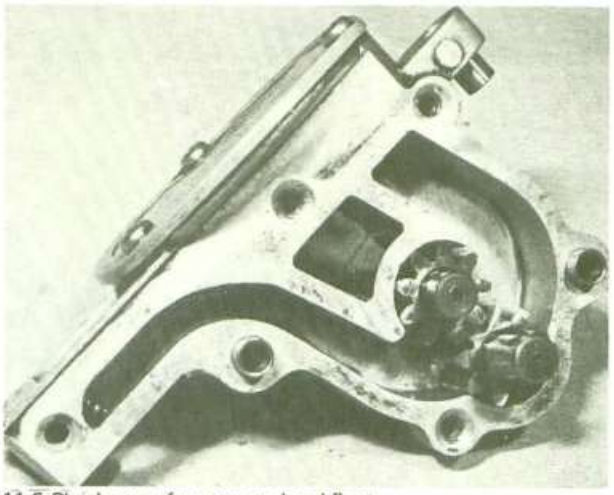
2 To dismantle the pump for inspection, the sump has to be removed, and the two screws that hold the pump body to the crankcase. The pump can then be lifted away. Secure the pump in a soft-jawed vice, or take precautions to avoid deforming the pump body. Remove the circlip retaining the main gear, the alignment pin, and the shim.

3 Remove the six crosshead screws that hold the two pump body halves together, then gently tap the two shafts alternately until the halves can be separated, without damaging the shafts.

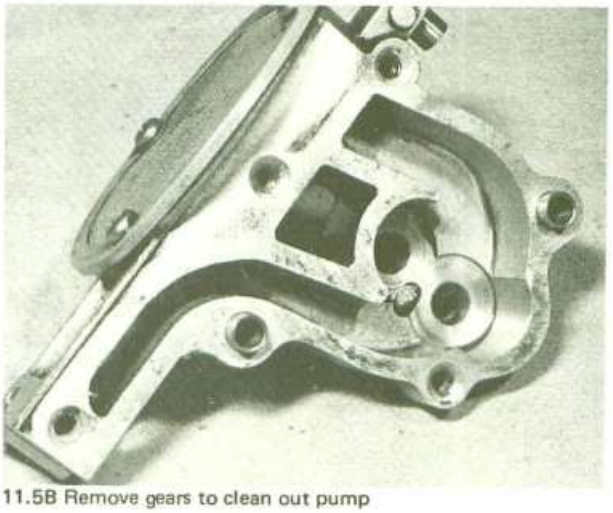
4 Clean the pump components thoroughly in petrol or a suitable solvent, then blow them dry. Inspect all the parts for a worn or damaged condition, and replace them as necessary. New gaskets and 'O' rings should be fitted.

5 Assemble the two internal gears in one side of the pump body, and check the clearance between each gear and the pump body with a feeler gauge. The standard clearance is 0.0001 - 0.0014 in. (0.003 - 0.036 mm). The pump must be replaced if it is worn beyond its serviceable limit of 0.004 in. (0.10 mm). The strainer screen should be inspected for damage or a permanently clogged condition and replaced if necessary. This is available as a separate replacement. The pump body and gears are sold as a complete unit only.

6 Assembly and re-installation of the pump is in the reverse order of dismantling. Make sure that the jointing surface of both pump body halves is in perfect condition, and is absolutely clean, and always use a new gasket during reassembly. Make sure that the pump drive gear meshes correctly with the crankshaft drive gear when replacing the pump. Also, when replacing the sump, make sure the gasket and surfaces are clean and that the sump pan screws are tightened in a diagonal sequence to avoid deforming the gasket.



11.5 Check gears for wear and end float



11.5B Remove gears to clean out pump

12 Rear chain lubrication: the chain oil pump

Z1 model only

1 The rear chain oil pump is located in the cover that shrouds the gearbox main drive sprocket. The pump is shaft driven, driving from the gearbox layshaft end. It is of the plunger type and is controlled by engine revolutions, since the layshaft drives the main sprocket and the pump shaft simultaneously. When the pump lever is adjusted for minimum flow (0 on a scale from 0 - 5), the length of plunger travel is at a minimum, and vice versa.

2 The pump is gravity fed from an oil tank mounted underneath the dualseat, through a hose. A non return check valve is mounted on the output side of the pump, and the oil flows through the hollow pump shaft to the output shaft where it exits through a series of drilled holes near the drive sprocket. As the output shaft rotates, the oil is flung onto the rear drive chain.

3 To remove the chain oil pump, unscrew the two crosshead mounting screws, and remove the pump. Insert a mounting screw into the feed hose to stop oil leaking from the hose.

4 Inspect all parts for a worn or damaged condition. The 'O'

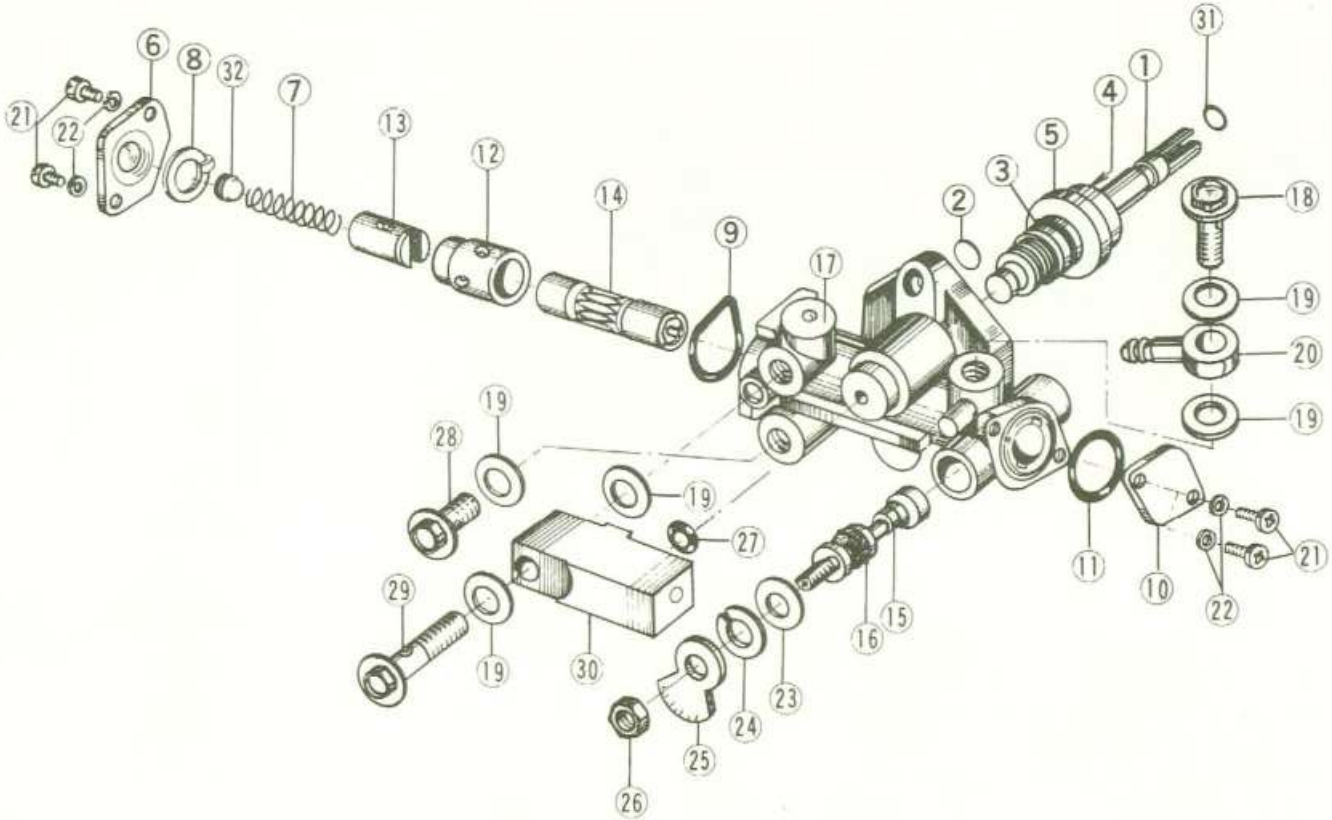


Fig. 2.8 Rear chain oil pump assembly

1	*Pump shaft*	9	*'O' ring*	17	*Oil pump body*	25	*Lever control*
2	*Spacer*	10	*Cap*	18	*Banjo bolt*	26	*Nut*
3	*'O' ring*	11	*'O' ring*	19	*Washer*	27	*'O' ring*
4	*Oil seal*	12	*Guide plunger*	20	*Banjo*	28	*Bleeder bolt*
5	*Bush*	13	*Plunger*	21	*Bolt*	29	*Bolt*
6	*Cap*	14	*Plunger*	22	*Lock washer*	30	*Check valve*
7	*Spring for plunger*	15	*Cam control*	23	*Washer*	31	*'O' Ring*
8	*Stopper guide plunger*	16	*'O' ring*	24	*Lock washer*	32	*Spring seat*

rings and the check valve are the only parts that normally wear, and consequently are the only available replacement parts If any other parts are worn or damaged, the complete pump assembly should be replaced.

5 Determine that the check valve will pass oil only in one direction, and that it is not clogged. The valve can be cleaned with petrol or solvent in a syringe. Whenever the pump is dismantled or if the oil supply tank runs dry while the pump is in operation, air will enter into the pump, which must then be bled. Do this by removing the bleeder bolt until oil starts to run from the hole, and then secure the bolt.

6 Assembly and installation are in the reverse order of removal. Lubricate the oil seal with clean oil before pressing it into position, and lubricate the 'O' and 'V' rings, plungers and plunger guide before assembly. Rotate the rear wheel until the pin in the layshaft is brought into line with the groove in the oil pump shaft. This is essential for correct installation as otherwise the pump will not seat correctly. Replace the mounting screws and secure them tightly. Bleed the pump by slackening the bleeder bolt until oil runs from the bolt and then secure the bolt. The pump cover can now be replaced. Check the level in the chain oil tank and replenish with SAE 30 or 40 oil. As previously mentioned the chain oil pump can be adjusted for oil flow 'O' supplies the least oil and 'S' is for maximum output. The chain should be kept just wet but not dripping. 'O' is usually the best position. The Z1-B models have dispensed with the chain oil pump altogether and use a prelubricated chain that requires attention only at infrequent intervals.

13 Fault diagnosis: Fuel system and lubrication

Symptom	Cause	Remedy
Engine will not start	Fuel starvation	Check if fuel flows to the carburettors when sucking main tube to fuel tap Check air vent in fuel tank cap. Check strainer and clean. Check float valves in carburettors. Clean and reset.
Engine runs erratically and will not pull	blocked jets	Remove jets, and clean.
Engine overheats and starts to pink	Shortage of oil	Check oiling system and refill if oil level is low
Engine starts to smoke excessively in traffic	Oil breathing system blocked	Clean out return oil passage from breather to sump.
Rear chain throwing excessive oil	Chain oil pump set incorrectly (Z1 models only)	Remove oil pump cover and reset gauge to 'O'

Chapter 3 Ignition system

Contents

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Specifications

Spark plugs	
Make	NGK *
Size	14 mm
Type	B8ES (B9ES - high speeds) Alternative: Motorcraft AG1
Gap	0.028 inch to 0.031 inch (0.7 - 0.8 mm)
Contact breaker points gap	0.012 - 0.016 inch (0.3 - 0.4 mm)
Ignition timing	From 5° BTDC @ 1,500 rpm (20° BTDC @ 1,500 rpm - Z1-B) To 40° BTDC @ 3,000 rpm

** Manufacturers recommendation*

1 General description

1 The spark necessary to ignite the petrol vapour in the combustion chambers is supplied by a battery and two ignition coils (one coil to two cylinders).

There are two sets of contact breaker points, two condensers, four spark plugs and an automatic ignition advance mechanism. The breaker cam, which is incorporated in the advance mechanism, opens each set of points once in 180° of crankshaft rotation, causing a spark to occur in two of the cylinders. The other set of points fires 180° later, so that in every 360° of crankshaft rotation each plug is fired once. One extra spark occurs during the time when there is no combustionable material in the chamber.

Each set of points has one fixed and one movable contact, the latter of which pivots as the lobe of the cam separates them. The two condensers are wired in parallel, one with each set of contact points, and these function as electrical storage reserviors, whilst also preventing arcing across the points. The condensers serve to absorb surplus current that tries to run back through the system when there is an overload situation, and feeds the current back to the ignition coils. They also help intensify the spark. When the points are closed, the current flows straight through them to earth. When they open, there is now an open circuit. If not for the condensers, the current may arc across the points causing them to burn and pit. When the condensers reach their capacity, they discharge the current back through the primary windings and eventually to the spark plug. Any time the points get badly burnt, it is advisable to renew them, and the condensers also.

Each of the two coils has two high voltage spark plug leads, and as in the case of points, one coil serves cylinders 1 and 4, and the other, cylinders 2 and 3.

The coils convert the low tension voltage into a high tension voltage sufficient to provide a spark strong enough to jump the spark plug air gap. If at any time a very weak or erratic spark occurs at the plug, and the rest of the ignition system is known to be in good condition, it is time to renew an ignition coil. Although coils normally have a long life they can sometimes be faulty, especially if the outer case has been damaged.

2 The automatic advance mechanism serves to advance the ignition timing as the engine R.P.M. rises. The mechanism is made up of two spring loaded weights which under the action of centrifugal force created by the rotation of the crankshaft fly apart and cause the contact points to open earlier. If the mechanism does not operate smoothly, the timing will not advance smoothly, or it may stick in one position. This will result in poor running in any but that one position. Sometimes the springs are prone to stretching, which can cause the timing to advance too soon. It is best to check the automatic advance mechanism, by carrying out a static timing test on the ignition followed by a strobe test. It is always best to check the motion of the weights by hand every 2000 miles and to clean and lubricate the unit at the same time.

3 The ignition system is operated by a key switch, mounted on a dash panel between the speedometer and the tachometer.



Spark plug maintenance: Checking plug gap with feeler gauges



Altering the plug gap. Note use of correct tool



Spark plug conditions: A brown, tan or grey firing end is indicative of correct engine running conditions and the selection of the appropriate heat rating plug



White deposits have accumulated from excessive amounts of oil in the combustion chamber or through the use of low quality oil. Remove deposits or a hot spot may form



Black sooty deposits indicate an over-rich fuel/air mixture, or a malfunctioning ignition system. If no improvement is obtained, try one grade hotter plug



Wet, oily carbon deposits form an electrical leakage path along the insulator nose, resulting in a misfire. The cause may be a badly worn engine or a malfunctioning ignition system



A blistered white insulator or melted electrode indicates over-advanced ignition timing or a malfunctioning cooling system. If correction does not prove effective, try a colder grade plug



A worn spark plug not only wastes fuel but also overloads the whole ignition system because the increased gap requires higher voltage to initiate the spark. This condition can also affect air pollution

There are three positions on the switch, OFF, ON, and PARK. In the OFF position all the circuits are turned off and the key can be removed from the switch. In the ON position the motorcycle can be started and all the lights and accessories can be used. The key cannot be removed from the switch when it is in this position.

In the PARK position, the tail light and parking light stays on, and the key can be removed from the switch. The charging of the battery that operates the ignition system is taken care of by an AC alternator that is mounted on the left-hand side of the crankshaft. This supplies current which is rectified by a rectifier, mounted on a panel alongside the voltage regulator, on the right-hand side of the machine below the dualseat.

2 Crankshaft alternator: checking the output

1 The alternator generates all the current required by the machines electrical circuits; the output is three phase alternating current (AC). The output is changed to direct current (DC) by the rectifier, the voltage being controlled by the voltage regulator. The alternator consists of a rotor and armature. Permanent magnets supply the magnetic field of the rotor, so that no slip rings or brushes are necessary. This makes the rotor practically maintenance free. The armature consists of three sets of coils wound on laminated steel cores. The coils are connected in a 'Y' pattern, so that there is always a smooth, ample supply of current available.

2 To check the output of the alternator, the battery and the rectifier must first be tested so that they are known to be good. If the battery shows less than the required 12 volts it should be fully charged.

3 Remove the right-hand side cover, and unplug the green regulator plug from the connector panel. Make sure that all the lights, indicators, are turned off then connect a voltmeter of 30 volts DC range, with the negative side of the voltmeter to the negative side of the battery and the positive side of the voltmeter to the positive side of the battery.

4 Start the engine, and run at 4,000 rpm. Note the meter reading. The voltage reading should be between 15 and 20 volts DC. A lower reading than this indicates the alternator is defective.

5 Turn off the engine and disconnect the voltmeter leads from the battery. Set an ammeter to the 12 amp DC range, unplug the wire that goes between the fuse and the starter relay, connect the positive meter lead to the white wire on the fuse side, and connect the negative meter lead to the white wire on the relay side. This places the ammeter in series with the rectifier and the battery so that the battery charging circuit current can be measured.

6 Note: If the ammeter is connected in series direct to the battery terminal instead of at the above point, do not use the electric starter to start the engine, otherwise the reverse starting current will damage the ammeter.

7 Turn on the ignition switch and start the engine. Hold the engine speed at 4,000 rpm and note the ammeter reading. The reading should be 9.5 amperes or more if it is normal. If the current is below this figure, the alternator is defective.

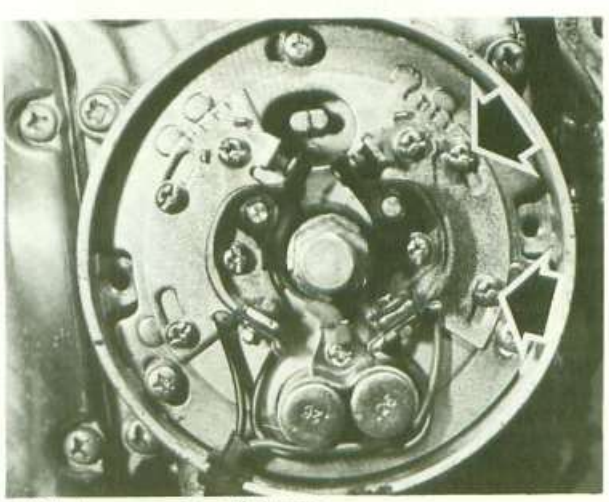
8 To determine if the trouble lies in the windings or the rotor, first turn off the engine and disconnect the blue plug from the connector panel. Using an ohmmeter with a scale of R.X.1, measure the resistance between each pair of the three alternator wires going to the connector plug: BLUE – PINK, BLUE – YELLOW, and PINK – YELLOW. The resistance between any two wires should be 0.45 to 6 ohms. Less than this resistance means that the coils are shorted out. A higher resistance or no reading at all means that the coils are open circuit. If the coils are found to be either shorted or open circuit, replace with a new stator assembly.

9 Using the highest resistance scale of the ohmmeter, measure the resistance between each alternator wire and earth (engine or frame). No reading is normal. Any meter reading indicates a short, and the stator assembly must be replaced.

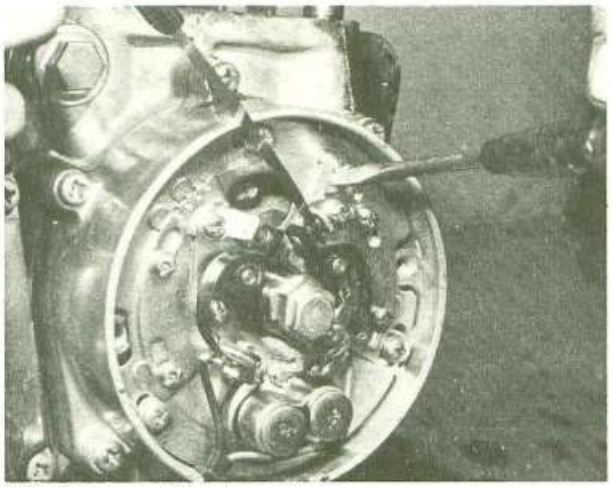
10 If the windings have a normal resistance, but voltage and current checks show the alternator to be defective, then the rotor magnets have probably weakened and lost their efficiency. The rotor must then be replaced with a new one.



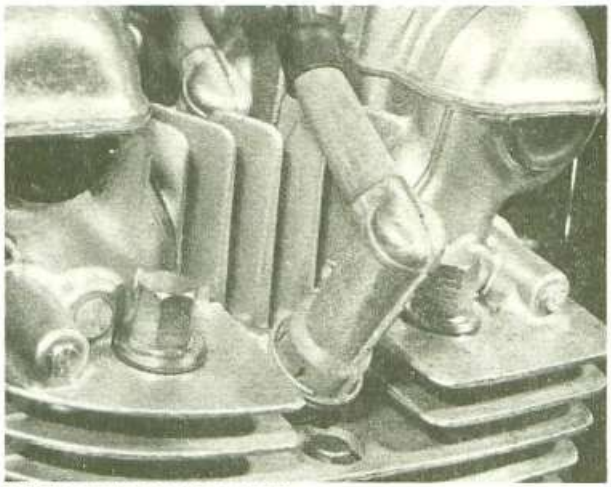
2.3 Take off side panel



4.3 Slacken screws for adjustment



4.3A Use a screwdriver in notches



9.3 Check plug caps for tracking

3 Ignition coils: checking

1 The ignition coils are a sealed unit designed to give long life, and are mounted on the frame tubes in the upper cradle behind the steering head. The most accurate test of a ignition coil is with a three point coil and condenser tester (electrotester).
2 Connect the coil to the tester when the unit is switched on, and open out the adjusting screw on the tester to 7 mm (0.28 inch). The spark at this point should bridge the gap continously. If the spark starts to break down or is intermittent, the coil is faulty and should be renewed.
3 It is not practicable to effect a satisfactory repair to a faulty ignition coil.

4 Contact breaker adjustments

1 To gain access to the contact breaker it is necessary to remove the cover plate screws and the cover on the right-hand front of the crankcase.
2 Rotate the engine by slowly turning it over with the kick-starter until one set of points is fully open. Examine the faces of the contacts for pitting and burning. If badly pitted or burnt they should be renewed as described in Section 5, of this Chapter.
3 Adjustment is carried out by slackening the screws on the base of the fixed contact, and adjusting the gap within the range 0.012 - 0.016 inch (0.3 to 0.4 mm) when the points are fully open by moving the base contact with a screwdriver at the slotted point. Retighten the two screws after adjustment with the feeler gauge and re-check the gap, then repeat the same operation for the other set of points. Do not forget to double check after you have tightened the setting screws, in case the setting has altered.
4 Before replacing the cover and gasket, place a slight smear of grease on the cam and a few drops of oil on the felt pad. Do not over lubricate for fear of oil getting on the points, and causing poor electrical contact.

5 Contact breaker points: removal and replacement

1 If the contact points are badly burnt or worn, they should be renewed. Undo the two screws that hold the base of the fixed contact of each set of points, and remove the wire leading to the condenser, which will allow the points to be lifted off. Removal of the circlip on the end of the pivot pin will permit the moving contact point to be detach. Note the arrangement of the insulating washers.
2 Replace the contact points by reversing the order of removal, making sure the insulating washers are in their correct order before replacing the contact arms.
3 Check and if necessary readjust the contact breaker gap. When the points are fully open the correct gap is within the range 0.012 to 0.016 in (0.3 to 0.4 mm).

6 Condensers removal and replacement

1 There are two condensers contained in the ignition system each one wired in parallel with a set of points. If a fault developes in a condenser, ignition failure is likely to occur.
2 If the engine proves difficult to start, or misfiring occurs, it is possible that a condenser is at fault. To check, separate the contact points by hand when the ignition is switched on. If a spark occurs across the points as they are separated by hand and they have a burnt or blackened appearance, the condenser connected to that set of points can be regarded as unservicable.
3 Test the condenser on a coil and condenser tester unit or alternatively fit a new replacement. In view of the small cost involved it is preferable to fit a new condenser, and observe the effect on engine performance as a result of the substitution.
4 Check that the screws that hold the condensers to the contact breaker plate are tight, and also form a good earth.

7 Ignition timing: checking and resetting static

1 In order to check the ignition timing statically it is necessary to remove the contact breaker cover, and check the point gaps first. Using a feeler gauge set the gaps within the range 0.012 - 0.016 in (0.3 - 0.4 mm) when each set of points is fully open.
2 Rotate the engine with a spanner on the timing shaft bolt, until the "F" mark on the timing advancer for the set of points to be adjusted is slightly to the left of the timing mark, located just above the timing advancer.
3 Connect a timing light (a tail light bulb and two pieces of wire one wire to the base of the bulb and one wire to the side of the bulb). Fit crocodile clips to the other ends of the wire, and connect wire to the rocker arm point spring, and the other to

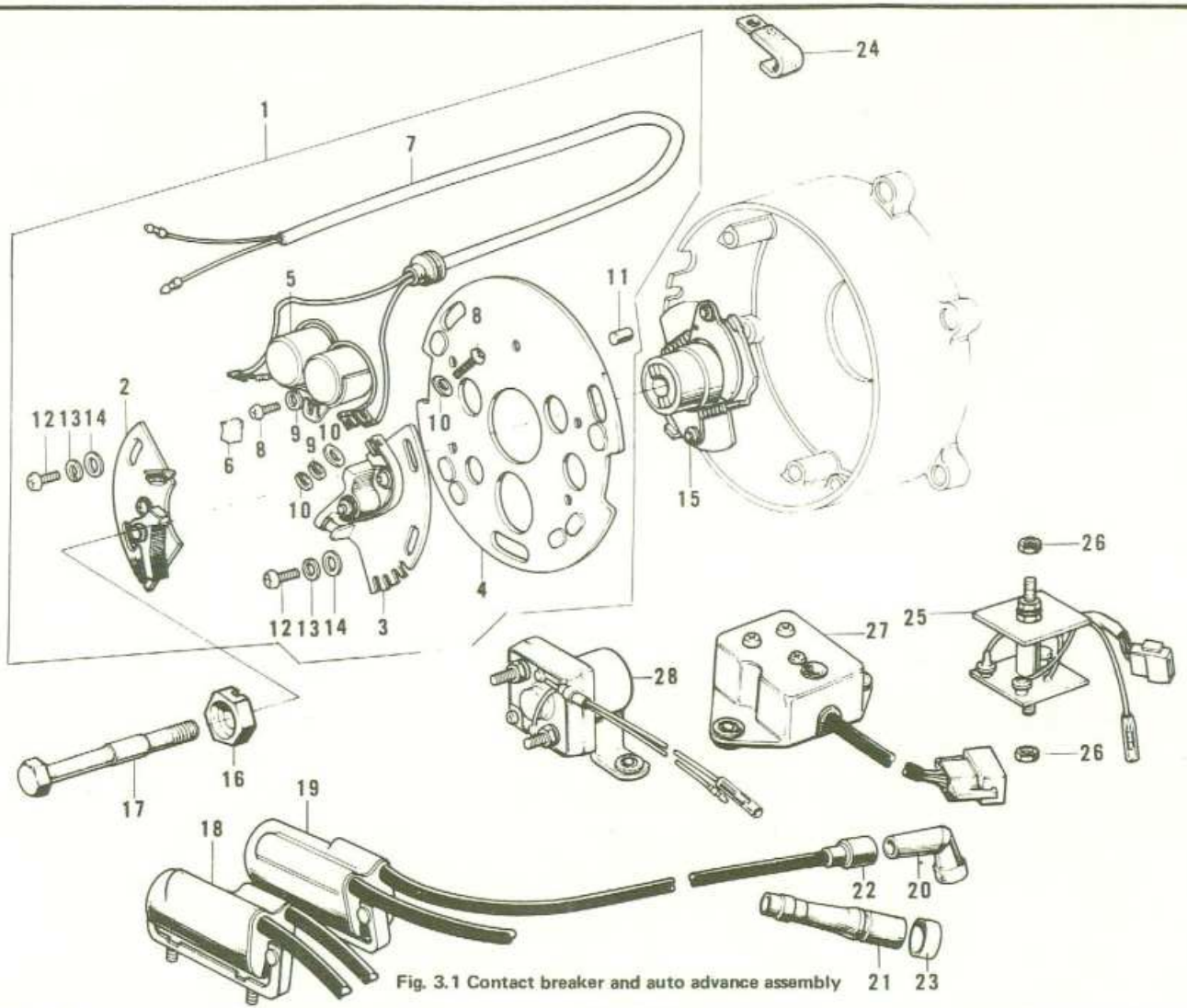


Fig. 3.1 Contact breaker and auto advance assembly

1 *Contact breaker assembly*
2 *Contact breaker left-hand*
3 *Contact breaker right-hand*
4 *Contact breaker base plate*
5 *Condenser assembly*
6 *Felt*
7 *Breaker wiring harness*
8 *Pan head screw - 9 off*
9 *Spring washer - 5 off*
10 *Plain washer - 4 off*
11 *Dowel pin*
12 *Pan head screw - 3 off*
13 *Spring washer - 3 off*
14 *Plain washer - 3 off*
15 *Auto advance assembly*
16 *Washer*
17 *Bolt*
18 *Igniton coil left-hand*
19 *Ignition coil right-hand*
20 *Spark plug cap - 2 off*
21 *Spark plug gap - 2 off*
22 *High tension wire grommet - 4 off*
23 *Spark plug cap grommet - 4 off*
24 *High tension wire clamp - 8 off*
25 *Rectifier*
26 *Nut - 2 off*
27 *Voltage regulator*
28 *Solenoid switch assembly*

earth (an engine cooling fin or the frame etc). Turn on the ignition switch, rotate the engine backwards a few degrees past the point of alignment, and then rotate forward again until the "F" mark is aligned with the timing mark. The light should flicker as the two come together. If it does, the timing is correct. Check in a similar fashion the other set of points.

4 If the mounting plate for the points has to be moved, loosen the two screws on the point adjusting plate and use a screwdriver to lever the plate in the position desired, so that the points just begin to open as the timing marks come into line. If the points adjusting plate will not travel far enough for any set of points, loosen the contact breaker base plate by unscrewing the three crosshead screws enough to rotate the baseplate to the required position. Secure the screws and recheck the timing before going on to the other set of points. **Note:** Do not leave the ignition switched on for long, just enough to set the timing, otherwise the points will burn.

5 If the light will not come on, there could be a bad connection, the points gap may need attention again, or the points may need cleaning thoroughly.

8 Ignition timing with a dial guage and buzzer

1 To carry out the timing with a dial gauge and buzzer, first remove the left-hand (no. 1) spark plug and screw the dial gauge into the plug hole of the cylinder head. Rotate the engine until T.D.C. (top dead centre) is shown on the gauge. Connect the timing buzzer with one lead to earth, and the other wire to the moving contact. Turn the face of the dial gauge until it reads zero. Clean the points of the cylinder to be timed and check that the gap is correct with the points fully open. Turn the crankshaft clockwise until the needle on the gauge shows the appropriate timing. The points should now close, which will be signified by the buzzer. If the points close too late, the points must be adjusted by turning the base plate in an anticlockwise direction, so that they close earlier. If they close too early, the baseplate must be turned in a clockwise direction. Repeat for cylinders 2 and 3 using the other set of points. Remember one set of points is marked on the timing plate for cylinders 1 and 4 and the other mark is for cylinders 2 and 3, with one set of points for each pair of cylinders.

2 The timing setting for the Z1 is 5° B.T.D.C. @ 1,500 rpm to 40° B.T.D.C. @ 3,000 rpm and for the Z1-B 20° B.T.D.C. @ 1,500 rpm to 40° B.T.D.C. @ 3,000 rpm.

9 Spark plugs: checking and resetting the gaps

1 The spark plugs fitted to the Z1 series are 14 mm NGK B8 ES this is the recommendation for standard road usage. Certain operating conditions may indicate a change in the grade of spark plug, although the type recommended by the manufacturer usually gives the best all round service and performance. For high performance use a grade higher - B9ES.

2 To reset the plug gap always gently tap the outer electrode. The special plug tool as shown in the diagram is the best method of making this adjustment without risk of damage. The correct gap is from 0.7 mm to 0.8 mm (0.028 – 0.031 inch).

3 When screwing the spark plugs into the cylinder heads, always use the plug spanner in the tool kit and do not over-tighten, otherwise damage will result to the threads of the cylinder head. If the plug threads are damaged they can usually be repaired by a competent dealer, using a Helicoil insert. These can be fitted at an economical price. Make sure the plug caps are a good fit, they should be kept clean to prevent tracking. The caps contain suppressors that eliminate both radio and TV interference

10 Fault diagnosis: ignition system

Symptom	Cause	Remedy
Engine will not start	Faulty ignition switch	Operate switch several times, in case the contacts are dirty. If the lights and other electrics function, the switch may need replacement.
Engine misfires	Faulty condenser	Replace with new condenser and retest.
	Faulty coil	Replace coil and retest.
	Fouled spark plugs	Replace with new plugs, and clean the originals.
	Poor spark due to generator failure, and discharged battery	Check the output of the generator. Remove and recharge the battery.
Engine lacks power and overheats	Retarded ignition timing	Check the contact gaps and ignition timing.
Engine fades when under load	Pre-ignition	Check the grade of plugs fitted. Change to recommended grade. Check ignition timing.

Chapter 4 Frame and forks

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Front forks: dismantling 3
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1 General description

1 The frame of the Kawasaki Z1 series is of the full cradle type, in which the engine is supported by duplex tubes at the base of the crankcase.

2 A top tube runs from the steering head to a position at the rear of the petrol tank; the frame is extended to the rear mudguard with provision for fitting the mudguard. Lugs for the attachment of the dualseat, the pillion footrests, rear brake pedal, centre stand and prop stand are fitted to the frame.

3 The front forks are hydraulically damped, consisting of two telescopic shock absorber assemblies, each of which comprises an inner tube, an outer tube, a spring and a cylinder, piston and valve. The whole fork assembly is attached to the frame by the steering head stem and is mounted on two bearing assemblies contained in the steering head housing.

4 The damping action of the fork is accomplished by the flow resistance of the fork oil flowing between the inner and outer tubes. The method of removal, dismantling, and reassembly of the complete fork assembly is described in the following text.

2 Front forks removal from the frame

1 The only time the front forks need to be removed from the frame as a complete unit is for renewal of the steering head races or if the machine suffers frontal impact in an accident.

2 Commence operations by removing the handlebar levers with their control cables attached.

3 Detach the handlebars by undoing the four top bolts holding the top clamps. Take off the handlebars, leaving the bottom clamp halves integral with the top fork yoke.

4 Disconnect the speedometer and the tachometer drive cables from their respective instrument heads, pull out the bulb holders from the back of the instruments once the covers have been removed, and also from the instrument panel (the bulbs are a push fit). Remove the mounting bolts that secure the instruments and ignition cluster assembly and remove the whole assembly.

5 Unscrew the three headlamp fixing bolts, one each side and one underneath. Take the snap connectors apart on the headlamp harness, and detach the headlamp from the machine.

6 The machine should be stood firmly on its centre stand. Place a support, such as a very stout wooden box, or a small jack using a piece of wooden board as a bearer for the jack, underneath the crankcase, so that the front wheel is well clear of the ground. Remove the speedometer cable from the front wheel.

7 Remove the four nuts that secure the front wheel spindle clamps, and then remove the clamps. The front wheel can now be removed. The four bolts that secure the front mudguard can be undone and the mudguard removed. **Note:** Under no circumstances operate the front brake while the front wheel disc is removed, or the caliper piston will be forced out of the cylinder.

8 Remove the caliper by undoing the two mounting bolts and place it out of the way. The brake pipe need not be disconnected from the caliper, however the assembly should either be tied to the frame, or rested on a suitable receptable, to avoid bending the brake pipe.

3 Front forks dismantling

1 It is advisable to dismantle each fork leg separately using an identical procedure. There is less chance of mixing the parts if this approach is adopted. Commence by draining the fork legs of oil. There is a drain plug in each leg located near the bottom of the outer slider. A Phillips screwdriver is necessary for this operation. Note that each drain plug has a copper sealing washer. Pump the forks up and down several times to expel all the oil.

2 The Allen bolts can now be removed from the bottom of the fork legs (these are recessed in the bottom of the outer lower slider). There are two of them, one to each fork leg. Removal of these Allen bolts releases the stanchion assembly.

3 Unscrew the fork cap bolts (these are also the filler caps) on the top of each fork leg, and remove the centre cap nut from the steering stem and the upper fork yoke.

4 Slacken the two top clamp bolts in the upper yoke, slacken the two clamp bolts in the lower yoke, and remove the four bolts. Use flat bladed screwdrivers to spread the clamps in the yokes which will permit the fork leg to be withdrawn more easily.

5 The spring and stanchion assembly can now be pulled out. Remove the circlip from the stanchion using circlip pliers, and remove the stanchion from the lower fork leg.

6 Remove the dust seal from the lower fork leg, and then

remove the circlip and the oil seal. The fork leg is now completely dismantled. Repeat for the other leg.

4 Steering head bearings: examination and renovation

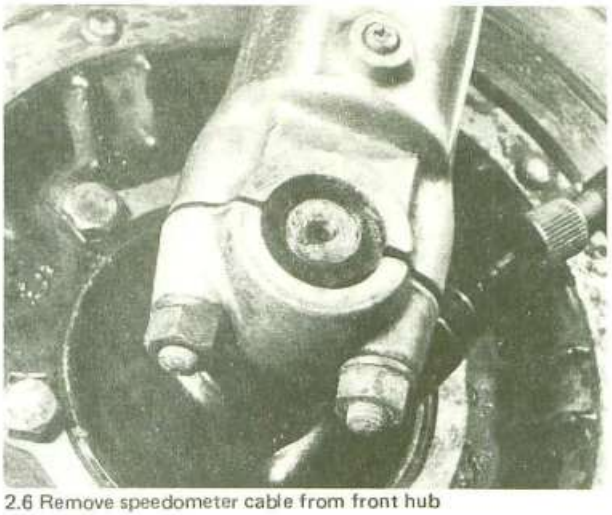
1 Before commencing reassembly of the forks, examine the steering head races. The ball bearing tracks of the cups and cones should be polished and free from indentures or cracks. If there are signs of damage or wear, the cups and cones must be renewed. New ball bearings should be fitted at the same time.
2 The cups are a tight push fit and should be drifted out of position.
3 There are thirty nine ¼ inch ball bearings fitted in the steering head, 19 in the top race and 20 in the botton race. They should be packed with new grease to hold them into position.

5 Front forks: examination and renovation

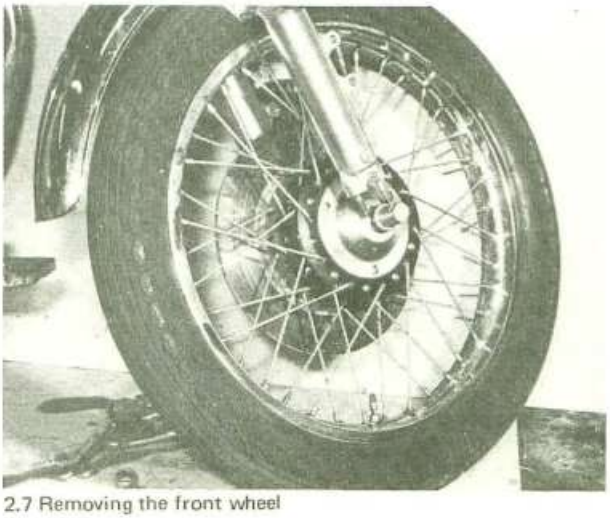
1 Clean all the fork components in a suitable solvent, and then blow them dry. Inspect all the components for wear, stripped threads, scoring or other damage and renew where necessary.
2 Inspect the stanchion for straightness by rolling it on a flat surface. If it is not too badly bent it is possible for an expert repairer to straighten it with a lathe and press. If it is severely bent however, it must be replaced with a new one.
3 Inspect the springs for signs of compression. After lengthy service, the springs can often be renewed to advantage. Measure the spring to check its free length. If the spring has compressed to less than 19 1/16 inch (485 mm), it must be renewed. It is essential to renew both springs at the same time as a matched pair.

6 Front forks replacement

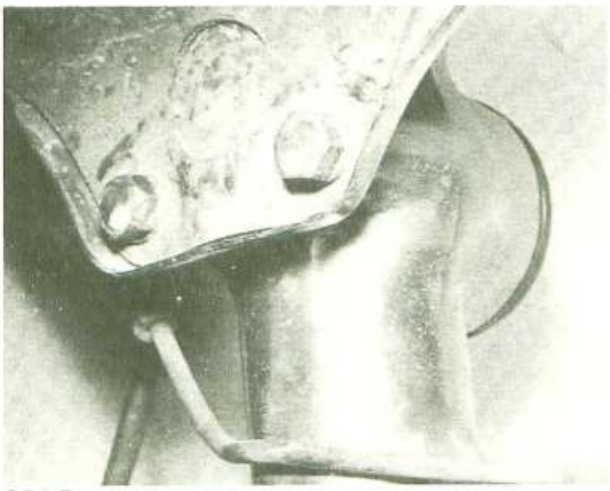
1 Replace the front forks by reversing either of the dismantling procedures described in Sections 2 and 3 of this Chapter, whichever is appropriate. Note that the damper unit must be locked into the fork by screwing in the Allen screw at the base, before the stanchion and spring are inserted.
2 Refit new oil seals to the lower fork legs and new circlips, if the old ones have opened too much.
3 Replace the fork legs in the bottom and top yokes. A flat bladed screwdriver will again be needed to prise open the fork yokes to facilitate entry of the stanchions.
4 Before tightening the top fork yoke make sure the flange surface of the fork leg cap is level with the top of the yoke.



2.6 Remove speedometer cable from front hub



2.7 Removing the front wheel



2.7A Four bolts secure front mudguard



2.8 Removing caliper mounting bolts

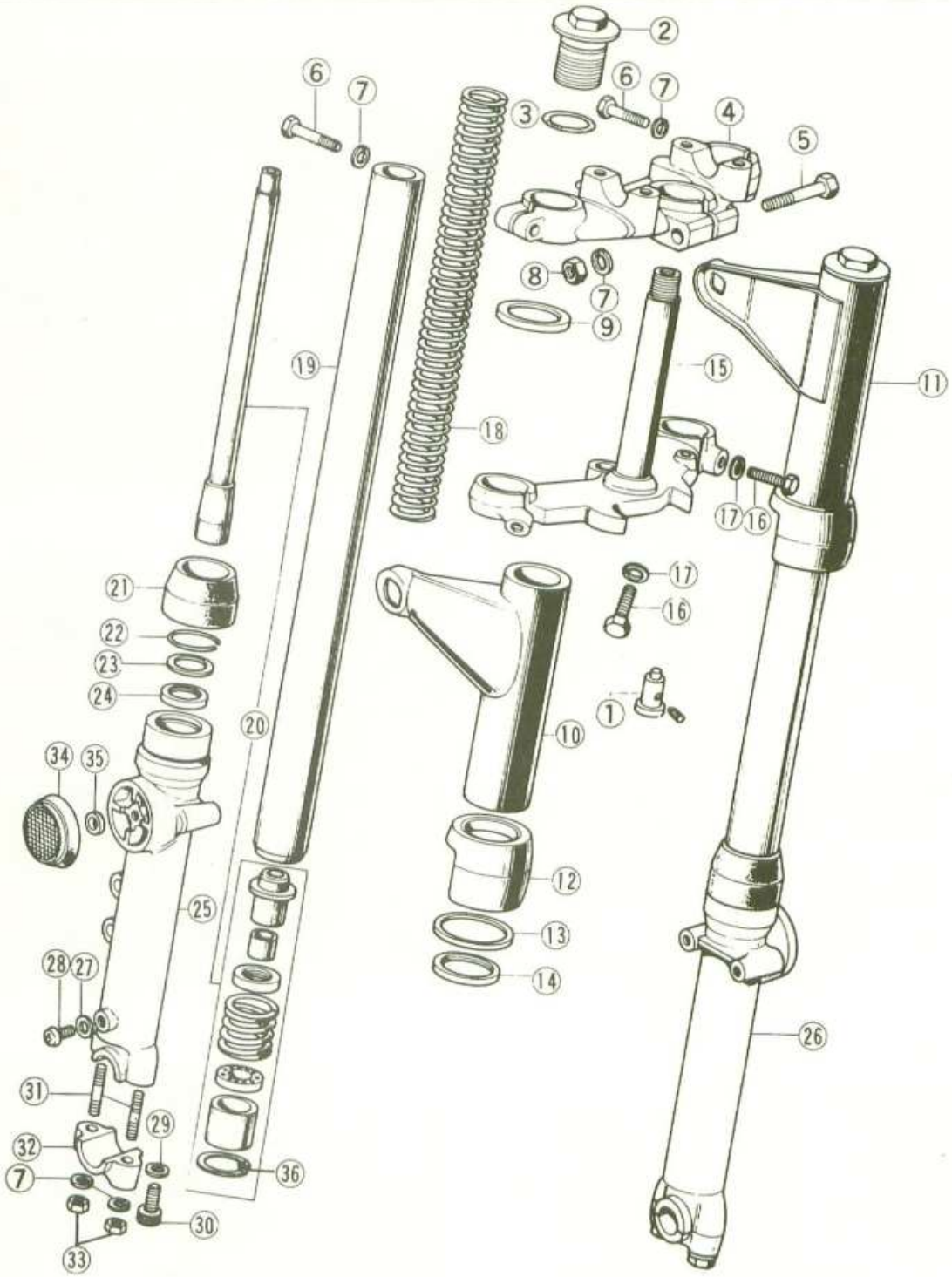


Fig. 4.1 Front fork components

1 Fork assembly complete
2 Fork cap bolt - 2 off
3 'O' ring cap bolt - 2 off
4 Steering stem top yoke
5 Bolt
6 Bolt - 2 off
7 Spring washer - 7 off
8 Nut
9 Fork cover washer - 2 off
10 Left-hand cover
11 Right-hand cover
12 Guide - 2 off
13 Guide washer - 2 off
14 Gasket - 2 off
15 Steering stem
16 Bolt - 2 off
17 Spring washer - 2 off
18 Fork spring - 2 off
19 Stanchion - 2 off
20 Fork damper - 2 off
21 Fork dust shield - 2 off
22 Circlip - 2 off
23 Plain washer - 2 off
24 Oil seal - 2 off
25 Left-hand lower fork leg
26 Right-hand lower fork leg
27 Fork drain plug gasket - 2 off
28 Pan head screw - 2 off
29 Damper bolt gasket - 2 off
30 Damper bolt - 2 off
31 Stud - 4 off
32 Front spindle holder - 2 off
33 Nut - 4 off
34 Reflector - 2 off
35 Reflector rubber - 2 off
36 Steering lock assembly
37 Key set
38 Screw steering lock

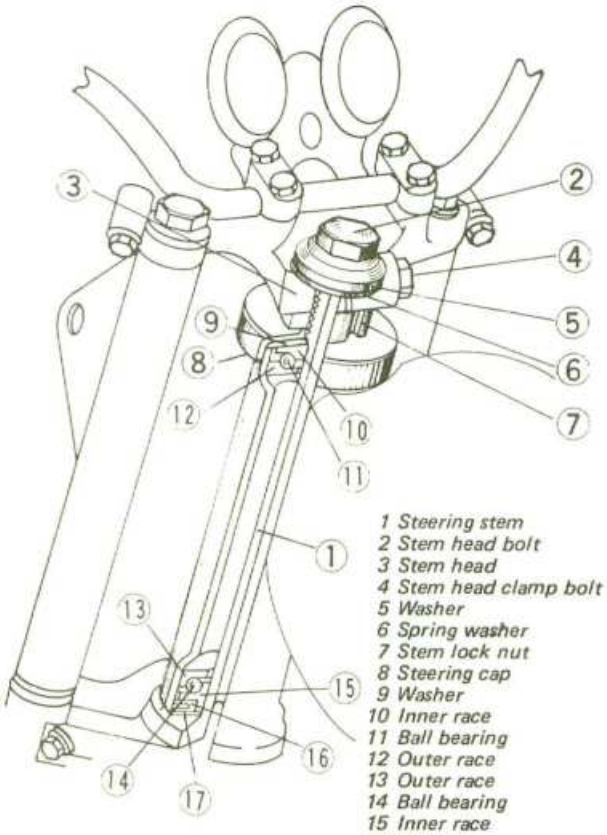


Fig. 4.2 Steering stem assembly

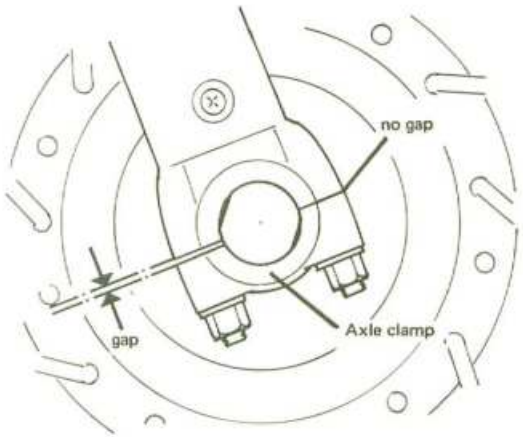


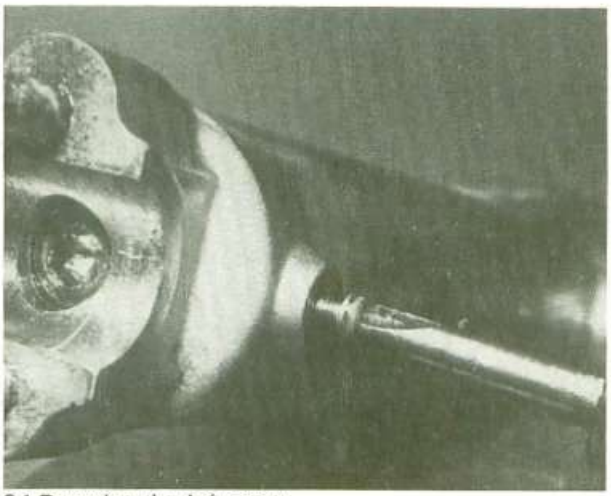
Fig. 4.3 Correct location of front spindle clamps

5 When the forks have been replaced, refit the front mudguard, by means of the four bolts inside the fork legs.

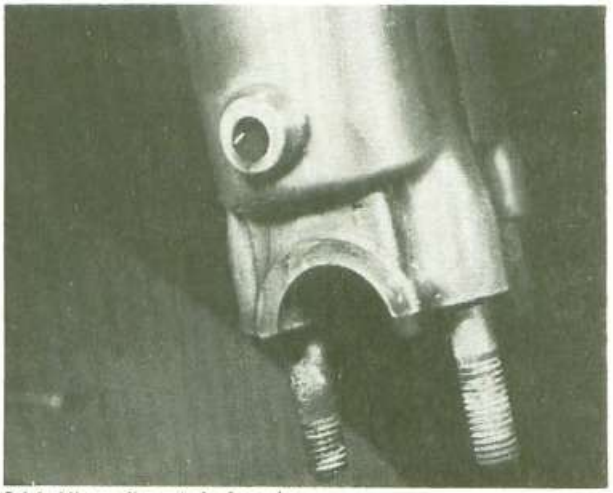
6 Refit the wheel in the bottom fork clamps, making sure they are correctly installed with the gap at the back, and no gap at the front.

7 Fill each fork leg with the correct quantity of oil. Each leg requires 169 cc (5.7 oz) of S.A.E. 10W. oil.

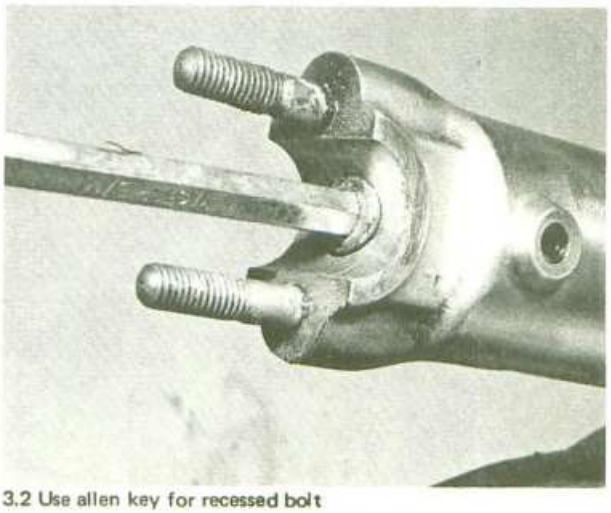
8 Before the machine is used on the road, check that the adjustment of the steering head bearings are correct. There should be no play at the steering head when the handlebars are pulled and pushed, with the front brake fully applied. The handlebars should swing from side to side with just a light tap, when the



3.1 Removing the drain screw



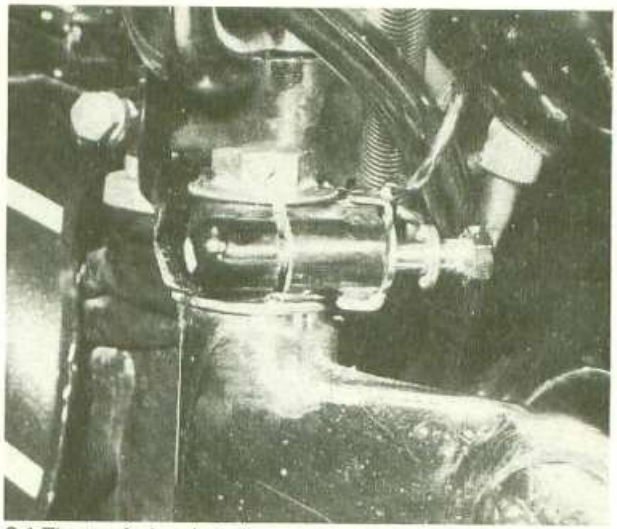
3.1A Allow oil to drain from leg



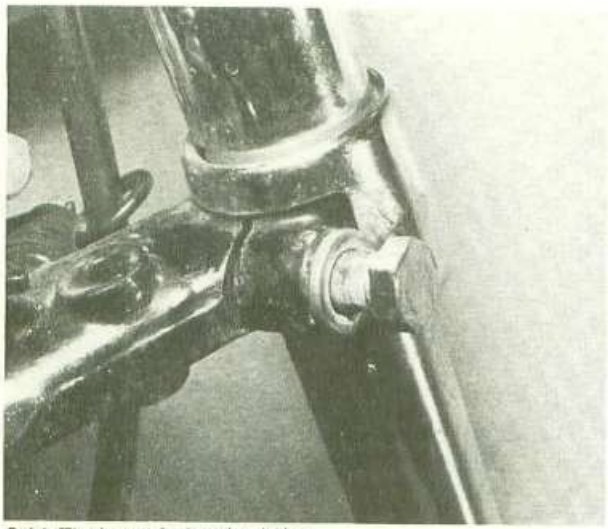
3.2 Use allen key for recessed bolt



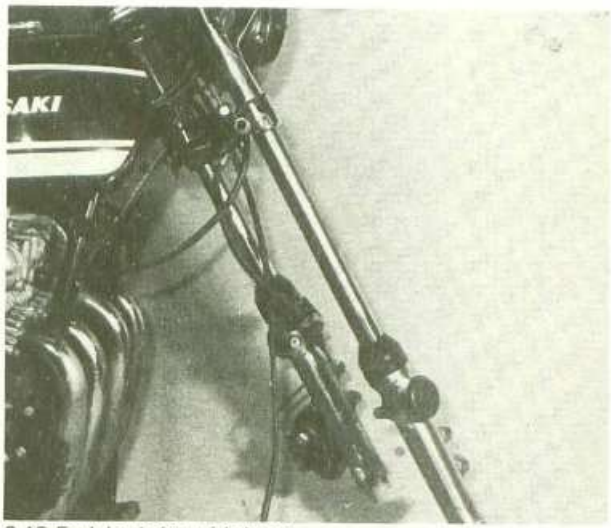
3.3 Unscrew fork cap bolts



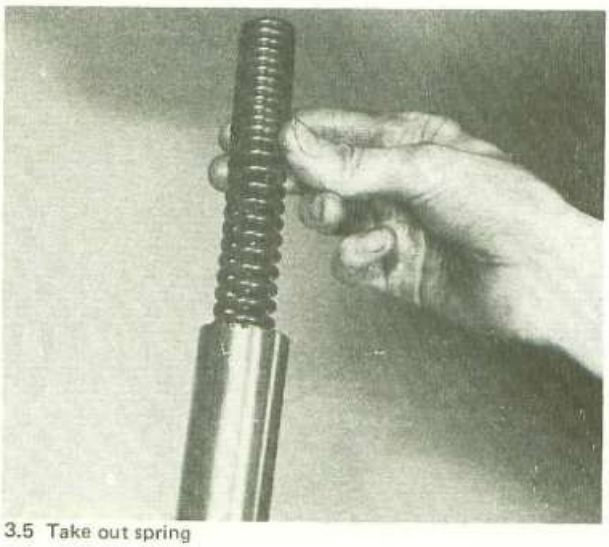
3.4 The top fork yoke bolts



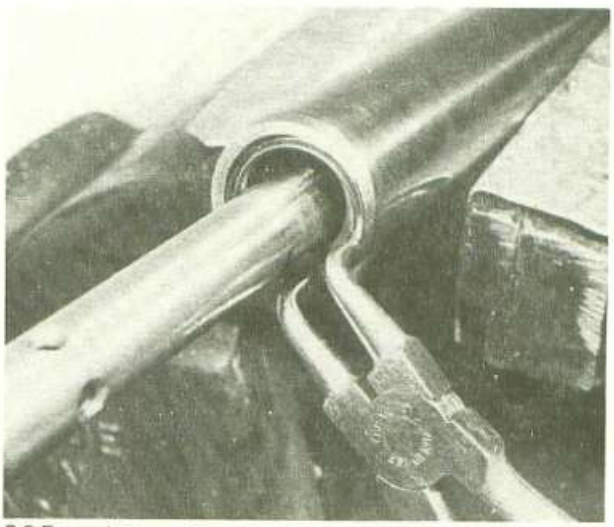
3.4A The lower fork yoke bolts



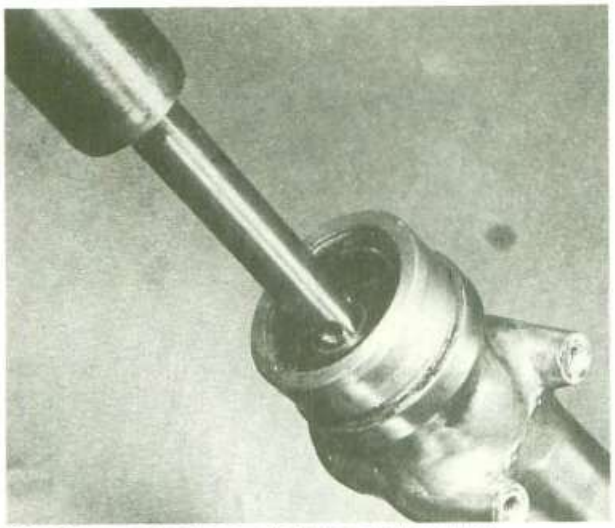
3.4B Fork leg being withdrawn



3.5 Take out spring



3.6 Removing stanchion



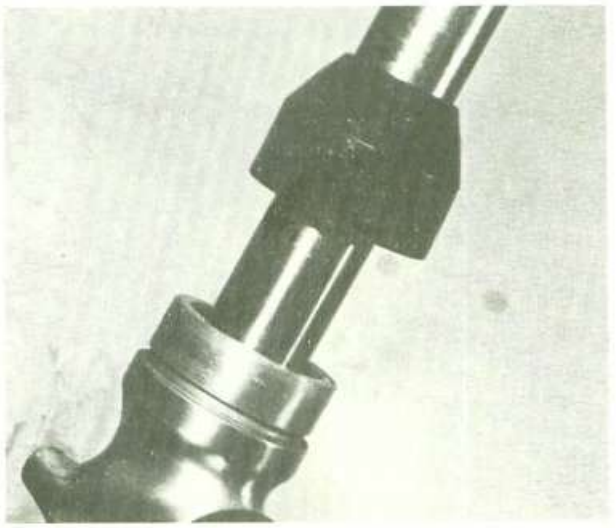
3.6A Take out stanchion with damper unit attached



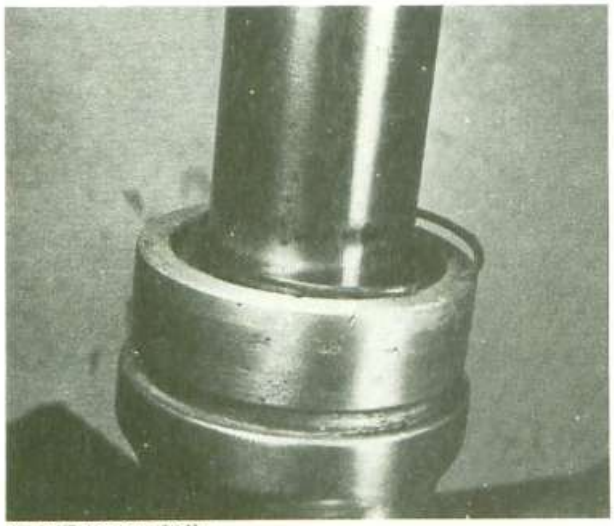
3.6B Check bushes for wear



3.6C End bush on damper unit



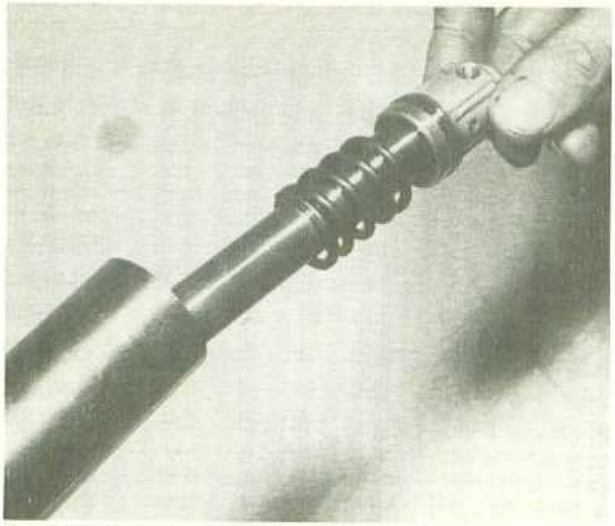
3.7 Remove dust seal



3.7A Take out circlip



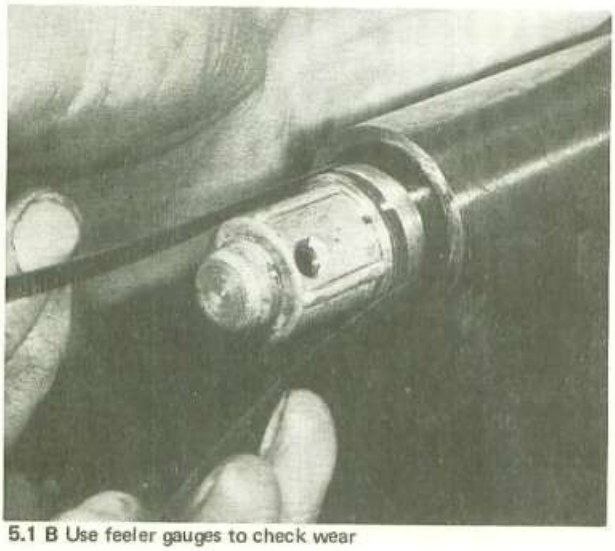
3.7B Oil seal fits inside leg



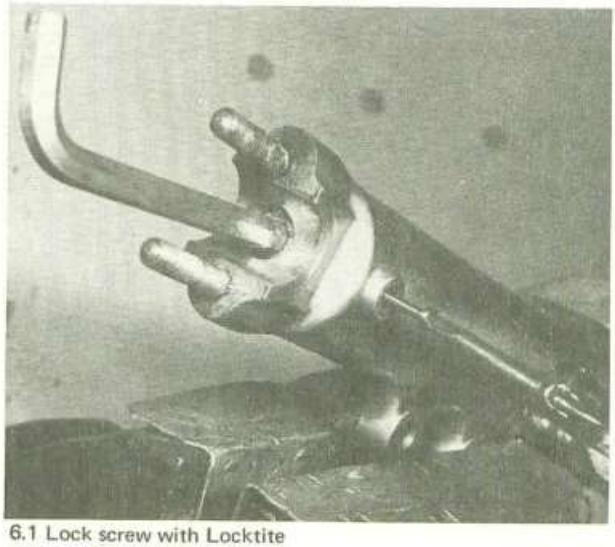
5.1 Clean all components before reassembly



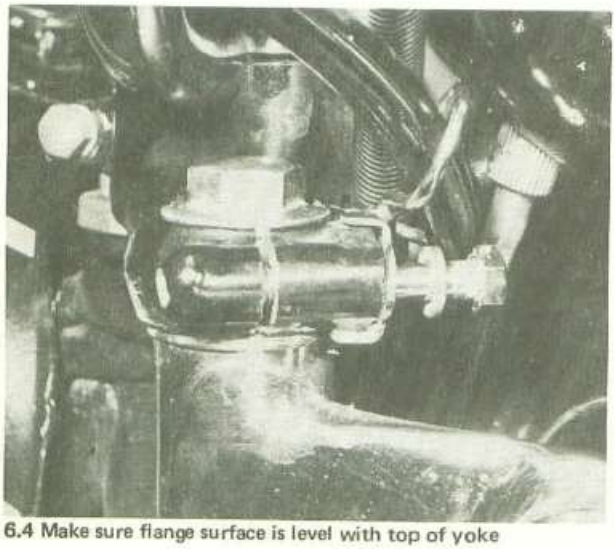
5.1A Check bushes are a good fit



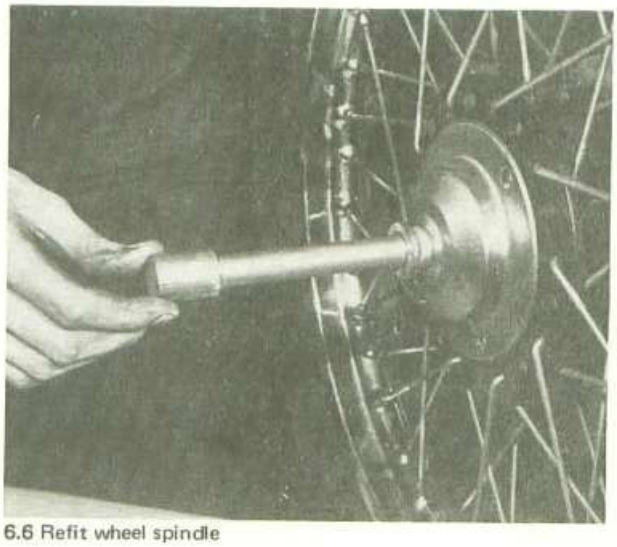
5.1 B Use feeler gauges to check wear



6.1 Lock screw with Locktite

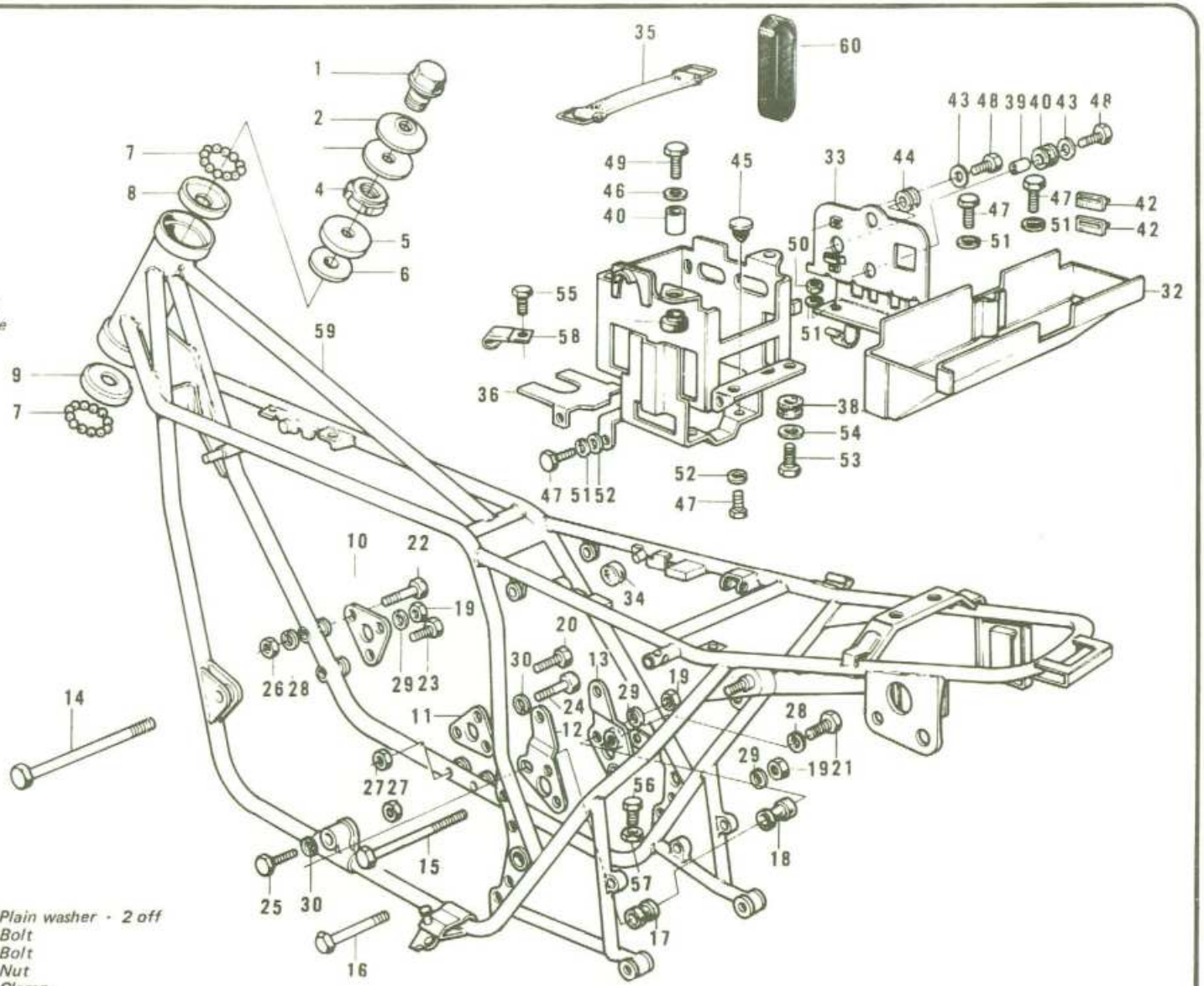


6.4 Make sure flange surface is level with top of yoke



6.6 Refit wheel spindle

Fig. 4.4 Frame assembly



1 *Steering stem head bolt*
2 *Washer for stem*
3 *Wave washer*
4 *Stem head cap nut*
5 *Steering head cap*
6 *Upper cone*
7 *Steel ball ¼" - 39 off*
8 *Upper race*
9 *Lower race*
10 *Front plate*
11 *Lower plate*
12 *Left-hand engine mounting plate*
13 *Right-hand engine mounting plate*
14 *Bolt*
15 *Bolt*
16 *Bolt*
17 *Collar*
18 *Collar*
19 *Nut - 3 off*
20 *Bolt - 2 off*
21 *Bolt - 4 off*
22 *Bolt*
23 *Bolt*
24 *Bolt*
25 *Bolt*
26 *Nut - 2 off*
27 *Nut - 2 off*
28 *Spring washer - 6 off*
29 *Spring washer - 3 off*
30 *Spring washer - 2 off*
31 *Battery case*
32 *Tool case*
33 *Electrics panel*
34 *Rubber for case - 2 off*
35 *Battery band*
36 *Air cleaner stay*
37 *Battery case rubber - 2 off*
38 *Rubber damper - 2 off*
39 *Collar - 2 off*
40 *Collar - 2 off*
41 *Rubber - 2 off*
42 *Rectifier seat - 2 off*
43 *Plain washer - 4 off*
44 *Rubber*
45 *Rubber - 4 off*
46 *Plain washer - 2 off*
47 *Bolt - 6 off*
48 *Bolt - 4 off*
49 *Bolt - 2 off*
50 *Nut - 2 off*
51 *Spring washe - 6 off*
52 *Plain washer - 2 off*
53 *Bolt - 2 off*
54 *Plain washer - 2 off*
55 *Bolt*
56 *Bolt*
57 *Nut*
58 *Clamp*
59 *Frame*
60 *Battery protector*

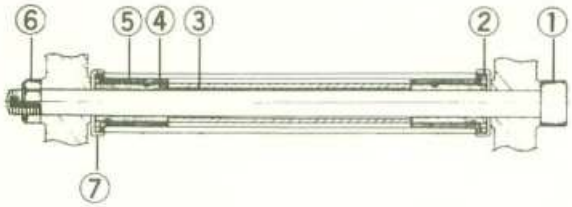
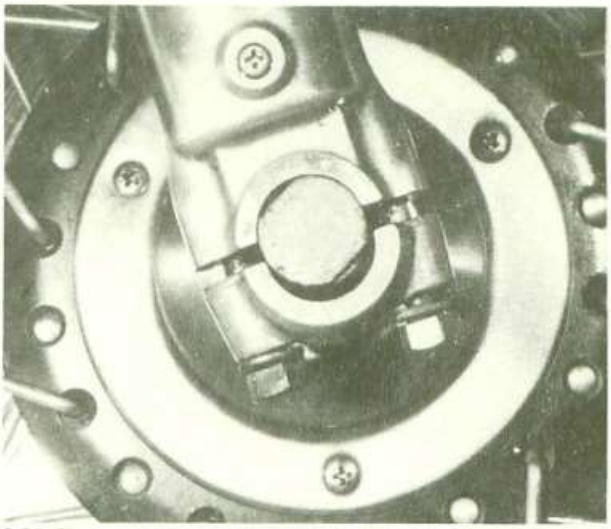
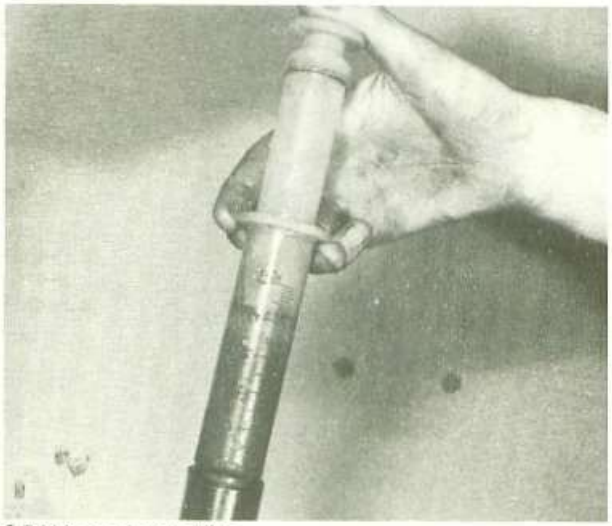


Fig. 4.5 Swinging arm pivot

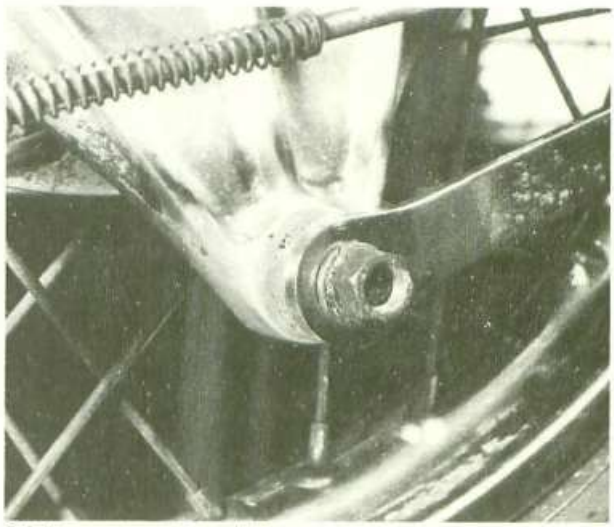
1 *Pivot shaft*
2 *'O' ring - 2 off*
3 *Collar*
4 *Sleeve*
5 *Bush - 2 off*
6 *Self-locking nut*
7 *Dust cap - 2 off*



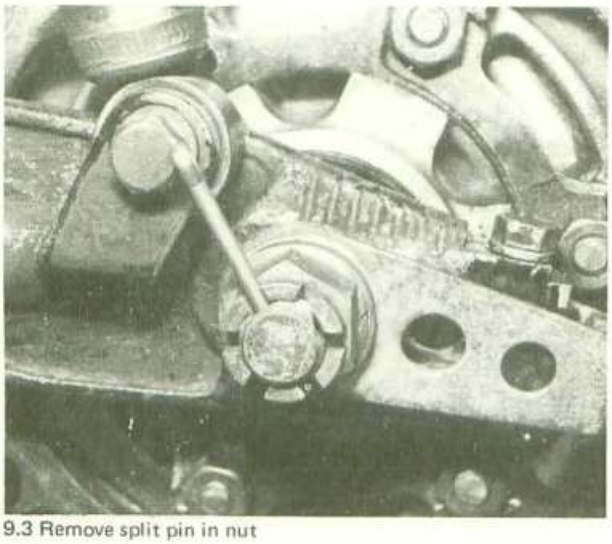
6.6A Clamp only fits one way round



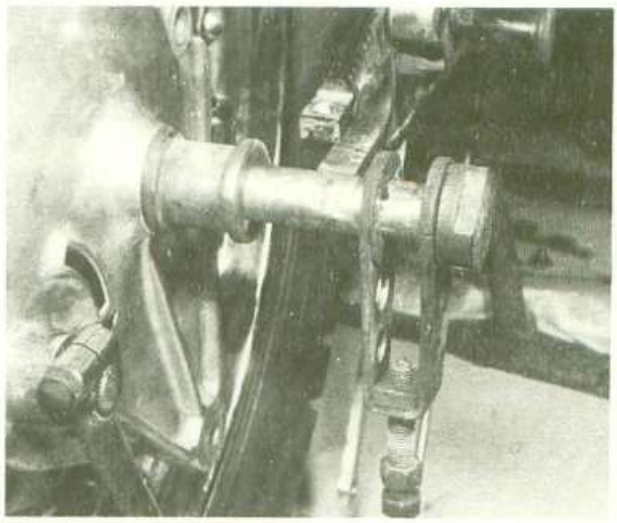
6.7 Using a plunger filler



9.2 Remove torque arm bolt



9.3 Remove split pin in nut



9.3A Leave adjusters to hang down

machine is on the centre stand with the front wheel raised clear of the ground.

7 Steering head lock: removal and replacement

1 The steering head fork lock is located under the bottom fork yoke. It is of the barrel type with a tongue that extends from the barrel when the key is turned. To lock the steering, turn the handlebars to the left, insert the ignition key, and turn clockwise. If a fault developes in the lock it must be replaced with a new one. It is removed by undoing the single grub screw that screws in behind the fork yoke. UK models have a Neiman lock secured by a rivet.

8 Frame: examination and renovation

1 The frame is unlikely to require attention unless accident damage has occured. In some cases, renewal of the frame is the only satisfactory remedy if the frame is badly out of alignment. Only a few frame specialists have the jigs and mandrels necessary for resetting the frame to the required standard of accuracy, and even then there is no easy means of assessing to what extent the frame may have been overstressed.
2 After the machine has covered a considerable mileage, it is advisable to examine the frame closely for signs of cracking or splitting at the welded joints. Rust corrosion can also cause weakness at these joints. Minor damage can be repaired by welding or brazing, depending on the extent and nature of the damage.
3 Remember that a frame which is out of alignment will cause handling problems and may even promote "speed wobbles". If misalignment is suspected, as a result of an accident, it will be necessary to strip the machine completely so that the frame can be checked, and if necessary, renewed.

9 Swinging arm fork: dismantling and renovation

1 The rear fork of the frame is of the swinging arm type. It pivots on a shaft that passes through the crossmember and both sides of the main frame assembly, with a spacing collar, two inner bushes, and two flanged outer bushes. The whole assembly is held together with a pivot shaft that is bolted up with a nut one end.

Worn swinging arm bushes can be detected by placing the machine on its centre stand and pulling and pushing vigorously on the rear wheel in a horizontal direction. Any play will be noticable by the leverage effect.
2 To remove the swinging arm fork, first position the machine on its centre stand, remove the rear brake adjuster and take out the torque arm bolt from the rear brake plate.
3 Remove the wheel by withdrawing the large split pin which locks the wheel nut, followed by the nut itself. Push the wheel forwards, having disengaged the adjusters, to allow the rear chain to be disengaged from the sprocket. Then pull the wheel rearwards out of the swinging arm. The chainguard can be removed by detaching the two fixing bolts.
4 Remove the lower two bolts that hold the suspension units to the swinging fork, so that the fork swings down. Leave the suspension units hanging from the frame, but slacken the top nut so that they are free to move. This facililates reassembly.
5 Take out the swinging arm pivot shaft by undoing the nut on the left-hand side of the machine. This may need a gentle tap with a rawhide mallet and drift to displace it. Pull out the swinging fork complete with bushes.
6 Take off the two dust covers, noting the rubber seals ('O' rings) under the covers. This will expose the bushes. They should be drifted out from opposite ends along with the inner bushes and centre collar. Wash the bushes in a petrol/parrafin mix, then check the amount of play in them. If the clearance between the bush and shaft exceeds 0.020 inch (0.5 mm) the bushes and shaft should be replaced as a set. The same applies if the pivot shaft is bent; it must be renewed.
7 Grease the pivot shaft and bushes prior to reassembly, and make sure the "O" rings are renewed if needed, also the dust covers. Always keep the pivot well greased. Apply a grease gun to the nipple provided until the smallest trace of grease is seen at the spindle end.

10 Rear suspension units: examination

1 Rear suspension units of the 5 way adjustable type with hydraulic damping are fitted to the Z1 series. The units can be adjusted to give 5 different settings. A hook spanner in the toolkit is used to adjust the units by means of peg holes.
2 There is no means of draining or topping up the units as they are permanently sealed. In the interests of good road holding, both units should be renewed if either starts to leak or loses its damping action.

11 Centre stand: examination

1 The centre stand is attached to the machine by two bolts on the bottom of the frame. It is returned by a centre spring. The bolts and spring should be checked for tightness and tension respectively. A weak spring can cause the centre stand to "ground" on corners and unseat the rider.

12 Prop stand: examination

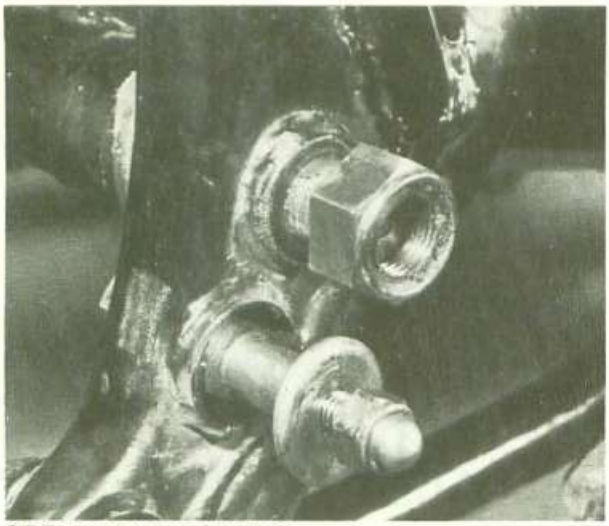
1 The prop stand is secured to a plate on the frame with a bolt and nut, and is retracted by a tension spring. Make sure the bolt is tight and the spring is not overstretched, otherwise an accident can occur if the stand drops during cornering.

13 Footrests and rear brake pedal: examination

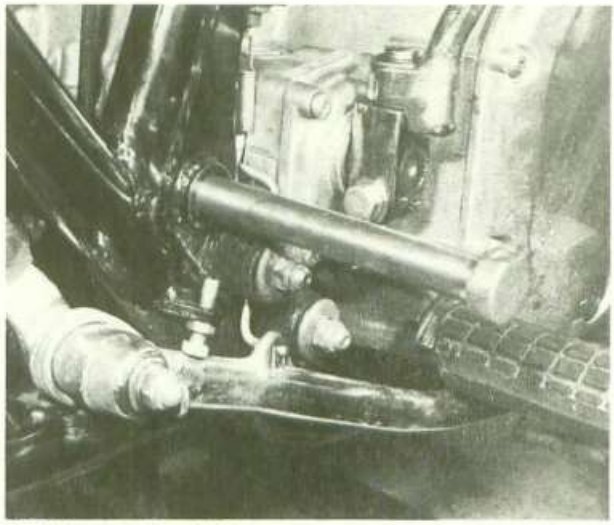
1 The footrests are of the swivel type and are retained by a clevis pin secured by a split pin. The advantage of this type of footrest is that if the machine should fall over the footrest will fold up instead of bending.
2 The rear brake pedal is held in position by a stud and domed nut the pedal return spring must be detached to remove the brake lever.



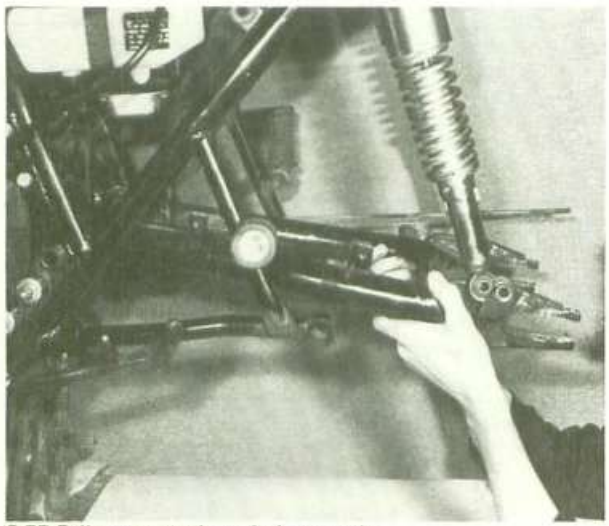
9.4 Remove bottom suspension unit bolts



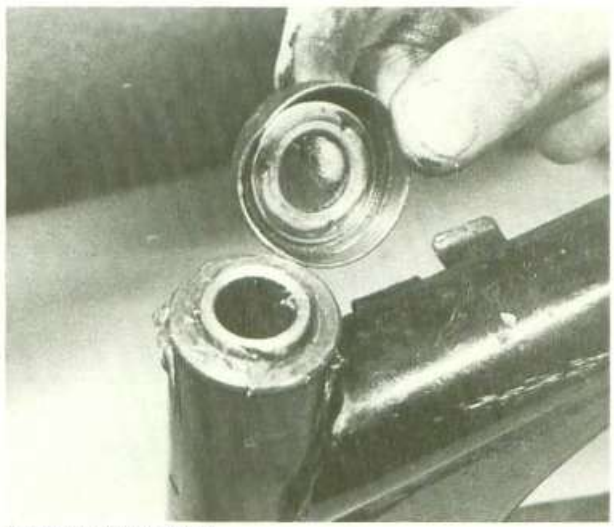
9.5 Remove nut on pivot shaft



9.5A Tap out pivot shaft



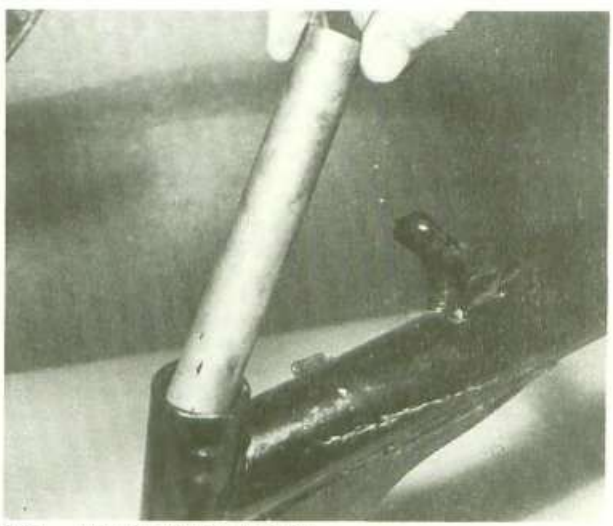
9.5B Pull down to release fork assembly



9.6 Take off dust caps



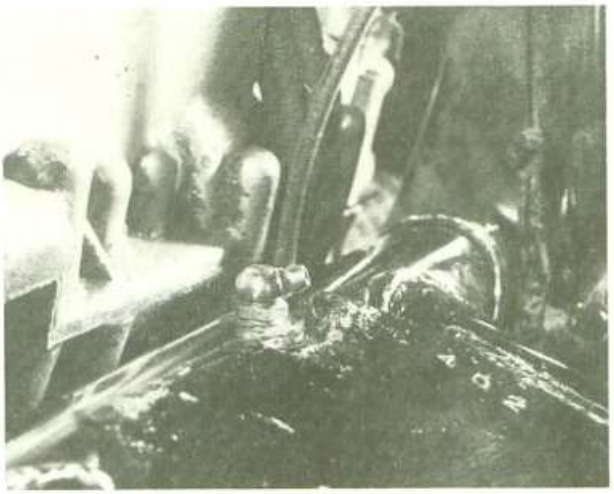
9.6A Remove end bushes



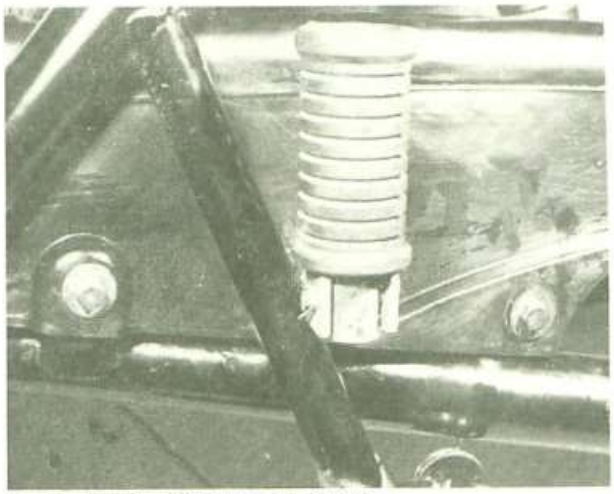
9.6B ... and distance centre collar



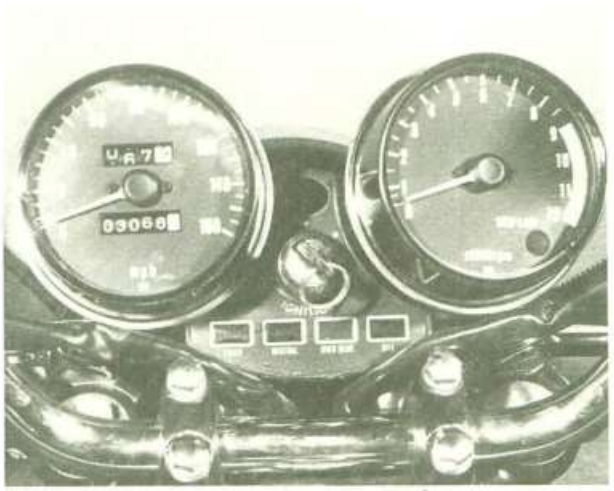
9.7 Grease bushes when assembling



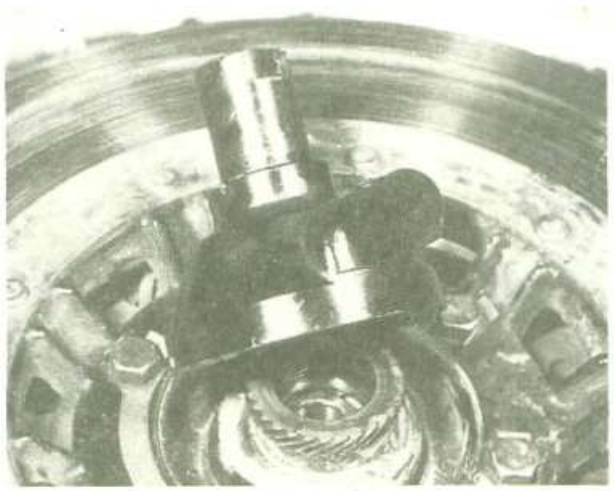
9.7A Also pump grease through grease nipple



13.1 Make sure pillion rests are secure



15.1 Instruments are mounted on rubber bushes



16.1 Speedometer gearbox engages with tongues

14 Dualseat: removal and replacement

1 The dualseat is attached to the frame by two clevis pins that are located with split pins, on the right-hand side of the frame. To remove the seat, release the spring loaded catch on the left-hand side, and prop the seat up with the stay provided. Withdraw the two split pins from the clevis pivot pins, and remove the pivot pins. The seat mountings and damper rubbers can be left in place as the seat is lifted off.

2 If the dualseat is removed because it is torn, it is possible in most cases to find a specialized firm that recovers dualseats for an economical price, usually considerably cheaper than having to buy a new replacement. The usual charge is about 50% the cost of a new replacement, depending on the extent of the damage.

15 Speedometer and tachometer heads: removal and replacement

1 The speedometer and tachometer are both mounted together on a single panel on top of the front forks. They are mounted on studs with rubber bushes and secured with nuts. The heads are encased in light alloy shrouds secured to the instruments by a single crosshead screw. The shrouds have to be removed first, to enable the instruments to be released.

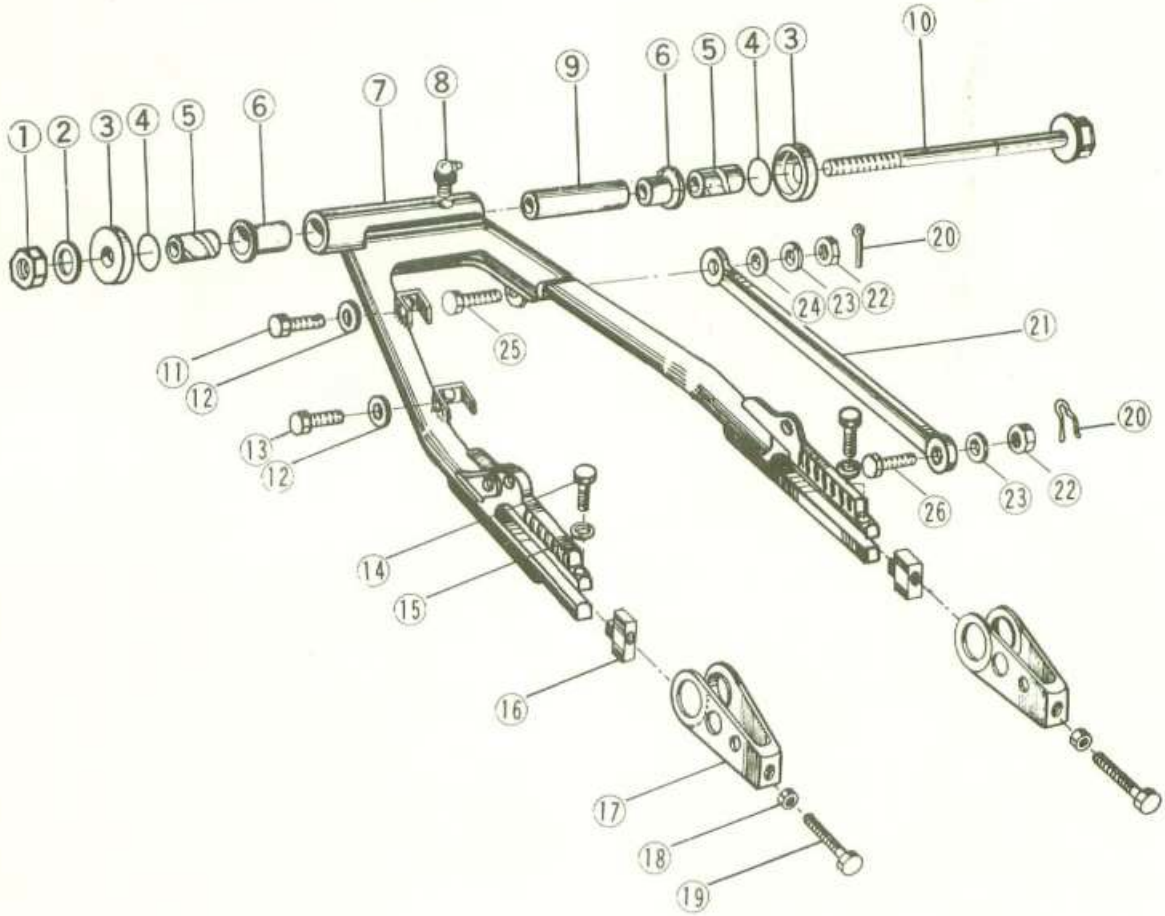


Fig. 4.6. Swinging arm fork

1 *Self locking nut*
2 *Washer*
3 *Cap*
4 *'O' ring*
5 *Sleeve*
6 *Bush*
7 *Swinging arm*
8 *Grease nipple*
9 *Distance collar*
10 *Pivot shaft*
11 *Chain guard mounting bolt*
12 *Washer*
13 *Chain guard mounting bolt*
14 *Chain adjuster stop mounting bolt*
15 *Washer*
16 *Chain adjuster stop mounting bolt*
17 *Chain adjuster*
18 *Locknut*
19 *Adjuster bolt*
20 *Cotter pin*
21 *Torque arm*
22 *Nut*
23 *Lock washer*
24 *Washer*
25 *Bolt*
26 *Bolt*

2 After the shrouds are detached the drive cables can be unscrewed. The rubber mounted bulb holders can be pulled out with the bulbs. Check for blown bulbs while they are out. The four bulbs in the dash panel are also a push fit and can be checked at the same time.
3 The speedometer and tachometer heads cannot be repaired by the private owner, and if a defect occurs a new instrument has to be fitted. Remember that a speedometer in correct working order is required by law on a machine in the UK also may other countries.
4 Speedometer and tachometer cables are only supplied as a complete assembly. Make sure the cables are routed correctly through the clamps provided on the top fork yoke, brake branch pipe, and the frame.

16 Speedometer and tachometer drives: location and examination

1 The speedometer is driven from a gear inside the front wheel hub assembly. The gear is driven internally by a tongued washer (receiver). The receiver engages with two slots in the wheel hub, on the left-hand side. As the whole gearbox is pre-packed with grease on assembly, it should last the lift of the machine, or until new parts are fitted. The spiral pinion that drives off the internal gear is retained in the speedometer gearbox casing by a grub screw, which should always be secured tightly.
2 The tachometer drive runs off the camshaft in the cambox and screws directly into the cylinder head cover in the centre position. The cable is retained by a screwed ferrule, in the same manner as the speedometer cable.

17 Cleaning the machine

1 After removing all the surface dirt with warm water and a rag or sponge, use a cleaning compound such as "Gunk" or "Jizer" for the oily parts. Apply the cleaner with a brush when the parts are clog so that it has an opportunity to soak into the film of oil or grease. Finish off by washing down liberally, taking care that water does not enter into the carburettors, air cleaner or electrics. If desired, a polish such as Solvol Autosol can be applied to the alloy parts to give them a full lustre. Application of a wax polish to the cycle parts and a good chrome to the chrome parts will also give a good finish. Always wipe down the machine if used in the wet, and make sure the chain is well oiled. Check on models fitted with the rear chain oiler that the oiler is set correctly, also that there is always the required amount of oil in the chain supply oil tank. Check that the control cables are kept well oiled (this will only take 5 minutes of your time each week with an oil can). There is also less chance of water getting into the cables, if they are well lubricated.

18 Fault diagnosis: frame and forks

Symptom	Cause	Remedy
Machine veers to left or right with hands off handlebars	Wheels out of alignment. Forks twisted Frame bent	Check wheels and realign. Strip and repair. Strip and repair or renew.
Machine tends to roll at low speeds	Steering head bearings not adjusted correctly or worn	Check adjustment and renew the bearings if worn.
Machine tends to wander	Worn swinging arm bearings	Check and renew bearings. Check adjustment and renew.
Forks judder when front brake is applied.	Steering head bearings slack, front bushes worn	Strip forks and bushes; Check adjustment and renew.
Forks bottom	Short of oil	Replenish with correct viscosity oil.
Fork action stiff	Fork legs out of alignment. Bent shafts, or twisted yokes.	Strip and renew or slacken clamp bolts, front, wheel spindle and top bolts. Pump forks several times, and tighten from bottom upwards.
Machine tends to pitch badly	Defective rear suspension units, or ineffective fork damping	Check damping action. Check the grade and quantity of oil in the front forks.

Chapter 5 Wheels, brakes and tyres

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Specifications

Brake fluid specification:	**Specification and classification.**	**Remarks**
	Dot 3*	(USA)
	Dot 4	(USA)
	SAE JITO3 A	
	SAE JITO3 B	
	SAE JITO3 C	
	SAE TO R.B.	A classification in obsolete specification of SAE J70B
Tyres		
	Front:	325 x 19 4 P.R.
	Rear:	400 x 18 4 P.R.
Tyre pressures: Solo riding		**Tyre pressures: Pillion rider**
	Front: 26 P.S.I.	Front: 26 P.S.I.
	Rear: 31 P.S.I.	Rear: 36 P.S.I.
Brakes:		
	Front:	Disc, 296 mm x 35 mm
	Rear:	Internal expanding... 200 mm

**In UK use CASTROL GIRLING UNIVERSAL CLUTCH AND BRAKE FLUID*

1 General description

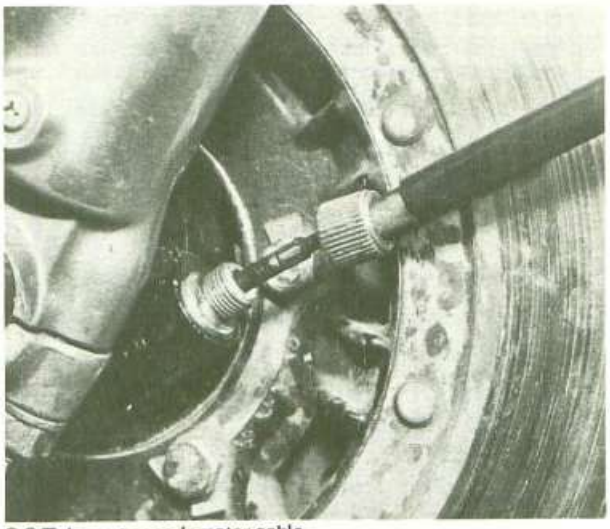
The Z1 series have a 19 inch front wheel and a 18 inch rear wheel. Front tyres are of the ribbed tread pattern; the rear tyres have a block tread pattern. All models employ steel rims in conjunction with cast aluminium hubs. The front brake is of the hydraulic disc type, the rear wheel is the internal expanding drum type.

2 Front wheel: examination and renovation

1 Place the machine on its centre stand so that the front wheel is clear of the ground. Spin the wheel by hand and check the rim for alignment.

Small irregulalities can be corrected by tightening the spokes in the affected area. Any flats in the wheel rim will be evident at the same time. In this latter case it will be necessary to have the wheel rebuilt with a new rim. The machine should not be run with a deformed wheel, since this will have a very adverse effect on handling.

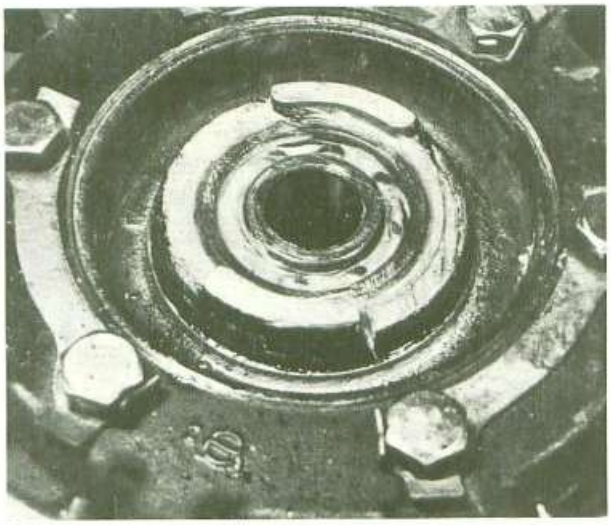
2 Check for loose or broken spokes. Tapping the spokes is good guide to the correct tension; a loose spoke will always produce a different sound and should be tightened by turning the nipple in



3.2 Take out speedometer cable



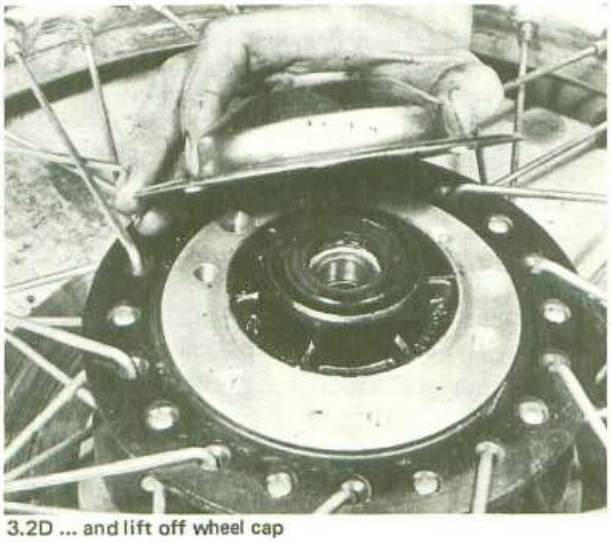
3.2A Speedometer drive gear



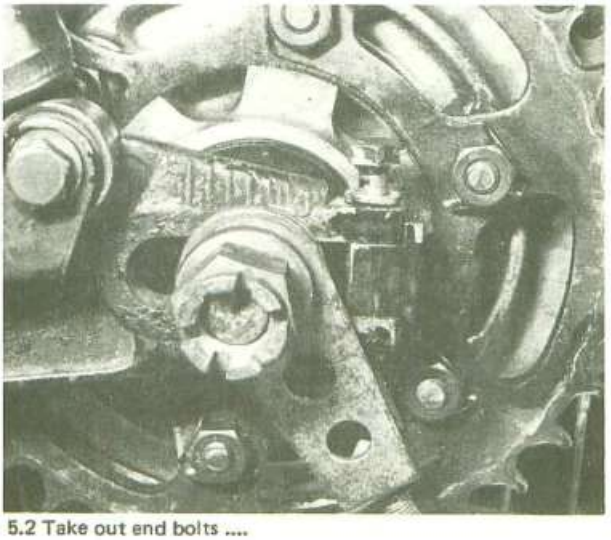
3.2B Tongues engage with gearbox



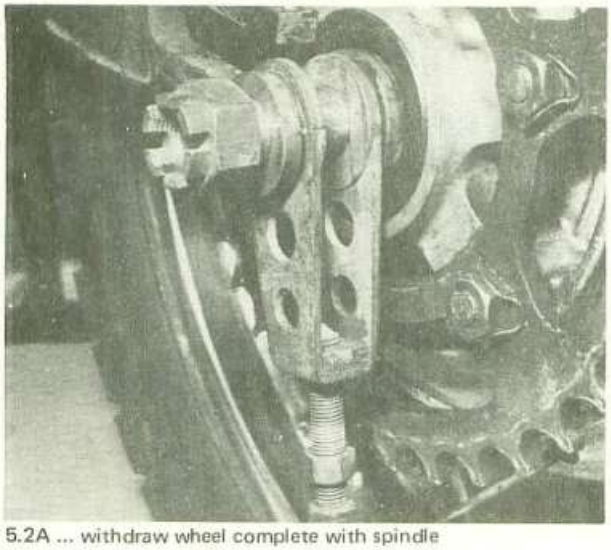
3.2C Take out collar ....



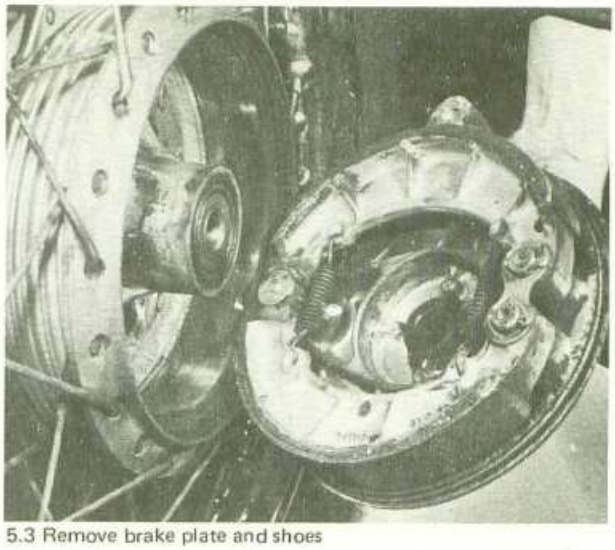
3.2D ... and lift off wheel cap



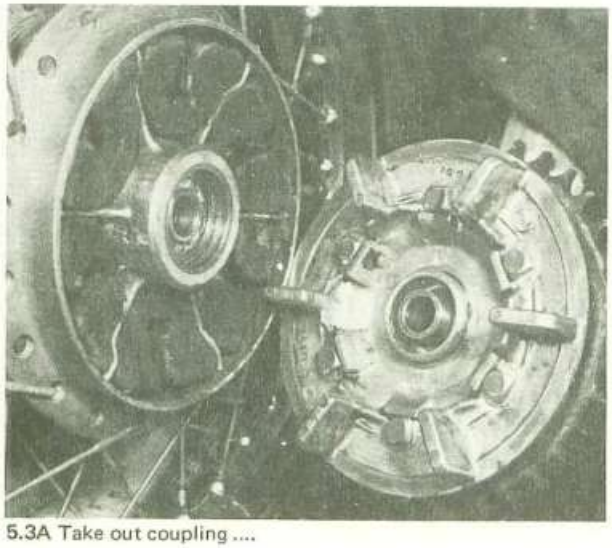
5.2 Take out end bolts ....



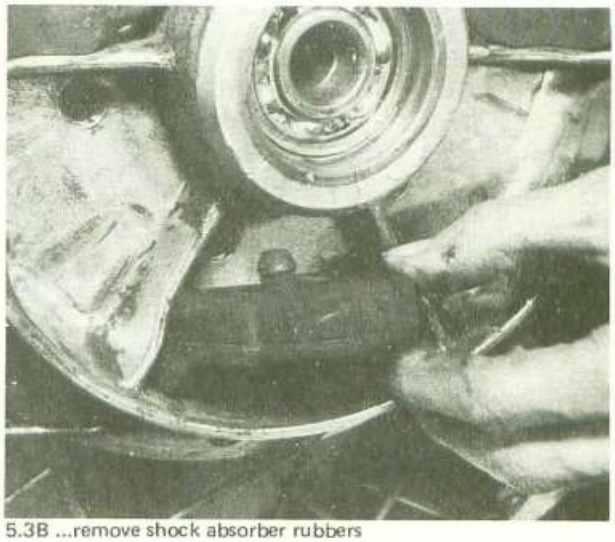
5.2A ... withdraw wheel complete with spindle



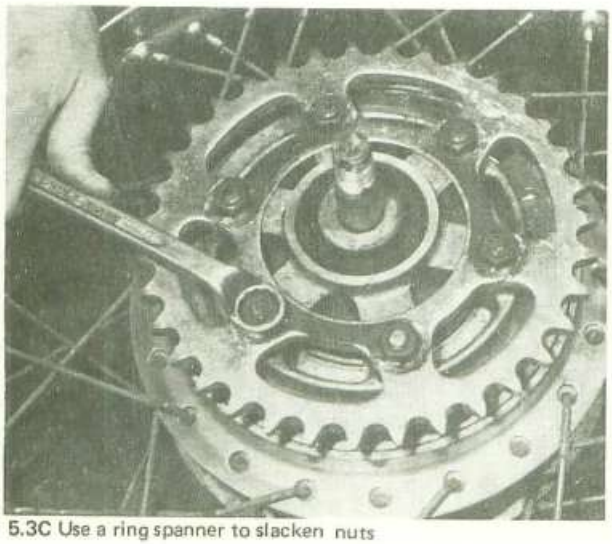
5.3 Remove brake plate and shoes



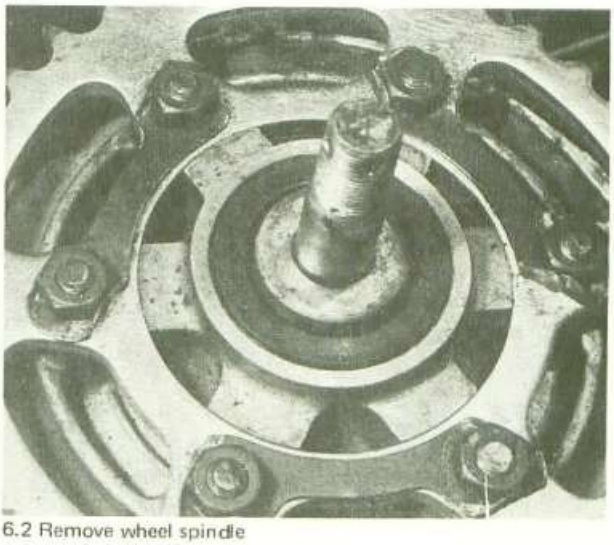
5.3A Take out coupling ....



5.3B ...remove shock absorber rubbers



5.3C Use a ring spanner to slacken nuts



6.2 Remove wheel spindle

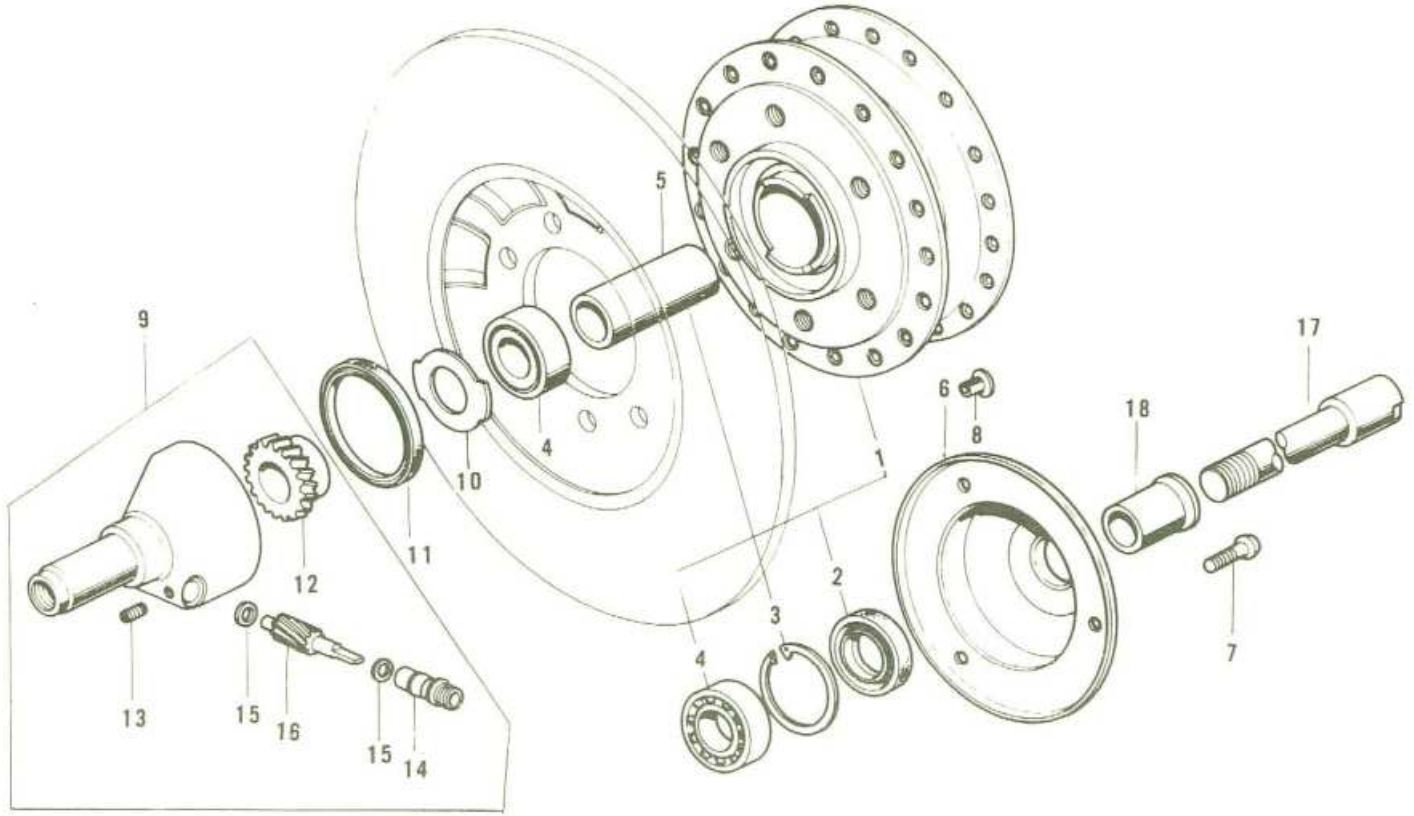


Fig. 5.1 Front hub components

1 *Hub*
2 *Oil seal*
3 *Circlip*
4 *Ball bearing - 2 off*
5 *Bearing spacer*
6 *Dust cover*
7 *Countersunk screw - 3 off*
8 *Drum hole cap - 6 off*
9 *Speedometer gearbox*
10 *Oil seal*
11 *Speedometer gear reciever*
12 *Speedometer gear*
13 *Grub screw for bush*
14 *Speedometer cable bush*
15 *Thrust washer*
16 *Speedometer pinion*
17 *Front wheel spindle*
18 *Spindle collar*

an anticlockwise direction. Always check run-out by spinning the wheel again. If the spokes have to be tightened an excessive amount it is advisable to remove the tyre and inner tube as detailed in Section 18 of this Chapter. This will allow the protruding ends of the spokes to be ground off, and prevent them giving rise to a spate of punctures.

3 Front wheel bearings: examination and replacement

1 Access is available to the front wheel bearings when the speedometer and front wheel spindle are removed. The bearings are of the ball journal type and non-adjustable. There are two bearings and two oil seals, the two bearings are interposed by a distance collar in the centre of the hub.
2 First remove the speedometer cable by undoing the knurled nut. To remove the bearings hold the speedometer gearbox stationary and unscrew the front wheel spindle, caution: do not hold the spindle and unscrew the gearbox otherwise the speedometer gear will be damaged. Take off the collar and wheel cap, and drive out the left-hand bearing using a double diameter drift from the right-hand side.

When the bearing is removed, the distance collar can be taken out. Working from inside the hub, use the same drift to displace the right-hand bearing. Remove the oil seal, take out the retaining ring, and from the left side use the drift to tap evenly around the inner race of the right-hand bearing and knock it out.
3 Remove all the old grease from the hub and bearings, wash the bearings in petrol, and dry them thoroughly. Check the bearings for roughness by spinning them whilst holding the inner track with one hand and rotating the outer track with the other. If there is the slightest sign of roughness renew them.
4 Before driving the bearings back into the hub, pack the hub with new grease and also grease the bearings. Use the same double diameter drift to place them into position. Refit any oil seals or dust covers which have been displaced.

4 Front wheel: reassembly and replacement

1 Refit the speedometer gearbox, by holding the gearbox stationary and screw in the front wheel spindle. Do not hold the spindle and screw in the gearbox otherwise the speedometer drive gear will be damaged.
2 Have the bottom fork clamps ready when the front wheel is lifted back into position. First tighten the front spindle clamp bolt and then the rear bolt for each fork leg, so that there will be a gap at the rear after tightening. Spin the wheel to make sure it revolves freely, and check that the brake operates correctly. Turn the front wheel while inserting the speedometer cable, so that the tongue of the speedometer drive will locate correctly.

5 Rear wheel assembly: examination and renovation

1 Place the machine on the centre stand so that the rear wheel is raised clear of the ground. Check the rim for alignment, damage to the rim or broken spokes by following the procedure relating to the front wheel described in Section 2 of this Chapter.
2 Remove the bolt holding the rear torque arm to the brake plate. Disconnect the rear brake cable, and slacken and displace the rear wheel adjusters. Remove the split pin and nut from the wheel spindle and push the wheel forward so that the rear chain can be disengaged. Finally, ease the wheel back and free of the swinging arm.
3 Remove the wheel spindle and take out the brake plate. Take the coupling assembly from the cush drive rubbers, and remove the rubbers. The rear wheel sprocket can be unbolted for inspection, by removing the six nuts and the three locktabs.

6 Rear wheel bearings: examination and replacement

1 The rear wheel bearings are a drive fit into the hub. They are separated by a spacer and a distance collar. There are two bearings in the hub and one in the centre of the rear final drive sprocket.
2 Remove the distance collar from the cush drive hub, take out the wheel spindle collar, and then the oil seal. Tapping evenly around the inner race from the inside of the coupling, knock out the bearing.
3 To remove the two bearings from the wheel hub, use a double diameter drive again and tapping evenly around the inner race from the sprocket side knock out the bearing on the brake plate side.
4 Remove the large distance collar, and tapping on the inner race from the brake plate side, knock out the bearing on the sprocket side.
5 Remove all the old grease from the bearings and hub. Wash the bearings in petrol and dry them thoroughly. Check the bearings for roughness by spinning them whilst holding the inner track with one hand, and rotating the outer track with the other hand. If there is the slightest sign of roughness renew them.
6 Before driving the bearings back into the hub and sprocket centre, pack the hub with new grease and also grease the bearings. Use the same double diameter drift to place them into position. Refit any oil seals or dust covers which have been displaced.

7 Rear brake assembly: examination, renovation and reassembly

1 The rear brake is of the internal expanding variety. Access to the brake shoes is obtained by first removing the rear wheel, and taking off the brake plate to which the shoes are attached.
2 To remove the shoes, first withdraw the two split pins and the double washer that secures the brake shoes. Use a punch to mark the original position of the brake cam and the brake operating lever. Remove the pinch bolt and lever. Remove the dust seal, and the brake shoes, by prying them up evenly and removing them along with the brake cam.
3 Take off the brake shoe return springs. Inspect the brake drum for a scored or warped condition. If the drum is scored or warped slightly, it is possible to have it turned down on a lathe by a specialist repairer but if the scoring is too deep or the warpage too great, a new replacement is necessary.
4 Inspect the brake shoes for excessive uneven wear, or for oil or grease on the linings. If the impregnation is too bad the shoes will have to be replaced with new ones.

The standard measurement for the brake linings is as follows:

Standard thickness	*Service limit*
0.1909 - 0.2146 inch	*0.118 inch*
(4.85 - 5.45 mm)	*(3.00 mm)*

5 Inspect the brake return springs for a worn, pitted or collapsed condition, and replace them as necessary.

The brake return spring free length specifications are as follows:

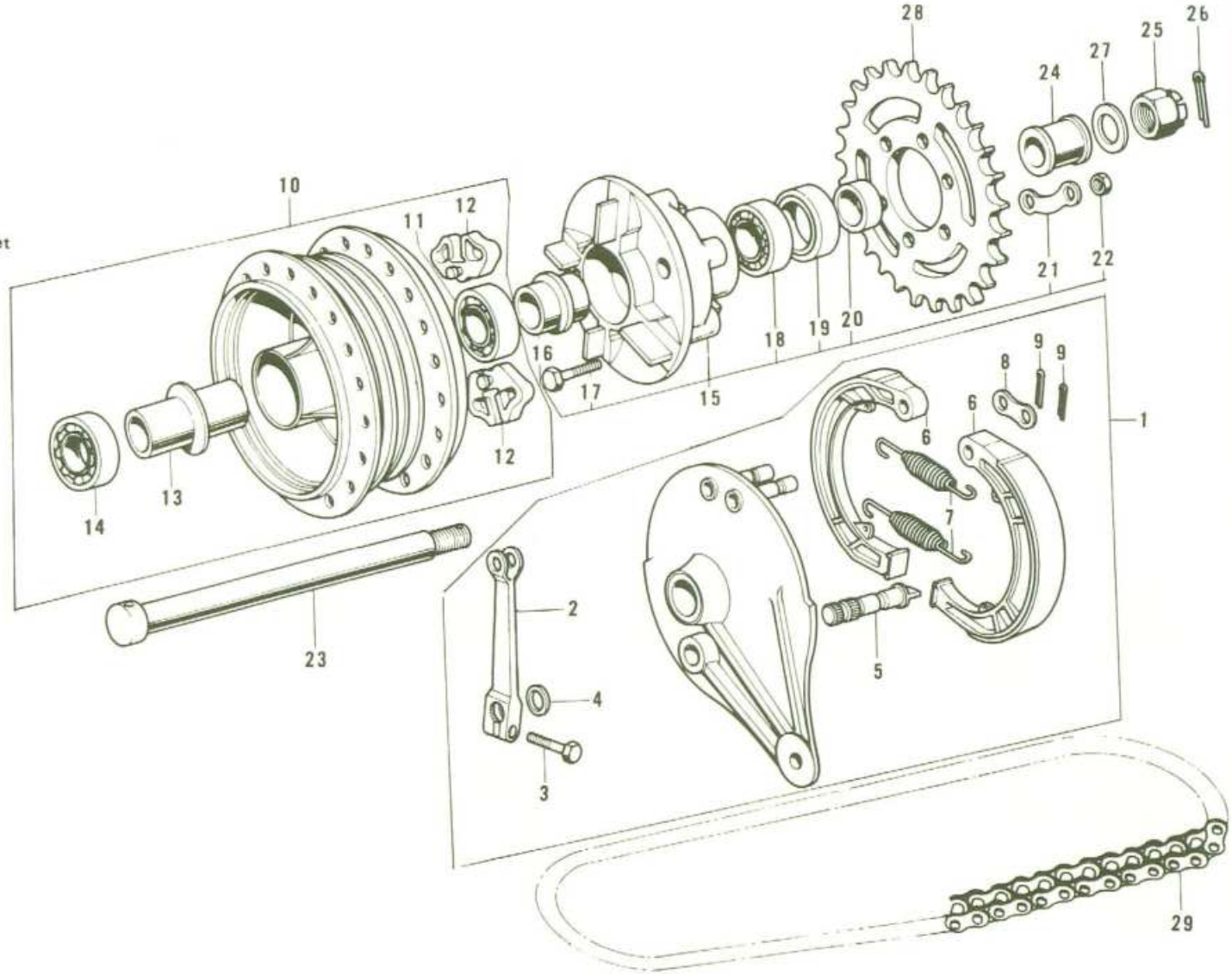
Standard length	*Service limit*
2.62 inch	*2.72 inch*
(66.5 mm)	*(69.0 mm)*

6 Inspect the brake cam and brake plate for signs of wear or damage, and replace as necessary. It cannot be overstressed that wear on these parts are critical if full braking efficientcy is to be maintained.
7 Assembly is in the reverse order of dismantling, use new locking tabs and split pins whenever possible, also smear a light touch of grease on the brake cam and pivot pins during assembly, taking care not to get any grease on the brake linings.

8 Rear sprocket assembly: examination, renovation and replacement

1 The rear wheel sprocket is held to the wheel by six nuts and three locktabs. To remove the sprocket, bend back the locktabs and undo the nuts. The sprocket needs to be renewed only if the

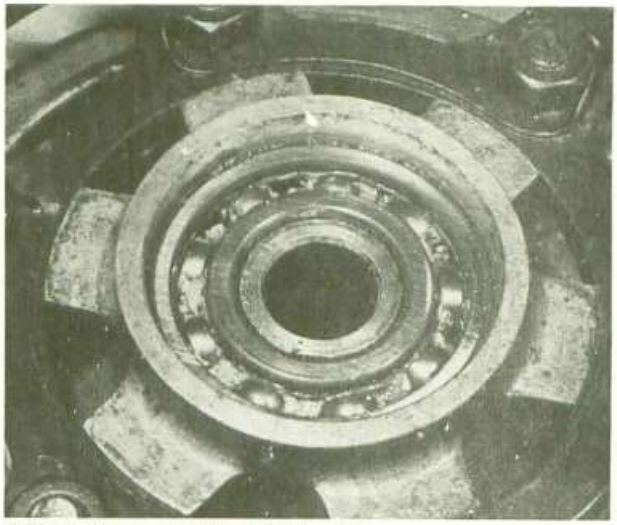
Fig. 5.2 Rear hub, brake and sprocket



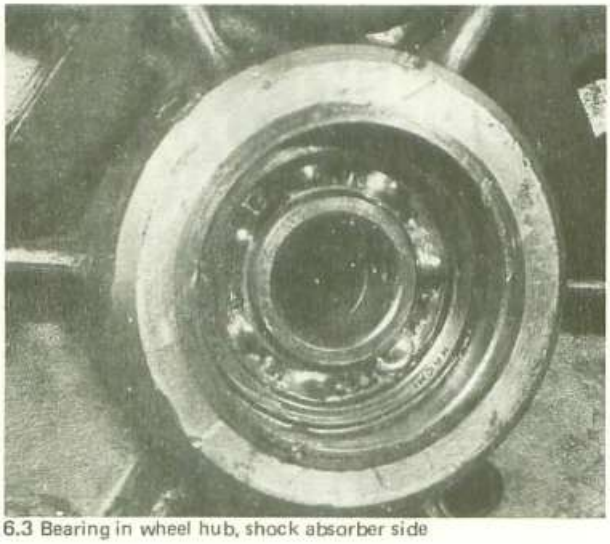
1 Brake panel
2 Cam lever
3 Bolt
4 Cam dust shield
5 Cam shaft
6 Brake shoe - 2 off
7 Brake shoe spring - 2 off
8 Brake shoe washer
9 Cotter pin - 2 off
10 Brake drum
11 Ball bearing
12 Rubber shock absorber - 6 off
13 Bearing spacer
14 Ball bearing
15 Rear hub coupling
16 Coupling sleeve
17 Sprocket holding belt - 6 off
18 Ball bearing
19 Oil seal
20 Collar for sleeve
21 Lock washer - 3 off
22 Nut - 6 off
23 Rear spindle
24 Rear spindle collar
25 Castle nut
26 Cotter pin
27 Plain washer
28 Sprocket
29 Rear chain



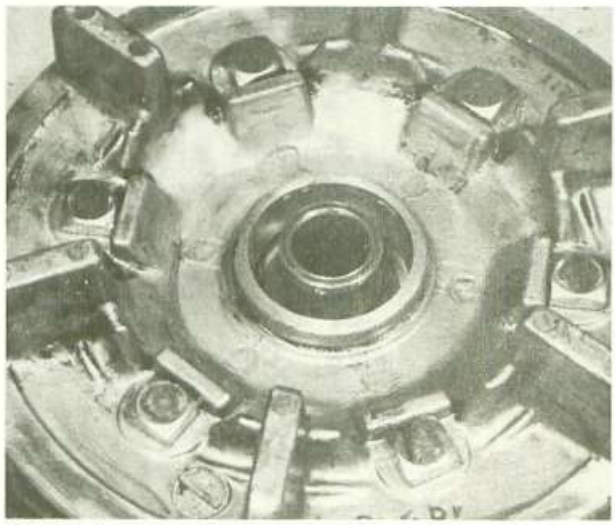
6.2A Take out distance collar



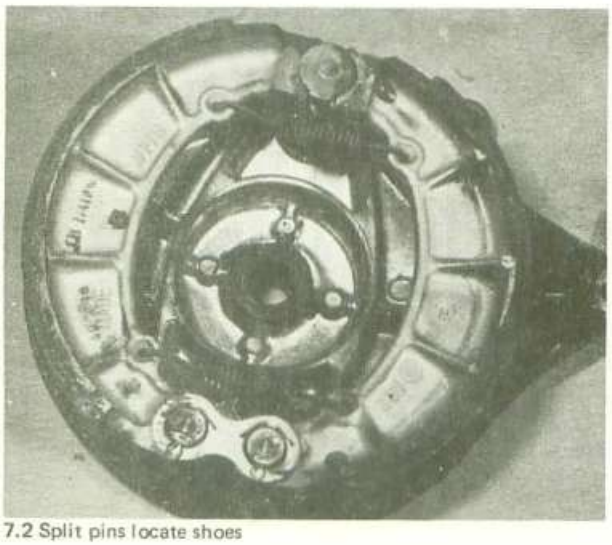
6.2B Bearing in coupling, sprocket side



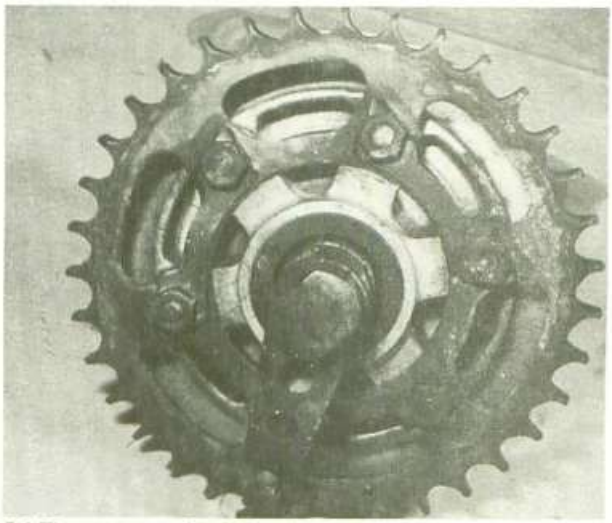
6.3 Bearing in wheel hub, shock absorber side



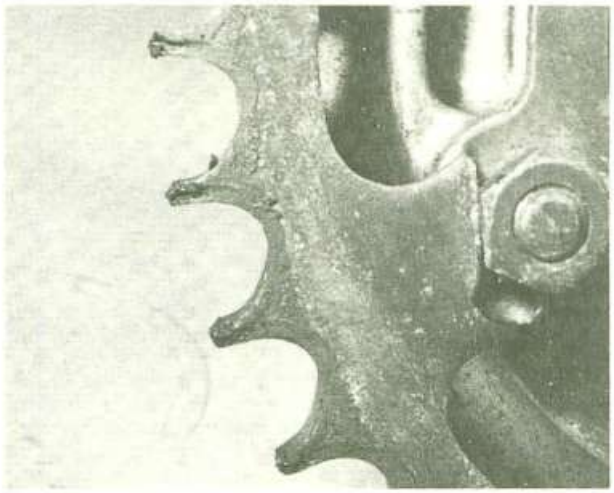
6.3A Bearing removed



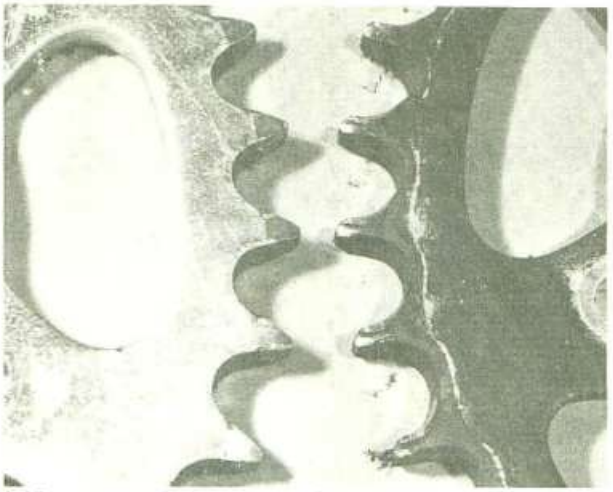
7.2 Split pins locate shoes



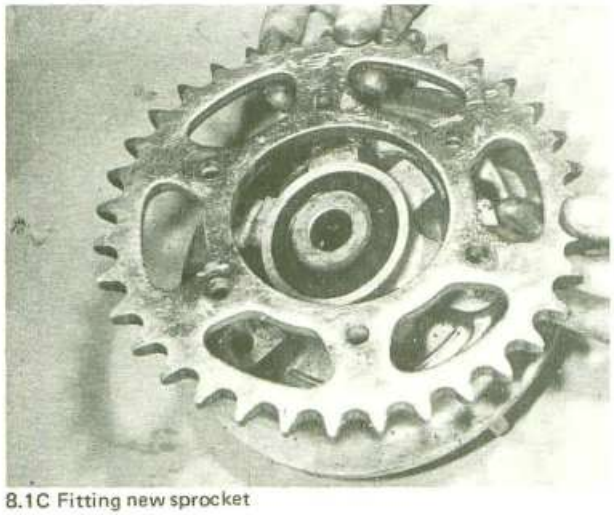
8.1 The worn sprocket before removal



8.1A Note hooked teeth ....



8.1B ... compared with new sprocket



8.1C Fitting new sprocket



8.1D Bolts retain sprocket; tighten fully

teeth are worn, hooked or chipped. It is always good policy to change both sprockets at the same time, also the chain, otherwise very rapid wear will develop.

2 It is not advisable to alter the rear wheel sprocket size or the gearbox sprocket size. The ratios selected by the manufacturer are the ones that give optium performance with the existing engine power output.

9 Rear cush drive: examination and renovation

1 The cush drive assembly is contained in the left-hand side of the wheel hub. It takes the form of six triangular rubber pads incorporating slots. These engage with vanes on the coupling which is bolted to the rear sprocket. The rubbers engage with ribs on the hub and the whole assembly forms a shock absorber which permits the sprocket to move within certain limits. This cushions any surge or roughness in the transmission which would otherwise convey an impression of harshness.

2 The usual sign that shock absorber rubbers are worn is excessive movement in the sprocket, or rubber dust appearing in between the sprocket and hub. The rubbers should then be taken out and renewed.

10 Rear brake assembly: adjusting

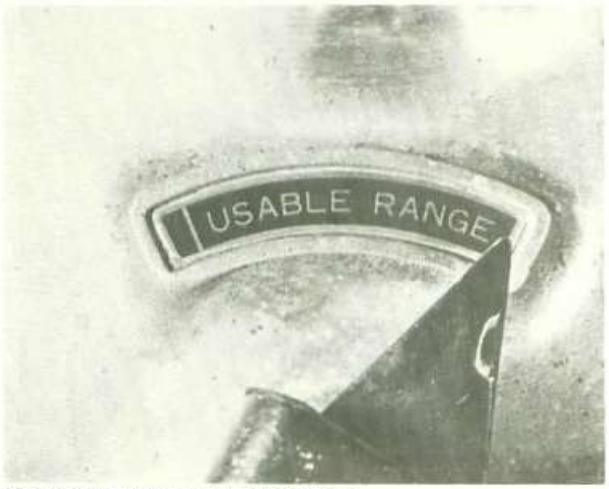
1 If the adjustment of the rear brake is correct, the brake pedal will have a travel of 20 mm to 30 mm (0.8 to 1.2 inch). Adjustment is carried out at the end of the operating rod by the knurled adjuster.

2 It may be necessary to change the height of the stop lamp switch if the pedal travel has been altered to any marked extent. Raise the switch for the stop lamp to operate earlier by turning the adjustment nut clockwise.

11 Final drive chain: examination and lubrication

1 As the final drive chain is fully exposed on all models it requires lubrication and adjustment at regular intervals. To adjust the chain, take out the split pin from the rear wheel spindle and slacken the spindle nut. Undo the torque arm bolt, and leave the bolt in position, slacken the chain adjuster locknuts and turn the adjusters inwards to tighten the chain, or outwards to slacken the chain.

2 Chain tension is correct if there is (25 to 40 mm) about 1¼ inch slack measured at the centre of the bottom run of the chain between the two sprockets.



10.1 Range of lever travel is indicated

3 Do not run the chain too tight to try to compensate for wear, or it will absorb a surprising amount of engine power. Also it can damage the gearbox and rear wheel bearings.
4 Machines other than those fitted with a chain lubricating pump are equipped with a 'self-lubricating' chain. The latter should be cleaned and lubricated in situ in the same manner as conventional chains. As all chains are of the endless variety, removal for thorough cleaning involves a considerable amount of dismantling work. The manufacturers stress that the endless chain should not be broken or replaced with the conventional spring link type. For details of chain removal and maintenance, reference should be made to Chapter 7, Section 2.

12 Front brake assembly: examination and renovation

1 The hydraulic disc brake adopted for the Z1 series comprises four main components: A brake disc mounted on the front wheel hub, a master cylinder for pressurising the system, a brake hose for conveying the fluid pressure, and a caliper assembly, which presses the pads on to the brake disc by means of hydraulic pressure.
2 The brake disc attached to the front wheel rarely requires any attention. Renewal is necessary only if the surface is scored or damaged.
3 The disc is attached to the hub with six bolts and three lock-plates. If the front wheel is removed from the forks, the disc will be freed when the bolts are withdrawn. There is no necessity to detach the hydraulic brake system or to dismantle any part of it. The disc will pull clear of the friction pads in the caliper. It is advisable however, to place a clean spacer such as a piece of wood or metal between the pads, to prevent them being ejected if the front brake is unintentionally applied. This precaution is not necessary if the caliper assembly has also to receive attention.
4 Check the condition of the friction pads in the caliper. If either of the pads is worn up to the red line limit marked on the circumference, renew them as a pair by unscrewing the pad fastening screw from pad B. This is the single screw at the bottom. Take out the pad. The other pad is not secured by a screw and is ejected by squeezing the front brake several times. The pad will come out with fluid pressure when filling new pads. Apply brake pad grease (which forms part of the brake pad set) onto the pheriphery and backplate of the unretained pad in a very thin layer. Push the pad back into the caliper body, and then mount the other pad in the caliper body, screwing in from the inside of the fork leg. Install the front wheel into the fork legs, squeeze the brake lever two or three times to confirm its operation, and bleed the air if necessary. (Refer to Section 16 of this Chapter, if it is necessary to bleed the brake system).

13 Front brake disc: examination and replacement

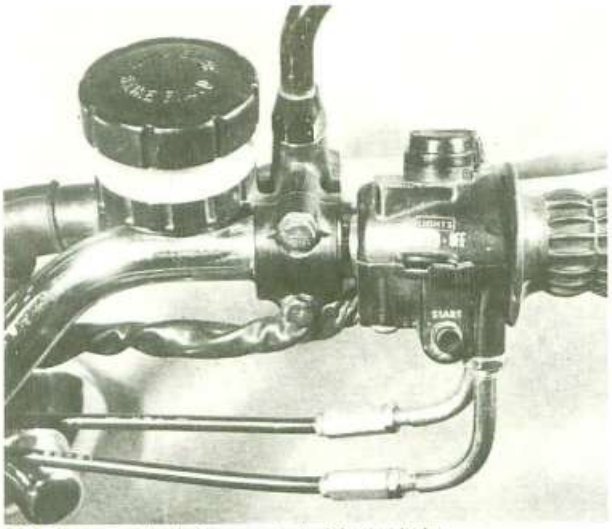
1 It is necessary to remove the front wheel, to detach the disc from the front wheel. Bend down the three lock tabs and remove the six disc mounting bolts, the disc can then be lifted off.
2 Clean off any oil on the surface of the disc using a degreasing agent. Inspect the disc for deep score marks or wear and measure the disc with a micrometer at its most work part. The disc can be safely skimed up to 0.050 inch to remove any score marks, but if the scoring or wear runs deeper than the disc's servicable thickness of 0.217 inch (5.5 mm) the disc must be renewed. The standard thickness for the disc is 0.276 inch (7.0 mm).
3 Check the disc for a warped condition. Warping will cause both the pads and disc plate to wear down quickly, and will also cause overheating and poor braking efficiency. Check the disc for warpage in the following ways: If the disc is still mounted on the wheel, the runout can be checked with a dial indicator. Alternatively, place the disc on a perfectly flat surface, and use a feeler gauge under the rim of the disc to check for clearance, which will indicate warpage. If the disc is warped in excess of 0.012 inch (0.3 mm) it must be renewed.

14 Front brake master cylinder: examination and renovation

1 The master cylinder and hydraulic reservoir take the form of a combined unit mounted on the right-hand side of the machine, on the handlebars, to which the front brake lever is attached. The master cylinder is actuated by the front brake lever and applies hydraulic pressure through the system to operate the front brake. The master cylinder pressurises the hydraulic fluid into the brake pipe, which being incompressible, causes the piston to move in the caliper unit and apply force to the friction pads on the disc plate. If the master cylinder seals leak, hydraulic pressure will be lost, and the braking action rendered much less effective.
2 Before the master cylinder can be removed for examination the system must be drained of fluid. Place a clean container below the caliper unit and attach a plastic tube from the bleed screw on top of the caliper unit to the container. Open the bleed screw one turn, and drain the system by operating the front brake lever until the master cylinder reservoir is empty. Close the bleed screw and remove the pipe.
3 Remove the banjo bolt that secures the brake line to the master cylinder, and then remove the rest of the brake line. Remove the clamp bolts which secure the master cylinder, and remove the cylinder. Remove the reservoir cap, the diaphragm, and then empty out any residual brake fluid. Remove the brake lever, and then the dust cover stopper, then remove the dust cover. Remove the retaining ring, using retaining ring pliers, then remove the stopper, the piston, the primary cup, and spring with the check valve from the master cylinder body.

Caution: Do not attempt to remove the secondary cup from the piston as this will damage the cup.

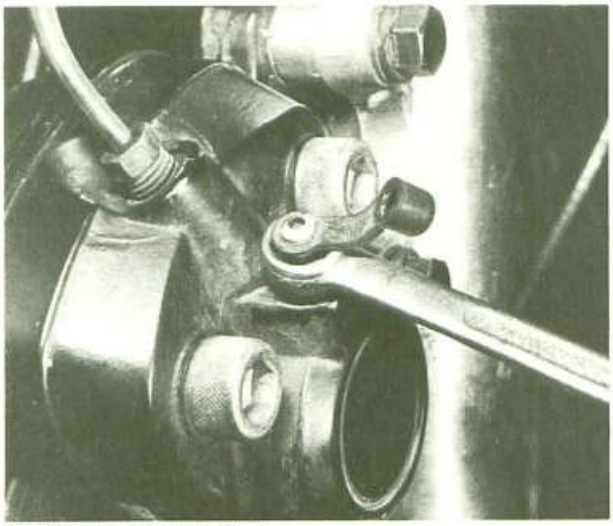
4 The pressure switch, the three way fitting, the brake hose and brake line to the caliper, may now be removed.
5 Clean all the parts in a suitable solvent, then blow them dry. Use compressed air to blow out all the passages. A cloggged relief port will result in the friction pads dragging on the disc.
6 Inspect the master cylinder bore and pistons for signs of wear, rust, pitting or damage, and renew as necessary. The master cylinder and piston must also be renewed if worn past their servicable limit.



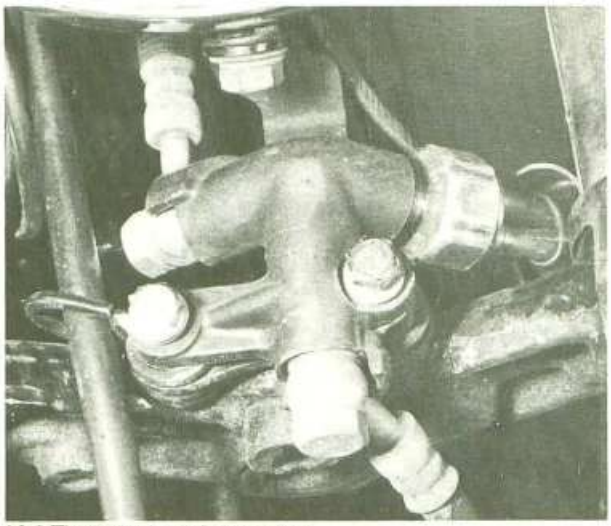
14.1 Master cylinder is mounted with two bolts



14.1A Resevoir cap removed



14.2 Undoing the bleed screw



14.4 Threeway branch connector

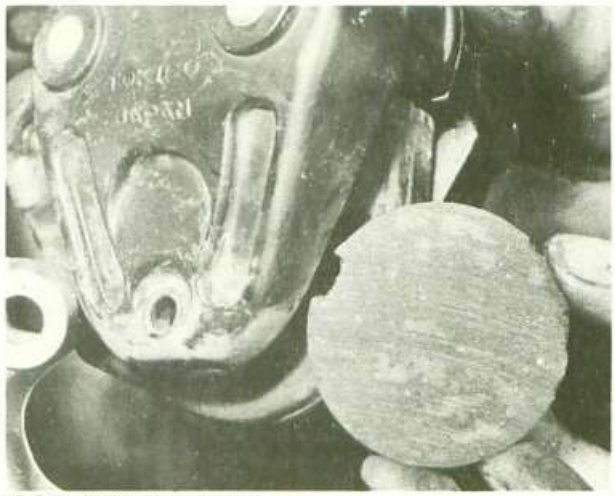


15.1 Mounting plate for brake pipe

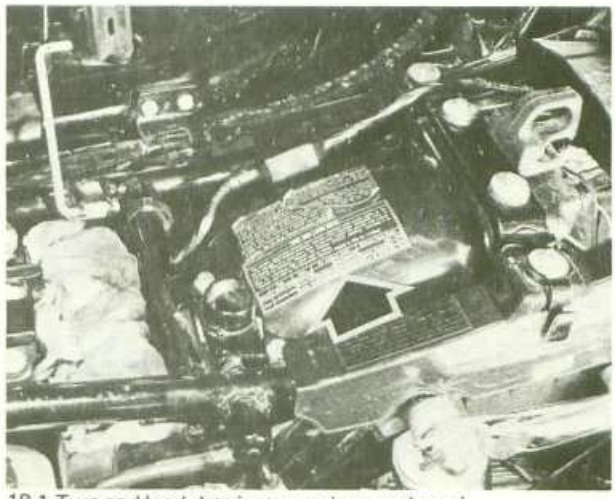


15.1A Remove securing screw


15.1B To release pad 'B'


15.2 Pad 'A' being removed


15.2A Shim in Pad 'A'


18.1 Tyre and load data is stamped on mudguard

7 Inspect the primary and secondary cups for signs of wear, damage, rotting or swelling and replace them as necessary. Leaking at the brake lever is an indication of bad cups. The piston must also be replaced if the secondary cup is damaged. It is preferable to replace the whole set of cups, piston, and spring, by means of the repair kit that is sold by the manufacturer.
Replace the rubber dust cover if it is damaged or aged.
Inspect the fittings, hoses and brake pipes for signs of wear, rust, or cracking or any other damage and replace where necessary.
8 When assembling the master cylinder follow the removal procedure in reverse order. Pay particular attention to the following points: Make sure the primary cup is fitted the correct way round. Renew the lockwasher on the pivot bolt nut and fit it securely.
9 Mount the master cylinder on the handlebar so that the bottom clamp projection points towards the twist grip. Fully tighten the lower clamp bolt first and then the upper clamp bolt. Fill the reservoir with fresh brake fluid and bleed the system of air (air always accumulates in the system when new parts are fitted). Refer to Section 16 of this Chapter for the correct procedure. After the bleeding operation check the level of the reservoir and top up to the level line, if necessary.
10 The components parts of the master cylinder assembly and the caliper assembly may wear or deteriorate in function over a long period of use. It is however generally difficult to forsee how long each component will work with proper efficiency, and from a safety point of view it is best to change all the expendable parts every two years on a machine that has covered normal mileage.
11 Note that hydraulic brake fluid is a very effective paint stripper. Avoid spillage, particularly on the petrol tank.

15 Front brake disc caliper: examination and renovation

1 When the system is drained of fluid, unscrew the brake pipe nut from the caliper body. Loosen the heads of the two allen shafts that hold the two halves of the caliper together, remove the two mounting bolts, and then take off the caliper assembly. Unscrew the Allen head shafts evenly, alternating between the two shafts a little at a time, then remove the right-hand inner caliper. Remove the right-hand friction pad by undoing the securing screw.
2 Remove the bolts which secure the caliper holder, taking care not to damage the boots, or "O" rings and then remove the outer or left-hand friction pad. Now remove the two shafts from the outer caliper then remove the piston dust seal, and pull the

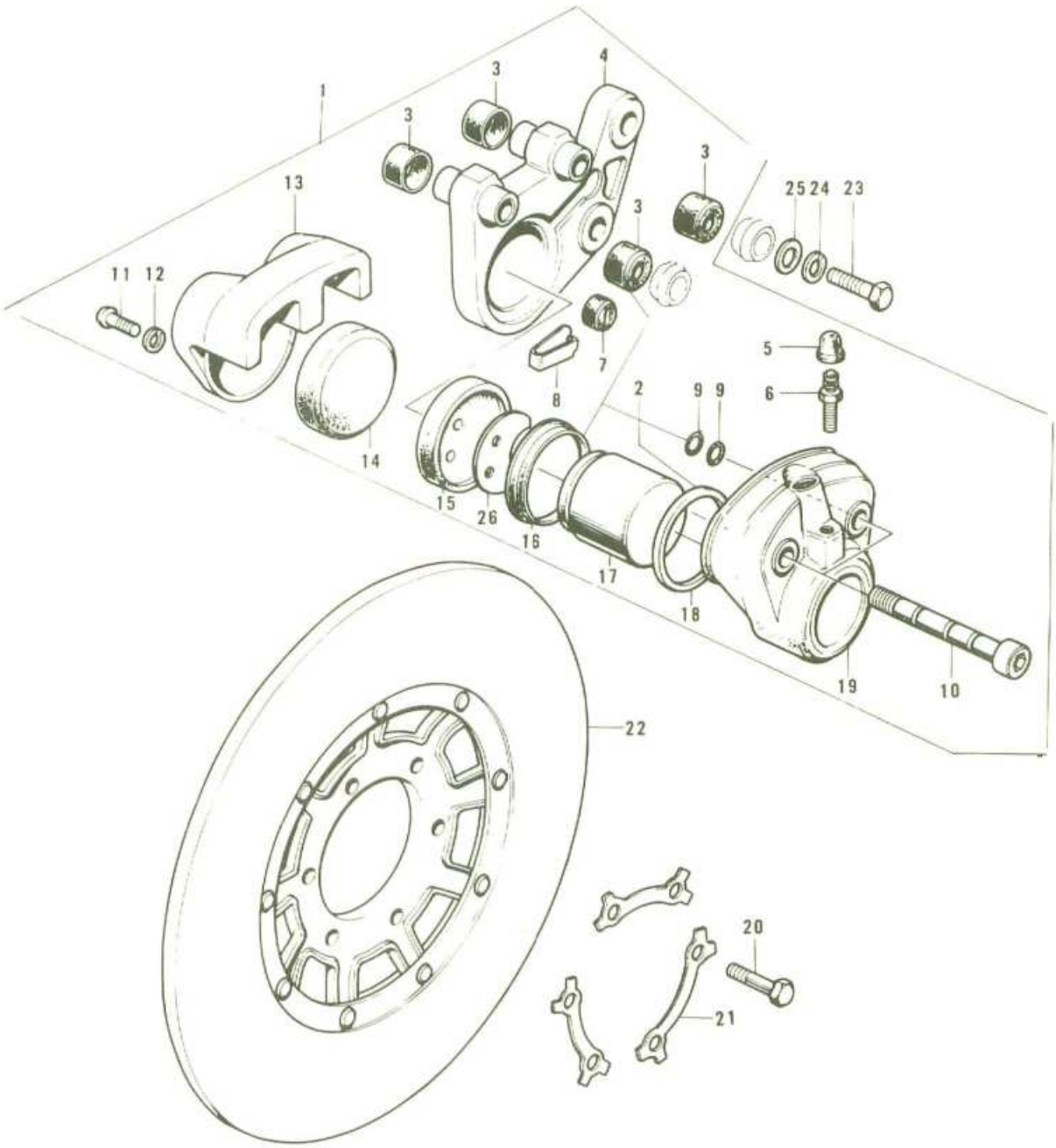


Fig. 5.3 Caliper assembly and disc

1 *Caliper assembly*
2 *Caliper repair kit*
3 *Dust seal - 4 off*
4 *Caliper holder*
5 *Cap for bleeder nipple*
6 *Bleeder nipple*
7 *Rubber bush*
8 *Disc pad 'A' stopper*
9 *'O' ring - 4 off*
10 *Shaft - 2 off*
11 *Pan head screw*
12 *Spring washer*
13 *Caliper 'B'*
14 *Disc pad 'B'*
15 *Disc pad 'A'*
16 *Piston seal*
17 *Caliper piston*
18 *Piston ring seal*
19 *Caliper 'A'*
20 *Bolt - 6 off*
21 *Lock washer - 3 off*
22 *Disc plate*
23 *Bolt - 2 off*
24 *Spring washer - 2 off*
25 *Plain washer - 2 off*
26 *Shim*

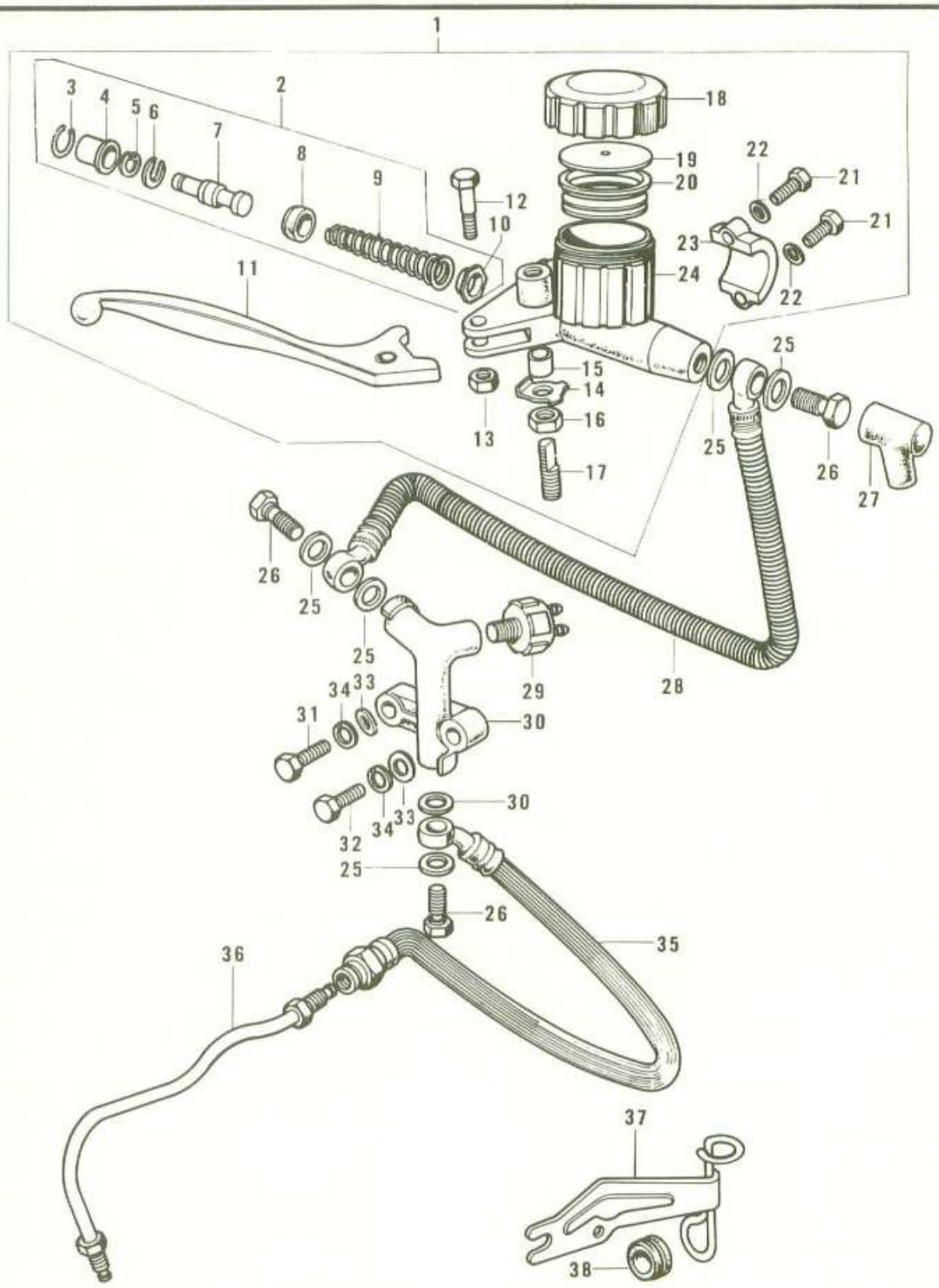


Fig. 5.4 Master cylinder and hoses

1 *Master cylinder assembly*
2 *Repair kit*
3 *Stopper*
4 *Boot*
5 *Circlip*
6 *Piston stopper*
7 *Piston*
8 *Primary cup*
9 *Return spring assembly*
10 *Check valve assembly*
11 *Front brake lever*
12 *Lever bolt*
13 *Nut*
14 *Lock washer*
15 *Tube*
16 *Nut*
17 *Lever adjusting bolt*
18 *Oil reservoir cap*
19 *Master cylinder plate*
20 *Diaphragm*
21 *Bolt - 2 off*
22 *Plain washer - 2 off*
23 *Master cylinder holder*
24 *Body master cylinder*
25 *Oil bolt washer - 6 off*
26 *Bolt - 3 off*
27 *Dust cover*
28 *Hose*
29 *Front brake switch*
30 *Three way joint*
31 *Bolt*
32 *Bolt*
33 *Spring washer - 2 off*
34 *Plain washer - 2 off*
35 *Hose*
36 *Brake pipe*
37 *Bracket*
38 *Hose grommet*

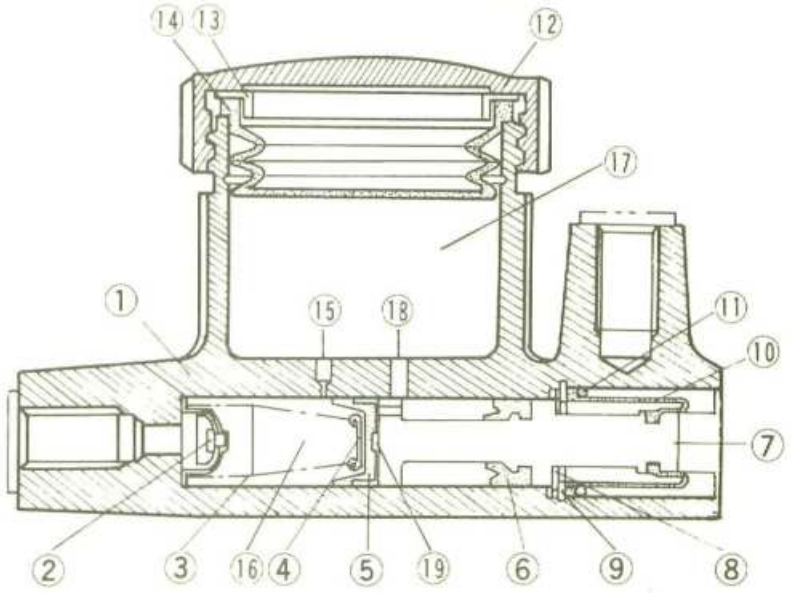


Fig. 5.5 Master cylinder assembly

1 *Body*
2 *Check valve*
3 *Spring*
4 *Spring seat*
5 *Primary cup*
6 *Secondary cup*
7 *Piston*
8 *Piston stopper*
9 *Circlip*
10 *Dust seal*
11 *Stopper dust seal*
12 *Cap*
13 *Plate*
14 *Cap seal*
15 *Relief port*
16 *Pressure chamber*
17 *Reservoir*
18 *Supply port*
19 *non-return valve*

piston straight out without turning it. The piston can also be blown out with compressed air through the brake line outlet, if it is reluctant to leave its seat.

3 Remove the piston seal taking care not to damage the cylinder wall. All the remaining parts such as the bleeder valve and nipple, may be removed at this time.

4 Clean all the parts in cleaning fluid and then blow them dry, taking care to pass air through all the passages.

5 Inspect all the parts for a worn or damaged condition, and replace them as necessary. Check the brake friction pads for damage or excessive wear and renew them if necessary, especially if they have worn down to the red line. The pads should alwayt be replaced as a pair. If the pads are oil impregnated, they should be renewed without question.

6 Inspect the oil seals for a worn, damaged or cracked conditon and renew them if necessary. If the seal around the caliper piston is bad, one pad will tend to wear more quickly than the other. The constant friction caused by the dragging pad, will cause a sharp increase in brake and fluid temperature, which may result in damage to the various parts.

7 When assembling the new seals and piston, coat them all liberally with clean brake fluid. The system is now ready for bleeding, as described in the following Section.

16 Bleeding the hydraulic brake system

1 A mushy feeling at the front brake lever can often be traced to air in the brake system. Brake fluid is not easily compressed, so that when the front brake lever is operated, almost all of the force applied to the lever is transmitted to the brake caliper. Air on the other hand compresses more easily, so that any air in the system compresses before the fluid will. This also means that some of the lever travel is wasted as it is used in compressing air without actually applying force to the caliper.

2 The brake system should be bled whenever the action at the front brake lever feels spongy, whenever brake fluid is changed, or whenever a brake line fitting has been loosened or disconnected. Bleed the hydraulic brake system in the following manner.

3 Remove the reservoir cap and check that there is plenty of fluid in the reservoir. The brake fluid level must be checked several times during the bleeding operation, and replenished as necessary. If the fluid in the reservoir runs out at any time, during the bleeding operation, air will enter the system and the procedure will have to be started all over again.

4 Use only new brake fluid. Do not use fluid that has been left unsealed in a container for any length of time. Use only the type of fluid recommended in this manual. **Caution:** Brake fluid must not be spilled on painted surfaces, it will strip the paint and should therefore be wiped off immediately.

5 Slowly pump the brake lever until no air bubbles can be seen rising up through the fluid from the holes at the bottom of the reservoir. When no more bubbles appear, the master cylinder end of the brake system has been purged of air.

6 Replace the reservoir cap, and run a clear plastic hose from the caliper bleeder valve into a container containing some brake fluid. The bottom of the hose must remain immersed throughout the whole operation. Unscrew the bleed nipple one turn and pump the front brake lever until no more air bubbles can be seen emerging from the plastic hose. Tighten the bleed nipple whilst the brake lever is squeezed towards the handlebars. During this process repeatedly check the fluid level in the reservoir, and replenish it as necessary.

7 When the system has been bled, replace the rubber cap on the bleeder valve, and check the fluid level in the reservoir once more. The handlebars must be turned so that the reservoir is level, and the brake fluid must come up to the level line inscribed inside the reservoir.

17 Wheel balancing and alignment

1 Wheel balancing should preferably be carried out on a truing stand, but as this necessitates removing the wheels, it can however be done in the machine. The front wheel can be balanced in

the forks as long as the brake is free and not binding. Similarly the rear wheel can also be balanced in the swinging arm as long as the chain is removed, and the rear brake is not binding.

Balancing should be accomplished with balance weights, although solder can be wrapped round the spokes as a substitute. The procedure is to spin the wheel in question and see where it stops, then mark the rim at its lowest point. Do this several times to determine where the heaviest section of the wheel is. Then begin adding weight to the opposite side of the rim as a counter-balance.

The weights available are measured in grams of 10, 20 and 30 or (1/3, 2/3 and 1 oz.). These can be obtained from a dealer. When the wheel is perfectly balanced it should not stop at any one point in particular, when spun.

2 Wheel alignment is easy on the Z1 series due to the fact that the rear fork ends are marked with a series of vertical lines. If the draw bolts are adjusted an even amount at a time as indicated by the lines, correct wheel alignment is preserved. If desired, the wheel alignment can be cross-checked by running a plank of wood parallel to the machine, so that it touches both walls of the rear tyre. If wheel alignment is correct, the measurement should be equal from either side of the front wheel tyre when tested on both sides of the rear wheel.

18 Tyres: removal and replacement

1 At some time or other the need will arise to remove and replace the tyres, either as a result of a puncture or because replacements are necessary to offset wear. To the inexperienced, tyre changing represents a formidable task, yet if a few simple rules are observed and the technique learned, the whole operation is suprisingly simple.

2 To remove the tyre from either wheel, first detach the wheel from the machine. Deflate the tyre by removing the valve core, and when the tyre is fully deflated, push the bead from the tyre away from the wheel rim on both sides so that the bead enters the centre well of the rim. Remove the locking ring and push the tyre valve into the tyre itself.

3 Insert a tyre lever close to the valve and lever the edge of the tyre over the outside of the rim. Very little force should be necessary; if resistance is encountered it is probably due to the fact that the tyre beads have not entered the well of the rim, all the way round.

4 Once the tyre has been edged over the wheel rim, it is easy to work round the wheel rim, so that the tyre is completely free from one side. At this stage the inner tube can be removed.

5 Now 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 completely free from the rim.

6 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 the position of the leak, 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 rubber solution and allow this to dry before removing the backing from the patch, and applying the patch to the surface.

7 It is best to use a patch of the self vulcanizing 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 into position. Inner tubes made from a special synthetic rubber may require a special type of patch and adhesive, if a satisfactory bond is to be achieved.

8 Before replacing the tyre, check the inside to make sure that the article that caused the puncture is not still trapped inside the tyre. Check the outside of the tyre, particularly the tread area to make sure nothing is trapped that may cause a further puncture.

9 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.

10 To replace the tyre, inflate the inner tube for it just to assume a circular shape but only to that amount, and then push the tube into 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 ring on the first few threads, sufficient to hold the valve captive in its correct location.

11 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.

12 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 ring touches the rim. This will ensure that the inner tube is not trapped when the last section of bead is edged over the rim with a tyre lever.

13 Check that the inner tube is not trapped at any point. Reflate 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 an equal distance 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.

14 Always run the tyres at the recommended pressures and never under or over inflate. The correct pressures for solo use are given in the Specifications Section of this Chapter.

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 surface 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 a good chance of the ends of the spoke nipples chaffing the inner tube and causing a crop of punctures.

17 Never fit a tyre that has a damaged tread or sidewalls. Apart from legal aspects, there is a very great risk of a blowout, which can have very serious consequences on a two wheeled 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 extra seal.

19 Tyres: valves and dustcaps

1 Inspect the valves in the inner tubes from time to time making sure the seal and spring are making an effective seal. There are tyre valve tools available for clearing damaged threads in the valve body, and incorporating thread cleaning for the outside thread of the body. A key is also incorporated for tightening the valve core.

2 The valve caps prevent dirt and foreign matter from entering the valve, and also form an effective second seal so that in the event of the tyre valve sticking, air will not be lost.

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

Fault diagnosis is overleaf.



Tyre removal: Deflate inner tube and insert lever in close proximity to tyre valve



Use two levers to work bead over the edge of rim



When first bead is clear, remove tyre as shown



Tyre fitting: Inflate inner tube and insert in tyre



Lay tyre on rim and feed valve through hole in rim



Work first bead over rim, using lever in final section



Use similar technique for second bead, finish at tyre valve position



Push valve and tube up into tyre when fitting final section, to avoid trapping

20 Fault diagnosis: wheels, brakes and tyres

Symptom	Cause	Remedy
Handlebars oscillate at low speed	Buckle or flat in wheel rim, most probably front wheel	Check rim alignment by spinning the wheel. Correct by retensioning spokes or having wheel rebuilt on new rim. Check tyre alignment
	Tyre not straight on rim.	
Machine lacks power and accelerates poorly	Brakes binding	Hot brakes drums provide best evidence.
	Wrongly adjusted caliper.	Readjust caliper.
Brakes grab when applied gently	Ends of brake shoes not chamfered (on internal expanding brakes)	Chamfer with a file.
	Eliptical brake drum	Lightly skim in a lathe by a specialist.
	Faulty caliper, on disc brake	Replace with a new caliper.
	Warped disc.	Replace disc if beyond skimming limit.
Brake squeal	Glazed pads	Lightly sand the pads, and use the brake gently for a hundred miles or so until they have a chance to bed in properly.
	Improperly adjusted caliper	Readjust caliper, as described in section 15 of this chapter.
	Extremely dirty and dusty front brake caliper and disc assembly	Clean with water, do not use high pressure spray equipment.
Excessive lever travel on front brake	Air in system, or leak in master cylinder or caliper; worn disc pads.	Bleed the brake Replace the cylinder seals Replace the pads.

Chapter 6 Electrical system

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Specifications

Battery	
Make	Yuasa
Type	12 N 14-3A
Voltage	12 volt
Amp hour capacity	14 amp hour
Earth or ground	Negative
Generator/Alternator:	
Make	Kokusan
Type	AR 3701
Output	12 volts
Ignition coil	
Make	Kokusan
Type	1G 3303, 1G 3304
Starter motor:	
Make	Kokusan
Type	SM 226 K
Brush length new	½ inch (12 – 13 mm)
Minimum permissable	¼ inch (7 mm)
Bulbs:	
Headlamp	12V 50/35W
Stop/tail lamp	12V 4/32W or 8/23W
Neutral indicator lamp	12V 3.4W
Instrument lamps	12V 3.4 W
Indicator lamps	12V 3.4W
Flashing direction lamps	12V 23W x 4
Fuse	20 amp

1 General description

1 The Z1 models covered by this manual use a 12 volt electrical system. The system comprises a crankshaft driven AC generator of the rotating magnet type surrounded by a stator coil assembly.
2 The output of the generator is AC hence the need for a rectifier of the silicon type to convert the current to DC so that it can be used to charge the battery. The standard output with a fully charged battery is 15 to 20 volts.

2 Crankshaft alternator: checking the output

1 The output from the alternator can be checked by connecting both a voltmeter and an ammeter into the battery circuit. Refer to Section 2 of Chapter 3 for details. The test gives only an approximate indication as to whether the alternator is functioning correctly within its prescribed limits. It is necessary to seek the assistance of a Kawasaki Agent or an Auto Electrical Expert to determine whether the generator is working to peak efficiency. The average rider/owner is unlikely to have the necessary test equipment available to carry out a sufficiently accurate check.

3 Battery: maintenance procedure

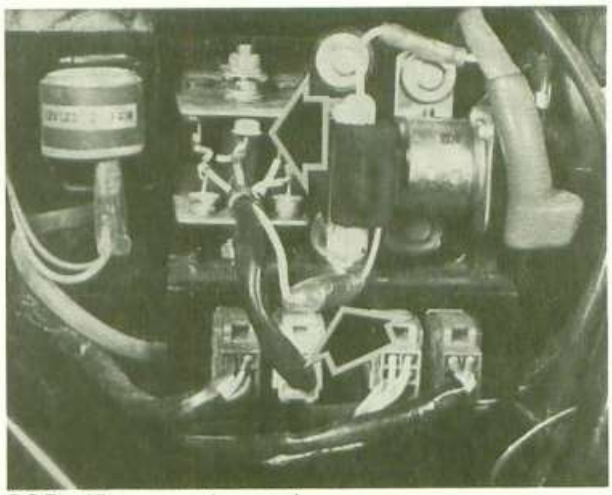
1 The battery fitted to the Z1 models is a Yuasa 12 volt with a 14 amp. hour capacity.
2 The transparent case of the battery gives an instant visual check of the level of electrolyte contained in the battery. The battery fits under the dualseat in a special cradled compartment.
3 The level of the electrolyte in the battery should never be allowed to fall below the lower level mark. If it does, it must be topped up with distilled water to the upper level, after the initial fill with sulphuric acid of a specific gravity of 1,260 to 1,280. Also make sure the vent pipe is routed through the proper channel provided to ensure that it discharges clear of the frame parts.
4 It is seldom practicable to repair a cracked battery case because the acid that is already established in the crack will prevent the formation of an effective seal. A cracked battery should be renewed at once because apart from a deterioration in efficiency there will be a considerable amount of corrosion if the acid continues to leak.
5 The battery should be checked every week, and topped up when necessary to the upper electrolyte level. When the machine is laid up for any length of time, it is always advisable to remove the battery and give it a refresher charge every four to six weeks, using a battery charger. Once a battery has been put into service (filled with acid) it must be kept in use, otherwise the cell plates will sulphate and render it useless.

4 Battery: charging procedure

1 The normal charging rate for batteries of up to 14 amp. hour capacity is 1½ to 2 amps. It is permissable to charge at a more rapid rate in an emergency but this shortens the life of the battery, and should be avoided. Always remove the vent caps when recharging a battery, otherwise the gas created within the battery when charging takes place will explode and burst the case with disastrous consequences.

5 Silicon rectifier: location and replacement

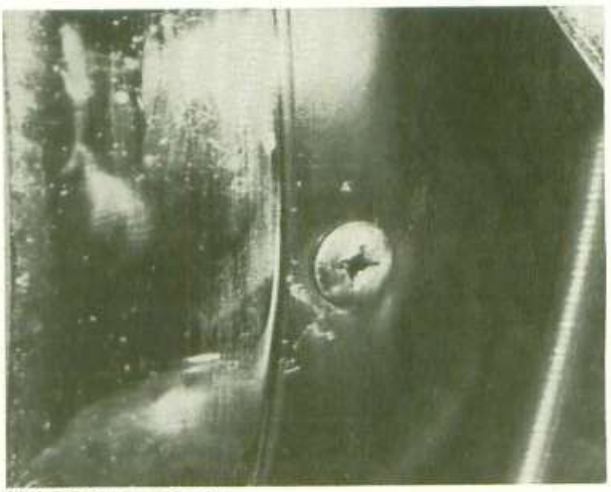
1 The silicon rectifier fitted to the electrical system converts the AC current produced by the alternator to DC so that it can be used to charge the battery.
2 The rectifier is mounted on the electrical panel with the voltage regulator and connector blocks, on the right-hand side of the machine below the dualseat. The whole panel is enclosed by



5.2 Rectifier mounted on panel



8.1 Undo the mounting bolts to free starter motor



10.1 3 Screws retain rim

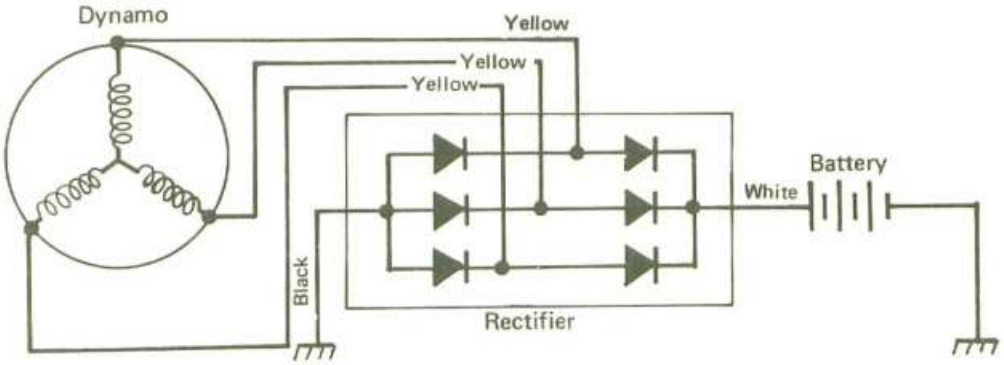


Fig. 6.1 Rectifier circuit

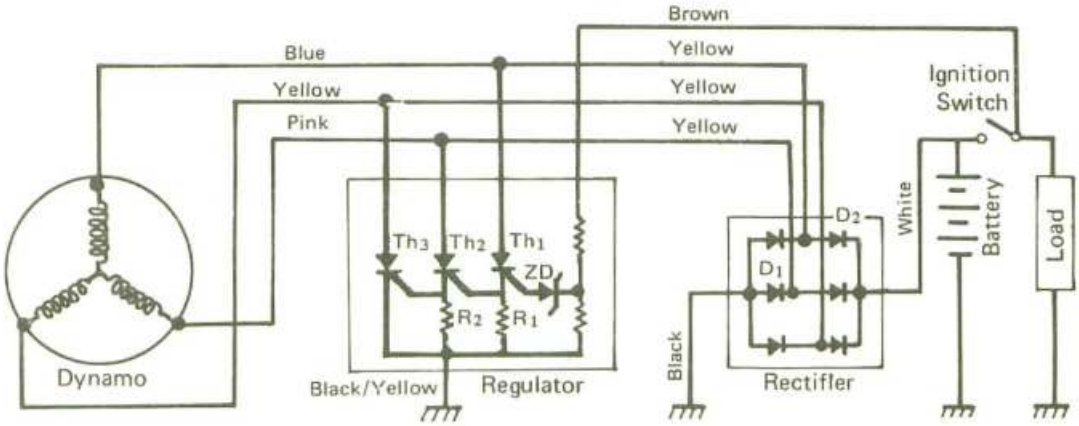


Fig. 6.2 Rectifier and regulator circuit

a cover that is pushed on to fasteners.

3 The rectifier is a component that cannot be repaired, and if found faulty it has to be replaced with a new unit. Damage to the unit can be caused by running the machine without a battery or if the battery leads are accidentally reversed.

4 The six-diode arrangement (two diodes for each of the dynamo's three output phases) is used to convert the AC current into DC current for battery charging, ignition, lighting, and horn circuits. The diodes in the rectifier can only conduct current from negative to positive, and therefore they convert AC to DC. If the rectifier or diodes become faulty they will conduct current either in both directions, or not at all, and therefore lead eventually to a discharged battery.

5 The rectifier can be tested with an ohmmeter. First disconnect the white rectifier plug from the connector panel, and the white lead going to the battery. With the tester set on the RX10, or RX100 range, check the resistance between the white rectifier lead and each of the yellow leads, the yellow leads and the white lead, the black lead and each of the yellow leads, and also each yellow and black lead. This involves a total of twelve measurements. The resistance should be low in one direction, and about ten times as great in the other direction. If the readings are the same in either direction for any pair of wires, the rectifier is faulty and should be replaced. The lower reading should be within the 1/3rd scale of zero ohms, regardless of the type of tester used.

6 Note: When removing or installing a rectifier, do not loosen or try to tighten the main assembly nut of the rectifier, as this is part of the assembly and should not be disturbed. If disturbed damage will be caused to the whole rectifier assembly and render it useless. When fitting a new replacement take great care not to disturb the coating over the electrodes, which may peel or flake and destroy the working action.

6 Voltage regulator: operating principle and testing

1 The voltage regulator fitted to the Z1 models is of the solid state type. Its function is to handle the power output from the three phase generator, and to limit the voltage to 15 - 16 volts. It is constructed to control each of the three phases of the alternator output.

2 Two symptoms which would indicate the possibility of a faulty regulator are repeated battery discharging or battery overcharging. A battery overcharged is indicated by the need to top up the electrolyte more frequently than is normal, and also by blowing bulbs in the lighting system when running at high rpm's.

3 Discharging of the battery more excessively than is normal is indicated by a battery that when checked reads correctly, but goes dead quickly after being fully charged.

4 To test the voltage regulator disconnect the green regulator plug from the connection panel. This is located under the right-hand plastic cover. When removing the regulator do not loosen or remove the three screws contained in the regulator body. These screws aid heat dissipation; the unit will overheat badly if they are not properly installed.

5 With an ohmmeter set on the RX10 or RX100 scale, there should be 1,000 - 1,100 ohms resistance between the black and brown leads, and no reading (00) between any other lead. Any other results indicate that the regulator is defective.

6 For the next test a 14 V.D.C. and a 16-17 V.D.C. power

source must be available. If the sources used cannot provide sufficient power, the tests will be inaccurate, and if more than 18 volts are passed through the regulator it may be damaged.
7 Connect the regulator to the 14 V.D.C. source, set the ohmmeter to either the RX10 or the RX100 range, and check that there is no reading (00) between the black lead and pink lead or the yellow lead and blue lead. If the meter gives any reading for any of these leads, the regulator is defective.
8 Connect the regulator to the 16-17 V.D.C. source in the same manner as paragraph 7, and set the meter on the RX1 scale, this should result in a very low reading when the meter is connected between the black lead and the blue, pink or the yellow leads. If there is no reading between any or all of the leads, or if any one reading is higher than the other two, the regulator is defective and must be replaced with a new one.
Note: If the voltage source and regulator are connected backwards for even a moment, the regulator will be damaged. Also be sure that the black and brown leads never touch the meter leads at the same time, or the meter will be damaged.

7 Fuse: location and replacement

1 A fuse is incorporated in the electrical system. It is contained in a plastic holder and clips to the side of the battery holder. The fuse is incorporated in the system to give protection from a sudden overload such as could happen with a short circuit. The fuse is rated at 20 amps.
2 If the fuse blows it should not be renewed until the cause of the short is found. This will involve checking the electrical circuit to correct the fault. If this rule is not observed, the fuse will almost certainly blow again.
3 When a fuse blows and no spare is available a "get you home" remedy is to wrap the fuse in silver paper before replacing it in the fuse holder. The silver paper will restore electrical continuity by bridging the broken wire within the fuse. Replace the doctored fuse at the earliest opportunity to restore full circuit protection. Make sure any short circuit is elimimated first.
4 Always carry two spare fuses of the correct rating.

8 Starter motor: removal, examination and replacement

1 An electric starter is fitted to the Z1 models operated by a push button switch on the body of the right-hand twistgrip. The starter motor is mounted on the top of the crankcase, to the rear of the cylinder block, and is accessible by removing the cover that is held on by two screws. The motor is held by two bolts that go through the end bracket and secure the motor to the crankcase. Remove the fuel tank, carburettors, starter cover and gasket, also the left-hand engine cover. Remove the right-hand side cover, unscrew the starter wire from the starter relay terminal, and free the wire from the cable clamp. Unscrew the two mounting bolts and the starter motor can now be removed.
2 To dismantle the motor, first remove the two long assembly screws through the body. The end cover can then be removed. Disconnect the brush assembly from the field coil lead, and then remove the brush plate and brushes.
3 Remove the remaining end cover, and withdraw the armature from the starter body and field coil assembly. Inspect the carbon brushes for wear, and replace them if they have worn past the standard measurement of ½ inch (12 to 13 mm) to ¼ (7 mm) or more. Always replace the brushes as a pair.
4 Before fitting the brushes make sure the commutator is clean. Clean with a strip of fine emery pressed against the commutator whilst it is rotated by hand, then wipe with a clean rag soaked in petrol.
5 Reassemble the starter motor by reversing the dismantling procedure, place it back into the top of the crankcase and tighten the two mounting bolts. Refit the starter cable to the switch and replace the plastic cover. Replace the starter motor cover with the gasket and two screws.
Note: When reassembling the starter motor make sure the marks scribed on the body are in line, also when slipping the starter motor into place lubricate the "O" ring with a small amount of fresh oil. This facilitates reassembly.

9 Starter motor switch: function and location

1 The starter motor switch is designed to work on the electromagnetic principle. When the starter motor button is depressed, current from the battery passes through the windings of the solenoid switch and generates an electro-magnetic force which causes a set of contacts to close. Immediately the points close, the starter motor is energised and a very heavy current is drawn from the battery.
2 This arrangement is used for two reasons. First the current is drawn only when the starter button is depressed and is cut off again when pressure on the button is released. This ensures minimum drainage to be taken from the battery. Secondly, if the battery is in a low state of charge, there will not be sufficient current to cause the solenoid contacts to close. In consequence, it is not possible to place an excessive drain on to the battery, which in some circumstances can cause the battery plates to overheat and shed their coatings.
3 If the starter will not operate, first suspect a discharged battery or a defective switch. If there is a "click" when the button is depressed the solenoid switch is functioning but the battery is probably discharged. If there is no contact, the solenoid switch probably needs renewing (provided the circuit is correct). It is not practicable to repair a solenoid switch.

10 Headlamp: replacing bulbs and adjusting beam light

1 In order to gain access to the headlamp bulbs remove the rim, this is retained by two screws behind the rim. The rim can now be pulled off with the reflector unit complete and the pilot bulb removed.
2 Disconnect the headlamp bulb adaptor from the sealed beam unit and remove the lens retaining ring. The main bulb can now be removed.
3 To adjust headlight beam height, slacken the two turn signal mounting nuts inside the headlamp shell, loosen the mounting bolts underneath the lamp and adjust the aim of the unit to the required position (up and down) vertical aim.
4 Adjust the horizontal (left to right) aim of the light by turning the small crosshead screw situated directly in front of the rim. Screwing the screw inwards moves the beam to the right and screwing out moves the beam to the left. On European models the headlamp bulb is the prefocus type, on USA models the headlamp lens and bulb are a sealed unit, and the whole unit has to be replaced in the event of light failure. Set the beam height with the machine on a level surface 25 yards from a wall so that the centre of the light spot is the same distance as that from the centre of the headlamp to the ground.

11 Stop and tail lamp: replacing the bulb

1 The tail lamp fitted to the Z1 series has a double filament bulb. One lights the rear lamp and the other for the braking of the machine. The brake light is operated by either the front or rear brake lamp switch. The front brake switch is an oil pressure switch that is installed in the front hydraulic brake hose and it turns on when front brake pressure is applied. The rear brake switch is operated by the rear brake pedal, and is adjustable by altering its position higher or lower in the mounting bracket.
2 Remove the two long screws that retain the rear lamp lens. The bulb can be removed by pushing in and at the same time turning in an anticlockwise direction. Replace the bulb by reversing the procedure. The bulb has to be renewed if either the tail lamp or brake light filament burns out. When the lens is

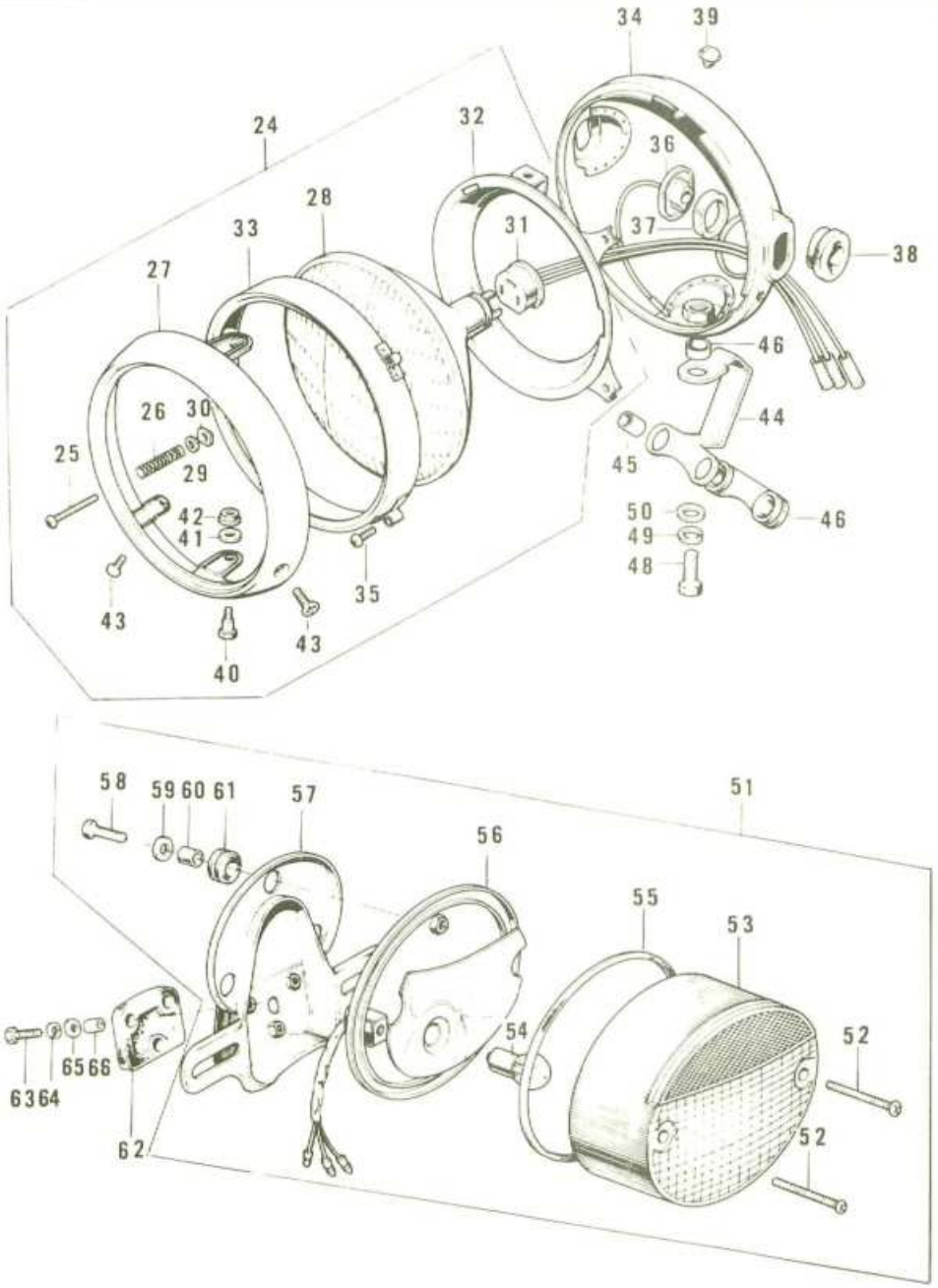
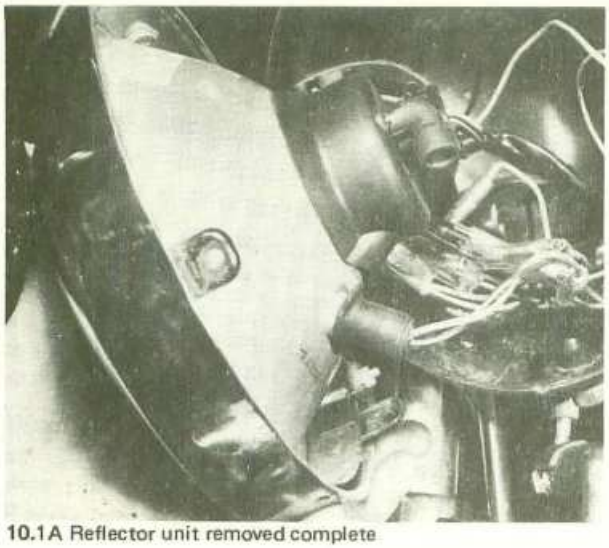
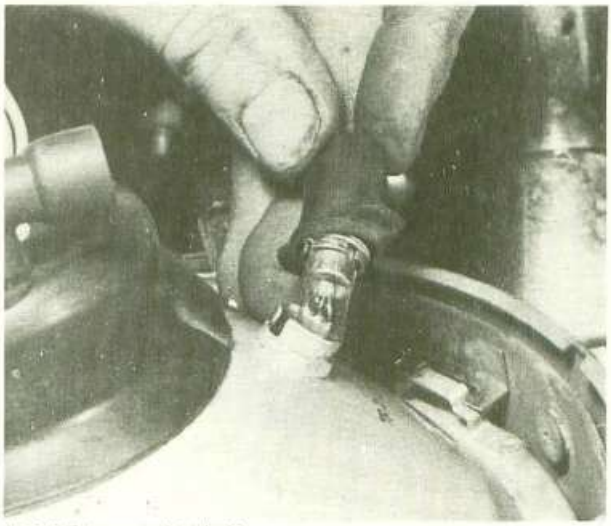


Fig. 6.3 Headlamp and tailamp assembly

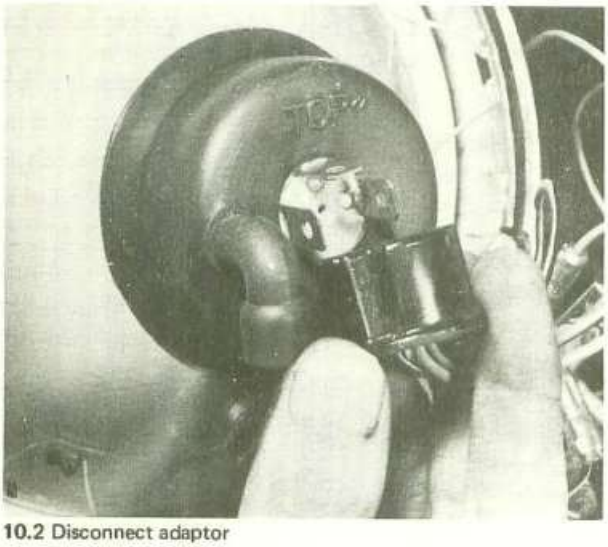
24 Headlamp assembly
25 Adjusting screw
26 Adjusting screw spring
27 Headlamp rim
28 Sealed beam unit
29 Plain washer
30 Nut
31 Socket
32 Ring
33 Ring
34 Headlamp shell
35 Pan head screw - 2 off
36 Collar - 2 off
37 Rubber for headlamp shell
38 Rubber for headlamp shell
39 Rubber plug
40 Pan head screw - 2 off
41 Plain washer - 2 off
42 Nut - 2 off
43 Pan head screw - 2 off
44 Bracket
45 Collar - 2 off
46 Rubber
47 Collar
48 Bolt
49 Spring washer
50 Plain washer
51 Tail lamp assembly
52 Pan head screw - 2 off
53 Tail lamp lens
54 Bulb stop and tail 12 v 32/4 watt
55 Rubber gasket
56 Body tail lamp
57 Tail lamp and plate bracket
58 Bolt - 3 off
59 Plain washer - 3 off
60 Collar - 3 off
61 Rubber - 3 off
62 Shock damper
63 Bolt - 3 off
64 Plain washer - 3 off
65 Collar - 3 off
66 Rubber - 3 off



10.1A Reflector unit removed complete



10.1B Take out pilot bulb



10.2 Disconnect adaptor



10.2A Remove cap



10.2B Take out bulb



12.2 Removing indicator lens

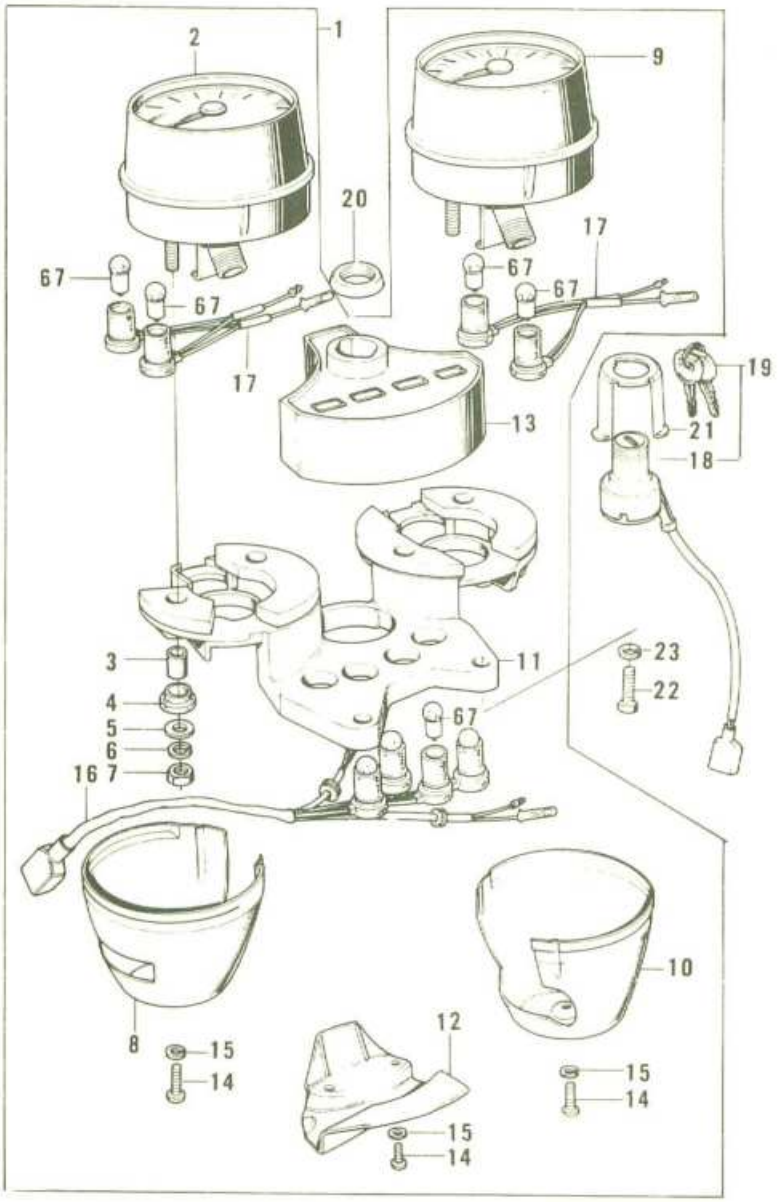


Fig. 6.4 Speedometer and tachometer assembly

1 *Speedometer and tachometer assembly combined*
2 *Speedometer only*
3 *Meter collar - 4 off*
4 *Rubber - 4 off*
5 *Plain washer - 4 off*
6 *Spring washer - 4 off*
7 *Nut*
8 *Cover*
9 *Tachometer assembly*
10 *Tachometer cover*
11 *Bracket*
12 *Wiring harness cover*
13 *Indicator lamp cover*
14 *Pan head screw - 5 off*
15 *Spring washer - 5 off*
16 *Socket assembly - indicators*
17 *Socket assembly meter lamp - 2 off*
18 *Ignition switch*
19 *Key set*
20 *Locknut*
21 *Igniton switch holder*
22 *Bolt - 2 off*
23 *Washer - 2 off*
67 *Bulb 12v. 3 watt*

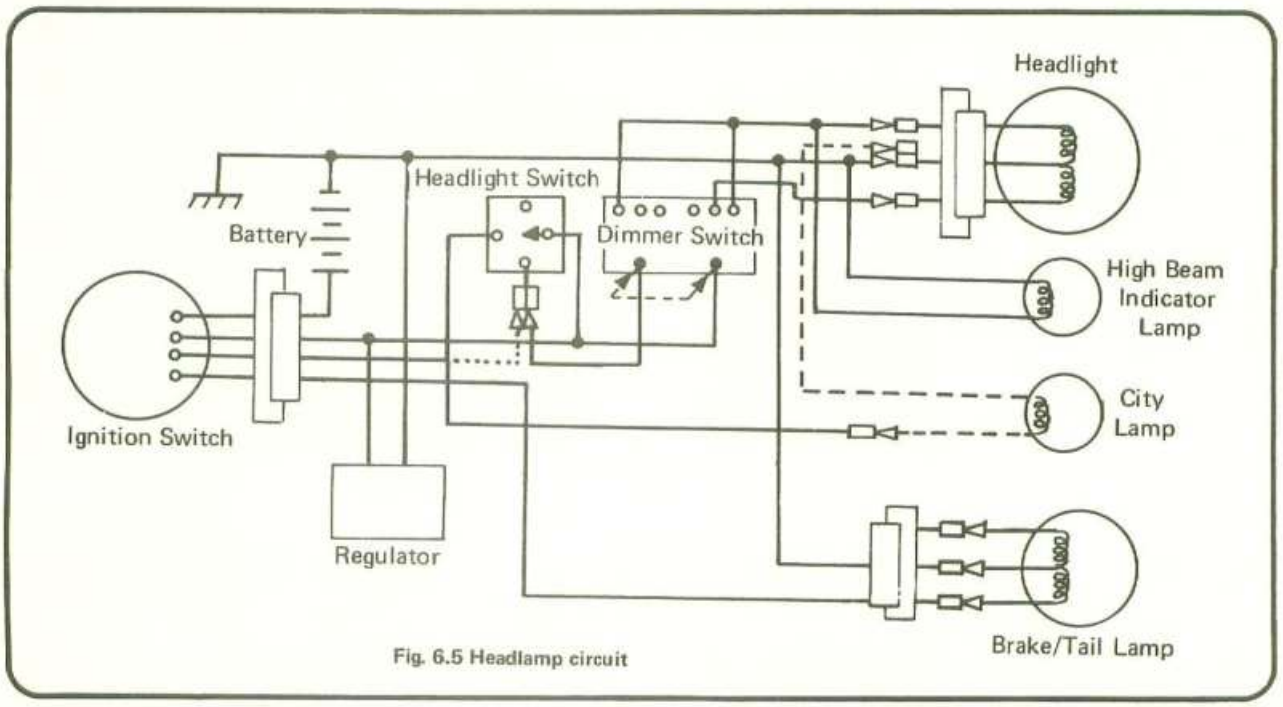


Fig. 6.5 Headlamp circuit

replaced, make sure the mounting gasket is in good condition and waterproof.

12 Flashing indicator relay and lamps: location and replacement

1 The flashing indicator relay is fitted to the same electrical panel as the voltage regulator and rectifier, below the dualseat on the right-hand side of the machine. It is mounted in rubber because of the fragile mechanism inside. It is very important not to drop the unit otherwise damage will result.
2 The flashing indicator lamps are fitted to the front and rear of the machine on 'stalks' through which the wires pass. To renew the bulbs remove the two screws that retain each lens, and remove the bayonet type bulbs. These are single filament with a rating of 12 volt 23 watt. Make sure the rubber gaskets on the base of the lens are in good condition and waterproof, when replacing the lens.

13 Speedometer and tachometer: replacing the bulbs

1 The bulbs that fit into the instruments and dash panel are of the small bayonet type, rated at 12 volts 3.4 watt.
2 The shrouds that cover the instruments have to be removed to expose the bulbs; the bulb holders are a push fit into the back of the panel and are easily removed and replaced.

14 Horn: location and adjustment

1 The horn is adjustable by means of the small screw located at the back of the horn, situated in the top of the front frame gusset. To adjust the volume, turn the screw about half a turn either way until the desired tone is required.
2 If it is necessary to dismantle the horn to clean the contacts, first remove the fuel tank, then remove the horn. Clean the contacts with a fine sand paper, and if after this the horn does not work it must be renewed. Make sure the horn is watertight by renewing the gasket when reassembling.

15 Handlebar switches, ignition and lighting switches: examination and replacement

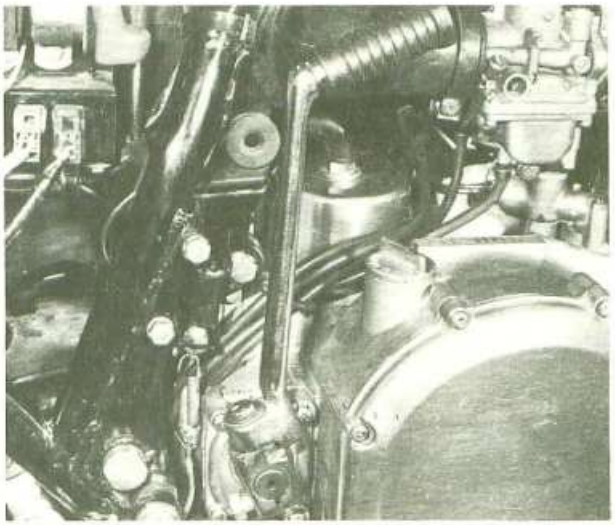
1 The handlebar switches are made up of two halves that clamp together with small crosshead screws, these are situated underneath the switch assemblies. The switches seldom give any trouble, and it is not advisable to take them apart as the parts are so small that difficulties can occur during reassembly, not to mention the time involved. If a switch fails it is far better to fit a new replacement. This is quite a simple task as the wires are fitted into snap connectors.
2 The main ignition switch is located in the centre of the dash panel and is removed by unscrewing the ring nut round the barrel of the switch. The dash panel can then be removed. Take off the front light unit and headlamp shell together with the flasher lamps and remove the switch lower cover and the mounting nut. The ignition switch can now be removed by unplugging the leads.
3 When replacing the ignition switch, the vertical aim of the headlight will have to be readjusted. Also note that the left-hand turn signal wires goes to the green wire, and the right-hand turn signal wire is plugged into the grey wire.

16 Stop lamp switches: adjustment and replacement

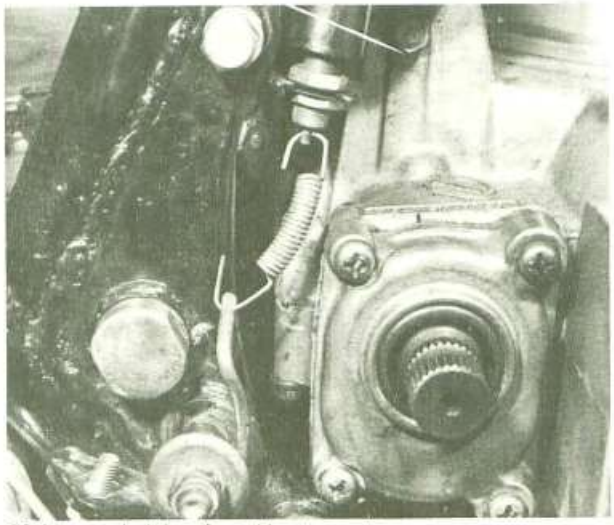
1 The rear brake stop lamp switch is located in a bracket above the rear brake pedal and is operated by an expansion spring linked to the rear brake pedal. The body of this switch is threaded to enable it to be raised or lowered.
2 If the rear brake stoplamp is late in operating, slacken the two locknuts and raise the switch body. When the adjustment is correct tighten the locknuts and test. If the stoplamp is early in operation, slacken the locknuts and lower the body in relation to the bracket.
3 As a guide the light should come on when the rear brake pedal has been depressed about ¾ inch (2 cm).
4 The hydraulic front brake lamp switch operates the same bulb in the tail light as the rear brake switch. The hydraulic pressure switch switch operates when the front brake lever is compressed. Adjustment of this switch is not possible. If the pressure switch has to be renewed, the complete switch can be unscrewed after the hydraulic system has been drained from the



15.1 Switches are clamped with two screws



16.1 Rear stop lamp switch ....



16.1A ....switch is adjusted by two nuts



17.1 The oil pressure switch



17.1A Removing pressure switch from body

three way branch pipe situated underneath the headlamp. When a new hydraulic pressure switch is installed it will be necessary to refill and bleed the hydraulic brake system as described in Section 16, Chapter 5.

17 Engine oil pressure switch: removing and replacement

1 The oil pressure switch is mounted on top of the engine to the rear of the cylinder block. The oil pressure switch serves to indicate when the oil pressure has dropped due to pump failure, blockage in a oilway or too little oil available to the oil pump. It is not however intended to be used as an indication of correct oil level. If the oil pressure lamp (located in the dash panel) comes on and stays on when the oil is hot and the machine is being rapidly accelerated, the fault is probably the switch, this can sometimes be remedied by revving the engine up past 6.000 rpm for a second or two but if this does not put the light out, disconnect the blue wire from the oil pressure switch, and remove the switch. When installing a new switch coat the thread with a sealer to form an oil tight seal. MAKE SURE IT IS THE SWITCH AT FAULT BEFORE USING THE MACHINE. A GENUINE LUBRICATION PROBLEM WILL CAUSE SEVERE ENGINE DAMAGE.

18 Fault diagnosis: electrical system

Symptom	Cause	Remedy
Complete electrical failure	Blown fuse	Check wiring for loose connections before fitting a new fuse.
	Isolated battery	Check battery connections for signs of corrosion.
Constant blowing of bulbs	Vibration or poor earth connections	Check bulb holders, check earth return connections.
Dim lights, horn and starter do not work	Discharged battery	Recharge battery with a battery charger. Check generator for output.
Starter motor sluggish or will not work	Worn brushes	Remove starter motor and replace with new bush Clean commutator.
Flashing lights will not flash	Faulty relay unit Bad earth	Replace with a new relay unit. Check flasher lamp bulb holders for good earth.

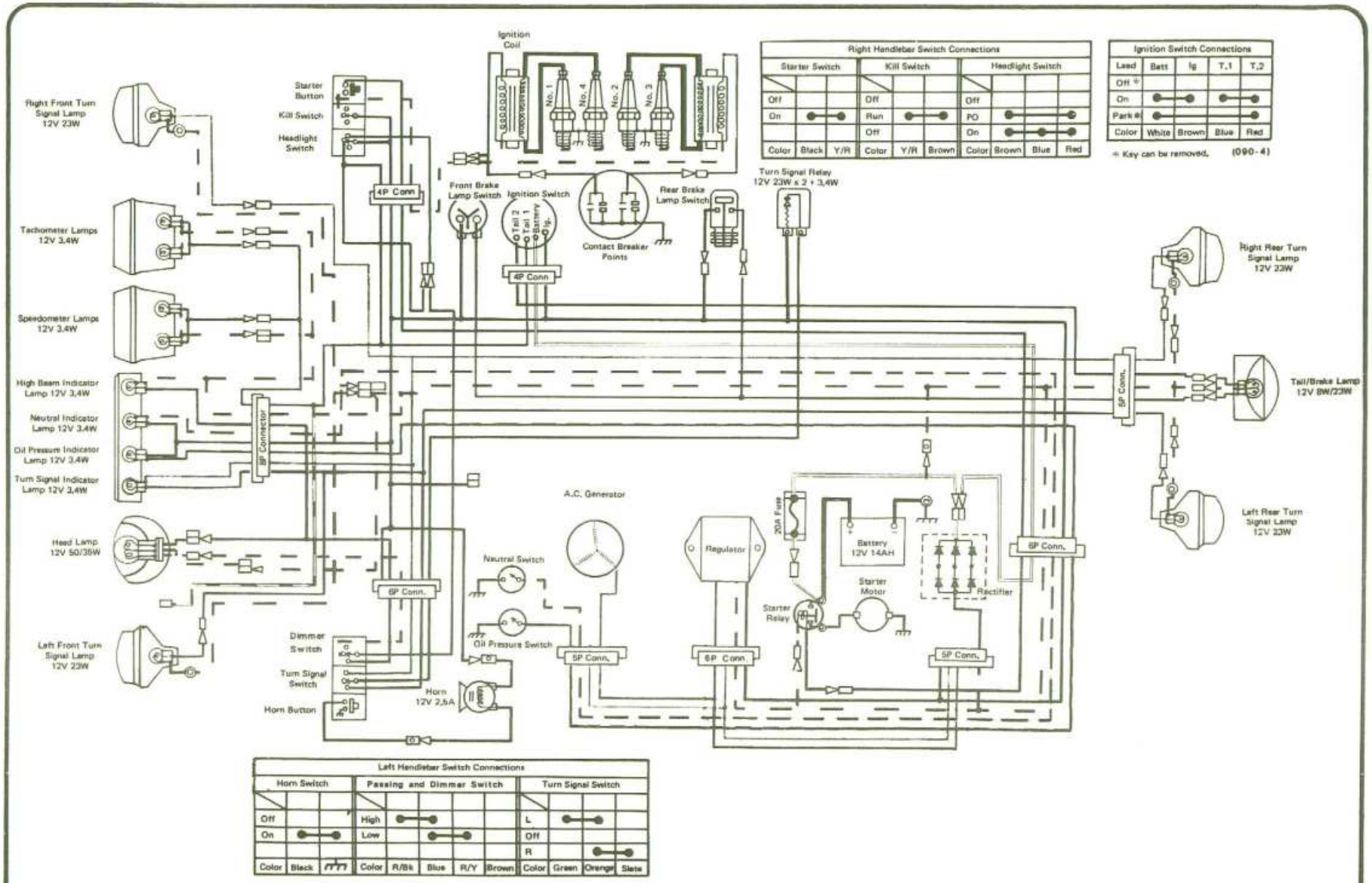


Fig. 6.6 Kawasaki 900cc ZI Wiring diagram (U.S. model)

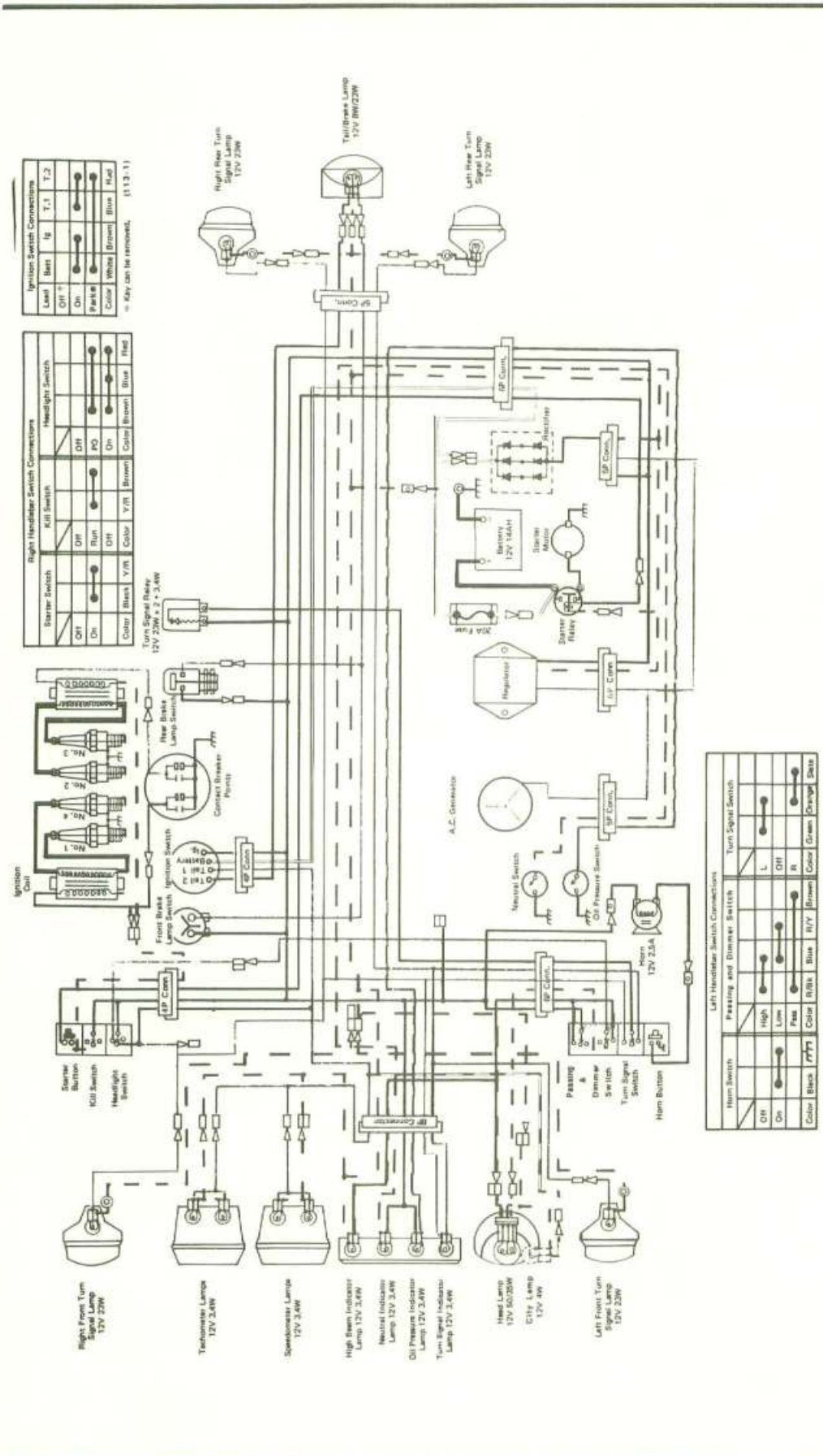


Fig. 6.7 Kawasaki 900cc Z1 Wiring diagram (European model)



Left and right-hand views of the 1977 Kawasaki Z1000 DOHC



Chapter 7 The Z900 and Z1000 models

Contents

General description
Swinging arm fork: removal and renovation ... 1
Final drive chain: maintenance and renewal ... 2
Hydraulic disc brakes: modifications ... 3
Rear brake master cylinder: maintenance, removal and renovation ... 4
Rear brake caliper: maintenance, removal and replacement 5

Specifications

The additional specifications given here cover the Z900 and Z1000 models where they differ from those given in the main text for the Z1 machines. Where specific mention is not made, it may be assumed that the Z1 specifications can be applied.

	Z900	Z1000
Engine		
Bore	66 mm	70 mm
Stroke	66 mm	66 mm
Displacement	903 cc	1015 cc
Compression ratio	8.5 : 1	8.7 : 1
Maximum horsepower	81 @ 8,000 rpm	83 @ 8,000 rpm
Maximum torque	7.3 kg/m @ 7,500 rpm	8 1 kg/m @ 6,500 rpm
Piston ring end gap	0.2 - 0.4 mm (0.008 - 0.016 in)	0.3 - 0.5 mm (0.012 - 0.020 in)
Carburettors		
Make	Mikuni	Mikuni
Type	VM 26 SS	VM 26 SS
Main jet	115 - R	107 - 5R
Pilot jet	17.5	17.5
Needle jet	0 - 6	0 - 8
Jet needle	5DL31 - 3	5CN8-3
Needle position	No. 3 groove	No. 3 groove
Tyre pressures		
Front	28 psi	28 psi
Rear solo	32 psi	32 psi
Rear pillion	36 psi	36 psi
Front fork capacity (per leg)	188-196 cc	170-178 cc
Brakes		
Front (UK)	Twin disc	Twin disc
Front (US)	Single disc	Single disc
Rear	Disc or drum	Single disc
Battery		
Make	Yuasa	Yuasa
Type	YB 10	YB 14L-AZ
Capacity	12V 10AH	12V 14AH
Generator		
Make	Kokusan	Kokusan
Type	AR 3703	AR 3703
Starter motor		
Make	Mitsuba	Mitsuba
Type	SM-226-K	SM-226-K
Ignition coil		
Make	Toyo Denso	Toyo Denso
Type	ZC001-14/ZC001-23	ZC001-14/ZC001- 23

General description

In 1976, the highly successful Z1 models were superseded by the Z900. The updated specification included audible turn signal indicators, now deleted, hazard warning flashers and twin front disc brakes, the latter having been an option for some time.

The Z900, although equally successful, produced marginally less power than its earlier ancestors, mainly due to the addition of the PCV system. Although the effect of this was, to all practical purposes, academic, Kawasaki were quick to introduce the Z1000 model later in the same year.

The Z1000 produced even more power than the original Z1, this being obtained by increasing the bore size from 66mm to 70mm. The exhaust system had by now been modified to a sleeker four-into-two arrangement. Many subtle alterations were incorporated into the new model.

Many of the engine castings were thickened to give quieter running. A heavier-webbed crankshaft made the engine smoother, despite it being over-square in configuration, so that low speed tractability was maintained.

The frame also received attention, being gusseted and reinforced at various points. The rake of the steering head was reduced slightly, and a new lengthened swinging arm fitted, running on needle roller bearings.

Most of the model changes and modifications have no real effect on the methods described in the foregoing text concerning maintenance and renovation: The manufacturers have preserved the initial concept of the Z1 wherever possible, and have restricted all subsequent alterations to the minimum, their policy being one of refinement, rather than change for change's sake.

This Chapter then, deals with those operations which demand a different approach or method when dealing with a specific task or component. Where specific mention is not made, it may be assumed that any modifications do not materially affect the methods of operation described in the preceding Chapters.

1 Swinging arm fork: removal and renovation

1 As mentioned in Section 1 of this Chapter, the swinging arm on Z1000 models is supported by needle roller bearings, rather than by the bushes used on earlier models. The use of needle rollers gives a greater degree of precision than the earlier bushed type, and they are also less prone to wear.

2 The bearings can be checked for wear by pushing the swinging arm fork from side to side. This is best done whilst the rear wheel is removed. Another good indication that all is not well is a slight twitch, particularly evident when the machine is ridden hard through a series of bends.

3 Access to the bearings is gained after removing the swinging arm as described in Section 2, paragraphs 9 to 17. It should be noted at this juncture that it is not possible to remove the bearings without damaging them, so be sure to have new bearings to hand before commencing work.

4 It is advisable to remove the brake torque arm from the swinging arm as it tends to get in the way. It is retained by a spring pin, nut and spring washer.

5 Withdraw the inner sleeve spindle, which forms the inner bearing race, and through which the pivot shaft passes. Examine the sleeve spindle for wear at the bearing surfaces, looking for pitting or grooves which may have occurred due to lack of lubrication or old age. If the surface is anything less than perfect, the sleeve should be renewed. It is false economy to re-use a worn sleeve, as the damaged surfaces will quickly destroy the new bearings.

6 Using a long drift, such as a long bolt, pass it through the bore of the swinging arm and drive out the bearing on the opposite side. Turn the swinging arm over and drive out the other bearing.

7 The new bearings are best fitted by using the drawbolt method. Obtain three plain washers and a spacer which will fit over the pivot shaft. Check that when assembled the nut can be tightened to hold the assembly firmly against each end of the swinging arm bore. Fit a washer behind the pivot shaft head, and pass the shaft through the swinging arm bore. Slide on a bearing, followed by another washer, the spacer, the third washer, and finally the nut. Ensure that the washer adjacent to the bearing is larger in diameter than the bearing, and that the assembly, particularly the bearing, is square in relation to the bore.

8 Gradually tighten the nut so that the bearing is drawn squarely into the swinging arm bore. Remove the drawbolt components and repeat on the other side. Always lubricate the new bearings with gear oil before fitting.

9 Replace the swinging arm in the frame, following the removal sequence in reverse. Do not omit to loop the endless chain over it before refitting the wheel. Before using the machine, lubricate the pivot and bearing with high melting point grease. Pump the grease in until it just begins to ooze from the ends of the swinging arm bore.

10 Re-adjust the rear chain and brake before taking the machine on the road. The torque arm nut should be tightened to 2.6 - 3.5 kg m (19.0 - 25.0 ft lbs) and the spring pin replaced.

2 Final drive chain: maintenance and renewal

1 With the exception of the Z1 and Z1A models, which were fitted with a chain lubrication pump, the later models are supplied with what the manufacturers describe as pre-lubricated chains. These consist of roller chains with small O-rings at the ends of each roller which retain the lubricant that is applied on assembly.

2 Without exception, the chains are of the endless type. Spring links are not fitted as they are not considered strong enough to take the tremendous power produced by the engine. Consequently, it is not advisable to attempt to separate and re-rivet the chain, should it need removal, as this will probably weaken it considerably.

3 Despite its title, it should not be assumed that the chain does not need periodic maintenance. On the contrary, in view of the fact that considerable dismantling is necessary to renew the chain, frequent cleaning and lubrication will prolong its life and postpone the inevitable.

4 The chain should be cleaned in situ, and relubricated with one of the proprietary aerosol lubricants designed for this purpose. Engine oil is not really suitable as it tends to be flung off easily. Do not use paraffin as a cleaner and do not over-lubricate. Little and often is advised.

5 This task should be undertaken every 200 miles at least. In wet, dirty conditions this period can be reduced considerably, lubrication being especially important before and after a long run.

6 It is unfair to expect the rear chain to last for more than a year. In practice it is not usual to have to renew the chain more frequently, especially if the machine is driven hard.

7 Chain wear can be measured with the chain stretched taut by means of the chain tension adjusters. Measure the length of 20 links on the top run of the chain. It is easier to remove the chainguard first. The distance of a new chain, pin centre to pin centre, should be 381mm (15 in). If the distance has increased to more than 388mm (15.27 in), the chain should be renewed.

8 The correct way to remove the chain is as follows:

9 Place the machine securely on its centre stand, and block, if necessary, to raise the rear wheel clear of the ground. The silencers should be detached to give better access, as should the chain guard.

Drum brake models

10 Slacken off both chain adjusters, and the wheel spindle nut. Allow the adjusters to drop, exposing the stops at the end of the fork ends. These are each retained by a single bolt and should be removed.

11 Push the wheel forward so that the chain can be disengaged from the sprocket. Allow it to rest to one side. Disconnect the

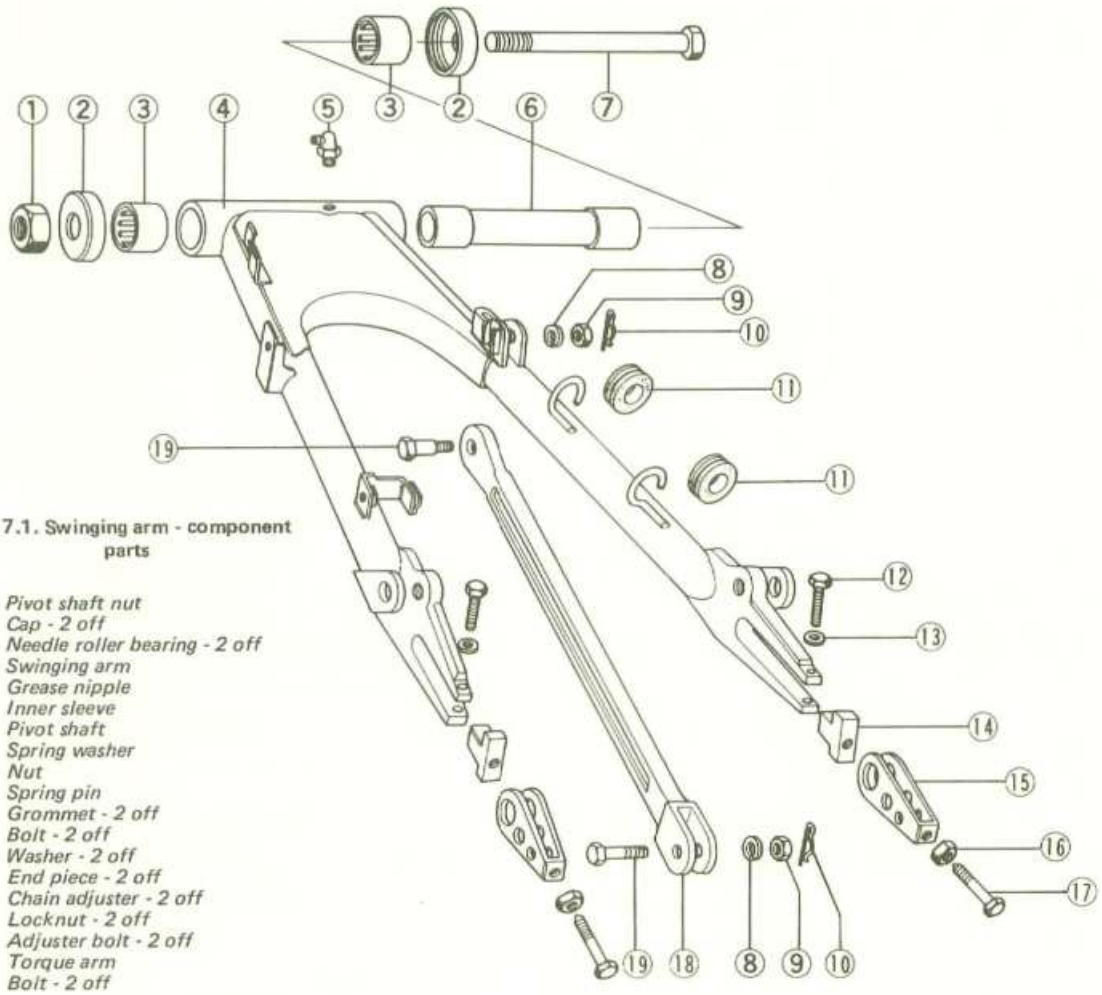


Fig. 7.1. Swinging arm - component parts

1 *Pivot shaft nut*
2 *Cap - 2 off*
3 *Needle roller bearing - 2 off*
4 *Swinging arm*
5 *Grease nipple*
6 *Inner sleeve*
7 *Pivot shaft*
8 *Spring washer*
9 *Nut*
10 *Spring pin*
11 *Grommet - 2 off*
12 *Bolt - 2 off*
13 *Washer - 2 off*
14 *End piece - 2 off*
15 *Chain adjuster - 2 off*
16 *Locknut - 2 off*
17 *Adjuster bolt - 2 off*
18 *Torque arm*
19 *Bolt - 2 off*

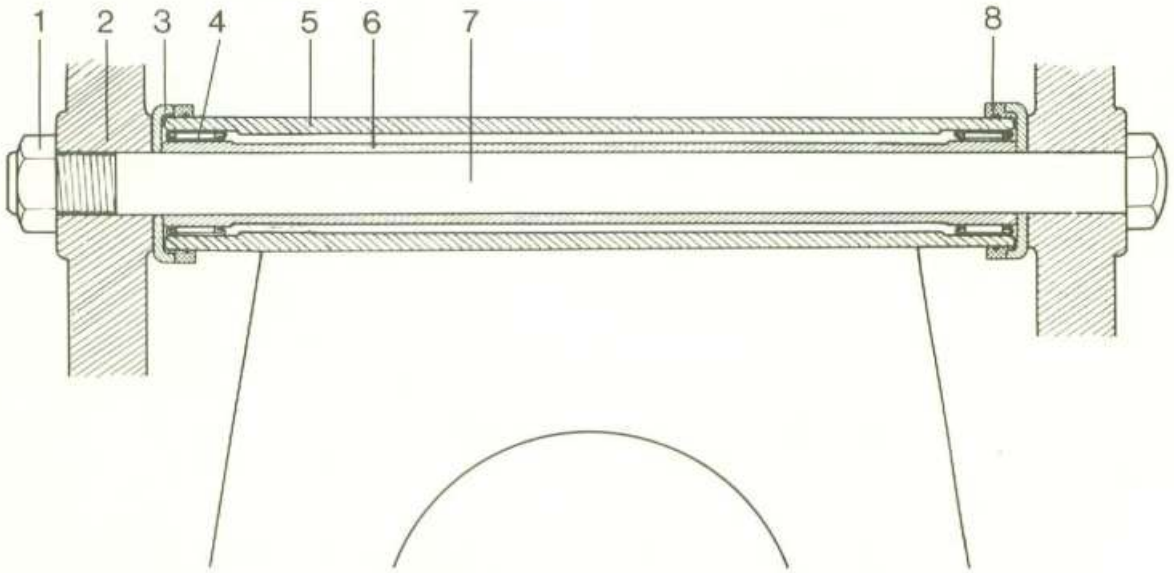


Fig. 7.2. Swinging arm pivot - sectioned view

1 *Pivot shaft nut*
2 *Frame*
3 *Dust cap*
4 *Needle roller bearing - 2 off*
5 *Swinging arm*
6 *Inner sleeve*
7 *Pivot shaft*
8 *Grease seal - 2 off*

torque arm from the brake plate by removing the single retaining nut. Detach the rear brake cable at the actuating lever.
12 Remove the wheel spindle nut completely, and withdraw the spindle. The wheel can now be drawn clear.

Disc brake models

13 Slacken the chain adjusters and wheel spindle nut, and remove the adjuster stops as described in paragraph 10.
14 Remove the spring pin, nut and bolt which retains the caliper to the torque arm. Push the wheel forward and disengage the chain from the rear wheel sprocket.
15 The wheel, together with the caliper, should be drawn backwards to clear the swinging arm. The caliper mounting lug can then be disengaged from the wheel spindle and tied clear of the swinging arm. Note that it may prove necessary to disconnect the hydraulic hose from the caliper. If this is the case, then the hose should be tied up at a higher level than that of the master cylinder, to avoid fluid loss. Take care not to drip the fluid on any paintwork. Unhook the hydraulic hose from the guides on the swinging arm.

All models

16 Remove the lower mounting bolts from the suspension units, and free the units from their mounting lugs.
17 Remove the pivot shaft nut, and withdraw the shaft. The swinging arm can now be pulled clear and disengaged from the chain.
18 Detach the left-hand footrest and the gearchange pedal, followed by the starter cover and gasket. Remove the engine sprocket cover after first removing its four retaining bolts.
19 Knock back the tabwasher, and remove the engine sprocket nut. The sprocket can be locked in position by bunching the chain against the casing.
20 Pull off the sprocket and disengage the chain. The new chain can be fitted by reversing the removal sequence. Ensure that the chain is adjusted to give 30 - 35mm (1.2 - 1.4 in) movement at the middle of the lower run. Tighten the wheel spindle to 10.0 - 14.0 kg m (72 - 101 ft lbs). If the hydraulic hose has been removed, bleed the rear brake system as described in Chapter 5, Section 16.

3 Hydraulic disc brakes: modifications

1 The increase in power output on the Z1000 models has been offset by an uprated braking system. In the UK, the single 296mm disc brake (still used on USA models) has been replaced by a twin 245mm configuration. A single 290mm disc has been fitted in place of the rear drum brake.
2 Front brake maintenance is similar, irrespective of the number of discs employed, and reference for this should be made to Chapter 5 for information.

4 Rear brake master cylinder: maintenance, removal and renovation

1 The rear brake master cylinder, and its integral reservoir, are located beneath the right-hand side panel. It is retained to the frame by two bolts. Movement from the brake pedal is conveyed mechanically to the master cylinder via an adjustable pushrod. Hydraulic pressure is transmitted from the master cylinder to the rear brake caliper by way of a flexible hydraulic hose.
2 The hydraulic fluid level is visible through the translucent sides of the reservoir, and should be checked weekly (or every 200 miles). Top up, if necessary, using only new hydraulic fluid which complies with DOT 3 standards. In the UK, the manufacturers recommend Castrol Girling Universal Brake and Clutch Fluid, or similar.
3 Avoid allowing the reservoir or its contents to become contaminated. It should be noted that hydraulic fluids are by nature hygroscopic; that is, they absorb water from the atmosphere. This in turn degrades the fluid specifications. To minimise water absorption, a rubber diaphragm is fitted beneath the vented reservoir cap. This rises and falls with the fluid level when the brakes are used, but prevents the ingress of damp air. The manufacturers recommend that the fluid should be changed annually. This is well worth doing, as it will flush out any impurities which may have accumulated, and which would otherwise tend to wear the cylinder and caliper components. In view of the small amount of fluid involved, it is not an expensive operation.
4 Leakage of the master cylinder, characterised by spongy and vague brake operation, and traces of fluid around the pushrod, will necessitate removal of the unit.
5 The master cylinder can be withdrawn after the banjo union on the brake pipe is detached, and the two mounting bolts removed. Take care not to spill any fluid on painted or plastic parts, as it will quickly attack these unless removed immediately.
6 The construction and operation of the rear master cylinder is very similar to that of the front unit, and the sequences described in Chapter 5, Section 14 can be applied. After the unit is refitted, bleed the system as described in Chapter 5, Section 16, to remove any air.

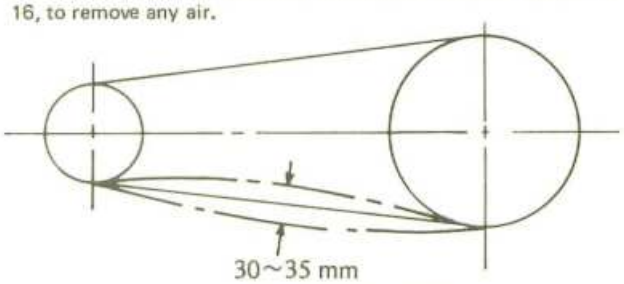


Fig. 7.4. Chain tension adjustment
30 - 35 mm (1.2 - 1.4 in)

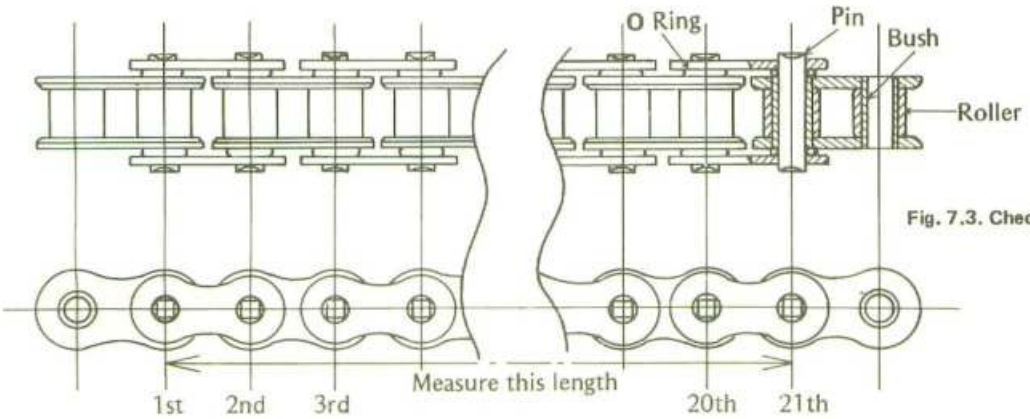


Fig. 7.3. Checking drive chain for wear

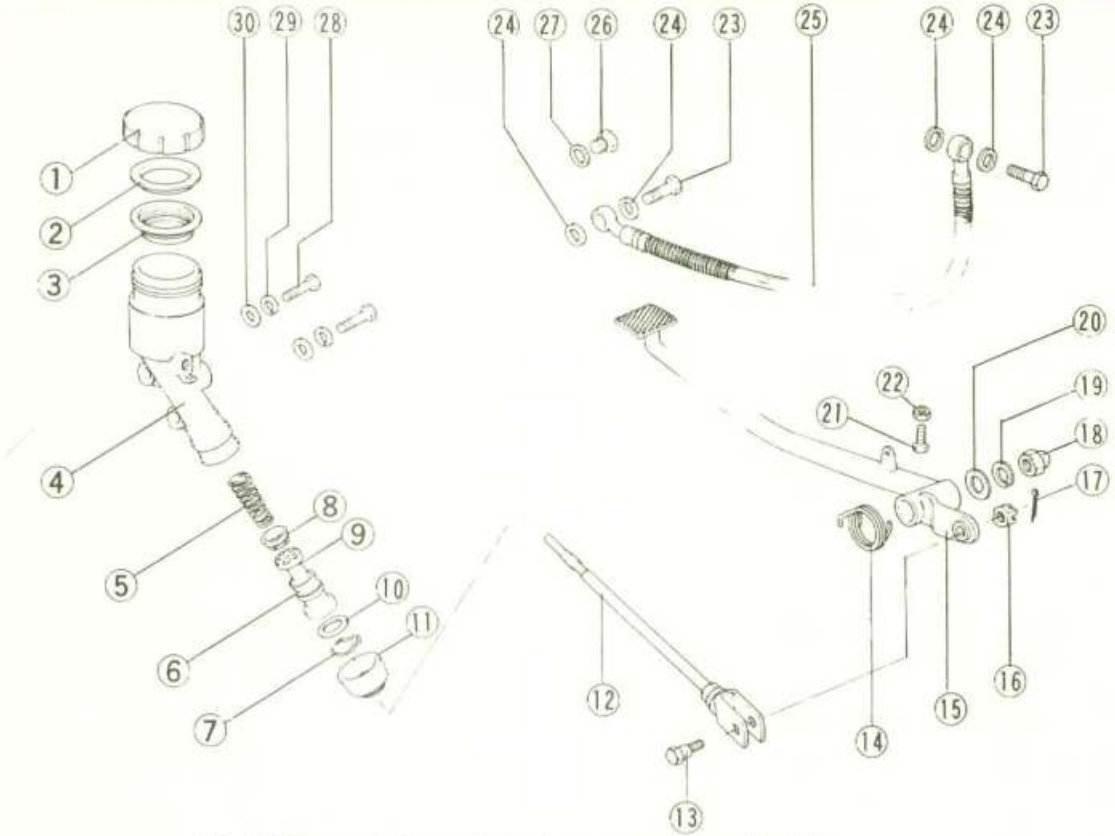


Fig. 7.5. Master cylinder and hydraulic components - rear disc brake

1 *Reservoir cap*
2 *Washer*
3 *Diaphragm*
4 *Master cylinder/reservoir body*
5 *Return spring*
6 *Secondary seal*
7 *Retainer*
8 *Primary seal*
9 *Piston*
10 *Washer*
11 *Dust cover*
12 *Push rod*
13 *Shouldered bolt*
14 *Pedal spring*
15 *Brake pedal*
16 *Castellated nut*
17 *Split pin*
18 *Domed nut*
19 *Spring washer*
20 *Washer*
21 *Stop bolt*
22 *Lock nut*
23 *Banjo bolt - 2 off*
24 *Washer - 4 off*
25 *Brake hose*
26 *Plug*
27 *Fibre washer*
28 *Mounting bolt - 2 off*
29 *Spring washer - 2 off*
30 *Washer - 2 off*

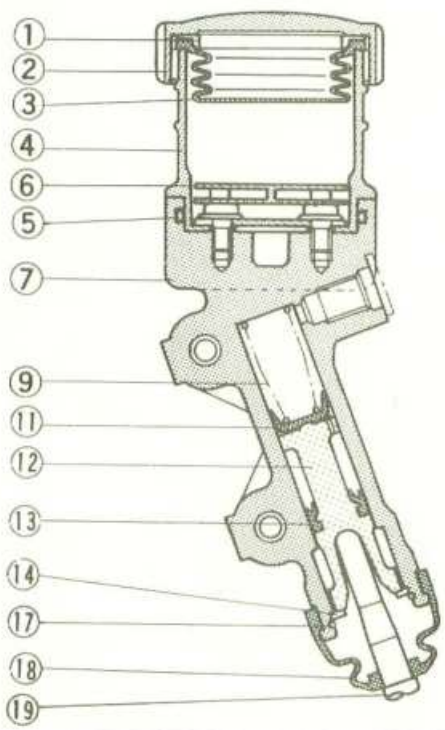


Fig. 7.6. Rear master cylinder - sectioned view

1 *Washer*
2 *Cap*
3 *Diaphragm*
4 *Reservoir*
5 *O ring*
6 *Plate*
7 *Master cylinder body*
9 *Return spring*
11 *Seal*
12 *Piston*
13 *Secondary seal*
14 *Stop*
17 *Retainer*
18 *Dust cover*
19 *Push rod*

5 Rear brake caliper: maintenance, removal and replacement

1 The rear disc pads can be checked visually for wear by removing the cover on the top of the caliper unit. There is a small step in the friction material of each pad, which indicates the maximum permissible wear limit. The pads must be renewed when this point is reached.
2 Remove the two spring clips which retain the guide pins in the caliper body. Pull out the guide pins, using a pair of pointed nosed pliers. Hold the anti-rattle springs in position as this is done.
3 Withdraw the pads and shims from the caliper body.
4 Replacement is a reversal of the above procedure. It should be noted that the caliper pistons will have to be pushed back to permit the insertion of the new pads. This is best done by placing a bleed tube over the end of the bleed nipple and slackening the latter to release the hydraulic pressure.
5 The system should be bled as described in Chapter 5, Section 16, after the pads are fitted.
6 Should attention to the caliper itself be necessary, it can be removed together with the rear wheel as described in Section 2, paragraphs 13 to 15. The pads should be removed as described in the foregoing paragraphs.
7 Remove the two socket screws which retain the left-hand caliper half and draw the halves apart. The two pistons are best removed by blowing them out with an air line or footpump. Wrap some rag around the caliper half during this process, to avoid spraying hydraulic fluid everywhere.
8 Examine the pistons and bores for signs of scoring or corrosion, either of which will cause seal wear and subsequent failure.
9 Fit new seals to each caliper half and reassemble in the reverse order of the dismantling sequence. Ensure that all the components are lubricated with clean hydraulic fluid during assembly. The hydraulic system must be bled when the caliper is refitted to the machine. See Chapter 5, Section 16.
10 Periodically inspect the hydraulic hose which connects the master cylinder and caliper, for signs of perishing or chafing. If in any way suspect, the hose must be renewed to obviate the risk of sudden, and dangerous, failure.

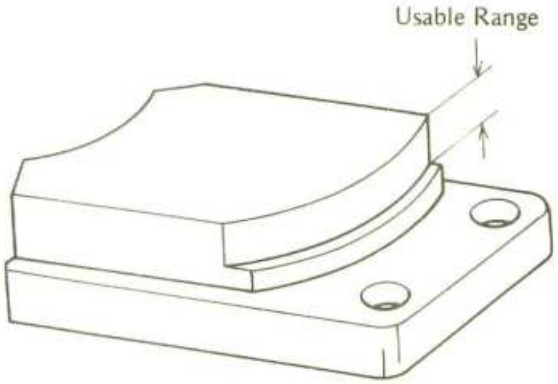


Fig. 7.8. Step showing wear limit of rear pads

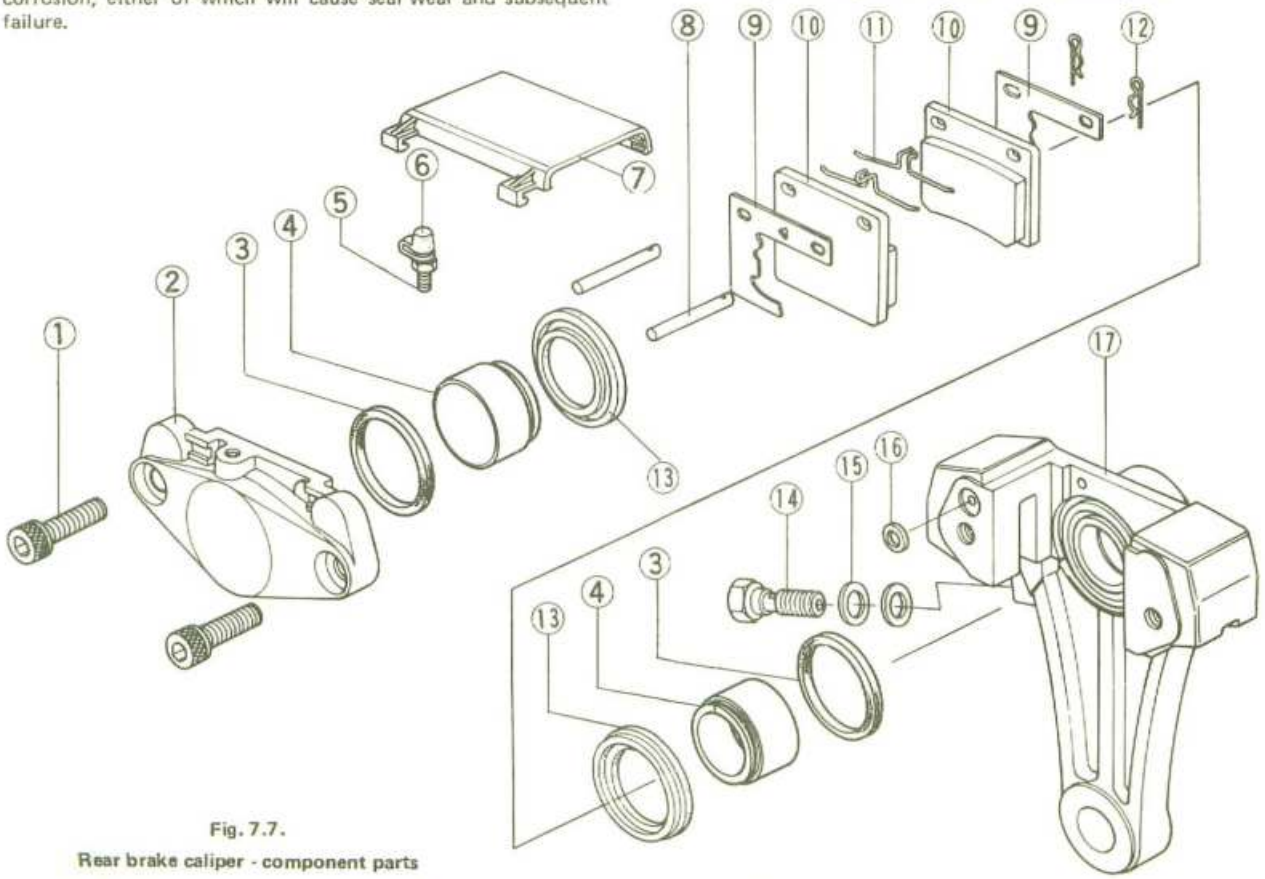


Fig. 7.7.
Rear brake caliper - component parts

1 *Socket screw*
2 *Left-hand caliper half*
3 *Seal*
4 *Piston*
5 *Bleed screw*
6 *Dust cap*
7 *Cover*
8 *Pin*
9 *Shim*
10 *Pad - 2 off*
11 *Anti-rattle spring - 2 off*
12 *Spring clip - 2 off*
13 *Dust seal*
14 *Banjo bolt*
15 *Washer*
16 *O ring*
17 *Caliper body*

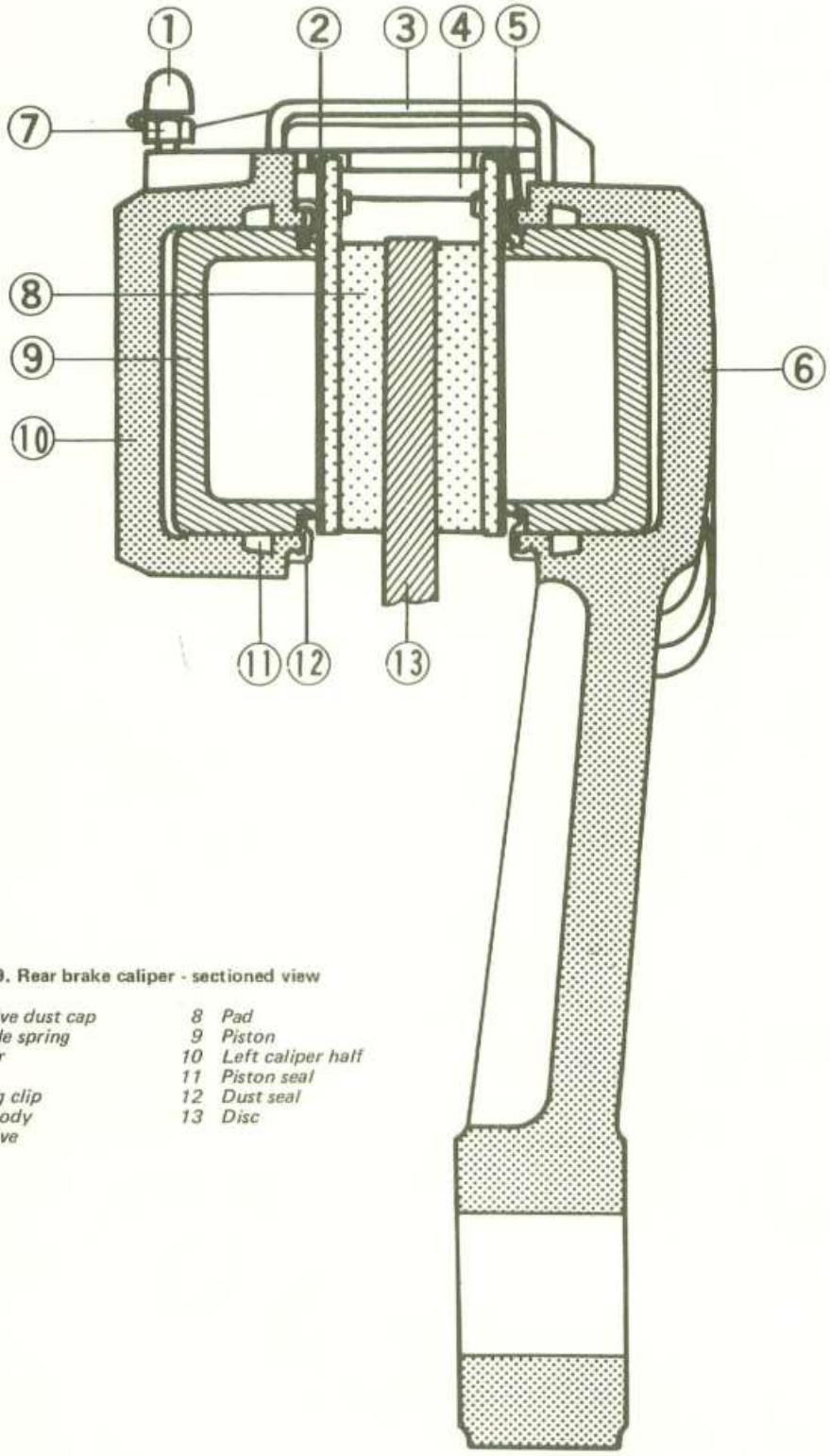


Fig. 7.9. Rear brake caliper - sectioned view

1 *Bleed valve dust cap*
2 *Anti-rattle spring*
3 *Pad cover*
4 *Pin*
5 *Retaining clip*
6 *Caliper body*
7 *Bleed valve*
8 *Pad*
9 *Piston*
10 *Left caliper half*
11 *Piston seal*
12 *Dust seal*
13 *Disc*

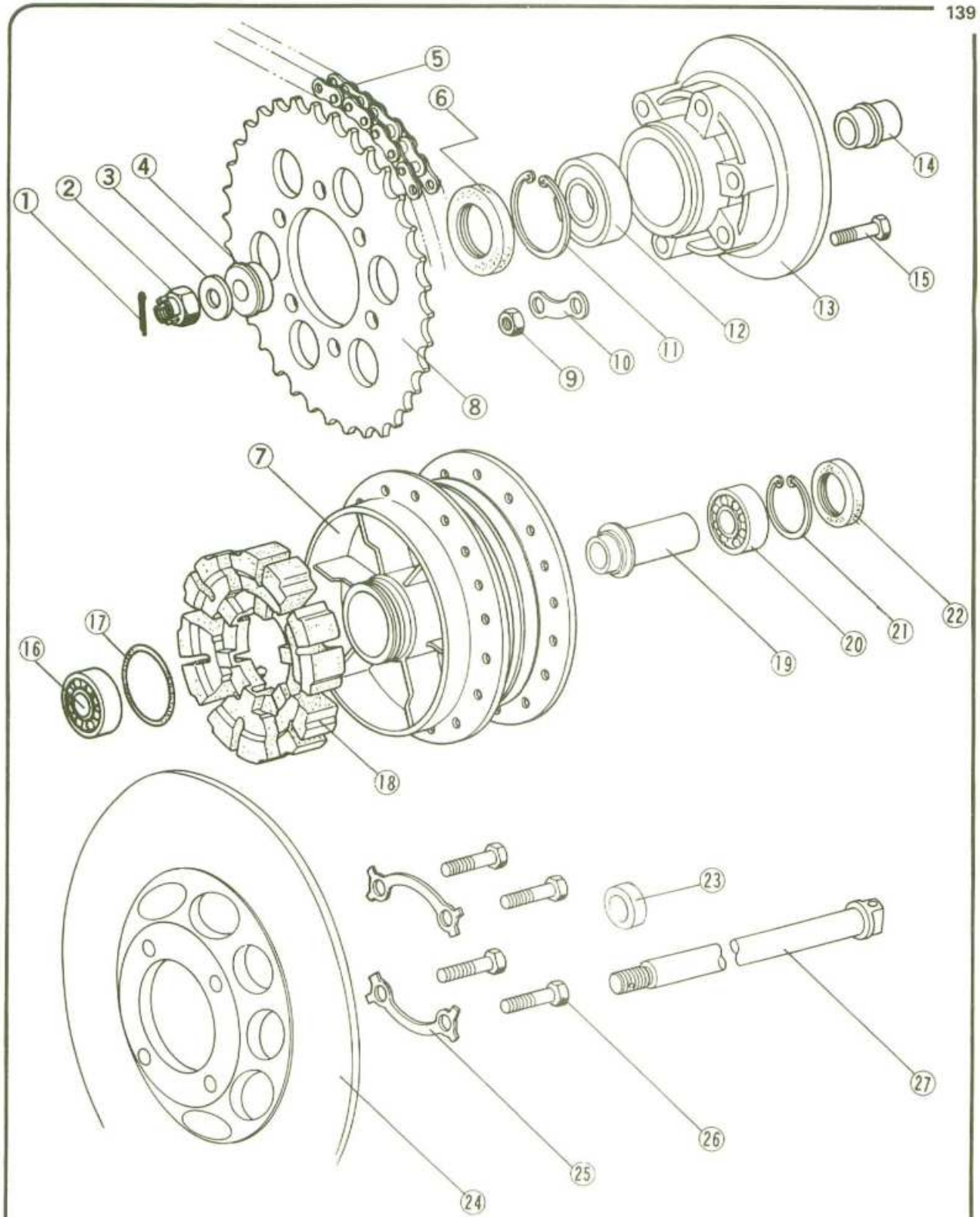
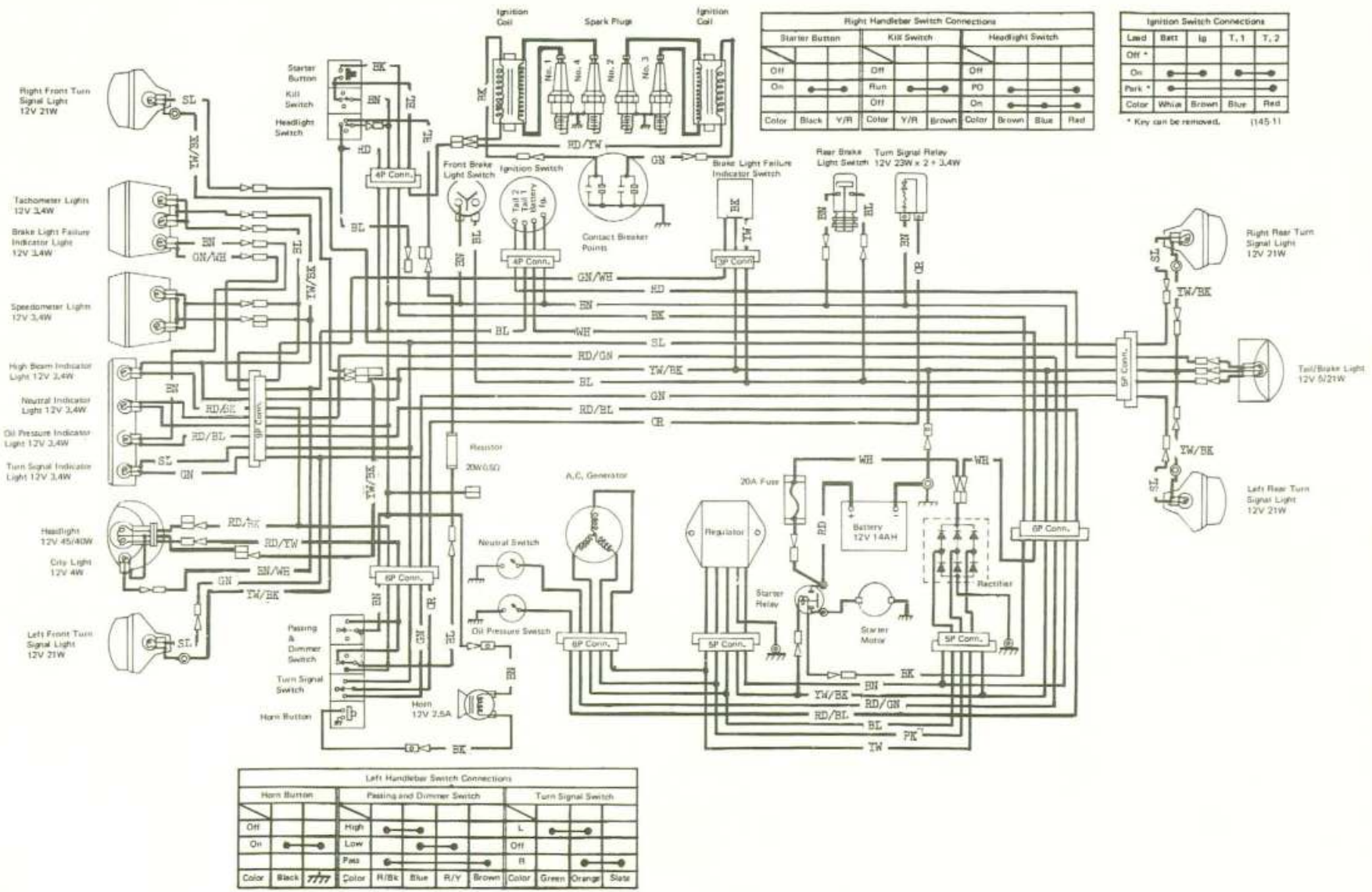
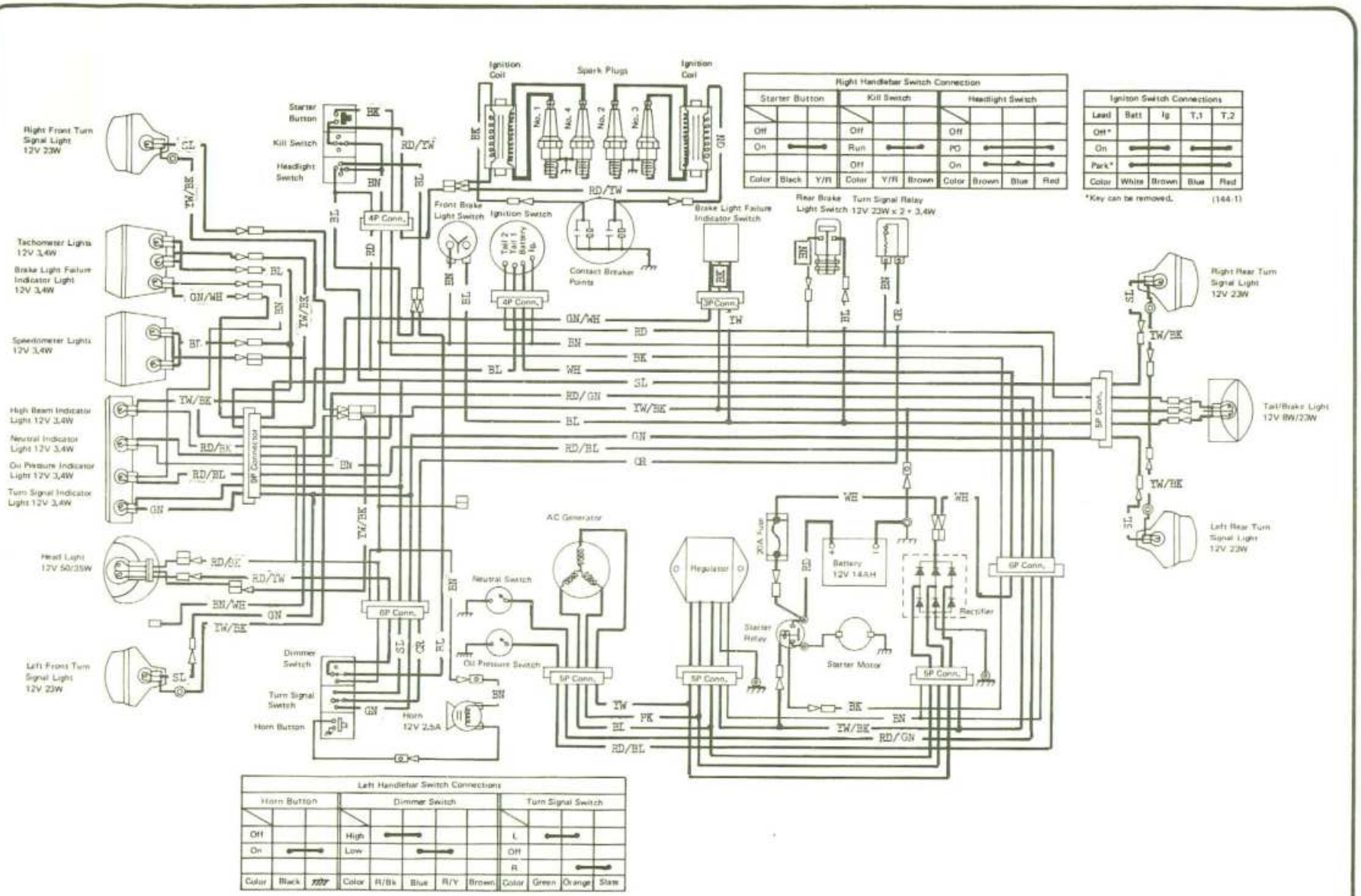


Fig. 7.10. Rear hub - component parts

1	Split pin	8	Rear wheel sprocket	15	Bolt - 6 off	22	Grease seal
2	Castellated nut	9	Nut - 6 off	16	Bearing	23	Spacer
3	Washer	10	Locking plate - 3 off	17	O ring	24	Disc
4	Collar	11	Circlip	18	Cush drive rubber	25	Locking plate - 2 off
5	Drive chaint	12	Bearing	19	Distance piece	26	Bolt - 4 off
6	Grease seal	13	Cush drive/sprocket hub	20	Bearing	27	Wheel spindle
7	Rear hub	14	Sleeve	21	Circlip		



Kawasaki 900 Z1-A wiring diagram (European model)



Right Handlebar Switch Connection

Starter Button			Kill Switch			Headlight Switch			
Off			Off			Off			
On	●	●	Run	●	●	PO	●	●	●
			Off			On			
Color	Black	Y/R	Color	Y/R	Brown	Color	Brown	Blue	Red

Ignition Switch Connections

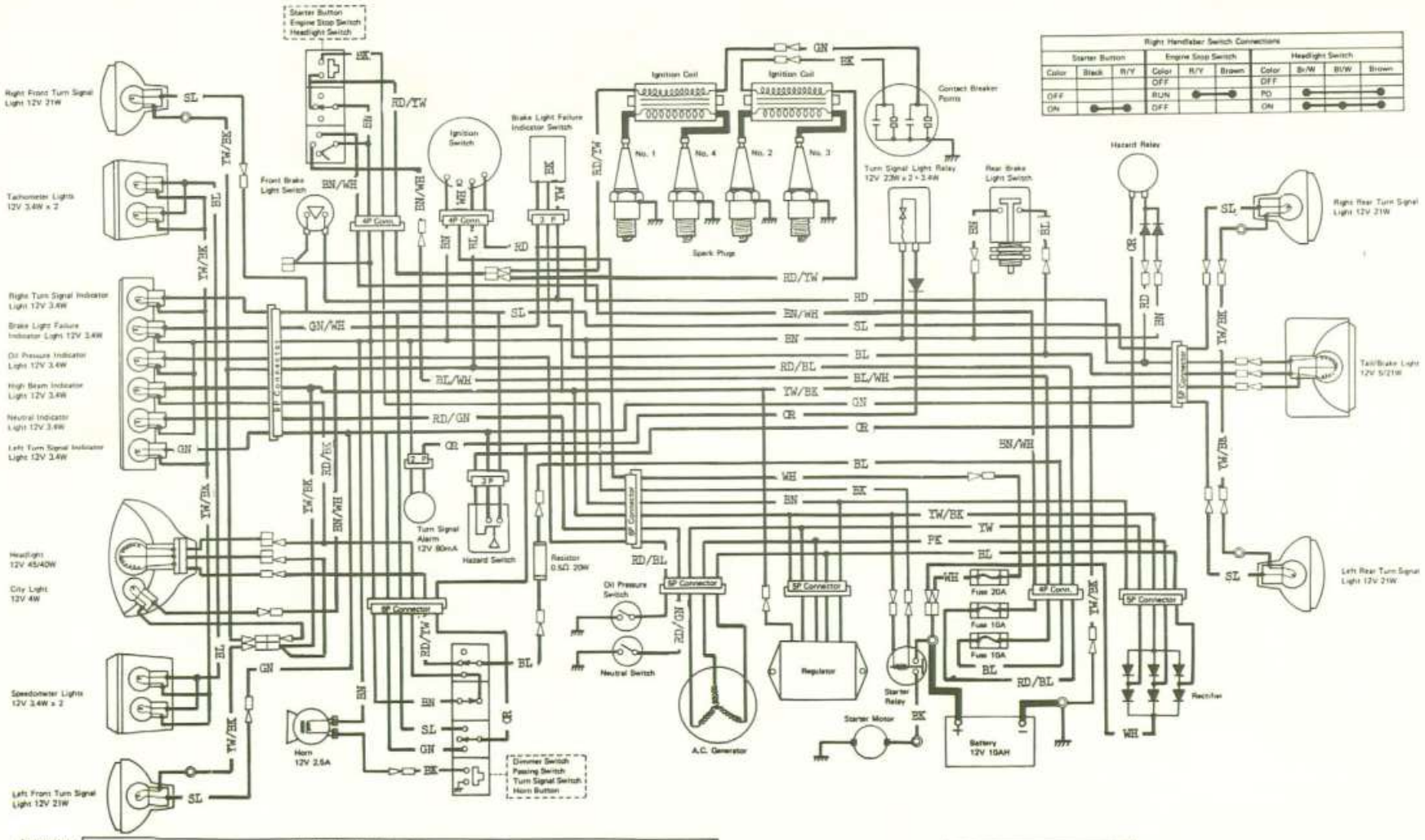
Lead	Batt	Ig	T.1	T.2
Off*				
On		●	●	
Park*	●		●	
Color	White	Brown	Blue	Red

*Key can be removed. (144-1)

Left Handlebar Switch Connections

Horn Button			Dimmer Switch					Turn Signal Switch			
Off			High	●			●	L	●		
On	●	●	Low		●		●	Off			
								R		●	
Color	Black	⌀	Color	R/Bk	Blue	R/Y	Brown	Color	Green	Orange	Slate

Kawasaki 900 Z1-A wiring diagram (US model)



Right Handlebar Switch Connections

Starter Button			Engine Stop Switch			Headlight Switch			
Color	Black	R/Y	Color	R/Y	Brown	Color	Br/W	Bl/W	Brown
			OFF			OFF			
OFF			RUN	●	●	PO	●	●	●
ON	●		OFF			ON	●	●	●

Left Handlebar Switch Connections

Passing Switch			Horn Button			Dimmer Switch					Turn Signal Switch			
Color	Brown	Bl/R	Color	Black	Yellow	Color	Bl/R	Blue	R/Y	Brown	Color	Green	Orange	Slate
			OFF			HI	●	●			Right	●	●	
PASS	●	●	ON	●	●	LO		●	●					
											Left		●	●

Hazard Switch

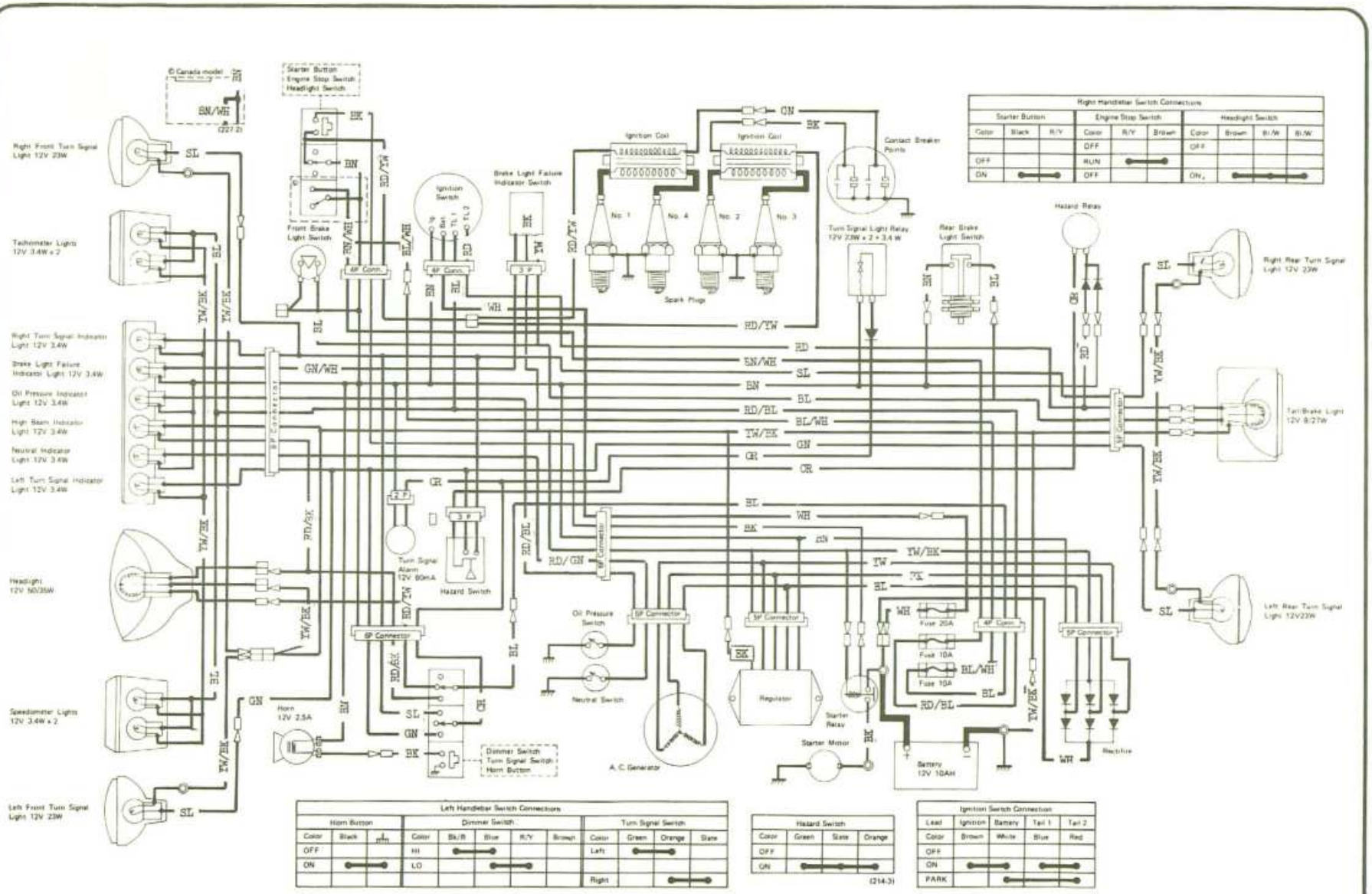
Color	Green	Slate	Orange
OFF			
ON	●	●	●

Ignition Switch Connections

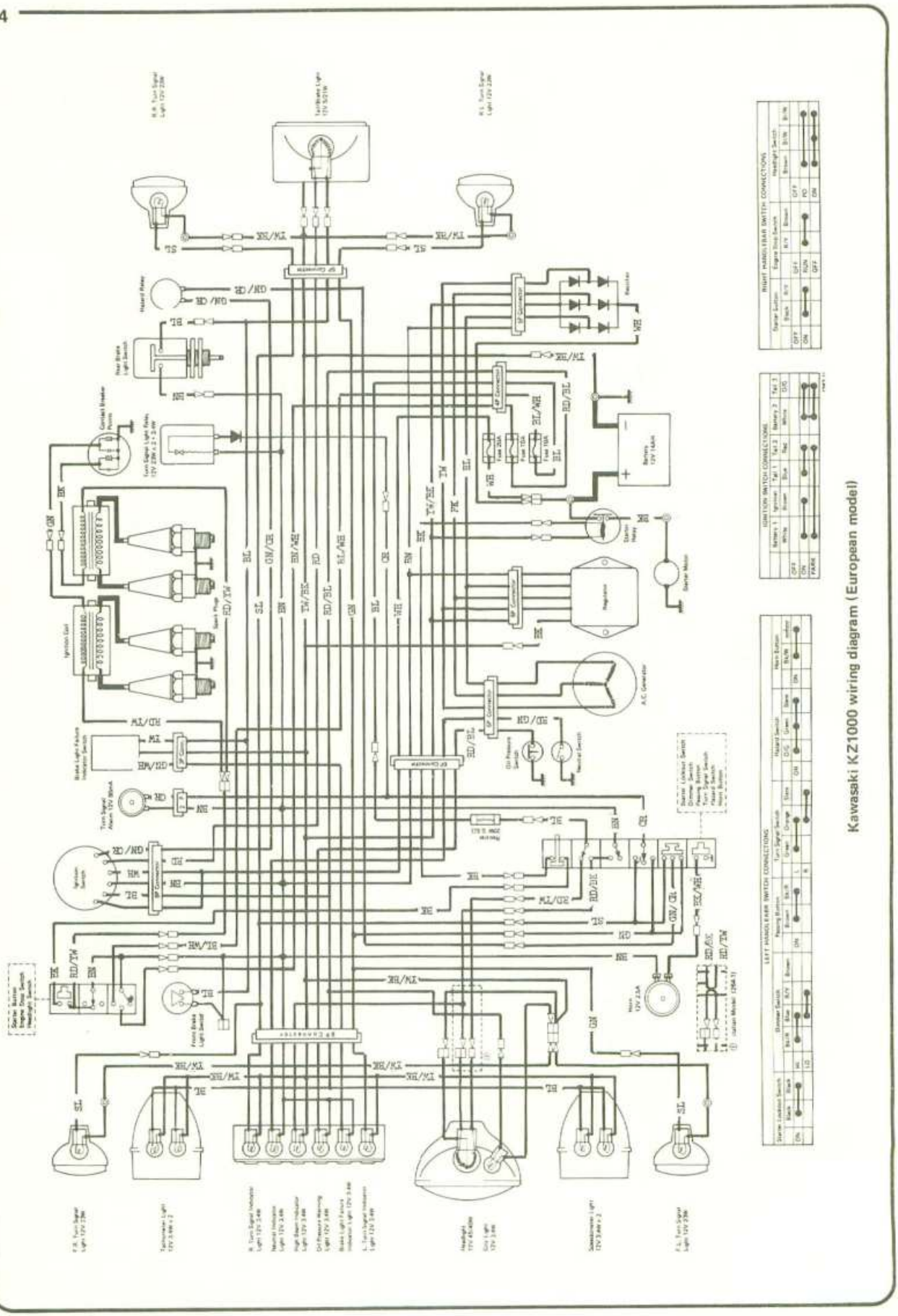
Lead	Ignition	Battery	Tail 1	Tail 2
Color	Brown	White	Blue	Red
OFF				
ON	●			●
PARK		●		●

① Italy Model (224-2)

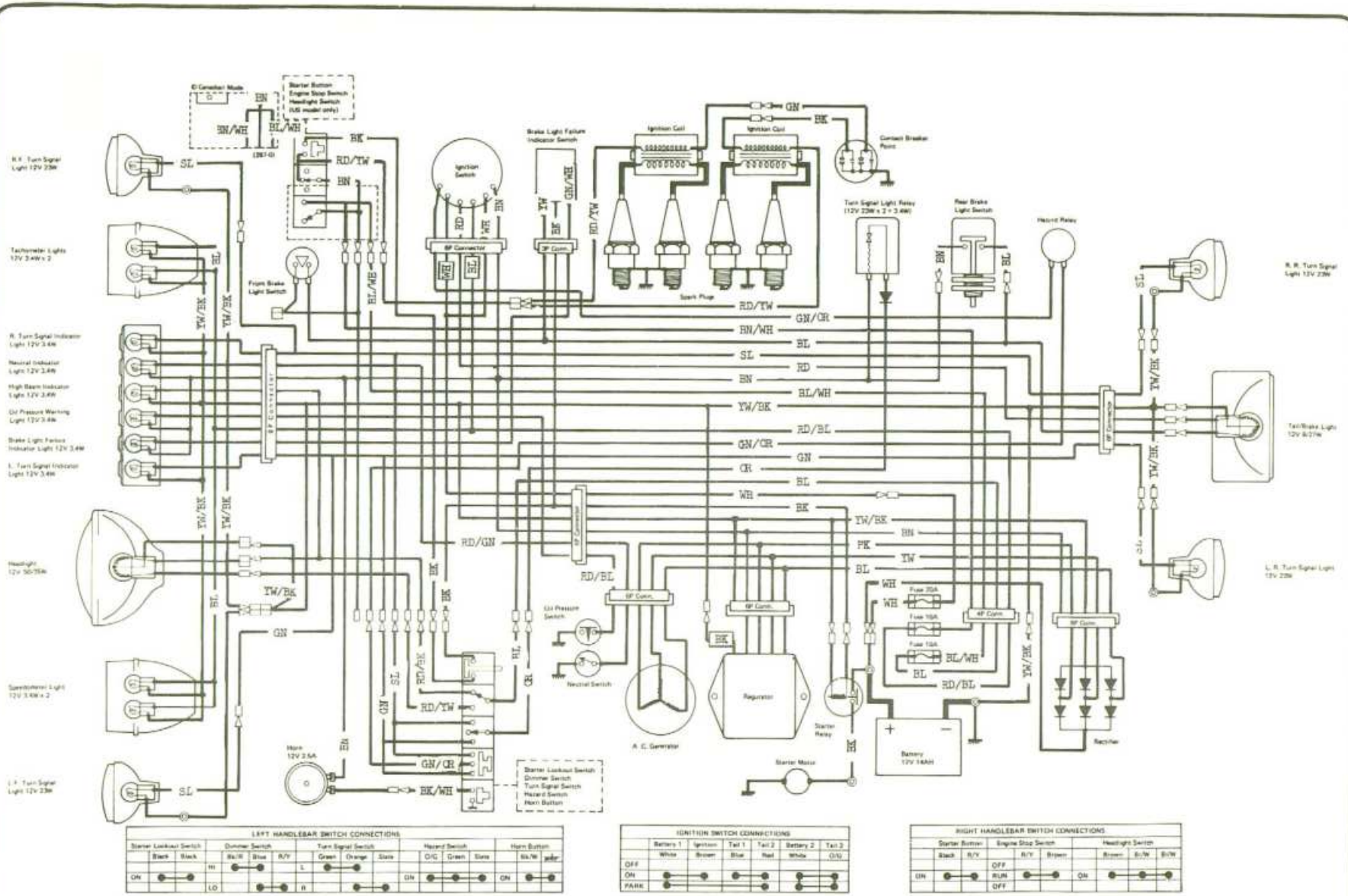
Kawasaki Z900-A4 wiring diagram (European model)



Kawasaki Z900A Canadian wiring diagram



Kawasaki KZ1000 wiring diagram (European model)



Kawasaki KZ1000 wiring diagram (US, Canadian model)

Castrol GRADES

Castrol Engine Oils

Castrol GTX

An ultra high performance SAE 20W/50 motor oil which exceeds the latest API MS requirements and manufacturers specifications. Castrol GTX with liquid tungsten† generously protects engines at the extreme limits of performance, and combines both good cold starting with oil consumption control. Approved by leading car makers.

Castrol XL 20/50

Contains liquid tungsten†; well suited to the majority of conditions giving good oil consumption control in both new and old cars.

Castrolite (Multi-grade)

This is the lightest multi-grade oil of the Castrol motor oil family containing liquid tungsten†. It is best suited to ensure easy winter starting and for those car models whose manufacturers specify lighter weight oils.

Castrol Grand Prix

An SAE 50 engine oil for use where a heavy, full-bodied lubricant is required.

Castrol Two-Stroke-Four

A premium SAE 30 motor oil possessing good detergency characteristics and corrosion inhibitors, coupled with low ash forming tendency and excellent anti-scuff properties. It is suitable for all two-stroke motor-cycles, and for two-stroke and small four-stroke horticultural machines.

Castrol CR (Multi-grade)

A high quality engine oil of the SAE-20W/30 multi-grade type, suited to mixed fleet operations.

Castrol CRI 10, 20, 30

Primarily for diesel engines, a range of heavily fortified, fully detergent oils, covering the requirements of DEF 2101-D and Supplement 1 specifications.

Castrol CRB 20, 30

Primarily for diesel engines, heavily fortified, fully detergent oils, covering the requirements of MIL-L-2104B.

Castrol R 40

Primarily designed and developed for highly stressed racing engines. Castrol 'R' should not be mixed with any other oil nor with any grade of Castrol.

†*Liquid Tungsten is an oil soluble long chain tertiary alkyl primary amine tungstate covered by British Patent No. 882,295.*

Castrol Gear Oils

Castrol Hypoy (90 EP)

A light-bodied powerful extreme pressure gear oil for use in hypoid rear axles and in some gearboxes.

Castrol Gear Oils (continued)

Castrol Hypoy Light (80 EP)

A very light-bodied powerful extreme pressure gear oil for use in hypoid rear axles in cold climates and in some gearboxes.

Castrol Hypoy B (90 EP)

A light-bodied powerful extreme pressure gear oil that complies with the requirements of the MIL-L-2105B specification, for use in certain gearboxes and rear axles.

Castrol Hi-Press (140 EP)

A heavy-bodied extreme pressure gear oil for use in spiral bevel rear axles and some gearboxes.

Castrol ST (90)

A light-bodied gear oil with fortifying additives

Castrol D (140)

A heavy full-bodied gear oil with fortifying additives.

Castrol Thio-Hypoy FD (90 EP)

A light-bodied powerful extreme pressure gear oil. This is a special oil for running-in certain hypoid gears.

Automatic Transmission Fluids

Castrol TQF

(Automatic Transmission Fluid)

Approved for use in all Borg-Warner Automatic Transmission Units. Castrol TQF also meets Ford specification M2C 33F.

Castrol TQ Dexron®

(Automatic Transmission Fluid)

Complies with the requirements of Dexron® Automatic Transmission Fluids as laid down by General Motors Corporation.

Castrol Greases

Castrol LM

A multi-purpose high melting point lithium based grease approved for most automotive applications including chassis and wheel bearing lubrication.

Castrol MS3

A high melting point lithium based grease containing molybdenum disulphide.

Castrol BNS

A high melting point grease for use where recommended by certain manufacturers in front wheel bearings when disc brakes are fitted.

Castrol Greases (continued)

Castrol CL

A semi-fluid calcium based grease, which is both waterproof and adhesive, intended for chassis lubrication.

Castrol Medium

A medium consistency calcium based grease.

Castrol Heavy

A heavy consistency calcium based grease.

Castrol PH

A white grease for plunger housings and other moving parts on brake mechanisms. *It must NOT be allowed to come into contact with brake fluid when applied to the moving parts of hydraulic brakes.*

Castrol Graphited Grease

A graphited grease for the lubrication of transmission chains.

Castrol Under-Water Grease

A grease for the under-water gears of outboard motors.

Anti-Freeze

Castrol Anti-Freeze

Contains anti-corrosion additives with ethylene glycol. Recommended for the cooling systems of all petrol and diesel engines.

Speciality Products

Castrol Girling Damper Oil Thin

The oil for Girling piston type hydraulic dampers.

Castrol Shockol

A light viscosity oil for use in some piston type shock absorbers and in some hydraulic systems employing synthetic rubber seals. It must not be used in braking systems.

Castrol Penetrating Oil

A leaf spring lubricant possessing a high degree of penetration and providing protection against rust.

Castrol Solvent Flushing Oil

A light-bodied solvent oil, designed for flushing engines, rear axles, gearboxes and gearcasings.

Castrollo

An upper cylinder lubricant for use in the proportion of 1 fluid ounce to two gallons of fuel.

Everyman Oil

A light-bodied machine oil containing anti-corrosion additives for both general use and cycle lubrication.

Metric conversion tables

Inches	Decimals	Millimetres	Millimetres to Inches		Inches to Millimetres	
			mm	Inches	Inches	mm
1/64	0.015625	0.3969	0.01	0.00039	0.001	0.0254
1/32	0.03125	0.7937	0.02	0.00079	0.002	0.0508
3/64	0.046875	1.1906	0.03	0.00118	0.003	0.0762
1/16	0.0625	1.5875	0.04	0.00157	0.004	0.1016
5/64	0.078125	1.9844	0.05	0.00197	0.005	0.1270
3/32	0.09375	2.3812	0.06	0.00236	0.006	0.1524
7/64	0.109375	2.7781	0.07	0.00276	0.007	0.1778
1/8	0.125	3.1750	0.08	0.00315	0.008	0.2032
9/64	0.140625	3.5719	0.09	0.00354	0.009	0.2286
5/32	0.15625	3.9687	0.1	0.00394	0.01	0.254
11/64	0.171875	4.3656	0.2	0.00787	0.02	0.508
3/16	0.1875	4.7625	0.3	0.01181	0.03	0.762
13/64	0.203125	5.1594	0.4	0.01575	0.04	1.016
7/32	0.21875	5.5562	0.5	0.01969	0.05	1.270
15/64	0.234375	5.9531	0.6	0.02362	0.06	1.524
1/4	0.25	6.3500	0.7	0.02756	0.07	1.778
17/64	0.265625	6.7469	0.8	0.03150	0.08	2.032
9/32	0.28125	7.1437	0.9	0.03543	0.09	2.286
19/64	0.296875	7.5406	1	0.03947	0.1	2.54
5/16	0.3125	7.9375	2	0.07874	0.2	5.08
21/64	0.328125	8.3344	3	0.11811	0.3	7.62
11/32	0.34375	8.7312	4	0.15748	0.4	10.16
23/64	0.359375	9.1281	5	0.19685	0.5	12.70
3/8	0.375	9.5250	6	0.23622	0.6	15.24
25/64	0.390625	9.9219	7	0.27559	0.7	17.78
13/32	0.40625	10.3187	8	0.31496	0.8	20.32
27/64	0.421875	10.7156	9	0.35433	0.9	22.86
7/16	0.4375	11.1125	10	0.39370	1	25.4
29/64	0.453125	11.5094	11	0.43307	2	50.8
15/32	0.46875	11.9062	12	0.47244	3	76.2
31/64	0.484375	12.3031	13	0.51181	4	101.6
1/2	0.5	12.7000	14	0.55118	5	127.0
33/64	0.515625	13.0969	15	0.59055	6	152.4
17/32	0.53125	13.4937	16	0.62992	7	177.8
35/64	0.546875	13.8906	17	0.66929	8	203.2
9/16	0.5625	14.2875	18	0.70866	9	228.6
37/64	0.578125	14.6844	19	0.74803	10	254.0
19/32	0.59375	15.0812	20	0.78740	11	279.4
39/64	0.609375	15.4781	21	0.82677	12	304.8
5/8	0.625	15.8750	22	0.86614	13	330.2
41/64	0.640625	16.2719	23	0.90551	14	355.6
21/32	0.65625	16.6687	24	0.94488	15	381.0
43/64	0.671875	17.0656	25	0.98425	16	406.4
11/16	0.6875	17.4625	26	1.02362	17	431.8
45/64	0.703125	17.8594	27	1.06299	18	457.2
23/32	0.71875	18.2562	28	1.10236	19	482.6
47/64	0.734375	18.6531	29	1.14173	20	508.0
3/4	0.75	19.0500	30	1.18110	21	533.4
49/64	0.765625	19.4469	31	1.22047	22	558.8
25/32	0.78125	19.8437	32	1.25984	23	584.2
51/64	0.796875	20.2406	33	1.29921	24	609.6
13/16	0.8125	20.6375	34	1.33858	25	635.0
53/64	0.828125	21.0344	35	1.37795	26	660.4
27/32	0.84375	21.4312	36	1.41732	27	685.8
55/64	0.859375	21.8281	37	1.4567	28	711.2
7/8	0.875	22.2250	38	1.4961	29	736.6
57/64	0.890625	22.6219	39	1.5354	30	762.0
29/32	0.90625	23.0187	40	1.5748	31	787.4
59/64	0.921875	23.4156	41	1.6142	32	812.8
15/16	0.9375	23.8125	42	1.6535	33	838.2
61/64	0.953125	24.2094	43	1.6929	34	863.6
31/32	0.96875	24.6062	44	1.7323	35	889.0
63/64	0.984375	25.0031	45	1.7717	36	914.4

1 Imperial gallon = 8 Imp pints = 1.16 US gallons = 277.42 cu in = 4.5459 litres

1 US gallon = 4 US quarts = 0.862 Imp gallon = 231 cu in = 3.785 litres

1 Litre = 0.2199 Imp gallon = 0.2642 US gallon = 61.0253 cu in = 1000 cc

Miles to Kilometres		Kilometres to Miles	
1	1.61	1	0.62
2	3.22	2	1.24
3	4.83	3	1.86
4	6.44	4	2.49
5	8.05	5	3.11
6	9.66	6	3.73
7	11.27	7	4.35
8	12.88	8	4.97
9	14.48	9	5.59
10	16.09	10	6.21
20	32.19	20	12.43
30	48.28	30	18.64
40	64.37	40	24.85
50	80.47	50	31.07
60	96.56	60	37.28
70	112.65	70	43.50
80	128.75	80	49.71
90	144.84	90	55.92
100	160.93	100	62.14

lb f ft to Kg f m		Kg f m to lb f ft		lb f/in^2: Kg f/cm^2		Kg f/cm^2: lb f/in^2	
1	0.138	1	7.233	1	0.07	1	14.22
2	0.276	2	14.466	2	0.14	2	28.50
3	0.414	3	21.699	3	0.21	3	42.67
4	0.553	4	28.932	4	0.28	4	56.89
5	0.691	5	36.165	5	0.35	5	71.12
6	0.829	6	43.398	6	0.42	6	85.34
7	0.967	7	50.631	7	0.49	7	99.56
8	1.106	8	57.864	8	0.56	8	113.79
9	1.244	9	65.097	9	0.63	9	128.00
10	1.382	10	72.330	10	0.70	10	142.23
20	2.765	20	144.660	20	1.41	20	284.47
30	4.147	30	216.990	30	2.11	30	426.70

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