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MOTORCYCLE, 350 cc, BSA, B40, MK1

TECHNICAL HANDBOOK

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AMENDMENTS

It is essential that this book be kept up to date with all amendments. Immediately an amendment is inserted, particulars will be entered hereunder.

Amendment No.	*Date*	*Signature*	*Amendment No.*	*Date*	*Signature*

MOTORCYCLE, 350 CC, B.S.A., B40, MK I

TECHNICAL HANDBOOK

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NOTES TO READERS

The subject of this publication may be affected by Defence Council Instructions, EMER Modification or Miscellaneous Instructions, or General Orders and Modification Leaflets. If possible amendments are issued to correct this publication accordingly. When an Instruction or Leaflet contradicts any portion of this publication the Instruction or Leaflet is to be taken as the overriding authority.

The tools illustrated throughout this book are not necessarily the tools available to Workshops. The illustrations only suggest the methods that should be employed when dismantling or reassembling the various components.

The lubricants and lubrication periods to be used will be those quoted in the Servicing Schedule or Air Diagram listed in the Associated Publications.

ASSOCIATED PUBLICATIONS

ARMY

Publication	*Code No.*
User Handbook	22154
Servicing Schedule	
Complete Equipment Schedule	P34133/2
Parts List	

RAF

Publication	*AP No.*
Data Book for RAF Vehicles	2782
Electrical Manual for Mech. Trans. and Marine Craft	4343 Series
Manual for Mech. Trans. Servicing	3260A
RAF Engineering - Mech. Trans.	1464E
User Handbook	4999A (UH)

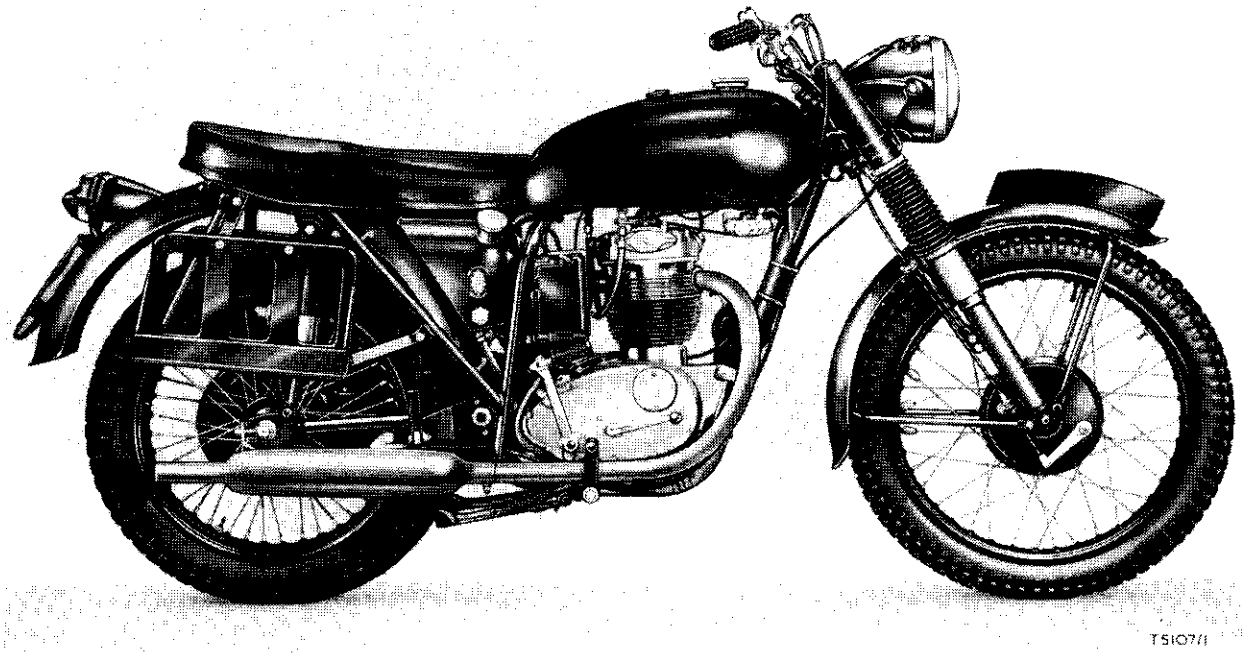


Fig 1 Motorcycle, 350 cc, B.S.A., B40, Mk 1 (right-hand side)

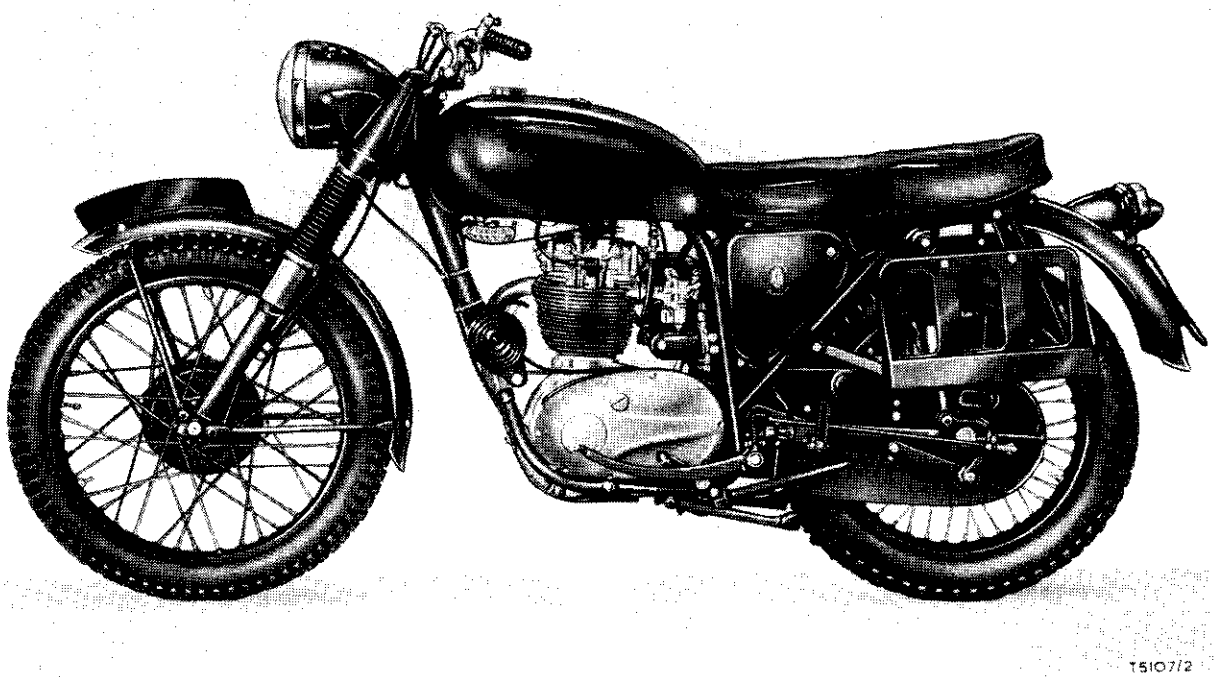


Fig 2 Motorcycle, 350 cc, B.S.A., B40, Mk 1 (left-hand side)

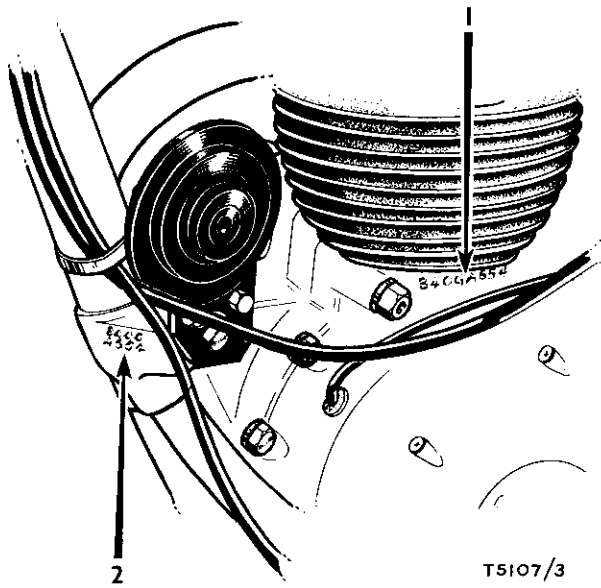
INTRODUCTION

1. This publication has been compiled to provide comprehensive information to assist service personnel in carrying out satisfactory repair work and basic maintenance on the BSA, B40, Mk 1 motor-cycle. It should be noted that the manual is divided into sections dealing with major assemblies and these are sub-divided into the individual operations required for maintenance or repair.

ENGINE AND FRAME NUMBERS

2. Both the engine and frame numbers, together with prefix and suffix letters, must be quoted in full on any correspondence relating to the machine.

3. The engine number is stamped on the left-hand side of the crankcase immediately below the cylinder base. The frame number is stamped on the left-hand side of the front engine mounting lug as indicated in the drawing below (Fig 3).



1 Engine number

2 Frame number

Fig 3 Engine and frame numbers

DATA

GENERAL DATA

PISTON

Material	"Lo-Ex" Aluminium	
Compression ratio	7.0 : 1	
Clearance (bottom of skirt)	.0021-.0024 in.	(.06554-.06096 mm)
Clearance (top of skirt) (both measured on major axis)	.0051-.0054 in.	(.12954-.13716 mm)

PISTON RINGS

Material - compression (top)	Brico BSS.5004 (chrome-plated)	
Material - compression (centre)	Brico 8	
Material - scraper	Brico BSS.5004	
Width - compression (top and centre)	.0625 in.	(1.5875 mm)
Width - scraper	.125 in.	(3.175 mm)
Depth	.120-.127 in.	(3.048-3.2258 mm)
Clearance in groove	.001-.002 in.	(.0254-.0508 mm)
Fitted gap (maximum)	.014 in.	(.3556 mm)
Fitted gap (minimum)	.009 in.	(.2283 mm)

OIL PUMP

Pump body material	Zinc base alloy	
Type	Double gear	
Drive ratio	.5 : 1	
Non-return valve spring (free length)	.5 in.	(12.7 mm)
Non-return valve spring ball (diameter)	.25 in.	(6.35 mm)
Oil pressure relief valve spring (free length)	.6094 in.	(15.4781 mm)
Oil pressure relief valve ball (diameter)	.3125 in.	(7.9375 mm)

CAMSHAFT

Journal diameter (left-hand)	.5598-.5603 in.	(14.2189-14.2316 mm)
Journal diameter (right-hand)	.7480-.7485 in.	(18.9992-19.0119 mm)
Cam lift (inlet and exhaust)	.2610 in.	(6.6294 mm)
Basic circle radius	.386 in.	(9.8044 mm)

CAMSHAFT BEARING BUSHES

Bore diameter (fitted) left-hand	.561-.562 in.	(14.2494-14.2748 mm)
Bore diameter (fitted) right-hand	.7492-.7497 in.	(19.0297-19.04238 mm)
Outside diameter (left-hand)	.719-.720 in.	(18.2626-18.2880 mm)
Outside diameter (right-hand)	.908-.909 in.	(23.0632-23.0886 mm)
Camshaft clearance (left-hand)	.0012-.0017 in.	(.03048-.0432 mm)
Camshaft clearance (right-hand)	.0012 in.	(.03048 mm)

VALVES

Seat angle (inclusive)	90 deg	
Head diameter (inlet)	1.470-1.475 in.	(37.338-37.465 mm)
Head diameter (exhaust)	1.407-1.412 in.	(35.737-35.864 mm)
Stem diameter (inlet)	.3095-.3100 in.	(7.861-7.874 mm)
Stem diameter (exhaust)	.3090-.3095 in.	(7.848-7.861 mm)

VALVE GUIDES

Material	Cast-iron	
Bore diameter	.3120-.3130 in.	(7.9248-7.950 mm)
Outside diameter	.5005-.5010 in.	(12.7127-12.7254 mm)
Length	1.859 in.	(47.2186 mm)
Cylinder head interference fit	.0005-.0025 in.	(.0127-.0635 mm)

VALVE SPRINGS

Free length (inner)	1.625 in.	(41.275 mm)
Free length (outer)	2.03125 in.	(51.5937 mm)
Fitted length (inner)	1.30 in.	(33.02 mm)
Fitted length (outer)	1.37 in.	(34.798 mm)

VALVE TIMING

Tappets set to .020 in. (.508 mm) for checking purposes only

Inlet opens B.T.D.C.	26 deg
Inlet closes A.B.D.C.	70 deg
Exhaust opens B.B.D.C.	61.5 deg
Exhaust closes A.T.D.C.	34.5 deg

TAPPET CLEARANCE (Cold)

Inlet	.008 in.	(.2032 mm)
Exhaust	.010 in.	(.254 mm)

IGNITION TIMING

Piston position (B.T.D.C.) fully advanced	.280 in.	(7.112 mm)
Crankshaft position (B.T.D.C.) fully advanced	33.5 deg	
Contact breaker gap setting	.015 in.	(.381 mm)

SPARK PLUG

Type	Champion N5	
Gap setting	.020 in. (minimum) .025 in. (maximum)	(.508-.635 mm)
Thread size	14 mm dia x .75 in. reach	(19.05 mm)

CYLINDER BARREL

Material	Close grained cast-iron	
Bore size (standard)	79 mm	
Stroke	70 mm	
Capacity	343 cc	
Oversizes	.020 in. & .040 in.	(.508 & 1.016 mm)

CYLINDER HEAD

Material	Aluminium alloy	
Inlet port size	1.0625 in.	(26.9875 mm)
Exhaust port size	1.250 in.	(31.750 mm)

CARBURETTER

Type	Amal 398/6	
Main jet	210 cc	
Pilot jet	25 cc	
Nominal choke size	26 mm	

BEARING DIMENSIONS

Clutch roller (25)	.1875 in. x .1875 in.	(4.7025 x 4.7025 mm)
Con-rod big-end bush (bore)	1.8110-1.8116 in.	(45.9994-46.0146 mm)
Con-rod big-end needle roller	38 x 46 x 20 mm	
Con-rod small-end bush (bore)	.7503-.7506 in.	(19.0576-19.0652 mm)
Crankshaft bearing (drive-side)	25 x 62 x 17 mm	
Crankshaft bearing (gear-side)	25 x 62 x 17 mm	
Crankshaft diameter (drive-side and gear-side)	.9841-.9844 in.	(24.9961-25.0038 mm)
Gearbox layshaft bearings (drive-side and gear-side)	0.5 in. x .625 in. x .8125 in.	(12.7 x 15.875 x 20.6375 mm)
Gearbox layshaft diameter (drive-side and gear-side)	.6245-.625 in.	(15.8623-15.8750 mm)
Gearbox mainshaft bearing (drive-side)	30 x 62 x 16 mm	
Gearbox mainshaft bearing (gear-side)	.625 in. x 1.5625 in. x .4375 in.	(15.875 x 39.2875 x 11.1125 mm)
Gearbox mainshaft diameter (drive-side)	.7485-.749 in.	(19.0119-19.0246 mm)
Gearbox mainshaft diameter (gear-side)	.6245-.625 in.	(15.8623-15.8750 mm)
Gearbox sleeve pinion (internal diameter)	.752-.753 in.	(19.1008-19.1262 mm)
Gearbox sleeve pinion (external diameter)	1.179-1.180 in.	(29.9466-29.9720 mm)
Gudgeon pin diameter	.750-.7502 in.	(19.05-19.055 mm)

TRANSMISSION

CLUTCH

Type	Multi-plate with integral cush drive	
Number of plates:		
Driving (bonded segments)	4	
Driven (plain)	5	
Overall thickness of driving plate and segments	.167 in.	(4.242 mm)
Clutch springs	4	
Free length of springs	1.65685 in.	(42.0687 mm)
Clutch push rod (length)	9.0 in.	(228.6 mm)
Clutch push rod (diameter)	.1875 in.	(4.7025 mm)

GEAR RATIOS

Gearbox - top	1.0
Gearbox - third	1.57
Gearbox - second	2.36
Gearbox - first	3.05
Overall - top	6.53
Overall - third	10.25
Overall - second	15.41
Overall - first	19.92

SPROCKETS

Engine	23 teeth
Clutch	52 teeth
Gearbox	18 teeth
Rear wheel	52 teeth

CHAIN SIZES

Primary	Duplex .375 in. x 70 pitches
Transmission	.5 in. x 118 pitches

FRAME AND FITTINGS

FRONT FORKS

Type	Coil-spring (hydraulically damped)	
Springs - free length	10.375-10.50 in.	(263.525-266.70 mm)
Springs - spring rate	25/27 lb in.	
Springs - number of coils	$21\frac{1}{2}$	
Springs - colour identification	Nil	

REAR DAMPERS

Type	Coil-spring (hydraulically damped)	
Springs - free length	8.40 in.	(213.36 mm)
Springs - spring rate	100 lb in.	
Springs - colour identification	Green/pink	

SWINGING ARM

Bush type	Bonded rubber	
Bush diameter	1.250-1.253 in.	(31.75-31.8262 mm)
Housing diameter	1.247-1.248 in.	(31.673-31.699 mm)
Interference fit	.002-.006 in.	(.0508-.1524 mm)
Spindle diameter	.810-.811 in.	(20.570-20.595 mm)

FRONT FORK BUSHES

Outer diameter (top)	1.4750-1.4755 in.	(37.465-37.477 mm)
Outer diameter (bottom)	1.473-1.474 in.	(37.414-37.439 mm)
Inner diameter (top)	1.250-1.251 in.	(31.750-31.755 mm)
Inner diameter (bottom)	1.2485-1.2495 in.	(31.711-31.737 mm)
Working clearance (top)	.0005 in.	(.0127 mm)
Working clearance (bottom)	.002-.003 in.	(.0508-.0762 mm)
Length (top)	2.125 in.	(53.975 mm)
Length (bottom)	1.25 in.	(31.75 mm)
Shaft diameter	1.248-1.249 in.	(31.699-31.7246 mm)
Sliding tube bore diameter	1.475-1.477 in.	(37.465-37.515 mm)
Damper tube bush (outer diameter)	.6165-.6185 in.	(15.6591-15.7099 mm)
Damper tube bush (inner diameter)	.339-.340 in.	(8.6106-8.636 mm)
Damper tube bush (length)	.53125 in.	(13.4937 mm)

WHEELS, BRAKES AND TYRES

WHEELS

Rim size and type (front)	WM1-20
Rim size and type (rear)	WM3-18

WHEELS (Contd)

Spoke sizes:			
Front (long) 20	10 s.w.g. x 9.3125 in.	(3.251 x 236.5375 mm)	
Front (short) 20	10 s.w.g. x 7.9375 in.	(3.251 x 201.6125 mm)	
Rear (long) 20	10 s.w.g. x 7.4375 in.	(3.251 x 188.9125 mm)	
Rear (short) 20	10 s.w.g. x 7.375 in.	(3.251 x 187.325 mm)	

WHEEL BEARINGS

Front (left-hand and right-hand)	.875 in. x 2 in. x .5625 in.	single seal
Rear hub (left-hand and right-hand)	.875 in. x 2 in. x .5625 in.	single seal
Rear brake drum	.875 in. x 2 in. x .5625 in.	double seal
Spindle diameter (front)	.8740-.8745 in.	(22.199-22.212 mm)
Spindle diameter (rear, left-hand)	.8745-.8750 in.	(22.212-22.225 mm)
Spindle diameter (rear, right-hand)	.685-.686 in.	(17.399-17.424 mm)

BRAKES

Front (diameter)	7 in.	(177.8 mm)
Front (width)	1.125 in.	(28.575 mm)
Rear (diameter)	7 in.	(177.8 mm)
Rear (width)	1.125 in.	(28.575 mm)
Lining thickness (front and rear)	.15625 in.	(3.9687 mm)
Lining area sq in. (sq cm) - front and rear	15.48	(99.84)

TYRES

Size (front)	3.00 in. x 20 in.	(76.20 x 508 mm)
Size (rear)	3.50 in. x 18 in.	(88.9 x 457.2 mm)
Pressure (front)) Road	18 lb/sq in.	(1.266 kg/sq cm)
Pressure (rear)) use	23 lb/sq in.	(1.617 kg/sq cm)
Pressure (front))Cross-country	14 lb/sq in.	(0.984 kg/sq cm)
Pressure (rear))use	28 lb/sq in.	(1.969 kg/sq cm)

ELECTRICAL EQUIPMENT (12 VOLT)

Alternator type	Lucas R.M.19 (encapsulated)
Contact breaker	Lucas 4CA
Coil	Wipac S.0810
Battery	Lucas PUZ5A
Lamps (headlight)	50/40 watt, pre-focus
Lamps (stop/taillight)	6/21 watt
Lamps (speedometer light)	2.2 watt
Lamps (pilot light)	6 watt
Horn	Lucas 6H
Rectifier	Lucas 2DS506
Zener Diode	Lucas ZD715

CAPACITIES

Fuel tank	3.5 gallons	(15.911 litres)
Oil tank	5 pints	(2.841 litres)
Primary chaincase	0.5 pints	(.284 litres)
Gearbox	0.67 pints	(.3786 litres)
Front fork (each leg)	0.34 pints	(.1893 litres)

BASIC DIMENSIONS

Wheelbase	53 in.	(134.62 cm)
Overall length	84 in.	(213.36 cm)
Handlebar width	27.5 in.	(69.85 cm)
Seat height	32 in.	(81.28 cm)
Ground clearance	7 in.	(17.78 cm)

WEIGHTS

Machine unladen	350 lb approx.	(158.75 kg)

TORQUE WRENCH SETTINGS (DRY)

Listed below are a number of nuts and bolts for which it has been found necessary to determine torque settings. It is most important that these settings are strictly adhered to. Over-tightening or non-uniform tightening of the cylinder head and barrel nuts for instance, can cause distortion, resulting in loss of compression, increased engine wear and poor fuel economy.

Application	*Thread Dia and Form*	*T.P.I.*	*Hex (A/F)*	*Torque Lb ft (Kg m)*
Carburetter flange nuts (SL)	0.3125 in. B.S.C.	26	0.525 in.	10 (1.383)
Clutch centre nut	0.5 in. B.S.C.	20	0.820 in.	60-65 (8.295-8.987)
Crankshaft pinion nut	0.625 in. B.S.F.	20	0.919 in.	35-40 (4.839-5.530)
Cylinder barrel nuts	0.375 in. B.S.C.	26	0.595 in.	28-30 (3.871-4.148)
Cylinder head stud nuts	0.3125 in. B.S.C.	26	0.525 in.	18-20 (2.489-2.765)
Fork leg clamp bolts	0.375 in. B.S.C.	26	0.595 in.	23-25 (3.180-3.456)
Kickstart ratchet nut	0.5 in. B.S.C.	20	0.705 in.	60 (8.295)
Oil pump stud nuts (SL)	0.25 in. B.S.C.	26	0.445 in.	7 (.968)
Rotor fixing nut	0.625 in. B.S.C.	20	1.010 in.	60 (8.295)
Valve cover nuts	0.3125 in. B.S.C.	26	0.525 in.	10 (1.383)
Valve cover nuts	0.25 in. B.S.C.	26	0.440 in.	5-7 (0.691-0.968)

Abbreviations:
A/F - Across Flats
B.S.C. - British Standard Cycle
B.S.F. - British Standard Fine
SL - Self-locking
T.P.I. - Threads Per Inch

LUBRICATION

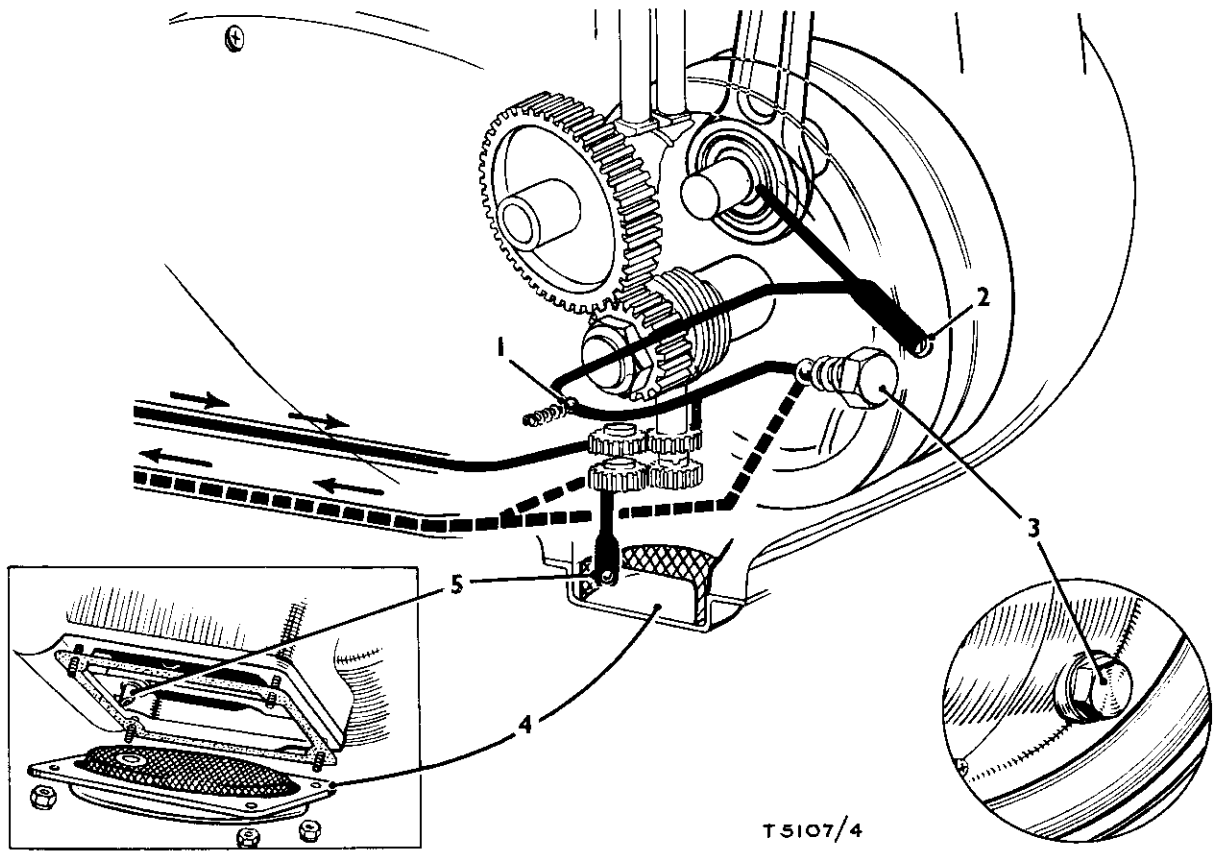
ENGINE

4. The lubrication system (Fig 4) is of the dry sump type, i.e., the oil is fed by gravity from a tank to a double-gear pump situated in the crankcase base at the right-hand side.

5. The top set of gears in the pump draws oil from the tank through a gauze filter and circulates it under pressure, past a pressure release valve (3), a non-return valve (1) and through the drilled crankshaft to the big-end bearing. Excess oil is thrown off by centrifugal force, on to the cylinder walls, the underside of the piston (to lubricate the gudgeon pin) and fills various wells to lubricate the camshaft and gears.

6. After lubricating the various internal components of the engine, the oil drains down into the crankcase.

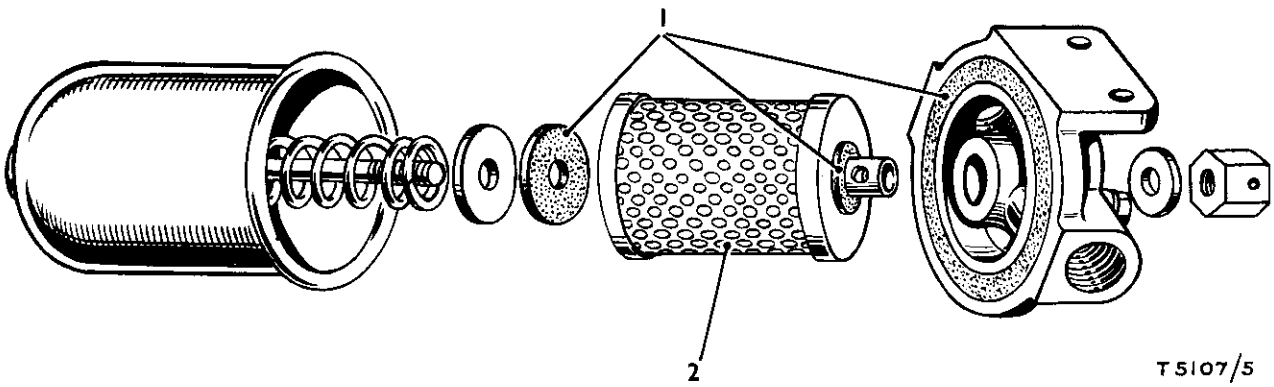
7. From here the lower, and larger set of pump gears, draws oil from the gauze sump filter through another non-return valve (5) and pumps it back to the tank at a greater rate than that of the feed side. This ensures that the sump never floods; hence the term "dry sump".



1 Non-return valve
2 Flywheel sludge trap
3 Pressure release valve
4 Sump
5 Scavenge non-return valve

Fig 4 Engine lubrication diagram

8. The oil return pipe is tapped to provide a supply of oil at low pressure to the valve rocker gear. This pipe is connected by means of a twin union to the left-hand side of the cylinder head. The oil is fed through the rocker shafts, lubricating the rocker ball pins, adjuster screws and finally the tappets as it drains back into the crankcase.



1 Sealing washers 2 Filter cartridge

Fig 5 External oil filter

External oil filter

9. The external oil filter (Fig 5) is inserted in the oil return pipe between the crankcase and oil tank. The filter cartridge (2) should be examined at the intervals quoted in the Servicing Schedule.

10. Remove the locking wire from the cap-nut and, whilst supporting the filter bowl, unscrew the nut. Withdraw the bowl, taking care not to lose the special sealing washers(1) and extract the filter cartridge. Wash the cartridge (2) thoroughly in clean petrol and allow to dry before inspecting it.

11. If the cartridge no longer appears serviceable, discard it and fit a new one, as it is most important that the oil flow is not obstructed by a blocked-up cartridge.

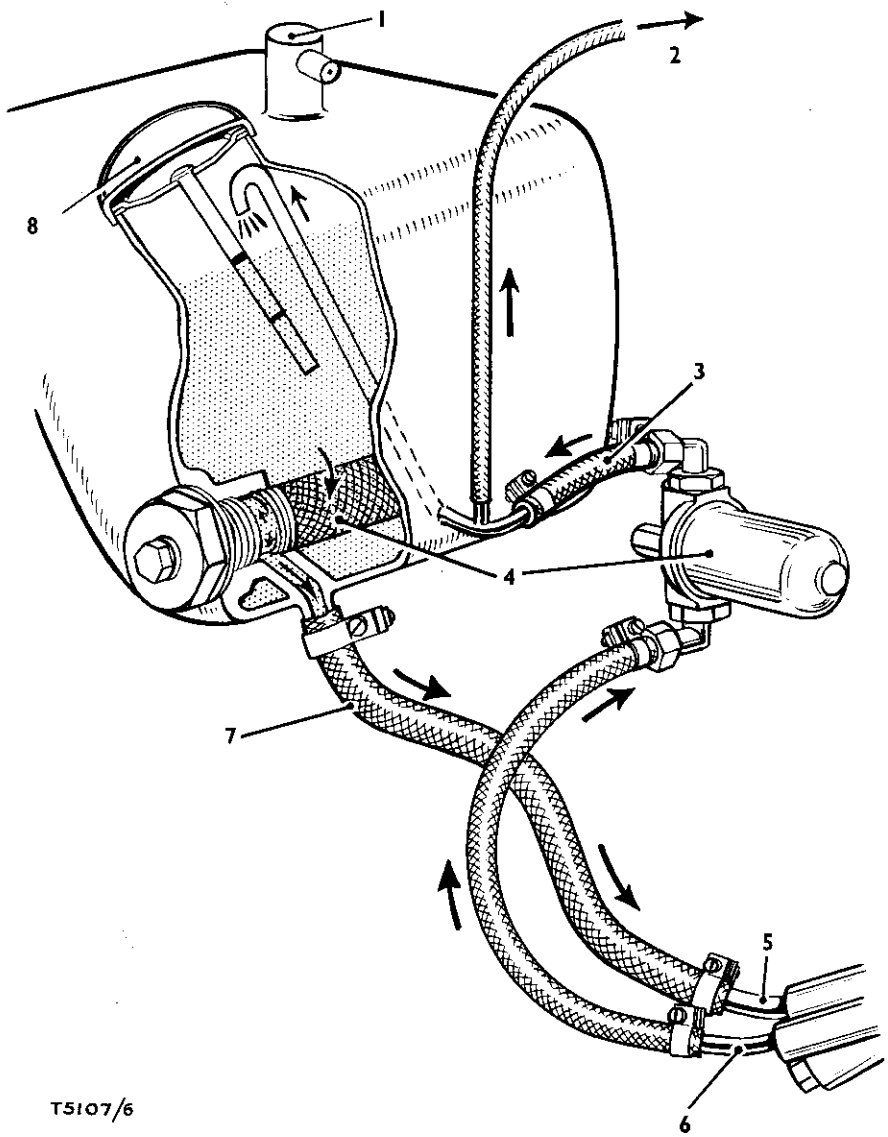
12. After cleaning the remainder of the components in petrol, allow to dry before reassembling. Do not omit to rewire the cap-nut in position.

13. Start the engine and check all joints for signs of leakage.

Changing the oil and cleaning the filters

14. The oil tank filter is screwed into the lower right-hand corner of the tank (see Fig 6). Obtain a suitable receptacle with a piece of stiff material to use as a chute and unscrew the small drain plug fitted in the filter plug and allow the oil to drain.

15. The filter element should now be removed, washed in clean petrol and allowed to dry. Lean the machine towards the right-hand side to drain off any remaining oil in the tank.



1 Tank breather
2 Rocker lubrication
3 Oil return pipe
4 Oil filters
5 Inner crankcase union
6 Outer crankcase union
7 Oil supply pipe
8 Filler cap and dipstick

Fig 6 Oil tank and filters

16. To gain access to crankcase filter, first take off the crankcase shield. Again using a suitable receptacle to catch the oil, unscrew the four nuts holding the sump filter to the crankcase, take off the shakeproof washers and remove the filter. Also disconnect the supply and scavenge pipes at the crankcase union (one nut).

17. Allow the oil to drain, wash the filter thoroughly in petrol, and clean off the old jointing material from the filter and crankcase. If there is any sign of damage to the old gasket, replace it on reassembly.

18. After reassembling the various components, check each joint for soundness and refill the oil tank with correct grade of oil. The tank capacity is approximately five pints.

Scavenge non-return valve

19. Whilst changing the oil it is a good point to check the scavenge pipe non-return valve for correct operation. Using a piece of wire push the ball up off its seating and allow it to drop of its own weight. If the ball will not drop it indicates a

build-up of sludge which can usually be cleared by immersing the pipe in petrol for a short period.

20. If there has been a tendency for the crankcase to fill with oil after standing overnight, so causing the engine to emit clouds of smoke when started, it is quite possible that the feed line non-return valve is not seating properly thus allowing oil to run back from the tank. This is the valve in the inner timing cover (see para 30).

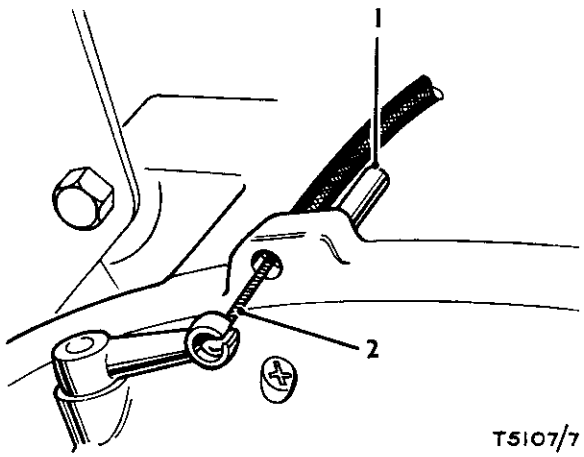
Crankcase oil pipe union

21. The oil pipe union is secured to the crankcase with one nut. If the small rubber sealing rings in the oil pipe union are damaged, they must be replaced.

Note: *The oil pipes are correctly fitted when crossed over, i.e., the outer pipe from the tank is attached to the inner connection on the crankcase.*

Crankcase breather

22. The short crankcase breather pipe (Fig 7(1)) emerges from the timing case near to the clutch cable abutment. It is most important that this pipe is unobstructed, this should be ensured by regular examination.



1 Breather pipe

2 Clutch cable

Fig 7 Crankcase breather

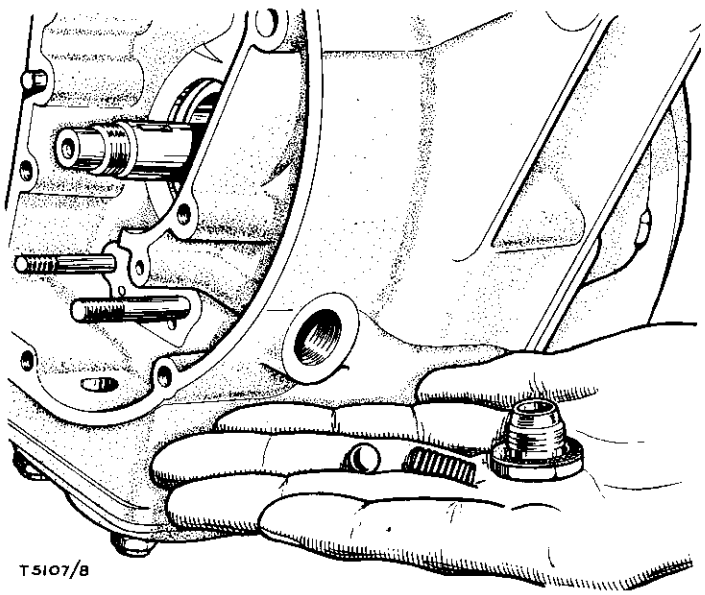


Fig 8 Oil pressure release valve

Oil pressure and non-return valves

23. A constant oil pressure is maintained by the release valve (Fig 8) situated on the front right-hand side of the crankcase.

24. To prevent the oil pressure becoming excessive, the valve opens and releases the excess oil direct into the crankcase from where it is returned to the tank.

25. The valve is pre-set and there is no point in altering the setting. However, after prolonged use, the spring does tend to weaken and corrode and must then be replaced. If there is corrosion it is wise to replace the ball also, after first cleaning the valve body.

26. To remove the valve, simply unscrew the large hexagon plug. Ensure that the fibre washer is fit for further use.

Low oil pressure

27. Low oil pressure is dangerous since insufficient oil is likely to be delivered to the engine components. The possible causes of low pressure being:-

(1) Insufficient oil in the tank. Check the level and the return after replenishing. If the return is correct it will show as a mixture of oil and air issuing from the return pipe.

(2) Tank and sump filters or external filter partly blocked, preventing the free passage of oil.

(3) Badly worn oil pump or big-end bearing in need of attention.

(4) Oil pipes incorrectly connected, when the pump would be inducing air through the return pipe.

Syphoning

28. This, one of the more common troubles, happens when one of the non-return ball valves is sticking off its seating. It can also be caused by a badly worn pump or one which is loose on its mounting.

29. Indications of syphoning are clouds of smoke from the exhaust when the engine is first started after standing overnight.

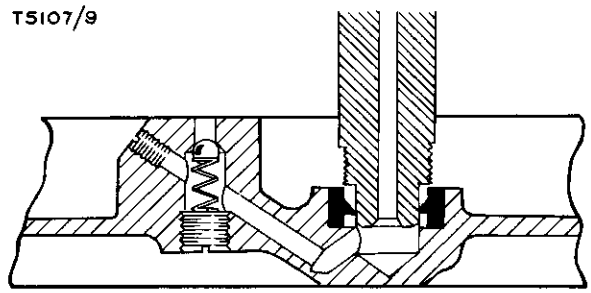


Fig 9 Non-return valve

30. The feed line non-return valve (Fig 9) consists of a ball and spring and is located in the inner timing cover. After unscrewing the retaining plug, the valve spring and ball can be removed for examination. Should there be any doubt about the condition of the valve components renew them.

31. The non-return valve in the scavenge pipe is described in para19.

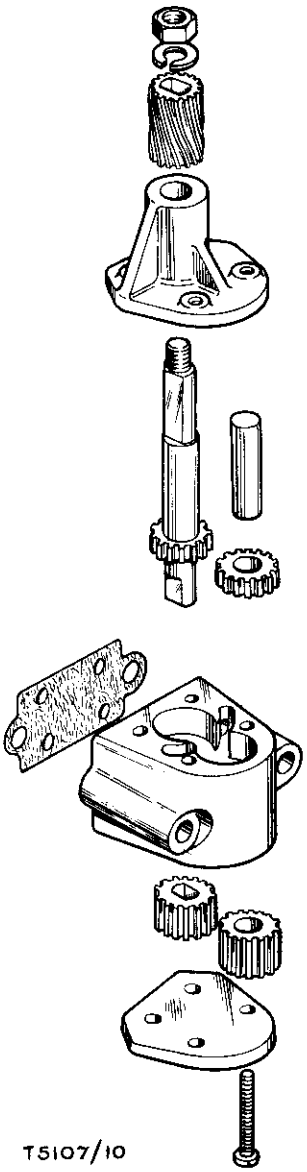
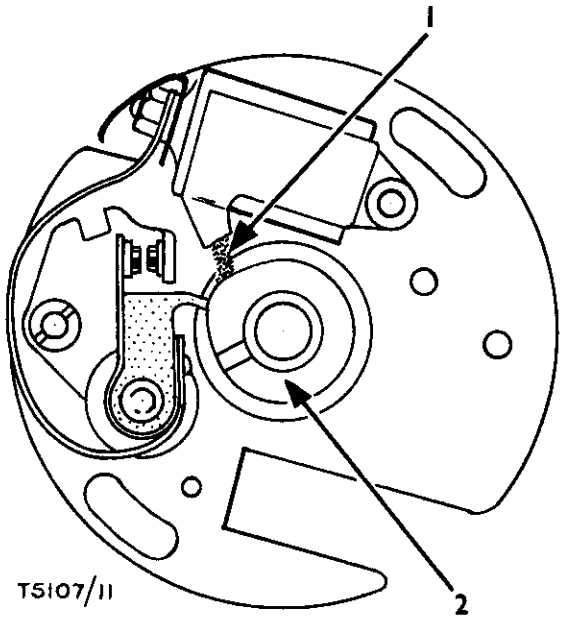


Fig 10 Oil pump



1 Felt wick

2 Cam

Fig 11 Contact breaker

Dismantling the oil pump

32. Having removed the oil pump (Fig 10) from the engine, take out the four screws from the base of the pump, releasing the baseplate and top cover from the pump body. The driving spindle and driving worm gear are secured to the top cover with one nut and spring washer. Before removing the worm gear, make careful note of the way in which it is fitted to assist in rebuilding.

33. Wash all the parts thoroughly in petrol and allow to dry before examining. Look for foreign matter jammed in the gear teeth and deep score marks in the pump body. These will be evident if the oil changing has been neglected. Slight marks can be ignored, but any metal embedded in the gear teeth must be removed.

34. The most likely point of wear will be found on the driving gears. If the shoulders of the gear teeth appear rounded, they must be renewed.

Rebuilding the pump

35. Absolute cleanliness is essential when rebuilding the oil pump and the parts must be handled carefully to avoid any damage.

36. Insert the driving spindle (with fixed gear) into pump top cover, fit the worm drive and secure in position with nut and spring washer.

37. Fit the driven spindle and gear into the cover, place the assembly on top of the pump body and insert the lower gears. Apply clean oil to the gears and refit the baseplate. Check that the spindle and gears rotate easily before tightening the four fixing screws.

38. Finally, check the joint faces for parallelity; if the housing face is not level, it will be distorted when bolted to the crankcase and may prevent the pump from working.

CONTACT BREAKER

39. The contact breaker is situated on the outer timing cover and it is essential that no engine oil gets into the contact breaker housing. To prevent this, an oil seal is pressed into the inner timing cover behind the auto-advance unit. Lubrication of the contact breaker cam and the auto-advance unit pivot points, however, is necessary.

40. The contact breaker cam (Fig 11(2)) is lubricated from an oil-soaked felt wick (1) which should have a few drops of engine oil applied as detailed in the Servicing Schedule.

41. To lubricate the auto-advance unit it is necessary to remove the contact breaker plate. First mark across the plate and the housing so that it can be replaced in exactly the same position. Take out the fixing screws and withdraw the contact breaker plate. The pivot points of the auto-advance unit can then be lightly oiled.

42. After lubricating replace the plate to the marks. If the timing has been lost, follow the instructions in paras 280 to 299.

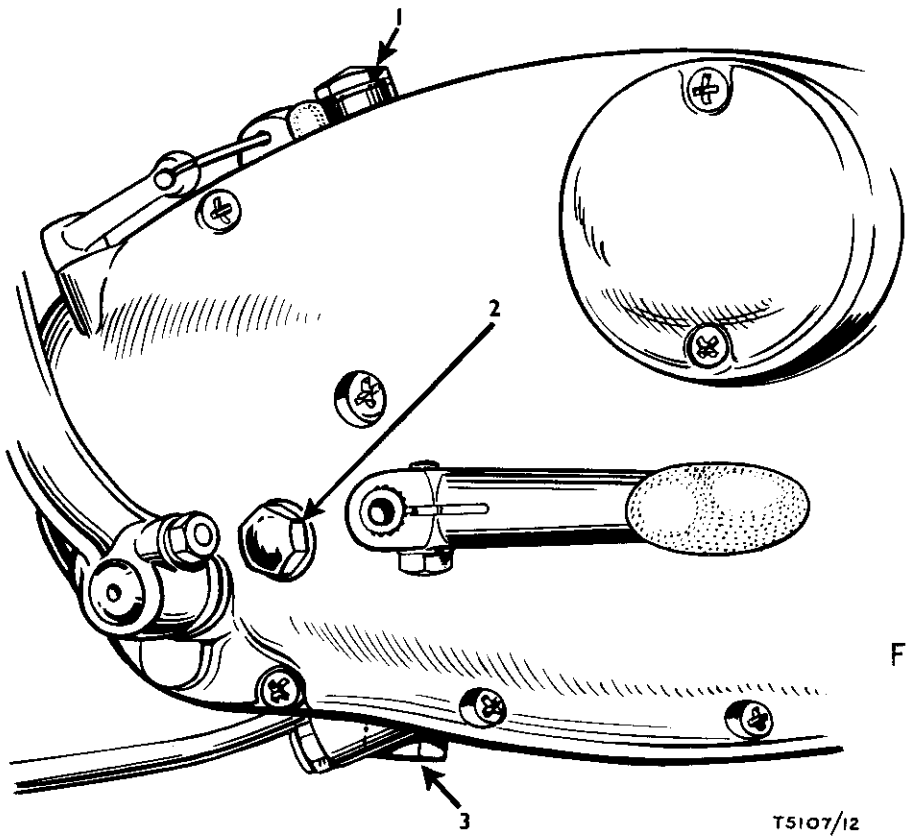
GEARBOX LUBRICATION

43. The gearbox, having its own oilbath, is independant of the engine for lubrication but, for the same reason, the oil level must be checked and any loss due to leakage made good.

43. The layshaft gears run in the oilbath and oil being carried by or thrown off these gears lubricates the mainshaft gears, bearings and bushes.

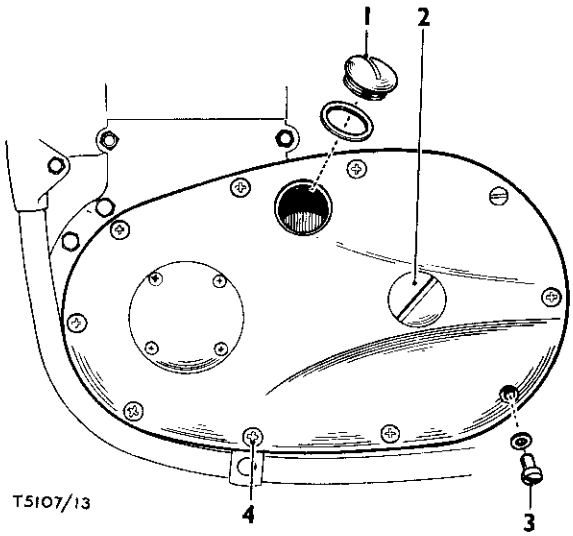
44. To drain the oil first take out the oil level plug (Fig 12(2)) then unscrew the drain plug (3) which is accessible through an aperture in the crankcase shield. The oil will drain more easily if it is warm after running the machine.

45. After draining, replace the drain plug making sure that the rubber "O" ring is in good condition.



1 Filler plug
2 Level plug
3 Drain plug

Fig 12 Gearbox level and drain plugs



1 Chain inspection cap
2 Clutch adjustment cap
3 Oil level screw
4 Drain screw

Fig 13 Primary chaincase

46. With the machine standing upright on level ground, unscrew the filler plug (1) and replenish the gearbox with correct grade of oil until surplus oil begins to flow from the level hole. Replace the level plug with the "O" ring and refit the filler plug on top of the gearbox.

47. Recommended grades of oil are quoted in the Servicing Schedule.

PRIMARY DRIVE

48. Like the gearbox, the primary chaincase, having its own oilbath, is independant of the engine but the level of oil must be checked periodically and the oil drained and replaced as indicated in the Servicing Schedule. The oilbath in the primary chaincase does not lubricate the chain only, the clutch being contained in the same case is dependant on this oil supply for its efficient functioning. A drip feed is also provided for the rear chain through an oil well and nozzle at the back of the chaincase.

49. There are two of the chaincase cover screws which have their heads painted red; they are situated along the lower rim of the case, the rear one being the oil level screw (Fig 13(3)) and the centre is the drain screw (4).

> **Note:** *The drain screw is fitted with an aluminium washer to ensure oil-tightness.*

50. The oil level screw is fitted with a sleeve nut and also secures the front section of the chaincase.

51. To drain the oil, take out the chain inspection cap (1) at the top of the case and the drain screw (4). Cap (2) is only removed to enable clutch adjustments to be carried out.

52. After draining, replace the drain screw, take out level screw and pour oil through the inspection cap hole until it commences to run out of the level screw hole. Allow the level to settle then replace the level screw and inspection cap. The machine should be upright and on level ground when this operation is carried out to ensure correct level of oil. When replenishing, use the lubricants recommended in the Servicing Schedule.

REAR CHAIN

53. Oil thrown off the primary chain is collected in a small well at the back of the primary case from which a drip feed is supplied to the rear chain. This may not, however, be adequate in some circumstances and it is advisable to supplement the drip feed by occasionally applying oil to the chain links with an oil can.

54. Should it be necessary to remove the chain, ensure on replacement, that the spring clip of the connecting link has its closed end pointing in the direction of travel of the chain (i.e. forwards on the top run).

STEERING HEAD

55. The steering head bearings are packed with grease on assembly and should only require repacking when repairing or overhauling the steering head. Removal and replacement of the steering is dealt with in paras 410 to 419 and in the fork section.

56. Wipe out all the old grease from the bearing cups and clean the ball bearings, by rolling them in a clean rag. After cleaning, carefully examine the bearings, cups and cones for pitting, corrosion or cracks, and renew if necessary. The fresh grease will hold the ball bearings in position during reassembly. Check that the grease is as quoted in the Servicing Schedule. The correct number of ball bearings for each cup is twenty.

FRONT FORK

57. The oil contained in the fork legs not only lubricates the bearing bushes, but also acts as the damping medium. Because of the latter function, it is essential that the amount of oil in each fork leg is exactly the same.

58. Oil leakage mid-way up the forks usually indicates that an oil seal has failed and requires replacement; this is dealt with in para 425 covering the dismantling and reassembly of the forks.

59. Correct periods for changing the oil are quoted in the Servicing Schedule.

60. To drain the oil, unscrew the fork cap-nuts and the small drain plugs in the lower ends of the fork sliding members. Allow the oil to drain out then, whilst standing astride the machine, apply the front brake and slowly depress the forks a few times to drain any oil remaining in the system.

Note: *When draining the right-hand leg, care must be taken to prevent the oil from entering the brake drum. It is recommended therefore, that the machine is tilted to the right whilst carrying out this operation.*

61. Replace the drain plugs, raise the cap-nuts a few inches and pour 1/3 pint of oil into each fork leg (see Servicing Schedule for recommended grades of oil).

62. Ensure that the rubber sealing washer and special retainer are correctly fitted below the damper rod locknut before replacing the cap-nuts.

WHEEL BEARINGS

63. The wheel bearings are packed with grease on assembly and only require repacking during repair or overhaul of the hubs.

64. The bearings should be removed as quoted in paras 468 to 485. After removal, the bearings must be washed thoroughly in paraffin and, if possible, an air line should be used to blow out any remaining grit or paraffin.

65. Pack with correct grade of grease as quoted in the Servicing Schedule, after assembling the first bearing.

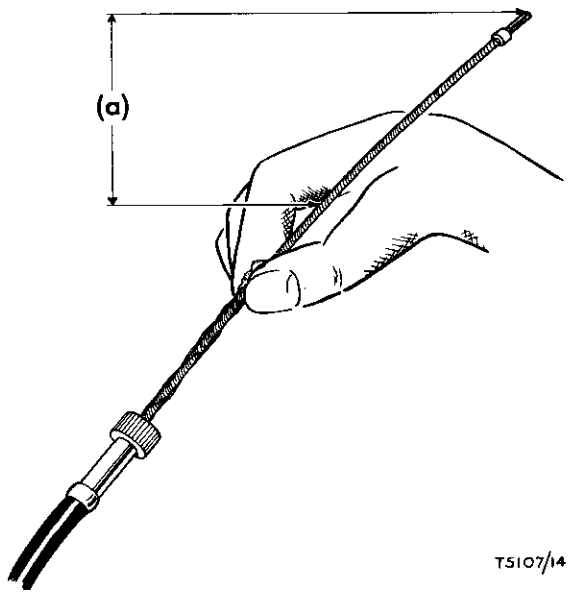
Note: *Do not over-lubricate and avoid handling the brake shoes with greasy hands.*

CONTROL CABLES

66. Exposed sections of inner cables should be lubricated periodically as detailed in the Servicing Schedule. All the control cables are provided with grease nipples so that the inner cables can be lubricated more adequately. During their manufacture, the inner cables are greased with a molybdenum based grease which forms a semi-permanent lubricant and should therefore give long service before needing attention.

SPEEDOMETER CABLE

67. During repairs it may be found necessary to lubricate the speedometer cable to prevent premature failure of the inner wire. Care is also necessary to avoid over-zealous greasing which may result in the lubricant entering the instrument head. For lubricating, it is only necessary to unscrew the cable nut at the speedometer drive unit and withdraw the inner wire. The grease should be applied sparingly to the wire and the top six inches (Fig 14(a)) must not be greased. Servicing instructions for the rider only are contained in the Servicing Schedule.



(a) The top 6 in. must not be lubricated

Fig 14 Speedometer cable

ENGINE

DESCRIPTION

68. The overhead valve four-stroke engine is of the unit construction type and has a single cylinder barrel of close-grained cast-iron.

69. A special "Lo-Ex" aluminium piston having one plain (chrome-plated) compression ring, one tapered compression ring and one scraper ring is used on a 'H'-section connecting rod, employing a needle roller big-end assembly.

70. Two balanced flywheels each with a crankshaft, are pressed on to a taper-fit crankpin, the unit revolving on two large roller bearings housed in the crankcase.

71. The aluminium alloy cylinder head has cast-in, heavy duty cast-iron valve seats and removable valve guides. Housed within the top of the cylinder head are two valve rocker spindles, carrying the inlet rocker at the rear and the exhaust rocker at the front.

72. The one-piece camshaft operates in two bushes, one of phosphor bronze and the other of sintered bronze.

73. Contained within the primary drive case on the left-hand half of the crankcase are the clutch assembly, primary chain and the alternator. The alternator unit consists of a six-coil stator, mounted on three studs and a rotor, secured to the drive-side shaft.

74. A vertically mounted oil pump of the double gear type is driven off a worm wheel on the gearside crankshaft and supplies oil to the big-end assembly, piston, cylinder walls and the timing gears.

75. The gearbox, at the rear of the right-hand half of the crankcase, and the primary chaincase are independent of the engine lubrication system and each contain their own oilbath.

76. Power from the engine is transmitted through the engine sprocket and duplex primary chain to the clutch assembly which has a built-in cush drive. Here the drive is taken up by the bonded friction plates and is transmitted through the four-speed constant-mesh gearbox to the final drive sprocket.

DECARBONISING

77. Decarbonising or "top overhaul" as it is cometimes called, means the removal of carbon deposits from the combustion chamber, piston crown, valve heads and inlet and exhaust ports, and to restore a smooth finish to these surfaces. Obviously, whilst the upper portion of the engine is dismantled for this purpose, opportunity will be taken to examine the valves, valve seats, springs, guides, etc., for general wear.

78. Carbon, produced by combustion taking place in the engine when running, is not harmful providing it is not allowed to become too heavy and therefore likely to cause pre-ignition or other symptoms which may impair the engine performance.

79. The usual symptoms indicating the need for decarbonising, are an increased tendency for the engine to "pink" (metallic knocking sound when under load), a general decrease in power and a tendency for the engine to run hotter than usual. An increase in petrol consumption may also be apparent.

Preparing to decarbonise

80. Before commencing with the work, it is advisable to have the following equipment available:-

Spanners for 3/16 in. W., 1/4 in. B.S.F. to 5/16 in. W., 3/8 in. B.S.F.
Set of scrapers
Set of feeler gauges
Supply of fine grade emery cloth
Jointing compound
Valve grinding tool and coarse/fine grade grinding paste
Valve spring compressor
Clean engine oil
Pieces of hard wood to support piston
Top overhaul gasket set
Gudgeon pin circlips
Valve springs (set) inner and outer
Paraffin and clean rag

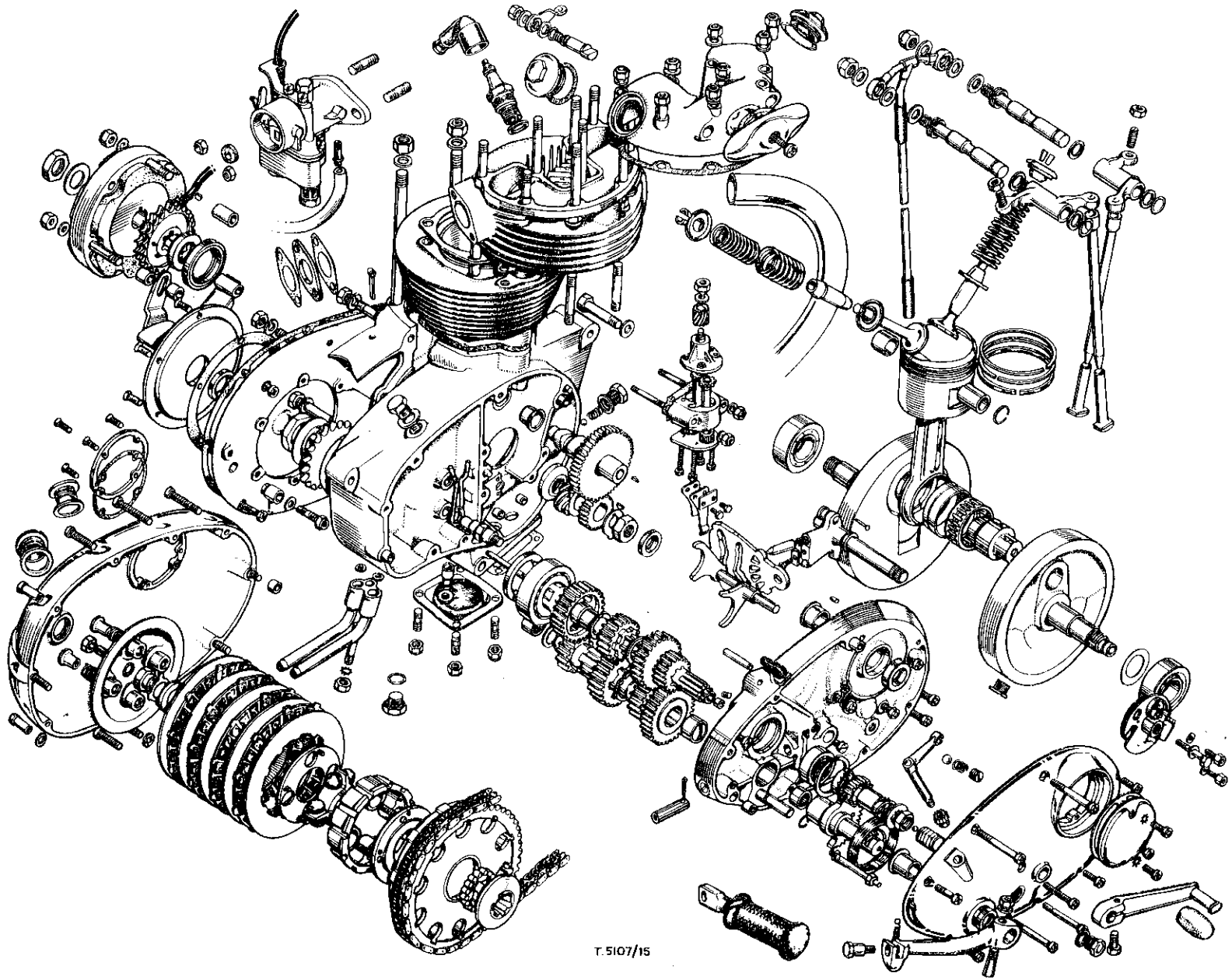


Fig 15 Engine clutch and gearbox

81. Perfect cleanliness is essential to ensure success in any service task so, before starting a job such as this, make sure that you have a clean bench or working area on which to operate and room to place parts as they are removed.

82. To facilitate removal of the cylinder head, first take off the petrol tank (see para 148(1)).

83. With the tank removed, the engine steady bracket can be disconnected, together with the exhaust valve lifter assembly, after the inner cable has first been extracted through the slot in the end of the operating lever. To avoid any damage, the coil should now be removed. This is held with its bracket by two nuts and bolts to the frame top tube. The exhaust pipe is a push-fit into the cylinder head and can be withdrawn after releasing its bracket from the front engine mounting bolt and loosening the silencer pinch bolt.

84. Disconnect and take off the battery, leaving its carrier in position.

85. Loosen completely, the carburetter adaptor hose clip and pull the hose away from the carburetter intake flange. The carburetter can now be released from its studs and tied back out of the way. If necessary, the control cable can be detached as detailed in para 390. The overflow pipe can simply be pulled off its adaptor on the carburetter.

86. The oil feed pipe to the rocker spindles should now be removed and the sparking plug taken out.

Removing the cylinder head

87. Set the piston at top dead centre on the compression stroke (both valves closed) and take off the six nuts holding the cylinder head to the barrel.

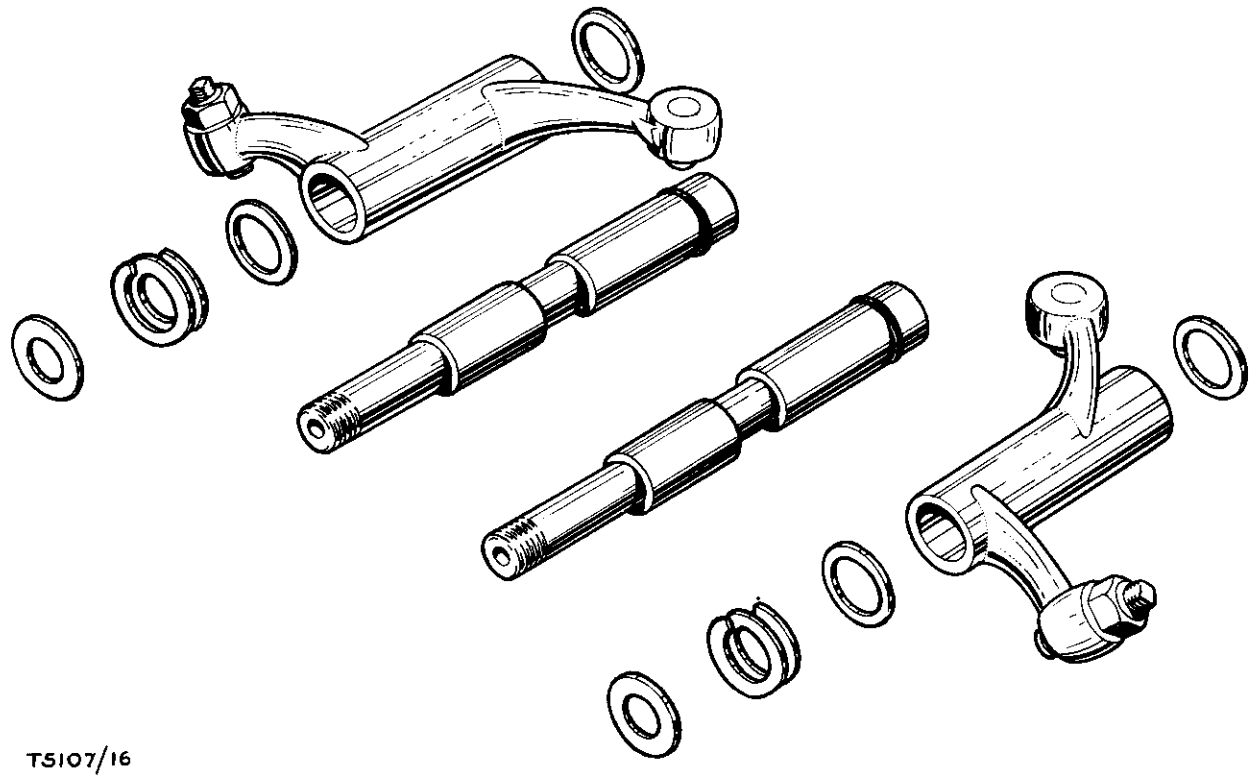
88. Leave the rocker box assembly in position on the cylinder head, and raise the latter until it clears its fixing studs. Rotate the whole assembly about the push rods so as to clear the frame top tube, and lift off. Take the push rods out of their housing. The rocker box can now be removed from the cylinder head, thus exposing the valves and springs. Note the locations of the special sleeve nuts holding the rocker box.

89. If it is necessary to dismantle the rockers and spindles, take care to renew any damaged rubber sealing rings. Refer to Fig 16 to assist in correct reassembly.

Removing the valve springs

90. Using a suitable valve spring compressor, compress each spring until the split collets can be removed. The valve springs and top collars can now be lifted from the valve stems, swilled in paraffin, then placed on a numbered board to indicate their position in the cylinder head.

91. The springs may have settled through long use and they should therefore be checked in accordance with the dimensions quoted in DATA. If the springs have settled appreciably, or there are signs of cracking, they should be replaced.



TS107/16

Fig 16 Valve rocker assembly

Push rods

92. Examine the push rod end cups to see if they are chipped, worn or loose, and check that the rods are not bent by rolling them on a flat surface (i.e., a piece of plate glass). If any of these faults are evident the rod(s) should be renewed.

Valve guides

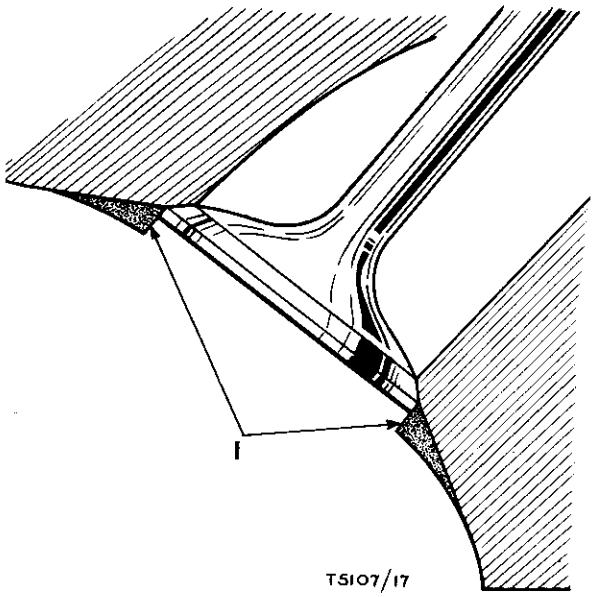
93. Check the valves in the guides; there should be no excessive side-play or evidence of carbon build-up on that portion of the stem which operates in the guide. Carbon deposits can be removed by careful scraping and very light use of fine grade emery cloth. If there are signs of scoring on the valve stems, indicating seizure, both valve and guide should be renewed.

94. An old valve guide can be driven out with the appropriate Service tool but, the aluminium heads should first be heated by immersing in hot water. The new guide can be driven in with the same punch whilst the head is still warm. Note that the exhaust guide is counterbored at the end which protrudes into the port.

95. Whenever new guides have been fitted, each valve seat must be refaced with a piloted valve seat cutter, to ensure that the seat is concentric with the guide bore.

Valves

96. Valve heads can be refaced on a valve refacer but if pitting is deep or the valve head is burnt, then a new valve must be fitted and ground-in.



1 Shaded area shows metal to be removed

Fig 17 Pocketed valve

97. The valve seats in the cylinder head are unlikely to require any attention, but if they are marked, they should be refaced with a valve seat cutter tool, used with a pilot and holder. The seat angle is 45 degrees.

98. Sometimes when the engine has been decarbonised many times, valves become "pocketed" (Fig 17). This is when the valve head and seat are below the surface of the combustion chamber, so impairing the efficiency of the valve and affecting the gas flow. The "pocket" should be removed with a special 30-degree angle cutter before recutting the seat or grinding in the valve.

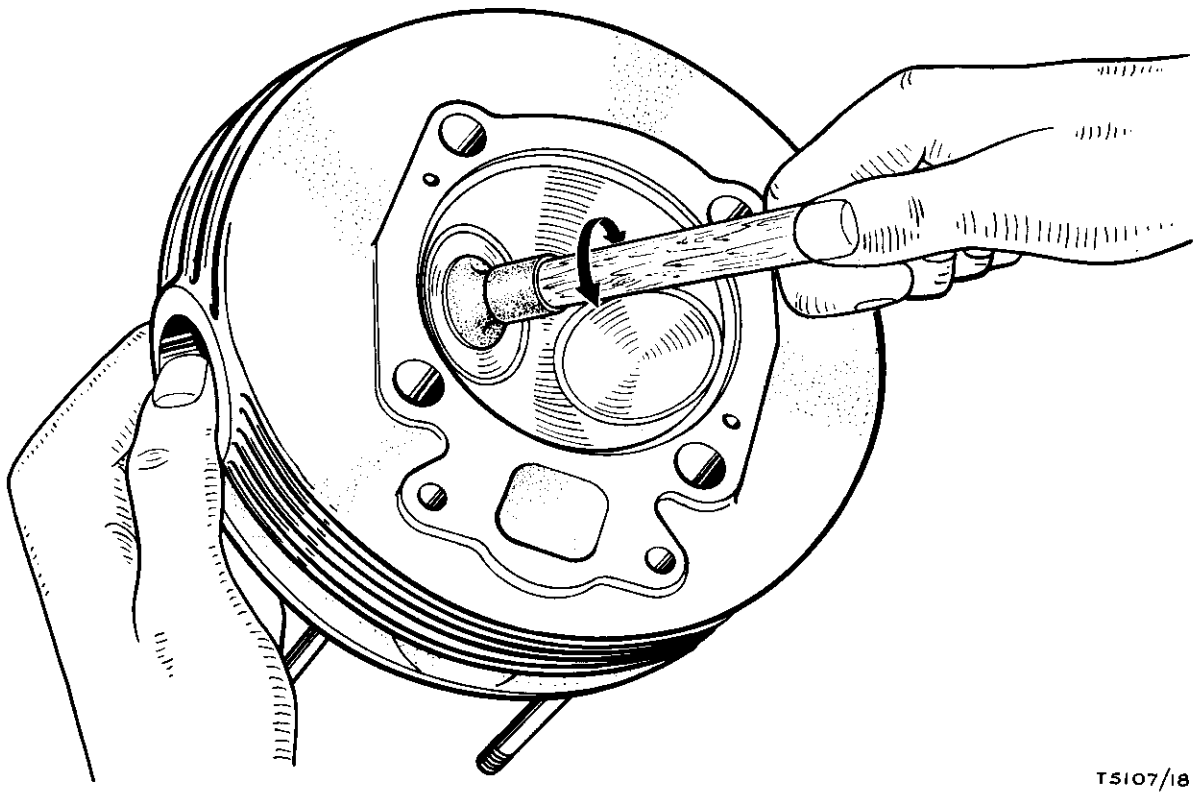


Fig 18 Grinding-in a valve

Valve grinding

99. If the valves have been renewed or refaced they must be lightly ground-in to their seats to ensure a good gas-seal. This operation is carried out only after all carbon deposits have been removed from the combustion chamber.

100. Removal of carbon from the head, inlet and exhaust ports can be carried out with scrapers or rotary files, but whichever method is used, great care must be taken to avoid scoring the valve seats. A final "polish" can be achieved with the use of fine emery cloth wetted by paraffin.

101. Do not attempt to decarbonise the cylinder head by immersing it in caustic soda solution; the solution has a harmful effect on aluminium.

102. Having removed all traces of carbon, smear a small quantity of fine grinding paste over the face of the valve and return the valve to its seat. Using a suction type valve grinding tool, rotate the valve backwards and forwards, maintaining steady pressure. Every few strokes, raise the valve and turn it to a new position. A light spring inserted under the valve head greatly assists in raising the valve to enable it to be re-positioned. Grinding should be continued until the mating surfaces of both the valve and seat show a uniform matt finish all round.

> **Note:** *Prolonged grinding-in of the valve does not produce the same results as re-cutting and must be avoided at all costs.*

Reassembling the cylinder head

103. Before reassembling the valves and springs, all traces of grinding paste must be removed from both the valves and their seats.

104. Smear each valve stem with clean engine oil and replace the valves in the head.

105. Fit the spring cup, valve springs (with close coils at the bottom), and top collar over each valve stem, then compress the springs with the valve spring compressor to allow the split collets to be inserted in the top collar. A little grease on the valve stem will assist in keeping the collets in position as the valve springs are released.

106. Ensure that the collets are correctly seated in the recess on the valve stem.

Cylinder barrel

107. Unless the condition of the engine indicates that the piston, piston rings or cylinder bore require attention, the cylinder barrel should not be disturbed.

108. If the bore is worn it can sometimes be detected by placing the fingers on top of the piston and attempting to push the piston backwards and forwards in the direction of flywheel rotation. Symptoms indicating faulty piston rings might include heavy oil consumption and poor compression, but only if the valves are known to be in good order. If the valves require attention they are much more likely to be the cause of such symptoms.

109. Excessive piston slap when warm may indicate a worn bore or severe damage through seizure.

110. The cylinder bore can be measured for wear with a suitable dial gauge, after moving the piston to the bottom of the bore.

111. If the barrel is not being removed, bring the piston to the top of the bore and, after plugging the push rod opening with clean rag, proceed to remove the carbon from the piston crown. A stick of tinsmiths solder, flattened at one end, provides an ideal scraper tool and will not damage the alloy piston.

112. Always leave a ring of carbon around the edge of the piston crown and around the top of the cylinder bore. This will help to provide an additional seal. After cleaning the piston crown, rotate the engine to lower the piston and wipe away any loose carbon from the cylinder wall.

113. The cylinder barrel and head joint faces must also be cleaned, care being taken not to damage the faces by scoring with the scraper. Such score marks would result in gas leakage, loss of compression or even burning of the cylinder head face.

Removing the cylinder barrel

114. To remove the cylinder barrel, rotate the engine until the piston is at the bottom of its travel, then lift the barrel upwards until the piston emerges from the base of the bore. Steady the piston as it comes free from the cylinder so that it is not damaged by violent contact with the crankcase mouth. As soon as the cylinder has been withdrawn, cover the crankcase mouth with a clean rag to prevent the entry of foreign matter.

115. Examine the cylinder carefully for wear and if a deep ridge has formed at the top of the bore then the barrel will require attention. The barrel will also require attention if there is any deep scoring as this will cause loss of compression and excessive oil consumption.

116. The cylinder barrel bore is of close-grained cast-iron, enabling a 1/2 mm and 1 mm rebore to be carried out for use with oversize pistons.

Removing the piston

117. It is not necessary to remove the piston unless it requires replacement or further dismantling of the engine is to be carried out.

118. To remove the piston from its connecting rod, it will first be necessary to prise out one of the gudgeon pin circlips (Fig 19) using a suitable pointed instrument in the notch provided.

119. Before the gudgeon pin can be withdrawn the piston must be thoroughly warmed by wrapping it in a rag that has been soaked in hot water and wrung out. Alternatively an electric iron can be applied to the piston crown until enough heat is

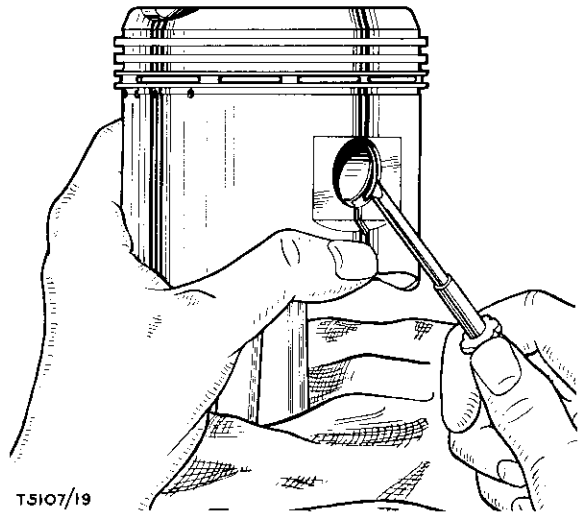


Fig 19 Removing the piston circlip

obtained. When the piston is warm, tap out the gudgeon pin with a suitable drift, supporting the piston to avoid any side strain on the connecting rod. If the gudgeon pin comes out easily before the piston is warm then the pin or bush is worn and will need replacement.

120. After freeing the piston, mark the inside of the piston skirt so that it can be replaced the correct way round.

Piston rings

121. The outside face of each piston ring should possess a smooth metallic surface and any signs of discolouration means that the rings are in need of replacement. The rings should also retain a certain amount of "springiness" so that when released from the barrel, the ends of each ring lie at least 3/16 in. apart.

122. Each ring should be free in its groove but with minimum side clearance. If the rings tend to stick in the grooves, remove them and clean out all the carbon from the groove and the inside face of the ring. Care is necessary to permit only a minimum amount of movement when removing the rings as they are very brittle and can be broken easily. A piece of a broken piston ring, ground as a chisel, will provide a useful tool for removing carbon deposits from the ring grooves.

123. To check the piston ring gaps, place each ring in the least worn part of the cylinder bore (usually at the bottom) and locate it with the top of the piston to ensure it is square in the bore. Measure the gap between the ends of the ring with a feeler gauge. The correct gap when new is between .009-.014 in. and although an increase of a few thousandths of an inch is permissible, any large increase to, say .025 in. indicates the need for a replacement ring. It is necessary to check the gap of a new ring before fitting, and if the gap is less than .009 in. the ends of the ring must be carefully filed to the correct limit.

124. The top compression ring is chromium-plated and must always be used at the top. The second compression ring has a taper outside face and its upper surface is marked "top" to ensure correct fitting. If the ring is fitted upside down, oil consumption will become excessive.

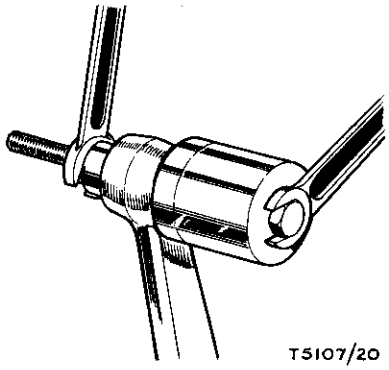


Fig 20 Re-bushing the small end

Small-end bush

125. Small-end bush wear is normally very slight, but when excessive it can cause an unpleasant high pitched tapping sound. The gudgeon pin should be a good sliding fit in the bush but if there is considerable up and down movement, then the bush should be replaced.

126. The bush can be changed in one operation by pushing the old bush out and, at the same time, pressing the new one in with the Service tool. The new bush must be correctly aligned with the oil hole and reamed to .7503-.7506 in. after pressing into the connecting rod.

Reassembly after decarbonising

127. Scrupulous cleanliness must be observed when reassembling, and each component should be smeared with fresh oil before replacing.

128. Warm the piston before inserting the gudgeon pin and ensure that the piston is the correct way round before fitting. Always use new gudgeon pin circlips and see that they are pressed well down into their grooves.

129. If the circlips should come adrift or if one is omitted the cylinder barrel will be damaged and may require replacement.

130. Use a new cylinder base washer and support the piston with two pieces of hard wood placed across the crankcase, under the piston skirt.

131. The piston ring gaps must always be equally spaced round the piston that is, at 120 degrees apart to restrict gas leakage through the gaps to the minimum.

132. Using a suitable piston ring slipper, compress the rings so that they are just free to move and replace the barrel. The slipper will be displaced as the piston enters the bore (Fig 21).

133. Take off the slipper and remove the hard wood supports, allowing the barrel to slide on to the crankcase.

134. Insert the two push rods down the barrel aperture, on to their respective tappets, the outer one operating the inlet push rod (see Fig 22).

135. Place the cylinder head gasket in position with its raised lip uppermost and refit the head, complete with rocker box.

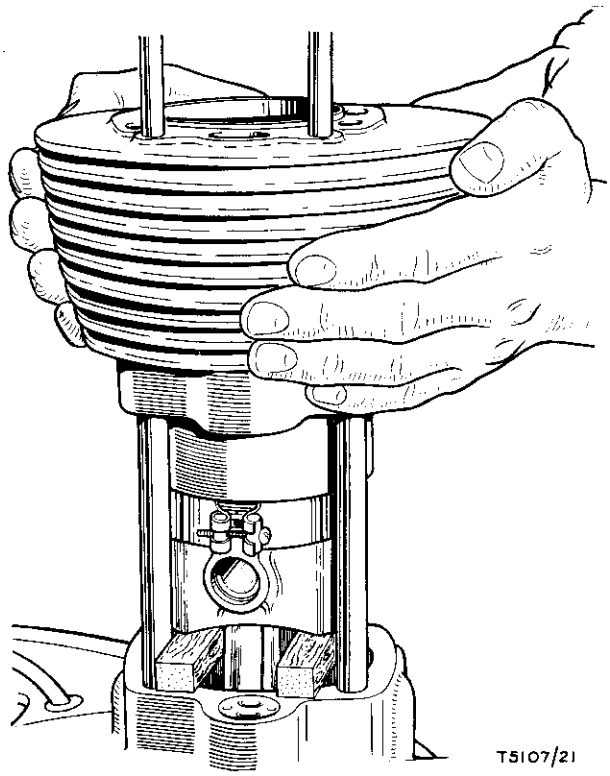
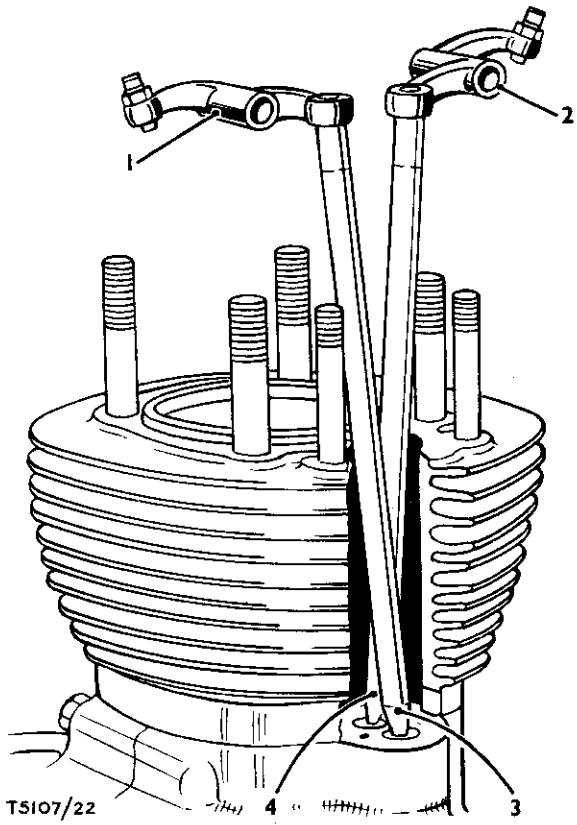


Fig 21 Replacing the cylinder barrel



1 Inlet rocker
2 Exhaust rocker
3 Inner push rod
4 Outer push rod

Fig 22 Push rod location

136. The push rod inspection cover should be removed so that the upper ends of the rods can be fitted to their appropriate rocker arms. Note that the top of the exhaust push rod is painted red for identification purposes.

137. In order to avoid any undue strain on the head or rocker box from valve spring pressure, the piston should be set at top dead centre on the compression stroke. Alternatively, the valve rocker adjusters should be completely slackened off.

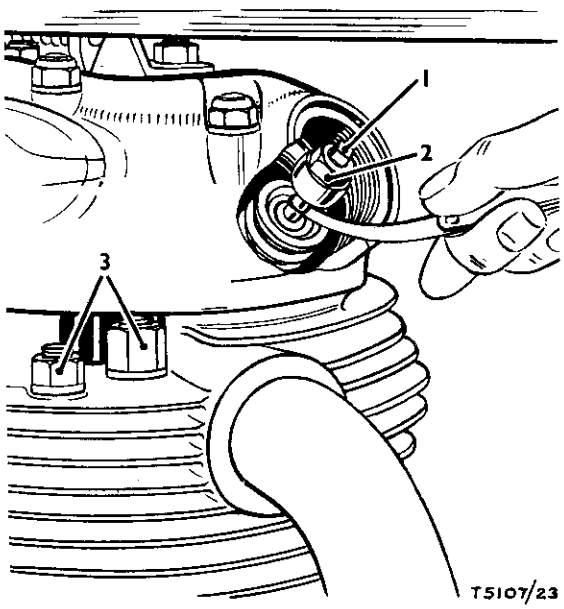
138. Now, using a suitable torque wrench, tighten the six cylinder head fixing nuts firmly and evenly to the figures quoted in DATA. Check that the push rods are correctly located in their proper positions and tighten the rocker box fixing nuts. Replace the inspection cover with its sealing washer.

139. After first checking that the overflow pipe adaptor does not protrude into the carburetter bore, fit the carburetter onto its studs, using the appropriate joint washers. Locate the rubber hose adaptor between the carburetter intake flange and the air cleaner, then secure with the clips. Replace the coil, exhaust system and engine steady bracket. Next, replace the petrol tank, reconnect the petrol pipes and refit the exhaust valve lifter assembly.

140. Assemble the zener diode and heat sink assembly to the base of the petrol tank and check the cable connections.

141. Reconnect the rocker oil feed pipe and finally, adjust the valve clearances as described in para 144. Finally, refit the battery and connect the cables to the appropriate terminals.

142. If the engine was removed for decarbonising, see paras 148 and 149 for details of replacement.



1 Adjusting pin
2 Locknut
3 Cylinder head nuts

Fig 23 Checking valve clearances

Checking valve clearances

143. The clearances between the top of each valve stem and the rocker adjusting pin, must be set when the engine is quite cold.

144. Remove the rocker caps, set the piston at top dead centre on the compression stroke (both valves closed) and using a feeler gauge, check that the fully open gaps for the inlet and exhaust valves are as follows:-

.008 in. (inlet) and .010 in. (exhaust)

145. If the clearance requires adjusting slacken the locknut (Fig 23(2)) and adjust the pin (1) until the correct gauge will just slide between the valve stem and pin. Holding the pin in its new position, retighten the locknut. Check the clearance again to make sure that the setting has not altered whilst tightening the locknut.

REMOVING THE ENGINE UNIT

146. During the process of removing the engine unit, keep careful watch for any nuts or bolts which are found to be loose or have worn considerably. Such parts are no longer safe and must be replaced.

147. Examine the wiring for places where the insulation may have rubbed through and protect with a few turns of good insulating tape. It should be borne in mind that a bare wire can cause an electrical short-circuit which may set the machine on fire.

148. The procedure for removal of the engine unit is as follows:-

(1) First remove the petrol tank. It will not be necessary to drain this, but only to turn off the petrol taps and detach the pipes from each tap. Unscrew the two nuts holding the zener diode heat sink bracket to the base of the tank and tie the unit safely out of the way. The tank is mounted on rubber pads and is secured by a single bolt which passes through a rubber sleeve in the tank centre, to its anchorage on the frame top tube. Remove the rubber cap from the top of the tank, unscrew the nut and withdraw the tank complete with rubber sleeve and petrol taps, leaving the fixing bolt attached to the frame.

(2) Take off the crankcase shield and drain the oil system as detailed in para 16. Uncouple the rocker oil feed pipes from the ends of the rocker spindles and release the supply and scavenge pipes union beneath the crankcase.

(3) Take off the battery and remove its carrier. This is secured by two nuts to the frame cross-member lugs and by one nut to the rear engine mounting plate.

(4) Disconnect the generator and contact breaker cables from the snap connectors behind the engine. Also disconnect the high-tension lead from the sparking plug.

(5) Remove the engine steady bar and its bracket from the top of the rocker box, complete with exhaust valve lifter assembly. The latter can remain attached to its cable but must first be released from the operating lever.

(6) Release the flexible connection between the carburetter and air cleaner then disconnect the overflow pipe from the flange. Unscrew the fixing nuts, withdraw the carburetter from its studs and tie back out of the way. If necessary, the control cable can be detached (see para 390).

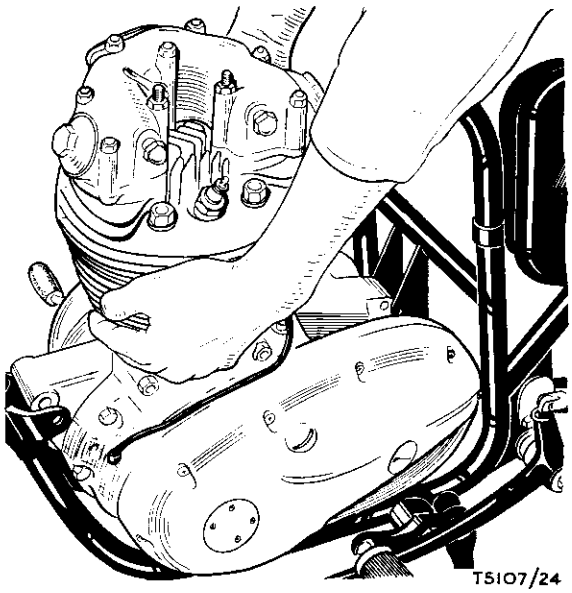


Fig 24 Removing the engine

(7) Remove both front and rear sections of the chaincase (see para 335), uncouple the rear drain at its spring link and detach it from the gearbox sprocket.

(8) Disconnect the clutch cable from its operating lever on top of the timing cover.

(9) Withdraw the front engine mounting bolt and support the horn as it is released. After noting their terminal connections the horn cables can be disconnected and the horn placed to one side.

(10) Removal of the front engine bolt also releases the exhaust pipe bracket and, when the silencer pinch bolt has been loosened, the exhaust pipe can be withdrawn from the front. The pipe is simply a push fit into the cylinder head. Note that a spacer is fitted between the exhaust pipe bracket and the frame lug.

(11) Release the remaining engine bolts from the base of the engine and from the rear mounting plates. Whilst withdrawing the final fixing bolt, great care should be taken to avoid trapping the hand or fingers as the engine may shift its position suddenly.

(12) Finally, to allow more clearance for engine removal, take off the right-hand footrest. This is held to its tapered lug by a single bolt.

(13) Raise the engine at the front until it is clear of the frame lug, then tilt it backwards.

(14) It will be necessary at this stage to disengage the engine lug from the rear frame brackets.

(15) The engine unit can now be lifted out from the right-hand side of the frame.

149. Replacement of the engine unit is a reversal of the above procedure for removal, but a check must be made to ensure that all nuts and bolts are tightened securely and that the handlebar controls are suitably readjusted.

TRANSMISSION

Description

150. Power from the engine is transmitted through the engine sprocket and primary drive chain to the clutch chainwheel, then via the clutch driving and driven plates to the cush drive or shock absorber unit and gearbox mainshaft. The drive is then transmitted through the four-speed gearbox to the final drive sprocket and finally, to the rear wheel.

151. The clutch cush drive, as its name implies, smooths out the drive as the engine power impulses fluctuate. The clutch, when operated correctly, enables the rider to stop and start his machine smoothly without stalling the engine, and assists in providing a silent and effortless gearchange.

152. Thus it will be evident that the satisfactory operation of one part of the transmission system is dependent on another part. In other words, if one part is worn or faulty, it can very often prevent other parts from working properly.

153. The dismantling and reassembly of the primary drive can if necessary, be carried out with the engine unit in the frame, but will be treated in the following notes, as though the unit were on a work bench.

Removing primary drive cover

154. Drain the oil as described in paras 49 to 52 and take out the fixing screws from around the outer edge of the cover. Note the positions of the sleeve nuts, one of which screws on to the rear chain oiler screw. The screws are of different lengths and a careful note should be made of their respective locations to facilitate refitting.

155. If the cover joint has not already been broken, tap the cover gently with a hide mallet to release, but have a suitable receptacle underneath to catch any remaining oil.

Clutch dismantling

156. Remove the locking wires and the four spring retaining nuts (Fig 29(2)) and withdraw the springs with their cups. The pressure plate and the remaining clutch plate can then be taken out. If these are the only items requiring attention, the clutch need not be dismantled further.

157. Before unscrewing the clutch centre nut, it will be necessary to lock the chainwheel and centre together with a Service tool, and to insert a bar through the connecting rod small-end bush. If a service tool is not available or if the cylinder barrel has not been removed, engage top gear and lock the gearbox sprocket with a length of chain held in a vice. Flatten the tab washer under the clutch centre nut and unscrew the nut, which has a normal right-hand thread.

158. Take off the nut, tab washer and distance piece. The clutch push rod may now be withdrawn but do not attempt to remove the chainwheel at this stage.

Generator removal

159. The generator comprises the rotor, fitted to the engine shaft, and the stator which is mounted on three studs around the rotor both being detailed in the electrical section.

160. Before the clutch chainwheel, chain or engine sprocket can be removed, the generator must be taken off.

161. To remove the stator, take off the three nuts and pull the generator lead through the rubber grommet in the front of the chaincase. Take care not to damage the stator casing when pulling the stator off its studs. Note that the stator unit is fitted with the lead on the inside.

162. The primary chain tensioner can now be taken off but make careful note of the spacer positions.

163. Bend back the tab of the lockwasher under the engine shaft nut and unscrew the nut (right-hand thread). Pull off the rotor and take out the small Woodruff key from the shaft to avoid losing it.

> **Note:** *This key must not be interchanged with a similar key on the clutch shaft.*

Now using the pinion extractor with special bolts, free the engine sprocket from its splined shaft.

164. The clutch sleeve should now also be released from its tapered mainshaft with an extractor tool (see Fig 25), enabling the clutch chainwheel, chain and engine sprocket to be withdrawn together.

Inspecting the clutch

165. The four driving plates have segments of special friction material which are securely bonded in the metal. These segments should all be complete, unbroken and not displaced. Even if there is no apparent wear or damage to the plates or segments,

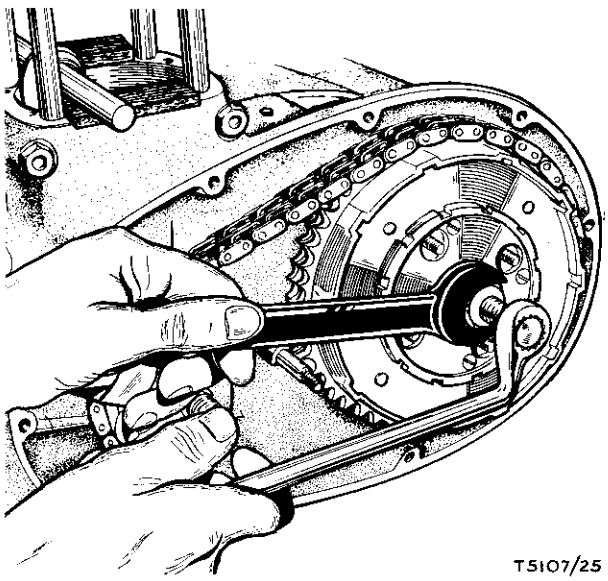


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Fig 25 Freeing the clutch sleeve

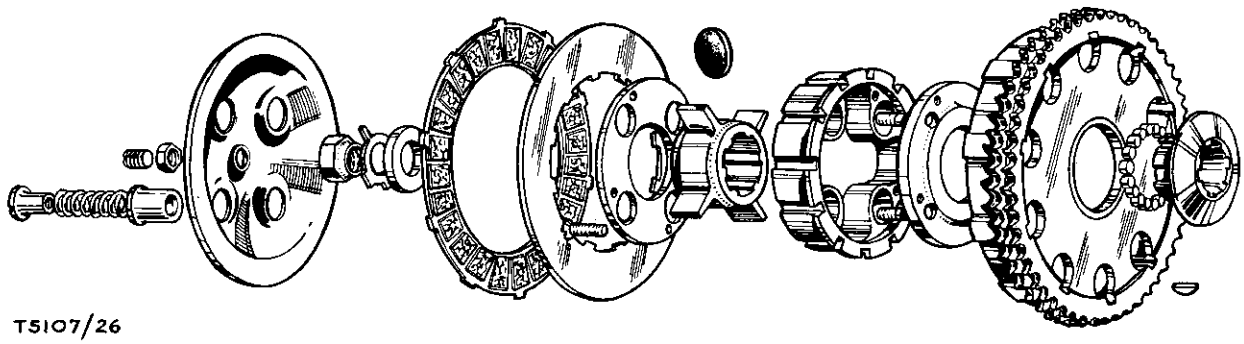

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Fig 26 The clutch and cush drive

the overall thickness of each segment should be measured and if the extent of wear is more than .030 in. (.75 mm), the plates should be replaced. Standard thickness is .167 in. (4.242 mm).

166. The tags on the outer edge of the plates should be a reasonable fit in the chainwheel slots and should not be "hammered" up. If there are burrs on the tags or the segments are damaged, the plates should be renewed.

167. The plain driven plates should be free from score marks and perfectly flat. To check the latter, lay the plate on a piece of plate glass; if it can be rocked from side to side, it is buckled and should be replaced.

Cush drive

168. To inspect the cush drive rubbers which are within the clutch centre, take out the four countersunk head screws adjacent to the clutch spring housings and prise off the retaining plate.

169. The rubbers should be quite firm and sound, and should not be disturbed unless wear or damage is suspected.

170. When refitting the clutch rubbers it may be found necessary to use a lubricant, in which case either liquid soap or hydraulic brake fluid should be used. Do not use oil or grease.

Clutch chainwheel

171. Examine the slots for wear; if they are corrugated or the teeth are hooked and thin, the chainwheel should be replaced. Check the chainwheel roller bearing for up and down movement. Slight play is permissible but if excessive the bearings should be renewed.

Gearbox or final drive sprocket

172. Access to the gearbox sprocket can only be obtained when the clutch has been removed. Take out the six screws holding the circular plate at the back of the primary case, break the joint and remove the plate with its oil seal (Fig 27).

173. Look for signs of oil leakage down the back of the cover. If leakage is evident, change the oil seal, taking care to see that it is fitted the correct way round

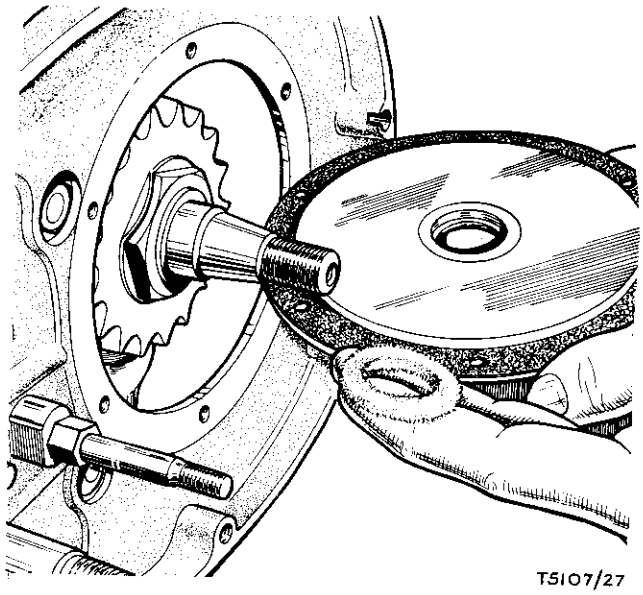


Fig 27 Primary case backplate

with the lip of the seal to the inside of the primary case. A felt washer is fitted between the circular plate and the sprocket fixing nut, preventing the entry of grit which may damage the small oil seal. If the washer no longer appears serviceable, replace it.

174. If it is necessary to change or renew the gearbox sprocket, first place a length of chain round the sprocket and lock in a vice with a suitable bolt, then flatten the tab washer and unscrew the large nut. The sprocket can now be pulled off the mainshaft splines.

175. If the oil seal is suspected of being faulty or leakage has occurred it should be renewed. Check that the sprocket boss is not worn or damaged as this would quickly damage a new seal.

176. If the sprocket boss is smooth and not scored it can be replaced, but lightly oil the boss to avoid damaging the seal as the sprocket is pressed home.

177. Reassemble in the reverse order but do not omit to turn the tab washer over the nut after tightening.

Clutch operation

178. As already indicated, the clutch being part of the transmission system, carries power to the rear wheel, but by separating the driving and driven plates this connection is broken. The disengagement is achieved by operating the clutch lever, the force imposed being transmitted via the clutch cable to the clutch lever in the timing case. The lever, working on the rack-and-pinion principal, drives the push rod through the hollow gearbox mainshaft, forcing the pressure plate out; so compressing the clutch springs and freeing the plates. To ensure smooth clutch operation, it is essential that the spring pressures are equal and that the pressure plate runs "true".

179. See below for details of clutch adjustments.

Reassembling the primary drive

180. Place the felt grit protection washer in position against the sprocket securing nut and replace the circular cover, using a new paper gasket jointed on one side only.

181. If the clutch sleeve has been removed from the chainwheel, smear the sleeve with grease and place the 25 rollers in position. Now, slide the chainwheel over the rollers and fit the clutch centre over the splines of the sleeve.

182. Pass the stator lead through the front of the primary chaincase and clip in position behind the cylinder base. This operation may be found difficult if left to a later stage.

183. The engine shaft distance piece should not have been disturbed, but if it was removed for any reason, it must now be refitted with the chamfered side outwards.

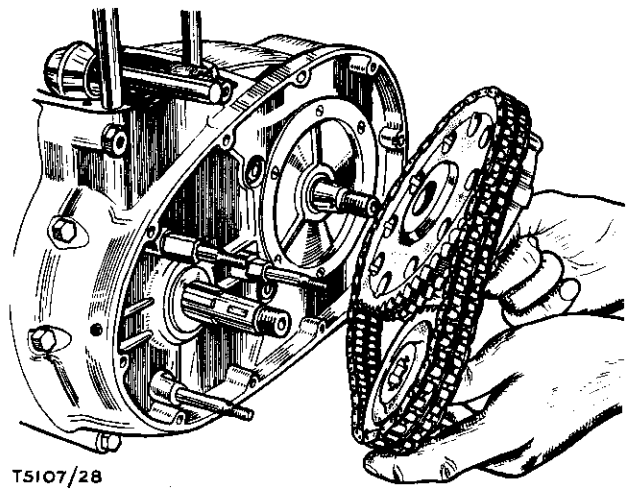
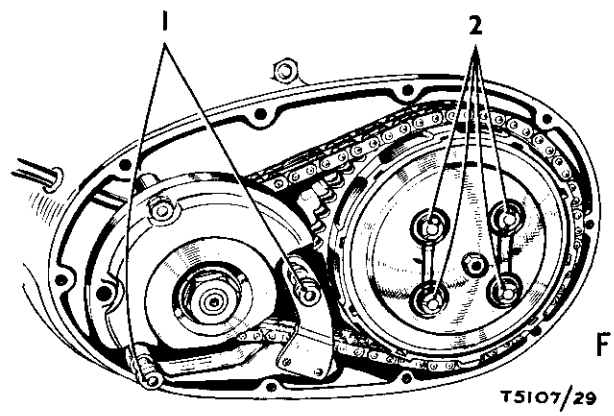


Fig 28 Fitting primary drive

184. See that the Woodruff keys are fitted to both mainshafts and that they are a good fit in the keyways.

185. Place the primary chain around both the engine and clutch sprockets, pulling the chain taut. Pick up the engine sprocket, chain and chainwheel with both hands and slide the sprockets on to their respective shafts. It will be necessary to turn the clutch chainwheel to locate over the keyed shaft. Place the thick washer with the recess outwards in position against the clutch sleeve, then the tab washer and fixing nut. After tightening the nut, lock in position with the tab washer.



1 Stator studs

2 Spring nuts

Fig 29 Primary chain tensioner

186. Replace the clutch plates, starting with one plain then one segmented plate and so on alternately, there being five plain plates and four segmented plates. Insert the clutch push rod into the hollow mainshaft.

187. Place the pressure plate in position and fit the four spring cups with springs, which should be of equal length. If in any doubt about the condition of the springs, renew them.

188. Screw on the four spring nuts (Fig 29(2)) with the special screwdriver until the underside of each head is approximately 1/8 in. from the face of each cup.

189. If the springs are compressed excessively, the handlebar lever will be stiff to operate. On the other hand, if the spring pressure is insufficient the clutch will tend to slip. Check the accuracy of the spring setting by declutching and depressing the kickstart lever, when it will be seen if the pressure plate is running "true" or not. A suitably positioned pointer, attached to one of the primary cover screws, will act as a guide for checking this operation. If necessary, adjust each nut accordingly to correct any "run-out".

190. When the spring setting has been determined the clutch movement can be adjusted by means of the central screw and locknut on the pressure plate.

191. The control is in correct adjustment when, with the handlebar lever released, the control arm above the timing cover on the right side of the engine is inclined outwards by a small amount. In this position there must be a small amount of free play at the lever. When the handlebar lever is gripped, the control lever should take up a position approximately parallel with the timing cover joint face.

192. If adjustment is necessary, slacken the locknut and turn the pin until the above condition is obtained, retightening the locknut afterwards. Provision is made for cable adjustment at the handlebar lever and is intended for fine adjustment of the cable only.

193. Replace the rotor on to the keyed engine shaft with its "Lucas" marked face outwards and fit the tab washer and nut. Turn the tab over the nut after tightening securely.

194. Replace the primary chain tensioner into the two lower stator studs (Fig 29(1)) with appropriate spacers.

195. Fit the stator on to its studs with the cables on the inside, at the front, and fix loosely with the self-locking nuts. It is important that the air gap between the rotor and the stator pole pieces is equal all round. The gap can be checked with a .008 in. feeler gauge and any variation should be corrected. Adjust the primary chain tensioner to give approximately 1/4 in. free play on the top run of the chain between the sprockets. Finally, tighten the stator fixing nuts.

196. Having completed the assembly of the primary drive, the primary cover can now be replaced. Apply non-hardening jointing cement to both faces of the chaincase and, using a new gasket, replace the cover. Ensure that the fixing screws and two sleeve nuts are fitted in their correct positions and that the rear chain oiler is replaced. Refit the footrest and tighten the fixing nut.

197. See that the oil level and drain screws are correctly located in the lower edge of the case and are fitted with aluminium washers.

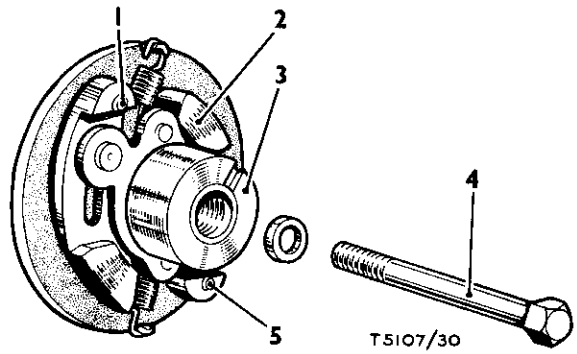
CONTACT BREAKER

Description

198. The contact breaker assembly is contained within a circular compartment in the inner timing cover, its cover being secured by two screws.

199. The assembly comprises the contact breaker plate, on which are mounted the contacts and condenser (capacitor). An oil seal is fitted in the back of the housing and prevents oil from reaching the assembly. The automatic advance/retard unit, mounted behind the plate, consists of two spring-loaded bob-weights coupled to the contact breaker cam and is secured in the tapered hole of the camshaft by one central bolt and washer.

200. The bob-weights, when the engine is stationary are held closed by the springs, retaining the contact breaker cam in the fully retarded position. This is necessary to make starting easier and considerably reduces "kick-back" on the kickstart lever.



1 Bearing
2 Bob weight
3 Cam
4 Central securing bolt
5 Bearing

Fig 30 Automatic advance unit

201. As the engine revolutions increase, centrifugal force carries the bob-weights outwards, progressively turning the cam into the direction of rotation, thus advancing the ignition.

202. The elongated holes in the contact plate enable the plate to be moved backwards and forwards around the cam, so providing a means of fine adjustment for ignition timing.

Removing the contact breaker

203. Before removing the contact plate, scribe a mark across the plate and housing so that it can be replaced in exactly the same position, otherwise the ignition will have to be retimed.

204. Disconnect the condenser cable at its snap connector, unscrew the two pillar bolts and take off the plate complete with contacts, condenser and cable.

205. To remove the auto-advance unit and cam, first take out the central fixing bolt then free the unit from its taper with the Service tool.

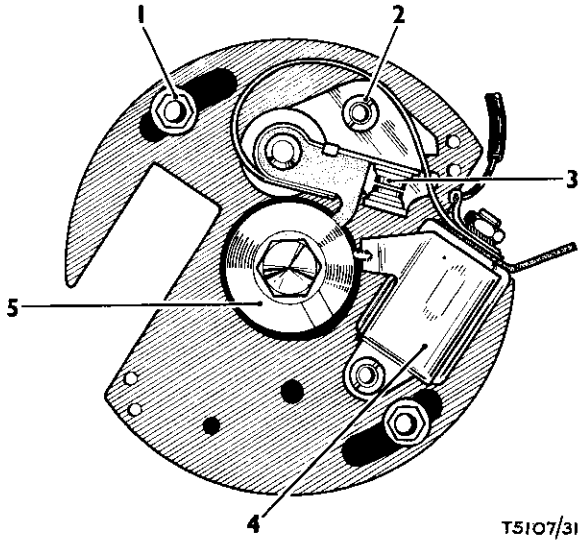
206. Avoid removing the auto-advance unit unnecessarily as the timing will have to be reset. During reassembly refit loosely and retime the ignition as detailed in paras 280 to 299.

Contact breaker points

207. To change or inspect the contact points unscrew and remove the barrel nut inside the C-shaped spring and take off the nut securing the spring and lead to the condenser. The movable contact can now be lifted off, followed by the fibre washer and fixed contact.

208. The contacts must be free from grease or oil. If they are blackened or burnt, clean with a fine carborundum stone or very fine emery cloth. Wipe away any traces of dirt or metal dust with a clean rag, moistened with petrol.

209. When replacing, do not omit to fit the fibre washer between the contacts. Also ensure that the insulating strip is fitted on to the condenser terminal before the spring or cable.



1 Plate fixing bolt
2 Contact plate screw
3 Contact breaker points
4 Condenser
5 Cam

Fig 31 Contact breaker unit

210. It will now be necessary to reset the contact points gap. Revolve the engine until the fibre heel is on the peak of the cam, loosen the fixed contact screw and move the contact accordingly to give the correct gap of .015 in. (.381 mm). Tighten the contact screw and re-check the setting.

211. It is advisable to check the ignition timing after carrying out any adjustment to the contact breaker points as a variation in the contact points gap tends to alter the timing. Widening the points gap advances the ignition; closing the gap retards the ignition. Although this variation is very slight, it must be remembered that accurate timing is important in the operation of the ignition system.

212. See paras 280 to 299 for full details of ignition timing.

TIMING COVERS

213. To obtain access to the timing gears or the gearbox components it will be necessary to remove the covers on what is known as the timing or gear-side of the engine. It will be assumed that the primary drive has been dismantled as described on previous pages.

214. To remove the outer cover, first take off the gearchange and kickstart pedals, then take out the ten cover retaining screws, noting their respective locations. The cover, complete with contact breaker plate and clutch operating mechanism, can now be withdrawn, exposing the auto-advance unit and kickstart mechanism. Note that the contact breaker lead is held by a spring clip under one of the inner timing cover screws and passes through a rubber grommet in the top of the cover.

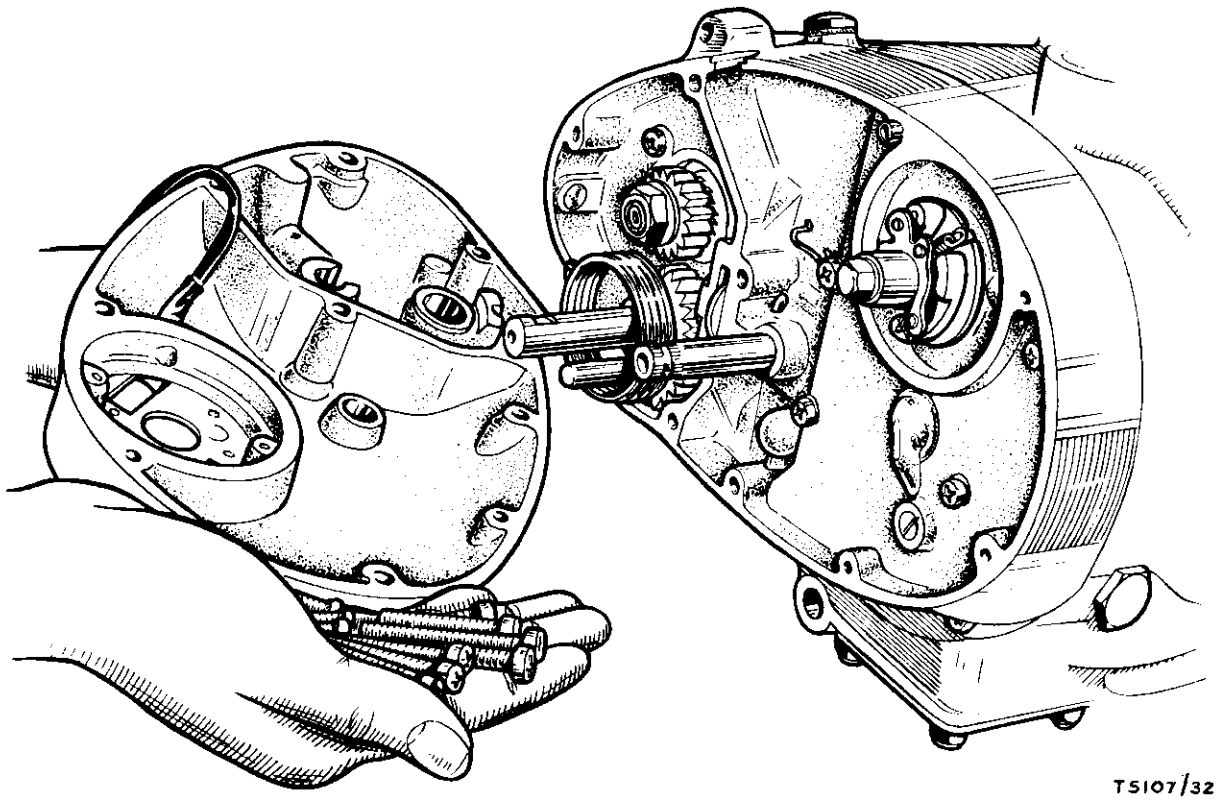


Fig 32 Removing outer timing cover

215. If the clutch operating lever is to be removed, care must be taken to avoid losing the operating rack and ball which are loosely located on the inside of the outer cover. It is not necessary to remove the kickstart quadrant or spring unless they require attention.

216. Should it be necessary to remove the spring, release the spring from the kickstart spindle and withdraw the quadrant complete with layshaft needle bearing. When fitting a new spring, first locate the hooked end of the spring in the quadrant slot then "wind-up" the spring in a clockwise direction and slip the eye of the spring on to its stud. The quadrant bush is a push-fit into the outer timing cover.

217. Remove the contact breaker auto-advance unit as described in paras 203 to 206.

218. Take out the seven fixing screws, noting their relative locations. Note also that the contact breaker cable clip fits under the uppermost central fixing screw. The inner cover joint can be broken by tapping gently around the edges with a mallet or wooden block.

219. The cover, complete with kickstart ratchet, gear cluster and gearchange assembly can now be eased away, leaving the oil pump and timing gears exposed. Take care not to lose the loose fitting thrust washer on the end of the layshaft.

Note: *The camshaft bush in the cover is located by a small peg to ensure correct alignment of the oil holes during reassembly.*

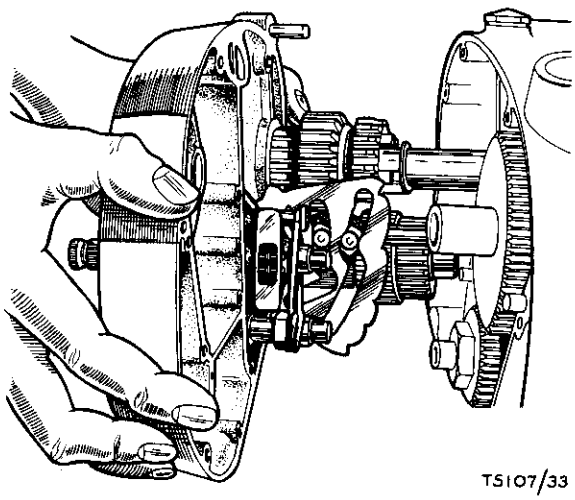


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Fig 33 Removing inner timing cover

220. Check that the oil seals in the covers are not damaged and are fit for further use.

OIL PUMP, TIMING GEARS AND TAPPETS

Oil pump removal

221. During engine dismantling, the oil pump need not be removed unless it is known to be faulty.

222. Use a suitable bar through the connecting rod to lock the flywheel, flatten the tab washer under the crankshaft nut and unscrew the nut. Pull off the crankshaft pinion, using the extractor tool with appropriate legs. The oil pump worm drive need not be disturbed unless further engine dismantling is to be carried out, in which case the extractor should be used with the special legs.

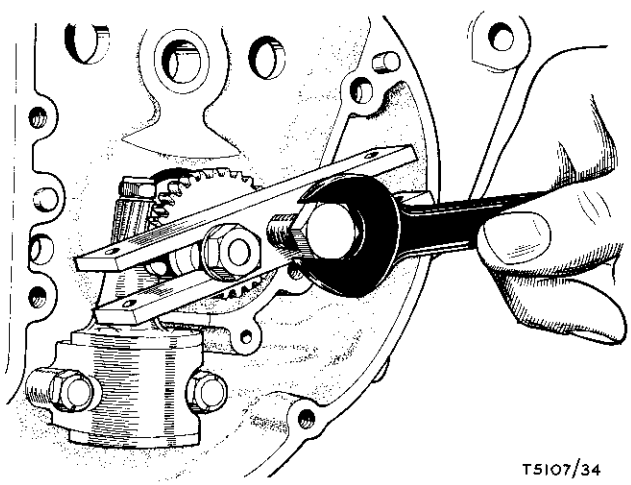

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Fig 34 Crankshaft pinion extractor tool

223. Unscrew the two self-locking nuts from the main body of the pump and pull the pump off its studs.

224. It is not advisable to dismantle the oil pump unless it is suspected that there is possible damage caused by neglected periodical oil changes. Full details of dismantling and rebuilding the oil pump are given in paras 32 to 38.

Replacing the oil pump

225. Ensure that the joint faces are clean, apply a smear of grease to a new gasket and place the gasket in position on the crankcase face. Locate the pump over the studs, replace the fixing nuts and tighten evenly to a torque wrench setting of 7 lb ft to avoid distortion.

Timing gears

226. Careful examination of the timing gears will show that there are marks on the faces of the gears, adjacent to the gear teeth. These marks are to assist in correct reassembly, so ensuring precise valve timing. It is good practice to familiarise oneself with them before removing the gears (see Fig 35).

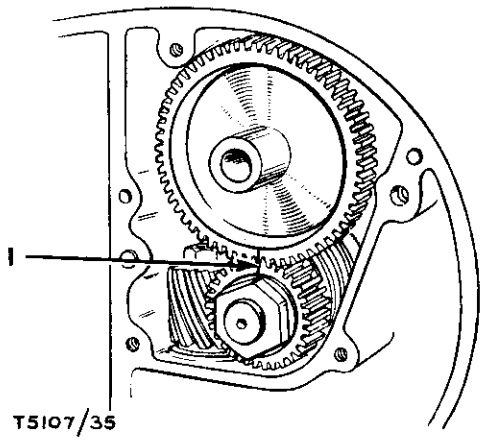


Fig 35 Timing marks

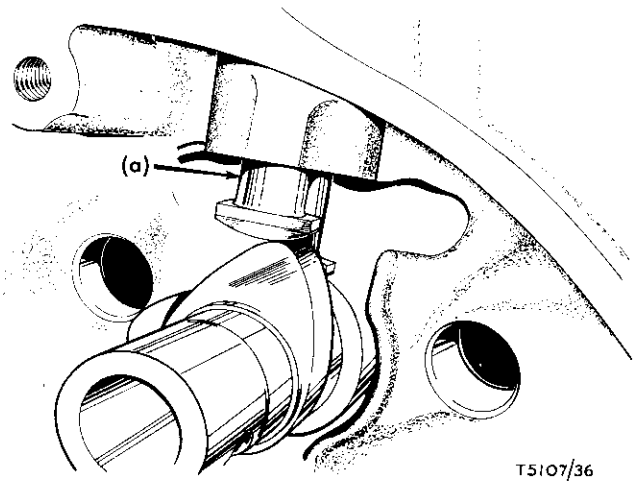
227. The removal of the crankshaft pinion and oil pump worm drive is described in para 222.

228. Pull the camshaft, with pinion, from its location in the crankcase and allow the tappets to fall clear. The pinion is a push-fit on to the keyed end of the camshaft.

Tappets

229. Examine both ends of each tappet for signs of excessive wear or chipping and make sure that they are quite free to move in their locations in the crankcase. If there are signs of "scuffing" on the feet, they should be replaced. The camshaft must also be examined as this may be damaged too. When replacing the tappets, ensure that the small oil holes are facing towards the gearbox.

230. Reassembly of the timing gear is the reversal of the above procedure for dismantling, but care must be taken to match the timing marks on the pinions.



(a) Oil hole should face gearbox

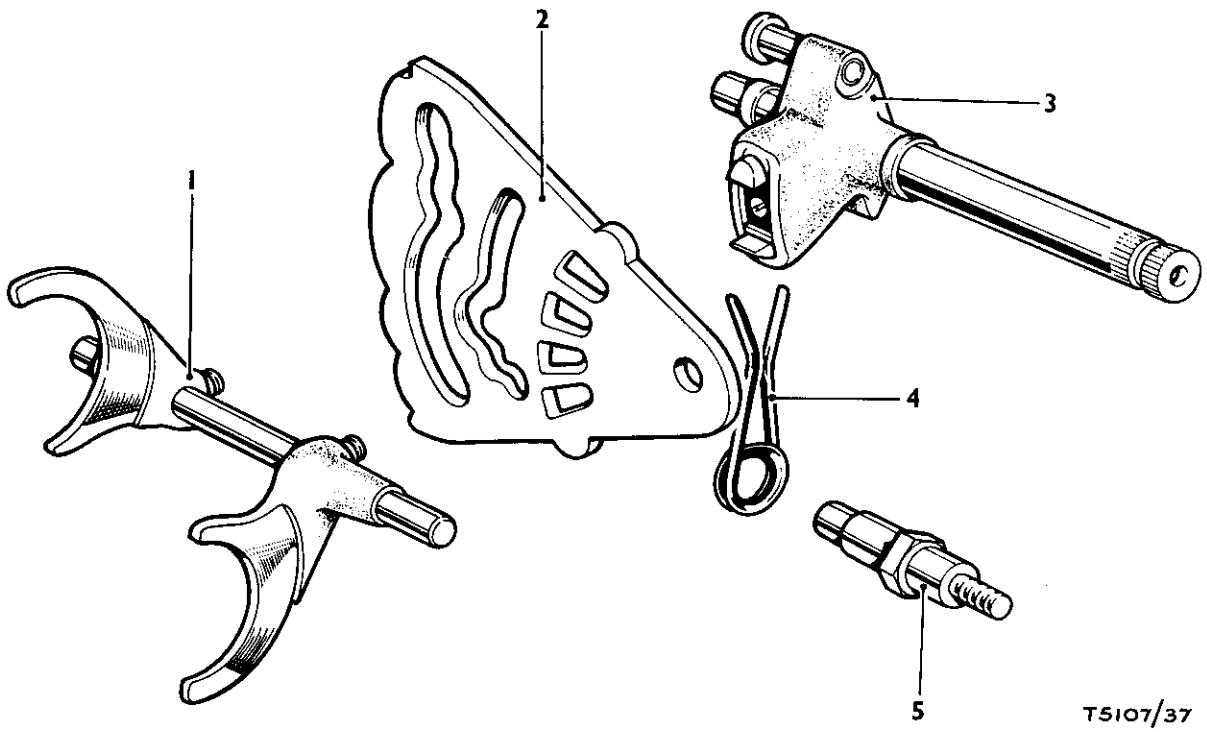
Fig 36 Fitting the tappets

GEARBOX DISMANTLING

Gearchange mechanism

231. First remove the timing covers, as detailed in paras 213 and 214.

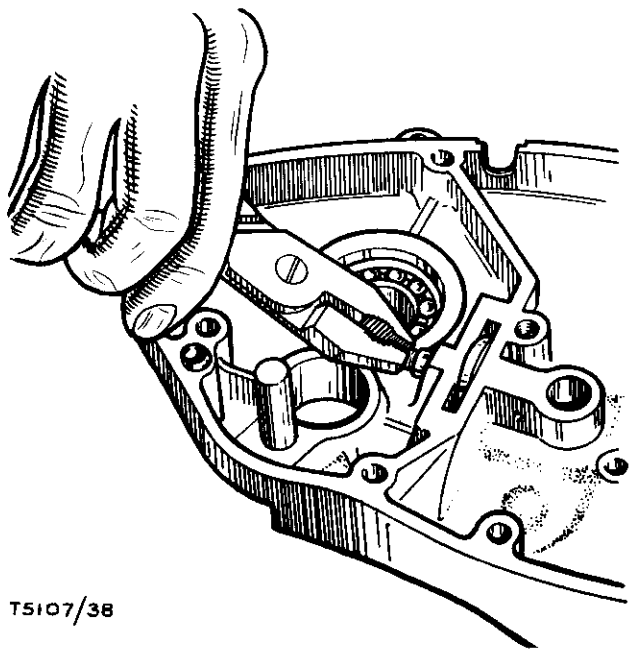
232. Press in the cam plate plungers with a suitable flat bladed instrument and withdraw the gearchange quadrant complete with spring. The spring-loaded plungers are retained by a small plate, secured with one screw. The gearchange return spring pivot bolt need not be disturbed.



1 Selector forks and spindle
2 Cam plate
3 Plunger quadrant
4 Return spring
5 Pivot bolt

Fig 37 Gearchange mechanism

233. Take out the large split pin from the outside of the cover and withdraw the cam plate pivot pin. This job will be simplified if a suitable bolt is screwed into the pin enabling the pin to be extracted with pliers (see Fig 38).



TS107/38

Fig 38 Removing the cam plate pivot pin

234. The cam plate can now be withdrawn from its slot, complete with selector forks and spindle, the layshaft with fixed top gear, second gear and sliding gear (third), and the mainshaft sliding gear (second). The large layshaft low gear with its bronze bush can now be removed. Note that the top face of the cam plate is stamped with a letter "T" (see Fig 40) to ensure correct reassembly. By fitting the cam plate upside down, the gearchange positions will be reversed, though this is not desirable.

235. Check the cam plate for wear in the cam tracks and the plunger "windows".

236. Also check that the quadrant plungers are not chipped or worn and are quite free in their housings. See that the retaining device is correctly fitted and secure.

237. The cam plate locating spring plates are secured to the gear-side crankcase half with two small bolts. If they are damaged or no longer retain their springiness, then they must be replaced.

238. Any damage or wear to these parts will make a good gearchange impossible.

Gear cluster

239. Proceed as detailed above, when it will be seen that only the mainshaft with its third and low gear, remains on the inner timing cover.

240. To remove first grip the shaft in a vice using soft metal clamps, unscrew the kickstart ratchet nut then take off the special washer, spring, ratchet pinion, sleeve and driving pinion. The gearbox mainshaft can now be withdrawn from the cover bearing together with its low gear and third gear.

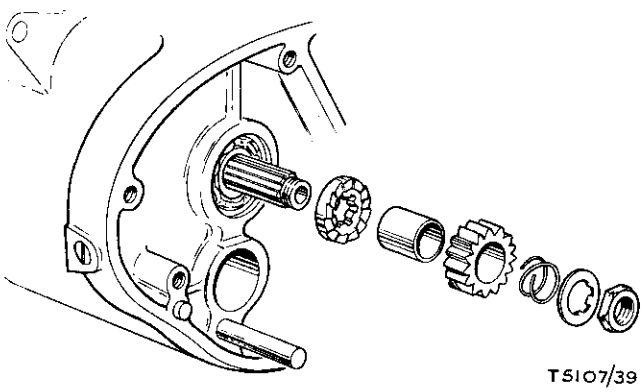


Fig 39 Kickstart ratchet

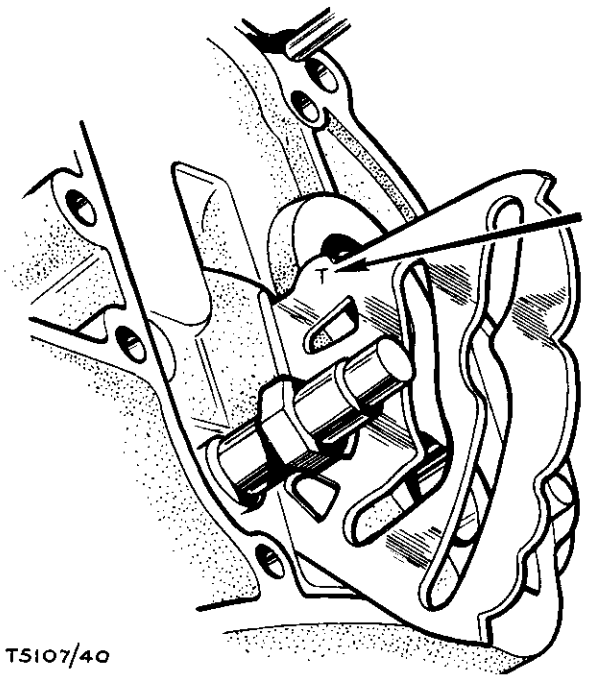
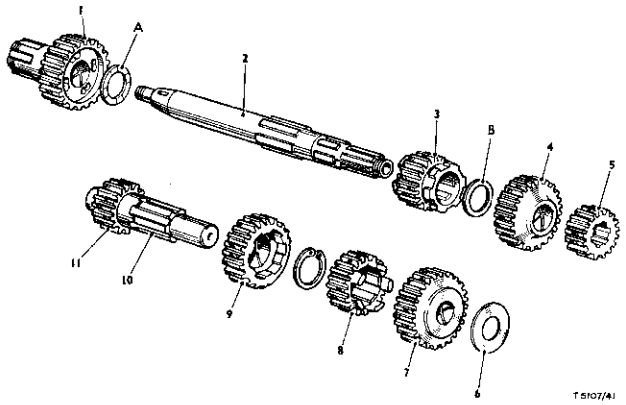


Fig 40 Replacing the cam plate



1 Mainshaft top gear
2 Mainshaft
3 Mainshaft sliding gear (second)
4 Mainshaft third gear
5 Mainshaft first gear
6 Shim
7 Layshaft first gear
8 Layshaft sliding gear (third)
9 Layshaft second gear
10 Layshaft
11 Layshaft top gear
A Top gear spacer
B Third gear spacer

Fig 41 Gear cluster

241. The smaller gear is a press-fit on to the shaft, so retaining the larger gear which has a spacer between it and the end of the splines.

242. If it is necessary to change either of these gears, the shaft must be pressed out of both gears at the same time, an operation which requires a good press properly mounted on a workbench.

243. The layshaft second gear is held against the fixed gear (high) by one circlip.

244. When examining the gears, look for cracked, chipped or scuffed teeth, the latter will show (if present) on the thrust faces of the teeth and in severe cases, might even have broken through the case hardening.

Gearbox bearings

> **Note:** *Before attempting to remove any bearing or bush from an aluminium case, the case should first be heated. The bearing can then be pressed out and the replacement fitted whilst the case is still hot.*

245. When examining the gearbox bearings and bushes for wear, do not overlook the bronze bushes in the layshaft low gear and the mainshaft high gear. The mainshaft high gear is still in the crankcase at this stage.

246. The layshaft has needle roller bearings at each end, one in the crankcase and one in the kickstart quadrant boss.

247. The mainshaft has two ball journal bearings, one at each end. To gain access to the left-hand bearing, first remove the gearbox sprocket (as detailed in paras 172 to 177, then drive the high gear sleeve pinion through into the gearbox. After prising out the oil seal, the bearing can be pressed out from the inside of the cover. If the seal appears to be damaged, renew it. The right-hand mainshaft bearing can be pressed out from the inside of the inner cover, after first removing the circlip.

GEARBOX REASSEMBLY

248. It will be assumed that all bearings, bushes and oil seals have been replaced as necessary.

249. If it has been removed, replace the cam plate, correct way round, in the cover slot (see Fig 40 for guidance), insert the pivot pin and secure with the split pin.

250. Insert the mainshaft (Fig 41(2)) fitted with its first gear (5), third gear (4) and spacer (B) into the cover bearing, replace the kickstart ratchet assembly (Fig 39) and secure with the fixing nut. It will be necessary to hold the mainshaft in a vice, using soft metal clamps, to tighten the nut fully.

251. Holding the cover face down, place the layshaft first gear (Fig 41(7)) with its shim (6) and sliding gear (third) (8) in position on the cover. Fit its selector fork, the roller being located in the lower cam plate track.

252. Next fit the mainshaft sliding gear (second) (3) with the appropriate spacer (A) (see para 255). Replace its selector fork and locate the fork roller in the upper cam track. Insert the spindle through the selector fork bosses and locate in the cover.

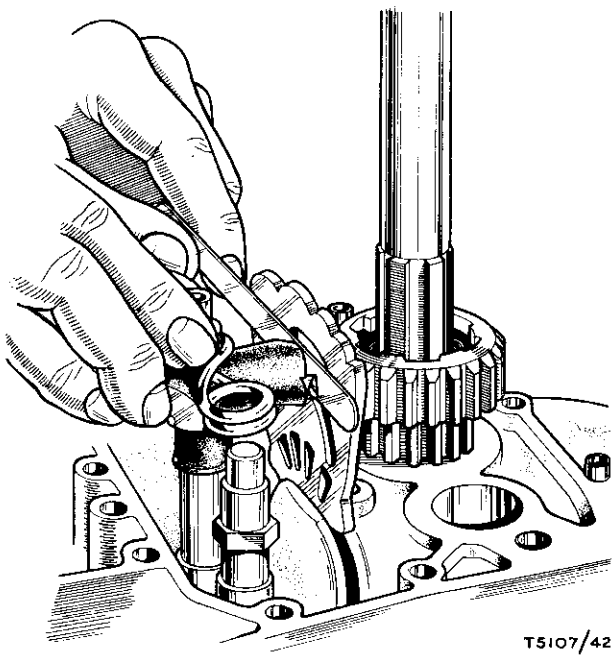


Fig 42 Fitting the gearchange quadrant

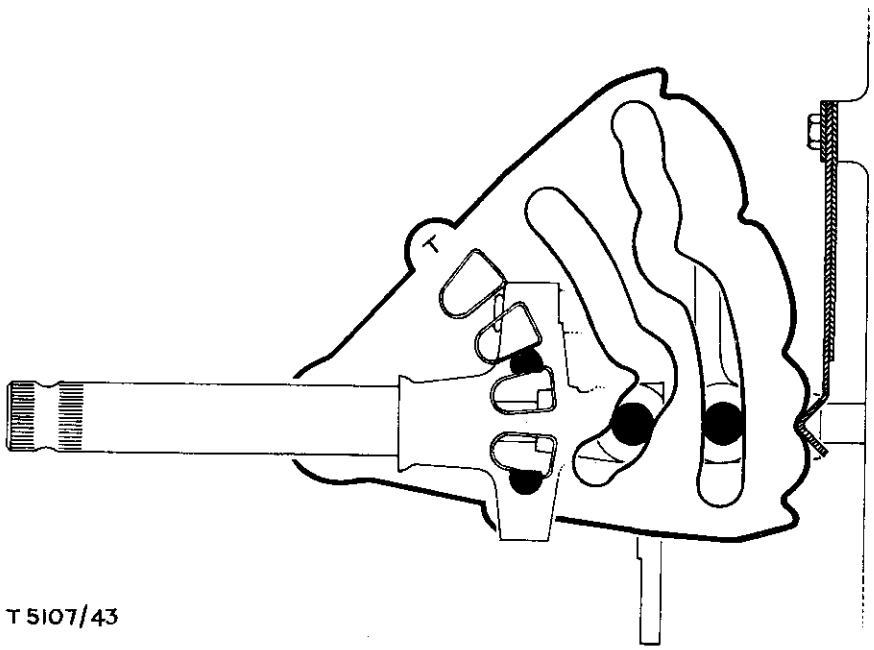


Fig 43 Selector and cam plate in neutral position

253. The layshaft, with its remaining two gears (fixed high gear and second gear) can now be passed through the gears on the cover, into the kickstart boss needle roller.

254. Fit the gearchange return spring to the quadrant and replace the assembly in the cover, locating the spring loop over the pivot bolt. It will be necessary, whilst carrying out this operation, to press in the plungers with a suitable flat bladed instrument, before finally engaging the plungers with the cam plate "windows" as the quadrant is pressed home.

255. The mainshaft, being locked to the inner cover, does not need checking for end float but excessive movement between the gears and the ends of the splines must be corrected by fitting the appropriate spacers. See Fig 41 for position of each spacer, the thicknesses of which are as follows:-

(A) .093-.094 in.
.098-.099 in.
.103-.104 in.

(B) .070-.071 in.
.075-.076 in.
.080-.081 in.

256. Before proceeding with assembly, check the gear selection for correct operation.

SEQUENCE OF GEAR CHANGING

257. To understand this description of the gear changing sequence, it will be necessary to refer to the various drawings and to understand some of the terms used.

(1) CAM PLATE - this is the large fan-shaped component that has "windows" for the gearchange quadrant plungers, cam tracks for the selector fork rollers and notches to locate the gear positions.

(2) CAM PLATE LOCATING SPRING PLATES - these are secured to the crankcase, the larger of which locates in the cam plate notches at various gear positions.

(3) QUADRANT PLUNGERS - these are held in the gearchange quadrant and operate in the cam plate "windows".

(4) SELECTOR FORKS - each selector fork has a roller which locates in the cam plate tracks. When the cam plate is turned about its pivot pin, these selector forks are moved backwards or forwards.

(5) SLIDING GEARS - both the layshaft and the mainshaft have one sliding gear each. They are operated by the selector forks and are carried along the splined shafts.

258. The gears must always be in the neutral position for starting the engine, this is the position shown in Fig 43 and 44.

259. The spring plate is holding the cam plate by the second notch. At the other end of the cam plate the selector quadrant plungers are compressed ready to operate either way the pedal is moved.

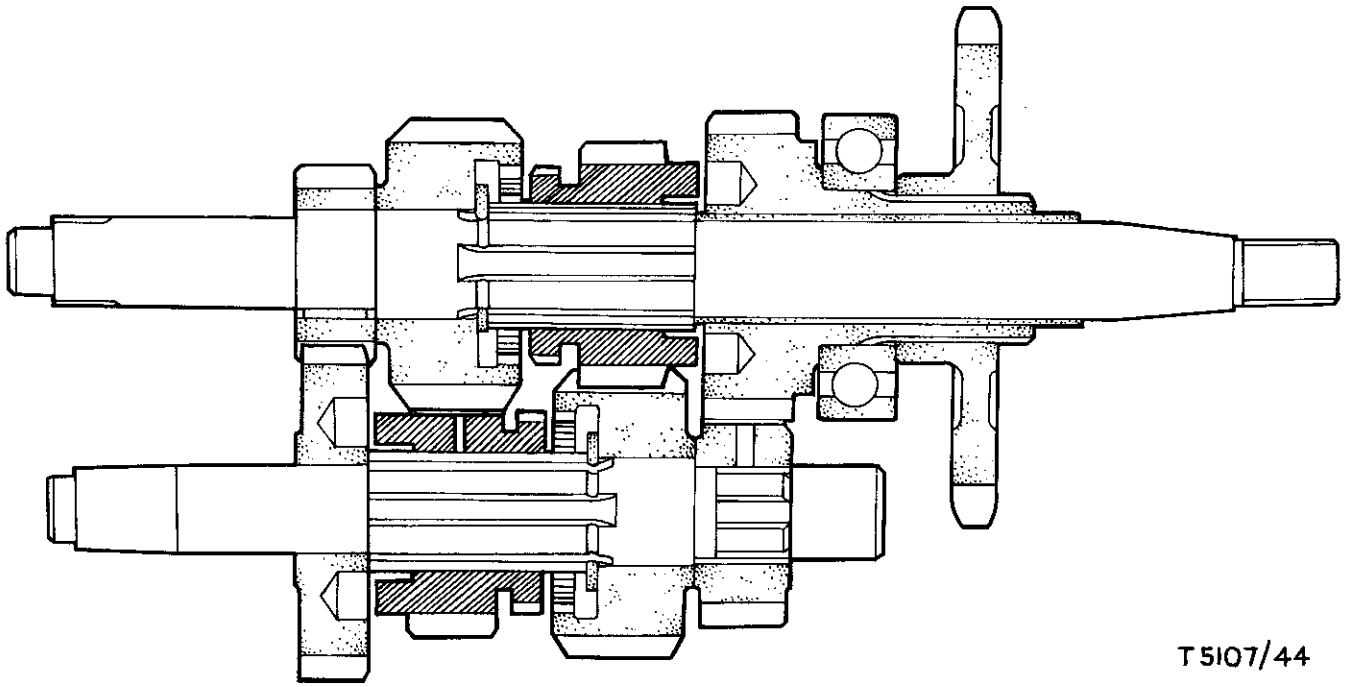


Fig 44 Sliding gears in neutral position

260. When the pedal is moved down, to engage first gear, the plungers will enter the cam plate and move it to first gear position, this in turn will operate the layshaft selector fork and will mesh the layshaft sliding gear with the layshaft first gear.

261. Reference to Figs 45 and 46 will now show the quadrant plunger in the second window ready to move the cam plate from first to second gear.

262. This time the cam plate moves in the opposite direction and again operates the layshaft selector fork moving the layshaft sliding gear in the opposite direction to mesh with the second gear.

263. Reference to Fig 47 and 48 will show both quadrant plungers in the cam plate windows ready to move the gears from second to first or neutral or back again.

264. When the cam plate is moved to third gear position as will be seen by reference to Fig 49 and 50 the action moves both selector forks, drawing the layshaft sliding gear to a neutral position and moving the mainshaft third gear. Again the quadrant plungers are ready to move the gears either way.

265. Finally, the move into fourth or top gear (Fig 51 and 52) operates the mainshaft selector fork only, again sliding the gear the opposite way to mesh with the sleeve pinion. After each movement of the gearchange pedal the quadrant returns to a static position so that the plungers are ready to operate the cam plate. The large spring plate at the large end of the cam plate is the positive gear location and it also serves to steady the cam plate whilst the quadrant plungers are returning to their static position.

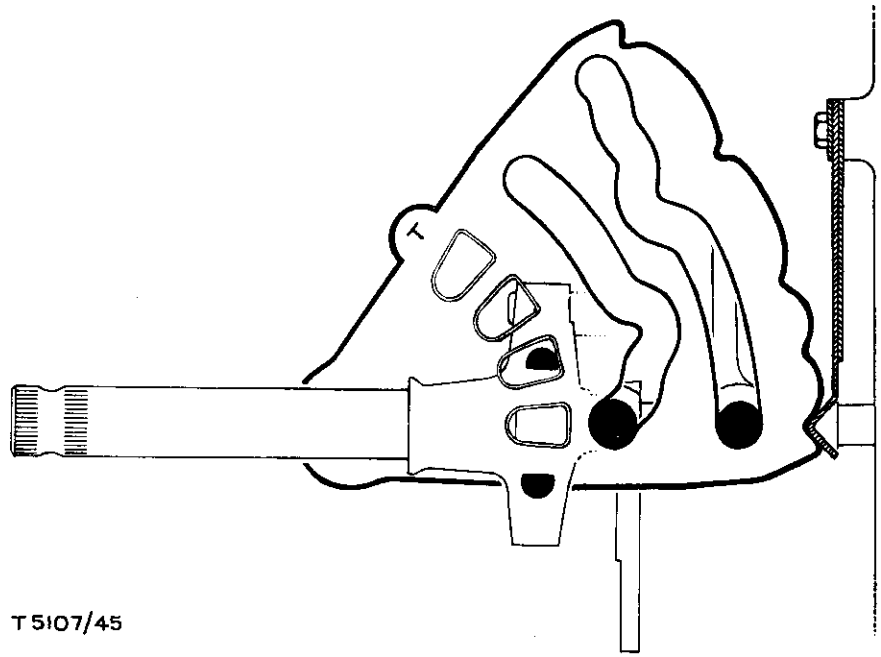


Fig 45 Selector and cam plate in first gear position

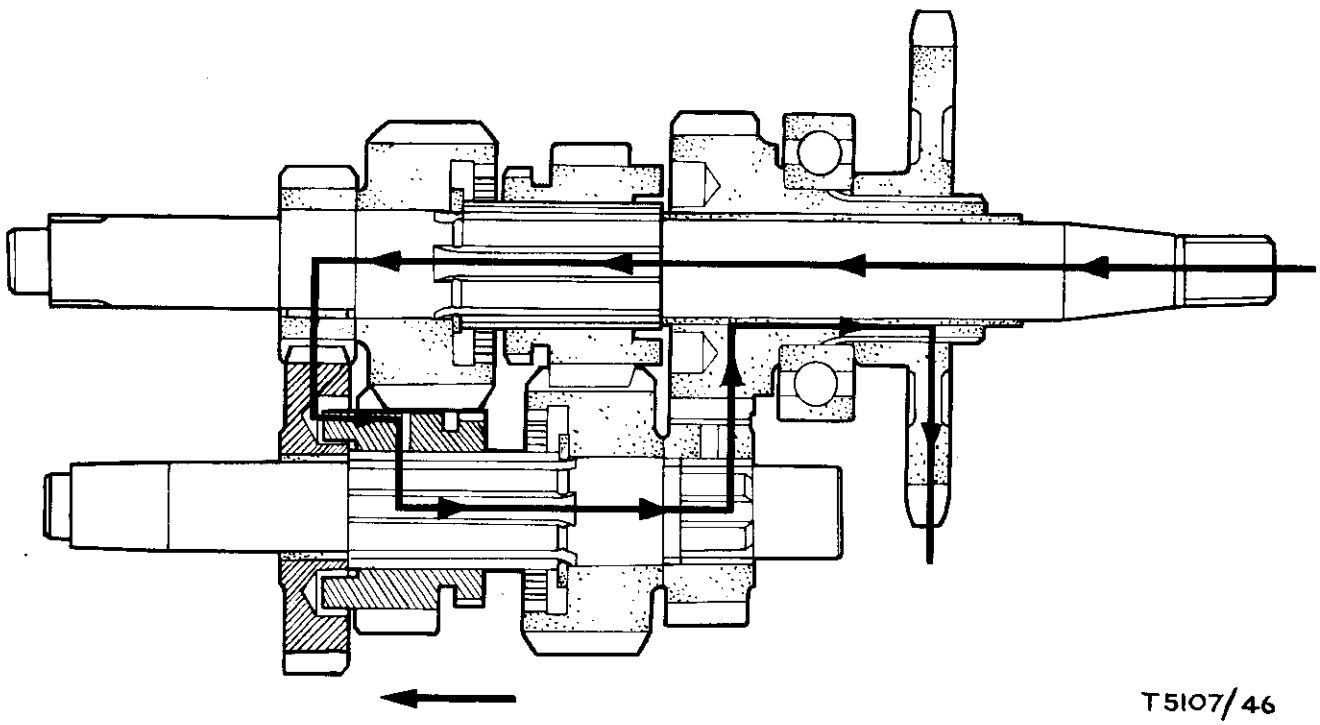


Fig 46 Sliding gears in first gear position

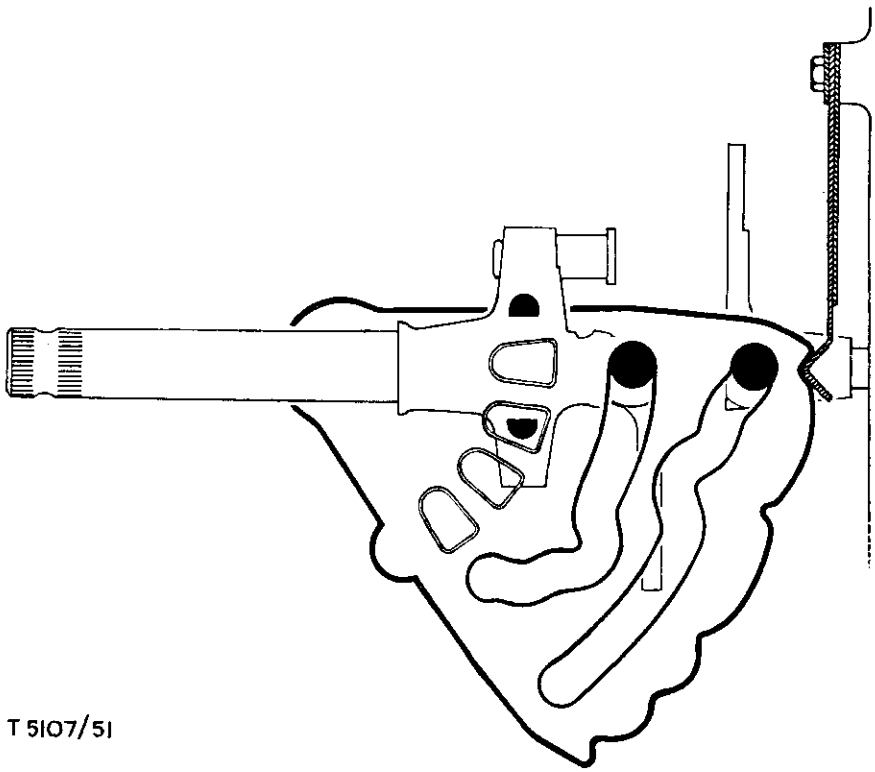


Fig 51 Selector and cam plate in top gear position

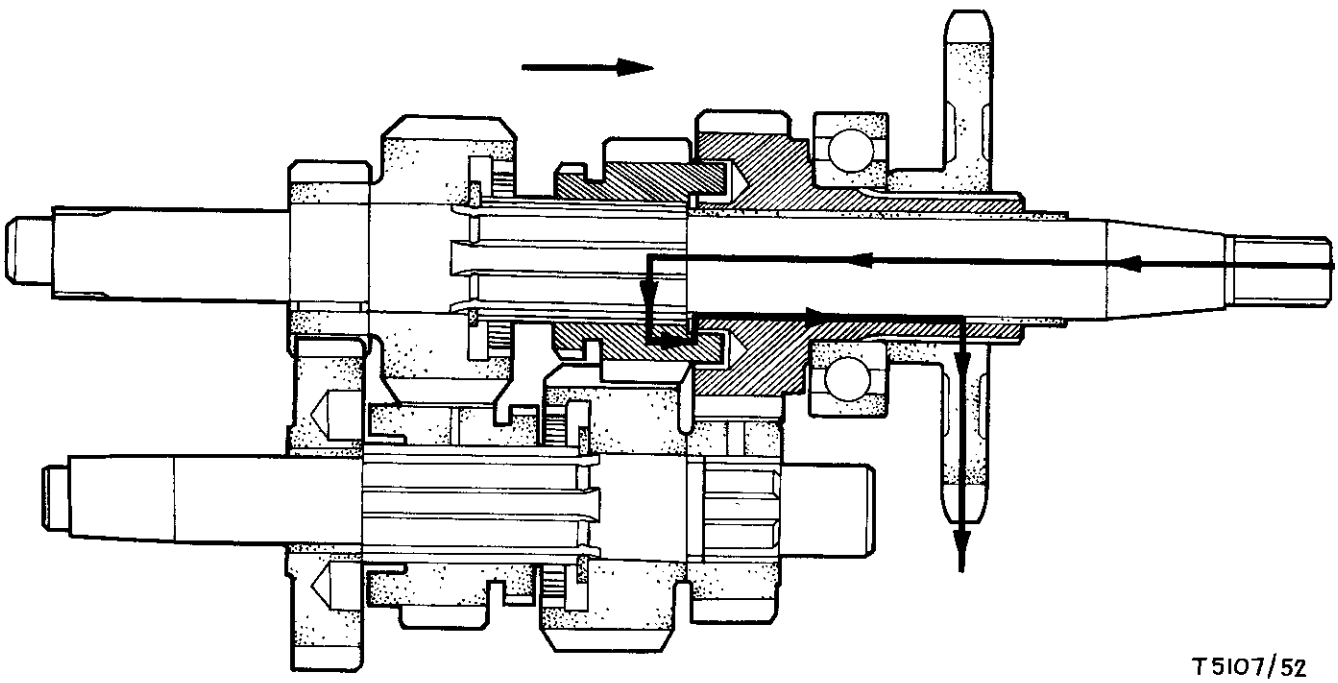


Fig 52 Sliding gears in top gear position

SPLITTING THE CRANKCASE HALVES

266. Before attempting to part the crankcase halves, first remove the primary drive assembly, timing covers and timing gear as described on previous pages.

267. Working on the primary side of the crankcase, first remove the three bolts at the lower front of the case then take off the four stud nuts; two from the centre of the case and two from the cylinder base.

268. The sump filter and the oil pipe union may be left on the crankcase unless they require cleaning or replacement.

269. Remove any Woodruff keys which may still be in the shafts, noting their particular locations, and break the crankcase joint by tapping gently with a hide-mallet. Do not attempt to prise the crankcase halves apart by using a tool between the joint. This will only damage the joint faces, resulting in oil leaks. The best method to use is to tap the gear-side shaft with a hide-mallet, so enabling the drive-side half of the case to be drawn away complete with flywheel assembly. The flywheel assembly can now be carefully tapped out of the drive-side case. Take care not to lose the gear-side shaft spacing shim. Do not omit to replace the oil seal for the drive-side bearing.

BIG-END AND FLYWHEEL ASSEMBLY

270. The flywheels are a press-fit on to the tapered ends of the crankpin and no attempt should be made to part them except in a fully equipped workshop. Should the

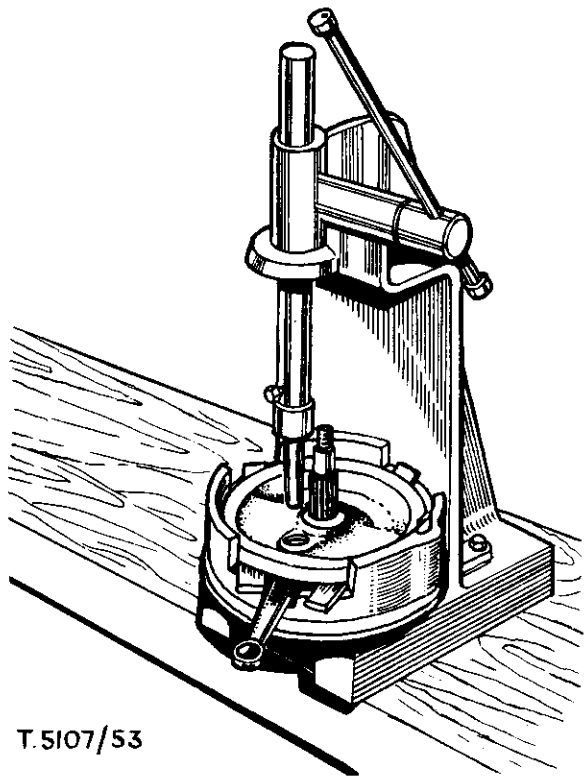


Fig 53 Parting the flywheels

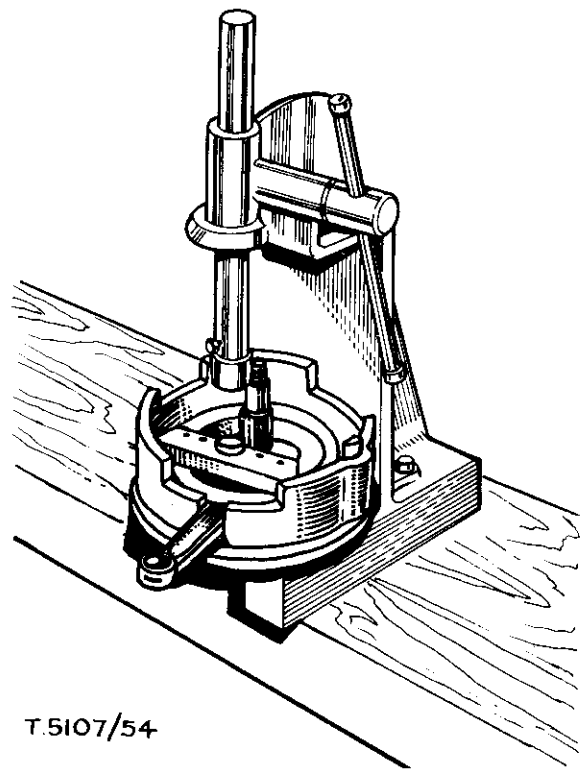


Fig 54 Reassembly of the flywheels

big-end assembly require replacement, it is advisable to obtain a replacement assembly. If, however, it has been decided to renew the big-end assembly, the flywheels must be parted using the special service tool.

271. Place the flywheels in the bolster and position suitable stripping bars between the flywheels as shown in Fig 53. Using the punch, drive out the crankpin and take off the uppermost flywheel. Reverse the lower flywheel in the bolster and again drive out the crankpin.

272. Having renewed the big-end assembly, place the gear-side flywheel in the bolster and locate the crankpin over the flywheel hole so that the oil hole in the crankpin will line-up with the oil-way in the flywheel. It is most important that these holes are not obstructed. Press the crankpin firmly in position and, using a bridge piece over the crankpin hole, press the drive-side flywheel on to the crankshaft until it is fully home. Check the oil-ways for clearance.

273. The flywheel assembly will now have to be "trued". Place the bearings on to the shafts and mount the assembly in vee-blocks. True-up the flywheels as indicated in Fig 55, using a dial indicator gauge for checking. Each wheel should be "trued" to within .005 in., the drive-side shaft to within .002 in. and the gear-side shaft to within .0005 in.

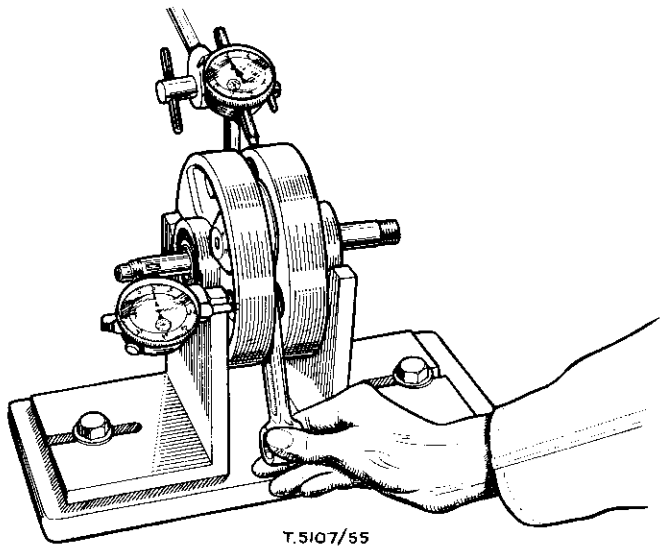


Fig 55 Checking the flywheels

REASSEMBLING THE CRANKCASE

274. Assuming that the bearings, bushes and oil seals have been checked and, where necessary, replaced, the crankcase can now be reassembled.

275. Place the flywheel assembly into the drive-side case. This operation will be simplified if the case is supported on a large block of wood, deep enough to keep the end of the shaft clear of the workbench.

276. Replace the shim on the gear-side shaft; these are available in thicknesses of .010 in. and .015 in. Apply a coating of non-hardening jointing compound to the joint faces of each crankcase half and refit the gear-side case. Replace the three bolts at the front of the case and the four nuts (two at the base of the cylinder and two in the primary case). Tighten bolts and nuts evenly, to avoid distorting the joint faces.

277. Check that the flywheel assembly rotates quite freely. If it does not, then the alignment may be incorrect and the cause of the trouble must be rectified.

278. Fit the engine shaft sprocket distance piece and the oil pump worm drive thrust washer, each with its chamfered face outwards. The sprocket distance piece is available in three thicknesses to provide accurate alignment of the primary chain in relation to the clutch sprocket. The sizes are as follows: .294-.297 in.; .309-.312 in.; .324-.327 in.

279. Reassembly from this point is described in the previous sections, but do not omit to replace the keys in the ends of the shafts before fitting the pinions or sprockets.

Note: *Always use new self-locking nuts when reassembling. Once a nut of this type has been used the locking device becomes inoperative, rendering the nut unfit for further use. The same applies with lockwashers.*

IGNITION TIMING

280. Before carrying out any check on the ignition timing, the contact points gap should first be verified and, if necessary, re-adjusted as described in para 210.

281. Remove the sparking plug to enable the engine to be rotated without any resistance due to compression. If the engine is in the frame, it will also help if top gear is obtained, so that the engine may be turned either backwards or forwards by rotation of the rear wheel.

Piston position

282. Before checking the ignition timing, the piston must first be set at the recommended position before top dead centre on its compression stroke (both valves closed).

283. This position can be most easily found with the aid of a dial indicator. The indicator should be mounted on to the cylinder head with its long rod projecting through the sparking plug hole. At piston top dead centre position the dial should read zero. The engine must then be rotated until the piston position is at .280 in. before top dead centre on the compression stroke.

284. If a dial indicator is not readily available a length of stout wire, marked appropriately, can be used as an alternative, though care must be taken to prevent the end of the wire from moving across the piston crown and giving a false reading.

285. At this stage the auto-advance unit should be freed from its taper and rotated until the contact points are about to open. This will give an approximate setting on which to base the final ignition timing.

286. Although the above method for setting the piston position is both quick and effective, it may be found necessary when preparing a machine for competition work, to employ a more accurate method with a degree plate.

287. The primary chaincase should first be removed and the degree plate mounted centrally on the engine shaft (see Fig 56). A suitable pointer should then be attached to some convenient part of the engine with the point adjacent to the plate.

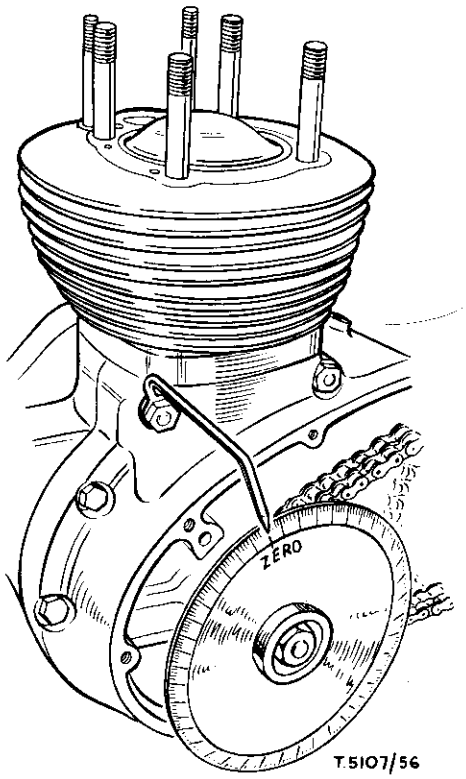


Fig 56 Piston at top dead centre

288. Rotation of the engine through several degrees near the top dead centre position produces very little piston movement, making the top dead centre position extremely difficult to find. It is preferable, therefore, to use a suitable stop (such as a dummy plug with a projection into the cylinder head) so that the piston can be brought gently against it by rotating the engine as far as the piston will allow in each direction. If degree plate readings are taken in each position and the point mid-way between them is calculated, this will be the precise top dead centre.

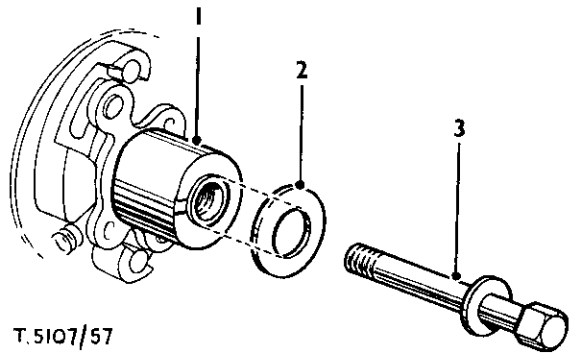
289. Having determined top dead centre of the piston, set the pointer to the zero mark on the degree plate. Rotate the engine backwards about 45° then bring it forward slowly to the desired reading of $33\frac{1}{2}$° on the plate.

Setting the contact breaker cam

290. The simplest way to set the ignition timing, that is the point at which the compressed charge in the combustion chamber is ignited, is to set it statically. Due to manufacturing tolerances this is not ideal since, whilst it will set the timing of the engine for tick-over speeds, the firing at wide throttle openings will vary due to differences in the amount of automatic-advance.

291. The automatic-advance functions by centrifugal force acting on spring-loaded bob-weights which will advance the ignition timing as the engine revolutions rise. Since exact timing accuracy is required at operating speeds it is better to time the engine in the fully advanced position so transferring any variations in the firing to the tick-over or low engine speeds when it can least affect the performance.

292. Whilst setting the ignition timing, therefore, the contact breaker cam must be locked in the fully advanced position.



1 Contact breaker cam
2 Washer
3 Bolt

Fig 57 Setting the contact breaker cam

293. Carefully remove the central fixing bolt (Fig 57(3)) with washer from the contact breaker cam (1) and temporarily fit another washer (2) having a hole just large enough to clear the cam inner bearing, thus allowing the washer to bear against the top face of the cam. Replace the bolt, but before tightening, rotate the cam in an anti-clockwise direction until the bob-weights are fully expanded, hold in position and tighten the bolt. Care must be taken during this operation to avoid releasing the whole mechanism from its location.

Setting the ignition timing

294. Having locked the contact breaker cam in the fully advanced position and with the piston at $33\frac{1}{2}^{o}$ or .280 in. before top dead centre, the ignition timing can now be set.

295. An accurate means of checking the opening of the contact points can be made by connecting a battery and lamp in circuit with the points (see Fig 58).

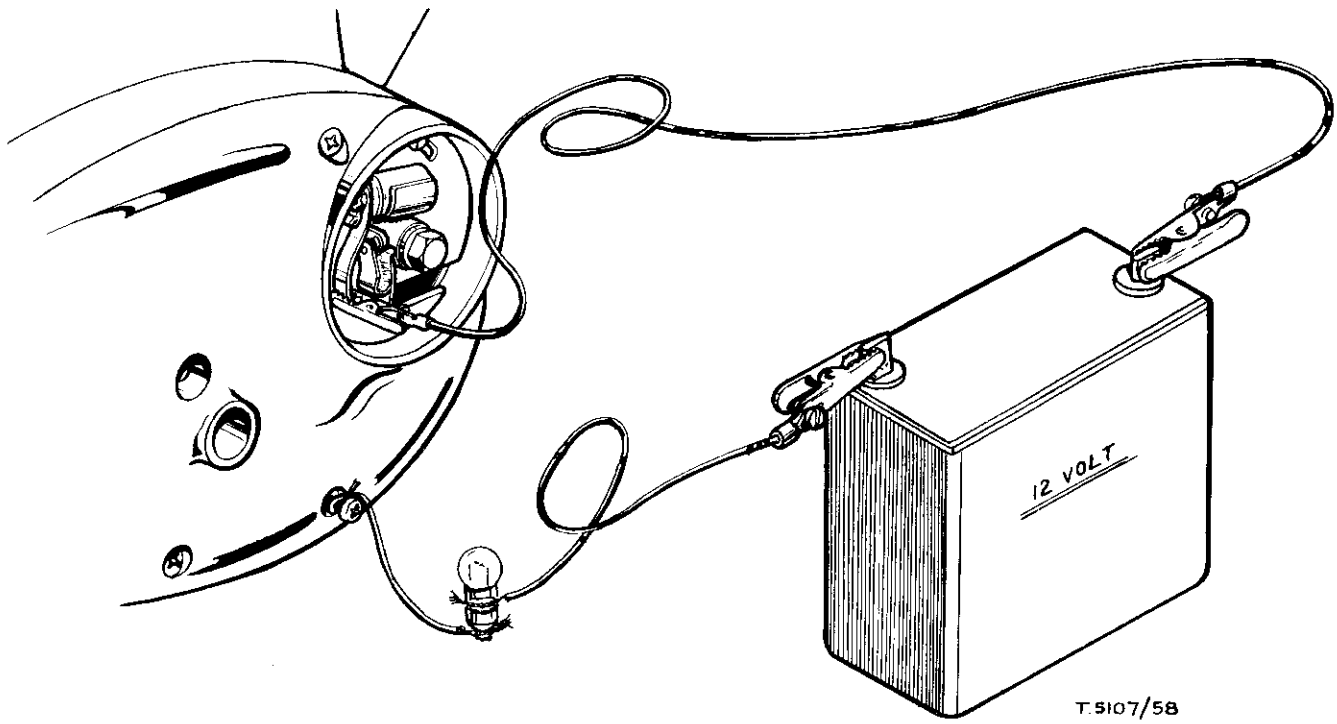


Fig 58 Battery and lamp in circuit

296. Attach one lead between the "C" spring and the battery terminal. Take a second lead from the other battery terminal to a lamp, then from the base of the lamp to a good earthing point on the machine.

> **Note:** *If the engine is in the frame whilst the setting is being carried out, the battery will not be required and the lead between the lamp and battery terminal can be connected direct to the contact breaker "C" spring.*

297. As soon as the contact points open, the circuit will be broken and the light will go out. Loosen the contact breaker plate pillar bolts and rotate the plate either backwards or forwards until the points are just opening. Hold the plate in this position, tighten the pillar bolts and recheck the setting. There should be no change in the fully-open gap setting.

298. Do not forget to remove the large washer, fitted temporarily behind the contact breaker fixing bolt, otherwise the auto-advance mechanism will be inoperative.

299. The importance of accurate ignition timing cannot be over emphasized. Care and patience must be taken to ensure that the final setting is in accordance with the recommended figures.

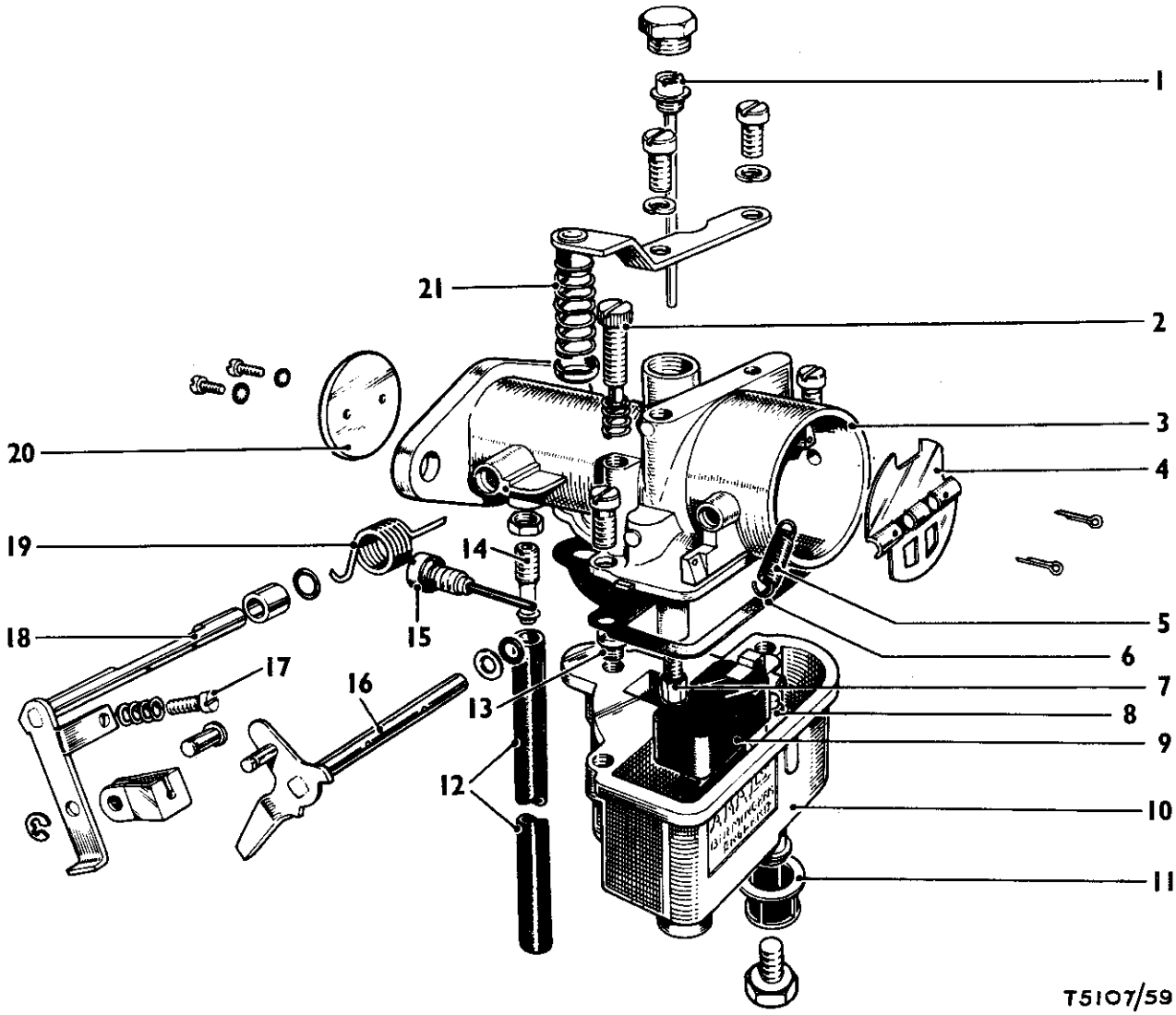
CARBURETTER

DESCRIPTION

300. The carburetter proportions and atomises the correct amount of fuel with the air drawn into the engine. This fuel/air ratio is governed by the jet sizes and main choke bore. The float chamber (Fig 59(10)) maintains a constant level of fuel at the jets and cuts off the supply when the engine stops. The butterfly type throttle valve (4), being operated from the handlebar twist grip, controls the volume of mixture and therefore the engine speed. Slightly opening the throttle valve brings into action the mixture supply from the pilot jet system for slow running and idling requirements. In this case fuel is fed directly from the float chamber through the pilot jet (13) and mixed with air introduced via the pilot air adjusting screw (2), the resultant mixture then passing through the pilot jet outlet to the engine. As the throttle valve is progressively opened, primary air to the system is admitted to the mixing chamber through the primary air duct, through the air bleed assembly and through the small bleed holes, mixing with fuel supplied from the main jet (7). This mixture is then drawn out of the annular outlet in the choke tube, where it is finally mixed with the incoming air stream from the main air intake. The function of this combined system is to ensure adequate compensation at all throttle positions. A strangler system is incorporated in the carburetters to facilitate cold starting, and a nylon fuel filter gauze, maintaining a clean supply of fuel to the jets, is fitted in the "banjo" type fuel connection.

DISMANTLING AND REBUILDING THE CARBURETTER

301. Most of the dismantling procedure detailed below, can be carried out with the carburetter on the machine but the following notes will be treated as though the unit is being completely dismantled on a workbench.



1	Air bleed tube	8	Float needle	16	Overflow drain tube adaptor
2	Pilot air adjusting screw	9	Float	17	Throttle cable spring
3	Carburetter body	10	Float chamber	18	Throttle valve
4	Strangler	11	Fuel filter gauze	19	Throttle return spring
5	Strangler spring	12	Overflow drain tube	20	Throttle valve spindle
6	Gasket	13	Pilot jet	21	Throttle valve stop screw
7	Main jet	14	Strangler spindle		
		15	Float pivot spindle		

Fig 59 Carburetter

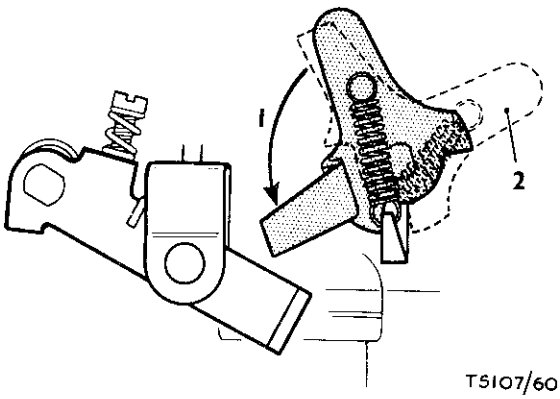
302. The float chamber is held to the carburetter body by two cheesehead screws and when removed, reveals both the pilot jet (Fig 59(13)) and the main jet (7). The pilot jet is located in the top face of the float chamber whilst the main jet is screwed into the base of the primary air chamber.

303. To remove the float (9) or needle (8), unscrew the float spindle from the rear of the chamber. Take care when extracting the float, as any damage to the hinge portion or needle stop will upset the regulation of the fuel flow.

304. The throttle butterfly valve (4) is held to its spindle by two small screws with shakeproof washers. When the valve is released, the spindle can be withdrawn complete with its spacer, return spring and rubber '0' ring. Note that one end of the return spring is inserted into the carburetter body, whilst the hooked end locates over the control arm.

305. The primary air tube is screwed into the top of the carburetter body and is protected by a plug. If the air bleed holes in the tube appear blocked, clean with petrol only.

306. Two small split pins hold the air strangler onto its spindle. When the pins have been removed, the spindle can be withdrawn and the strangler will be released. Take care not to lose the small plain washer and rubber '0' ring fitted behind the strangler lever.



1 Start (choke closed)
2 Normal running (choke open)

Fig 60 Carburetter choke control

307. The overflow drain tube (12) is a push-fit onto its adaptor, the latter being screwed into the base of the mixing chamber and secured with a locknut. When refitting the adaptor it is most important that it does not protrude into the carburetter bore, otherwise its purpose will be defeated and the air flow through the carburetter will be restricted.

308. Having dismantled the carburetter, carefully clean all parts in gasolene. Hard deposits on the carburetter body are best removed with a light grade wire brush. After washing the parts in clean petrol, allow to dry and ensure that all holes or small drillings are free from dirt. A hand pump is ideal for "blowing through" any blockages in the drillings. Inspect the component parts for wear and check that the jets are in accordance with the recommended sizes given in General Data.

309. Reassembly is simply a reversal of the above instructions but remember to replace any gaskets or "O" rings that appear unserviceable. Do not overtighten the jets when refitting. Refer to Fig 59 for guidance.

INSPECTING THE CARBURETTER COMPONENTS

310. The part most liable to show wear after considerable mileage is the throttle butterfly valve and its seating in the choke bore. The valve spindle may also have become loose, resulting in air leaks.

(1) Check that the butterfly valve closes correctly and that there are no heavy indentations in the choke bore.

(2) Check the float needle for efficiency by inserting it into the float needle seating block, pouring a small amount of petrol (gasolene) into the aperture surrounding the needle and checking it for leakage.

(3) Ensure that the float is not punctured by shaking it to see if it contains any fuel. Do not attempt to repair a damaged float. If there is any doubt about its condition, replace it with a new one.

(4) Check the petrol filter that fits over the needle seating block for any possible damage to the mesh. If the filter has parted from its supporting structure it will allow gasolene to pass through unfiltered.

HINTS AND TIPS

Throttle cable

311. See that there is a minimum of backlash when the twist grip is turned back and that any movement of the handlebar does not cause the throttle to open.

312. Use the adjuster on the cable to obtain the correct setting and ensure that the throttle butterfly closes fully.

Petrol feed

313. Unscrew the float chamber "banjo" bolt, remove the "banjo", and take off the filter gauze from the needle seating.

314. Ensure that the filter gauze is undamaged and free from all foreign matter. To check fuel flow before replacing the "banjo", turn on petrol tap momentarily and see that fuel gushes out.

Flooding

315. This may be due to a worn needle or a punctured float, but is more likely due to impurities (grit, fluff, etc.) in the tank. This trouble can sometimes be cleared by periodically cleaning out the float chamber. If however, the trouble persists the tank must be drained and swilled out.

Carburetter air leaks

316. Erratic slow-running is often caused by air leaks between the joints at the carburetter flange and the cylinder head (see Fig 61) and can be detected by applying oil around the joints. Eliminate by fitting new washers and tightening the flange nuts evenly to a torque wrench setting of 10 lb ft (1.383 kg/m).

317. On much used or old machines look for air leaks caused by a worn throttle or a worn inlet valve guide.

Banging, in exhaust

318. This may be caused by too weak a pilot mixture when the throttle is closed. It may also be caused by too rich a pilot mixture and an air leak in the exhaust system. The reason in either case is that the mixture has not fired in the cylinder but has fired in the hot silencer.

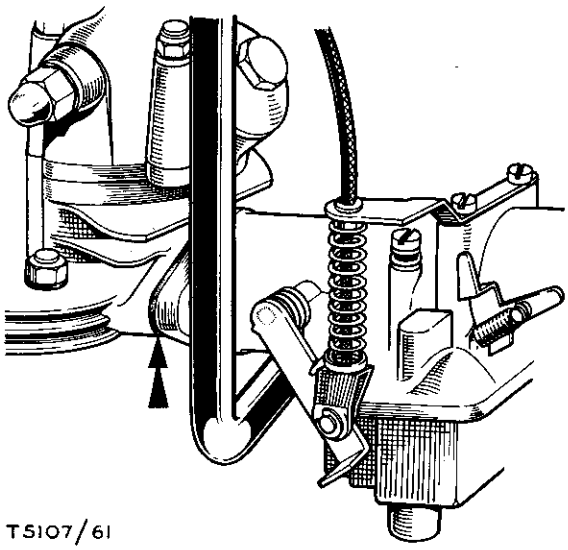


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Fig 61 Check for air leaks

319. If the banging occurs when the throttle is fairly wide open, the trouble will be traced to ignition, not carburation.

Excessive petrol consumption

320. If this cannot be corrected by normal adjustments, it may be due to flooding caused by impurities from the petrol tank lodging on the float needle seat, so preventing its valve from closing. The float needle should also be checked for wear or damage. There are many other causes of high petrol consumption and it should not be assumed that the fault lies in the carburetter alone.

Air filters

321. If a carburetter is first set with an air filter and the engine is then run without, the jet setting may be affected and care must be taken to avoid overheating the engine due to too weak a mixture. Testing with the strangler valve will indicate if a larger main jet is required.

Effect of altitude on a carburetter

322. Increased altitude tends to produce a rich mixture; the greater the altitude, the smaller the main jet required. Service carburetters are suitably set for use in altitudes of up to approximately 3,000 feet. Carburetters used constantly in altitudes of between 3,000 to 6,000 feet should have a reduction in main jet size of 5%. A further reduction of 4% should be made for every 3,000 feet in excess of 6,000 feet altitude. No adjustment can be made to compensate for lost power due to rarified air.

TRACING FAULTS

323. Faults likely to occur in carburation can be placed in one of two categories; either richness or weakness of petrol/air mixture.

(1) **Indications of richness**

Black smoke in exhaust
Petrol spraying out of carburetter
Four-strokes, eight-stroking
Heavy lumpy running
Sparking plug sooty

(2) **Indications of weakness**

Spitting back in carburetter
Erratic slow-running
Overheating
Engine goes better if strangler valve is partly closed.

324. Having established whether the mixture is too rich or too weak, check if caused by:-

(1) Petrol feed - check that jets and passages are clear, that filter gauze in "banjo" connection is not choked with foreign matter, and that there is ample flow of fuel. Also ensure there is no flooding.

(2) Air leaks - usually at the flange joint or due to worn inlet valve stem and guide.

(3) Defective or worn parts - such as a loose-fitting throttle valve, worn jet, loose jets.

(4) Air cleaner choked-up.

(5) An air cleaner having been removed.

(6) Removal of the silencer - this requires a richer setting.

325. Having ensured that the fuel feed is correct and that there is no air leaks etc., check the ignition, valve operation and timing. Now test to see if the mixture is rich or weak by partially closing the strangler valve and noting how the engine runs. If the engine runs better, weakness is indicated, but if the engine runs worse then the mixture is too rich.

ADJUSTING CARBURETTER FOR BEST SLOW RUNNING

326. An air adjusting screw (Fig 59(2)), and throttle stop screw (21) provide for setting the carburetter to obtain best slow running and idling speeds at small throttle openings. Larger throttle openings are governed by the proportions of the carburetter's main choke bore and main jet, and this is fixed by the makers to suit the engine requirements. The engine should be warm when adjustment is made to the carburetter, the ignition should be set for best slow running and the strangler valve kept in its fully open position throughout the adjustment procedure. With the engine at rest, first screw down the air adjusting screw as far as it will go without strain, then unscrew it in an anticlockwise direction approximately half a turn. Unscrew the throttle stop-screw so that the throttle valve can fully close. Next, with the throttle approximately 1/4 open start the engine and throttle down to a fast idling speed. Now, first set the throttle stop-screw to hold this position,

and then unscrew it to allow the throttle valve to be further closed and the engine to slow down until it begins to falter, then screw the air adjusting screw in or out until the engine runs regularly and faster. Then, further unscrew the throttle stop-screw until the closing of the throttle valve again makes the engine run slower and just begin to falter, then again adjust the air adjusting screw to get best slow running. If after this second adjustment the engine is still running too fast, carry out the same procedure a third time. After each adjustment of the throttle stop-screw and air adjusting screw, test that the engine does not falter or cut out when the throttle is opened fairly quickly. If the engine does falter or cut out the adjustment has been set for too slow running resulting in an over weak pilot mixture. A worn throttle valve and spindle will cause air leaks and prevent correct slow running.

FRAME AND FITTINGS

FRAME ALIGNMENT

327. The only satisfactory way of checking the frame for correct alignment is on an engineers setting-out table. In addition to the table, which should be approximately 5 ft x 3 ft, the following equipment will also be necessary.

One mandrel and two blocks, as in Fig 63.
One mandrel or bar for swinging arm pivot, 13/16 in. diameter x 12 in. long.
One large set-square.
One 18 in. Vernier height gauge or large scribing block.
One pair of large "V" blocks and several adjustable height jacks.

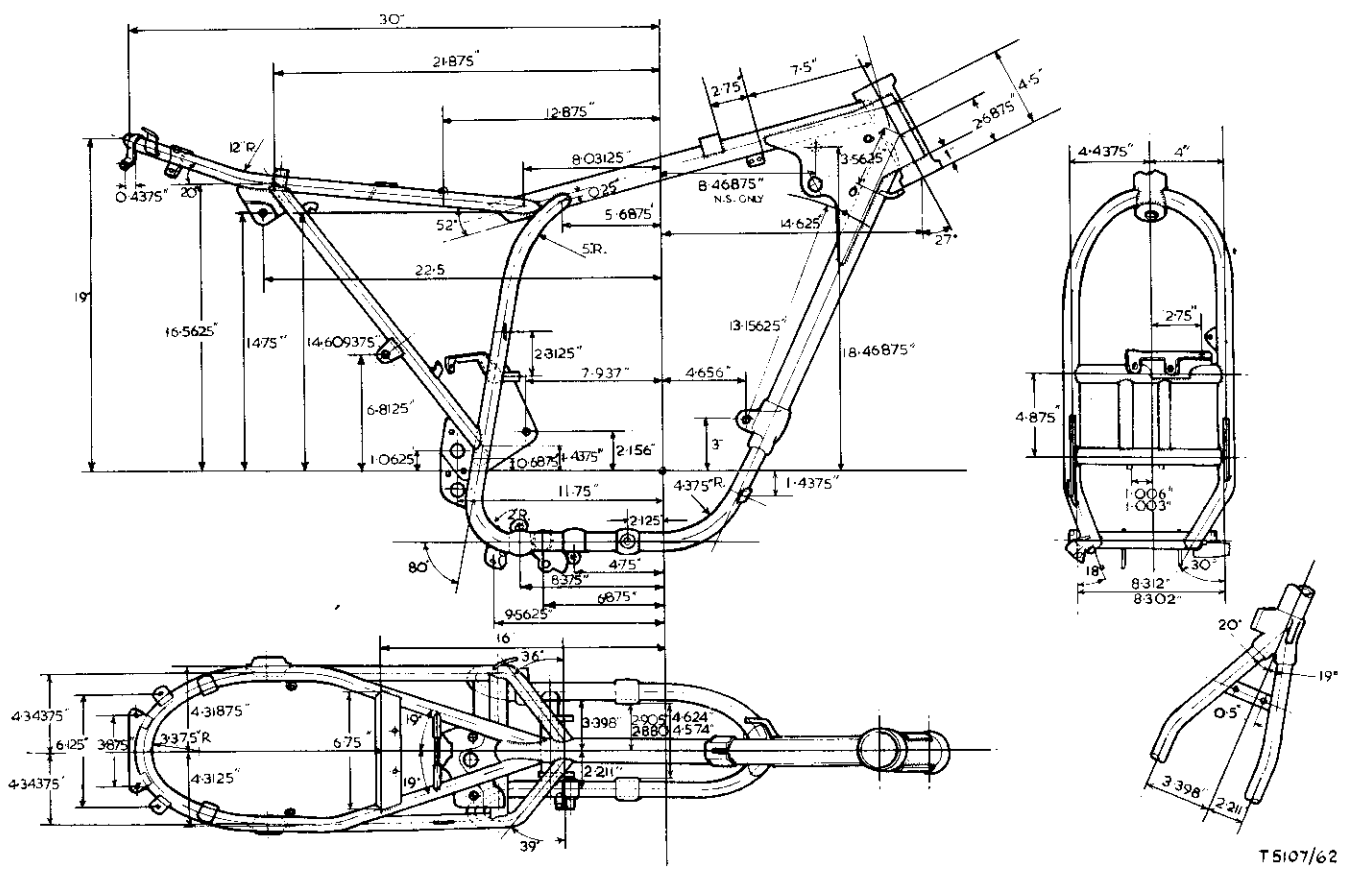


Fig 62 Frame

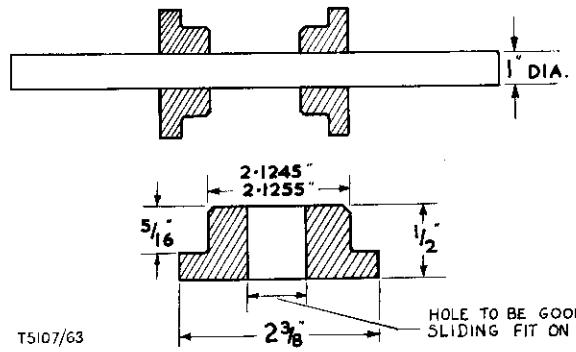
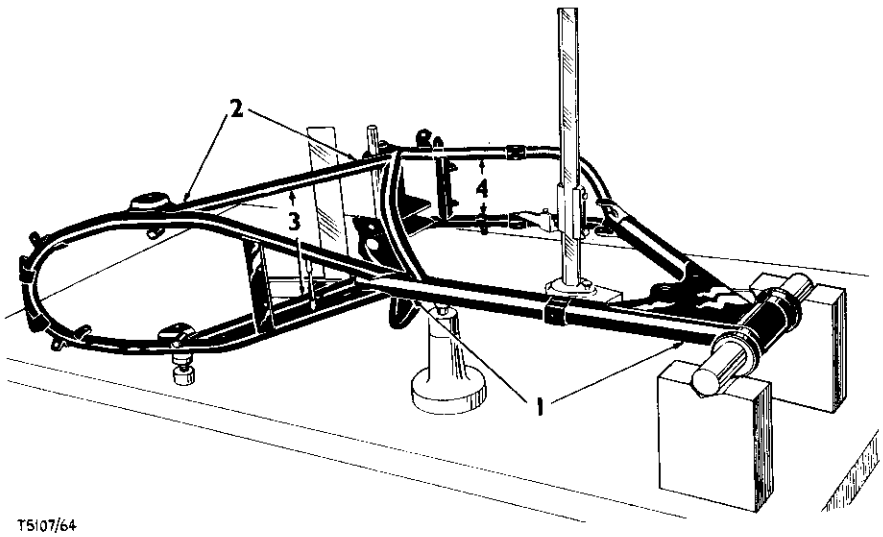


Fig 63 Steering head mandrel

328. If a scribing block is used, then an 18 in. steel rule will also be required. The mandrels must be straight and round, otherwise measurements will be affected. Figure 64 shows the basic set-up for checking the frame, though variations can of course be used according to the facilities available.

329. Place the blocks into the steering head, insert the mandrel and support with the "V" blocks at one end of the table. Check the mandrel at each end to ensure that it is parallel with the surface of the table. Insert the 13/16 in. diameter mandrel through the swinging arm pivot hole.

330. Now, using jacks or packing pieces, set the frame horizontal to the table so that checks taken at points (Fig 64(1)) are the same.



1 Top tube setting points
2 Side tube setting points
3 Side tubes
4 Bottom tubes

Fig 64 Setting up the frame

331. If the frame has suffered damage in an accident, it may not be possible to set points (1) parallel in which case points (2) can be used.

332. Sometimes if the machine has been subjected to a frontal impact, the main tube may remain parallel at points (1) but will be bent as shown in Fig 65. A straight-edge, made from a piece of good quality hardboard can be used for this purpose, but the checking edge must be quite straight.

333. When the frame is set parallel to the surface table, the mandrel through the swinging arm pivot holes should be vertical. This can be checked using the set-square and internal calipers or a slip gauge between the mandrel and the square. The set-

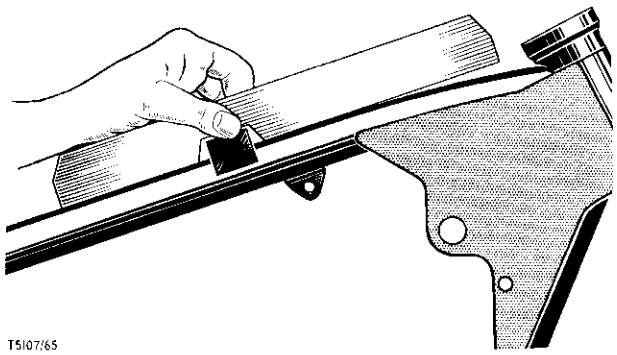


Fig 65 Bent top tube

square should touch both the upper and lower tubes together at points (Fig 64(3)) and (4) if the frame is true and correctly set-up on the table. To find the frame centre line, take the height of the main tube and subtract half the diameter of the tube.

334. Checks can now be taken at the engine mounting lugs and other points of the frame. Errors at any point should not exceed 1/32 in. (.79 mm).

CHAINCASE

335. If the rear chain must be taken off for repair or inspection, only the lower half of the chaincase need be removed to gain access.

336. Slacken off the large cam spindle nut behind the brake lever after first moving away the oil hole clip. Take out the two small bolts and one large bolt holding the lower half of the case to the swinging arm. The large bolts retain a bracket within the chaincase and the lower one also secures the brake plate anchor strap.

337. The lower half of the case can now be lowered and withdrawn gently from the rear. Take care not to lose the small sealing plate fitted on the inside of the case, above the brake cam spindle.

338. Should it be necessary to remove the top half of the case, the large bolt that holds the bracket to the lower swinging arm lug must first be replaced. If this precaution is not taken, the bracket will fall as the top bolt is removed and difficulty may be experienced in repositioning it when rebuilding the case.

339. By taking out the two small bolts and one large bolt, the top half of the case can now also be withdrawn from the rear.

340. To release the front section, first take out the primary chaincase oil level screw (painted red) with nut, then withdraw the lower half of the case from around the sprocket. The top half is held by one of the primary cover fixing screws and a sleeve nut.

341. After removal of the chaincase, see that the rubber sleeve over the swinging arm spindle housing is in good condition.

342. When replacing the front section of the chaincase note that the halves are located together by means of a peg and cup at the front.

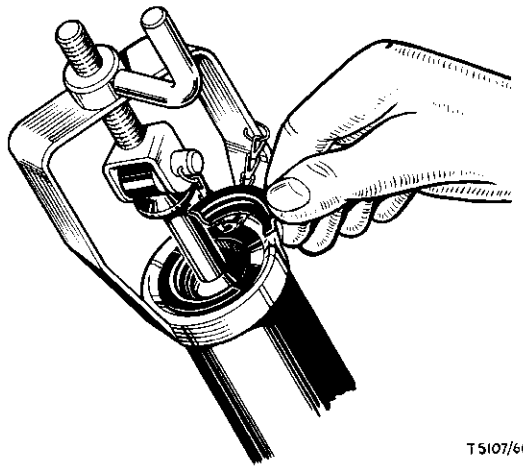


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Fig 66 Using the rear damper dismantling tool

REAR SHOCK ABSORBERS

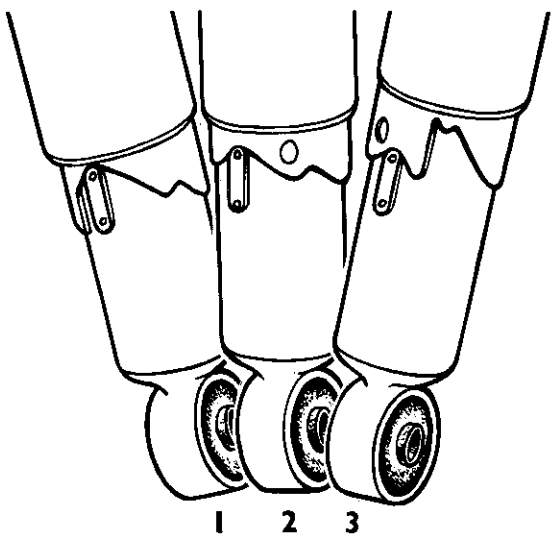
343. The rear shock absorbers, or dampers, are of the coil spring type, hydraulically damped and are mounted on bonded rubber bushes at each end.

344. The only dismantling that can be carried out is for the removal and replacement of the springs.

345. The bolts securing the dampers at the top also hold the pannier frames. In some cases, it may be found necessary to loosen the pannier frame fixing bolts before attempting to remove a damper.

346. To remove a damper, take out the top fixing bolt with nut and washers and unscrew the lower fixing nut. Pull the damper off the stud at the bottom and withdraw from the top frame bracket. Note that dust covers are fitted behind the lower fixing nuts.

347. The removal and replacement of the mounting bushes will be found much easier if a little liquid soap or hydraulic brake fluid is used.



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1 Light position
2 Medium position
3 Heavy position

Fig 67 Cam ring positions

348. The damper springs are graded at 100 lb/in. rate and have green/pink identification markings.

349. If the springs are to be changed, the spring must first be compressed with the Service Tool (Fig 129) to allow the split collets to be removed (see Fig 66). After removing the tool, the dust shield can be lifted off, allowing the spring to be taken out. Having renewed the spring and refitted the dust cover, the spring will have to be compressed with the service tool again to enable the split collets to be inserted.

350. Do not lubricate the plunger rod or bushes.

351. The dampers have three load positions, light medium and heavy (see Fig 67) and they must be set in the "light load" position before dismantling. A "C" spanner for this adjustment is provided in the tool kit.

SWINGING ARM

Removal

352. Take off the rear wheel (paras 475 to 478), chaincase (paras 335 to 341), dampers (paras 343 to 346) and rear brake pedal (para 368). Remove the large nut and lockwasher securing the swinging arm spindle at the right-hand side and unscrew the spindle flange retaining bolt from the opposite side. The brake light switch and the pillian footrest can be left on the flange but it will be necessary to detach the cables from the switch terminals. Remove the brake pedal stop pin and drive out the spindle with its flange from the right-hand side. Now, using a raw-hide mallet, tap the left-hand side of the swinging arm downwards and the right-hand side upwards to release it from the frame plates.

353. Replacement is the reversal of the above procedure for removal but, do not tighten the large spindle nut until the dampers have been refitted.

Bushes

354. Each of the two bushes fitted to the swinging arm fork consist of two steel sleeves, bonded together with rubber. The inner sleeve is slightly longer than half the width of the fork in the frame, the two inner sleeves are locked together on the end faces, so placing the rubber under tension when the fork moves.

355. Under normal circumstances, the bushes will last the life of the machine, but should they require renewal, the rubber will have to be first removed. This can be done by progressively burning out the rubber with thin rods or strips of metal which have been heated. When sufficient rubber has been burnt away, drive out the inner sleeves, after which the outer sleeves can be removed with a suitable drift.

Alignment

356. Before checking the swinging arm, it must be established that the bushes are in good condition.

357. Using the same mandrel that was used for the swinging arm pivot on the frame (see Fig 63), set the swinging arm in "V" blocks as shown in Fig 68. Another mandrel 9 in. long x 5/8 in. diameter should be inserted through the fork ends. Both mandrels should be parallel to the surface table. Should there be less than 1/4 in. malalignment of the swinging arm fork it is permissible to correct it by means of a suitable lever but, care must be taken to avoid causing further damage.

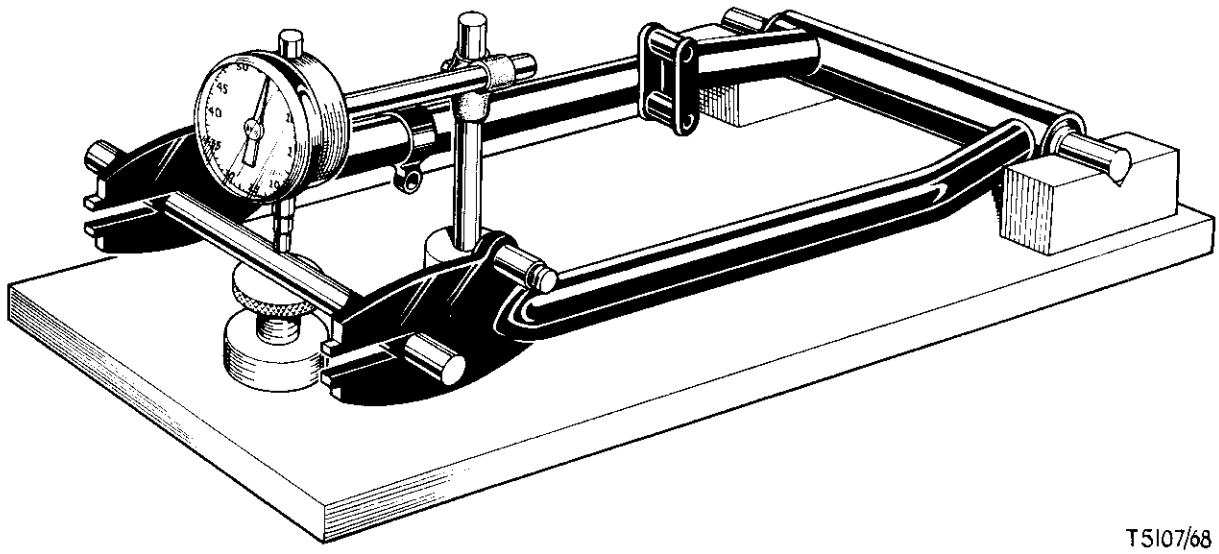

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Fig 68 Checking the swinging arm

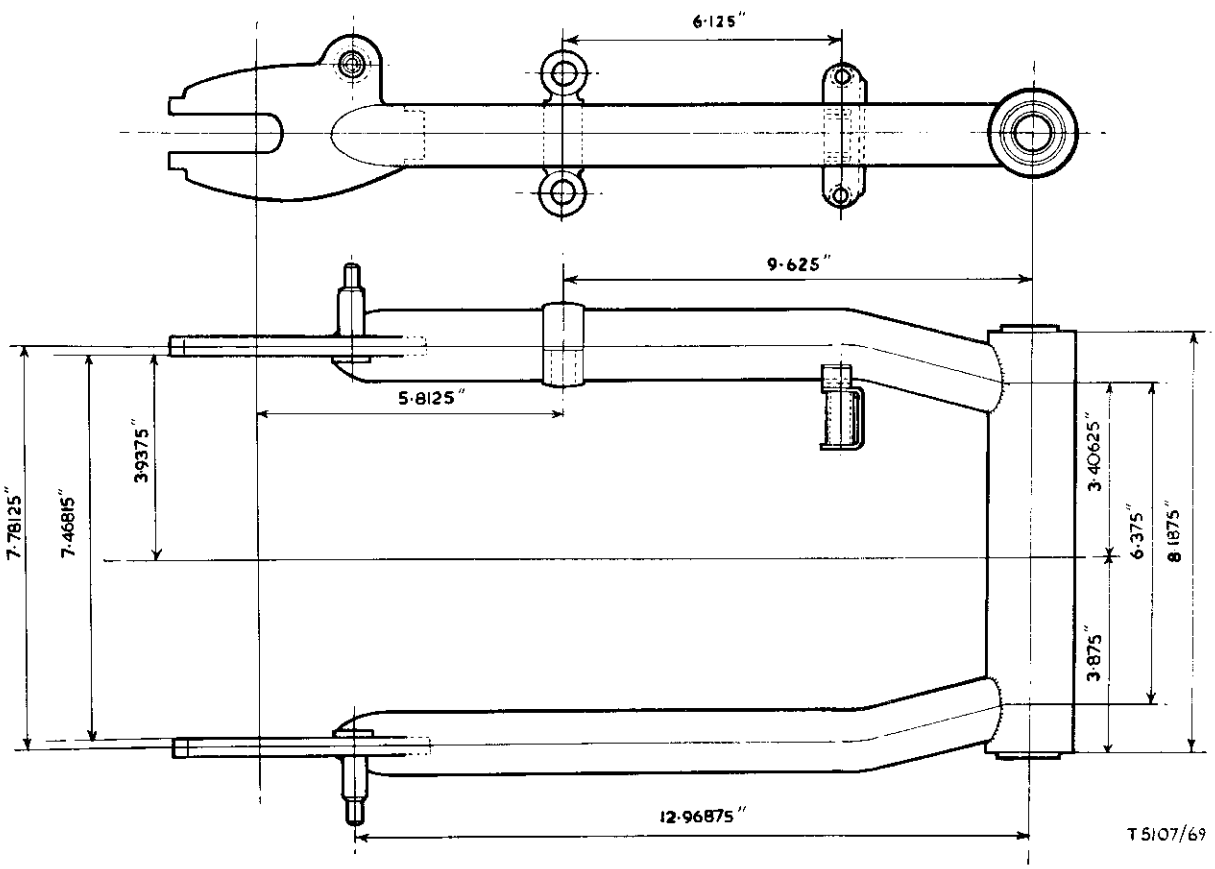

Fig 69 Swinging arm dimensions

358. To check that the forks are square to the pivot, they must be set-up at 90° to the position illustrated, so that the pivot is vertical. Next, find the centre of the pivot and check that the fork ends etc., are in accordance with the dimensions shown in Fig 69.

359. When there is considerable malalignment in either frame or swinging arm, it is recommended that a works reconditioned unit is fitted.

> **Note:** *There may also be a variation in the rear dampers and a careful examination should be made of the overall length between the mounting eyes. It is possible that one damper may be weaker than the other, caused by the "settling" of a spring. If this should be the case, it is advisable to renew the springs in both dampers.*

SADDLE

360. The saddle is mounted on a bracket at the rear, which is secured to the frame member by two self-locking nuts with spacers. To remove, reach below the saddle and unscrew the nuts. The saddle can then be withdrawn backwards to disengage its clip from the front mounting rod.

> **Note:** *The saddle is supported at each side by small rubber pads. These are a push-fit into the saddle base plate and rest on small circular plates, located on the support rail lugs by means of a peg.*

361. Replace in the reverse order, making sure that the clip engages correctly with the front mounting rod.

PROP STAND

362. The prop stand is secured to the frame lug with one bolt and a self-locking nut which should only be used once. The return spring will be released as the stand is drawn off the frame lug.

CENTRE STAND

363. The centre stand is held in position with a plain steel bar drilled at both ends for split pins, centre distance piece, two spring washers and two plain washers.

364. To remove the stand it is only necessary to remove the split pin from one side and draw the pivot pin out from the opposite side.

365. When replacing the stand, note that the spring washers are fitted outside the stand, then the plain washer and finally the split pin.

366. Lubrication nipples are provided in each stand lug to lubricate the pivot.

Stand spring

367. The simplest way to replace the stand spring is to use a Phillips-type screwdriver. Place the eye of the spring over the frame anchorage, insert the screwdriver in the other eye, place the screwdriver slot under the hook on the stand and lever downwards to press the spring over the hook (see Fig 70).

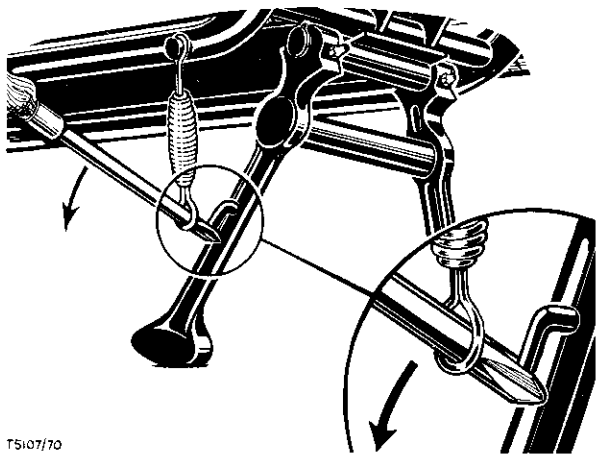

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Fig 70 Stand spring

REAR BRAKE PEDAL

368. Release the clevis pin that holds the brake rod to the pedal and allow the rod to fall clear. Remove the central fixing bolt with large plain washer from the ful crum pin and take off the pedal with return spring. The fulcrum pin is fixed to the frame with one large nut and washer.

REAR MUDGUARD

369. It is unnecessary to remove any other component when taking the rear mudguard off the machine, but more access will be gained to some of the fixing bolts if the pannier bags and frames are first removed.

370. Reach below the top left-hand side of the guard and unscrew the rectifier retaining nut, being careful not to allow the bolt to revolve. Release the rectifier and carefully tie it up out of the way to avoid any damage.

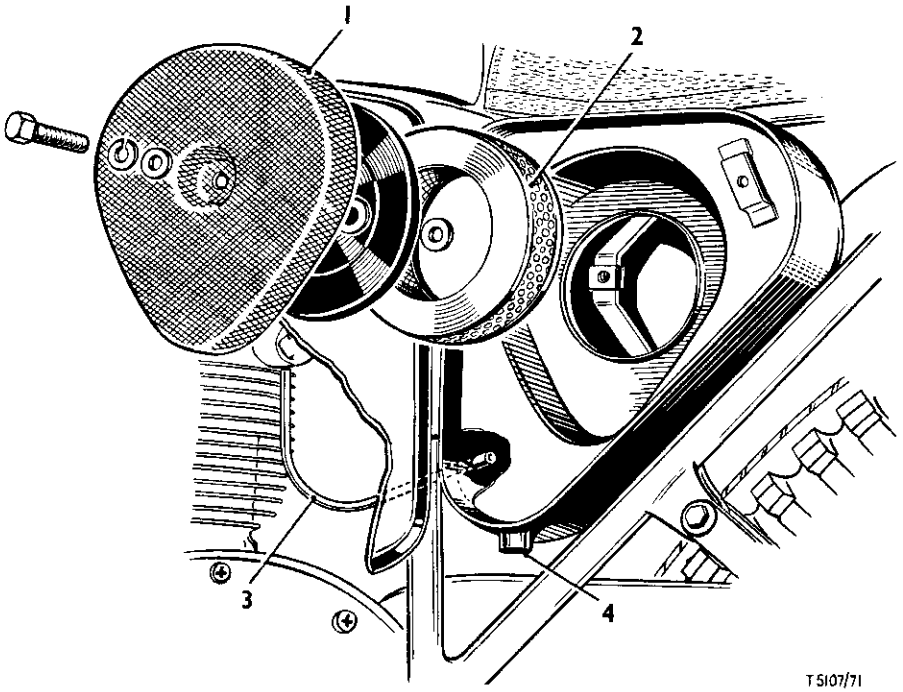
371. Disconnect both the brown and brown/green cables from their snap connectors below the saddle at the left-hand side.

372. The mudguard is held by four nuts and bolts with plain washers, there being two at the lower front (behind the oil tank) and two at the saddle rear fixing brackets. After releasing from its fixing points, the mudguard can be eased gently away from the rear, around the rear wheel.

373. The rear number plate assembly is secured to the mudguard by three nuts and bolts with plain washers. The two top nuts and bolts and a third nut fixes the tail lamp unit. Note that the tail lamp cables are held safely to the inside of the guard by clips.

374. Replace in the reverse order and check that the tail lamp connectors are in good order and the cables are not "bared" at any point.

> **Note:** *When tightening the rectifier fixing nut, hold the bolt head firmly with a second spanner to prevent it from turning. If this precaution is not taken, the plates may twist and break the internal connections.*



1 Perforated cover
2 Filter element
3 Carburetter overflow pipe
4 Porous plug

Fig 71 Carburetter air filter

CARBURETTER AIR FILTER

375. The carburetter filter should be regularly examined at the intervals laid down in the Servicing Schedule, but if the machine is used under exceptionally severe conditions a weekly examination should be made. Running the machine with a badly choked filter will cause restricted maximum speed, an increase in fuel consumption and many other carburation troubles.

376. The hinged filter box lid is held closed by an "Oddie" stud which requires a single turn to release. Using a suitable box spanner, unscrew the central bolt from the recess in the perforated cover. The cover, circular plate and the filter itself can now be taken off.

377. The filter is composed of paper elements and it is therefore inadvisable to attempt to clean it. If it appears to be contaminated with excessive quantities of dirt, replace it with a new unit.

378. A drain plug of porous sintered steel is provided at the base of the filter box and allows surplus petrol from the carburetter overflow pipe to drain away, without admitting particles of dust. The plug is retained by a spring circlip and should only be removed for cleaning by workshop personnel.

OIL TANK REMOVAL

379. Take out the drain plug and drain the oil from the tank. Remove the saddle (see para 360). Loosen the small oil pipe clips at the tank and disconnect the rocker box oil feed pipe and the main oil feed and return pipes (noting cross-over of pipes).

380. The oil tank is secured to the frame cross member, at the top rear, by a single rubber-mounted bolt (see Fig 72). Three rubber buffers support the tank at the front, one at the top and two at the base.

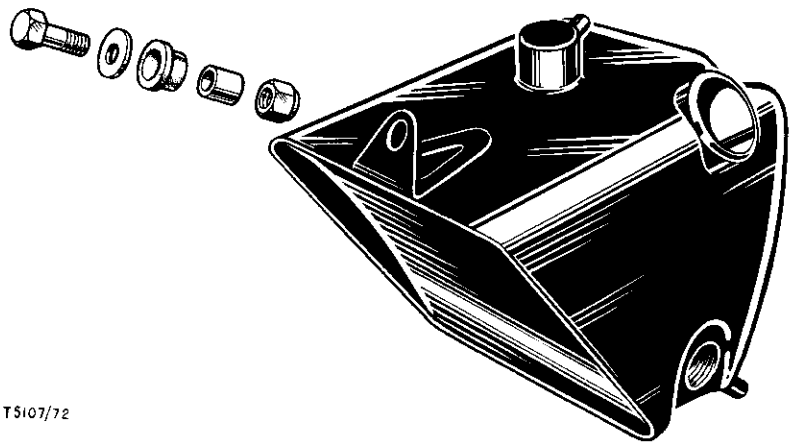


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Fig 72 Oil tank mounting

381. Before attempting to remove the oil tank, it will be necessary to lower the rear mudguard on to the wheel, to provide sufficient clearance for the withdrawal of the tank.

382. First, pull out the tank rubber buffers and remove the two fixing bolts with large washers and nuts, securing the mudguard front to the lower frame bracket. Also take out the two bolts with nuts and washers, holding the mudguard top to the rear of the saddle support rail. Now, slip the front edge of the mudguard behind the swinging arm pivot and push the guard gently downwards on to the top front of the rear wheel.

383. After releasing the oil tank from the top frame member, the tank can be lowered and withdrawn from the right-hand side of the frame.

384. Replacement of the tank is a reversal of the above instructions but, after replacing the oil pipes, check that there is no oil leakage. The rubber buffers that support the tank are simply a press-fit into the frame brackets. If they have become saturated with oil, it is advisable to renew them.

HEADLAMP REMOVAL

385. Slacken the rim retaining screw, situated at the top of the headlamp. Pull the rim away from the top and disengage from the clip at the base to release the light unit assembly. Press the main lamp adaptor inwards, rotate it to the left and lift it off. Pull out the parking lampholder from its location in the reflector, withdraw the light unit and rim assembly and place to one side. To avoid damage, the lamps should now be taken out of their holders. Disengage the light switch and ignition switch cable sockets (press-fit) then, making careful note of their respective locations, disconnect the cables at the ammeter terminals. Pull out the speedometer lamp holder and take out the lamp.

386. Release the speedometer drive cable by unscrewing the knurled ferrule at the base of the instrument head and pull the cable from the headlamp.

387. By displacing the large rubber grommet at the base of the headlamp shell, the harness complete with switch sockets can now be withdrawn from the shell. Note on reassembly, that the harness is held securely by a spring clip inside the headlamp shell.

388. Finally take out the two fixing bolts with washers and spacers from the fork leg brackets and withdraw the headlamp complete. The speedo head is held in place by two nuts and a bridge arrangement.

389. Replace in the reverse manner, making sure that the headlamp rim and light unit are correctly located before tightening the rim retaining screw. Also ensure that the cables are secure and are not 'bared' at any point.

CONTROL CABLE REPLACEMENT

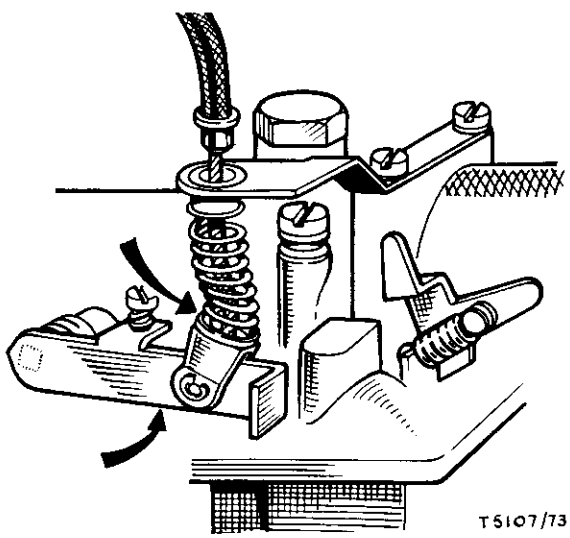
Throttle cable

390. First turn the twist grip to open the throttle, then whilst pulling the cable sleeve, release the grip to allow the slotted cable stop to be removed. Now remove the two screws from the twist grip control and take off the top half to expose the cable nipple. Ease the nipple out of the grip and remove the cable.

391. Fit the replacement cable to the grip by inserting it up through the lower half and locating the nipple in its slot. Replace the top half of the grip, but, before tightening the screws, check that the grip turns freely. Do not replace the cable stop at this stage.

392. Proceed by removing the petrol tank (see para 148(1)) and detaching the cable from the frame clips.

393. Detach the cable nipple from the carburetter control toggle and withdraw the cable, taking care not to lose the return spring and its seating which are loosely located beneath the cable stop. Pull the end of the new cable through the hole provided in the right-hand steering head plate and attach to the frame top tube with rubber clips. Insert the cable through the cable stop, spring and seating then, whilst holding these together, raise the control lever and slip the cable nipple into the toggle. Finally, replace the cable stop at the twist grip control, adjust the cable as necessary (see paras 311 and 312) and refit the petrol tank.



T5107/73 Fig 73 Removing throttle cable

Front brake cable

394. To remove the front brake cable, first completely loosen the cable adjusters and unscrew the nut and bolt holding the toggle to the lever on the brake coverplate. Now, pull the cable adjuster away from the handlebar lever bracket and slip the cable nipple out of the lever.

395. Replacement is simply a reversal of the above procedure, but see that the cable is located through the cable guides. Re-adjust the brake cable and test the efficiency of the brake thoroughly before using the machine.

Clutch cable

396. Unscrew and remove the handlebar lever fulcrum bolt and nut. Slacken the cable adjuster and swing the control lever away from the bracket, allowing the cable nipple to be released.

397. The adjuster and cable can now be withdrawn from the bracket. It will now be possible to release the nipple at the other end of the cable from the clutch actuating lever.

398. Replace the cable in the reverse manner and adjust as necessary to give correct operation. There should be 1/16 in. free play in the cable at the gearbox end.

> **Note:** *After adjustment, the control lever on the timing cover should take up a position approximately parallel with the timing cover joint face, when operated.*

399. Finally, attach the cable to the frame front down tube with two alloy clips. The clips also hold the speedometer drive cable.

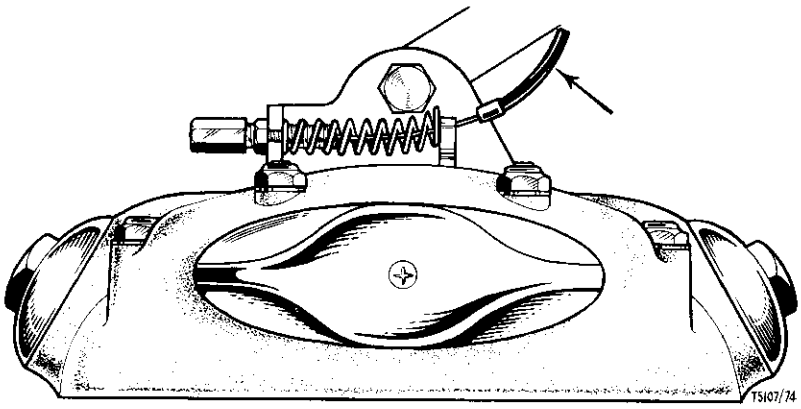


Fig 74 Exhaust valve lifter cable

Exhaust valve lifter cable

400. Undo the handlebar control lever pivot bolt and nut. Pull the lever away from the bracket and disconnect the cable nipple. Working from the right-hand side of the machine, pull the cable outer cover out of its location in the valve lifter lever and raise the cable to release (see Fig 74). Screw out the cable adjuster from the bracket and withdraw the cable complete with adjuster and spring. The new cable should be passed through the hole in the left-hand steering head plate before being connected to the control lever.

401. After replacing the cable, use the cable adjuster and locknut on the bracket to obtain the correct setting. Ensure that there is ample slack in the cable to allow the exhaust valve to close properly whilst the lever is not operated.

FRONT FORKS

DESCRIPTION

402. The forks are of robust design and therefore require the minimum of maintenance, apart from the periodical oil changes as detailed in the Servicing Schedule.

ADJUSTING STEERING HEAD RACES

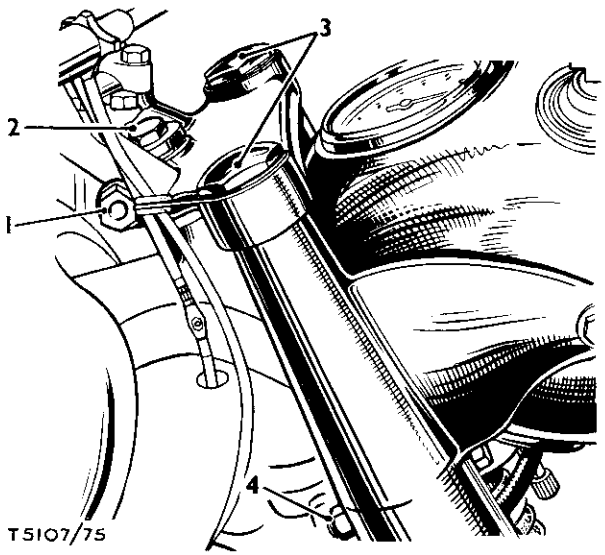
403. It is most important that the steering head races are always correctly adjusted.

404. Place a strong support underneath the engine so that the front wheel is raised clear of the ground then, standing in front of the wheel, attempt to push the lower fork legs backwards and forwards. Should any play be detected, the steering head must be adjusted.

405. Care is necessary to distinguish between play in the head races and play in the fork bushes. In some cases there may be both.

406. If possible, ask someone to place the fingers of one hand lightly round the top head races whilst the forks are being pushed and pulled. Any play will be felt quite easily by the fingers.

407. It should be possible to turn the forks from side to side quite smoothly and without any "lumpy" movement. If the movement is "lumpy" the balls are indented into the races or broken. In either case they and the cups and cones should be renewed.



1 Stem clamp nut
2 Steering stem cap nut
3 Filler plugs
4 Fork leg clamp nut

Fig 75 Front fork and steering head

408. To adjust the steering head assembly, slacken the three clamp nuts (Fig 75), then tighten down the steering stem cap-nut until adjustment is correct. There should be no play evident in the races but great care must be taken not to over-tighten, or the ball bearings will become indented into the races, making steering extremely difficult and dangerous.

409. Having carried out the adjustment, tighten the three clamp nuts securely. Re-check the adjustment.

RENEWING HEAD RACES

410. The steering head can be dismantled without stripping the forks but sufficient slack must be obtained in the headlamp cable harness and the front brake cable disconnected, to allow the column to be drawn out of the head.

411. If required, the headlamp can be removed, as detailed in para 385.

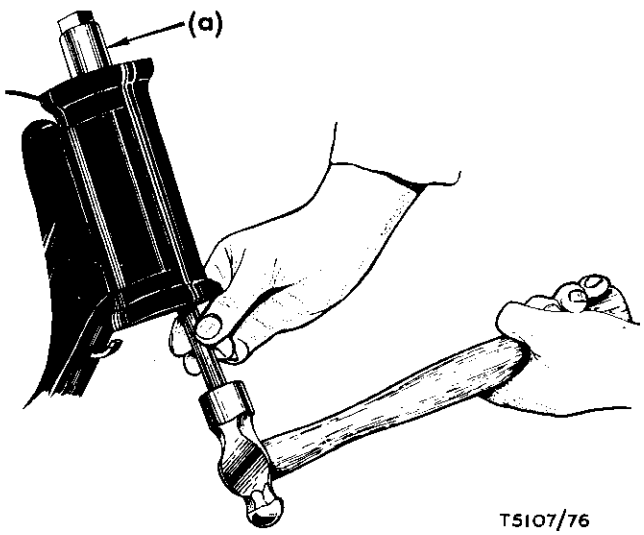
412. Protect the fuel tank with a piece of cloth, take out the four bolts securing the handlebar clips and place the handlebar on the tank.

413. Slacken the clamp nuts and take off the steering stem cap-nut. Unscrew and pull upwards, the fork filler plugs. To release from the internal damper rod, loosen the locknut beneath the plug and unscrew from the rod. Note carefully, the way in which the cable guide brackets are fitted.

414. Then, using a raw-hide mallet, strike the under sides of the top yoke alternately to release from the tapered legs. Place the top yoke to one side and draw the steering stem down and out of the head, taking care not to lose the bearings, which will be released as the stem is withdrawn. There should be twenty 1/4 in. diameter steel balls in each race (see paras 55 and 56, for details on lubrication).

415. The two bearing cones differ slightly in size but the cups are identical. The lower cone can be prised off the column but, when fitting the replacement, care must be taken to see that the cone is seated squarely. For this purpose a length of heavy gauge steel tubing, long enough to clear the column and 1-1/4 in. in diameter is most useful for driving the cone on to its seating. The cups can be removed with the aid of the race removal tool. Slacken off the nut on the tool sufficient to allow the tool to be screwed into the cup, then tighten the nut until the tool is expanded tightly into the cup threads. Drive out the cup with a suitable bar from inside the head tube (as shown in Fig 76).

416. Remove the tool by loosening the nut and repeat the procedure for the other cup.



(a) Race removal tool

Fig 76 Removing the top cup

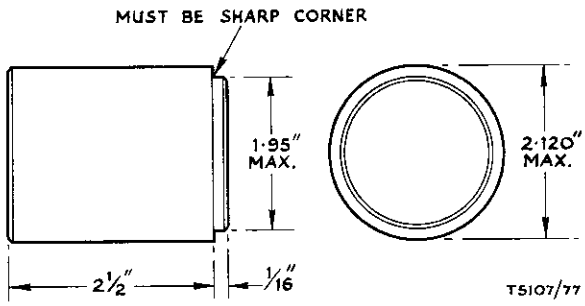
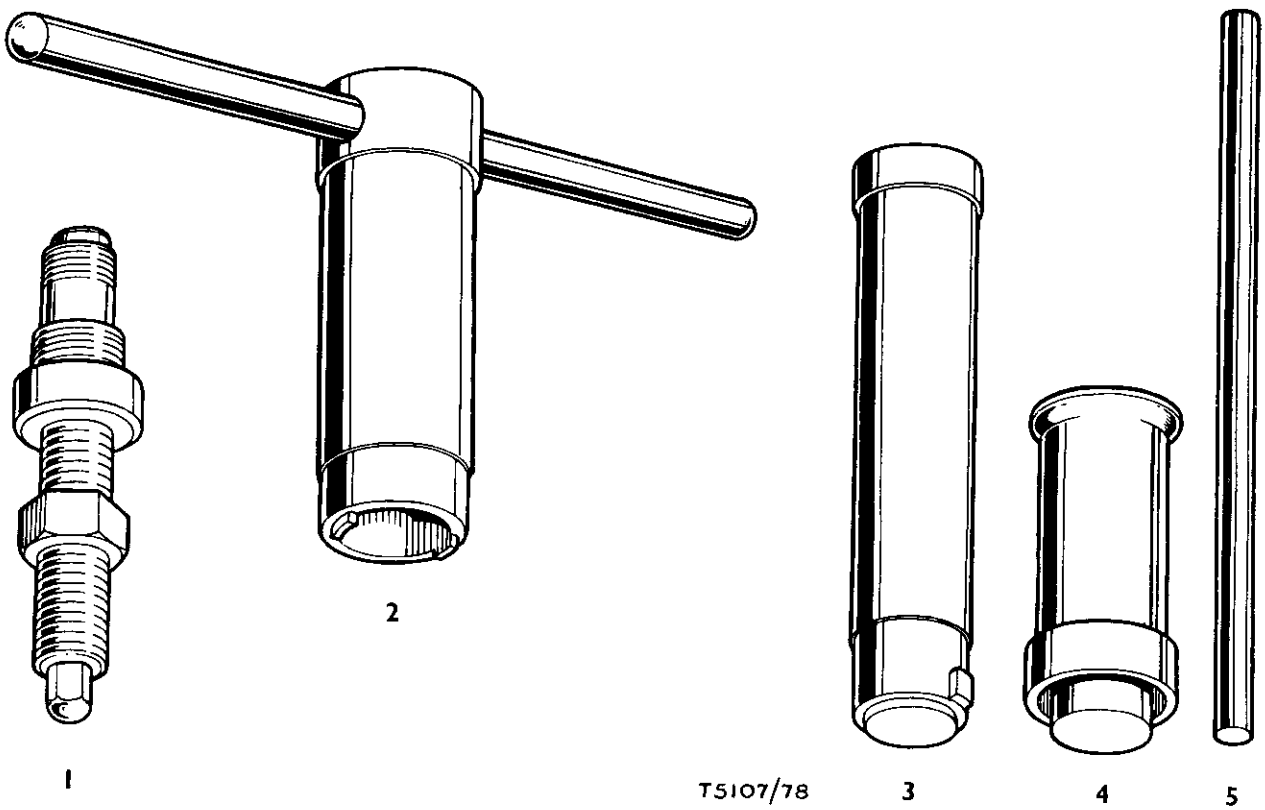


Fig 77 Cup drift

417. When fitting replacement cups, see that they enter their housings squarely. Do not drive the cup in with a drift against the radius of the ball race as this will impose undue strain and is liable to fracture the cup. If possible, use a piece of steel bar or tube having a diameter slightly less than that of the cup sides. A suitable drift would be as shown in Fig 77.



1 Fork leg removal and assembly tool
2 Fork oil seal holder removal tool
3 Fork oil seal extractor
4 Fork oil seal assembly tool
5 Fork damper rod recovery tool

Fig 78 Fork tools

418. After replacing the cups and bottom cone, grease the cups and assemble 20 balls into each cup. Slide the column back into the head, replace the top cone and dust cover then fit the top yoke. Screw on the cap-nut with the cable guide brackets and adjust the steering as quoted in paras 403 to 409.

419. Reassembly from this point is simply a reversal of the dismantling procedure.

REMOVING THE FORK LEGS

420. Before commencing work on the forks, it is advisable to have the following servicing tools (see Fig 78) and new parts available:-

(a) Oil seal (2)
(b) Top bush (2)
(c) Lower bush (2)
(d) Damper rod bush (2)

and a length of No.5 twine, approximately 15 in. long.

421. Remove the front wheel as described in paras 456 to 458 and then take off the front mudguard. Drain the oil from each fork leg (see para 60) and slacken off the clamp nuts in the bottom yoke. Slacken the top clip on the rubber bellows and withdraw from the outer sleeve.

422. Unscrew the fork leg cap and raise it sufficiently to enable the damper rod locknut (beneath the filler plug) to be loosened. The plug can then be unscrewed from the damper rod top and removed with the cable guide bracket. Screw the fork leg removal and assembly tool (minus the large nut and washer) into the top of the fork leg, take a firm grasp of the lower sliding member and strike the top of the service tool sharply with a mallet. This will release the leg from its taper fit in the top yoke, allowing the complete leg to be withdrawn.

423. Loosen the lower fixing clip and remove the rubber bellows. Note that a fibre washer and steel washer are fitted to the fork leg, directly below the bottom yoke. The fork outer sleeve is secured to the bottom yoke by the pinch bolts and need not be disturbed.

424. The fork springs can now be pulled out of the oil seal holder and checked for wear. If replacement springs are required, smear them with grease before fitting.

DISMANTLING THE FORK LEG

425. To assist in dismantling, hold the fork leg firmly in a soft-jawed vice at its wheel spindle lug. Slide the fork oil seal holder removal tool over the main tube and engage the dogs with the slots at the base of the oil seal holder. Whilst pressing down firmly on the tool, turn anti-clockwise to unscrew the holder.

426. Remove the tool and slide the holder upwards until it locks on the tapered section of the tube, but do not use force or the oil seal may be damaged.

427. The main tube assembly can now be withdrawn from the lower sliding member.

428. Grip the unground portion of the tube in a vice, using soft clamps, and unscrew the large nut at the base of the shaft, enabling the bushes, spacer and oil seal assembly to be withdrawn.

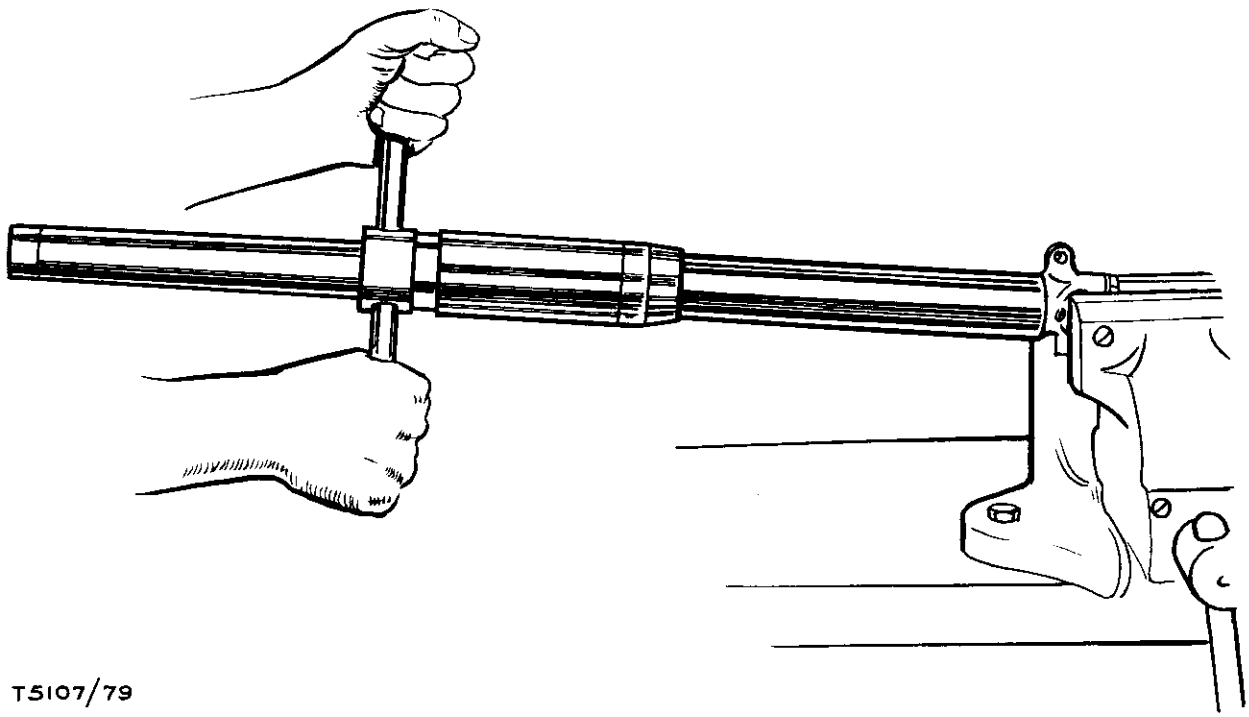


Fig 79 Removing the oil seal holder

429. The damper tube is retained in the lower sliding member at its base by one large "Allen" screw. After removing the "Allen" screw, take out the two circlips at the damper tube top releasing the damper rod with valve and bush. The damper valve assembly is secured to the damper rod by one nut (see Fig 80, for correct assembly).

430. The rubber sealing washer and special retainer, immediately below the damper rod top locknut need not be disturbed unless they require renewal.

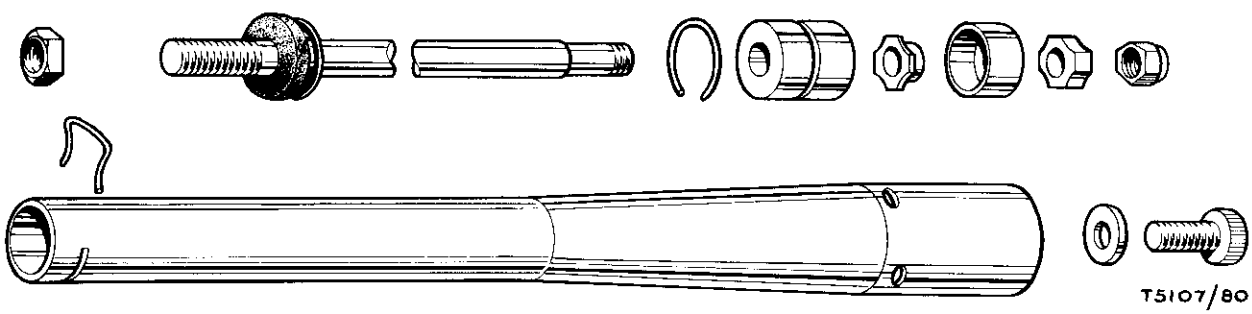


Fig 80 Damper valve assembly

OIL SEALS

431. If it is necessary to change an oil seal, place the lower edge of the holder on a wooden block and insert the fork oil seal extractor into the top of the holder. Give the tool a sharp blow with a hammer and the seal will be driven out.

432. To fit a replacement seal, coat the outside with a good jointing compound and, whilst still wet, enter the seal squarely into the holder with the open side upwards.

Drive the seal home with the fork oil seal assembly tool. Care must be taken to avoid damaging the feather edge of the oil seal and this should be greased before reassembly.

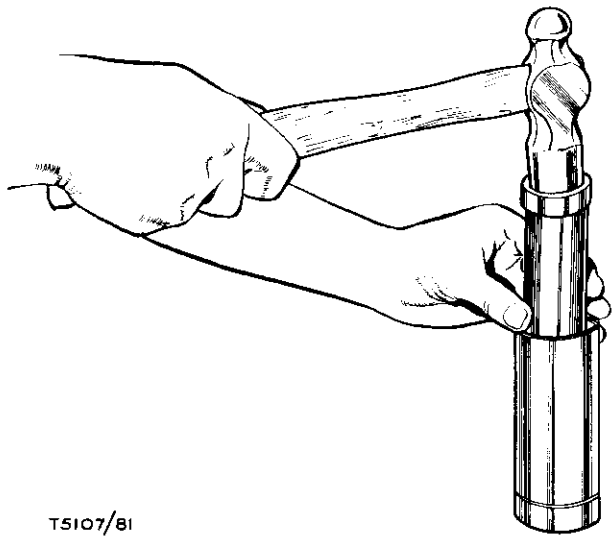


Fig 81 Removing the oil seal

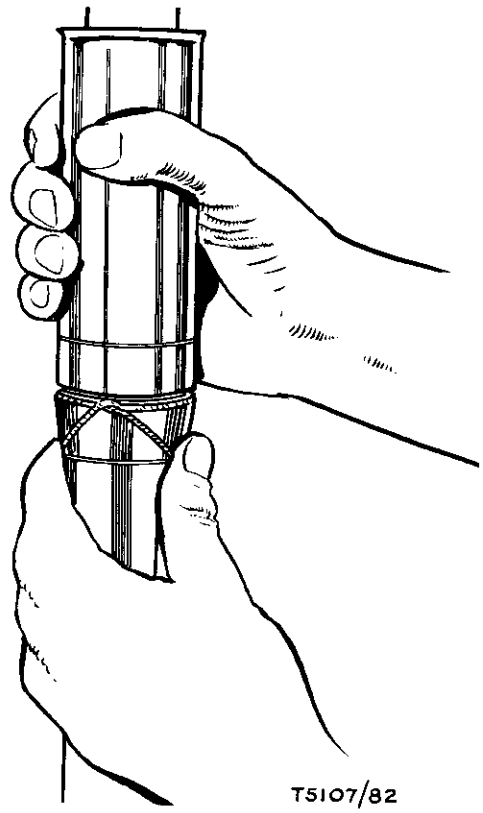


Fig 82 Using the twine

REBUILDING THE FORK LEG

433. Reassembly is carried out in the reverse order to the dismantling procedure. Cleanliness is essential and before attempting to reassemble, clean all the components thoroughly. It is advisable to also clean the workbench on which the forks will be rebuilt.

> **Note:** *During final assembly, screw down the oil seal holder on to one turn of twine round the groove at the end of the screw thread (see Fig 82). This will provide an additional oil seal.*

REPLACING THE FORK LEG

434. Fit the rubber bellows to the fork leg and secure with the lower fixing clip. Replace the steel washer and fibre washer over the fork leg to ensure a good seal below the bottom yoke. Screw the fork leg removal and assembly tool (minus the nut and collar) into the top of the fork leg and pass the assembly up through the two yokes. Fit the collar and nut, and tighten the latter until the leg is drawn firmly home into its taper. Tighten the clamp nuts in the bottom yoke before removing the tool.

435. Using the fork damper rod recovery tool, raise the damper rod to the top of the tube to enable the filler plug to be screwed on to the rod. Do not omit to fit the cable guide bracket to the plug first. Ensure that the rubber sealing washer and special retainer are correctly fitted directly below the damper rod locknut.

436. Repeat the operations on the other fork leg, refill with the correct amount of oil (1/3 pint to each leg), re-position the cable guide brackets and screw down the filler plugs firmly.

437. Final assembly is of course, simply a reversal of the procedure for dismantling but ensure that the fork leg clamp nuts are secure.

FORK ALIGNMENT

438. After replacing the forks legs, mudguard and wheel, it may be found that the fork is correctly aligned.

439. To rectify this, the front wheel spindle must first be screwed up tight into the right-hand leg and the pinch bolt in the left-hand leg slackened off. Also loosen the filler plugs and the clamp nuts in both the bottom and top yokes. The forks should now be pumped up and down several times to line them up and then tightened up from bottom to top, that is, wheel spindle, bottom yoke clamp nuts, filler plugs and finally, the steering stem clamp nut in the top yoke.

440. If, after this treatment, the forks still do not function satisfactorily then either the fork tubes are bent or one of the yokes are twisted.

441. The tubes can only be accurately checked for straightness with special equipment such as knife-edged rollers and dial gauges. Special gauges are also required to check the yokes. It is possible, however, to make a reasonable check of the tubes by rolling them on a good flat surface such as a piece of plate glass, but it is not a simple operation to straighten a bent tube. It is far better to obtain a replacement unit.

442. If the tube is obviously bent but not kinked, then it may be possible to carry out a reasonable repair with a little patience and care. Find the highest point on the bend, then with wooden blocks supporting each end, give the tube a sharp blow with a soft mallet and recheck. If a hammer is to be used, remember to protect the tube with a piece of wood. The measure of success will of course depend on the extent of the damage and the skill of the operator.

443. This job is vastly improved upon and simplified if a suitable press is available to the repairer. The damper rods and tubes should now be checked in a similar manner.

444. Having checked the tubes for straightness and reset as necessary, the top and bottom yokes can now be checked. First, assemble the two tubes into the bottom yoke so that a straight edge across the lower ends is touching all four edges of the tubes, then tighten the pinch bolts. Now view them from the side; the two tubes should be quite parallel. Alternatively, the lower 12 in. of the tubes can be placed on a surface plate, when there should be no rocking.

445. If the tubes are not parallel, as in Fig 83, then it will be necessary to reset the yoke, providing the error is not excessive.

446. To reset, hold one tube in a vice on the unground portion (using soft clamps) and re-position the other tube, using a longer and larger diameter tube to obtain sufficient leverage. Having checked the tubes this way, check the gap between them on the ground portion.

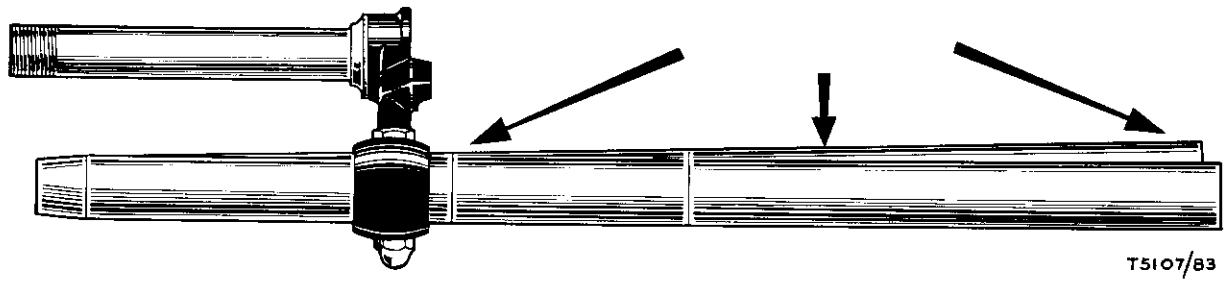


Fig 83 Twisted bottom yoke

447. The next step is to place the top yoke in position over the tubes, when the steering column should be quite central. Fig 84 shows a bent steering column.

448. The final step is to check if the tubes are parallel when assembled into the top yoke only. In this case the bottom yoke can be fitted loosely on the tubes, acting as a pilot only.

449. Though it is permissible to rectify slight errors in alignment by resetting, it is much safer to replace the part affected especially when there is excessive malalignment.

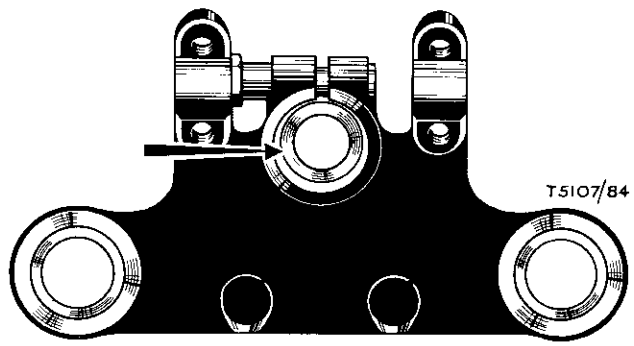


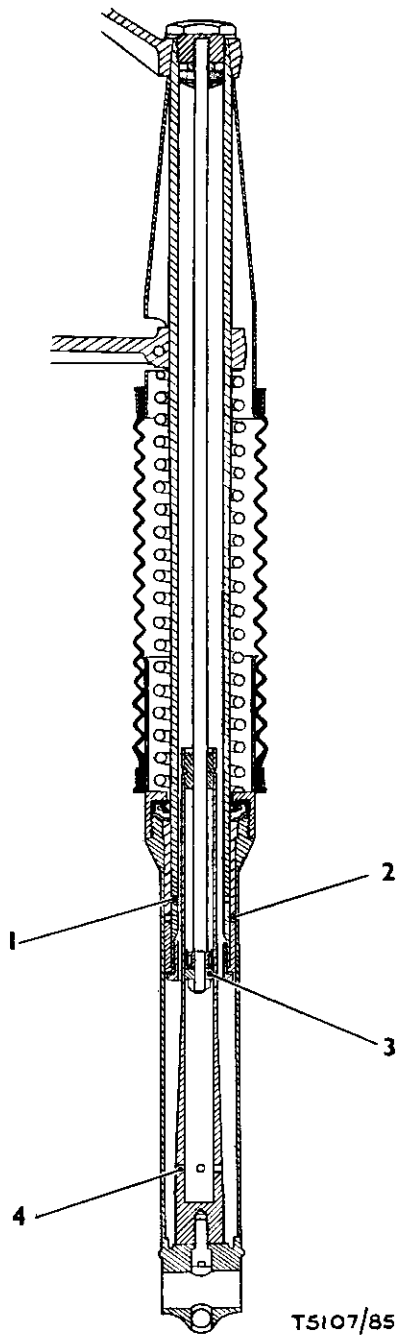
Fig 84 Bent steering column

HYDRAULIC DAMPING

450. Fig 85 shows a sectional view of a front fork leg extended. Note the four 3/32 in. diameter bleed holes in the main tube and the transfer holes at the base of the damper tube.

451. When the forks are compressed, a double damping action takes place within each fork leg. As the fork leg rises, oil in the damper tube is compressed by the valve and is forced through the transfer holes, into the main tube. At the same time, the oil in the main tube is also being compressed and is forced upwards between the outside of the damper tube and the top tube bush. The pressure of the oil increases as the gap narrows around the tapered damper tube, progressively slowing the fork spring action.

452. When the top tube begins to fill with oil which can no longer be compressed, the oil passes through the bleed holes and into the area between the fork leg and top tube bushes. Eventually the point of maximum compression is reached and is cushioned by the remaining oil in the main reservoir.



1 Bleed holes

2 Gap between bushes

3 Damper valve

4 Transfer holes

Fig 85 Front fork (leg extended)

453. As the fork leg begins to extend again, the oil in the area between the two fork bushes is compressed and forced through the four bleed holes, back into the main tube.

454. The damper valve, as it rises, creates a vacuum and draws oil into the damper tube, via the transfer holes, thus providing a smooth cushioned motion.

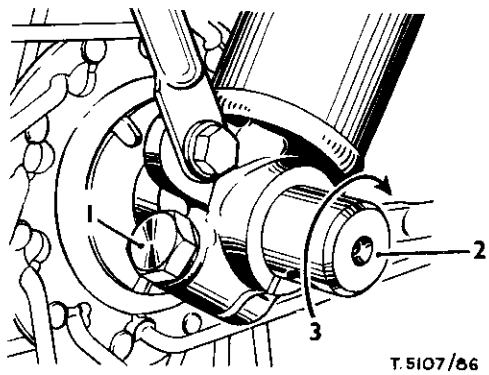
455. It will be seen therefore, that each leg should contain the same amount of oil (1/3 pint) to provide uniform damping.

WHEELS, BRAKES AND TYRES

FRONT WHEEL

Removal

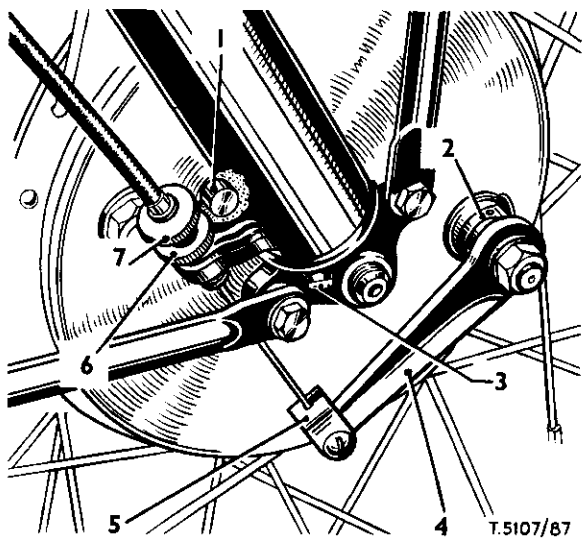
456. First, place a box or small wooden trestle underneath the crankcase to raise the front wheel clear of the ground. Screw in the brake adjuster completely and disconnect the front brake cable by unscrewing the nut and bolt holding the toggle to the brake plate lever. Having released the cable toggle, unscrew and remove the cable adjuster with cable (see Fig 87).



1 Pinch bolt
2 Spindle head
3 Unscrew clockwise

Fig 86 Front wheel pinch bolt

457. Slacken off the pinch bolt at the bottom of the left-hand fork leg, insert a stout tommy-bar through the hole in the wheel spindle head and unscrew it from the hub. Note that the spindle has a left-hand thread and unscrews by turning in a clockwise direction.



1 Brake plate stop
2 Lubricator clip
3 Fork drain plug
4 Brake plate lever
5 Slotted clevis
6 Finger locknut
7 Cable adjuster

Fig 87 Front brake drum

458. Support the wheel as the spindle is withdrawn and when free, the wheel can be pulled away from the right-hand fork leg and withdrawn from the machine. Do not allow the wheel to fall on to the bush which projects from the brake drum side of the hub. Although the bush is firmly pressed in, it may, if subjected to a sharp blow, be forced into the hub. Should this occur, however, the bush can be retrieved and re-positioned with the aid of the wheel spindle.

Replacement

459. Insert the wheel between the fork legs and screw in the spindle in an anti-clockwise direction, until it is almost tight. Locate the brake plate anchor peg in the recess on the inside of the right-hand fork leg and tighten the wheel spindle fully.

460. Before locking the spindle with the pinch bolt depress the forks once or twice to enable the left-hand fork end to position itself on the spindle. It is most important that this precaution is observed, otherwise the fork leg may be clipped out of position and will not function correctly.

461. Finally, tighten the pinch bolt and reconnect the brake cable. For details on brake adjustments see paras 498 to 504.

Brake cam

462. Lubrication of the cam spindle is made via an oil hole in the cam boss (see Fig 89). Move aside the spring clip to expose the hole and apply just sufficient oil to ensure that the cam can be operated easily.

463. Avoid over-lubricating as the oil may reach the brake linings and affect the braking performance.

Brake shoes

464. The brake plate is a push-fit on the bush (1) see Fig 88. The brake shoes can be removed by levering them outwards and upwards off the cam and fulcrum pin. It is also possible to remove the brake shoes complete with springs, cam and fulcrum pin after first unscrewing the nuts on the outside of the plate. The springs are very strong; take care not to trap the fingers behind the shoes.

465. The brake shoes are of the conventional type (not floating) and new ones can be fitted either side. Avoid interchanging part-worn shoes.

466. A hole is provided in the base of the brake plate to enable any water in the drum to drain away quickly. Check that it is not blocked with dirt or mud.

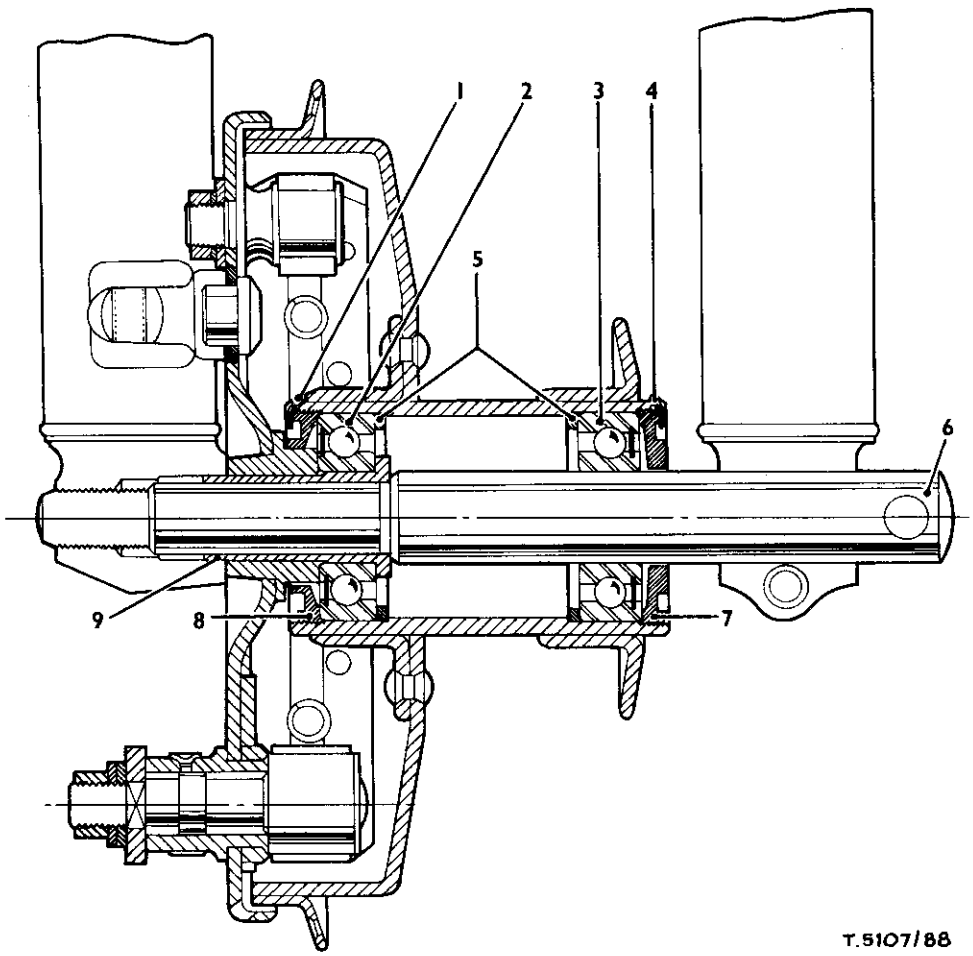
467. If the brake linings require replacement, the notes on relining the shoes (para 510) may be of some assistance.

Checking the bearings

468. Pull off the brake coverplate and remove the split pins at each side of the hub (see Fig 90). Unscrew the bearing retainers (which have normal right-hand threads) using the peg spanner.

469. Replace the wheel spindle and drive out the brake side bearing together with the bush (Fig 88(9)) by gently tapping the spindle head with a hide-mallet. If a suitable mallet is not available, protect the spindle head with a piece of hard-wood before striking.

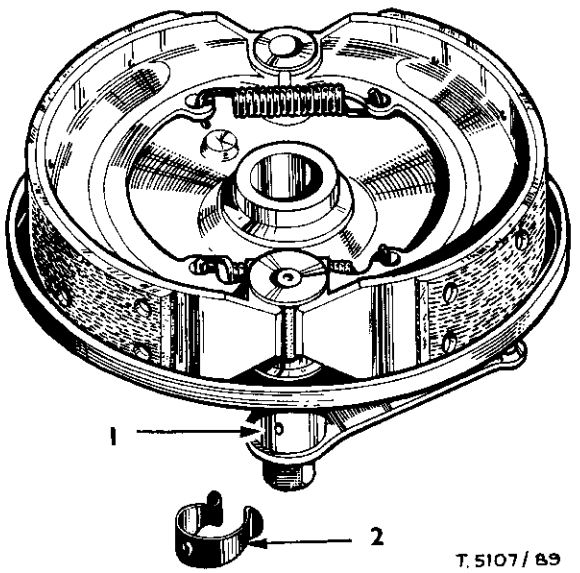
470. By inserting the spindle and bush from the right-hand side, it will be possible to drive out the left-hand bearing. Both bearings are the same size and are therefore interchangeable.



T.5107/88

1 Split pin
2 Wheel bearing
3 Wheel bearing
4 Split pin
5 Thrust washers
6 Wheel spindle
7 Bearing retainer
8 Bearing retainer
9 Bush

Fig 88 Section of front hub



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1 Oil hole

2 Clip

Fig 89 Front brake shoes and backplate

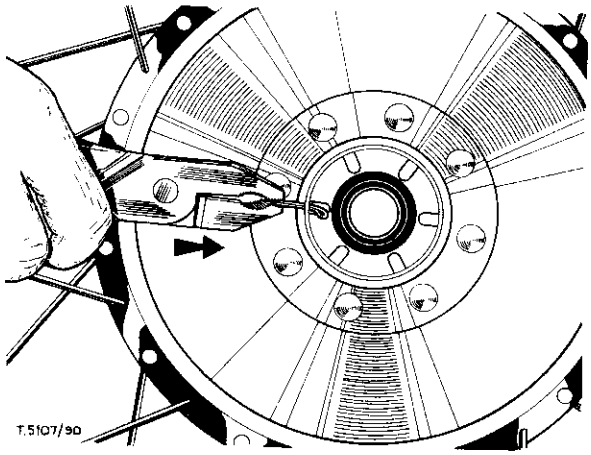


Fig 90 Removing the split pin

471. To examine the bearings, wash thoroughly in paraffin and blow out with a high-pressure air line if possible. Examine carefully for signs of roughness, indicating broken balls or damaged tracks, or excessive play.

Fitting new bearings

472. Ensure that the steel thrust washers (Fig 88(5)) are correctly located in the hub shell and fit the right-hand bearing with the oil seal outwards. It is essential that the bearings are pressed in absolutely square to the housing and the force applied must be on the outer ring, not on the inner ring.

473. Screw in the bearing retainer using the peg spanner and secure with the split pin. Insert the bush (9) and then the wheel spindle (6) (threaded end first) into the bearing from the left-hand side and tap the spindle gently home until the shoulder of the bush rests on the inner ring of the bearing.

474. Apply a liberal coating of grease on to the inner face of each bearing. Place the left-hand bearing over the spindle (with oil seal outwards) and drive it into the housing. Finally, replace the bearing retainer and split pin.

REAR WHEEL

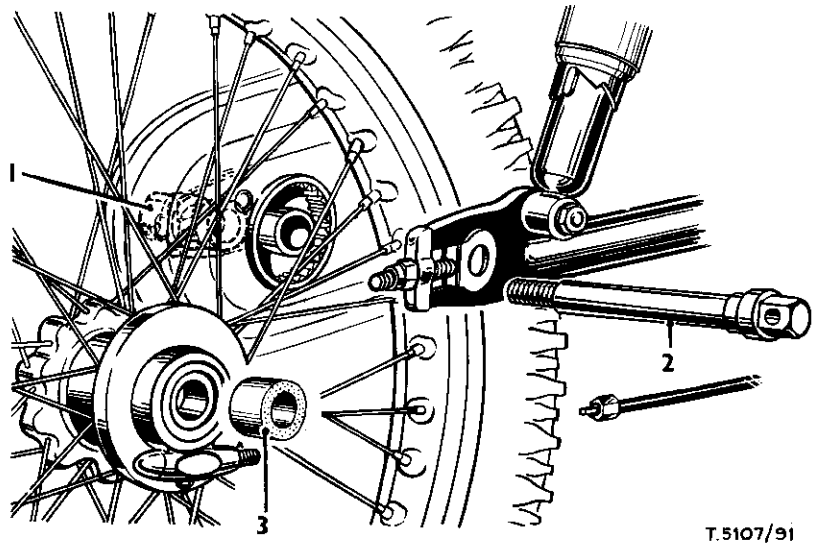
Removal and replacement

475. Removal of the rear wheel does not affect the chain or brake adjustments.

476. Disconnect the speedometer drive cable at the hub then unscrew and withdraw the wheel spindle (Fig 91(2)), using a suitable steel bar through the head. It has a normal right-hand thread and is therefore unscrewed in an anti-clockwise direction.

477. The outer collar (3) should fall clear on removal of the spindle and the wheel can then be pulled away from the brake drum and withdrawn from the machine.

478. The speedometer drive unit can now be pulled away from the hub. It will not be necessary to disturb the wheel nut (1) on the left-hand side, as this retains the brake drum assembly.



1 Wheel nut
2 Wheel spindle
3 Collar

Fig 91 Removal of rear wheel

479. Replace in the reverse manner but do not omit to refit the spindle outer collar.

Hub bearings

480. The hub is fitted with two identical single-seal bearings which are a light press-fit on to the hollow spindle in the hub shell. The brake drum bearing is the same size as the hub bearings, but has a double oil seal.

481. Unscrew the bearing retainer on the left-hand side; this has a left-hand thread and is unscrewed in a clockwise direction.

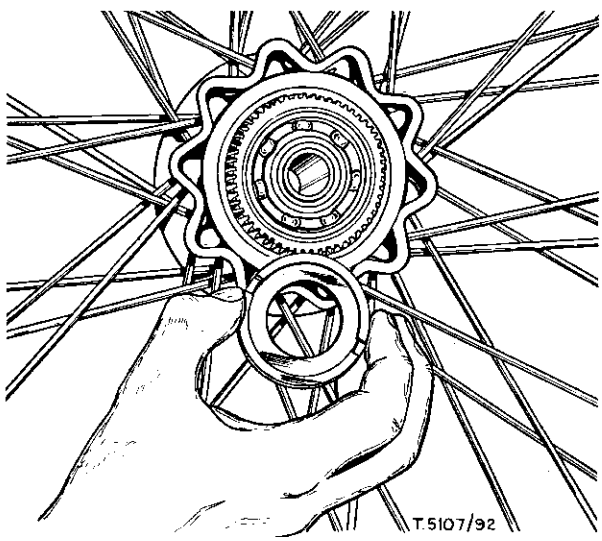


Fig 92 Bearing retainer

482. Using a drift slightly under .875 in. diameter, drive out the hollow spindle from the left-hand side, releasing the right-hand bearing, inner collar and the hub end cover from the right-hand side. Note position of the felt washer and its retaining rings.

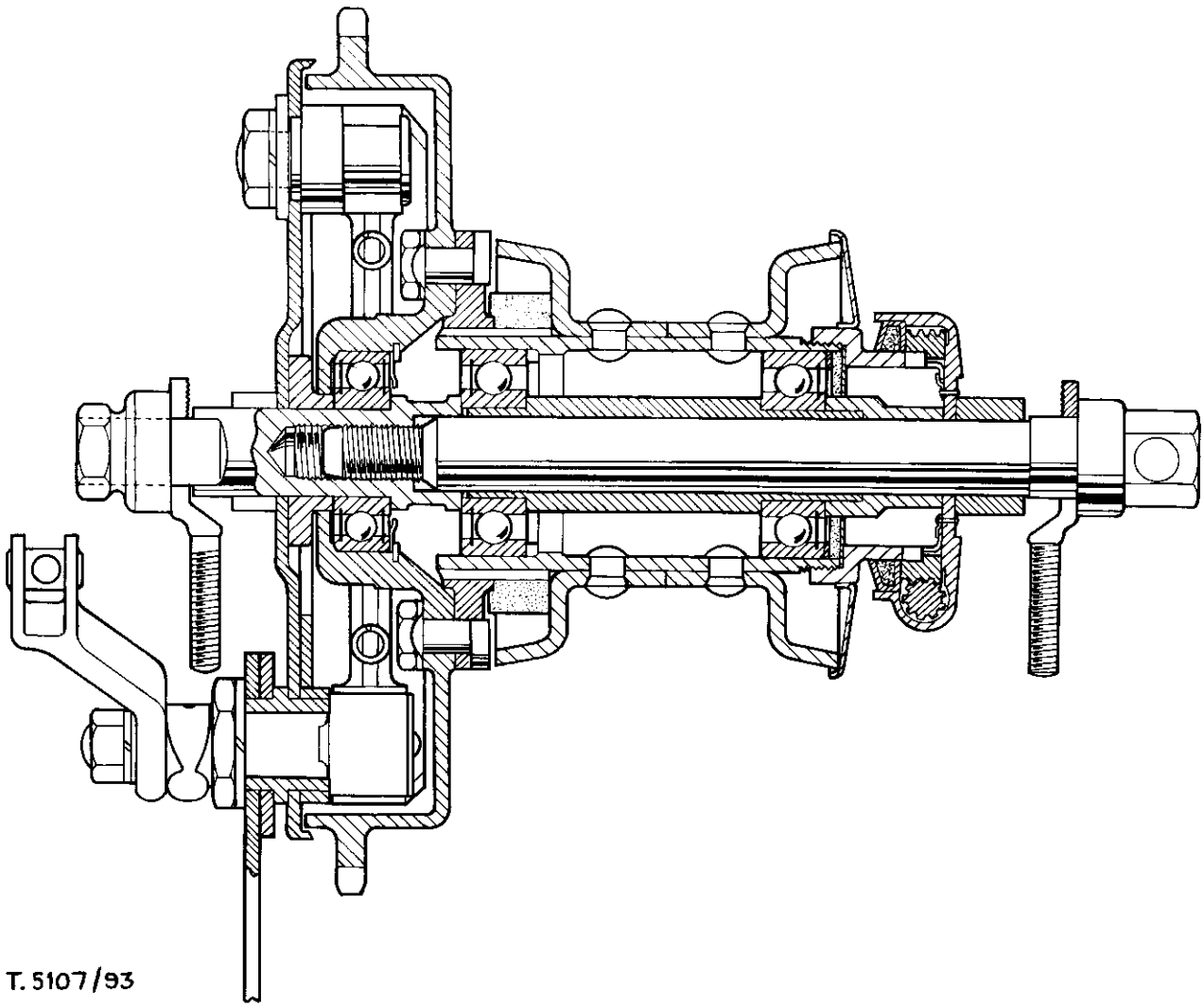


Fig 93 Section of rear hub

483. The left-hand bearing and its thrust washer can now be driven out from the right-hand side. The rubber oil seal for the left-hand bearing need not be disturbed and may be left in the hub.

484. To examine the bearings, wash thoroughly in paraffin and if possible, blow out with a high pressure air line. Examine each bearing carefully for signs of roughness indicating broken balls or damaged tracks, or excessive play.

485. Reassembly of the hub is simply the reverse of the dismantling procedure but, when pressing the bearings in, apply pressure only to the outside ring of the bearing and ensure that the retainer on the left-hand side is quite tight. Note that the hollow spindle is fitted with the short end on the left-hand side and also that the bearings are fitted with their oil seals outwards.

Brake drum and bearing

486. The brake drum is retained in the rear fork end by the spindle nut and the bolt securing the brake anchor strap (link) and chaincase bracket to the swinging arm lug.

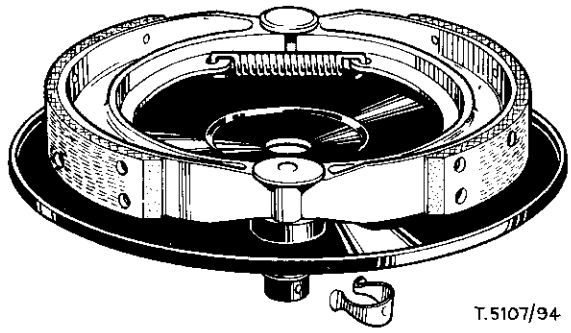


Fig 94 Rear brake shoes and backplate

487. To remove the drum, first take off the chaincase rear section, as detailed in para 336. Disconnect the rear chain at its spring link and unscrew the brake rod adjusting sleeve. Take off the spindle nut (the anchor strap (link) fixing bolt will have been removed with the chaincase) and withdraw the complete brake drum assembly.

488. Take off the outer collar and lift the brake plate, complete with brake shoes and springs, off the spindle.

489. There is no need to disturb the cam spindle unless it is to be replaced, in which case the position of the brake lever should be noted to assist in reassembly.

490. The brake shoes and springs can be removed in the usual way. Take off the left-hand inner collar, which is a push-fit into the hub.

491. To remove the bearing, first drive out the spindle from the left-hand side and release the bearing circlip with shim. The bearing can now be driven out from the front of the drum using a suitable drift.

492. Reassembly is the reverse of the dismantling procedure but, do not omit to replace the shim under the bearing circlip so that it seats on the outer ring of the bearing, not the inner ring. It should not be necessary to disturb the driving flange unless it is known to be worn and is being replaced.

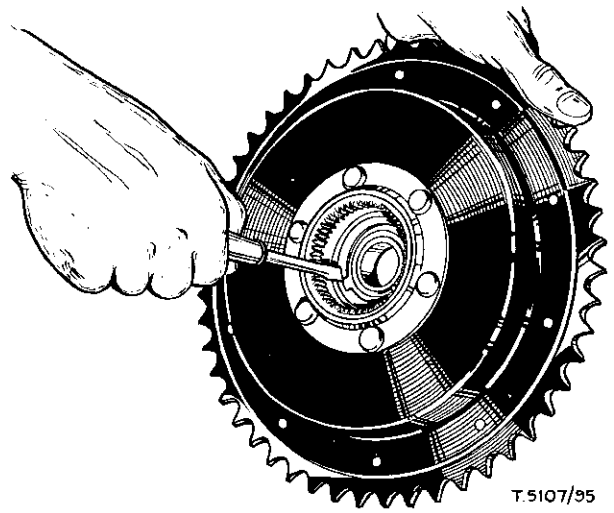


Fig 95 Releasing the bearing circlip

493. To remove the flange, flatten the locking plates, unscrew the six bolts and withdraw.

494. When fitting the new flange, see that it enters the drum squarely and that the mating surfaces are clean. Replace the six bolts and, after tightening the nuts evenly, turn the edges of the locking plates over.

495. If the chainwheel teeth are hooked or the inside of the brake drum is badly scored, then the unit must be replaced.

Brake drum replacement

496. See that the spindle is pressed well into the bearing and replace the cover plate complete with brakes, shoes etc. Fit the outer collar and place the assembly into the fork end. If the chain adjuster was taken out, replace it and screw on the spindle nut. If the chain tension was correct, there will be no need to make any adjustment now. Do not tighten the spindle nut until the wheel has been replaced, so that the alignment can be made for the complete assembly (see paras 535 to 538).

497. See that the bolt securing the brake anchor strap and chaincase to the bracket on the swinging arm lug, is tightened securely.

BRAKE ADJUSTMENTS

498. The brakes must be adjusted to give maximum efficiency at all times and for this to be maintained, the shoes should be just clear of the drum when the brake is off, and close enough for immediate contact when the brake is applied. The brakes must not be adjusted so closely, however, that they are in continual contact with the drum; excessive heat may be generated, resulting in deterioration of braking efficiency.

499. The front brake adjuster is situated on the lower fork leg and rotation of the screwed sleeve alters the effective length of the cable, so adjusting the position of the shoes in the drum. The locknut should be tightened after adjustment. A self-locking cable adjuster is also provided at the handlebar lever.

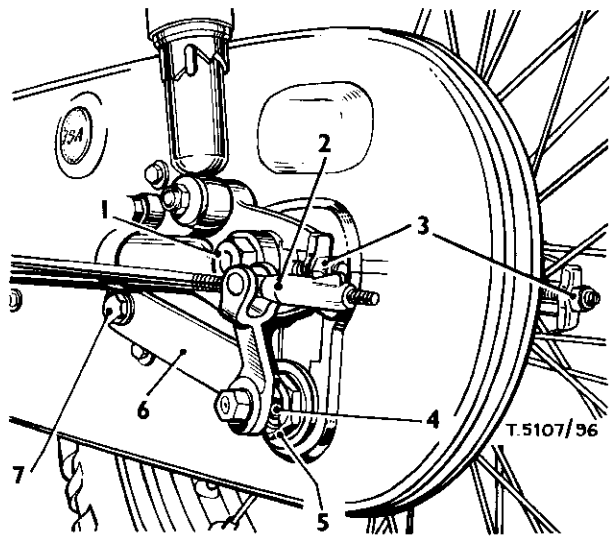
500. The rear brake is adjusted by turning the self-locking sleeve in a clockwise direction (viewed from the rear of the machine), to shorten the effective length of the brake rod and so open the shoes in the drum. A small adjuster bolt and locknut is provided on the brake pedal to allow the pedal movement to be varied according to the riders requirements.

501. Note that if maximum efficiency is to be obtained, the angle between the brake cable or rod and the operating lever on the brake plate should not exceed 90° when the brake is fully applied.

502. Both front and rear brake operating levers have serrated cam holes, enabling them to be removed and replaced in a new position to give finer brake adjustment.

503. When new brake shoes have been fitted or if, during dismantling of the wheel, the fulcrum pin was disturbed, the shoes must be centralised within the drum.

504. To do this, slacken the fulcrum pin nut and operate the brake cam so as to open the brake shoes. The fulcrum pin will then position itself in the housing until



1 Spindle nut
2 Brake adjuster
3 Chain adjuster nuts
4 Lubrication clip
5 Link nut
6 Link
7 Link bolt

Fig 96 Rear chain adjustment

both shoes are pressing equally on to the drum. Tighten the fulcrum pin nut firmly and release the brake.

REAR CHAIN ADJUSTMENT

505. The rear chain must be adjusted when the wheel is at the lowest point of the suspension travel (when the wheel is raised clear of the ground).

506. Rotate the wheel slowly until the tightest point on the chain is found, then check its up and down movement in the centre of the chain run. This can be checked through the aperture in the upper half of the chaincase when the rubber plug is removed. The total movement should be between $1\frac{1}{8}$-$1\frac{1}{4}$ in. and if it varies from this setting, the chain must be adjusted by moving the rear wheel either forwards, to increase slackness or backwards, to reduce slackness. As chains invariably stretch periodical inspection and adjustment is essential.

507. To adjust the chain, first slacken the wheel spindle nuts, the anchor strap (link) fixing bolt and large nut, then the brake rod adjusting sleeve. Tighten both chain adjuster nuts evenly until the correct chain setting is obtained.

508. After adjustment, tighten the wheel spindle nuts and anchor strap (link) bolt and nut, re-check the setting of the chain and adjust the rear brake.

509. It is advisable to check the wheel alignment after any adjustment to the rear chain has been made; full details of this are given on page 106.

RENEWING BRAKE LININGS

510. Hold the shoe firmly in a vice and, using a good sharp chisel, cut off the peened-over portion of the rivet (Fig 97).

511. Drive out the rivets with a suitable pin punch and discard the old lining. Reverse the shoe in the vice and draw-file the face of the shoe to remove any burrs.

512. Clamp the new lining tightly over the shoe and, using the shoe holes as a jig, drill straight through the lining with a 5/32 in. diameter drill.

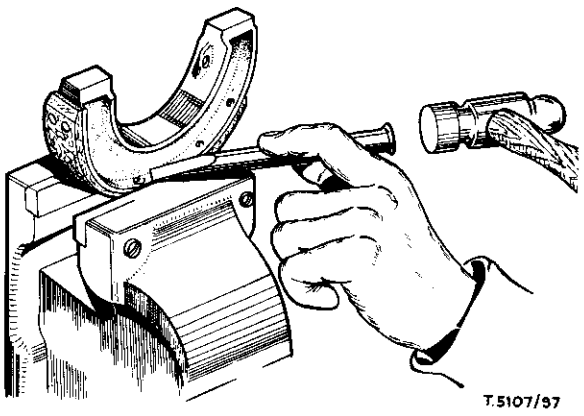


Fig 97 Removing brake linings

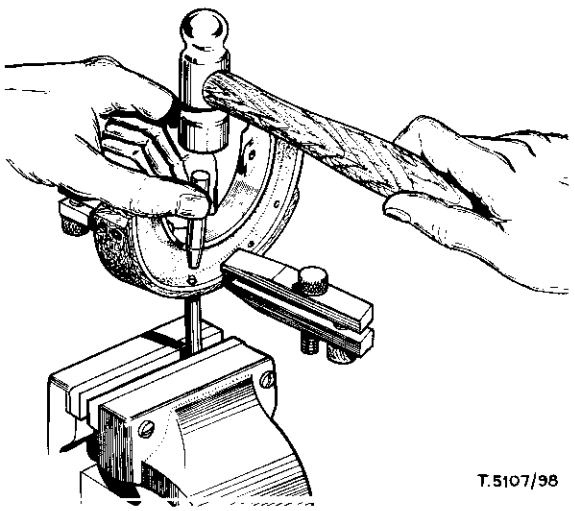


Fig 98 Renewing brake linings

513. Remove the clamps and, holding the lining carefully in the vice, counterbore or countersink (according to the type of rivet used) each hole to no more than two-thirds the thickness of the lining, i.e., if the lining is 3/16 in. thick, then the counterbore must not be deeper than 1/8 in.

514. Having prepared the linings for riveting, start at the centre and position the lining with one or more rivets.

515. Place a suitable mandrel in the vice, clamp the linings to the shoes with either small "G" or toolmakers clamps and peen-over the rivets as shown in Fig 98, working alternatively outwards from the centre.

516. The mandrel used in the vice must be flat on the end and the diameter should be no more than that of the rivet head. It will also help to bed the rivet down if a hollow punch is used before peening.

517. If the clamps are used correctly, that is, next to the rivet being worked on, the linings can be fitted tightly to the shoe. If the linings are fitted incorrectly, a gap will occur between the lining and the shoe, resulting in inefficient and "spongy" braking.

518. When the riveting is completed, file a good chamfer at each end of the lining to approximately half its depth and lightly draw-file the face of the lining to remove any fraze caused by the drilling.

WHEEL BUILDING

519. This is a job which is best left to the specialist as it is essential that the wheel is laced correctly and that when truing, the spokes are correctly tensioned.

520. It is however, possible to avoid trouble by periodically examining the wheels. As spokes and nipples bed down the tension will be lost and unless this is corrected the spokes will chafe and ultimately break.

521. Periodically test the tension either by "ringing", that is striking with a metal tool or by placing the fingers and thumb of one hand over two spokes at a time and pressing them together. If tension has been lost there will be no ringing tone and the spokes will move freely across each other.

522. When a spoke needs tensioning, the nipple through the rim must be screwed further on to the spoke but at the same time, the truth of the wheel must be checked and it may be necessary to ease the tension at another part of the wheel in order to maintain its truth. It will therefore be obvious that spoke replacement, spoke tensioning or wheel truing are not operations to be treated lightly.

523. Careful examination of the wheel will show that for every spoke there is another pulling in the opposite direction and that the adjacent spoke goes to the opposite side of the hub.

524. With a little care and patience it is possible for the unskilled to at least re-tension the spokes but, turn each nipple only a little at a time as, once the spoke is under tension only a fraction of a turn is sometimes sufficient to throw the rim badly out of truth.

SECURITY BOLTS

525. Sometimes, particularly if a tyre is under-inflated, it will creep around the rim taking the tube with it.

526. If this is not stopped, it will ultimately pull the valve from the tube. Therefore, the wheel rims are fitted with security bolts; one on the front wheel and two on the rear.

527. Before attempting to remove or replace a tyre, the security bolts must be completely loose.

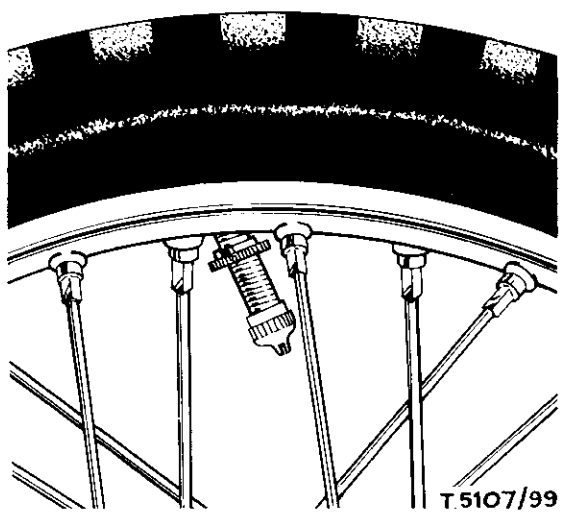


Fig 99 Tyre creep

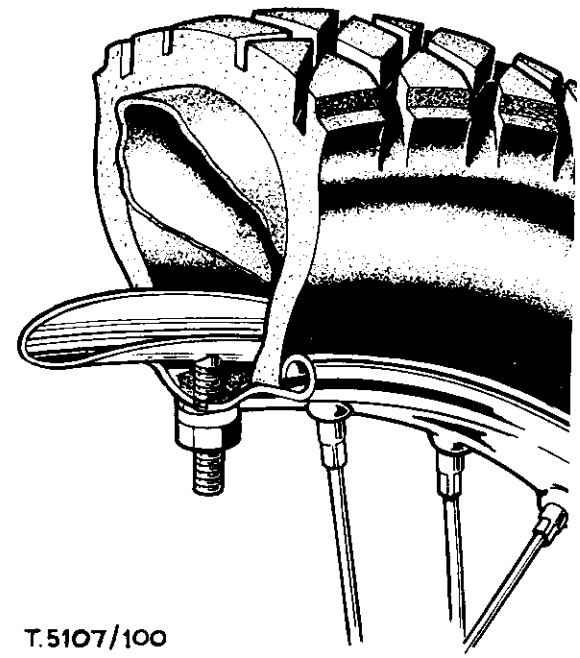


Fig 100 Security bolt

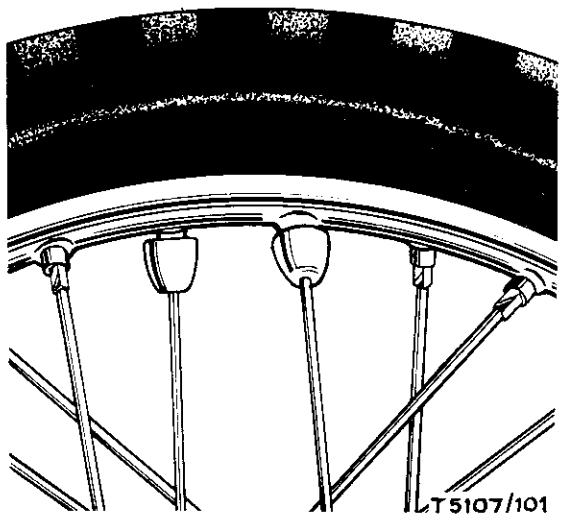


Fig 101 Balance weights

WHEEL BALANCING

528. All machines are issued with balanced wheels but, if the balance weights are removed or if the machine is being prepared for officially sanctioned competition work, the following notes on wheel balancing will be found most useful.

529. When a wheel is out of balance it means that there is more weight in one part than in another. This is very often due to variation in the tyre and at moderate speeds will not be noticed but at high speeds it can be very serious, particularly if the front wheel is affected.

530. Before starting, ensure that the wheel is absolutely free and revolves quite easily. If the rear wheel is being treated remove the driving chain.

531. With the wheel clear of the ground spin it slowly and allow it to stop on its own. Now mark the top of the wheel or tyre and repeat two or three times to check.

532. If the wheel stops in the same place the extra weight must be added at the marked spot.

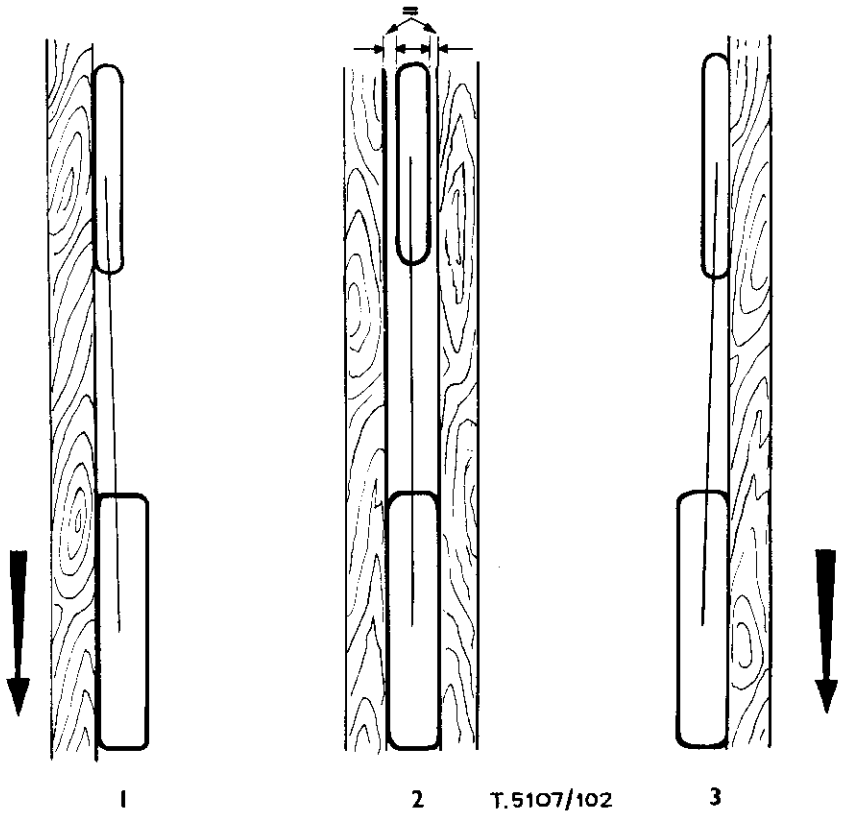
533. The next step is to ascertain how much weight is to be added, this can be done by sticking small pieces of plasticine to the nipples and recheck until the wheel will stop in any position without moving.

534. Having ascertained how much weight is required, a balance weight of exactly the same amount must be attached to the spokes at the spot originally marked.

WHEEL ALIGNMENT

535. Steering will be affected if the wheels are the slightest bit out of alignment (out of track).

536. Since the front wheel cannot be adjusted in this respect, it is the rear wheel which must be aligned to the front wheel. The adjustment will be necessary whenever the chain is adjusted or the wheel removed. It is also necessary to adjust the rear brake whenever re-alignment has been carried out.



1 Alignment incorrect
2 Alignment correct
3 Alignment incorrect

Fig 102 Checking wheel alignment

537. To check the alignment of the wheels a straight-edge of timber or steel is required approximately 80 in. long.

538. The straight-edge should be laid on blocks four to six inches high (alternately) each side of the machine.

539. As the front tyre is of smaller section then it should be as Fig 102(2).

540. If the alignment is as either (1) or (2) then the rear chain adjusters must be moved as indicated by the arrows to correct the alignment.

541. Assuming that the chain adjustment is correct the movement of the rear wheel will be made on the right-hand side chain adjuster which should be screwed in or out as necessary after the spindle nuts have been slackened off.

542. A machine suffering accidental damage may have wheels so out of alignment that they cannot be corrected in this way. Frame, fork or wheel geometry may be basically upset, in these cases a specialist workshop can probably reset any offending assembly.

TYRE PRESSURES

Note: *For full details of recommended tyre inflation pressures, refer to the Servicing Schedule.*

ELECTRICAL SYSTEM

INTRODUCTION

543. The electrical system is supplied from an encapsulated generator, model RM.19, contained in the primary chaincase and driven from the engine shaft. The generator gives "maximum" output with the lighting switch in all positions, the coils being permanently connected across the rectifier. Excessive charge is absorbed by the Zener Diode which is connected in parallel with the battery.

544. The current supplied to the ignition system is controlled by a contact breaker, driven direct from the camshaft.

545. Routine maintenance needed by the various components is detailed in the following sections. Whilst checking the electrical system, opportunity should be taken to ensure that all wiring connections and frame earthing points are clean and secure.

ALTERNATOR

546. The alternator consists of a spigot-mounted 6-coil laminated stator (encapsulated) and a rotor, carried on and driven by the left-hand engine shaft.

547. The rotor has an hexagonal steel core, each face of which carries a high-energy permanent magnet keyed to a laminated pole tip. The pole tips are riveted circumferentially to aluminium side plates, the assembly being cast in aluminium and machined to give a smooth external finish.

548. There are no rotating windings, commutator brushgear, bearings or oil seals and consequently the alternator requires no maintenance apart from occasionally checking that the snap connectors in the output cables are clean and tight.

549. If rotor removal is necessary, there is no need to fit magnetic keepers to the rotor poles. When removed, wipe off any swarf which may have been attracted to the pole tips and put the rotor in a clean place until required for refitting.

BATTERY INSPECTION AND MAINTENANCE

Description

550. The container for the model PUZ5A battery is moulded in transparent material through which the acid can be seen. The tops of the containers are so designed that when the covers are in position, the special anti-spill filler plugs are sealed in a common venting chamber. Gas from the filler plugs leaves this chamber through a vent pipe. Polythene tubing is attached to the vent pipe to lead the corrosive fumes away from any parts of the machine where they might cause damage.

Charging the battery

551. Whilst the battery leaves the factory in the fully "dry-charged" condition, it may slowly lose some charge in storage. In view of this, the following filling instructions must be carefully observed:-

552. With the acid, battery and room temperature between 60°F, and 100°F. (15.5-37.7°C), remove the vent plugs and fill each cell to the coloured marker line.

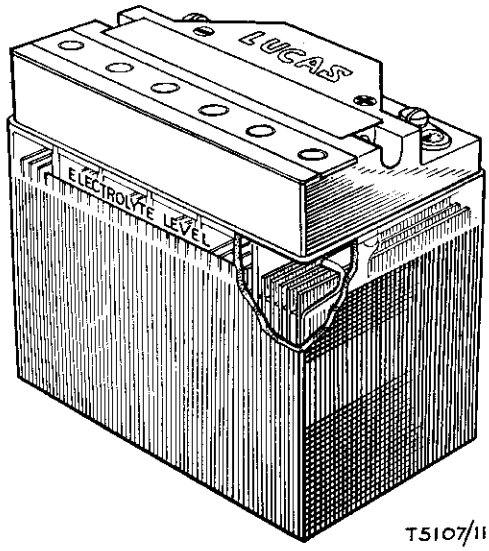


Fig 103 Battery (type PUZ5A)

553. Measure the temperature and specific gravity of the electrolyte in each of the cells.

554. Allow to stand for 20 minutes and then re-check the temperature and specific gravity of the electrolyte in each cell.

555. The battery is then ready for service unless the above checks show the electrolyte temperature to have risen by more than 10°F. (5.5°C) or the specific gravity to have fallen by more than 10 "points", i.e. by more than 0.010 specific gravity. In this event, it will be necessary to recharge the battery at the appropriate charge rate (0.7 amperes) until the specific gravity values remain constant for three successive hourly readings and all cells are gassing freely.

556. During charging, keep the electrolyte in each cell level with the coloured marker line by adding distilled water - not acid.

Routine maintenance

557. Every 1,000 miles (1,600 km) or monthly, or more regularly in hot climates the battery should be cleaned as follows:-

558. Remove the battery cover and clean the battery top. Examine the terminals: if they are corroded scrape them clean and smear them with a film of petroleum jelly, or with a silicone grease.

559. The level of the electrolyte in each cell should be checked weekly or every 250 miles. Lift the battery out of the carrier so that the coloured filling line can be seen. Add distilled water until the electrolyte level reaches this line.

Note: *On no account should the battery be topped-up above the coloured line.*

560. With this type of battery, the acid can only be reached by a miniature hydrometer, which would indicate the state of charge.

561. Great care should be taken when carrying out these operations not to spill any acid or allow a naked flame near the electrolyte. The mixture of oxygen and hydrogen given off by a battery on charge, and to a lesser extent when standing idle, can be dangerously explosive.

562. The readings obtained from the battery electrolyte should be compared with those given in Table 1.

563. A lead-acid battery slowly loses its charge whilst standing - the rate of loss being greater in hot climates. If a battery is not being used, it is important to give it freshening charges at the appropriate recharge rate. These should be given fortnightly in temperate climates and weekly in the tropics.

Table 1 Specific gravity of electrolyte for filling the battery

Climates normally below 80°F (26.6 C)		*Tropical climates over 80°F (26.6 C)*	
Filling	*Fully charged*	*Filling*	*Fully charged*
1.270	1.270-1.290	1.210	1.210-1.230

564. To obtain a specific gravity strength of 1.270 at 60°F (15.5°C) add one part by volume of 1.840 specific gravity acid to 3.2 parts of distilled water.

565. To obtain a specific gravity strength of 1.210 at 60°F (15.5°C) add one part by volume of 1.840 specific gravity acid to 4.3 parts of distilled water.

566. The specific gravity of the electrolyte varies with the temperature. For convenience in comparing specific gravities, they are always corrected to 60°F, which is adopted as a reference temperature. The method of correction is as follows.

567. For every 5°F below 60°F deduct .002 from the observed reading to obtain the true specific gravity at 60°F. For every 5°F above 60°F, add .002 to the observed reading to obtain the true specific gravity at 60°F.

568. The temperature must be indicated by a thermometer having its bulb actually immersed in the electrolyte and not the ambient temperature. To take a temperature reading tilt the battery sideways and then insert the thermometer.

Table 2 Maximum permissible electrolyte temperature during charge

Climates normally below 80°F (27°C)	*Climates frequently above 80°F (27°C)*
100°F (38°C)	120°F (49°C)

COIL IGNITION SYSTEM

Description

569. The coil ignition system comprises an ignition coil, mounted below the petrol tank, and a contact breaker unit fitted in the timing cover. Apart from cleaning in-between the terminals, and checking the connections for soundness, the coil will not require any other attention. However, a check must be made to ensure that the coil fixing clip has not been overtightened to the extent that the coil casing is "pinched".

570. Always ensure that the ignition switch is in the OFF position whilst the machine is not in use.

571. The best method of approach to a faulty ignition system is to first check the low-tension circuit for continuity as described in paras 573 to 576, then follow the procedure described in paras 577 and 578 to locate the faults.

572. Failure to locate a fault in the low-tension circuit indicates that the high-tension circuit or sparking plug is faulty, and the procedure detailed in paras 589 and 590 must be adopted. Before commencing any of the following tests, however, the contact breaker and sparking plug gaps must be cleaned and adjusted to eliminate this possible source of fault.

Checking the low-tension circuit for continuity

573. To check whether there is a fault in the low-tension circuit and to locate its position, the following tests should be carried out:-

574. Turn the ignition switch to the IGN position and slowly crank the engine. At the same time, observe the ammeter needle, which should fluctuate between zero and a slight discharge, as the contact breaker points open and close respectively.

575. If the ammeter needle does not fluctuate in the described way, then a fault in the low-tension circuit is indicated.

576. First, examine the contact breaker points for pitting, piling or presence of oxidation, oil, or dirt etc. Clean and ensure that the gap is set correctly to .015 in. (.381 mm) as described in para 210.

Fault finding in the low-tension circuit

577. To trace a fault in the low-tension wiring, turn the ignition switch to IGN position and then crank the engine until the contacts are opened, or alternatively, place a piece of insulating material between the contacts whilst the following test is carried out:-

578. For this test it is assumed that the wiring is fully connected as shown in the wiring diagram. With the aid of a 0-15 volt D.C. voltmeter and two test-prods make a point to point check along the low-tension circuit starting at the battery and working right through to the ignition coil, stage by stage, in the following manner, referring to the relevant wiring diagram.

(1) First, establish that the battery is earthed correctly by connecting the voltmeter across the battery negative terminal and the machine frame earth.

No voltage reading indicates that the red earthing lead is faulty. Also, a low reading would indicate a poor battery earth connection.

(2) Connect the voltmeter between the ignition coil (—) terminal and earth. No voltage reading indicates a breakdown between the battery and the coil (—) terminal, or that the switch connections or ammeter connections are faulty.

(3) Connect the voltmeter between both of the ammeter terminals in turn and earth. No reading on the "load" side indicates that either the ammeter is faulty or there is a bad connection along the brown and blue lead from the battery, and a reading on the "battery" side only indicates a faulty ammeter.

(4) Connect the voltmeter between ignition switch "feed" terminal and earth. No reading indicates that the brown and white lead has faulty connections. Check for voltage at the brown/white lead connections at rectifier, ammeter, zener diode and lighting switch terminals 2 and 10.

(5) Connect the voltmeter across ignition switch "load" terminal and earth. No reading indicates that the ignition switch is faulty and should be replaced. Battery voltage reading at this point but not at the ignition coil (—) terminal indicates that the white lead has become "open circuit" (broken or disconnected).

(6) Disconnect the black/white lead from the (+) terminal of the ignition coil. Connect the voltmeter across the (+) terminal of the coil and earth. No reading on the voltmeter indicates that the coil primary winding is faulty and a replacement ignition coil should be fitted.

(7) With the contact points open, reconnect the ignition coil lead and then connect the voltmeter across the contact points. No reading indicates that there is either a faulty connection or the internal insulation has broken down in the contact breaker condenser (capacitor). If the condenser is suspected, then a substitution should be made and a retest carried out.

Ignition coil

579. The ignition coil consists of a primary and secondary winding, wound concentrically about a laminated soft iron core, the secondary winding being next to the core.

580. The primary and secondary windings are wound on a laminated soft iron core and are vacuum impregnated with high-insulation varnish. The ratio between the turns of the windings is 43 to 1.

581. To test the ignition coil on the machine, first ensure that the low-tension circuit is in order, then disconnect the high-tension lead from the sparking plug. Turn the ignition switch to the IGN position and crank the engine until the contacts are closed.

582. Flick the contact breaker lever open a number of times whilst the high-tension lead from the ignition coil is held about 3/16 in. away from the cylinder head. If

the ignition coil is in good condition a strong spark should be obtained, if no spark occurs this indicates the ignition coil to be faulty.

583. Before a fault can be attributed to the ignition coil it must be ascertained that the high-tension cable is not cracked or showing signs of deterioration, as this may often be the cause of misfiring etc. It should also be checked that the ignition points are actually making good electrical contact when closed and that the moving contact is insulated from earth (ground) when open. It is advisable to remove the ignition coil and test it by the method described below.

Bench testing the ignition coil

584. Connect the ignition coil into the circuit shown in Fig 104 and set the adjustable gap to 9 mm. With the contact breaker running at 100 rev/min, not more than 5% missing should occur at the spark gap over a period of 15 seconds. The primary winding can be checked for short-circuit coils by connecting an ohmeter across the low-tension terminals. The reading obtained should be within the figures quoted below (at 20°C).

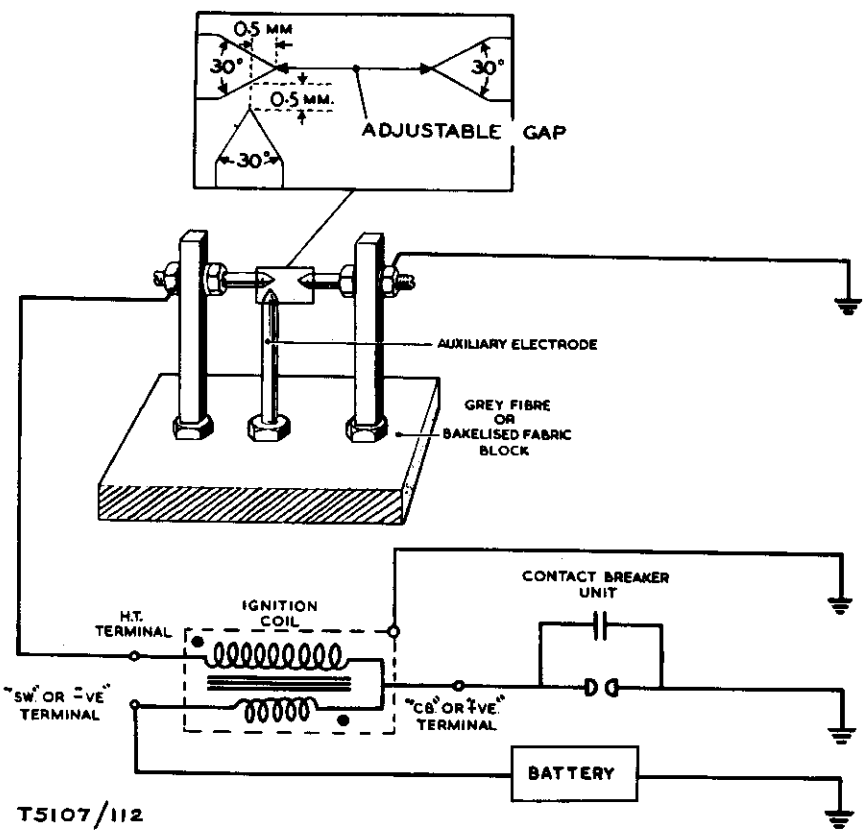


Fig 104 Ignition coil test rig

PRIMARY RESISTANCE		*SECONDARY RESISTANCE*	
Min.	*Max.*	*Min.*	*Max.*
3.8 Ohms	4.0 Ohms	4,300 Ohms	4,600 Ohms

Contact breaker

585. Faults occurring at the contact breaker are in the main due to, incorrect adjustments of the contacts or the efficiency being impaired by piling, pitting or oxidization of the contacts due to oil etc. Therefore, always ensure that the points are clean and that the gap is adjusted to the correct working clearance. See the Servicing Schedule.

586. To test for a faulty condenser, first turn the ignition switch to IGN position, and then take voltage readings across the contacts when open. No reading indicates that the condenser internal insulation has broken down. Should the fault be due to a condenser having a reduction in capacity, indicated by excessive arcing when in use, and overheating of the contact faces, a check should be made by substitution.

587. Particular attention is called to the periodic lubrication procedure for the contact breaker. When lubricating the parts ensure that no oil or grease gets on to the contacts.

588. If it is felt that the contacts require surface grinding then the complete contact breaker unit should be removed as described in para 207, and the moving contact disconnected by unscrewing the securing nut from the condenser terminal. Grinding is best achieved by using a fine carborundum stone or very fine emery cloth, afterwards wiping away any trace of dirt or metal dust with a clean petrol (gasolene) moistened cloth. The contact faces should be slightly domed to ensure point contact. There is no need to remove the pitting from the fixed contact. When refitting the moving contact do not forget to refit the insulating shield to the condenser terminal and apply a smear of grease to the contact breaker cam and moving contact pivot post. Lubricate the felt pad.

Checking the high-tension circuit

589. If ignition failure or misfiring occurs, and the fault is not in the low-tension circuit, then check the ignition coil. If the coil proves satisfactory, ensure that the high-tension cable is not the cause of the fault.

590. If a good spark is available at the high-tension cable, then the sparking plug suppressor cap or the sparking plug itself may be the cause of the fault. Clean the sparking plug and adjust the electrodes to the required setting as described in paras 594 to 601 and then reset the engine for running performance. If the fault re-occurs then it is likely that the suppressor cap is faulty and should be renewed.

SPARKING PLUG

591. It is recommended that the sparking plug be inspected, cleaned and tested at the intervals quoted in the Servicing Schedule.

592. To remove the sparking plug a box spanner (13/16 in., 19.5 mm, across flats) should be used and if any difficulty is encountered a small amount of penetrating oil should be placed at the base of the sparking plug and time allowed for penetration.

593. Examine the plug for signs of petrol (gasolene) fouling. This is indicated by a dry, sooty, black deposit, which is usually caused by over-rich carburation, although ignition system defects such as a faulty contact breaker, coil or condenser defects, or a broken or worn out cable may be additional causes.

594. Examine the plug for signs of oil fouling. This will be indicated by a wet, shiny, black deposit on the central insulator. This is caused by excessive oil in the combustion chamber during combustion and indicates that the piston rings or cylinder bore is worn.

595. To rectify this type of fault the above mentioned items should be checked with special attention given to carburation system.

596. Over-heating of the sparking plug electrode is indicated by severely eroded electrode and a white, burned or blistered insulator. This type of fault can be caused by weak carburation or over-advanced ignition timing, although plugs which have been operating whilst not being screwed down sufficiently can easily become over-heated due to heat that is normally dissipated through to the cylinder head not having an adequate conducting path.

597. Over-heating is normally symptomised by pre-ignition, short plug life, and "pinking" which can ultimately result in piston crown failure. Unnecessary damage can result from over-tightening the plugs.

598. To achieve a good seal between the plug and cylinder head, screw the plug in by hand on to its gasket, then lightly tighten with a box spanner.

599. A plug of the correct grade will bear a light flaky deposit on the outer rim and earth electrode, and these and the base of the insulator will be light chocolate brown in colour.

600. When the plug has been carefully cleaned, examine the central insulator for cracking and the centre electrode for excessive wear. In such cases the plug will have completed its useful life and a new one should be fitted.

601. Finally, the sparking plug electrode should be adjusted to the correct gap setting of .025 in. (.635 mm). Before refitting sparking plug the threads should be cleaned by means of a wire brush and a minute amount of graphite grease smeared on to the threads. This will prevent any possibility of thread seizure occurring.

602. If the ignition timing and carburation settings are correct and the plug has been correctly fitted, but over-heating still occurs, then it is possible that carburation is being adversely affected by an air leak between the carburetter and the cylinder head. This possibility must be checked thoroughly before taking any further action. When it is certain that none of the above mentioned faults are the cause of over-heating then the plug type and grade should be considered.

603. Normally the type of plug quoted in General Data is satisfactory for general use of the machine, but in special isolated cases, conditions may demand a plug of a different heat range.

CHARGING SYSTEM

Description

604. The alternator gives "maximum" output with the lighting switch in all positions, the coils being permanently connected across the rectifier. Excessive charge is absorbed by the zener diode which is connected in parallel with the battery.

605. Proceed to test the alternator as described in paras 606 to 609. If the alternator is satisfactory, the fault must lie in the charging circuit, hence the rectifier must be checked as given in paras 612 to 626 and then the wiring and connections as shown in paras 627 to 632.

Checking the alternator output

606. Disconnect the three alternator output cables and run the engine at 3,000 rev/min.

607. Connect an A.C. voltmeter (0-15 volts) with 1 ohm load resistor in parallel with each of the alternator leads in turn as shown in Table 3 and observe the voltmeter readings. A suitable 1 ohm load resistor can be made from a piece of nichrome wire as shown in paras 633 and 634.

608. The test is conducted by connecting a voltmeter and the 1 ohm load resistor between the following cables and note the readings:-

(a) White/green and green/black cables - voltmeter should read 4.0 volts (min).

(b) White/green and green/yellow cables - voltmeter should read 6.5 volts (min).

(c) White/green and joined green/black and green/yellow cables - voltmeter should read 8.5 volts (min).

(d) Motorcycle frame and each cable in turn - no reading should be obtained.

609. From the results obtained, the following deductions can be made:-

(1) If the readings (a), (b) and (c) are all equal to or higher than those quoted then the alternator is satisfactory.

(2) A low reading on any group of coils indicates either that the leads concerned are chafed or damaged due to running on the chains or that some turns of the coils are short-circuited.

(3) Low readings for all parts of the test indicate that either the green/white lead has become chafed or damaged due to rubbing on the chains or that the rotor has become partially demagnetized. As the latter is an extremely rare occurrence it is advisable to check by substitution before returning the rotor to the manufacturer for re-magnetization. If it is found that the rotor has become demagnetized, check that it has not been caused by a faulty rectifier and that the battery is of correct polarity.

(4) A zero reading for any group of coils indicates that a coil has become disconnected, is open-circuit, or is earthed.

(5) A reading obtained between any one lead and earth indicates that coil windings or connections have become earthed.

610. If any of the above mentioned faults occur, always check the stator leads for possible chain damage before attempting repairs or renewing the stator.

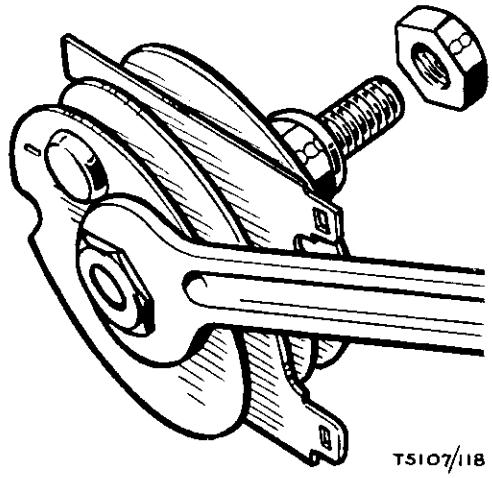


Fig 105 Refitting the rectifier

611. It is beyond the scope of this manual to give instruction for the repair of faulty stator windings. However, the winding specification is given in Table 3 for those obliged to attempt repair work.

Rectifier maintenance

612. The rectifier is a silicon semi-conductor device which allows current to flow in one direction only. It is connected to provide full wave rectification of alternator output current.

613. The rectifier requires no maintenance beyond checking that the connections are clean and tight. The nuts clamping the rectifier plates together must not under any circumstances be slackened. A separate nut is used to secure the rectifier to the motor-cycle and it is important to check periodically that the rectifier is firmly attached to its mounting bracket.

614. When tightening the rectifier securing nut, hold the spanner as shown in Fig 105, for if the plates are twisted, the internal connections will be broken.

> **Note:** *The circles marked on the fixing bolt and nut indicate that the thread form is unified series.*

Testing the rectifier

615. To test the rectifier, first disconnect the brown/white lead from the rectifier centre terminal and insulate the end of the lead to prevent any possibility of a short-circuit occurring, and then connect a D.C. voltmeter (with 1 ohm load resistor in parallel) between the rectifier centre terminal and earth.

> **Note:** *Voltmeter positive terminal to frame earth (ground) and negative terminal to centre terminal on rectifier.*

616. Ensure that all the temporary connections are well insulated to prevent a short-circuit occurring then turn the ignition switch to IGN position and start the engine.

617. With the engine running at approximately 3,000 rev/min observe the voltmeter readings. The reading obtained should be at least 7.5 volt minimum.

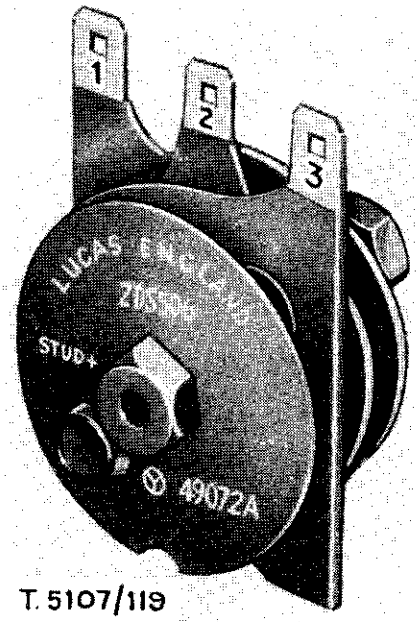


Fig 106 The rectifier showing terminal connections

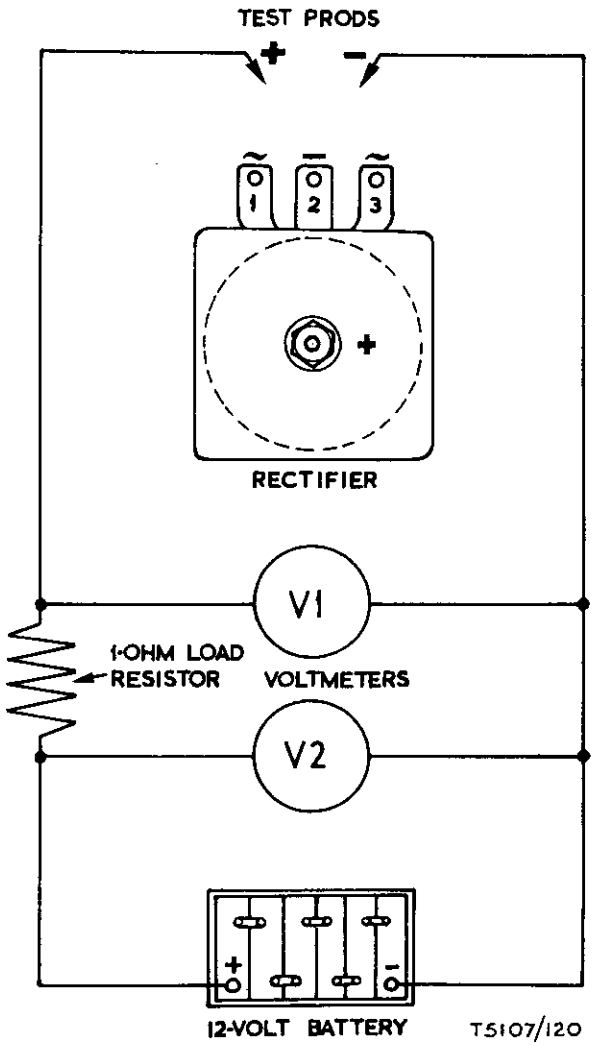


Fig 107 Bench testing the rectifier

(1) If the reading is equal to or slightly greater than that quoted, then the rectifier elements in the forward direction are satisfactory.

(2) If the reading is excessively lower than the figures given, then check the rectifier earthing bolt connection. If the connection is good then a replacement rectifier should be fitted.

(3) If the reading is lower than the figures quoted or zero readings are obtained, then the rectifier or the charging circuit wiring is faulty and the rectifier should be disconnected and bench tested so that the fault can be located.

618. Note that all the previous conclusions are made with the assumption that the alternator A.C. output figures were satisfactory. Any fault at the alternator will, of course, reflect on the rectifier test results. Similarly any fault in the charging circuit wiring may indicate that the rectifier is faulty. The best method of locating a fault is to disconnect the rectifier and bench test it as shown below.

Bench testing the rectifier

619. For this test the rectifier should be disconnected and removed. Before removing the rectifier, disconnect the leads from the battery terminals to avoid the possibility of a short-circuit occurring.

620. Connect the rectifier to a fully charged 12 volt battery of approximately 40 ampere/hours capacity at the 10 hour rate, and 1 ohm load resistor, and then connect the D.C. voltmeter in the V2 position, as shown in Fig 107.

621. Note the battery voltage (should be 12 volt) and then connect the voltmeter in V1 position whilst the following tests are conducted.

622. A voltmeter in position V1 will measure the volt drop across the rectifier plate. In position V2 it will measure the supply voltage to check that it is the recommended 12 volts on load.

623. In Fig 108, the rectifier terminal markings (1), (2) and (3) are as shown physically in Fig 106 and 107, while terminal (4) represents the rectifier centre bolt. (1) and (3) are the A.C. input terminals while (2) and (4) are the D.C. output terminals (— ve and +ve respectively).

Test I

624. With the test leads, make the following connections but keep the testing time as short as possible to avoid over-heating the rectifier cell:

(a) 1 and 2
(b) 1 and 4
(c) 3 and 4
(d) 3 and 2

Each reading should not be greater than 1.5 volts with the battery polarity as shown.

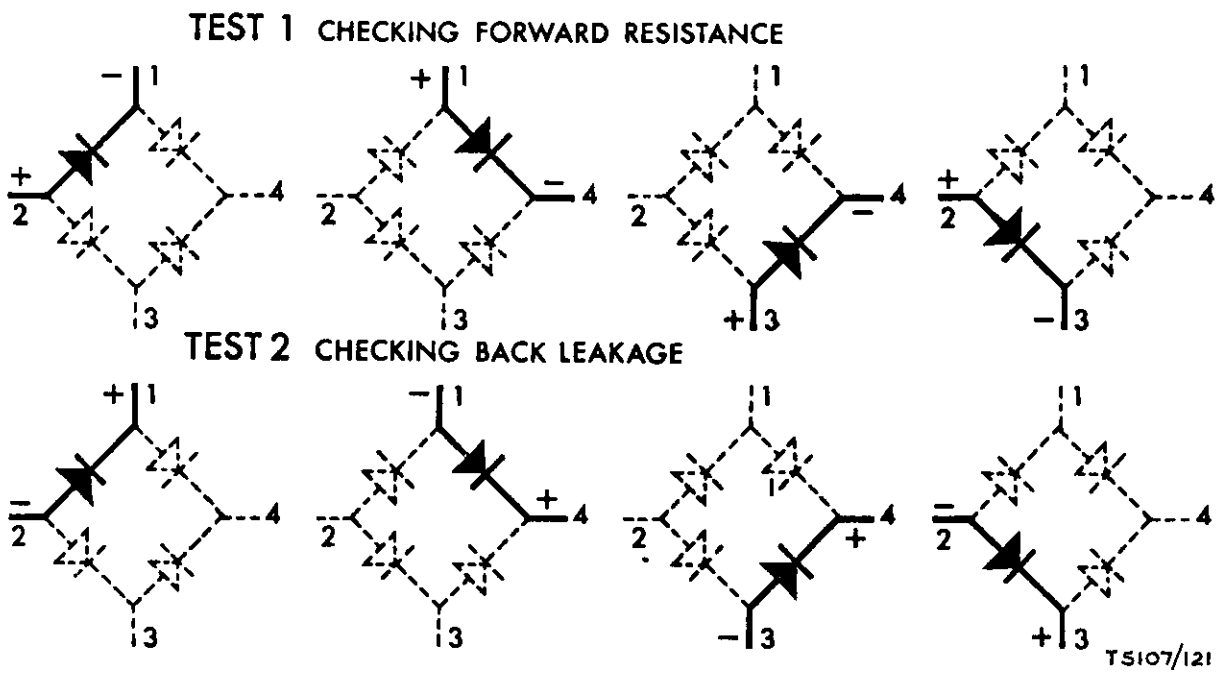


Fig 108 Rectifier test sequence

Test 2

625. Reverse the leads or battery polarity and repeat Test 1. The reading obtained should be the same as the battery voltage (V2).

626. If the readings obtained are not within the figures given, then the rectifier internal connections are shorting or aged and the rectifier should be renewed.

Checking the rectifier D.C. current output

627. First check state of charge of battery on machine. If it is not in a well-charged condition it must be temporarily replaced with a fully-charged one, before testing. Remove the cable from the centre terminal of the rectifier and disconnect the zener diode. Connect the ammeter input cable to the cable removed and the output cable to the rectifier centre terminal.

628. Start the engine and run at a constant 3,000 rev/min.

Note: *The reading on the ammeter, with the lighting switch in the OFF 'Pilot' and 'Head' positions. Readings should approximate the values given below:-*

Lighting switch positions	OFF	-	2.5 min.
	PILOT	-	2.0 min.
	HEAD	-	1.75 min.

629. If the ammeter registers the value stated for the equipment, the charging circuit and alternator are satisfactory.

630. No reading on the ammeter indicates either a faulty alternator or rectifier. To find out which is at fault apply the individual tests for the alternator and rectifier.

631. A faulty battery can cause "high" or "low" readings. If reading is "high" it can be due to a short-circuited battery cell, a "low" reading can be caused by a sulphated battery or faulty connections, or result from partial de-magnetisation of the alternator rotor.

632. No readings will be obtained if any wiring connections are open-circuited. Inaccurate readings can be due to faulty wiring such as poor earth connections, or "snap" connectors.

Constructing a 1 ohm load resistor

633. The resistor used in the following tests must be accurate and constructed so that it will not over-heat otherwise the correct values of current or voltage will not be obtained.

634. A suitable resistor can be made from 4 yards (3-3/4 metres) of 18 S.W.G. (.048 in., i.e. 1.2 mm diameter) nichrome wire by bending it into two equal parts and calibrating it as follows:-

(1) Fix a heavy gauge flexible lead to the folded end of the wire and connect this lead to the positive terminal of a 6 volt battery.

(2) Connect a D.C. voltmeter (0-10 volts) across the battery terminals and an ammeter (0-10 amp) between the battery negative terminal and the free ends of the wire resistance, using a crocodile clip to make the connection.

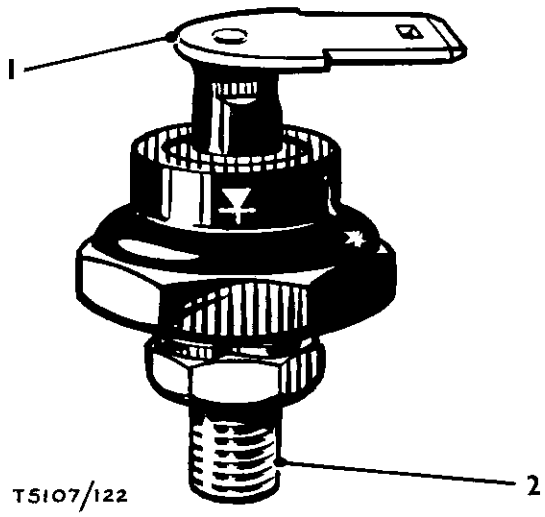
(3) Move the clip along the wires, making contact with both wires until the ammeter reading is numerically equal to the number of volts shown in the voltmeter. The resistance is then 1 ohm. Cut the wire at this point, twist the two ends together and wind the wire on an asbestos former approximately 2 in. (5 cm) diameter so that each turn does not contact the one next to it.

Zener diode charge control

Description

635. The Zener Diode output regulating system which uses the coils of the alternator connected permanently across the rectifier, provides automatic control of the charging current. It will only operate successfully on a 12 volt system where it is connected in parallel with the battery as shown in the wiring diagram.

636. Assuming the battery is in a low state of charge its terminal voltage (the same voltage is across the Diode) will also be low, therefore the maximum charging current will flow into the battery from the alternator. At first none of the current is by-passed by the Diode because of it being non-conducting due to the low battery terminal volts. However, as the battery is quickly restored to a full state of charge the system voltage rises until at 14-volts the Zener Diode becomes partially conducting, thereby providing an alternative path for a small part of the charging current. Small increases in battery voltage result in large increases in Zener conductivity until, at approximately 15 volts about 5 amperes of the alternator output is by-passing the battery. The battery will continue to receive only a portion of the alternator output as long as the system voltage is relatively high.



1 Terminal blade
2 Earthing stud

Fig 109 Zener diode

637. Depression of the system voltage, due to the use of headlamp or other lighting equipment, causes the Zener Diode current to decrease and the balance to be diverted and consumed by the component in use.

638. If the electrical loading is sufficient to cause the system voltage to fall to 14 volts, the Zener Diode will revert to a high resistance state of non-conductivity and the full generated output will go to meet the demands of the battery.

Maintenance

639. The Zener Diode is mounted on a finned aluminium heat sink below the petrol tank at the front. Providing the Diode and the heat sink are kept clean, and provided with an adequate airflow, to ensure maximum efficiency, no maintenance will be necessary.

640. The "earthing" stud, which secures the Diode to the heat sink, must not be subjected to a tightening torque greater than 24/28 lb/in. The earth wire must be fitted under the fixing nut, not between the Diode and heat sink.

Checking performance of Zener Diode

641. The following procedure enables the Zener Diode to be tested on the machine. Only suitably calibrated first-grade moving coil instruments should be used.

642. It is essential that the battery is in good condition and in reasonably good state of charge. If the battery condition is uncertain, it should be temporarily replaced by a good battery for this test.

(1) Withdraw the cable from the Zener Diode terminal blade.

(2) Connect a suitable ammeter between the end of the cable removed and the Zener Diode terminal blade, using a suitable jumper lead.

Note: *The ammeter red or positive lead must be connected to the Zener Diode.*

(3) Connect a suitable voltmeter between the Zener Diode terminal blade and the heat sink.

Note: *The voltmeter red or positive lead must be connected to the heat sink.*

(4) Check that all lights are switched off.

(5) Start the engine and gradually increase the speed while observing both meters:

(a) When the voltage across the Zener Diode reaches 12.75 volts, the Zener current ammeter must indicate zero.

(b) Increase engine speed until a Zener current of 2 amperes is indicated on the ammeter. At this value, a satisfactory Zener Diode should cause a reading on the voltmeter of between 13.5 and 15.5 volts.

(6) If the Zener current ammeter in test (a) registers any current at all before the Zener voltmeter indicates a voltage of 12.75 volts across the Zener, then a replacement Zener Diode must be fitted. If test (a) proves satisfactory but in test (b) a higher voltage than that stated is registered on the voltmeter, before the Zener current ammeter registers 2 amperes, then a replacement Zener Diode must be fitted.

Table 3 Alternator - Specifications and Output Figures

Stator No.	*System Voltage*	*Alternator Output Minimum A.C. Volts with 1 Ohm load at 3,000 rev/min*			*Stator Coil Details*		
		A	*B*	*C*	*No. of Coils*	*Turns Per Coil*	*S.W.G.*
47162	12 volt	4.0	6.5	8.5	6	140	22

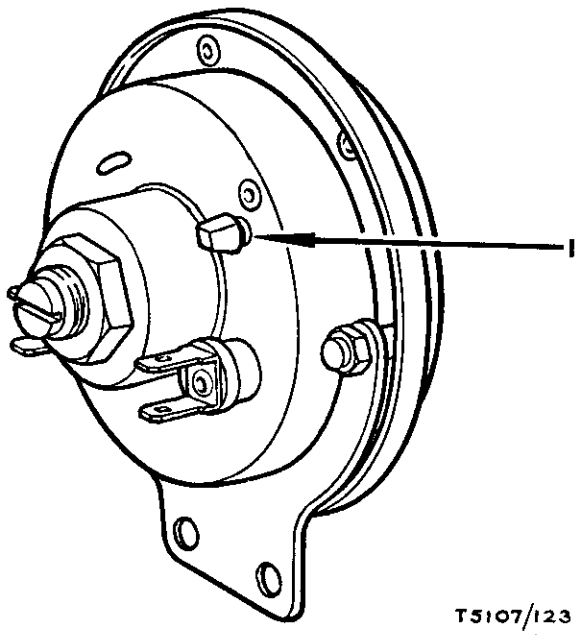
A - White/green and green/black.
B - White/green and green/yellow.
C - White/green and green/black - green/yellow connected.

ELECTRIC HORN

Description

643. The horn is of a high frequency single-note type and is operated by direct current from the battery. The method of operation is that of a magnetically operated armature, which impacts on the core face, and causes the tone disc of the horn to vibrate. The magnetic circuit is made self-interrupting by contacts which can be adjusted externally.

644. If the horn fails to work, check the mounting bolts etc., and horn connection wiring. Check the battery for state of charge. A low supply voltage at the horn



1 Adjustment peg

Fig 110 Horn

will adversely effect horn performance. If the above checks are made and the fault is not remedied, then adjust the horn as follows.

Adjustment

645. When adjusting and testing the horn do not depress the horn push for more than a fraction of a second or the circuit wiring may be overloaded.

646. A small serrated adjustment peg (Fig 110(1)) situated near the terminals is provided to take up wear in the internal moving parts of the horn. To adjust, turn this peg anti-clockwise until the horn just fails to sound, then turn it back (clockwise) about one-quarter to half a turn.

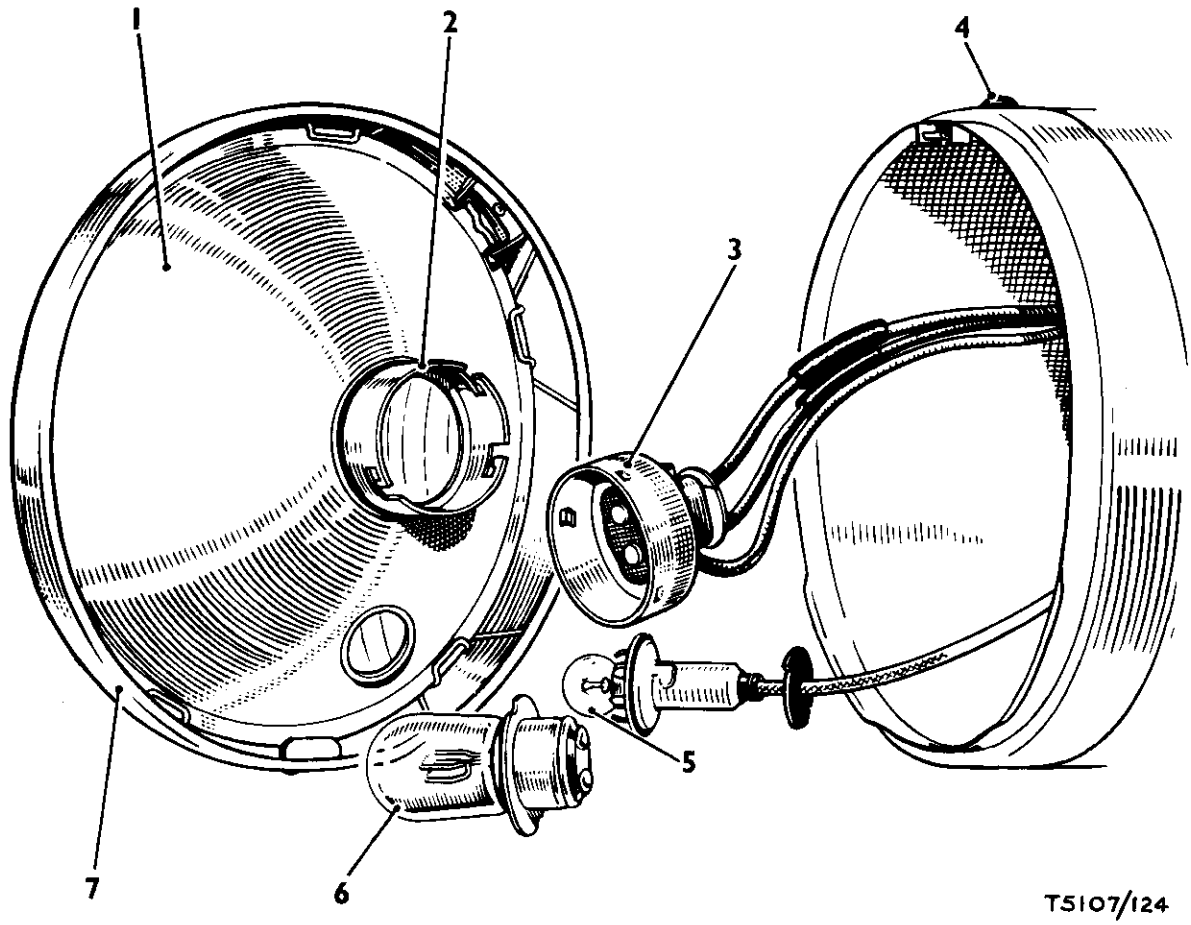
HEADLAMP

Description

647. The headlamp is of the pre-focus type and access is gained to the lamp and lampholder by withdrawing the rim and light unit assembly. To do this slacken the screw at the top of the headlight shell just behind and adjacent to the rim and prise off the rim and light unit assembly.

648. The lamp can be removed by first pressing the cylindrical adapter inwards and turning it anti-clockwise. The adapter can then be withdrawn and the lamp is free to be removed.

649. When fitting a new lamp, note that it locates by means of a cut-away and projection arrangement. Also note that the adapter can only be replaced one way, the tabs being staggered to prevent incorrect reassembly. Check the replacement lamp voltage and wattage specification and type before fitting. Focussing with this type of unit is unnecessary and there is no provision for such.



1 Light unit
2 Lamp holder
3 Adaptor
4 Front rim retaining screw
5 Parking lamp
6 Main lamp
7 Front rim

Fig 111 Headlight dismantled

Beam adjustment

650. When the motor-cycle carries its normal load, the headlight full-beam should project straight ahead and parallel with the road surface.

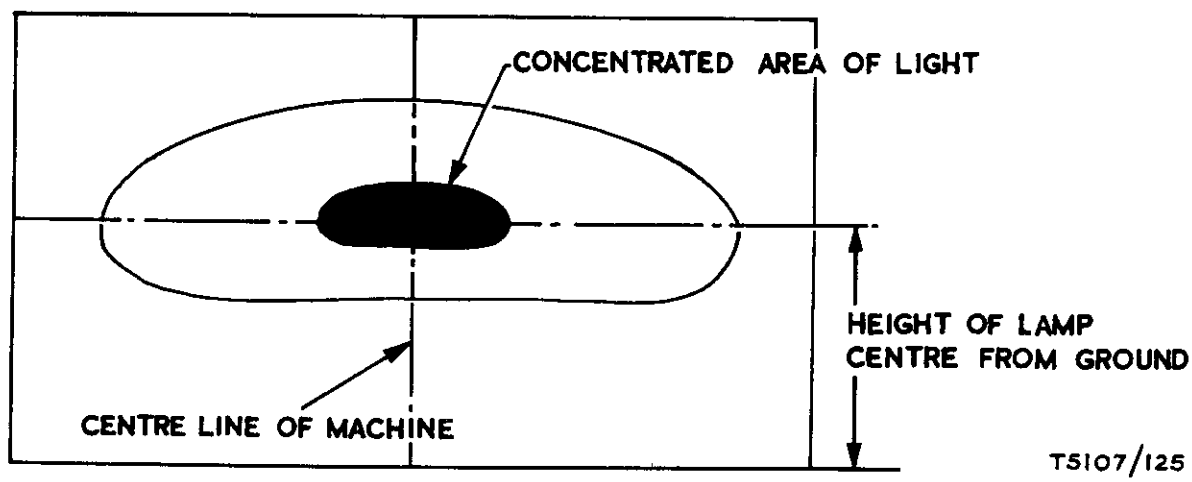


Fig 112 Beam adjustment

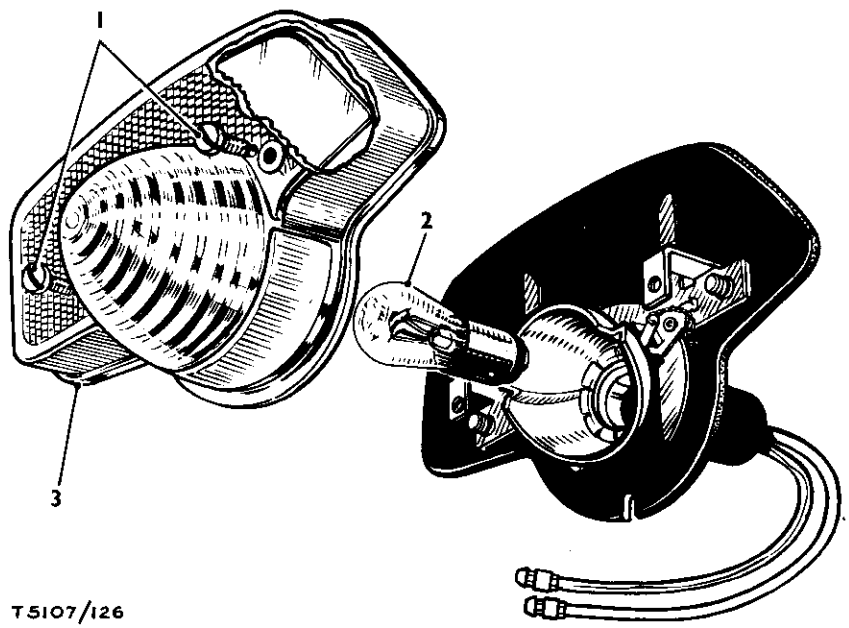
651. To achieve this, place the machine on a level road pointing towards a wall at a distance of 25 feet away, with a rider and passenger on the machine, slacken the two headlight fixing bolts at either side and tilt the headlight until the beam is focused as indicated in Fig 117. Do not forget that the headlight should be on "full beam" lighting during this operation.

652. Tighten the fixing bolts securely after adjustment.

TAIL AND STOP LIGHT UNIT

653. Access to the lamp in the tail and stop light unit is achieved by unscrewing the two slotted screws which secure the lens. The lamp is of the double filament offset pin type and when a replacement is carried out, ensure that the lamp is fitted correctly. Check that the two supply leads are connected correctly and check the earth (ground) lead to the lampholder is in satisfactory condition.

654. When refitting the lens, do not over-tighten the fixing screws or the lens may fracture as a result.



1 Lens securing screws

2 Lamp

3 Lens

Fig 113 Stop and taillight

OTHER LIGHT UNITS

655. The headlight shell contains the speedometer light, the ignition warning light and the parking light, access being gained to each of them by first removing the rim and light unit assembly.

656. Each lampholder is a push-fit into its respective component, and the lamps are located by means of a peg arrangement, except for the speedometer light which has a screw type lamp.

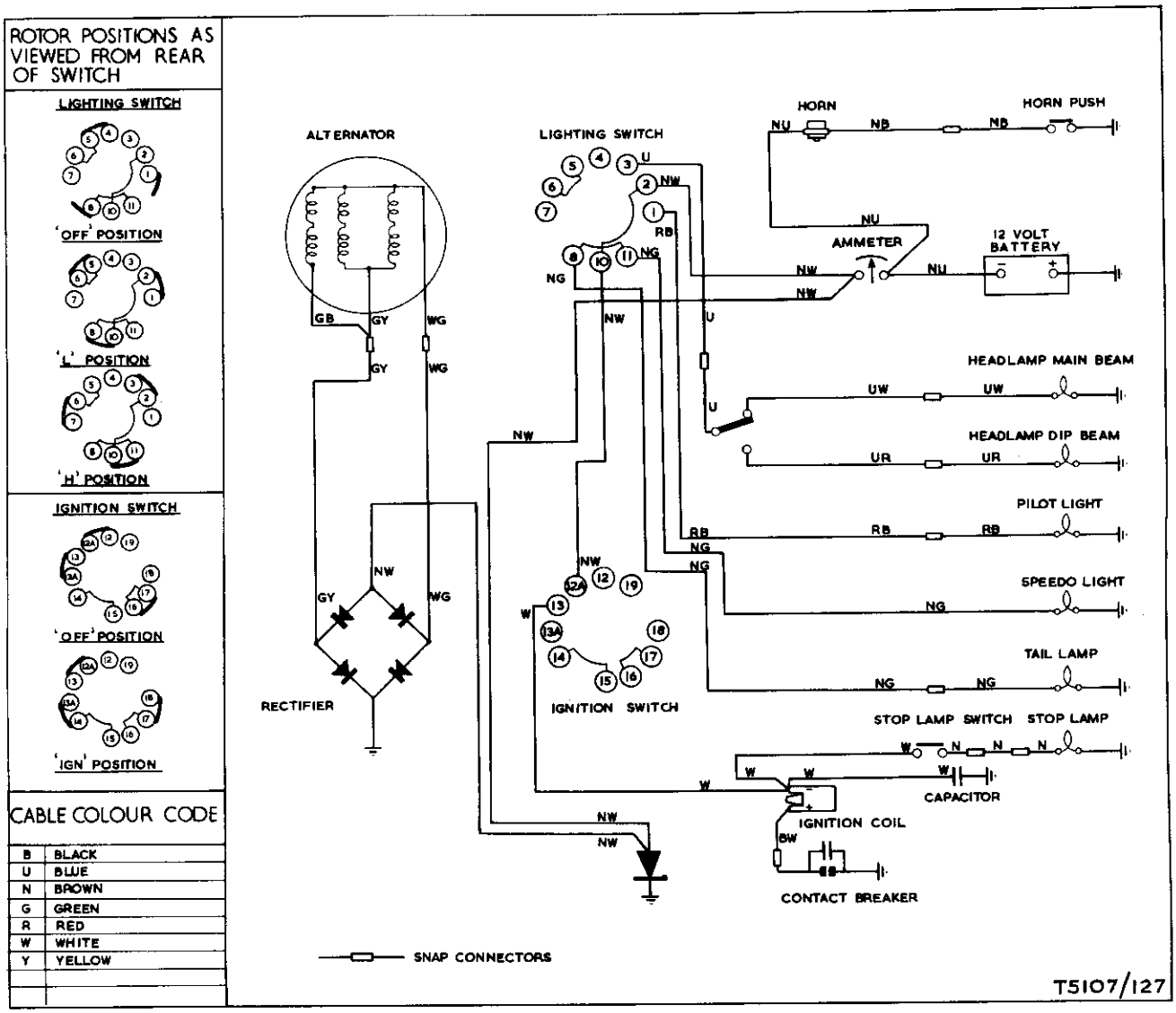
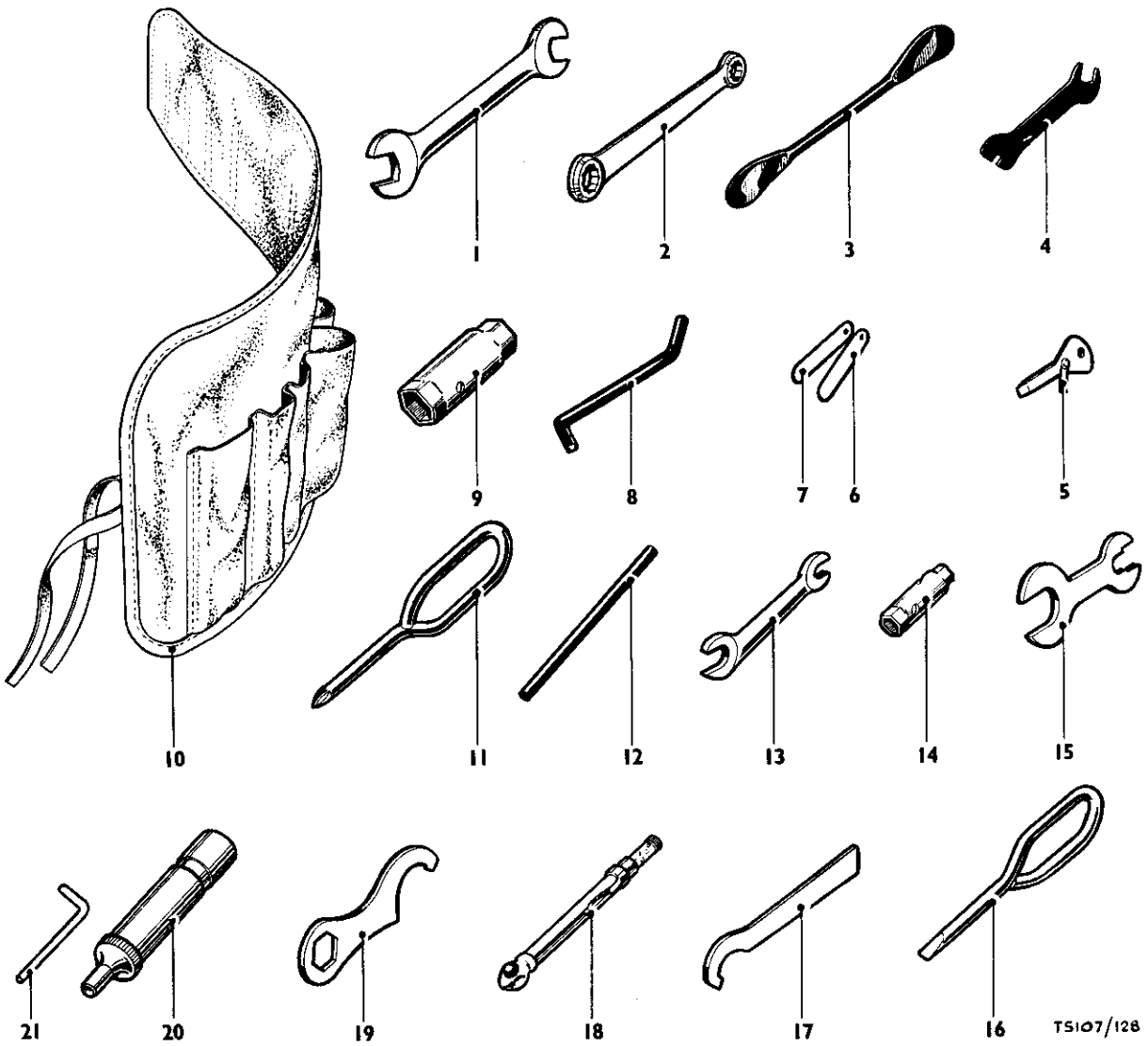


Fig 114 Wiring diagram

TOOL KIT



Listed on this page are the tools needed to assist in carrying out both routine maintenance and minor repair work on the machine. The tools should all be found in the toolbox, but it is recommended that a periodical check is made to ensure that the toolkit is complete at all times.

1 Open-ended spanner .720 in. (18.288 mm) and .830 in. (21.082 mm) A/F
2 Ring spanner .445 in. (11.303 mm) and .600 in. (15.240 mm) A/F
3 Tyre lever (2 off)
4 Tappet spanner .265 in. (6.731 mm) and .530 in. (13.462 mm) A/F
5 Screwdriver for contact breaker
6 Feeler gauge .008 in. (.2032 mm)
7 Feeler gauge .010 in. (.254 mm)
8 Tommybar for box spanner
9 Box spanner .840 in. (21.336 mm) and .940 in. (23.876 mm) A/F
10 Tool roll
11 Phillips screwdriver
12 Tommybar for box spanner
13 Open-ended spanner .533 in. (13.538 mm) and .608 in. (15.443 mm) A/F
14 Box spanner .440 in. (11.176 mm) and .525 in. (13.335 mm) A/F
15 Open-ended spanner 1.025 in. (26.035 mm); .716 in. (18.186 mm) and .826 in. (20.980 mm) A/F
16 Screwdriver
17 "C" spanner for damper adjustment
18 Tyre pressure gauge
19 Spanner for fork top nut
20 Grease gun
21 Allen key for fork damper tube bolt

Fig 115 Tool kit

SERVICE TOOLS

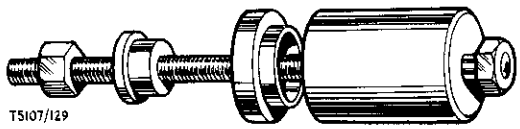


Fig 116 Small end bush extractor

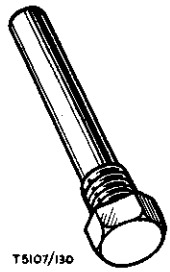


Fig 117 Contact breaker cam removal tool

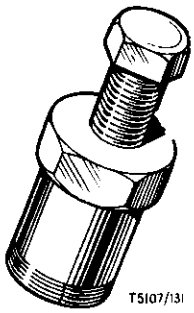


Fig 118 Clutch sleeve extractor

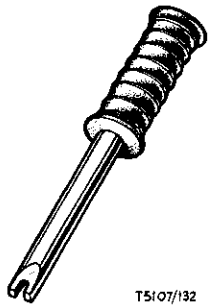


Fig 119 Clutch nut screwdriver

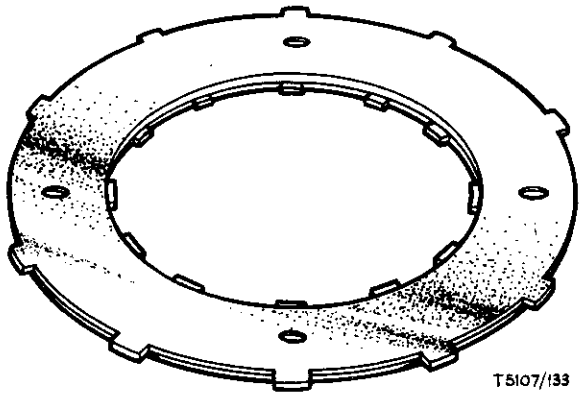


Fig 120 Clutch locking tool

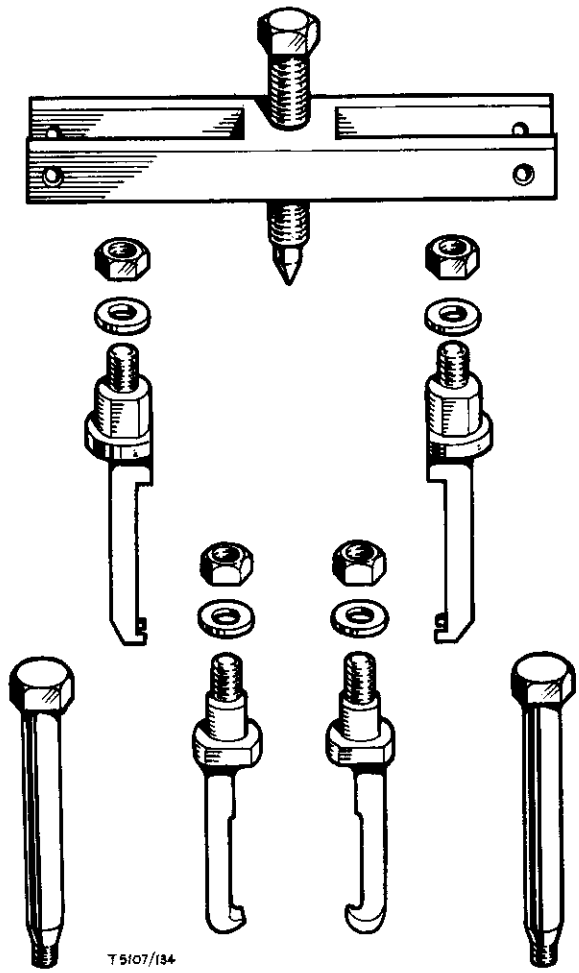


Fig 121 Pinion extractor set

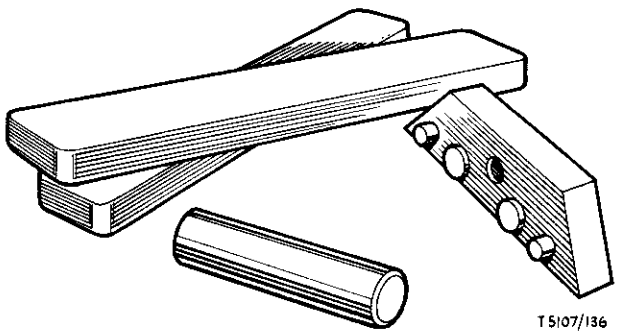


Fig 122 Flywheel assembly and dismantling tools

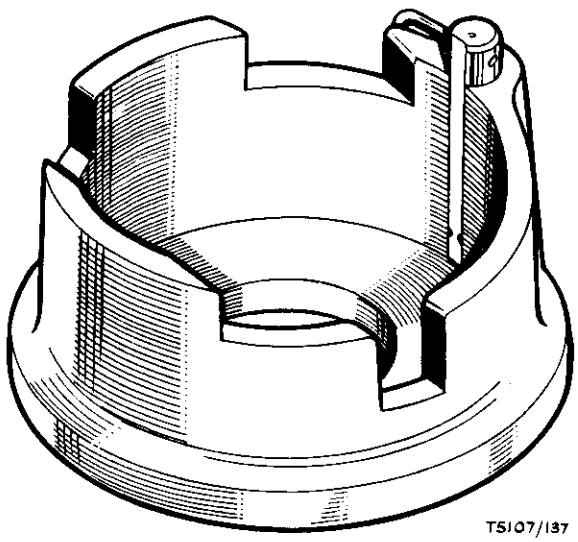


Fig 123 Flywheel bolster

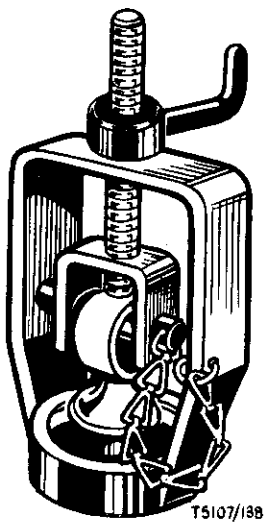


Fig 124 Rear damper dismantling and assembly tool

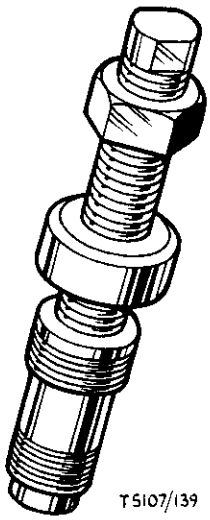


Fig 125 Fork leg removal and assembly tool

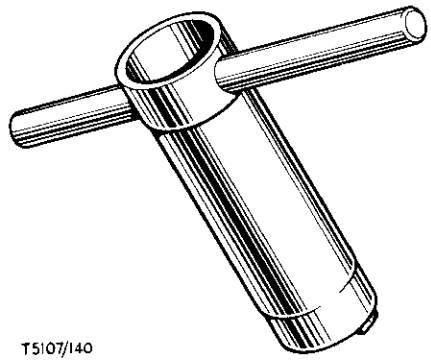


Fig 126 Fork oil seal holder removal tool

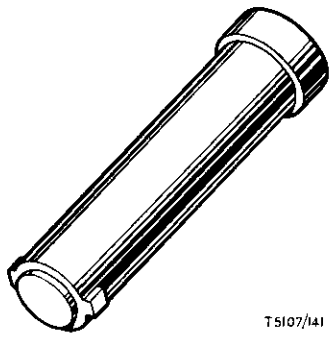


Fig 127 Fork oil seal extractor

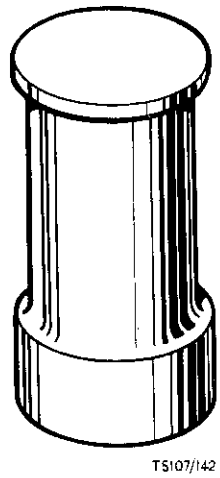


Fig 128 Fork oil seal assembly tool

I.F.V.M.E.

END