

# **SECTION D**

## **GEARBOX**

### **Section**

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## SECTION D1

### DESCRIPTION

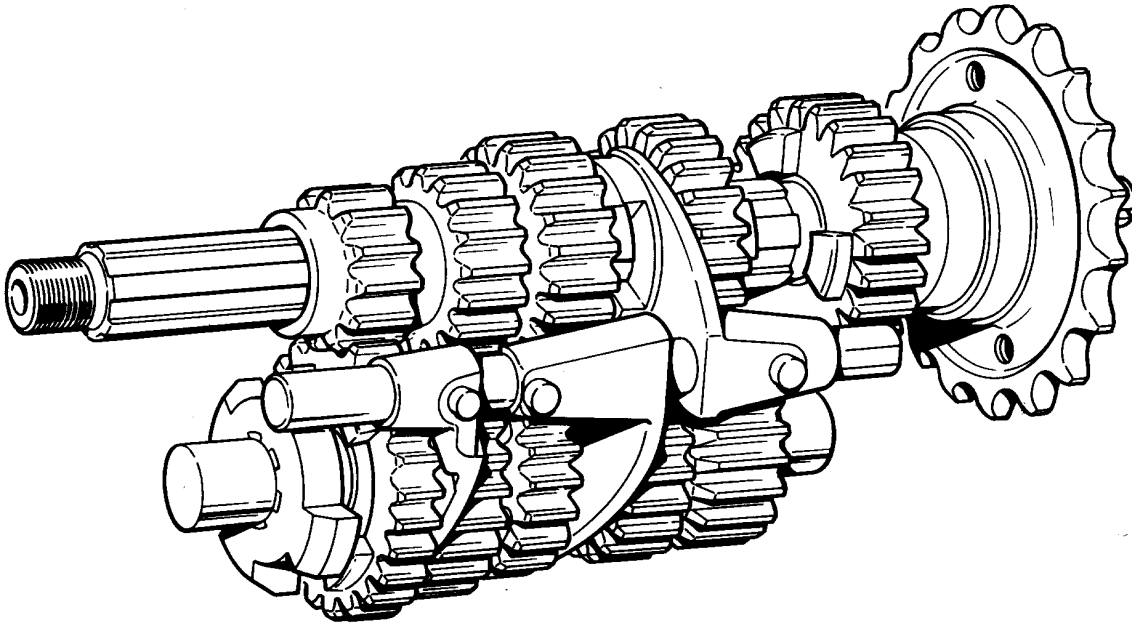


Fig. D1. The five speed gear cluster

### SEQUENCE OF GEARCHANGING

The gearbox is operated by the pedal on the left side of the machine splined to the gear-change spindle and engaging with the plunger quadrant. Two chamfered plungers with springs fit into the housing in such a way that as the gear pedal is moved up and down the plungers locate in the teeth at the outboard end of the camplate quadrant. The quadrant is pivoted in the centre and the inboard end formed to mate with the captive pinion of the camplate. See Figs. D3 and D5

Figs. D2(i) to D2(vi) illustrate the camplate with its plunger and the engaging pins of the selector forks which can be seen in the cam-

plate track. The three sliding pinions are moved along the mainshaft and layshaft by the selector forks. The neutral position of the camplate and gears are shown in Fig. D2(i).

When the pedal is depressed to engage low gear (first) the camplate is turned anti-clockwise moving the layshaft selector fork to mesh the sliding first gear with the dog-lock on the end of the layshaft. As second gear is selected by lifting the pedal, the second layshaft selector fork brings the sliding third gear into mesh with the layshaft second gear, while the previous selector fork disengages first gear from the dog-lock. Continued action of

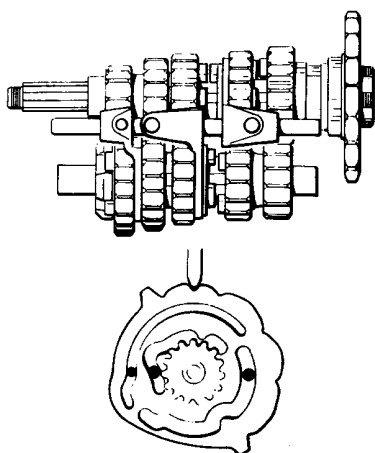


Fig. D2(i) Gears in Neutral position

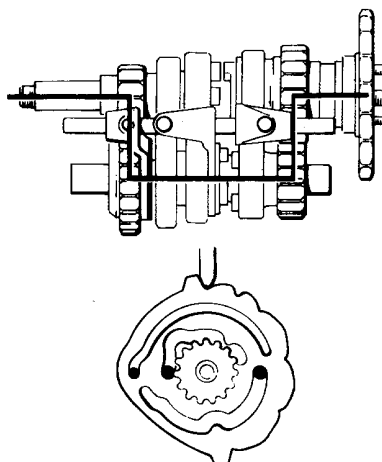


Fig. D2(ii) First gear engagement

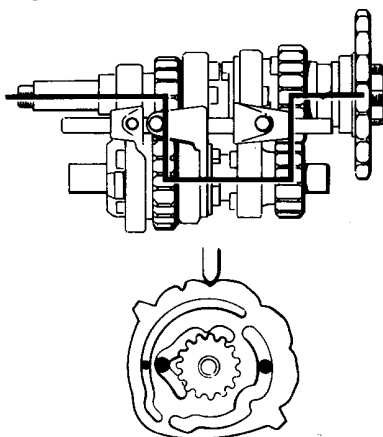


Fig. D2(iii) Second gear

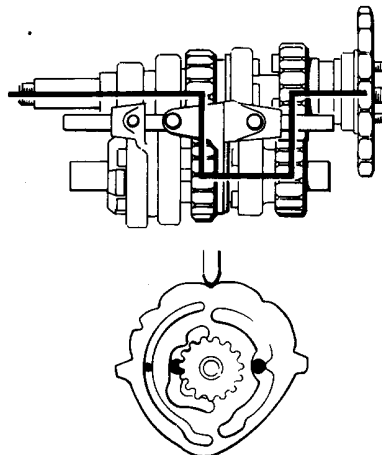


Fig. D2(iv) Third gear

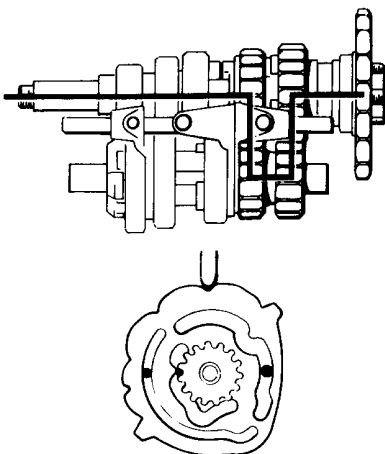


Fig. D2(v) Fourth gear engagement

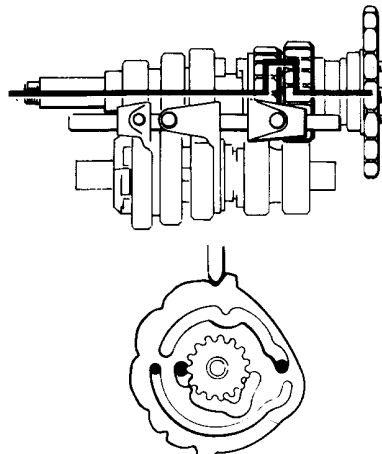


Fig. D2(vi) Fifth (top) gear

Fig. D2. The gearchange sequence

the gear lever in the same direction will select third gear by moving the mainshaft sliding gear into mesh with the mainshaft third gear. At the same time the second layshaft selector disengages second gear.

Further movement of the gear lever will select fourth gear by moving the sliding layshaft third gear into mesh with the layshaft fourth gear while the mainshaft fourth gear is moved into neutral position.

Finally, fifth gear is obtained by a final movement of the lever in the same direction. The mainshaft selector fork will bring the mainshaft sliding gear (fourth gear) into mesh with the mainshaft fifth gear. At the same time the second layshaft sliding gear (third gear) is moved into neutral position. It should be noted that throughout the range of gear pedal movements the gear pedal spindle and plunger housing return to the original position ready for the next selection.

## SECTION D2

### REMOVING AND REPLACING THE GEAR BOX OUTER COVER ASSEMBLY

Place a suitable receptacle under the gearbox drain plug and drain the gearbox oil (Fig. A5). Remove the generator cover and oil metering unit inspection cover (Fig. A3), disconnect and remove oil metering unit operating cable. Slacken LH footrest mounting bolt and swing footrest clear of the gearbox outer cover, release the nine socket headed screws holding the outer cover in place and gently tap the cover free (Fig. B3).

#### **WARNING**

DO NOT OPERATE THE GEAR CHANGE LEVER ONCE THE OUTER COVER HAS BEEN REMOVED. Operation of this lever will allow the spring loaded selector plungers to jump

out of their housings and this could cause injury. (See Fig. D3).

Once the outer cover has been removed, access is gained to the gear selector quadrant and the engine oil metering unit. (Refer to section A4 Removal & Replacement of oil metering unit).

Replacement is the reverse of removal. It is, however, important to remember to adjust the oil metering unit (See Section A6) and to refill with the recommended lubricant (Section A2) through the metering unit access cover to a level corresponding with the bottom of the access aperture.

## SECTION D3

### DISMANTLING & REASSEMBLING THE GEARCHANGE MECHANISM

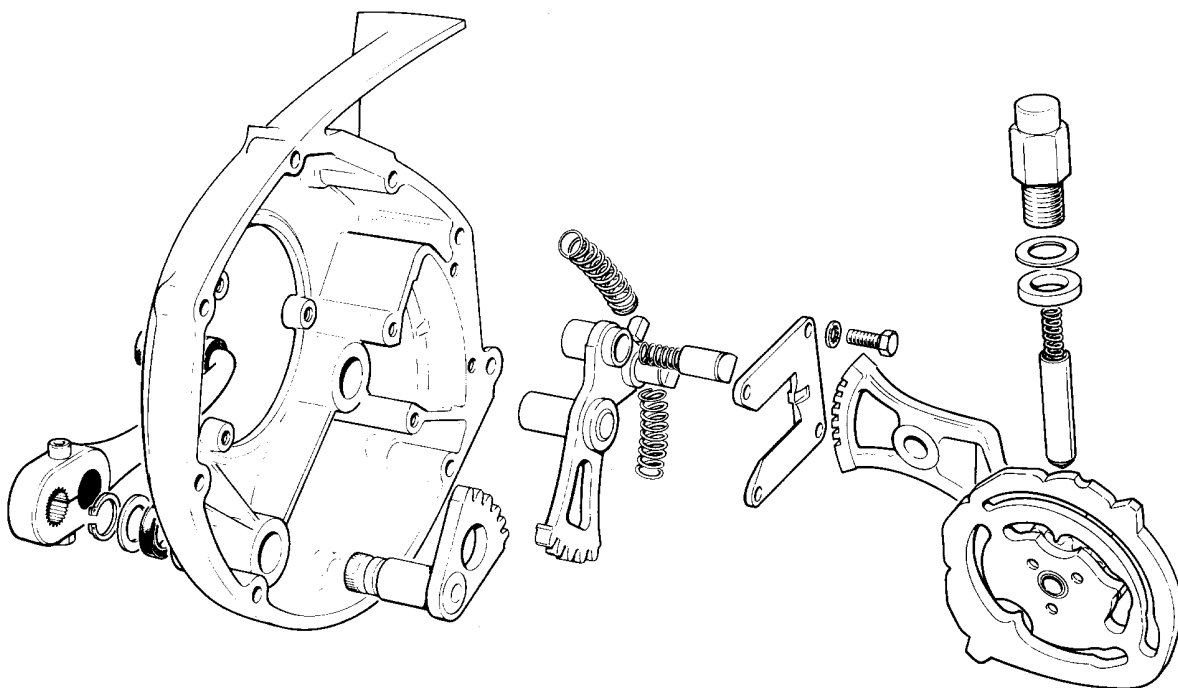


Fig. D3. The Gearchange Mechanism-Exploded view

Slacken off the gear change pedal locking bolt and withdraw the pedal from the splined shaft. A little leverage between the pedal and the cover may be necessary. For this, choose a suitable tool and protective pad to avoid damage to the cover.

Remove the four screws and locking washers securing the guide plate. Withdraw the guide plate, plunger quadrant and curved return springs. Thoroughly clean the parts in Paraffin (kerosene) and inspect them for wear etc., as detailed in Section D4.

To reassemble the mechanism offer the spindle to the outer cover bush using a smear of oil to assist assembly, then refit the two quadrant return springs and ensure that they locate correctly over the step in the cover. To facilitate assembly of the springs, first fit the gearchange pedal and clamp it in position, thus enabling the quadrant to be rotated and the springs compressed (See Fig. D3).

Refit the retainer plate, not forgetting the locking washers which fit one under each of the four screws. Finally, refit the springs and plungers, taking care that they are not suddenly ejected from their seats during assembly.

## SECTION D4

### INSPECTING THE GEARCHANGE MECHANISM

1. Inspect the gearchange plungers for wear and ensure that they are a clearance fit in the quadrant. Check the plunger springs by comparing their lengths with the figures given in 'General Data'.
2. Examine the plunger guide plate for wear and grooving on the taper guide surfaces. Renew the plate if grooving has occurred.
3. Inspect the footchange pedal return springs for fatigue and if they show signs of corrosion due to condensation, they should be renewed.
4. Examine the gearchange quadrant bore for wear and possible ovality by inserting the quadrant into the bore and feeling the amount of play.
5. Check the tips of the plungers and the teeth of the camplate operating quadrant for chipping and wear. To remove the camplate quadrant it is first necessary to remove the engine as detailed in Section D5 then remove the two split pins and withdraw the spindle.
6. Check the fit of the gearchange pedal spindle in the cover bore, by first removing the spindle oil seal. Insert the spindle and check the amount of play. Replace spindle or cover as necessary. Refit a new spindle oil seal, with the garter side facing inwards.

## SECTION D5

### DISMANTLING THE GEARBOX

Remove the engine unit (see section B1), drain the gearbox oil (A7) and remove the two pan headed slotted screws recessed in the RH gearbox end cover. Gently tap the cover loose and withdraw it from the gearbox mainshaft. Withdraw the layshaft 1st gear driving dog from the layshaft and remove the circlip

behind. Gently stone away any burrs that may have been thrown up on the edges of the circlip groove to prevent subsequent damage to the bore of the first gear bush. Carefully pull out the selector shaft and, raising the selector fork slightly, remove the selector fork and layshaft 1st gear. Remove the layshaft 2nd

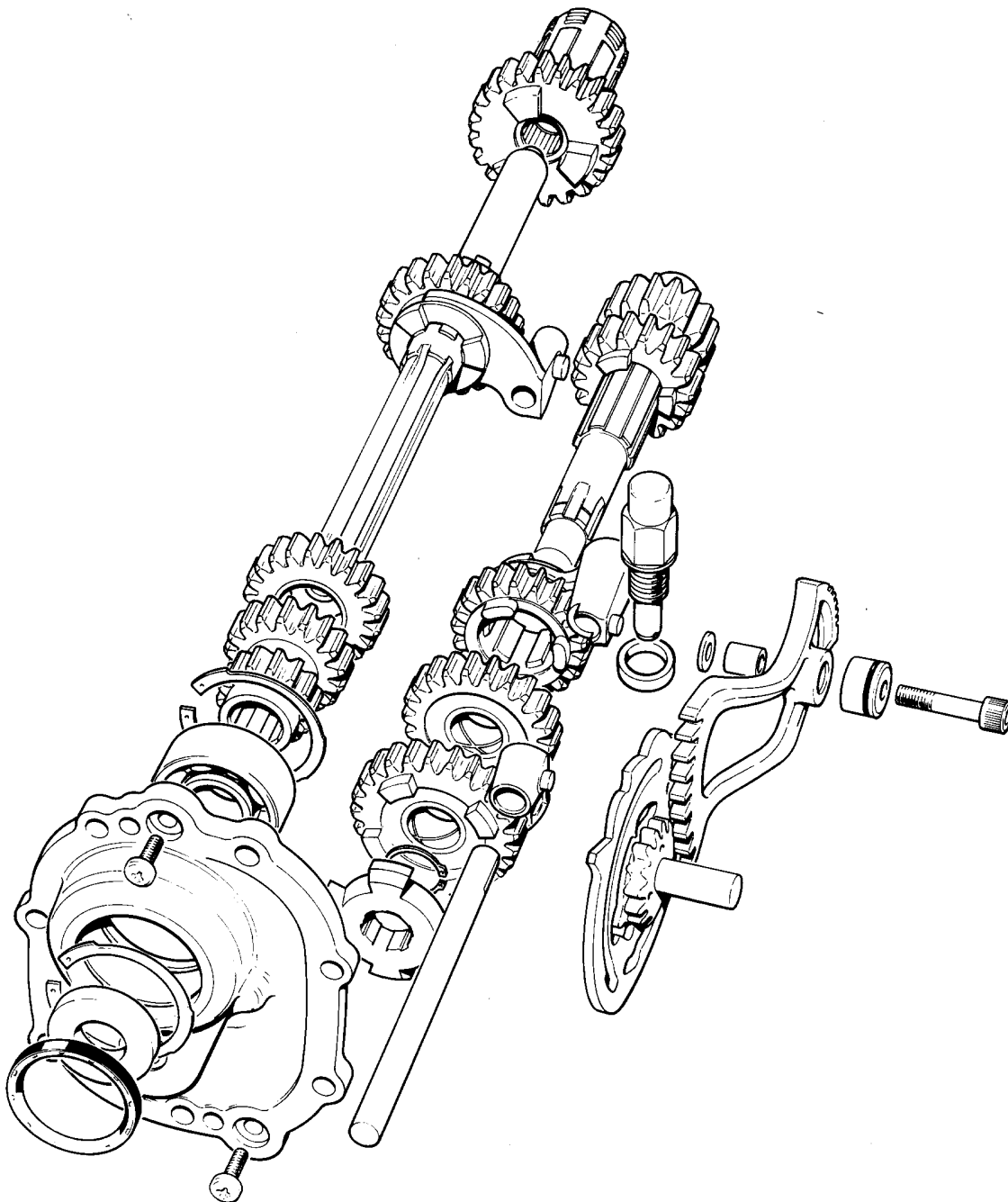


Fig. D4 Exploded view of the gearbox components.

gear mainshaft 1st and 2nd gear cluster, and mainshaft 3rd gear. Raise the selector fork and withdraw the selector and layshaft 3rd gear simultaneously. Pull out the mainshaft and 4th gear and the layshaft with its 4th and 5th gears. Take out the mainshaft 5th gear assembly by releasing the drive sprocket tab washer and removing the drive sprocket retaining nut. This will require the use of a suitable chain strap wrench and 1." A/F

spanner. (See also Section D8).

Between the tab washer and drive sprocket is located an 'O' ring. This must be removed to allow the mainshaft 5th gear assembly to be pushed into the gearbox. **The 5th gear assembly will not move if the 'O' ring is left in place.** Move to the left side of the machine and remove the camplate quadrant pivot bolt and quadrant assembly.

## SECTION D6

### INSPECTION OF THE GEARBOX COMPONENTS

Examine all gears for signs of wear, pitting, cracks and obvious damage, i.e. fractured teeth. Examine all bearings for damage, wear, fatigue and discolouration. If bearings do need to be replaced, heat the gearbox housing gently to 150° C to remove and replace.

Check the mainshaft high gear assembly to ensure the needle roller bearings which are a press fit into the bore of the gear have remained in their correct location. Any movement towards fourth gear can result in reduced mainshaft end float, and create gear changing difficulties. The bearings can be positioned correctly (1.52 mm/0.060 in) below the lip of the inner bore at the toothed end of the gear (using a 26.7/26.9 mm (1.05/1.06 in.) diameter shouldered gauge incorporating a 20.5/20.6 mm. (0.809/0.810 in.) spigot.

Later machines have the needle bearings located by the circlip and a spacing bush.

Examine the driving dogs for wear and damage, the selectors and camplate for wear. Ensure that the mainshaft and layshaft splines are not 'burred' or worn i.e. that the spline edges and faces are undamaged. Any lack of smoothness between the shaft and gear seriously affects gear changing and selection

**THE LAYSHAFT 4TH AND 5TH GEAR ASSEMBLY IS A FACTORY REPLACEMENT UNIT. DO NOT TRY TO DISMANTLE.** This is because this unit is selectively assembled from carefully matched components.

Examine all oil seals and 'O' rings for wear and damage and replace as necessary.

## SECTION D7

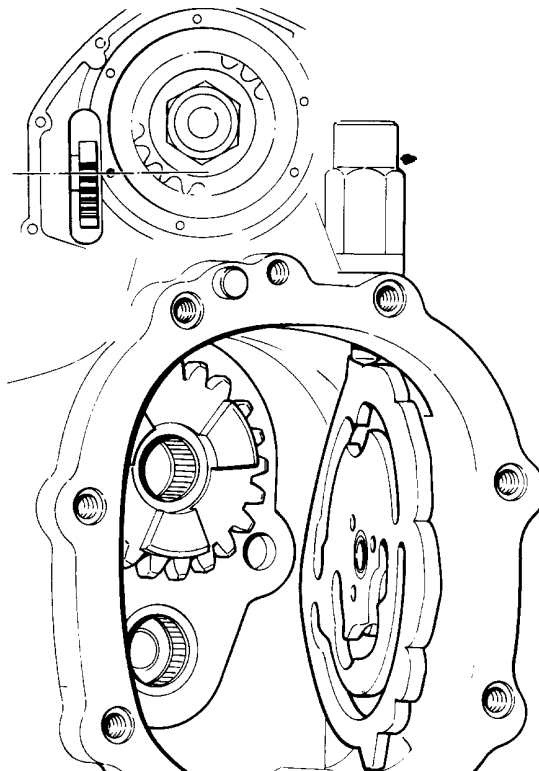
### REASSEMBLY OF THE GEARBOX COMPONENTS

Refit the camplate quadrant into the gearbox taking care when re-assembling the quadrant pivot bolt, bush, pivot sleeve and thrust washer that the pivot bolt is not tightened beyond the recommended torque setting. Always check the freedom of movement of the quadrant prior to continuing assembly. Refit the camplate after ensuring there is no damage to the spindle. Before pushing the camplate fully home it is essential that the camplate quadrant and the camplate gear are timed in their correct positions.

The camplate should be positioned as if in 5th gear (fig D5) and the quadrant positioned so that the top tooth aligns with the cover plate securing screw hole centre at 8 o'clock (see insert - Fig D5) then the camplate can be pushed fully home. To check the timing is correct, spin the camplate, checking that all the detents in the periphery align with the plunger before the quadrant prevents further rotation of the camplate.

Fit the mainshaft 5th gear assembly into the bearing. Fit the mainshaft selector fork onto the mainshaft 4th gear, insert the mainshaft, 4th gear, and selector fork into the gearbox with the mainshaft passing through the mainshaft 5th gear assembly and locating the selector fork driving pin in the camplate.

When assembling the mainshaft through 5th



**Fig. D5. Gearbox re-assembly showing initial camplate location when engaging with the gearchange quadrant.**

gear, rotate the mainshaft to prevent damage or accidental displacement of the oil seal.

**NOTE.** IT MAY BE NECESSARY TO MOVE THE CAMPLATE SLIGHTLY TO ACCOMMODATE THE SELECTOR FORK DRIVING PIN. Fit the layshaft assembly into the gearbox housing. Fit the layshaft 3rd gear and selector fork onto the layshaft locating the selector drive pin in the inner of the two drive slots. Fit mainshaft 3rd gear, layshaft 2nd gear, mainshaft 1st and 2nd gears onto their shafts. Fit the layshaft 1st gear and selector with the selector drive pin in the nearest slot. Refit the circlip onto the layshaft and re-position the layshaft 1st gear driving dog with rounded face outwards. Refit the gearbox end plate using clear silicone sealer.

At this point a check should be made for adequate mainshaft end float (approx 3mm or 1/8in). If not present, re-check the sequence of assembly. Should the problem persist, the mainshaft high gear needle roller bearing cage

location must be checked as detailed in section D6.

Before replacing the engine ensure that all gears can be selected. If all five gears cannot be selected, it is likely the camplate timing is at fault.

#### **WARNING**

**UNDER NO CIRCUMSTANCES WHATSOEVER MUST THE END OF THE MAINSHAFT BE STRUCK TO LOCATE THE NEEDLE ROLLERS. SUCH ACTION WOULD FRACTURE A ROLLER NEEDLE RESULTING IN ULTIMATE LOCK UP OF THE GEARBOX WHEN IN USE AND POSSIBLE INJURY TO THE RIDER.**

Refit the engine unit, primary drive etc as described in Section B10 and refill gearbox with recommended lubricant (Section A2).

## **SECTION D8**

### **CHANGING THE GEARBOX DRIVE SPROCKET**

To gain access to the gearbox sprocket, first drain gearbox (Section A7) and rear chain oil, (A9) then remove the LH gearbox outer cover assembly. (See Section D5). Remove the oil metering unit and the oil metering unit mounting plate (Fig. B3 and D6). This will give access to the gearbox sprocket. Detach the rear drive chain rubber gaiters from their gearbox end mountings and withdraw from the chain apertures (See Fig. D8).

Disconnect split link and pull chain from gearbox sprocket, wire ends of chain together to prevent the chain being pulled through the rear sprocket housing. After releasing the gearbox sprocket nut lock washer apply a chain wrench and remove the gearbox sprocket nut. After removing the 'O' ring the gearbox sprocket can be pulled off. If the service tool (Part No. 50-0408) is required to remove the sprocket, it is advisable to protect the bifurcated end of the gearbox mainshaft.

Inspect the mainshaft oil seal whilst the sprocket is removed and if necessary, replace. When fitting a new sprocket fit a new 'O' ring between the tab washer and the sprocket. Reassembly is the reverse of dismantling. However, care must be taken to clean and seal all mating surfaces with clear silicone sealer and to pre-load the sprocket nut to the correct figure. Do not forget to refill gearbox and rear chain oils (See recommended lubricants – Section A2).

D8

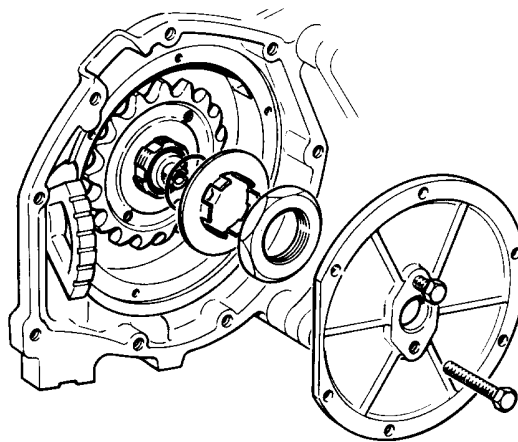


Fig. D6. Changing the gearbox sprocket.

#### **NOTE:**

1. If the gearbox sprocket is worn, there is a possibility that the chain and rear drive sprocket will also be worn. Examination is recommended and replacements should be made if any worn parts are found.
2. When refitting the gearbox cover plate ensure the locating dowel holes and all bolt holes are clear and not blocked by sealing compound, grease or oil. Tightening a bolt in a thread, filled or partially filled with any of the above could cause a hydraulic lock with subsequent damage to the gearbox casing.



## SECTION D9

### REAR DRIVE CHAIN

The rear chain specified for this machine is a single row 5/8in x 3/8in x 112 links 'Renold Grand Prix' totally enclosed and running in an oil bath.

This system of complete enclosure and constant lubrication ensures maximum chain life and reduces the need for frequent chain adjustment. The rear chain is considered to have reached the end of its useful life when the difference between its compressed and extended length, when laid in a straight line on a flat surface (112 links) exceeds 22 mm (7/8 in.). Continued running with any further stretch will inevitably initiate premature sprocket wear.

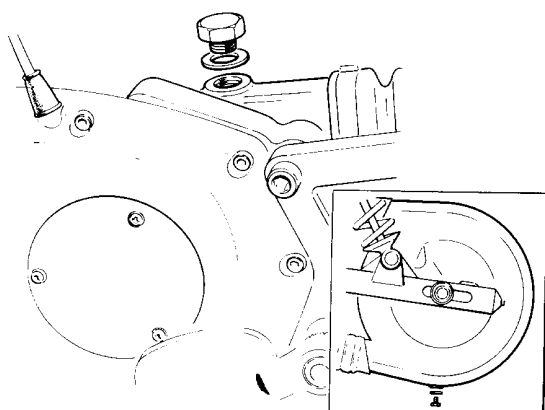


Fig. D7. Drain and refill the rear chaincase

#### Removing & Replacing the Rear Chain

Removal and replacement of the rear chain is a straight forward operation.

Place a suitable receptacle under the rear wheel sprocket outer cover, remove the drain plug and drain the oil. Remove the clip securing the bottom chain gaiter to the rear sprocket housing and push the gaiter forward. Rotate the rear wheel until the spring link comes into view. Slacken off the rear chain adjusters to allow for fitting of new chain. Remove spring link and connect new chain to

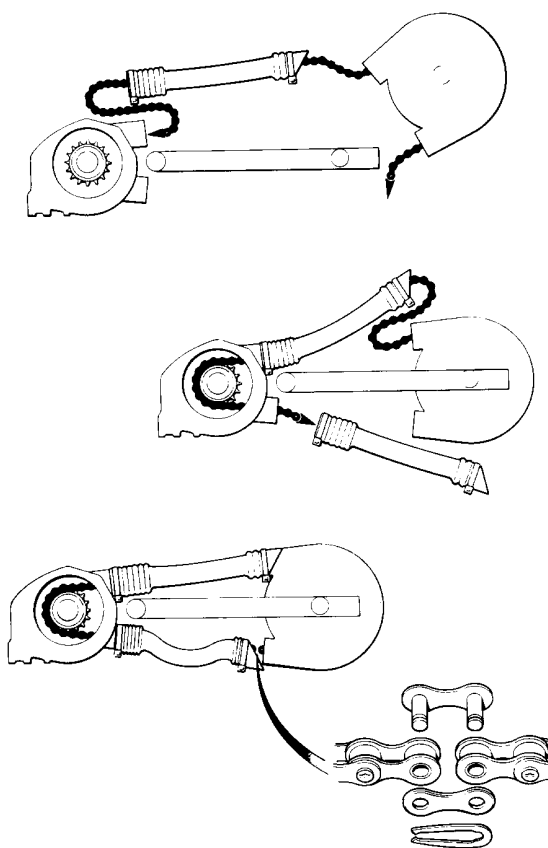


Fig. D8. Replacing the rear chain and gaiters.

old and pull through. When new chain appears, disconnect old chain and connect new one using new spring link fitted with CLOSED END IN THE DIRECTION OF TRAVEL. Clean any old sealing compound from joint faces, wash with petrol to remove all traces of lubricant and apply a good coating of clear silicone sealing compound. Refit lower chain gaiter and clip. Replace drain plug. Wipe off excess sealing compound refill with 175 cc of the recommended oil through plastic filler plug in the top of the gearbox casting and adjust the chain to give 1 1/4" (40 mm) total free play with the machine on the centre stand. Adjust in accordance with the following Section D10. Adjusting the rear chain tension.

**NOTE:** If at any time the rear chain has been withdrawn from around the rear wheel drive sprocket, the housing will have to be removed from the swinging arm to allow the chain to be re-engaged. See Fig. D8.

If one or more decals have become detached from the swinging arm, the only reliable way to re-affix replacement decals (Following chemically cleaning down the decal contact area to be totally free of oil, grease or dirt), is to correctly adjust the rear chain (Section D10), accurately align the front and rear wheels (Section G14) and replace the decals exactly in line with the marks on the spindle abutments. The original production location was determined in conjunction with a brand new chain, but due allowance for mileage can be given when replacing both decals (eg following re-painting). Obviously, when replacing only one decal, it must align exactly with the existing decal.

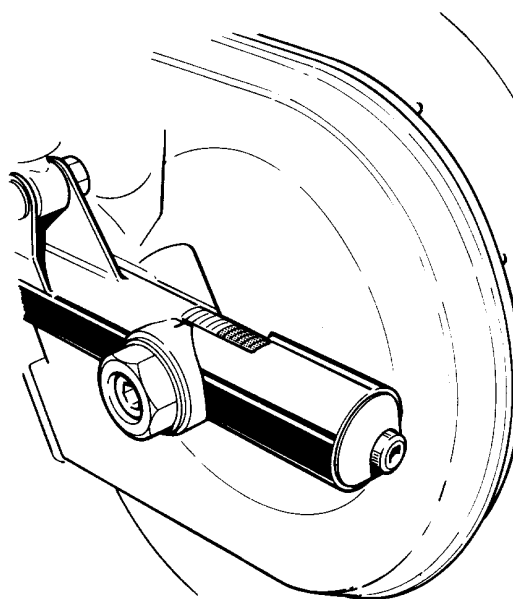


Fig. D10 Rear wheel alignment decal

## SECTION D11

### REAR CHAIN GAITERS

If, at any time, a split is found in the rear chain gaiter (s), they must be replaced as any ingress of dirt will drastically shorten the life of the chain. See Section D9.

Proceed as described for replacing the chain, but slacken the gaiter clips and remove both gaiters and the chain from around the rear wheel drive sprocket as shown in Fig. D8. It is advisable to restrain the chain from disengaging from the gear-box drive sprocket if the original drive chain is not being replaced. Clean any old sealing compound from the gaiter joint

faces, wash with petrol to remove all traces of lubricant, and apply a good coating of new clear silicone sealing compound. Pass the chain top run through the top gaiter as shown in Fig. D8. Thread the lower chain run through the lower gaiter. Pass the top chain run round the rear sprocket and replace the drive housing. Assemble the gaiters in the sequence shown in Fig'D8 and fit the chain spring link with the closed end in the direction of travel. Close the lower gaiter joint. Fit and lock-up the gaiter clips. Check wheel alignment and chain adjustment as directed in Section D10.