Chapter 6
Manual gearbox and automatic transmission

For modifications, and information applicable to later models, see Supplement at end of manual

Contents

Specifications

Manual gearbox

Type	Four forward and one reverse gear, synchromesh action on all forward gears

Clearances and adjustments

Laygear endfloat	0.002 to 0.006 in (0.05 to 0.15 mm)
Primary gear endfloat	0.0035 to 0.0065 in (0.088 to 0.164)
Idler gear endfloat	0.003 to 0.008 in (0.076 to 0.203 mm)
Lubrication	Engine/transmission lubrication system combined

Automatic transmission

Type	Automotive products

Torque converter

Type	Three-element
Multiplication	2.1 maximum
Lubrication	Engine/transmission lubrication system combined (capacity 9 pints/5 litres)

Torque wrench settings

Manual gearbox	lbf ft	Nm
Flywheel housing nuts and bolts	18	25
First motion shaft nut	150	207
Mainshaft (final drive pinion) nut	150	207
Mainshaft bearing retainer bolts	13	18
Engine to gearbox casing	6	8
Gearbox drain plug	25	35
Gearbox casing studs $\frac{3}{8}$ in UNC	8	11
Gearbox casing studs $\frac{5}{16}$ in UNC	6	8
Gearbox casing studs $\frac{3}{8}$ in UNF	25	35
Gearbox casing studs $\frac{5}{16}$ in UNF	18	25
Speedometer drive housing nuts	18	25

Automatic transmission

	lbf ft	Nm
Transmission drain plug	25	35
Converter centre bolt	112	152
Converter (six central bolts)	21	29
Converter drain plugs	20	27
Engine to transmission casing	12	16
Converter housing bolts	18	25
$\frac{5}{16}$ in UNF bolts	19	26
$\frac{3}{8}$ in UNF bolts	30	41

1 General description

The manual transmission fitted to all models covered by this manual comprises four forward and one reverse gear. All forward gears are engaged through baulk ring synchromesh units to obtain smooth silent gearchanges. The transmission is housed within an aluminium casing bolted to the lower face of the engine, and shares the engine lubricating oil. The differential assembly is contained within a separate housing bolted to the rear of the gearbox casing.

On early models movement of the gear lever is transmitted to the selector forks by a selector lever, two relay shafts and a ball-and-socket joint. The gear lever is mounted either on the rear of the differential casing or externally in a remote control housing, which is in turn bolted to the rear of the differential. In this case an additional shaft transmits movement of the gear lever to the relay shafts.

A revised gear selector mechanism with a simpler and more positive rod-change remote control linkage is incorporated in the later type gearboxes. Movement of the gearlever is transmitted to the selector forks by an external selector rod, a selector shaft, and a bellcrank lever assembly. The gear lever is mounted in a remote control housing attached to the vehicle floor via rubber mountings.

A four-speed automatic transmission is available on certain models as a factory option. Further information on the automatic transmission unit will be found in subsequent Sections of this Chapter.

2 Gearbox – removal and refitting

The gearbox is removed from the car together with the engine and differential assembly as described in Chapter 1. It is then necessary to separate the engine from the gearbox; full information on this procedure is also detailed in Chapter 1.

3 Gearbox (early type) – dismantling

1 Position the gearbox on a strong bench so that it is at comfortable working height and easily accessible from both sides. Alternatively place the gearbox on a clean floor, preferably covered with paper.

2 Begin dismantling by removing the differential assembly as described in Chapter 8.

3 Undo and remove the large hexagon-headed plug and washer from the front of the gearbox casing and then lift out the spring and reverse check plunger. **Note:** *On some models a reversing light switch may be fitted in place of the hexagon plug.*

4 Take off the idler gear from the side of the gearbox casing together with its thrust washers. Ensure that the thrustwashers are kept in their correct relative position either side of the gear.

5 Unscrew the clamp bolt and washer securing the selector lever to

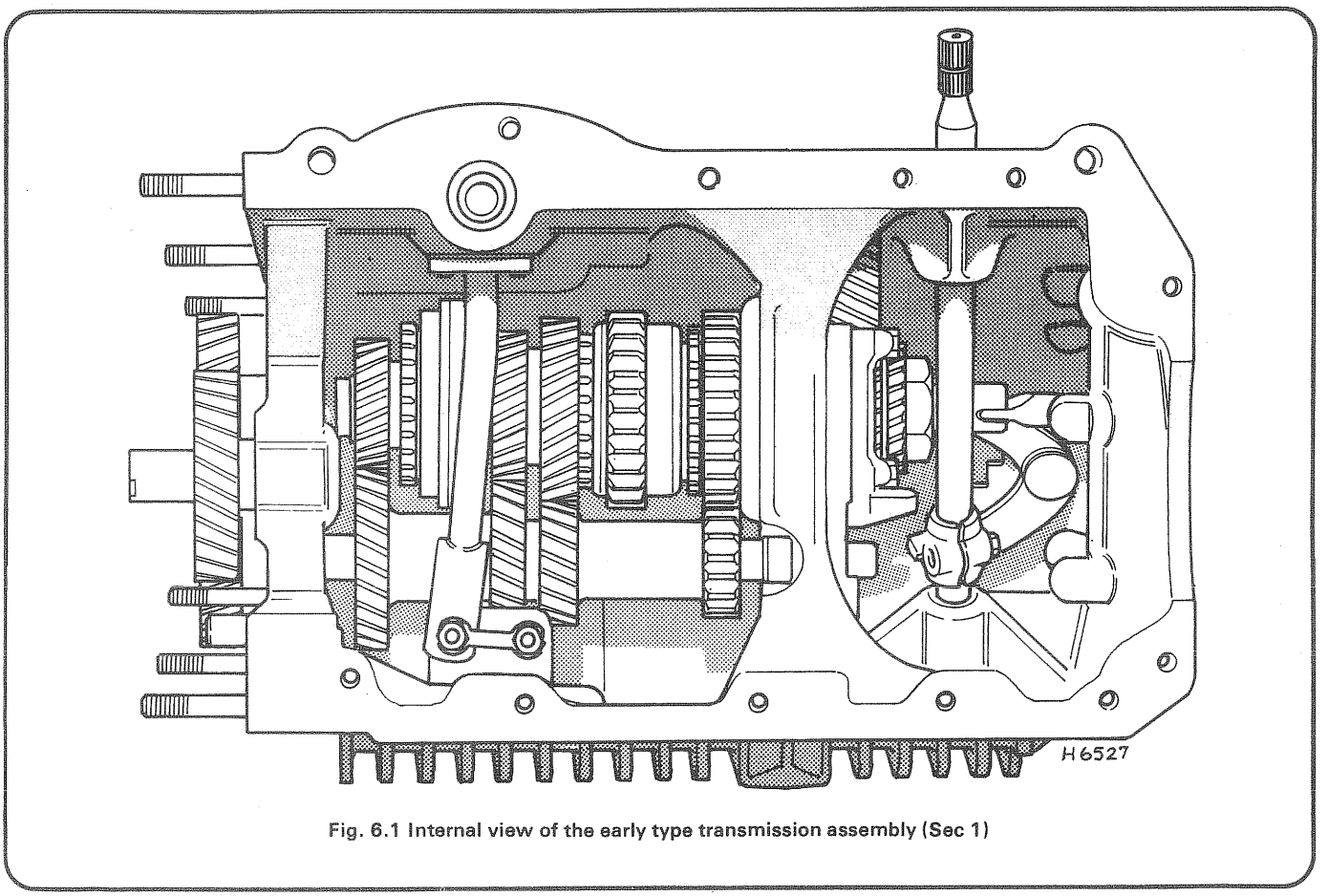


Fig. 6.1 Internal view of the early type transmission assembly (Sec 1)

the gearchange shaft. Slide the gearchange shaft off the selector lever and withdraw it from the casing. Take care not to lose the Woodruff key from the shaft (photo). Now lift out the selector lever and prise out the shaft oil seals if required.

6 Undo and remove the speedometer pinion housing cover retaining screw and lift off the cover and bush assembly. Now lift out the pinion.

7 Undo and remove the nuts and spring washers and lift off the engine mounting bracket and front cover.

8 Now lift out the interlocking change speed gate (photo).

9 Knock back the locktabs and undo and remove the two bolts securing the oil suction pipe blanking plate to the rear of the casing. Lift off the blanking plate and gasket.

10 Knock back the locktabs and undo and remove the two bolts securing the oil strainer and suction pipe support bracket to the lug on the gearbox casing. Pull the suction pipe out of the oil strainer and remove it from the gearbox (photo). The oil strainer cannot be removed at this stage.

11 From the flywheel housing side of the gearbox, extract the small circlip from the first motion shaft and then, using a puller or two screwdrivers, withdraw the small first motion shaft roller bearing from the end of the shaft.

12 Engage two gears simultaneously by moving two of the selector rods in or out. This will lock the mainshaft and prevent it from turning as the large retaining nuts are undone.

13 Tap back the lock washer and undo and remove the first motion shaft retaining nut from the flywheel housing side of the gearbox. This nut will be very tight and it may be necessary to place the gearbox on the floor and have an assistant stand on the casing as the nut is undone. Now slide the first motion shaft ear off the shaft.

14 Tap back the lockwasher and, using a socket and extension bar inserted through the open end of the casing, undo and remove the final drive pinion retaining nut. This will also be tight and your assistant may be required again. With the nut removed, slide off the final drive pinion (photos).

15 Knock back the locktabs and undo and remove the bolts securing the mainshaft bearing retainer to the centre web of the gearbox casing. Lift off the bearing retainer and shim followed by the layshaft and reverse shaft locking plate (photos).

16 Measure the endfloat of the leygear using feeler gauges. If the endfloat is outside the limits specified then new thrust washers must be fitted on reasssembly.

17 Unlock the two previously locked mainshaft gears by moving the selector rods back to the neutral position.

18 Using a brass drift, tap the layshaft out of the gearbox casing towards the flywheel housing side, and lift off the laygear together with the two thrust washers (photos).

19 Undo and remove the two plugs from the lower rear face of the gearbox and lift out the springs and interlocking plungers. Sludge in the bottom of the casing may prevent the plungers from being removed but this will not affect the dismantling procedure. Take care that they are not lost or dislodged when cleaning the casing after dismantling.

20 Extract the large circlip from the flywheel housing side of the gearbox which retains the first motion shaft bearing in position. Now very carefully, using a brass drift, tap out the first motion shaft and bearing from the casing (photos).

21 Using a brass drift or soft-faced mallet, tap the mainshaft toward the flywheel housing side of the gearbox until a gap of about 1 in (25 mm) exists between the bearing and first gear. Now, using extreme care, tap the outer race of the bearing away from the flywheel housing and out of the centre web of the casing. Tap each side of the bearing alternatively to prevent it from binding, and take care not to impose any load on the teeth of first gear. When the bearing is clear of the centre web slide it off the end of the mainshaft and withdraw it from the casing (photo).

22 Now carefully lift the complete mainshaft assembly up and out of the gearbox (photo).

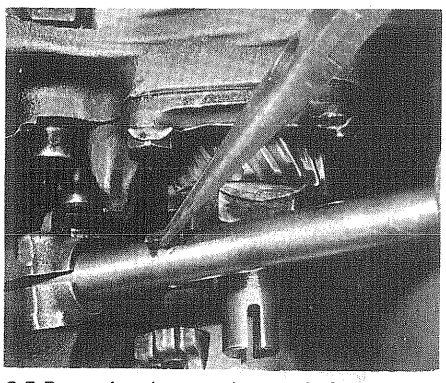
23 Lift out the oil strainer assembly (photo).

24 Tap out the reverse gear shaft (photo) and withdraw the gear and selector fork.

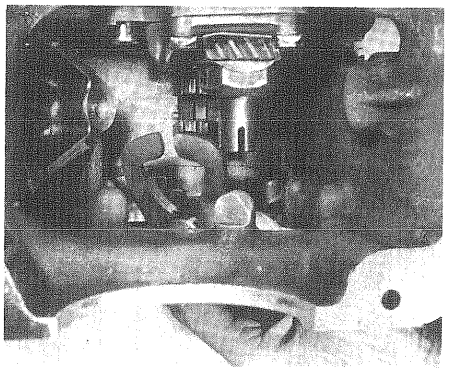
25 Slacken the locknuts and then undo and remove the selector fork retaining locking screws (photo).

26 Slide the selector rods out of the forks and withdraw the rods and forks from the gearbox.

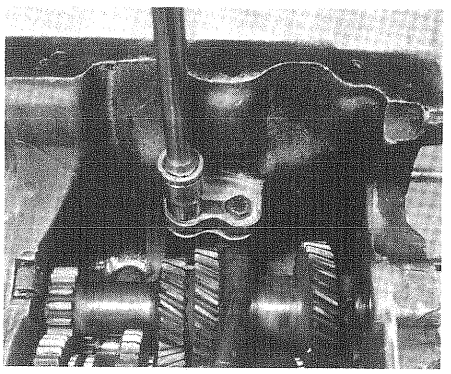
27 Remove the circlip from the reverse gear shift lever pivot pin and remove the lever (photo).



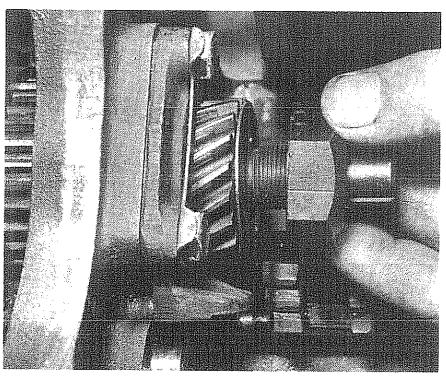
3.5 Removing the gearchange shaft and Woodruff key



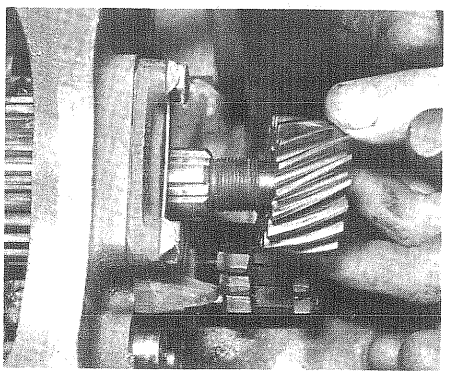
3.8 Removing the interlocking change speed gate



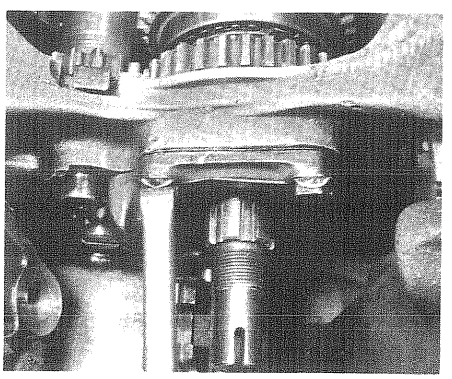
3.10 Removing the oil strainer retaining bolts



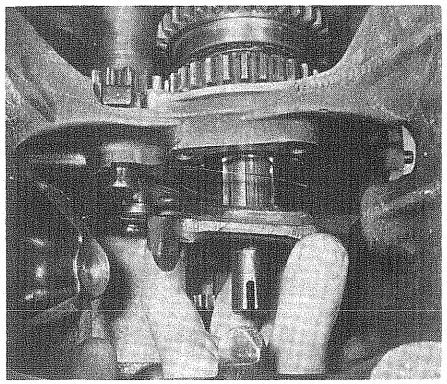
3.14a Unscrew the final drive pinion retaining nut...



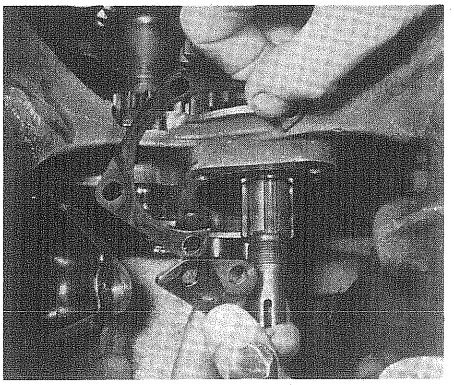
3.14b ...and slide off the final drive pinion



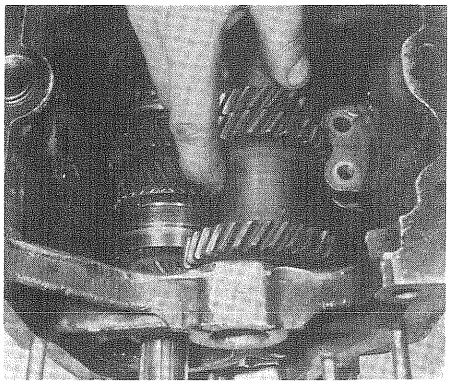
3.15a Bend back the locktabs and remove the bearing retainer bolts...



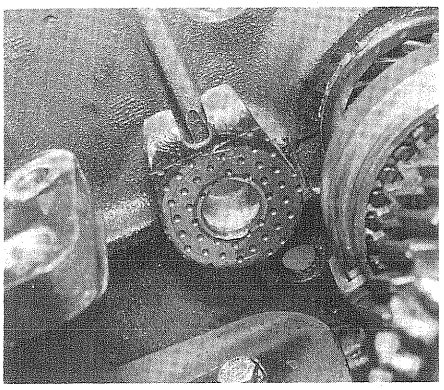
3.15b ...followed by the bearing retainer...



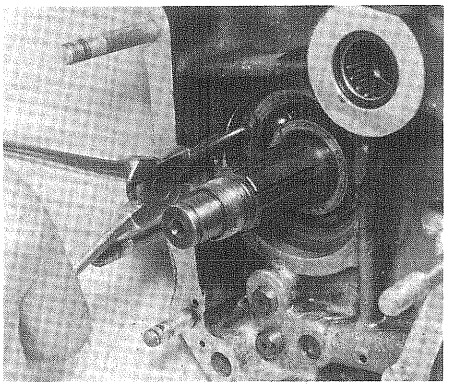
3.15c ...shims and locking plate



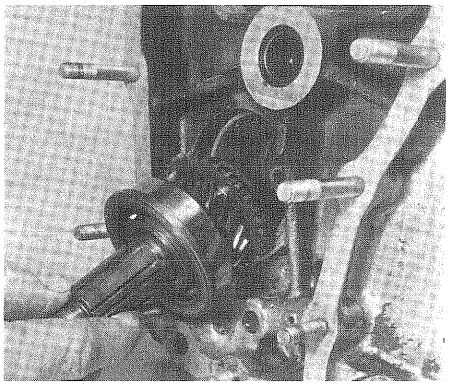
3.18a Withdrawing the laygear...



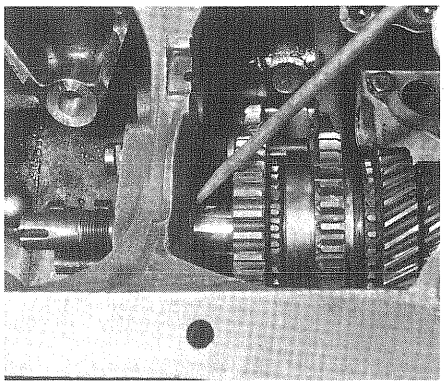
3.18b ...and thrust washers



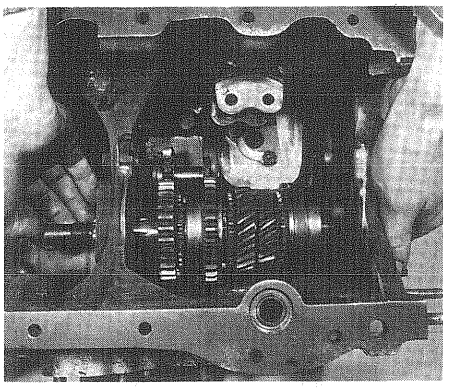
3.20a Extract the first motion shaft bearing circlip...



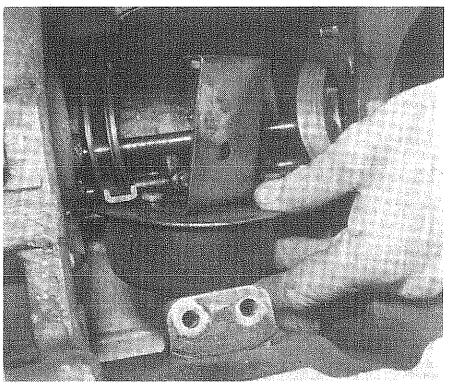
3.20b ...and remove the shaft and bearing assembly



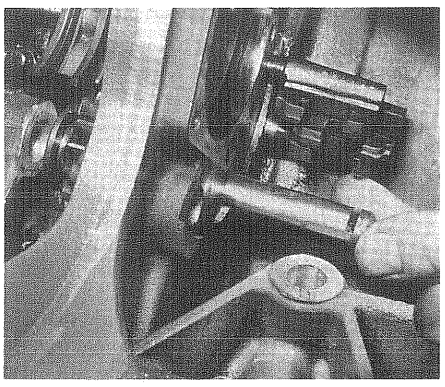
3.21 With extreme care, tap the mainshaft bearing out of the casing



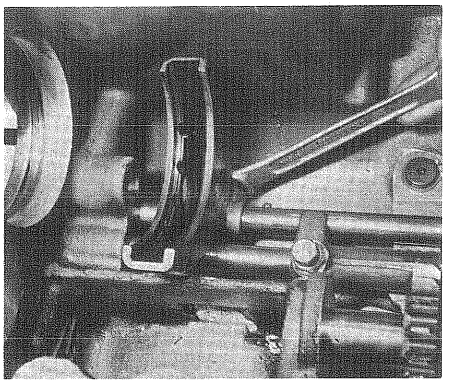
3.22 Lifting out the mainshaft assembly...



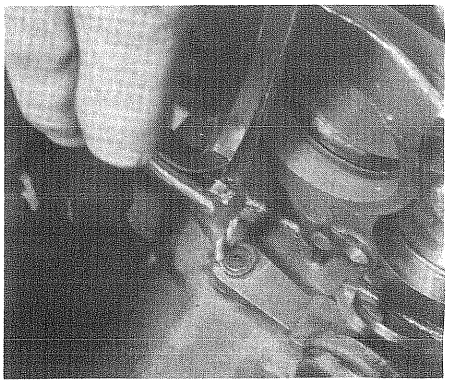
3.23 ...followed by the oil strainer



3.24 Removing the reverse gear shaft



3.25 Removing the selector fork locking screws



3.27 With the circlip removed, withdraw the reverse shift lever and pivot pin

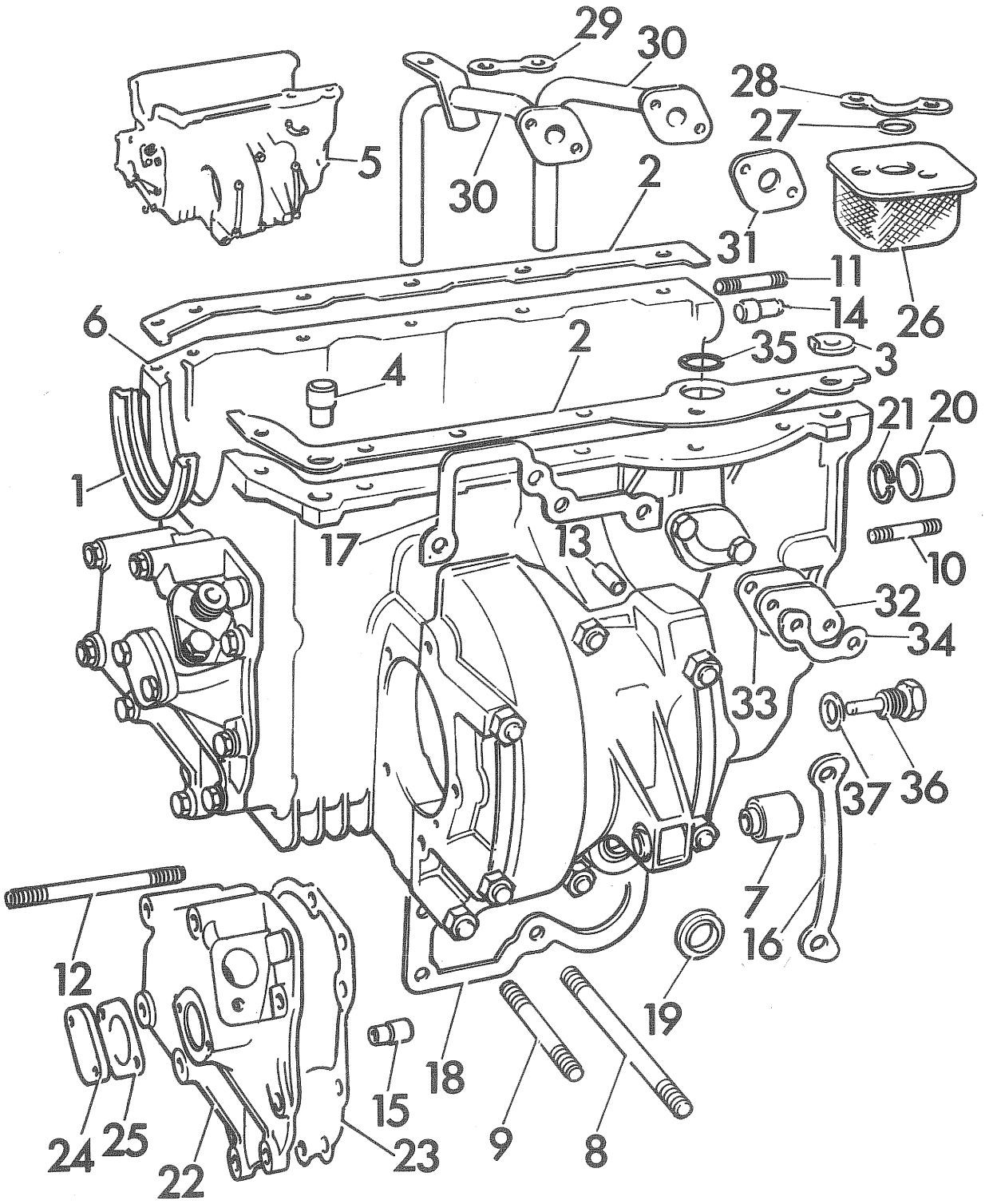


Fig. 6.2 Exploded view of the rod-change type transmission casing (Sec 4)

1 *Oil seal*
2 *Gasket*
3 *Collar*
4 *Dowel*
5 *Transmission casing*
6 *Case assembly*
7 *Bush*
8 *Stud*
9 *Stud*
10 *Stud*
11 *Stud*
12 *Stud*
13 *Dowel*
14 *Dowel*
15 *Dowel*
16 *Lockwasher*
17 *Gasket*
18 *Gasket*
19 *Oil seal*
20 *Bearing*
21 *Circlip*
22 *Speedometer drive housing*
23 *Gasket*
24 *Cover plate*
25 *Gasket*
26 *Oil strainer*
27 *Sealing ring*
28 *Lockwasher*
29 *Lockwasher*
30 *Pick-up pipe (alternative type)*
31 *Gasket*
32 *Cover plate*
33 *Gasket*
34 *Lockwasher*
35 *Sealing ring*
36 *Drain plug*
37 *Washer*

4 Gearbox (rod-change type) – dismantling

1 Position the gearbox on a strong bench so that it is at comfortable working height and easily accessible from both sides. Alternatively, place the gearbox on a clean floor, preferably covered with paper.
2 Begin dismantling by removing the differential assembly as described in Chapter 8.
3 Take off the idler gear from the side of the gearbox casing together with its thrust washers. Ensure that the thrust washers are kept in their correct relative positions on either side of the gear.
4 Undo and remove the speedometer pinion housing cover retaining screw and lift off the cover and bush assembly. Then lift out the pinion.
5 Undo and remove the nuts and spring washers and withddraw the engine mounting, adaptor, and front cover assembly.
6 Knock back the locktabs and undo and remove the two bolts securing the oil suction pipe blanking plate to the rear of the casing. Lift away the blanking plate and gasket.
7 Knock back the locktabs and undo and remove the two bolts securing the oil strainer and suction pipe support bracket to the lug on the gearbox casing. Pull the suction pipe out of the oil strainer and remove it from the gearbox. The oil strainer cannot be removed at this stage.
8 From the flywheel housing side of the gearbox, extract the small circlip from the first motion shaft and then, using a puller or two screwdrivers, withdraw the small first motion shaft roller bearing from the end of the shaft.
9 Turn the selector shaft anti-clockwise until the operating stub and the interlock spool are disengaged from the bellcrank levers.
10 Push the sliding collar of the third/ fourth synchro-hub toward the flywheel housing end of the gearbox to engage fourth gear. Now push the sliding collar of the first/second synchro-hub toward the gearbox centre web to engage first gear. This will lock the mainshaft and prevent it from turning as the large retaining nuts are undone.
11 Tap the lockwasher and undo and remove the first motion shaft retaining nut from the flywheel housing side of the gearbox. This nut will be very tight and it may be necessary to place the gearbox on the floor and have an assistant stand on the casing as the nut is undone. When the nut is removed, slide the first motion shaft gear and lockwasher off the shaft.
12 Tap back the lockwasher and, using a socket and extension bar inserted through the open end of the casing, undo and remove the final drive pinion retaining nut. This nut will also be tight and your assistant may be required again. With the nut removed slide off the final drive pinion and lockwasher.
13 Return the first and fourth gears to the neutral position.
14 Knock back the locktabs and undo and remove the bolts securing the mainshaft bearing retainer to the centre web of the gearbox casing. Lift off the bearing retainer and shim followed by the layshaft and reverse shaft locking plate.
15 Measure the endfloat of the laygear using feeler gauges. If the endfloat is outside the limits specified then new thrust washers must be fitted on reassembly.
16 Using a brass drift, tap the layshaft out of the gearbox casing towards the flywheel housing side, and lift out the laygear together with the two thrustwashers.
17 Extract the large circlip from the flywheel housing side of the gearbox which retains the first motion shaft bearing in position. Now, very carefully using a brass drift, tap out the first motion shaft and bearing from the casing.
18 Using a brass drift or soft-faced mallet, tap the mainshaft toward the flywheel housing side of the gearbox until a gap of about 1 in (25 mm) exists between the bearing and first gear. Take care that the sliding collar of the third/fourth synchro-hub does not become disengaged from the hub otherwise the detent balls and springs will be released.
19 Using extreme care tap the outer race of the bearing away from the flywheel housing end and out of the centre web of the casing. Tap each side of the bearing alternately to prevent it from binding, and take care not to impose any load on the teeth of first gear. As the bearing emerges it can be carefully levered the rest of the way out using a screwriver inserted between the casing and the bearing circlip.
20 When the bearing is clear of the centre web, slide it off the end of the mainshaft and withdraw it from the casing.
21 Carefully lift the complete mainshaft assembly up and out of the gearbox.
22 Remove the oil strainer assembly.

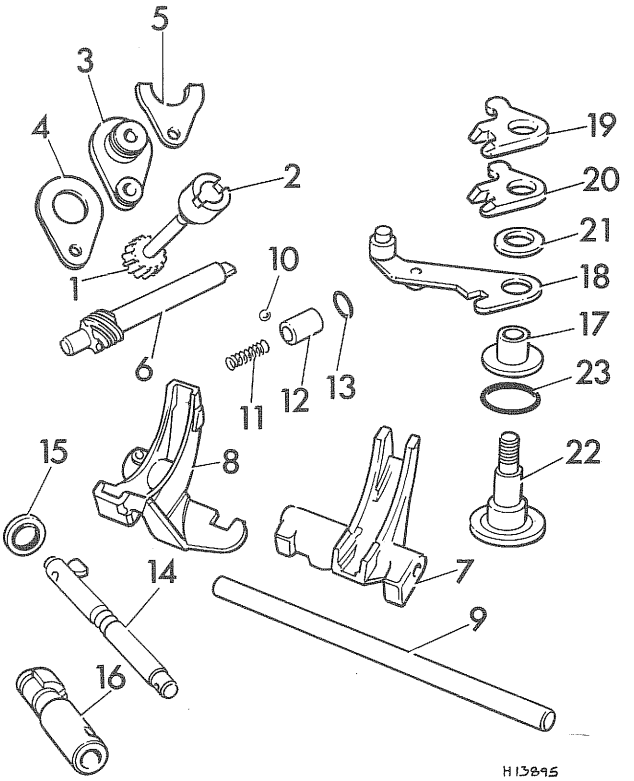


Fig. 6.3 The rod-change transmission selector mechanism (Sec 4)

1	*Speedometer pinion*	13	*O-ring*
2	*Bush*	14	*Selector shaft*
3	*Bush*	15	*Oil seal*
4	*Gasket*	16	*Interlock spool*
5	*Retainer*	17	*Bush*
6	*Gear and spindle*	18	*Reverse lever*
7	*1st and 2nd speed fork*	19	*Upper bell crank lever*
8	*3rd and 4th speed fork*	20	*Centre bell crank lever*
9	*Selector fork shaft*	21	*Spacer*
10	*Detent ball*	22	*Pivot pin*
11	*Detent spring*	23	*O-ring*
12	*Detent sleeve*		

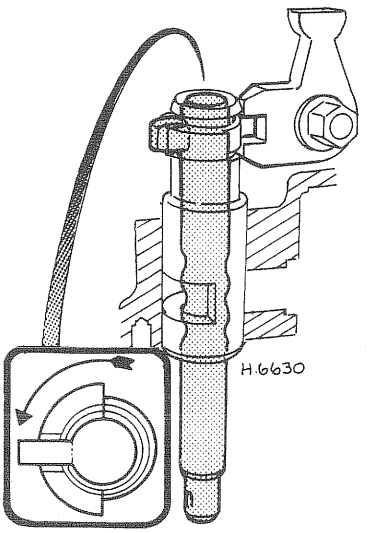


Fig. 6.4 Selector shaft turned anti-clockwise to disengage bellcrank levers (Sec 4)

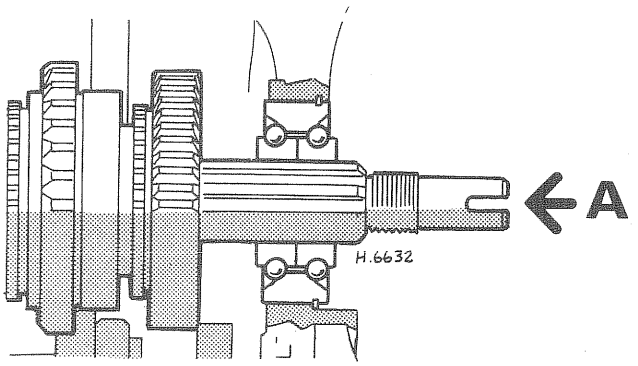


Fig. 6.5 Removal of mainshaft from centre support bearing – A indicates direction of removal (Sec 4)

23 Tap out the reverse gear shaft and withdraw the gear.
24 Using a small pin punch drift out the rollpin securing the third/fourth selector fork to its shaft.
25 Slide out the selector shaft and withdraw the two forks.
26 Undo and remove the bellcrank lever pivot post nut and washer.
27 Lift out the bellcrank levers, washers and pivot sleeve, noting the assembly sequence and the markings on the levers. Keep this assembly together to avoid confusion when refitting.
28 Wthdraw the interlock spool and selector shaft from inside the gearbox casing.
29 If necessary the bellcrank lever pivot post may be removed by drifting it downwards and out of the casing.

5 Gearbox – inspection

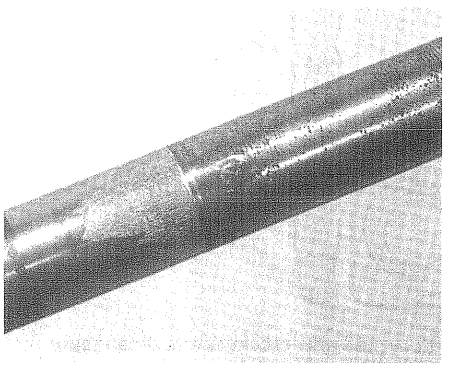
1 Thoroughly clean the interior and exterior of the gearbox casing. Check for any small parts that may have dropped into the gearbox during dismantling and recover them.
2 Examine the layshaft for signs of wear where the needle rollers bear. If a small ridge can be felt or if there is any deterioration of the surface hardening (photo), renew the layshaft. Also inspect the needle roller bearings (photo). If the shaft is worn the bearings will be worn and must be renewed. New thrust washers should be fitted as a matter or course, referring to the charts in Sections 8 and 9 for the correct size.
3 Examine the laygear, reverse idler gear and the gears on the mainshaft for excessive wear and chipping of the teeth.
4 Inspect the synchronising rings on the mainshaft for wear, distortion or cracks. If difficulty was experienced when changing gear then the rings should be renewed. If the vehicle had a tendency to jump out of gear then the complete synchro-hub of the relevant gear should be renewed.
5 Inspect the condition of the main ball-bearings, and also the small needle roller bearing and cage located on the front of the mainshaft. If there is any looseness between the inner and outer races, pitting of the balls or rollers, or roughness when the bearing is spun, then the bearing should be renewed. It is also advisable at this stage to check the condition of the idler gear bearings in the gearbox casing and flywheel housing. These bearings and the idler gear itself are notorious for wear and should be renewed if they show the slightest sign of such wear. Full information on these components will be found in Sections 11 and 12.
6 Examine the ends of the selector forks where they engage with the synchroniser-hubs. If possible compare the forks with new units to help determine the extent of the wear.
7 If it is necessary to renew the synchro-rings or the synchroniser-hubs or any of the mainshaft components, the mainshaft should now be dismantled as described in Section 7. If the first motion shaft or bearing require attention they should be dismantled as described below.

6 First motion shaft – dismantling and reassembly

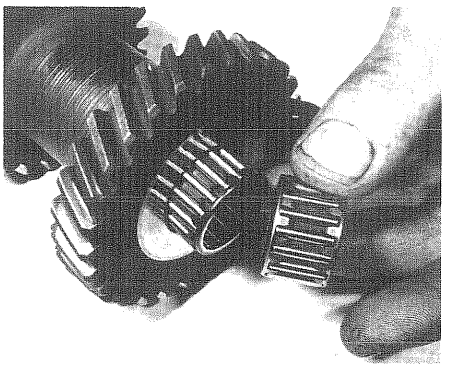
1 To remove the bearing from the first motion shaft, slide the shaft between open vice jaws and support the outer race of the bearing on the top of the jaws.
2 Using a soft-faced mallet drive the first motion shaft down and out of the bearing inner race. The strain placed on the bearing does not matter, as the bearing would not be removed unless it was being renewed. Alternatively use a two-legged universal puller (photo).
3 To fit a new bearing slide it onto the first motion shaft with the shoulder of the bearing towards the front of the shaft.
4 Now support the inner race of the bearing on protected vice jaws, and using a drift of suitable diameter inserted into the bearing hole at the rear of the gear, drive the shaft pulley into the bearing.

7 Mainshaft – dismantling and reassembly

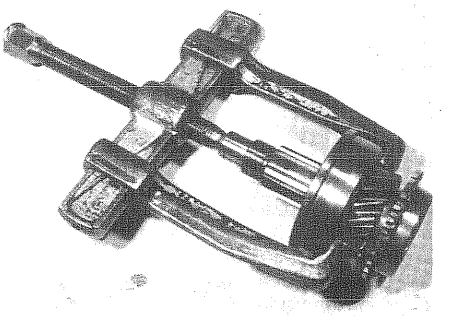
1 Place the mainshaft on a clean uncluttered working surface and begin dismantling by sliding off the third/fourth synchro-hub and baulk rings from the front of the shaft.
2 Using a thin screwdriver or thin piece of rod, press down the spring-loaded plunger and turn the splined thrust washer so that a spline holds the plunger down and the thrust washer is so positioned that it can now be slid off the front of the mainshaft.
3 Lift out the spring and plunger and then slide off the third speed gear and its caged needle roller bearing from the front of the mainshaft.
4 From the rear of the mainshaft withdraw the first speed gear and its caged needle roller bearing.
5 Using two screwdrivers carefully lever the first speed gear needle roller bearing journal rearwards and off the mainshaft.
6 Now slide off the first/second synchro-hub and the two baulk rings off the rear of the shaft.
7 The splined retaining thrust washer securing the second speed gear in position is retained with two spring-loaded plungers. To compress the plunger insert two small screwdrivers between the thrust washer and the edge of the gear. Now rotate the thrust washer so that the splines hold the plungers down and the thrust washer is so positioned that it can now be slid off the rear of the mainshaft.



5.2a Deterioration of the layshaft surface hardening at the needle roller bearing journal...



5.2b ...will also cause wear on the bearings



6.2 Using a puller to remove the first motion shaft bearing

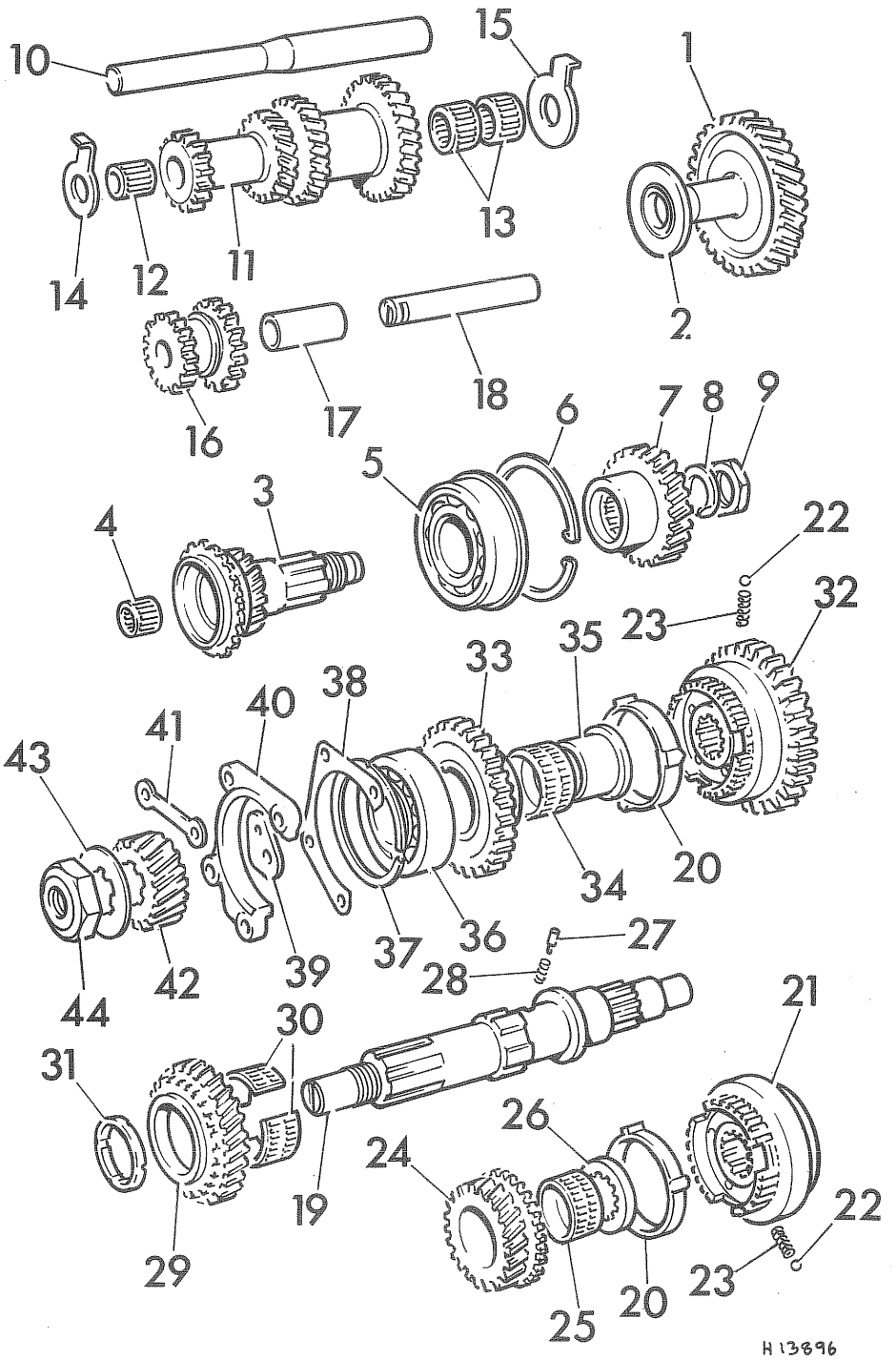
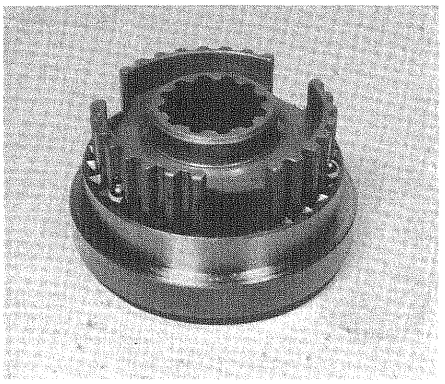
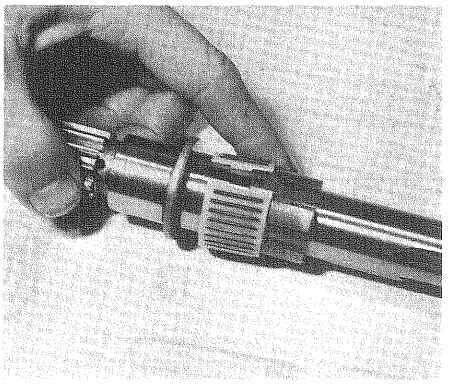


Fig. 6.6 Exploded view of the geartrain and related components (Sec 5)

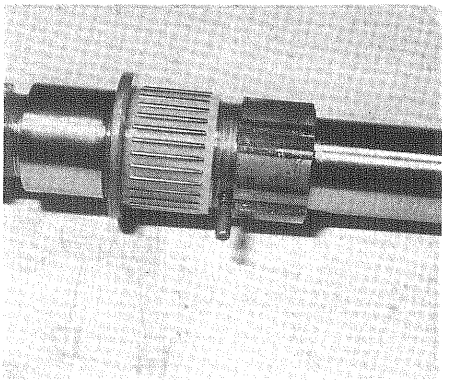
1 *Idler gear*
2 *Thrust washer*
3 *First motion shaft*
4 *Needle roller bearing*
5 *First motion shaft bearing*
6 *Circlip*
7 *First motion shaft drivegear*
8 *Tab washer*
9 *Nut*
10 *Layshaft*
11 *Laygear*
12 *Needle roller bearing*
13 *Needle roller bearing*
14 *Thrust washer (small)*
15 *Thrust washer (large)*
16 *Reverse idler assembly*
17 *Bush*
18 *Reverse idler shaft*
19 *Third motion shaft*
20 *Baulk ring*
21 *3rd and 4th speed synchroniser assembly*
22 *Ball*
23 *Spring*
24 *Third speed gear*
25 *Needle roller bearing*
26 *Thrust washer*
27 *Peg*
28 *Spring*
29 *Second speed gear*
30 *Needle roller bearing*
31 *Thrust washer*
32 *Reverse mainshaft gear and 1st & 2nd gear synchroniser*
33 *First speed gear*
34 *Needle roller bearing*
35 *First speed gear journal*
36 *Ball bearing*
37 *Circlip*
38 *Shim*
39 *Locating plate*
40 *Retainer (third motion shaft)*
41 *Lockwasher*
42 *Final drive pinion*
43 *Lockwasher*
44 *Pinion retaining nut*



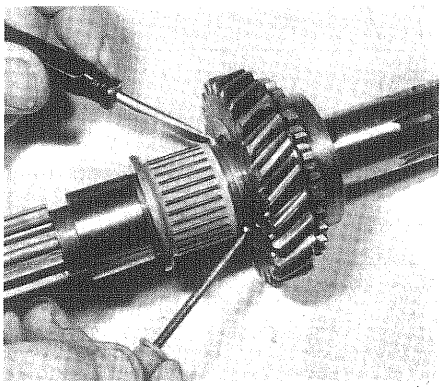
7.11 Synchro-hub balls and springs in position ready for assembly



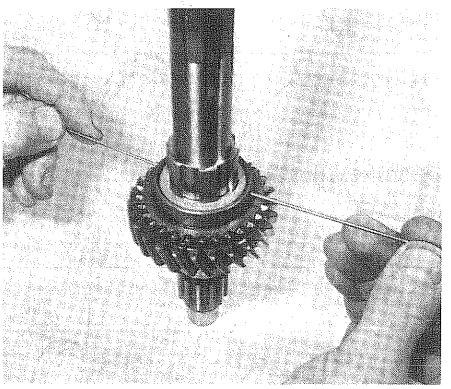
7.12a Place the two split halves of the needle roller bearing in position...



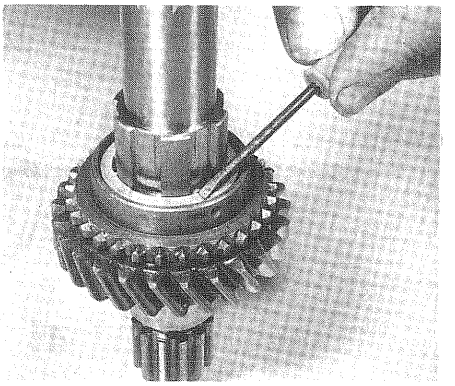
7.12b ...and then insert the spring and plungers



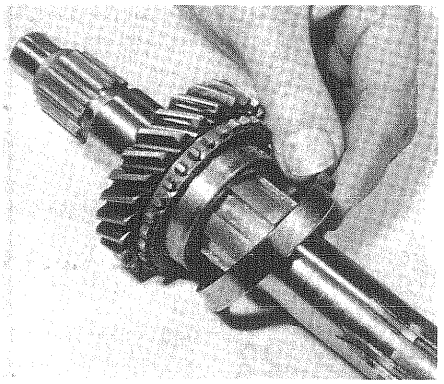
7.13 Depress the plungers and slide on second gear



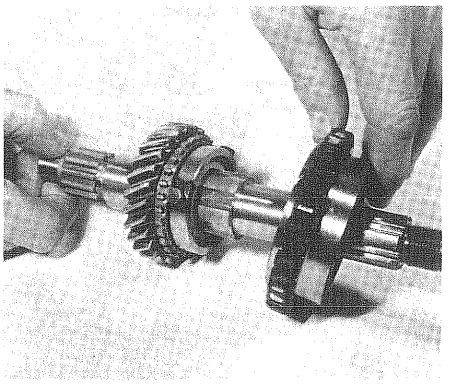
7.14 Fully compress the plungers with two thin pieces of rod and slide on the thrust washer



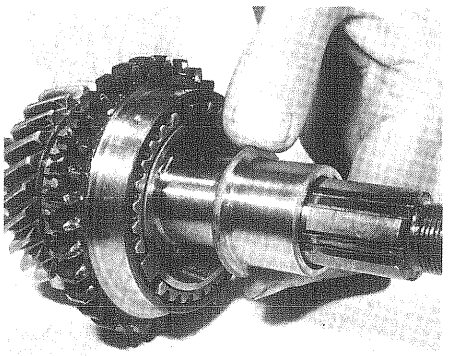
7.15 Rotate the thrust washer to lock it in position



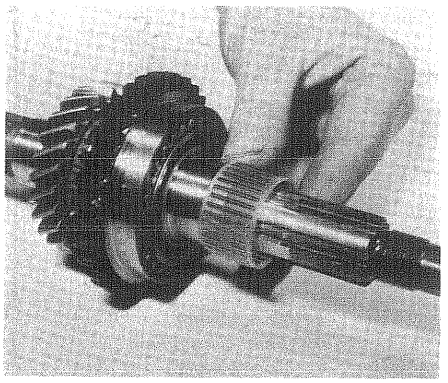
7.16a Place the baulk ring in position...



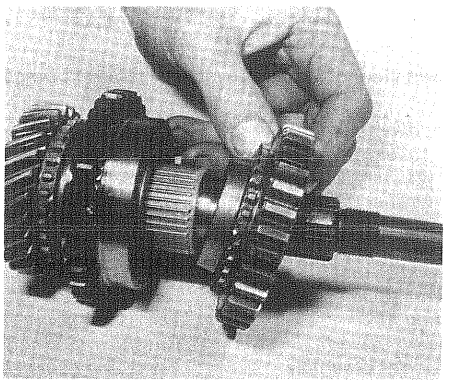
7.16b ...and refit the first/second synchro-hub



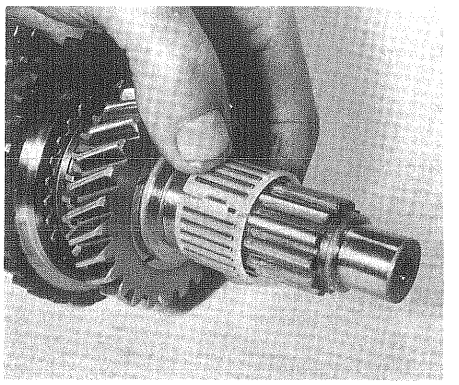
7.17 Fit the first gear needle roller bearing journal...



7.18a ...followed by the needle roller bearing

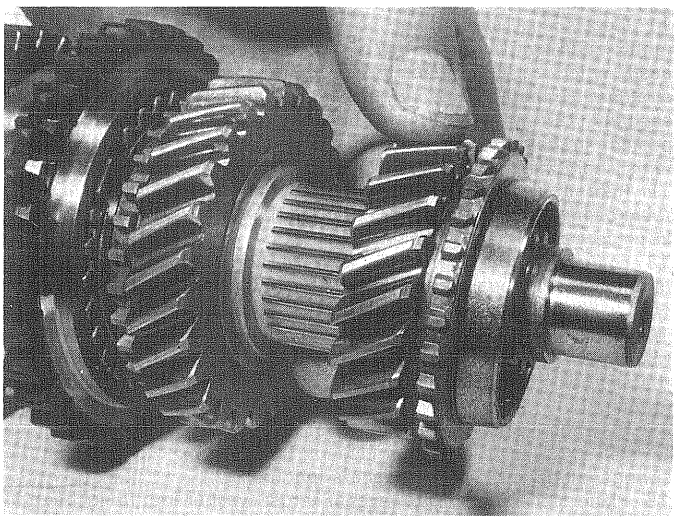


7.18b With the baulk ring in position, slide on first gear

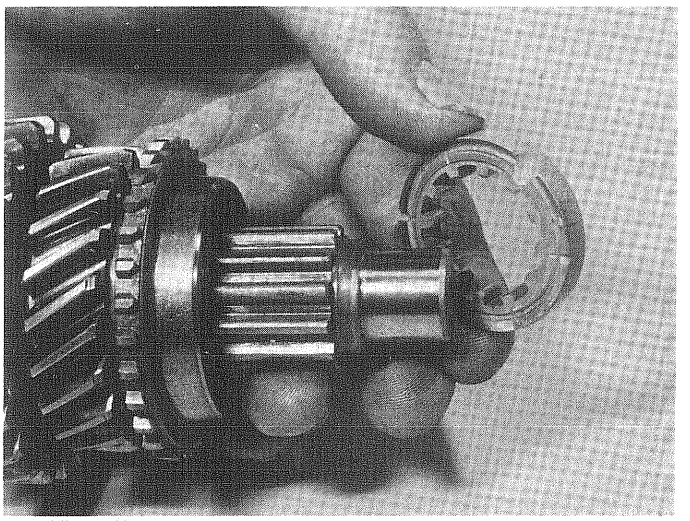


7.19 At the other end of the mainshaft, assemble the third gear needle roller bearing

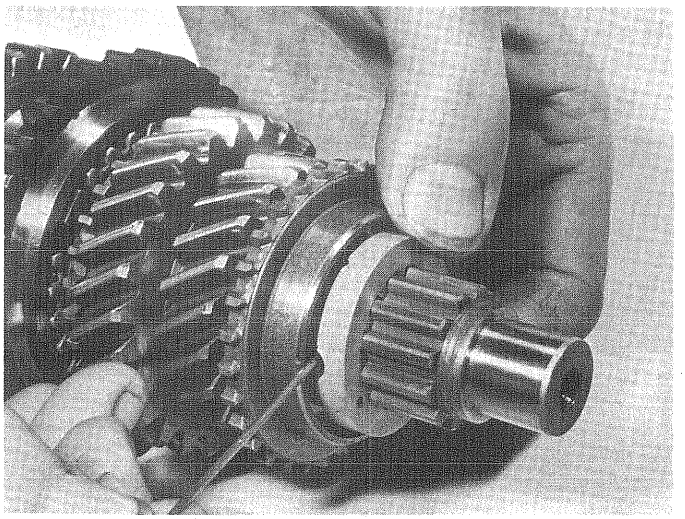
8 Insert two pieces of wire through the holes in the cone face of the second gear. Compress the two spring-loaded plungers and withdraw the gear from the rear of the mainshaft.
9 Finally lift out the spring and plunger and take off the second speed gear split caged needle roller bearing.
10 Should it be necessary to dismantle the synchro-hubs place a rag around the hub to catch the balls and springs that will be ejected and then slide the inner hub out of the collar. Now recover the balls and springs from the rag.
11 To reassemble the hubs, hold the balls against spring pressure with your fingers, and with the help of an assistant slide the hub into the collar (photo). Ensure that the spaces in the collar align with the cut-outs in the hub. Also ensure that the long boss on the collar and hub are on the same side when assembled.
12 Begin reassembly of the mainshaft by placing the two split halves of the second gear needle roller bearing in position, and then insert the spring and plungers into the drilling on the mainshaft (photos).
13 From the rear of the mainshaft slide on the second speed gear, flat face first, depress the plungers and slide the gear over the needle roller bearings (photos).
14 Support the mainshaft in a vice with suitable protected jaws and, using two thin pieces of rod inserted through the holes in the cone of the gear, compress the two plungers (photo).
15 Now slide the thrust washer into position and rotate it until the plungers can be heard to click into position and lock the thrust washer (photo).
16 Place the baulk ring in position on the second speed gear and then refit the first/second synchro-hub with the long boss towards the rear of the mainshaft (photos).
17 Fit the first speed gear needle roller bearing journal to the rear of the mainshaft (photo) and tap it fully home using a tube of suitable diameter.
18 Refit the first gear needle roller bearing, the baulk ring and then first gear with the flat side towards the rear of the mainshaft (photos).
19 From the front end of the mainshaft, assemble the third gear needle roller bearing and then place the spring and plunger into the drilling in the shaft (photo).
20 Slide on the third speed gear, flat side first, followed by the splined thrust washer (photos). Ensure that the notch at the rear of the thrust washer is adjacent to the plunger.
21 Depress the plunger and rotate the thrust washer until the plunger can be heard to click into place, and then lock the thrust washer (photos).
22 Refit the baulk ring to the third speed gear (photo) and then slide on the third/fourth synchro-hub ensuring that the large boss on the hub faces the front of the mainshaft (photo).
23 Finally refit the remaining baulk ring to the front of the third/fourth synchro-hub (photo).



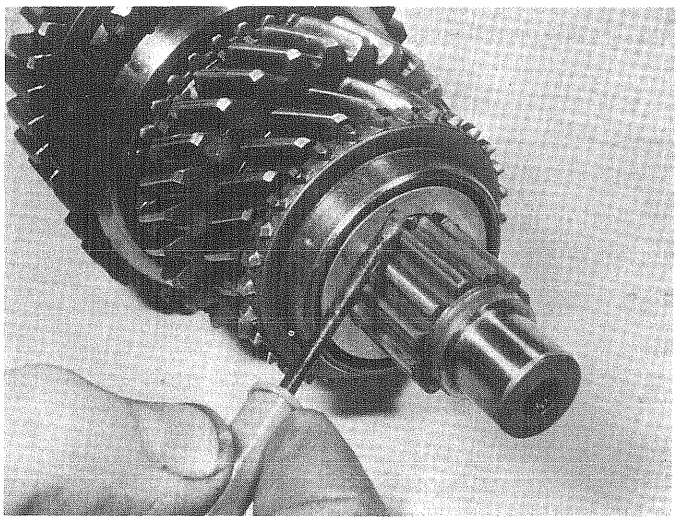
7.20a With the spring and plunger in place refit third gear...



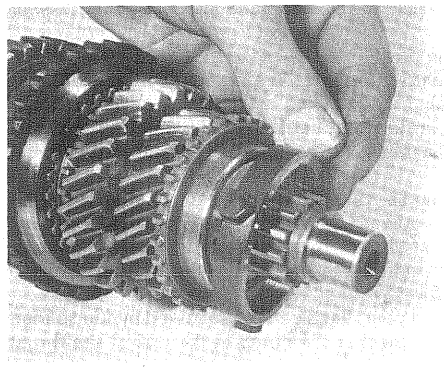
7.20b ...followed by the splined thrust washer



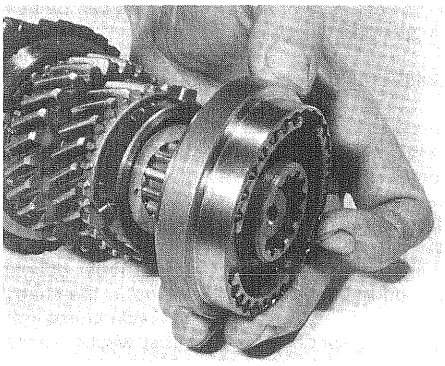
7.21a Depress the plunger and push the thrust washer fully home...



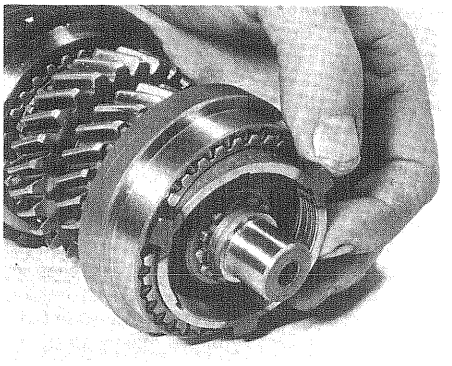
7.21b ...then turn it until it locks into position



7.22a Finally refit the third gear baulk ring...



7.22b ...the third/fourth synchro-hub...



7.23 ...and the remaining baulk ring

8 Gearbox (early type) – reassembly

Note: *Before reassembly commences ensure that the gearbox casing is thoroughly clean, with all traces of old gaskets removed. Also ensure that all the components are clean and dry and that a complete set of new gaskets is available.*

1 Press the reverse lever operating pin into its bore in the bottom of the casing with the groove in the pin uppermost.

2 Press the reverse operating lever into place on the operating pin and fit operating lever retaining circlip.

3 Refit the reverse fork into the hole in the operating lever, ensuring that the offset in the fork is towards the rear of the gearbox casing.

4 Place the reverse gear into the gearbox casing with the machined groove of the gear engaged with the selector fork. **Note:** *The gear must be positioned with the groove towards the right-hand side of the casing (photo).*

5 Lubricate the reverse gear shaft and pass it through the centre web of the casing, into reverse gear, and with the slotted end of the shaft facing upwards (photo).

6 Fit the reverse gear detent spring into the drilling in the rear of the casing and then slide in the reverse detent plunger, flat side first (photos).

7 Slide the reverse selector rod through the centre web of the casing and into the reverse selector fork (photo). Using a long screwdriver, push the detent plunger in against spring pressure, while at the same time pushing the reverse selector rod through into the end of the casing.

8 Place the third and fourth gear selector fork in the casing and push the third and fourth gear selector rod in from the left of the casing so the rod enters the lower hole in the fork (photo).

9 Place the first and second gear selector fork in the casing and push the first and second gear selector rod in from the left of the casing so the rod enters the locating hole in the first and second gear selector fork, and also passes through the clearance hole in the third and fourth gear selector fork (photo).

10 Line up the indentations in the rods with the holes in the forks and insert and tighten down the selector screws, lockwashers and locknuts. Make certain the locknuts are properly tightened down, and on no account omit the lockwashers. As the selectors lie in the bottom of the transmission casing, if one works loose the whole gearbox must be stripped to tighten it.

11 Place the oil strainer sealing ring in the recess in the oil strainer (photo) and lightly grease the ring to help the oil pipe pass through easily when it is fitted later. Attach the oil strainer bracket to the oil strainer, fit the lockwasher and insert and tighten the two bolts securely. Turn up the tabs on the lockwasher. Place the strainer in position in the bottom of the casing (photo). Do not yet insert the bolts which hold the bracket to the lugs on the casing.

12 Refit the mainshaft assembly with the forked end of the shaft toward the left of the gearbox casing and with the synchroniser hubs in place over the selector forks.

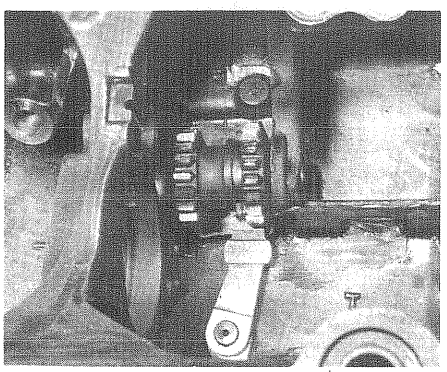
13 Ensure that the large circlip is in position in the retaining groove of the mainshaft bearing and refit the bearing, tapping it into the centre web of the casing with a tube of suitable diameter (photo).

14 Place the small caged needle roller bearing over the front of the mainshaft and then refit the first motion shaft and bearing assembly to the gearbox casing. Secure the bearing in position with the large circlip (photos).

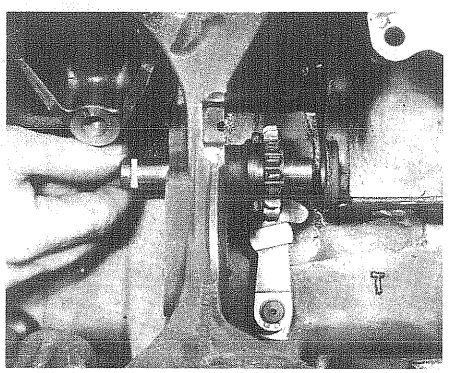
15 Refit the first/second and third/fourth selector rod detent plungers to their drillings in the rear face of the gearbox casing. Refit the springs, plugs and sealing washers (photos).

16 Place the standard size laygear thrust washer into its location in the gearbox casing and retain it with a dab of grease on its rear face. **Note:** *The large thrust washer is of standard size and the smaller one selective.*

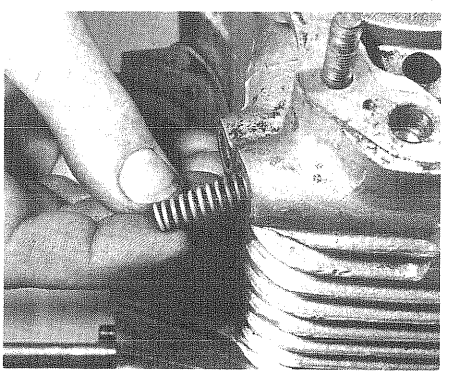
17 Carefully lower the laygear into the gearbox (photo), hold it against the thrust washer and, using feeler gauges, measure the clearance at the other end (photo).



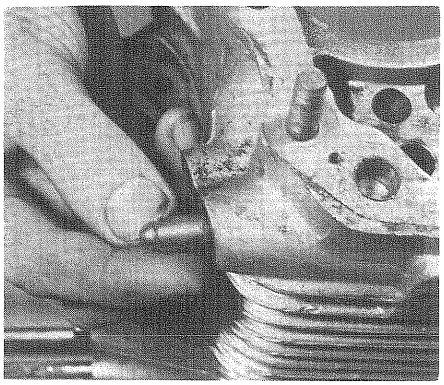
8.4 Reverse gear in position over the selector fork



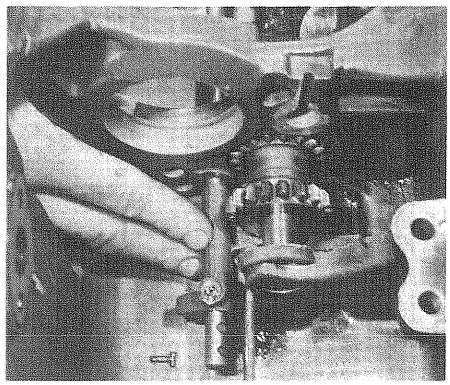
8.5 Refitting the reverse gear shaft



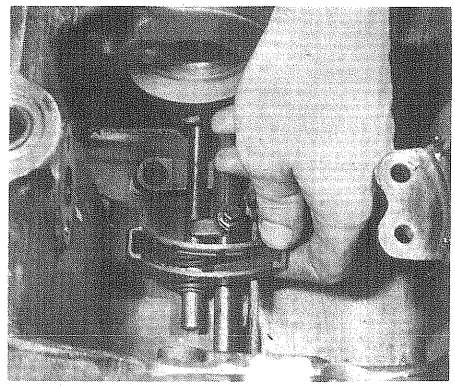
8.6a Place the reverse gear detent spring into the gearbox casing...



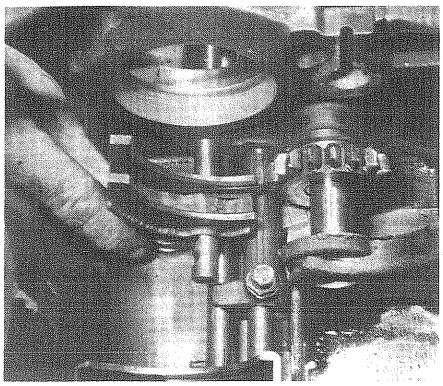
8.6b ...followed by the detent plunger



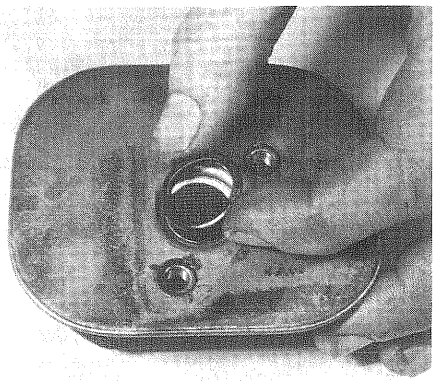
8.7 Refitting the reverse selector rod into the fork



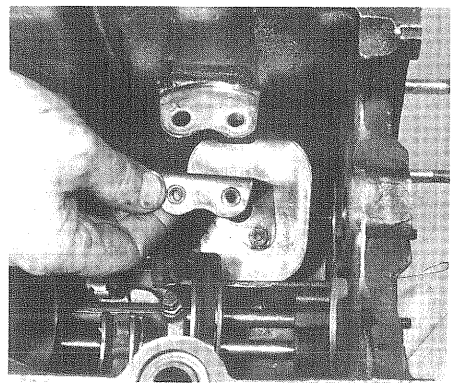
8.8 Refit the third/fourth selector fork and rod...



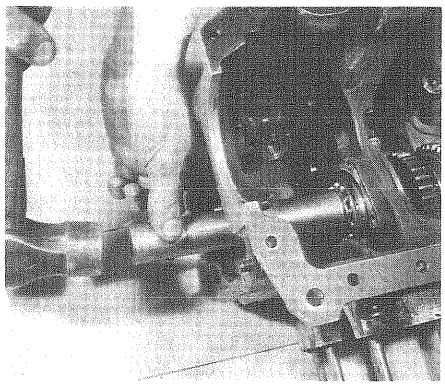
8.9 ...followed by the first/second selector fork and rod



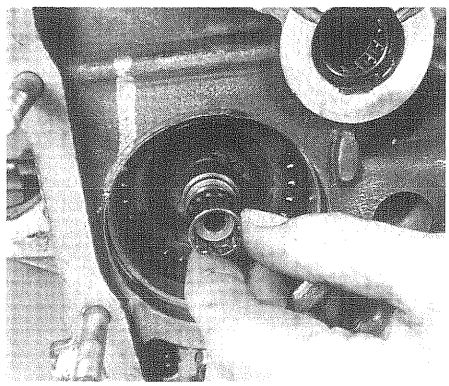
8.11a Fit a new oil seal to the oil strainer...



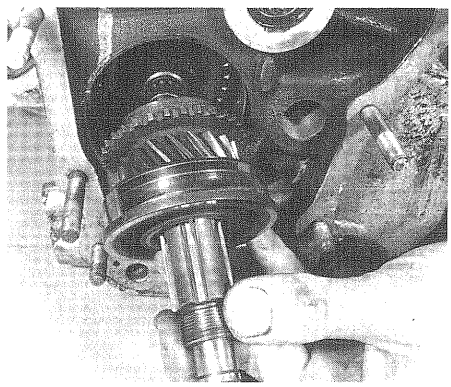
8.11b ...and with the bracket attached, place the strainer in the gearbox casing



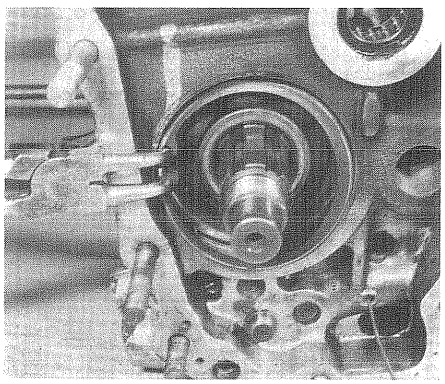
8.13 With the mainshaft in place, tap in the bearing



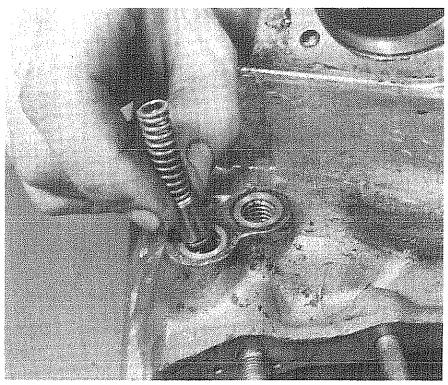
8.14a Position the small spigot bearing on the front of the mainshaft...



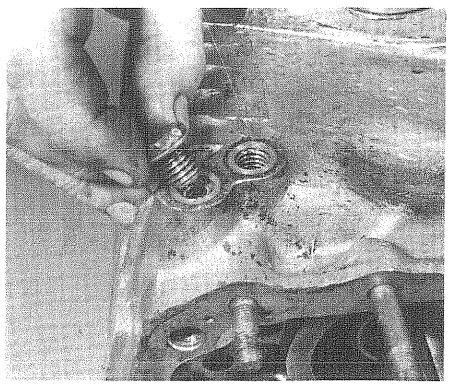
8.14b ...and then insert the first motion shaft assembly...



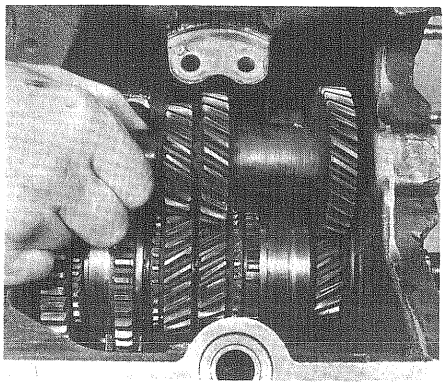
8.14c ...and secure with the circlip



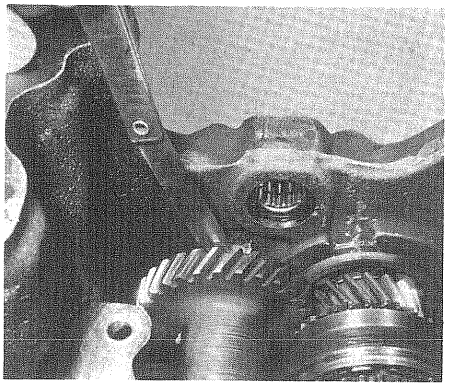
8.15a Insert the detent plungers and springs...



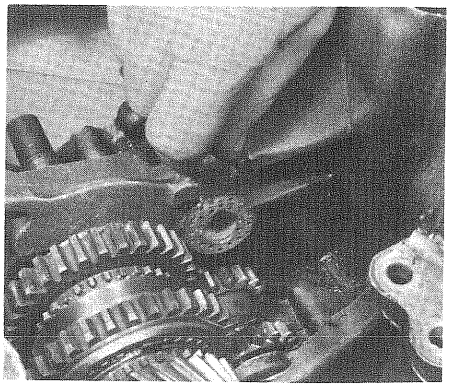
8.15b ...and refit the plugs



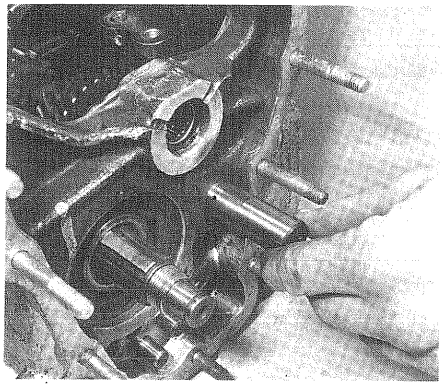
8.17a Lower the laygear into the casing...



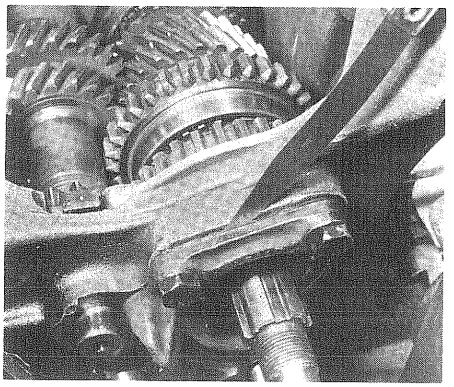
8.17b ...and with the standard size thrust washer fitted at the other end, measure the clearance



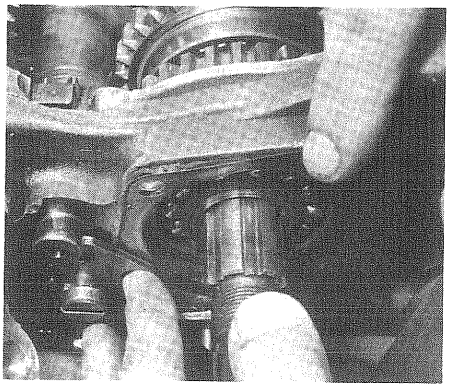
8.19a Now fit the appropriate thrust washers to the face of the gearbox casing...



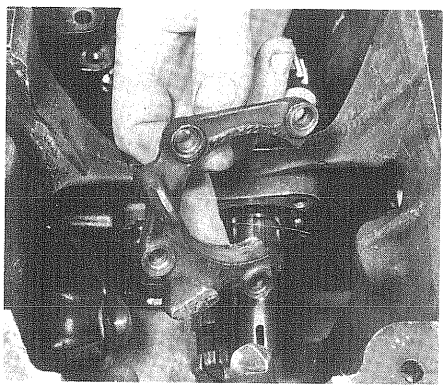
8.19b ...and with the laygear held in position, insert the layshaft



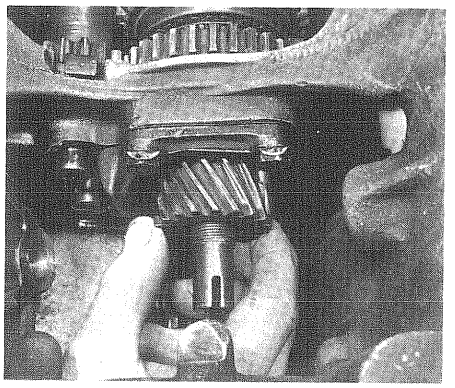
8.21 Measuring the clearance between the mainshaft bearing retainer and casing



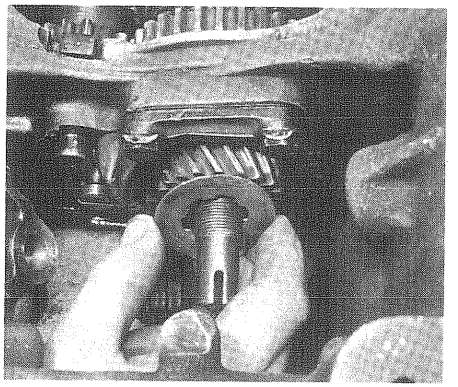
8.22a Fit the selected shims and the reverse/layshaft locking plate...



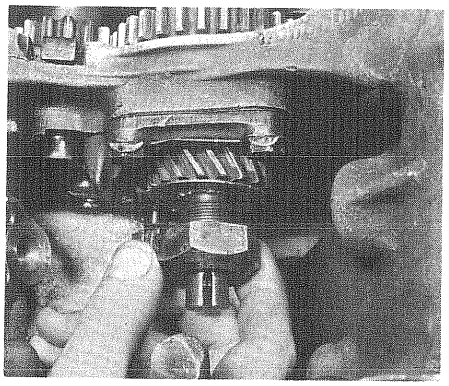
8.22b ...followed by the bearing retainer



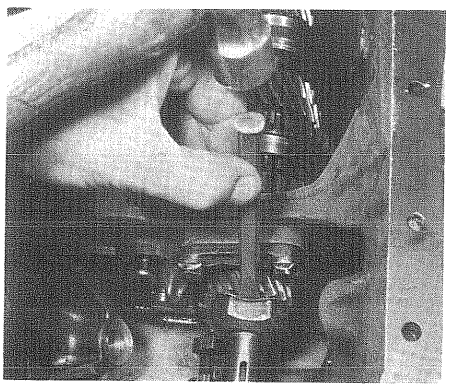
8.23a The final drive pinion...



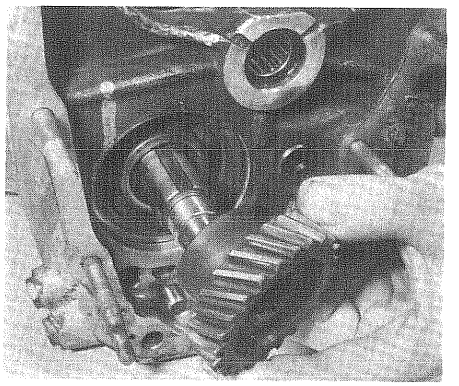
8.23b ...new lockwasher...



8.23c ...and retaining nut can now be fitted



8.25 After tightening the nut bend over the lockwasher



8.26a Next refit the first motion shaft gear...

18 With the standard washer fitted and the gap between the end of the laygear and the casing measured, the selective washer can be decided upon. The table below gives the part numbers for the appropriate selective washers, based on the measured gap with the standard washer fitted.

Gap	Thrust washer
0.125 to 0.127 in (3.18 to 3.22 mm)	*22G 856*
0.128 to 0.130 in (3.25 to 3.30 mm)	*22G 857*
0.131 to 0.133 in (3.32 to 3.37 mm)	*22G 858*
0.134 in (3.41 mm)	*22G 859*

The correct endfloat with the laygear installed and the appropriate washer selected is given in the Specifications.

19 Now refit both thrust washers to the gearbox casing and place the needle roller bearings in the laygear (photo). Lower the laygear into the gearbox, and by judicious manipulation insert the layshaft from the right-hand side of the casing and into the thrust washers and laygear (photo). Note that when installed the slot in the layshaft must face downwards.

20 Now recheck the laygear endfloat which, if the correct thrust washers have been selected, should be within the specified limits.

21 Refit the mainshaft bearing retainer to the centre web of the gear casing, but do not fit any shims at this stage. Lightly tighten the retaining bolts and then measure the clearance between the retainer and the gearbox casing centre web using feeler gauges (photo). Refer to the table below for the correct thickness of shims required.

Measured gap	Fit shims totalling
0.005 to 0.006 in (0.127 to 0.152 mm)	*0.005 in (0.127 mm)*
0.006 to 0.008 in (0.152 to 0.203 mm)	*0.007 in (0.178 mm)*
0.008 to 0.010 in (0.203 to 0.254 mm)	*0.009 in (0.229 mm)*
0.010 to 0.012 in (0.254 to 0.304 mm)	*0.011 in (0.279 mm)*
0.012 to 0.014 in (0.304 to 0.356 mm)	*0.013 in (0.330 mm)*
0.014 to 0.015 in (0.356 to 0.381 mm)	*0.015 in (0.381 mm)*

22 Now remove the retainer and place the shims in position, followed by the reverse gear shaft and layshaft locking plate. Ensure that the plate engages with the slots in the two shafts and then refit the bearing retainer, bolts and locktabs. Tighten the bolts and bend over the locktabs (photos).

23 Fit the final drive pinion to the end of the mainshaft followed by a new lockwasher and the retaining nut (photos).

24 Engage two gears simultaneously by moving two of the selector rods in or out.

25 Tighten the final drive pinion retaining nut to the specified torque and then bend over the lockwasher (photo).

26 Place the first motion shaft gear over the splines of the first motion shaft and then fit a new lockwasher and the retaining nut. Tighten the nut to the specified torque and then bend over the lockwasher (photos).

27 Return the selector rods to the neutral position.

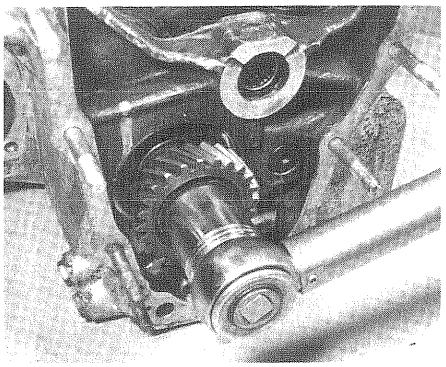
28 Refit the small roller bearing to the end of the first motion shaft, tapping it on using a tube of suitable diameter. Ensure that the bearing is positioned with the flat face of the roller cage facing the gear. Secure the bearing with the circlip (photo).

29 Lightly grease the end of the oil suction pipe and insert it into the hole in the centre of the oil strainer, taking care not to dislodge the rubber sealing ring.

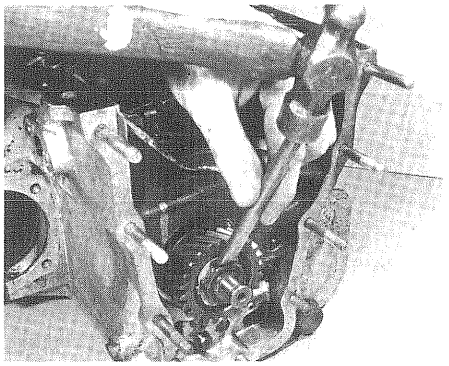
30 The top flange on the bracket lies under the lug on the side of the gearbox casing. The oil pipe bracket lies on the top of the lug. Position the lockwasher and insert the two bolts through the two holes in the lug into the fixed nuts under the bracket flange. Place a new joint gasket between the pipe blanking plate and the flange on the outside of the casing, and a new gasket between the oil flange and the inside of the casing. Fit a new lockwasher and tighten up the two pairs of bolts. Turn up the tabs on both lockwashers (photos).

31 Refit the oil seal (photo) and partially insert the gearchange shaft into the transmission casing. Refit the Woodruff key (photo) to the shaft, position the selector lever in the casing, and push the gearchange shaft through the hole in the lever so the Woodruff key mates with the slot in the selector lever. Push the shaft right into its housing in the transmission case, and line up the cut out in the shaft with the hole for the clamp bolt in the lever. Insert and tighten the clamp bolt (photo) and turn up the tab on the lockwasher.

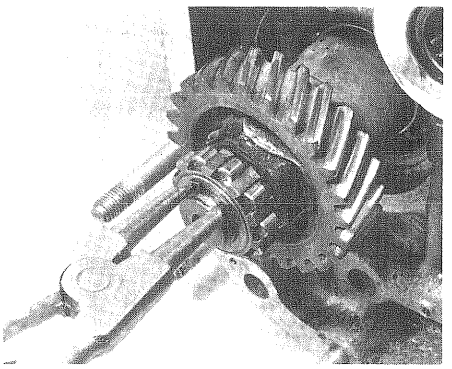
32 Refit the change speed gate (photo), fit a new front cover gasket



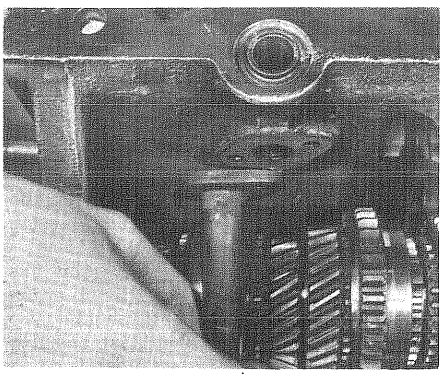
8.26b ...refit and tighten the retaining nut...



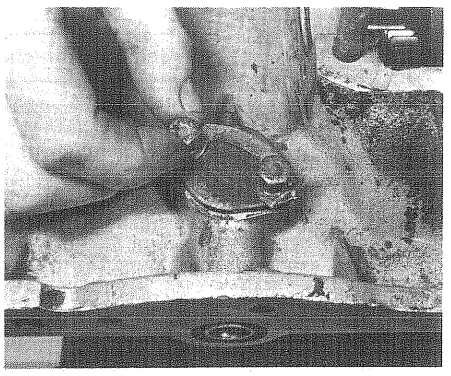
8.26c ...and bend over the lockwasher



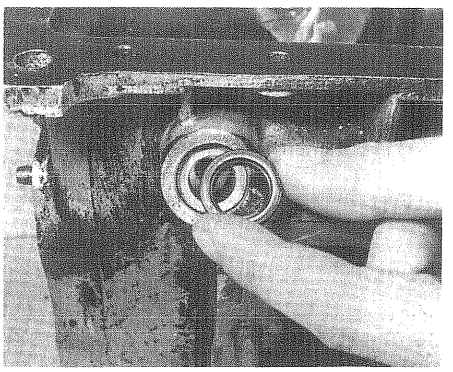
8.28 Secure the first motion shaft bearing in place with the circlip



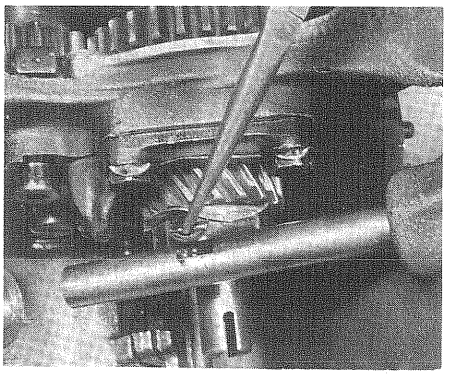
8.30a Place a new gasket on the oil feed pipe flange...



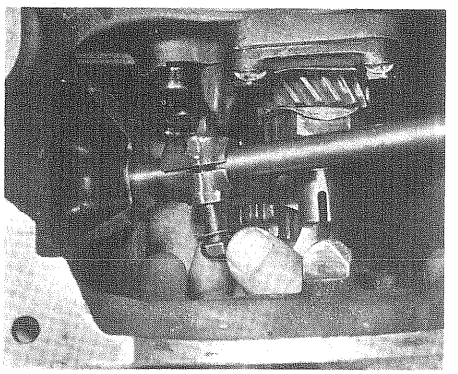
8.30b ...and refit the blanking plate from the other side



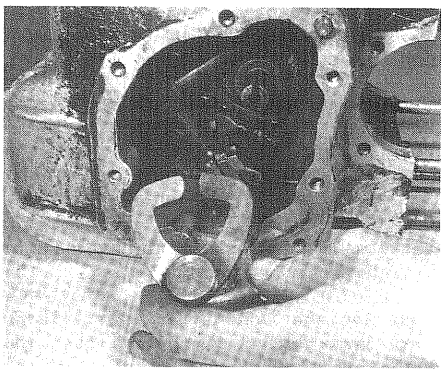
8.31a Fit a new gearchange shaft oil seal...



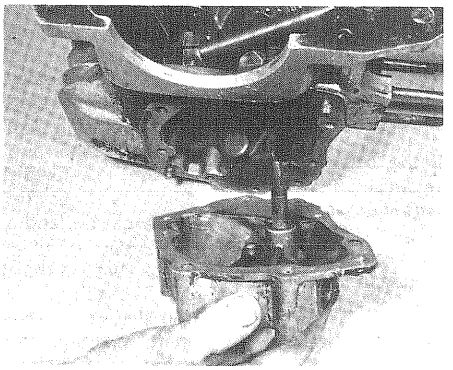
8.31b ...slide the shaft into the casing and refit the Woodruff key



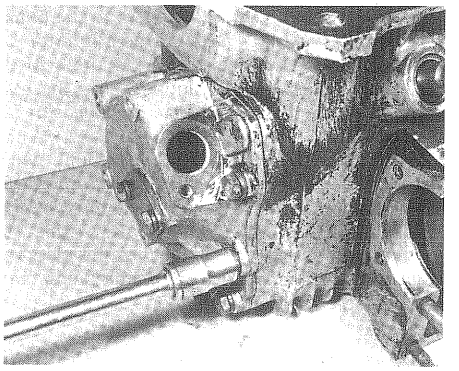
8.31c Engage the shaft with the selector lever and refit the clamp bolt



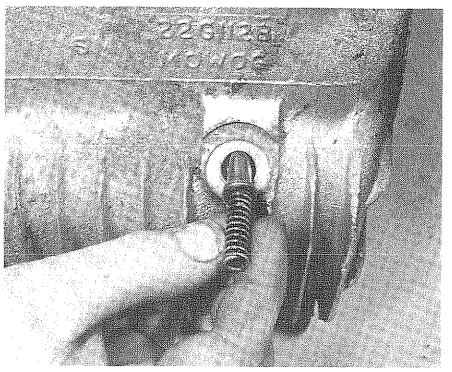
8.32a Refit the change speed gate...



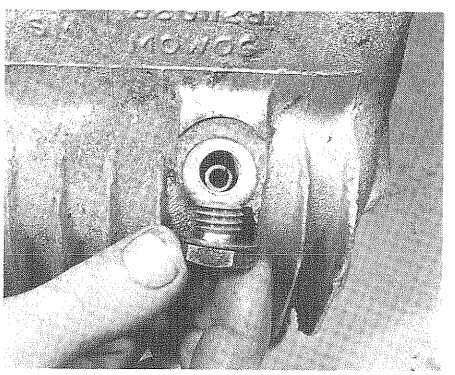
8.32b ...place a new gasket in position...



8.32c ...and refit the front cover



8.33a Finally refit the reverse check plunger and spring...



8.33b ...refit and tighten the spring plug

to the flange on the front of the casing; fit the front cover and insert and tighten up the bolts, nuts and springwashers as appropriate (photos).

33 Refit the reverse check plunger and the plunger spring in the hole in the casing; make sure the washer is under the head of the spring plug and tighten the plug securely (photos).

34 Insert the speedometer spindle and gear through the front cover so the spindle engages the slot in the end of the mainshaft, fit the joint gasket and endplate and tighten down the two securing bolts and lockwashers.

35 Refit the speedometer pinion to the front cover and then fit the bush, gasket and pinion housing cover. Secure the cover with the bolt and washer.

36 The differential assembly can now be refitted to the gearbox casing as described in Chapter 8. Before refitting the engine to the transmission refer to Section 11 regarding removal and refitting of the transfer gears.

9 Gearbox (rod-change type) – reassembly

Note: *Before reassembly commences, ensure that the gearbox is thoroughly clean with all trace of old gasket removed. Also ensure that all the components are clean and dry and that a complete set of new gaskets is available.*

1 Lightly lubricate a new O-ring oil seal and position it on the bellcrank lever pivot post. Drift the pivot post into the gearbox casing using a hammer and block of wood.

2 Refit the interlock spool to the selector shaft and insert this assembly into the gearbox casing. Position the operating stub of the selector shaft away from the bellcrank lever pivot post (photo).

3 Insert the bellcrank lever assembly onto the pivot post, ensuring that the sleeve, levers and washers are in their correct order as noted during dismantling (photo). Push the assembly fully home and refit the pivot post washer and locknut. **Note:** *Do not rotate the interlock spool*

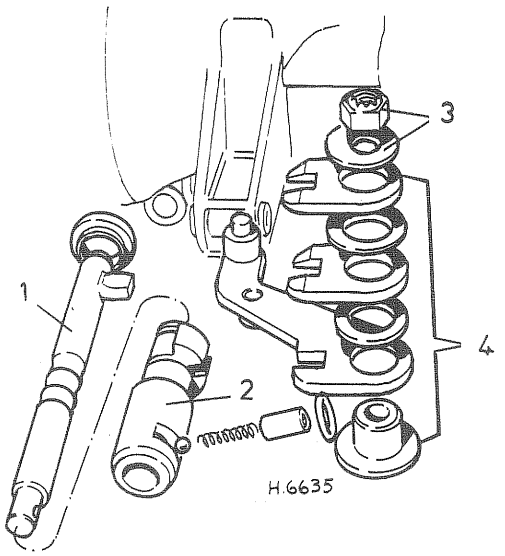


Fig. 6.7 Rod-change type gear selector mechanism (Sec 9)

1 Selector shaft
2 Interlock spool
3 Pivot post washer and locknut
4 Bellcrank lever assembly

and selector shaft into engagement with the bellcrank levers until the mainshaft and first motion shaft nuts have been refitted and fully tightened.

4 Place the third/fourth selector fork in the gearbox casing and engagement with the selector lever. Slide in the selector shaft until it just engages the fork (photo).

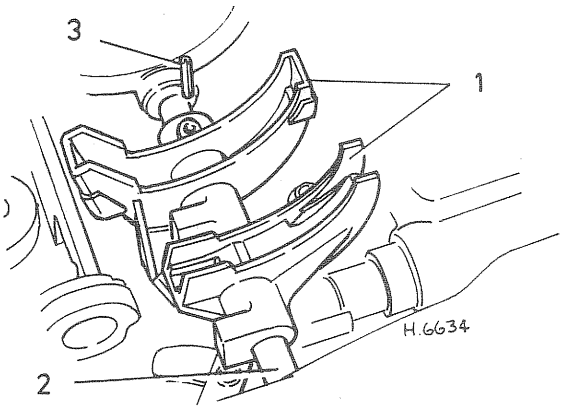


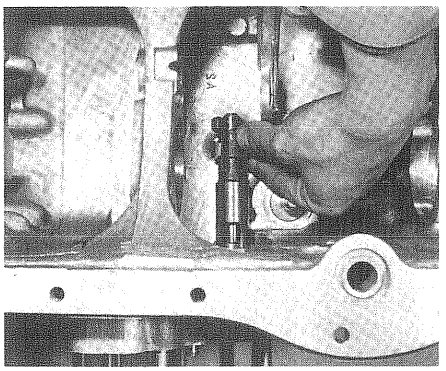
Fig. 6.8 Rod-change type selector fork assembly (Sec 9)

1 Selector forks
2 Selector shaft
3 Roll pin

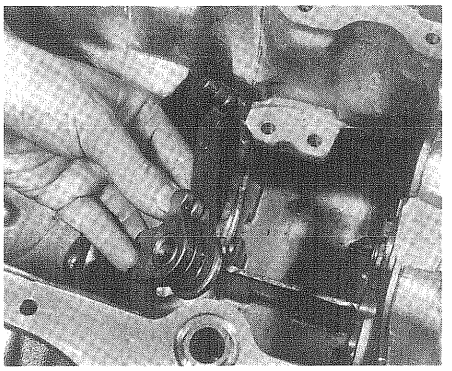
5 Place the first/second selector fork in position and then slide the selector shaft fully home. Align the holes in the third/fourth selector fork and the selector shaft and drift in a new roll pin until it is flush with the fork boss (photos).

6 Lay the reverse idler gear in the casing, ensuring that the chamfer on the gear teeth faces the centre web of the gearbox casing, and that the gear is engaged with the pin on the reverse selector lever. Insert the reverse idler shaft through the gearbox centre web and into the gear. Rotate the shaft so that the slot faces upward (photo).

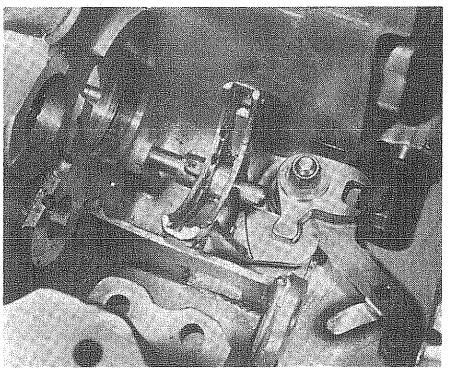
7 Lubricate the oil strainer sealing ring to help the oil pipe pass through easily when it is fitted later. Place the strainer in position in the bottom of the casing, but do not insert the bolts which hold the bracket to the lugs on the casing at this stage (photo).



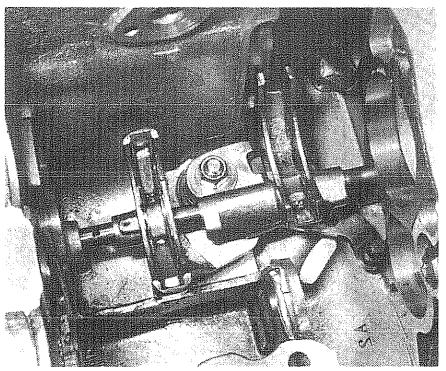
9.2 Refitting the interlock spool and selector shaft assembly



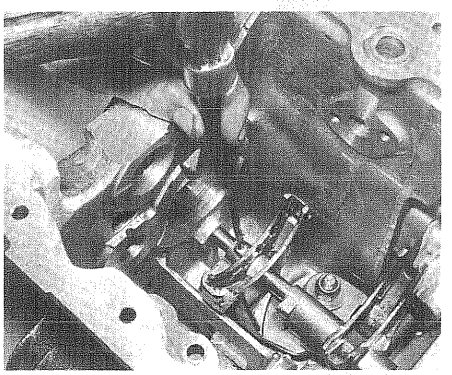
9.3 Refitting the bellcrank lever assembly onto the pivot post



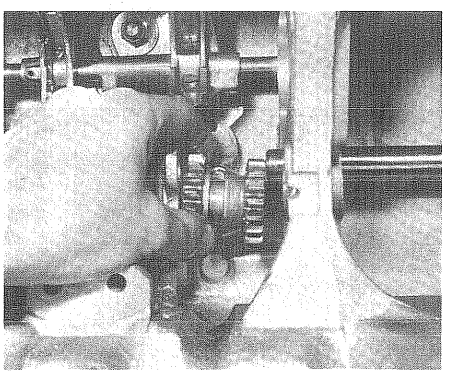
9.4 Position the third/fourth selector fork in the casing and insert the selector shaft



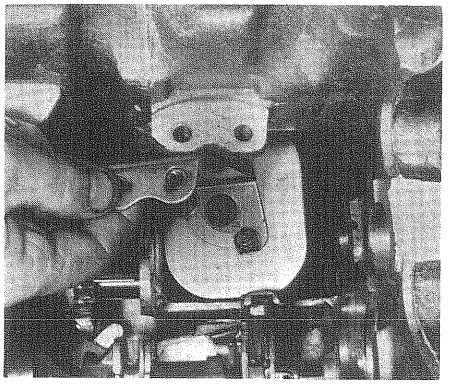
9.5a With the first/second selector fork in place push the selector shaft fully home...



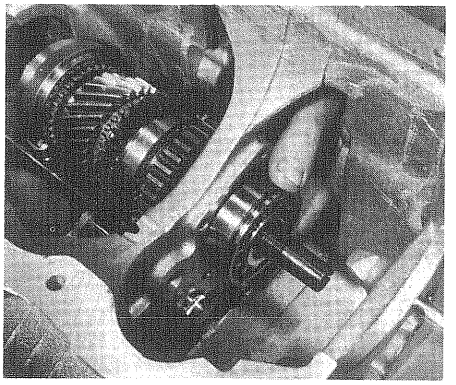
9.5b ...align the holes and drift a new roll pin into the third/fourth fork



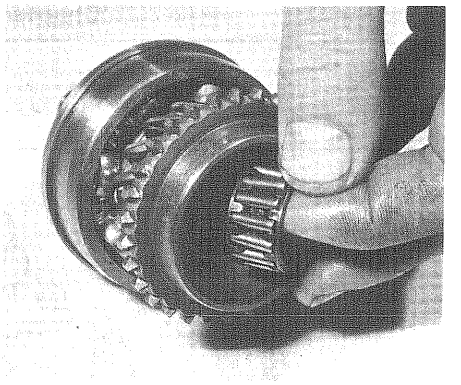
9.6 Lay the reverse idler in the casing and insert the reverse idler shaft



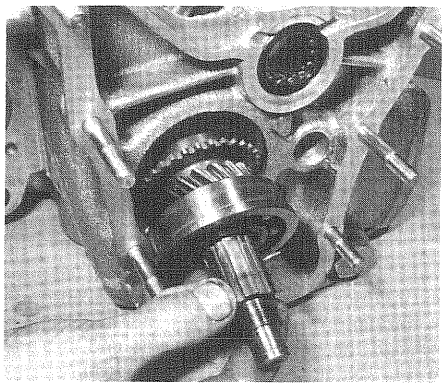
9.7 Positioning the oil strainer in the gearbox casing



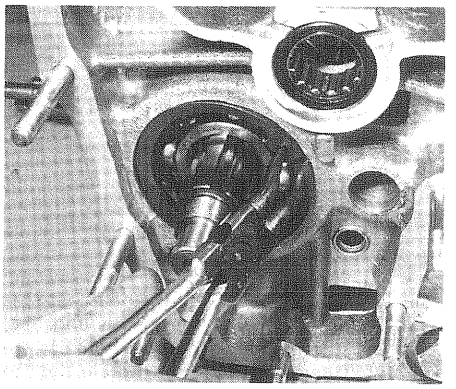
9.9 With the mainshaft in place, refit the bearing



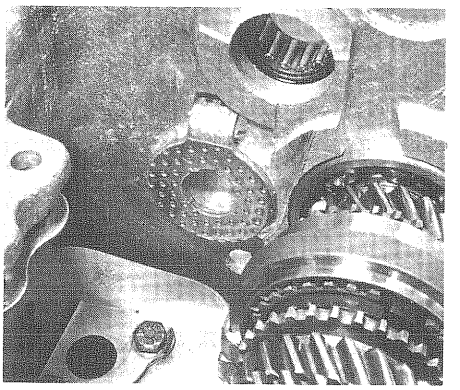
9.10a Insert the first motion shaft needle roller bearing into the recess in the gear...



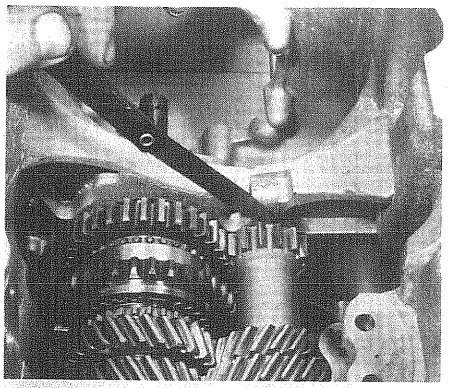
9.10b ...refit the first motion shaft assembly...



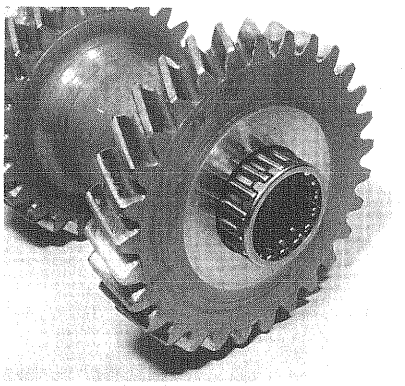
9.10c ...and secure it with the large circlip



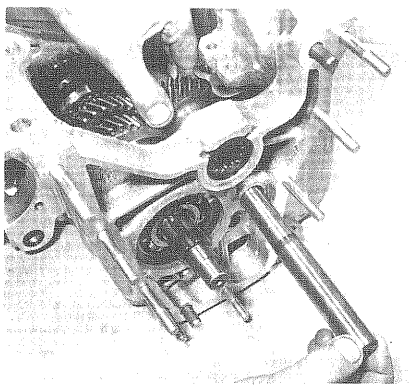
9.11 With the large thrust washer in position...



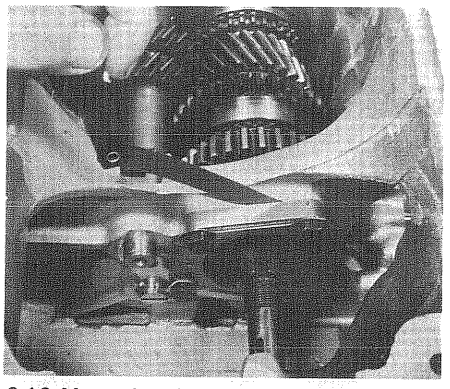
9.12 ...lower the laygear into the gearbox and measure the clearance at the other end



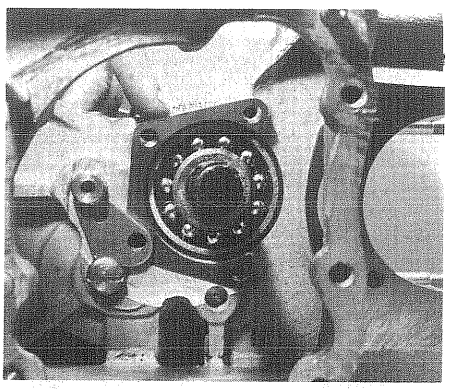
9.14a Refit the needle roller bearings to the laygear...



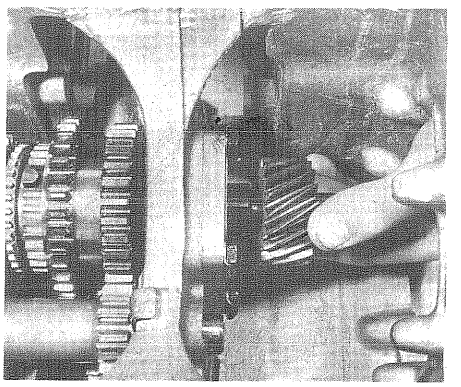
9.14b ...and with the thrust washer and laygear in place, insert the layshaft



9.16 Measuring the clearance between the bearing retainer and the casing



9.17 Place the selected shims and the reverse/layshaft locking plate in position, then refit the bearing retainer



9.18a Refit the final drive pinion...

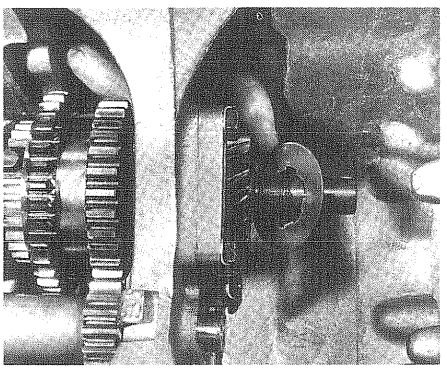
8 Refit the mainshaft assembly with the forked end of the shaft toward the left of the gearbox casing and with the synchroniser hubs in place over the selector forks.
9 Ensure that the large circlip is in position in the retaining groove of the mainshaft bearing and refit the bearing, tapping it into the centre web of the casing with a tube of suitable diameter (photo).
10 Insert the small caged first motion shaft needle roller bearing into its location in the gear and then refit the first motion shaft and bearing assembly to the gearbox casing. Secure the bearing in position with the large circlip (photos).
11 Place the standard size laygear thrust washer into its location in the gearbox casing and retain it with a dab of grease on its rear face (photo). **Note:** *The large thrust washer is of standard size and the smaller one selective.*
12 Carefully lower the laygear into the gearbox, hold it against the thrust washer and, using feeler gauges, measure the clearance at the other end (photo).
13 With the standard thrust washer fitted and the gap between the end of the laygear and the casing measured, the selective washer can be decided upon. The washer required will have a thickness of the measured clearance minus the specified endfloat (see Specifications). The following table gives the part numbers for the appropriate selective thrust washers.

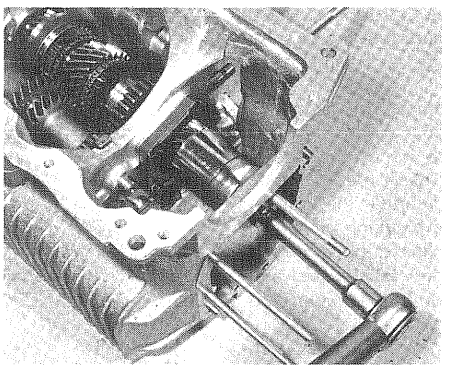
Washer thickness	Part number
0.123 to 0.124 in (3.12 to 3.14 mm)	*22G 856*
0.125 to 0.126 in (3.17 to 3.20 mm)	*22G 857*
0.127 to 0.128 in (3.22 to 3.25 mm)	*22G 858*
0.130 to 0.131 in (3.30 to 3.32 mm)	*22G 859*

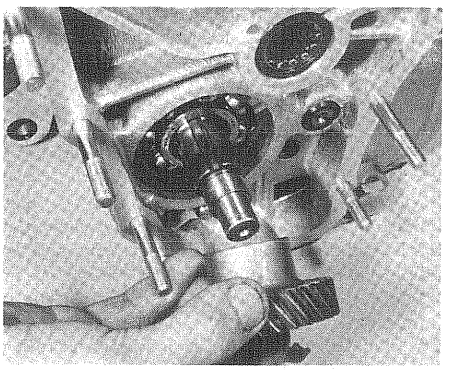
14 Now refit both thrust washers to the gearbox casing and place the needle roller bearings in the laygear (photo). Lower the laygear into the gearbox, and by judicious manipulation insert the layshaft from the right-hand side of the casing and into the thrust washers and laygear (photo). When installed the slot on the end of the layshaft must face downward.
15 Recheck the laygear endfloat, which, if the correct thrust washers have been selected, should be within the specified limits.
16 Refit the mainshaft bearing retainer to the centre web of the gearbox casing, but do not fit any shims at this stage. Lightly tighten the retaining bolts and then measure the clearance between the retainer and the gearbox casing centre web using feeler gauges (photo). Refer to the following table for the correct thickness of shims required.

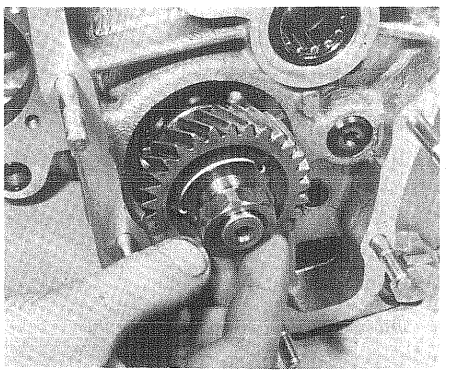
Measured gap	Fit shims totalling
0.005 to 0.006 in (0.127 to 0.152 mm)	*0.005 in (0.127 mm)*
0.006 to 0.008 in (0.152 to 0.203 mm)	*0.007 in (0.178 mm)*
0.008 to 0.010 in (0.203 to 0.254 mm)	*0.009 in (0.229 mm)*
0.010 to 0.012 in (0.254 to 0.304 mm)	*0.011 in (0.279 mm)*
0.012 to 0.014 in (0.304 to 0.356 mm)	*0.013 in (0.330 mm)*
0.014 to 0.015 in (0.356 to 0.381 mm)	*0.015 in (0.381 mm)*

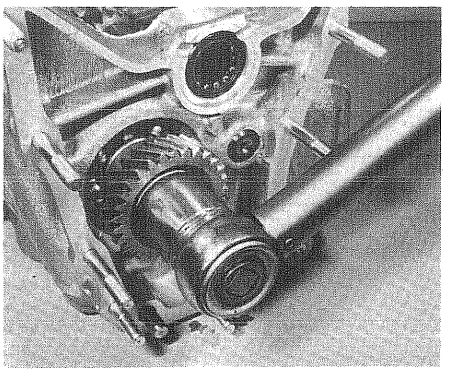
17 Having selected the required shims, remove the retainer and place the shims in position, followed by the reverse gear shaft and layshaft locking plate (photo). Ensure that the locking plate engages with the slots in the two shafts and then refit the bearing retainer, bolts and shafts. Tighten the bolts and bend over the locktabs.
18 Fit the final drive pinion to the end of the mainshaft, followed by a new lockwasher and the retaining nut (photos).
19 Engage first and fourth gears, by moving the selector forks, to lock the mainshaft.
20 Tighten the final drive pinion nut to the specified torque and then bend over the lockwasher (photo).
21 Place the first motion shaft gear over the splines of the first motion shaft, and then fit a new lockwasher and the retaining nut. Tighten the nut to the specified torque and then bend over the lockwasher (photos).
22 Return the selector forks to the neutral position. Rotate the interlock spool and selector shaft into engagement with the bellcrank levers.

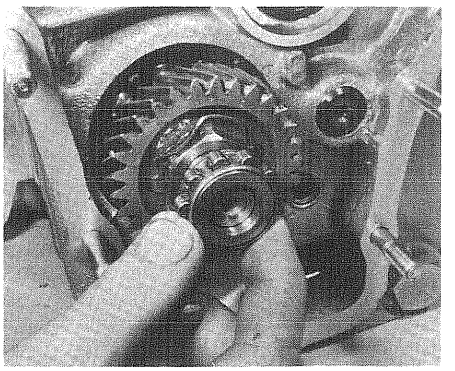

9.18b ...a new lockwasher...

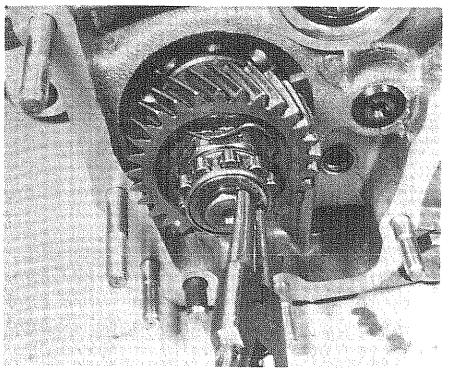

9.20 ...and the retaining nut tightened to the specified torque


9.21a Slide the first motion shaft gear over the splines...

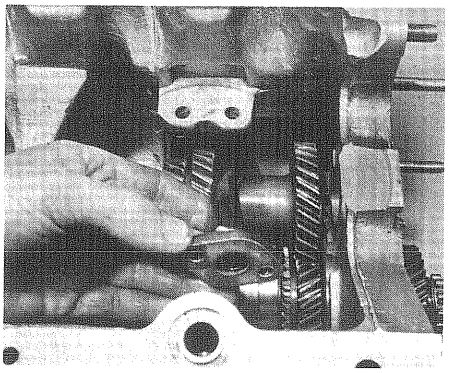

9.21b ...refit the lockwasher and retaining nut...


9.21c ...then tighten the nut to the specified torque

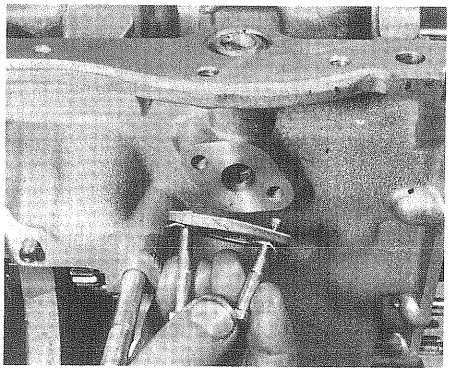

9.23a Drive the first motion shaft needle roller bearing onto the shaft...



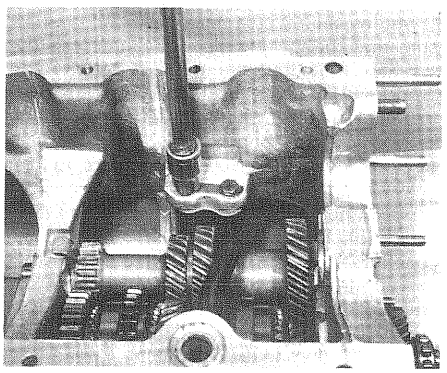
9.23b ...and secure with the circlip



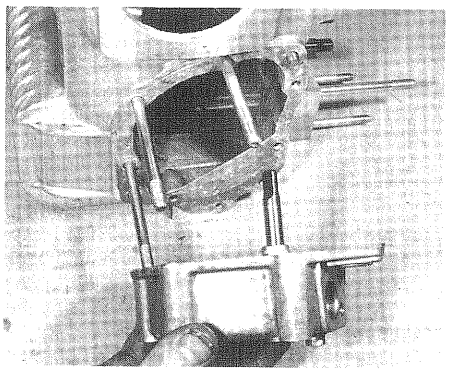
9.25a Place a new gasket on the oil pick-up pipe...



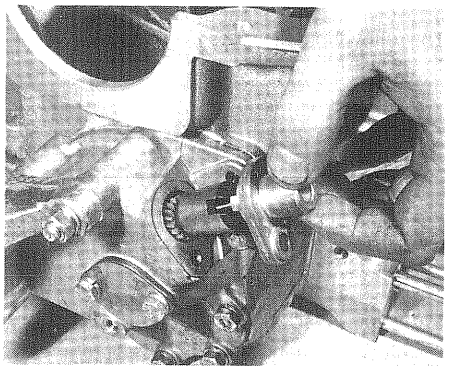
9.25b ...and on the blanking plate, then refit the bolts and lockwasher to the blanking plate...



9.25c ...and oil strainer, tightening both pairs of bolts fully



9.26 Refitting the gearbox front cover...



9.27 ...and the speedometer pinion and housing assembly

23 Refit the small roller bearing to the end of the first motion shaft, tapping it on using a tube of suitable diameter. Ensure that the bearing is positioned with the flat face of the roller cage facing the gear. Secure the bearing with the circlip (photos).
24 Insert the oil suction pipe into the hole in the centre of the oil strainer, taking care not to dislodge the rubber sealing ring.
25 The top flange on the oil strainer lies under the lug on the side of the gearbox casing. Position the lockwasher, and insert the two bolts through the two holes in the lug into the fixed nuts under the bracket flange. Place a new joint gasket between the pipe blanking plate and the flange on the outside of the casing, and a new gasket between the oil pipe flange and the inside of the casing. Fit a new lockwasher and tighten up the two pairs of bolts. Turn up the tabs on both lockwashers (photos).
26 Place a new gasket in position and refit the gearbox front cover, engine mounting and adaptor (photo). Refit and tighten the nuts, bolts and washers as appropriate.
27 Refit the speedometer pinion to the front cover and then fit the bush, gasket and pinion housing cover. Secure the cover with the bolt and washer (photo).
28 The differential assembly can now be refitted to the gearbox casing as described in Chapter 8. Before refitting the engine to the transmission, refer to Section 11 regarding removal and refitting of the transfer gears.

10 Transfer gears – description

Drive is transmitted from the clutch to the gearbox by means of three transfer gears. On the end of the crankshaft is the primary gear. When the clutch pedal is depressed the primary gear remains stationary while the crankshaft revolves inside it . On releasing the clutch pedal the drive is taken up and the primary gear revolves with the crankshaft at crankshaft speed.

Drive is taken from the primary gear, through an intermediate gear, to the first motion shaft drivegear, which is a splined fit on the nose of the first motion shaft.

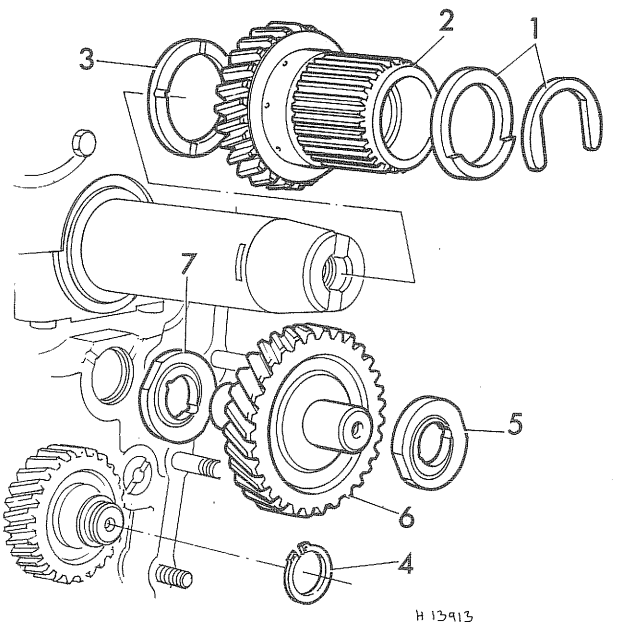


Fig. 6.9 Transfer geartrain (Sec 10)

1 *Retaining washer and U-ring*
2 *Primary gear*
3 *Thrust washer*
4 *Circlip*
5 *Thrust washer*
6 *Idler gear*
7 *Thrust washer*

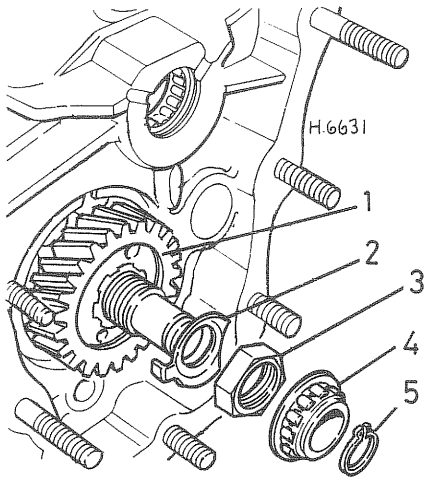


Fig. 6.10 First motion shaft gear and bearing assembly (Sec 11)

1 First motion shaft gear
2 Lockwasher
3 Retaining nut
4 Roller bearing
5 Circlip

11 Transfer gears – removal and refitting

Note: *To provide access to the transfer gears it will be necessary to remove the engine/transmission unit from the car as described in Chapter 1. The flywheel and flywheel housing must also be removed; full information on this procedure will also be found in Chapter 1.*

1 With the flywheel housing removed, the transfer gears are now exposed. The primary gear can be removed first by lifting off the U-shaped ring and retaining washer and sliding the gear off the end of the shaft. Now slide off the thrust washer.

2 Lift the idler gear out of its needle roller bearing in the transmission casing. Make sure that the thrust washers (one on each side) are kept in their correct relative positions.

3 To remove the first motion shaft gear, first extract the circlip and withdraw the roller bearing, using a puller or two screwdrivers, from the first motion shaft. Now bend back the lockwasher and undo and remove the nut. To prevent the first motion shaft from turning as the nut is undone, put the transmission in gear and then lock the drive flanges using blocks of wood between the flanges and gearbox casing. On later models BL tool 18G1088 may be needed.

4 Lift off the lockwasher and slide the gear off the first motion shaft.

5 Refitting the transfer gears is the reverse sequence to removal. However, the endfloat of the primary gear and idler gear must be checked, and if necessary adjusted, as described below before finally refitting the flywheel housing.

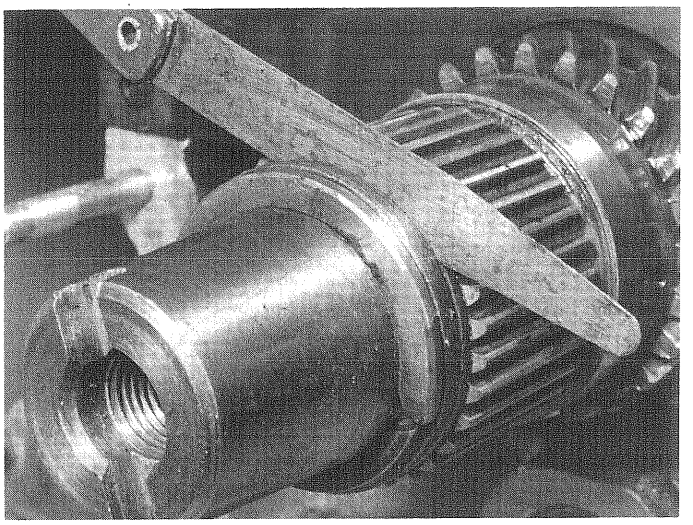
Primary gear

6 Refit the primary gear thrust washer with its chamfered bore against the crankshaft flange. Slide on the gear and secure with the retaining washer and U-shaped ring. Using feeler gauges measure the clearance between the end of the gear and the thrust washer (photo). The correct endfloat is given in the Specifications. If the measures endfloat is outside the specified limits, selective thrust washers are available from your BL dealer.

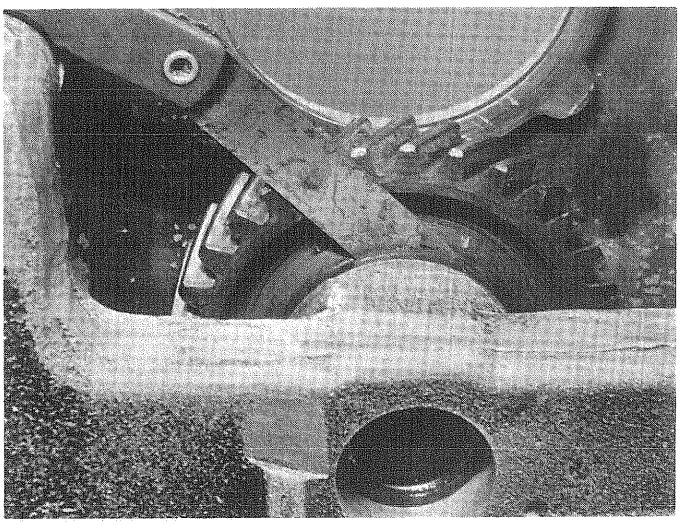
Idler gear

7 The endfloat of the idler gear can only be accurately measured with the engine removed from the transmission. If a new idler gear, thrust washers, transmission casing or flywheel housing are being fitted then this must be done to allow the endfloat to be accurately measured. If, however, the original components are being refitted, it can be assumed that the endfloat will be as before and therefore satisfactory.

8 To check the endfloat, refit the flywheel housing after making sure the mating faces are clean and a new gasket is in position. Tighten the retaining nuts to the specified torque and then, using feeler gauges, measure the clearance between the thrust washer and the side of the casing (photo). The endfloat should be as specified. Selective thrust washers are available from your BL dealer to correct any deficiency. The flywheel housing can now be removed, the engine positioned on the transmission and the transfer gears and housing finally refitted.



11.6 Using feeler gauges to measure the primary gear endfloat



11.8 Checking the endfloat of the idler gear

12 Transfer gear bearings – removal and refitting

Note: *If the idler gear bearings in the flywheel housing or gearbox casing on the first motion shaft support bearing outer race require renewal, proceed as follows.*

1 Remove the engine/transmission unit from the car and then remove the flywheel and flywheel housing as described in Chapter 1.

2 Heat the flywheel housing in boiling water. *On no account apply a direct flame to the housing.* If a receptacle large enough to hold the flywheel housing is not available, slowly pour boiling water over the area round the bearing.

3 Remove the reatining ring (where fitted) and carefully prise the bearing out of the casing, taking great care not to damage the bearing housing. If possible use BL service tool 18G581.

4 When fitting a new bearing carefully drift it into position (having previously heated the housing as described above) until it is just clear of the retaining ring recess (where fitted). *On no account press the bearing right into the recess in the housing,* as this would mask the bearing oil supply hole which is at the rear of the recess.

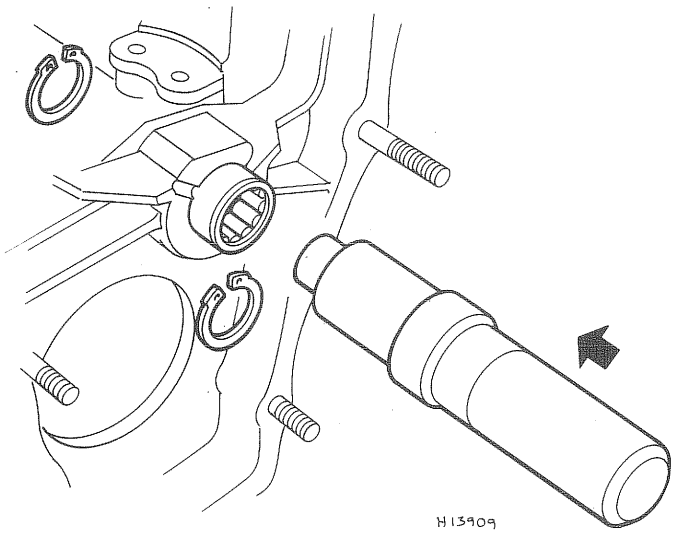
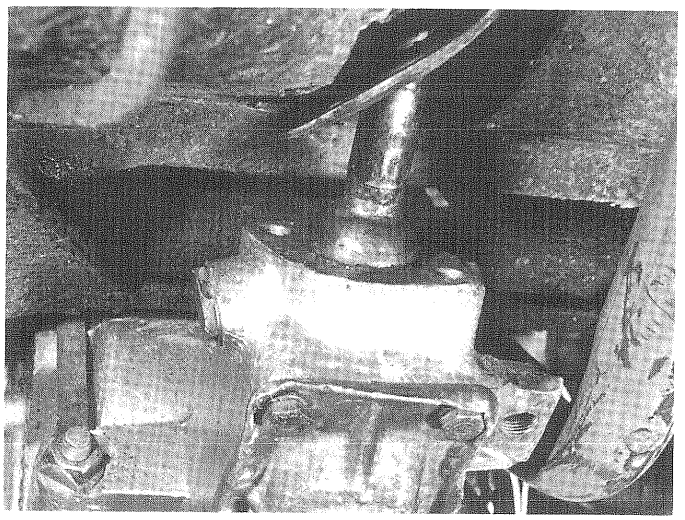


Fig. 6.11 Fitting a new idler gear bearing to the transmission casing (Sec 12)



13.3 Removing the gear lever retaining plate

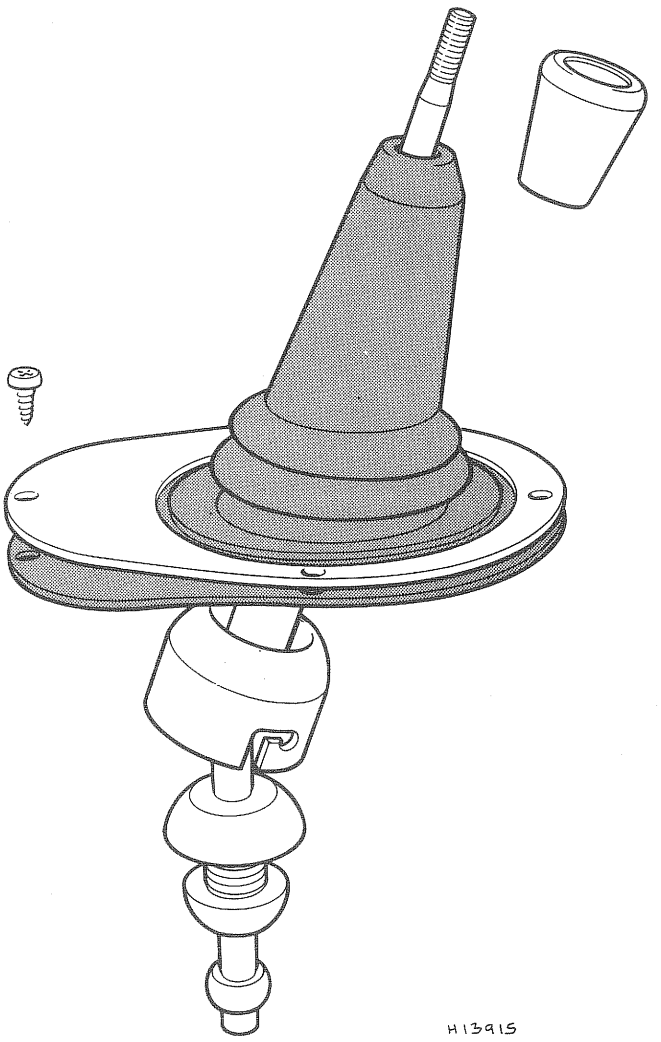


Fig. 6.12 The remote control gear lever assembly used with the rod-change transmission (Sec 13)

5 To renew the idler gear needle roller bearing in the gearbox casing, separate the engine from the transmission, remove the circlip and drift the bearing out of the casing. Alternatively, if BL service tool 18G581 is obtainable, the engine need not be separated from the transmission.
6 To refit the bearing, carefully drive it into position using a suitable drift and refit the circlips.
7 If the outer race of the first motion shaft roller bearing requires renewal, use the procedure described in paragraphs 2 and 3, or preferably obtain BL service tool 18G617A.

13 Gear lever – removal and refitting

Direct engagement lever

1 Jack up the rear of the car and support it on axle stands.
2 Lift up the front carpets and then undo and remove the screws securing the rubber boot retaining plate and rubber boot to the floor. Lift off the retaining plate and slide the boot up the gear lever slightly.
3 From underneath the car, undo and remove the two bolts and spring washers securing the gear lever retaining plate to the transmission casing (photo).
4 Lift the gear lever out of its location and remove it from inside the car. As the gear lever is removed take out the small anti-rattle spring and plunger from the drilling in the side of the gear lever seat.
5 Refitting the gear lever is the reverse sequence to removal. Lubricate the gear lever ball with general purpose grease before refitting.

Remote control lever (early type)

6 Working inside the car, lift up the carpets, undo and remove the screws securing the retaining plate and rubber boot to the floor.
7 Undo and remove the two screws and then lift off the gear lever complete with retainer, distance piece, spring and flange.
8 Refitting the gear lever is the reverse sequence to removal. Lubricate the gear lever ball with general purpose grease before refitting.

Remote contol lever (rod-change type)

9 Lift up the carpets, and then undo and remove the screws securing the retaining plate and rubber boot to the floor.
10 Slide the rubber boot up the lever then press down and turn the bayonet cap fixing to release the lever from the remote control housing.
11 Lift out the gear lever, rubber boot and retainer.
12 Refitting the gear lever is the reverse sequence to removal. Lubricate the gear lever ball with general purpose grease before refitting.

14 Gearchange remote control housing – removal and refitting

Early type

1 Jack up the front of the car and support it on axle stands.
2 Remove the gear lever as described in the previous Section.
3 From the rear of the housing, undo and remove the nut and washer securing the rubber mounting to the support bracket.
4 From the front of the housing, undo and remove the four shouldered bolts securing the front mounting to the housing.
5 Pull the housing down at the front to disengage the linkage, and then move it forward and out of the rear support bracket.
6 Refitting the remote control housing is the reverse sequence to removal. When engaging the front of the housing with the mounting it may be necessary to move the gear lever slightly to align the linkage and enable the front of the housing to be pushed fully home.

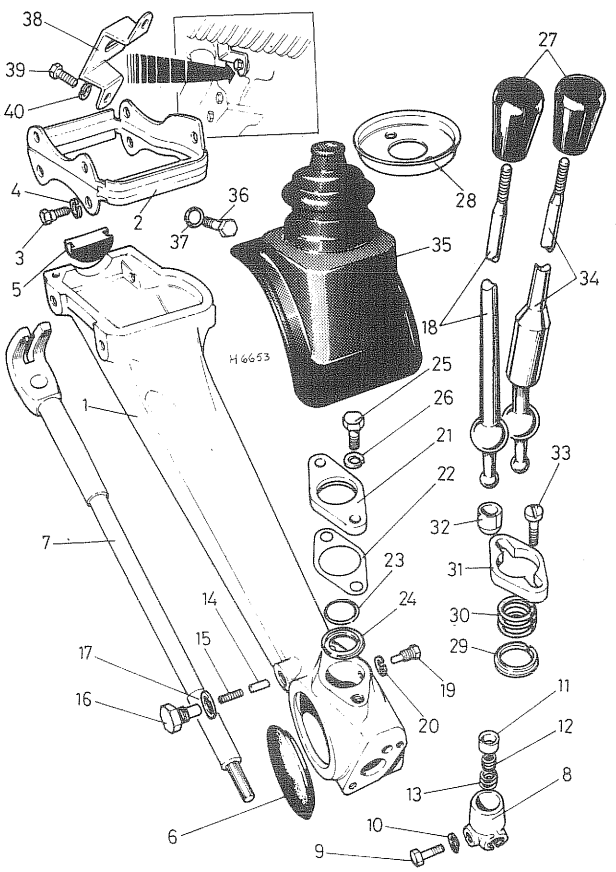
Rod-change type

7 Jack up the front of the car and support it on axle stands.
8 From underneath the car, release the bayonet cap that secures the gear lever to the remote control housing.
9 Using a parallel pin punch drift out the roll pin securing the collar of the gearchange extension rod to the gearbox shaft.
10 Undo and remove the nut and bolt scuring the remote control steady rod to the differential housing.
11 Undo and remove the nut and thorough-bolt securing the remote control housing to the mounting bracket. Withdraw the assembly from underneath the car.
12 Refitting is the reverse sequence to removal.

15 Gearchange remote control housing – dismantling and reassembly

Early type

1 Remove the remote control housing from the car as described in the previous Section.



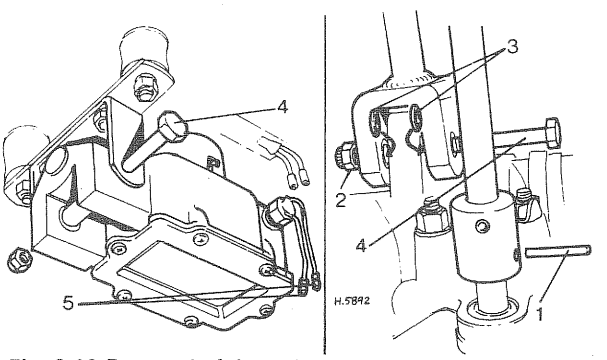


Fig. 6.13 Removal of the rod-change type remote control assembly from underside of car (Sec 14)

1 Roll pin
2 Nut
3 Plain washers
4 Bolt
5 Reversing light switch terminals

2 Undo and remove the anti-rattle spring, plunger retaining nut and washer and take out the spring and plunger.
3 Prise off the large grommet from the side of the housing and then, using a socket, undo and remove the primary shaft pinch-bolt.
4 Slide the primary shaft forward to disengage the shaft lever and then lift out the shaft and lever.
5 Examine the primary shaft and the nylon bush in the shaft lever for wear and renew as necessary. The bush in the lever may be prised out with a screwdriver, and a new bush simply pushed into place. Check that the anti-rattle spring is not weak or broken as this will cause a sizzling noise to be emitted from the gear lever during hard accleration. Also inspect the front and rear mountings for deteioration of the rubber, and renew if suspect.
6 Lubricate all the components with general purpose grease and reassemble using the reverse of the dismantling procedure. Ensure that the machined groove in the end of the primary shaft is in line with the pinch-bolt hole in the shaft lever when reassembling these components.

Rod-change type

7 Remove the remote control housing from the car as described in the previous Section.
8 Undo and remove the six screws and lift off the bottom cover plate.
9 Undo and remove the locknut, washer and steady rod from the housing.
10 Using a parallel pin punch, drift out the roll pin securing the

Fig. 6.14 Exploded view of the early type remote control gearchange housing (Sec 15)

1 Remote control housing
2 Front mounting
3 Shouldered bolt
4 Washer
5 Grommet
6 Grommet
7 Primary shaft
8 Shaft lever
9 Bolt
10 Washer
11 Thrust button
12 Inner spring
13 Outer spring
14 Anti-rattle plunger
15 Anti-rattle spring
16 Nut
17 Washer
18 Gear lever
19 Locating pin
20 Washer
21 Retaining plate
22 Gasket
23 Ring
24 Flange
25 Bolt
26 Washer
27 Knob
28 Lever retainer
29 Nylon flange
30 Spring
31 Distance piece
32 Split bush
33 Retaining screw
34 Alternative gear lever
35 Rubber boot
36 Bolt
37 Washer
38 Exhaust bracket
39 Bolt
40 Washer

gearchange extension rod to the rod eye and then withdraw the extension rod.
11 Drift out the second roll pin that secures the rod eye to the support rod and then withdraw the rod eye and support rod.
12 Examine the dismantled components for wear or corrosion and renew as necessary. Pay particular attention to the nylon bush in the rod eye and renew this item if it shows any signs of wear or deformation. Also check the rubber mountings, and renew these if there are signs of cracking or deterioration of the rubber.
13 Reassembly is the reverse sequence to removal. Lubricate all the parts with general purpose grease before reassembly.

16 Gearchange selector shaft oil seal (rod-change gearbox) – removal and refitting

1 Jack up the front of the car and support it on axle stands.
2 Place a suitable container beneath the engine and drain the engine/transmission oil.
3 Using a parallel pin punch, drift out the roll pin securing the gearchange extension shaft collar to the selector shaft.
4 Undo and remove the nut and bolt securing the gearchange steady rod to the differential housing. Move the steady rod rearwards slightly and withdraw the extension rod collar off the selector shaft.
5 Withdraw the rubber gaiter (if fitted) and then hook out the oil seal with a screwdriver.
6 Before refitting a new seal wrap adhesive tape around the selector shaft to avoid damaging the seal lips as it is installed. If possible, obtain the protector sleeve, BL special tool No 18G1238 and place this over the selector shaft.
7 Lubricate the new seal in clean engine oil and slide it over the shaft with the open side of the seal toward the differential.
8 Tap the seal fully into position using a tube of suitable diameter.
9 Remove the adhesive tape or protector sleeve and then refit the gearchange extension shaft and the steady rod.
10 Lower the car to the ground and refill the engine/transmission with oil.

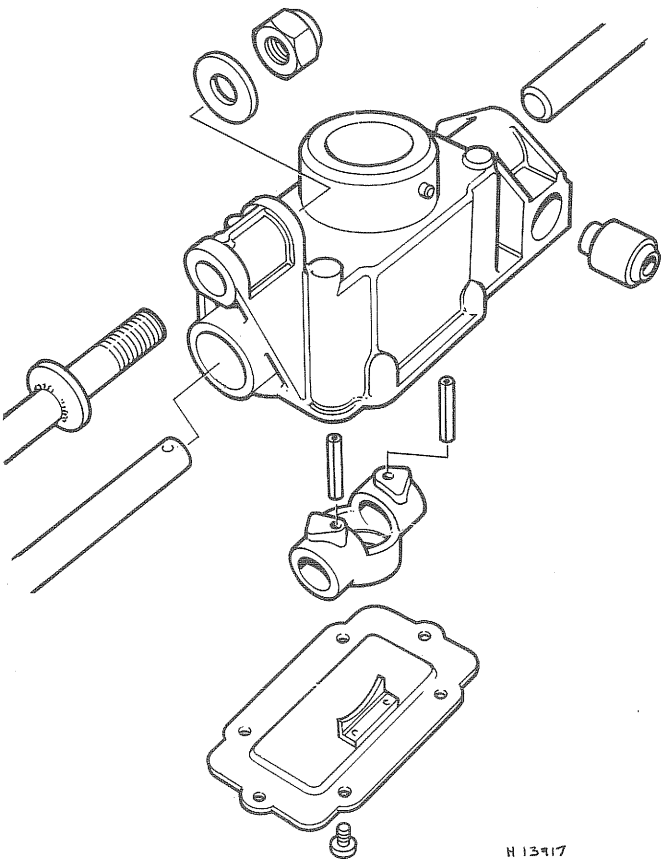


Fig. 6.15 Component parts of the rod-change type remote control housing (Sec 15)

17 Fault diagnosis – manual gearbox

Note: *It is sometimes difficult to decide whether it is worthwhile removing and dismantling the gearbox for a fault which may be nothing more than a minor irritant. Gearboxes which howl, or where the synchromesh can be 'beaten' by a quick gear change, may continue to perform for a long time in this state. A worn gearbox usually needs a complete rebuild to eliminate noise because the various gears, if re-aligned on new bearings, will continue to howl when different wearing surfaces are presented to each other. The decision to overhaul, must be considered with regard to time and money available, relative to the degree of noise or malfunction that the driver can tolerate.*

Symptom	Reason(s)
Gearbox noisy in neutral	Worn transfer gears or idler gear bearing (noise stops when clutch pedal depressed) Layshaft bearings worn
Gearbox noisy in all gears	One or both of above faults General wear
Gearbox noisy in one particular gear	Worn, chipped or damaged gear teeth
Gearbox jumps out of gear on drive or overrun	Detent balls and springs worn Coupling dogs worn Selector forks worn or rods loose Worn synchro hubs or baulk rings
Crunching or cracking when changing gear	Clutch fault (see Chapter 5) Worn baulk rings or synchro hubs
Difficulty in engaging gear	Clutch fault (see Chapter 5) Gearchange linkage worn, loose or maladjusted

18 Automatic transmission – general description

The automatic transmission fitted as an optional extra to Mini models incorporates a three element fluid torque convertor, with a maximum conversion of 2.1, coupled to a bevel geartrain assembly.

The final drive is transmitted from a drivegear to a conventional type differential unit, which in turn transmits engine torque through two flange type coupling driveshafts, employing constant velocity joints, to the roadwheels.

The complete geartrain assembly, including the reduction gears and differential units, runs parallel to, and below, the crankshaft and is housed in the transmission casing, which also serves as the engine sump.

The system is controlled by a selector lever within a gated quadrant marked with seven positions and mounted centrally on the floor of the car. The reverse, neutral, and drive positions are for normal automatic driving, with the first, second, third, and fourth positions used for manual operation or override as required. This allows the system to be used as a fully automatic four-speed transmission from rest to maximum speed, with the gears changing automatically according to throttle position and load. If a lower gear is required to obtain greater acceleration, an instant full throttle position (ie kick-down on the accelerator) immediately produces the change.

Complete manual control of all four forward gears by use of the selector lever provides rapid changes. However, it is very important that downward changes, are effected at the correct road speeds otherwise serious damage may result to the automatic transmission unit. The second, third and top gears provide engine braking whether driving in automatic or manual conditions. In first gear a freewheel condition exists when decelerating. Manual selection to third or second gear gives engine braking and also allows the driver to stay in a particular low gear to suit road conditions or when descending steep hills.

Due to complexity of the automatic transmission unit, if performance is not up to standard, or overhaul is necessary, it is imperative that this be left to the local main agents who will have the special equipment for fault diagnosis and rectification.

The content of the following Sections is therefore confined to supplying general information and any service information and instruction that can be used by the owner.

19 Automatic transmission – removal and refitting

The automatic transmission is removed from the car together with the engine and differential assembly as described in Chapter 1.

It will be necessary to separate the gearbox from the engine; again, full information will be found in Chapter 1.

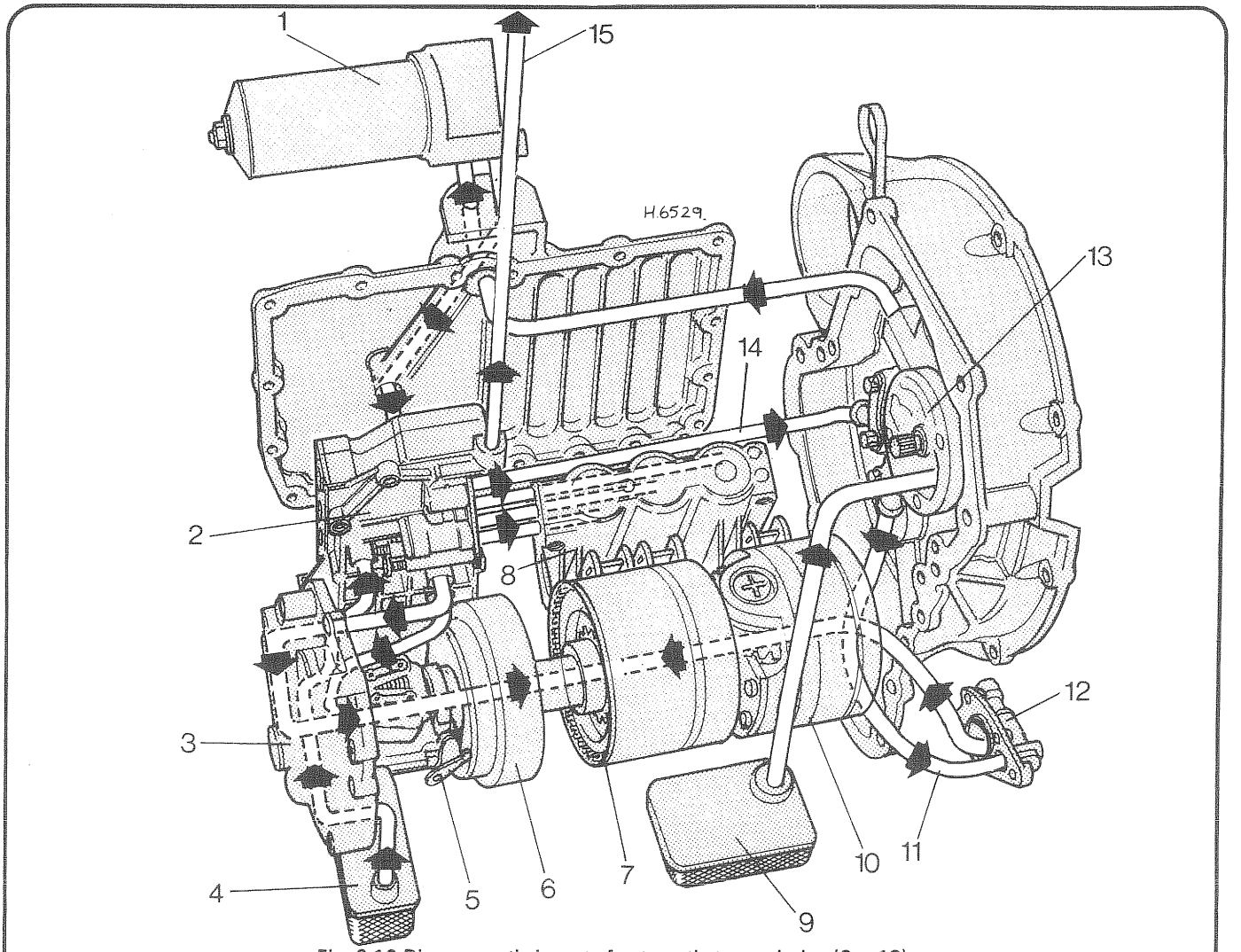


Fig. 6.16 Diagrammatic layout of automatic transmission (Sec 18)
Power flow and lubrication circuit shown by arrows

1 *Oil filter assembly*
2 *Valve block*
3 *Auxiliary pump*
4 *Oil strainer*
5 *Governor*
6 *Forward clutch*
7 *Top/reverse clutch*
8 *Servo unit*
9 *Oil strainer*
10 *Geartrain*
11 *Low pressure valve feed*
12 *Low pressure valve*
13 *Oil pump*
14 *Converter feed pipe*
15 *Engine oil feed*

20 Transfer gear (automatic transmission) – removal and refitting

1 The procedure for removing and refitting the transfer gear on vehicles equipped with automatic transmission is the same as described in Section 11 for manual gearbox models with the exception of the input (first motion shaft) gear which should not be disturbed.
2 To provide access to the transfer gears it will be necessary to remove the engine/transmission unit from the car and then remove the torque converter and converter housing as described in Chapter 1.

21 Starter inhibitor switch (automatic transmission) – adjustment

1 The starter inhibitor switch is located on the rear of the gear selector housing. Early switches have two terminals which are connected through the ignition/starter circuit. On later versions two additional terminals are used to actuate the reversing lights. The purpose of this is to ensure that the engine will only start when the gear selector lever is in the 'N' position.
2 The switch terminals marked '2' and '4' are used in the ignition/starter circuit and both the electrical leads are interchangeable to the '2' and '4' positions of the switch.
3 When the reversing light is fitted, terminals '1' and '3' are used for this light.
4 Before making any adjustments to the switch, ensure that the gearchange cable and selector rod adjustment is correct as described in Section 22.
5 To adjust the switch, just move the selector lever to the 'N' position.
6 Disconnect the electrical connections from the rear of the switch.
7 Slacken the locknut and screw out the switch as far as possible.
8 Connect a test light and battery across the switch terminals numbered '2' and '4'.
9 Screw the switch into the housing until the lamp *just* lights and then screw it in a further one half turn . Hold the switch in this position and tighten the locknut.
10 Remove the test equipment and reconnect the electrical leads to the appropriate terminals.
11 Check that the starter motor will operate with the selector lever in the 'N' position. When reversing lights are fitted check that they only come on when 'R' is selected.

22 Gear selector cable (automatic transmission) – adjustment

1 First check the cable setting as follows before carrying out any adjustment.
2 Apply the handbrake firmly, select 'N' and start the engine.
3 Move the selector lever to the 'R' position and check that reverse gear is engaged.
4 Move the lever slowly towards 'N' and check that reverse is disengaged just before or exactly as the lever locates the 'N' position.
5 Repeat the above procedure with the first gear '1' position.
6 If the checks show the cable to be in need of adjustment, proceed as follows.
7 Jack up the front of the car and support it on axle stands.
8 From underneath the car undo and remove the two bolts securing the bellcrank cover plate to the right-hand end of the transmission casing.
9 Undo and remove the nut and bolt securing the cable fork to the bellcrank lever.
10 Move the bellcrank lever to pull the transverse rod fully out and then move it back two detents.
11 From inside the car move the selector lever to the 'N' position.
12 Slacken the two selector cable adjusting nuts and position the cable so that the pivot bolt can be easily inserted through the cable fork and bellcrank lever.
13 Hold the cable in this position, tighten the adjusting nuts and check that the position of the cable has not altered.
14 Refit the pivot bolt and nut followed by the bellcrank cover plate.
15 Lower the car to the ground and recheck the cable setting as described in paragraphs 2 to 5 inclusive.

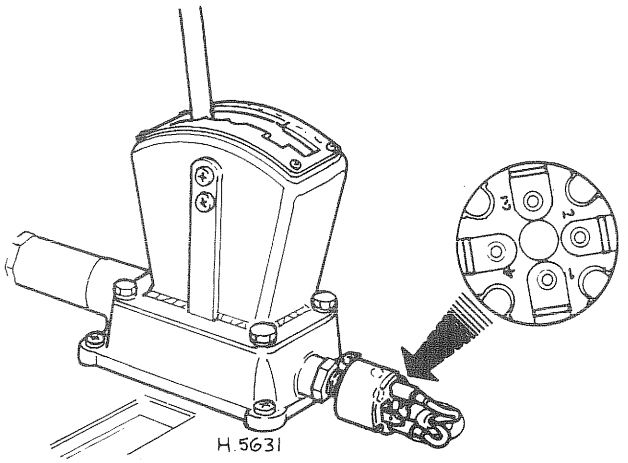


Fig. 6.17 Starter inhibitor switch (Sec 21)

23 Governor control rod (automatic transmission) – adjustment

1 Fot this adjustment a tachometer is needed.
2 Start the engine and run it until it reaches normal operating temperature.
3 Refer to Chapter 3 and ensure that the carburettor settings are correct.
4 Disconnect the governor control rod at the carburettor.
5 Insert a 0.25 in (6.4 mm) diameter rod through the hole in the governor control rod bellcrank lever and into the hole in the transmission casing.
6 Slacken the locknut and adjust the length of the rod to suit the carburettor linkage in the tickover position.
7 Reconnect the governor control rod to the carburettor. Tighten the balljoint locknut and remove the checking rod from the bellcrank lever.

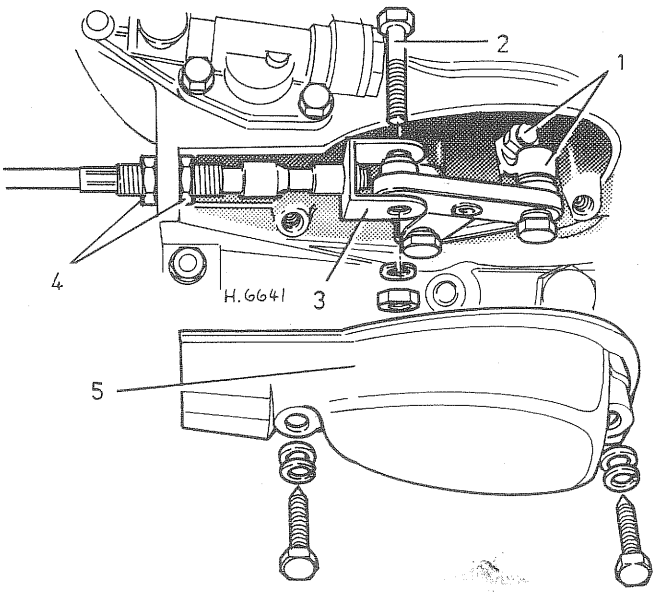


Fig. 6.18 Gear selector cable adjustment (Sec 22)

1 *Transverse rod-to-bellcrank lever adaptor*
2 *Cable fork-to-bellcrank lever retaining bolt*
3 *Cable fork*
4 *Cable adjusting nuts*
5 *Bellcrank cover plate*

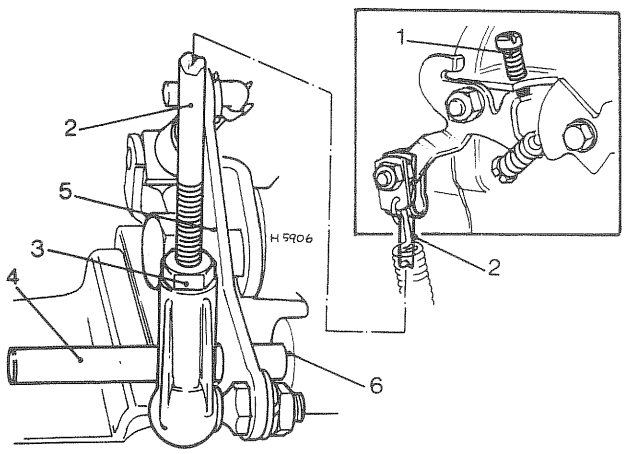


Fig. 6.19 Governor control rod adjustment (Sec 23)

1 *Throttle adjusting screw*
2 *Governor control rod*
3 *Locknut*
4 *0.25 in (6.4 mm) dia rod*
5 *Intermediate bellcrank lever*
6 *Transmission case hole*

24 Gear selector lever housing and cable (automatic transmission) – removal and refitting

1 Jack up the front of the car and support it on axle stands.
2 From underneath the car, undo and remove the two bolts securing the bellcrank cover plate to the right-hand end of the transmission casing.
3 Undo and remove the nut washer and pivot bolt securing the selector cable fork to the bellcrank lever.
4 Slacken the fork retaining nut and unscrew the fork from the cable.
5 Unscrew the fork retaining nut and then slide off the two rubber ferrules.
6 Undo and remove the outer cable adjusting nut and then pull the cable out of the transmission casing bracket.
7 Release the cable clip from the floor panel.
8 Working inside the car lift up the front floor covering.
9 Make a note of their relative positions, then disconnect the electrical leads from the starter inhibitor switch.
10 Undo and remove the four nuts and washers securing the selector lever housing to the floor panel, and withdraw the housing and cable from the car.
11 Refitting is the reverse sequence to removal. Adjust the cable as described in Section 22 and the inhibitor switch as described in Section 21 after refitting.

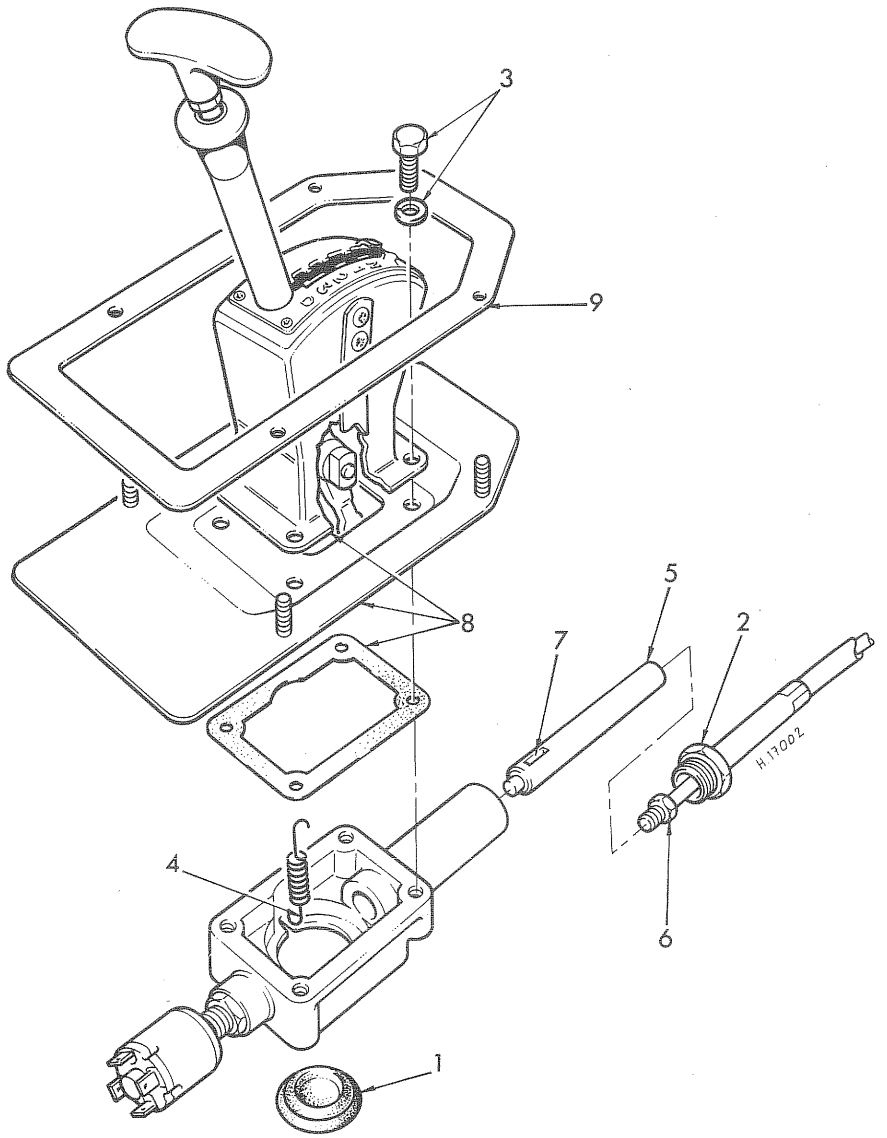


Fig. 6.20 Exploded view of gear selector lever housing (Sec 24)

1 *Grommet*
2 *Outer cable locknut*
3 *Quadrant securing bolts*
4 *Reverse return spring*
5 *Operating plunger*
6 *Inner cable locknut*
7 *Operating plunger slot*
8 *Quadrant, plate and gasket*
9 *Upper gasket*

25 Gear selector lever housing and cable (automatic transmission) – dismantling and reassembly

1 Remove the assembly as described in Section 24.
2 Prise out the rubber grommet at the base of the selector mechanism and then mount the assembly in a vice.
3 Slacken the nut securing the outer cable to the housing.
4 Undo and remove the four bolts securing the quadrant to the housing, release the reverse return spring and lift off the quadrant and lever.
5 Unscrew the outer cable and withdraw it from the housing.
6 Insert a screwdriver into the slot of the operating plunger to prevent it turning, and slacken the nut securing the cable to the plunger.
7 Finally, unscrew the plunger from the cable.
8 Inspect all the parts for wear and renew as necessary.
9 Reassembly is the reverse of the dismantling procedure. Lubricate all moving parts with general purpose grease before reassembling.

26 Fault diagnosis – automatic transmission

1 Before the automatic transmission is removed for repair of a suspected malfunction, it is imperative that the cause be traced and confirmed. To do this requires specialist experience and various gauges not normally found in the DIY mechanic's workshop.
2 If any fault arises that cannot be cured by attention to the oil level or the adjustment of the control cables, take the car to a BL main agent or an automatic transmission specialist for diagnosis and repair.
3 As a guide to determining if a fault exists, consult the change speed chart below. The tests should be made with the gear selector in 'D'.

Throttle position	Gear change	mph	kph
Light	*1-2*	*10-14*	*16-22*
	2-3	*15-19*	*24-30*
	3-4	*20-24*	*32-39*
Kickdown	*1-2*	*25-33*	*40-53*
	2-3	*37-45*	*60-72*
	3-4	*49-57*	*78-91*
Kickdown	*4-3*	*43-39*	*70-64*
	3-2	*35-31*	*56-50*
	2-1	*22-18*	*35-29*
Closed	*4-3*	*20-16*	*32-26*
(roll out)	*3-2*	*14-10*	*22-16*
	2-1	*8-4*	*12-6*