

Fig. 2. Gearbox Details (Fixed Parts)

Key to Fig. 2

60 Knob	86 Setscrew	112 Spring
61 Setscrew	87 Copper washer	113 Cap disc
62 Nyloc nut	88 Gasket	114 Lever
63 Setscrew	89 Bush	115 Nut
64 Cap	90 Cover plate	116 Top/3rd selector shaft
65 End plate	91 Setscrew	117 Interlock plunger
66 Cross bolt	92 Nut	118 Balls—interlock
67 Rubber 'O' ring	93 Drain plug	119 Reverse selector shaft
68 Top cover	94 Casing	120 Shim
69 Welch plug	95 Gasket	121 Spring
70 Bolt	96 Extension housing	122 Plunger
71 Plug	97 Bolt	123 Reverse actuator
72 Bolt	98 Silentbloc mounting	124 Distance piece
73 Welch plug	99 Nut	125 2nd/1st selector shaft
74 Gasket	100 Nut	126 Ball—detent
75 Top/3rd selector fork	101 Oil seal	127 Spring
76 Distance tube	102 Stay	128 Plug
77 Distance tube	103 Bolt	129 Ball—detent
78 2nd/1st selector fork	104 Speedometer cable adapter	130 Spring
79 Peg bolt	105 Seal	131 Plug
80 Oil seal	106 Rubber 'O' ring	132 Level/filler plug
81 Copper washer	107 Housing	133 Peg bolt
82 Bolt	108 Peg bolt	134 Selector 1st/2nd
83 Front cover	109 Ball—anti-rattle	135 Bolt
84 Gasket	110 Spring	136 Speed drive gear
85 Countershaft end plate	111 Selector—reverse	

GEARBOX REMOVAL

To Remove Gearbox Leaving Engine in Position

Raise the vehicle on a ramp or support it on axle stands.

Disconnect the battery, drain the gearbox and remove the seat cushions and front carpets.

Referring to Fig. 3, disconnect :

- cables (1) (3) from heater control switch.
- control cable (2) from heater unit.
- control cable (4) from control panel.

Remove :

- facia support (two bolts (7) top, two bolts (8) each side bottom).
- dipper switch (leave cables attached).
- centre floor cover (17 bolts and washers).
- propeller shaft.

Referring to Fig. 4, remove :

- clevis pin (1).
- two bolts (2).
- stay (4).
- clutch slave cylinder (5), (allowing it to hang by its flexible hose).
- clutch cover plate from lower portion of clutch housing.

Disconnect the speedometer cable, and over-drive connectors (if fitted). See page 2-304.

Using a block of wood to protect the sump, take the weight of the engine and gearbox with a jack placed as far as possible towards the rear of the sump.

Referring to Fig. 5, release the exhaust pipe bracket (9) and detach the rear mounting (10) from the gearbox and crossmember (8). Raise the engine and gearbox and remove the crossmember by sliding it forwards.

Remove the bolts, nuts and spring washers securing the clutch housing flange to the engine. Withdraw the gearbox rearwards until clear of the clutch ; then manoeuvre the clutch housing to the right and the rear end to the left, tilting the box to permit the clutch operating lever to clear the floor aperture.

Lift the gearbox from the vehicle.

To Refit

Reverse the removal procedure.

IMPORTANT : Do not allow the gearbox to hang on the clutch spigot shaft whilst fitting it to the engine.

Refill the gearbox with oil.

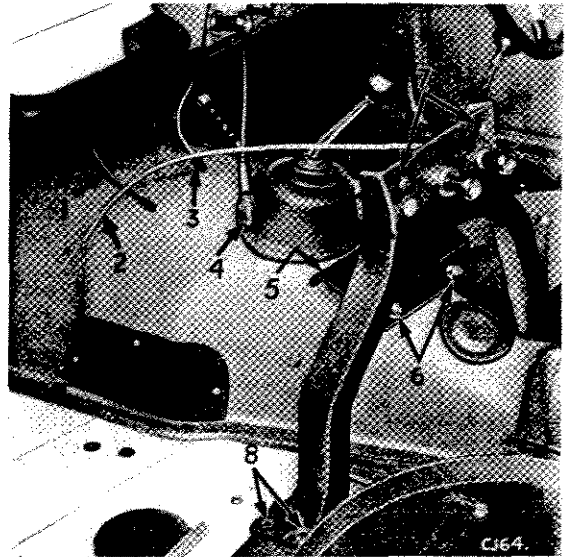


Fig. 3. Facia support and heater controls

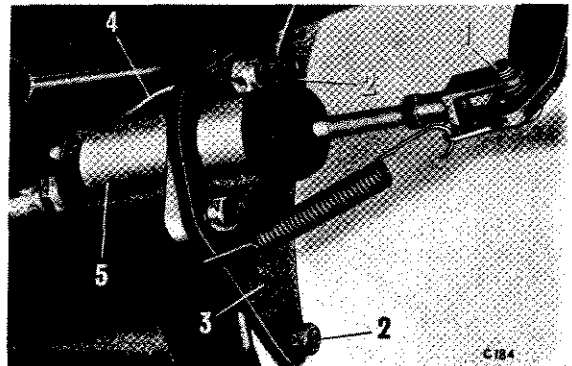


Fig. 4. Clutch slave cylinder

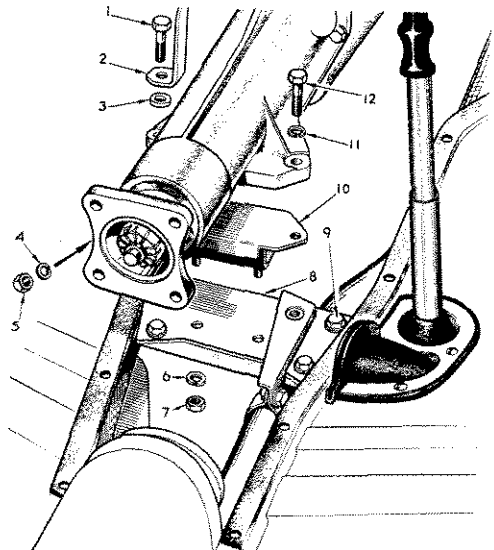


Fig. 5. Gearbox rear mounting

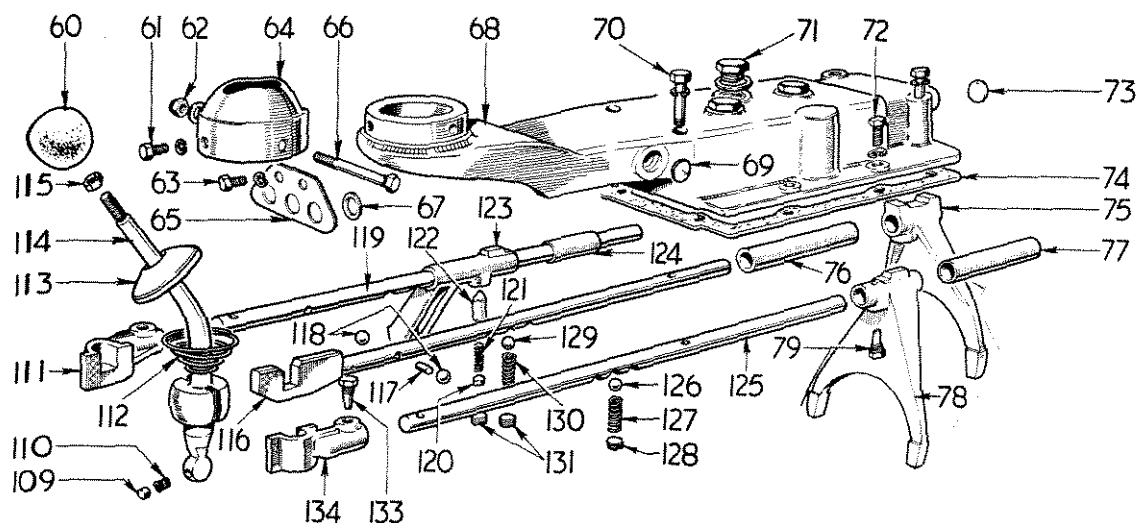


Fig. 6. Gearbox top cover details. The key to annotations is given on page 2-204

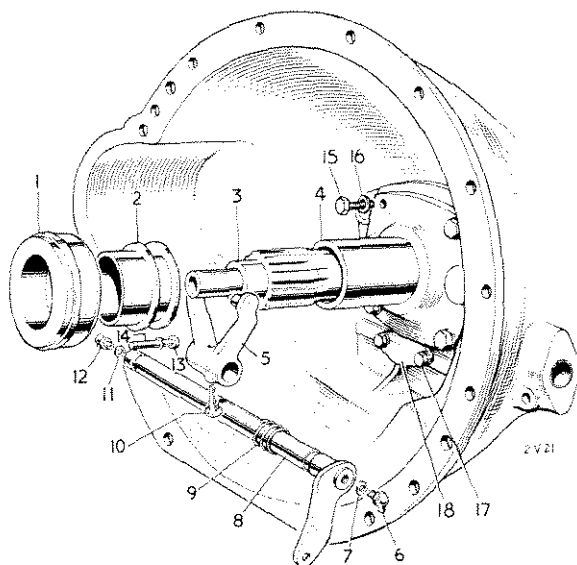


Fig. 7. Clutch release details

- | | |
|----------------------|------------------------------|
| 1 Release bearing | 10 Screwed taper pin |
| 2 Sleeve | 11 Fibre washer |
| 3 Input shaft | 12 Grease nipple |
| 4 Front cover | 13 Cross-shaft locating bolt |
| 5 Fork | 14 Spring washer |
| 6 Grease nipple | 15 Wedglok bolts |
| 7 Fibre washer | 16 Washers |
| 8 Cross-shaft | 17 Bolts |
| 9 Anti-rattle spring | 18 Plate |

GEARBOX

Dismantling

Top Cover (Fig. 6)

Remove the bolts (70) and (72), spring washers, top cover (68) and paper gasket (74).

Remove the nut (62), cross pin (66), cover (64) and withdraw the gear lever assembly from the top cover.

Invert the cover and remove the plugs (128), (131), distance piece (120), springs (130), (121) and (127), plunger (122) and balls (126), (129).

Detach the peg bolts (79).

With the selector shafts in the neutral position, withdraw the 3rd/Top gear selector shaft, (116) taking care to remove the interlock plunger (117) and balls (118) as they are released. Lift the 3rd/Top selector fork and distance tube from the top cover. Repeat this operation on the 1st/2nd and reverse gear selector shafts.

Remove the screws (63), spring washers and detach the retaining plate (65). Remove sealing rings (67) from recesses in the casing.

If necessary, remove the peg bolts (133) and detach the selectors (111) and (134) from their respective shafts.

Front Cover Details (Fig. 7)

Remove grease nipple (12), taper bolt (10), bolt (13), spring washer (14).

Withdraw cross-shaft (8) and release spring (9), release bearing (1), sleeve (2) and fork (5). Remove Wedglok bolts (15), washers (16) and detach front cover (4), bolts (17) and plate (18).

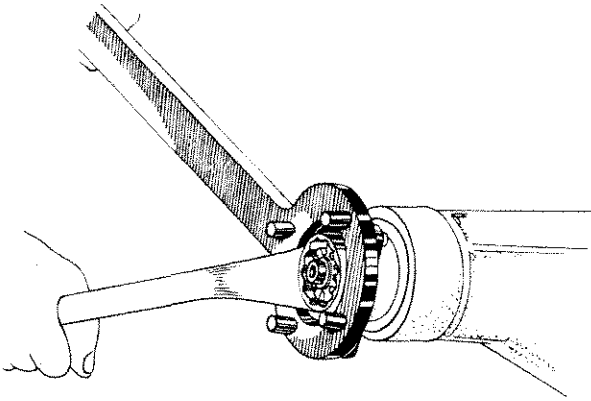


Fig. 8. Using Tool 20.SM.90 to remove the driving flange

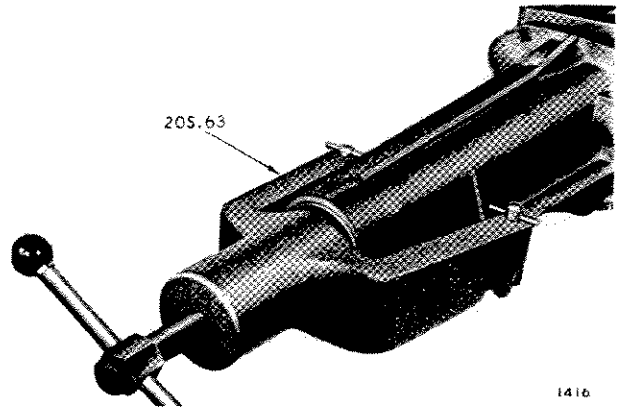


Fig. 10. Using Tool 20S.63 to remove rear extension

Rear Extension (Figs. 1 and 2)

Remove the peg bolt (108), spring washer, and withdraw the speedometer drive gear assembly (104) - (107).

Remove split pin (41), slotted nut (40), plain washer (39), and withdraw flange (38).

Remove bolts (135), spring washers, and detach the rear extension (96) using Churchill extractor No. 20.S/63.

Countershaft (Fig. 11)

Using a Phillips screwdriver, remove the screw (59) and retaining plate (58).

Withdraw the countershaft (51) and reverse pinion shaft (52).

Input Shaft (Fig. 1)

Using Churchill Tool No. S.4235.A, withdraw the input shaft assembly from the gearbox.

Remove the circlips (24) and (26), spacer washer (25) and withdraw the race (27) using Churchill Tool No. S.4221-2. Detach the disc (28). If necessary, extract the needle roller bearing (30).

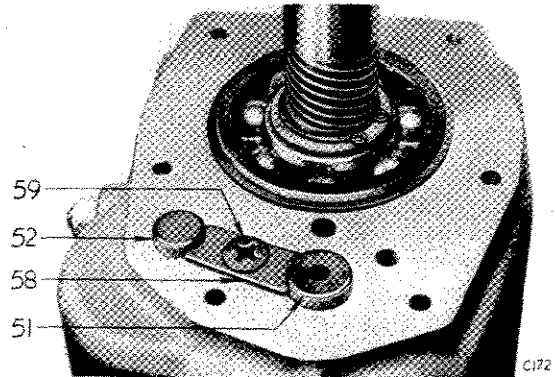


Fig. 11. Countershaft and reverse pinion shaft locating plate

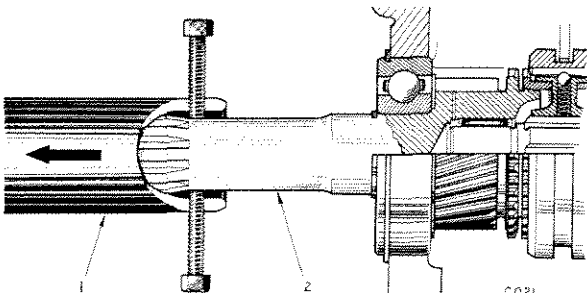


Fig. 9. Using Tool S.4235A with adaptor to remove the input shaft assembly

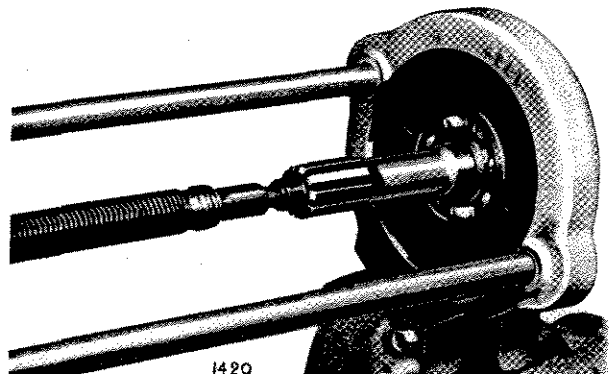
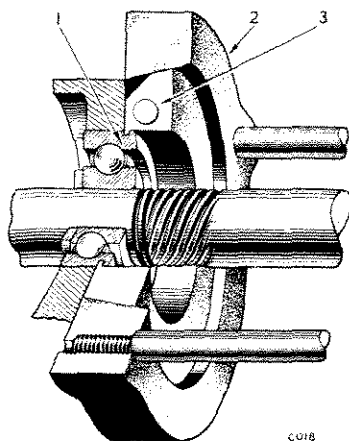


Fig. 12. Using Tool S.4221-2 to remove the input shaft ball race



- 1 Rear ball race
2 Multi-purpose hand press S.4221A
3 Adaptor No. S.4221A-15

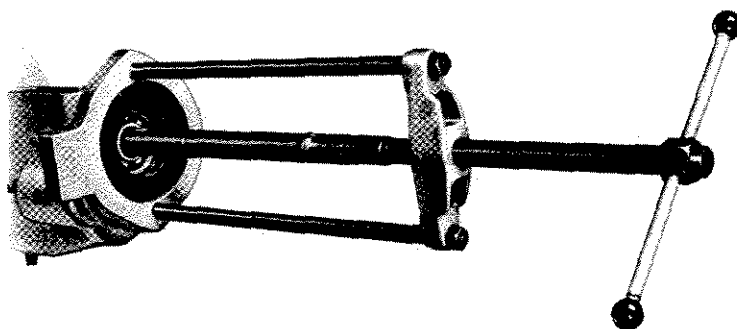


Fig. 13. Removing mainshaft rear bearing. The sectioned view on the left shows the adaptor gripping the ball race groove

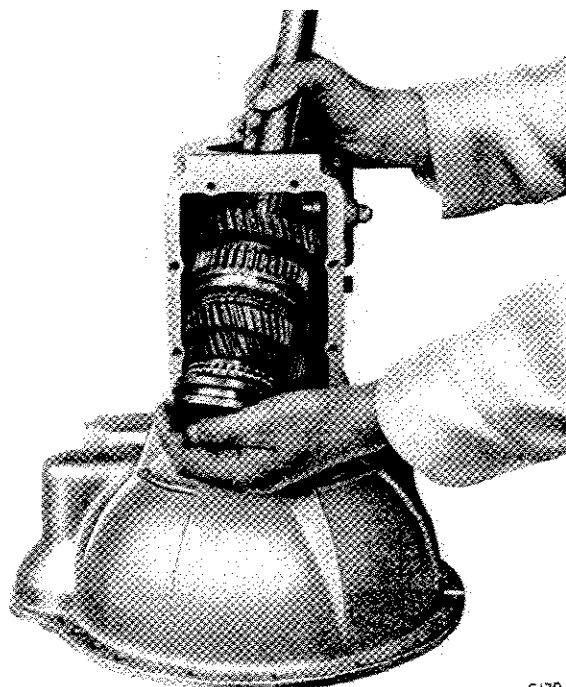


Fig. 14. Removing the mainshaft assembly

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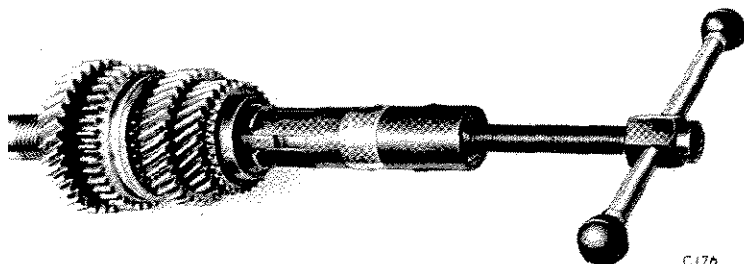


Fig. 15. Using Tool No. 20.SM.69 to remove the mainshaft circlip

C176

Mainshaft (Fig. 1)

Remove items (35), (34), (33) and detach the mainshaft rear race (32) using Churchill Tool No. S.4221A/15, as shown on Fig. 13.

Manoeuvre the mainshaft assembly out through the gearbox top cover aperture. Lift out the countershaft assembly, thrust washers (42) and (50) and reverse gear (56).

Remove the countershaft gears from the hub, and, if necessary, extract the needle roller assemblies from the hub bore.

Using Churchill Tool No. 20.SM.69, remove the circlip (17) by driving the tool beneath the circlip and levering the 3rd speed gear forward to dislodge the circlip from its groove. Remove all components from the mainshaft.

Remove the 1st/2nd and 3rd/4th synchro inner hubs from the outer sleeves, taking care to catch the springs (8) and (20), and balls (7) and (19).

Re-assembly (Fig. 1)**Reverse Gear**

Install the reverse gear (56) in the gearbox, placing the selector groove rearwards. Fit the reverse gear shaft (51) and secure it with string to prevent the shaft from sliding into the gearbox.

Countershaft

Using a stepped drift, drive a new needle roller bearing (lettered face outwards) into each end of the countershaft hub.

Fit the gears (45), (46), distance piece (47) and gear (48) to the countershaft hub as shown on Fig. 17.

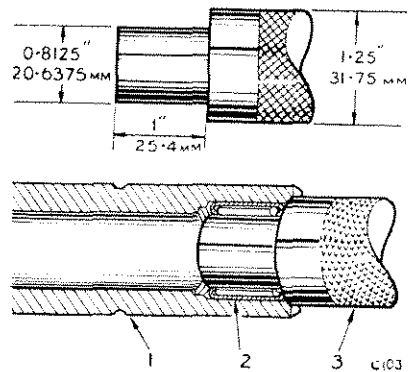
Using grease to retain them, locate the countershaft thrust washers (42) and (50) in the gearbox and lower the gear cluster into position. Temporarily fit the countershaft (51) and measure the gear end float. This should be 0.007"-0.012". Reduce excessive end float by selective assembly of available thrust washers and distance pieces.

Remove countershaft (51) and drop the gears to the bottom of the casing.

Synchro Units

1. Assemble synchro springs (20), balls (19) and shims to the 3rd/Top synchro hub (21). Fit the outer sleeve (22).
2. Repeat with 2nd/1st synchro unit.
3. Test the axial release load which should be :
3rd/Top. 19/21 lbs. 8.618/9.525 kg.
2nd/1st. 25/27 lbs. 11.34/12.247 kg.

NOTE : If the actual release loads differ from those specified, adjust the number of shims beneath each synchro spring to give the correct loading.



1 Countershaft 2 Bearing 3 Tool

Fig. 16. Details of tool required for installing new countershaft bearings

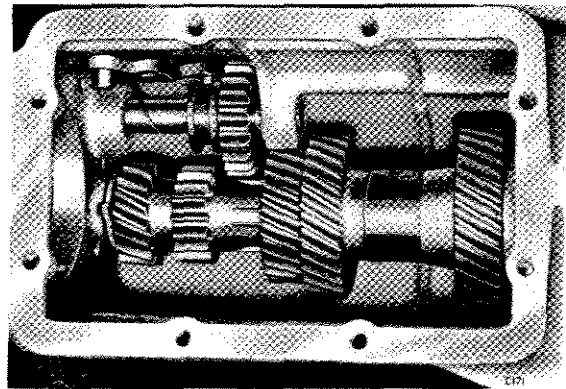


Fig. 17. Countershaft and reverse gear assembly

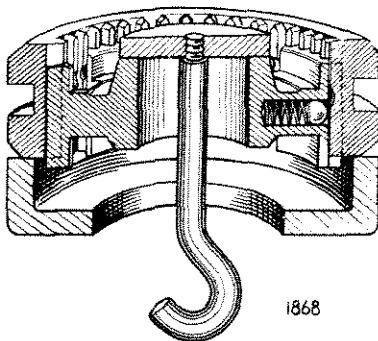


Fig. 19. Showing a simple method of checking synchro release loads. A spring balance is attached to the hook and the pull pressure increased to the point of release

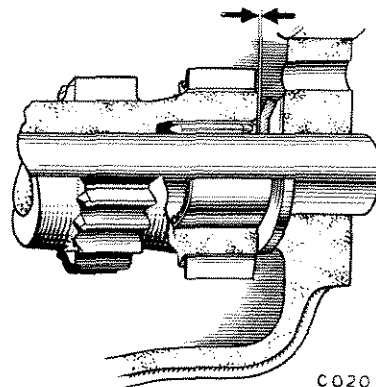


Fig. 18. Countershaft rear thrust washer
Clearance 0.007" - 0.012" (0.18 - 0.3 mm.)

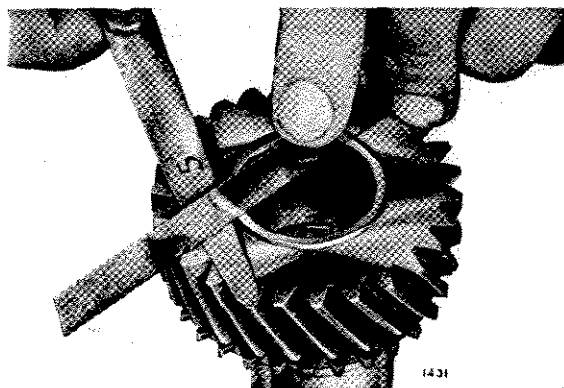


Fig. 20. Measuring gear end-float

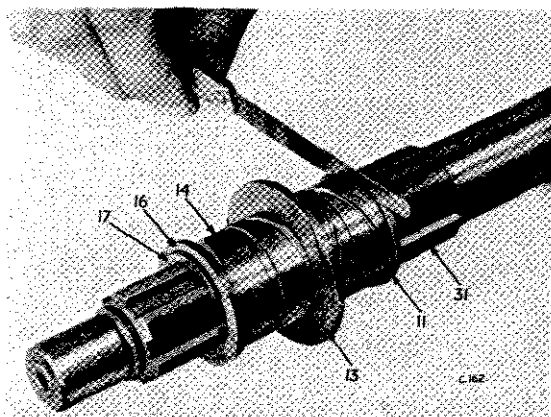


Fig. 21. Measuring bush end-float

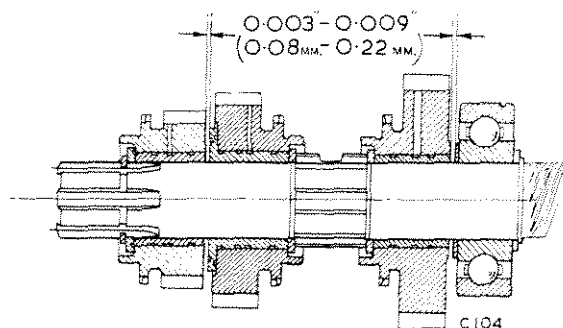


Fig. 22. Section through mainshaft assembly showing end-float of mainshaft bushes

1st, 2nd and 3rd Mainshaft Gear End Float on Bushes

Measure the end float of each gear on its respective bush as shown on Fig. 20. This should be 0.004" to 0.006" (0.1 to 0.15 mm.). Fit a new bush to increase float ; decrease float by reducing bush length.

CAUTION : Reduced bush length will increase end float of bushes on mainshaft.

Overall End Float of Bushes (Mainshaft)

Assemble the thrust washer (11), bush (13), bush (14) and thrust washer (16) to the mainshaft. Secure the assembly with a discarded half-circlip (17) and measure the total end float of the bushes and thrust washers on the mainshaft. If necessary, adjust the end float by selective use of thrust washers (11) to give 0.003" to 0.009" (0.08 to 0.23 mm.). Thrust washers are available in the following thicknesses:

Part Number	Colour	Thickness	
		ins.	mm.
129941	Self-finish	0.119	3.02
129942	Green	0.122	3.10
129943	Blue	0.125	3.18
129944	Orange	0.128	3.25
134670	Yellow	0.133	3.38

1st Speed Gear End Float

Assemble the thrust washer (4), bush (2) and thrust washer (1) to the mainshaft. Using the Churchill driver (S 314), drift the race (32) into position and fit the washer (34), circlip (35). Drive the race rearwards to ensure that it is hard against the circlip.

Measure the distance between the washer (1) and bush (2). This should be 0.003" to 0.009". Adjust by selective use of above thrust washers.

Remove all components from the mainshaft prior to final assembly.

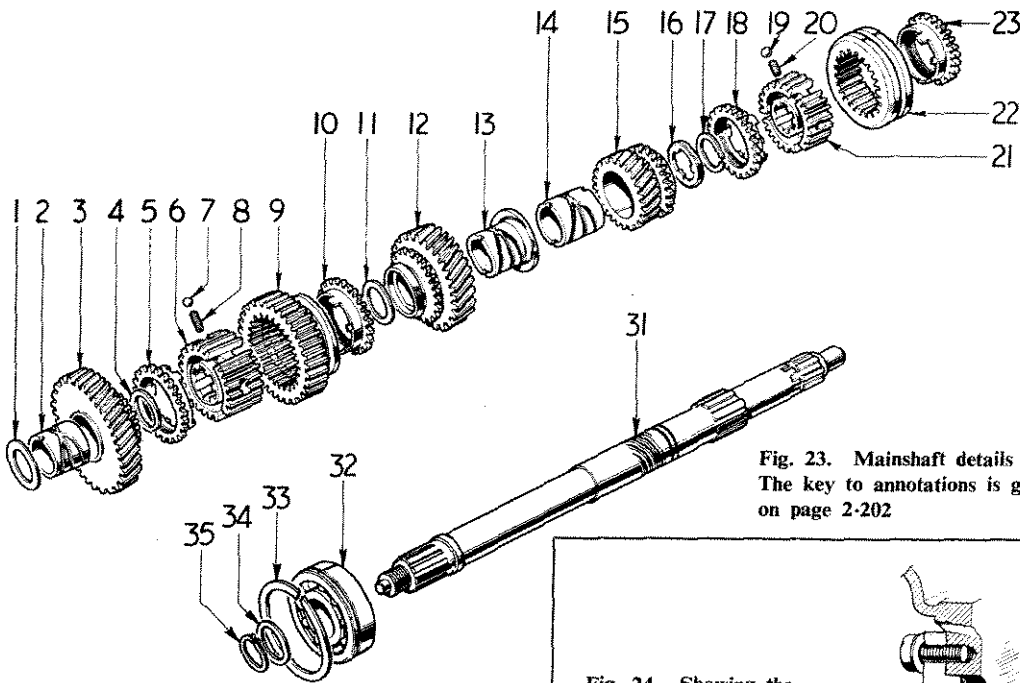


Fig. 23. Mainshaft details
The key to annotations is given
on page 2-202

Mainshaft Assembly

Place the components as shown on Fig. 23 and assemble to the front of the mainshaft in the following order :

- thrust washer (11).
- gear and bush (12), (13).
- gear and bush (14), (15).
- thrust washer (16).
- new circlip (17).
- 3rd/Top synchro unit with baulk ring (18) and (23) at each side.

With a baulk ring (5), (10) assembled to each side of the 2nd/1st synchro unit, slide this over the rear of the mainshaft and locate on the larger splines.

To the rear of the mainshaft assemble :

- washer (4).
- gear and bush (2), (3).
- washer (1).

Enter the rear of the mainshaft through the rear bearing housing and manoeuvre the shaft into position. Fit Churchill abutment plate (S.314) to gearbox front face.

Fit circlip (33) to bearing (32) and use Churchill driver S.314 to drift the bearing into position. Fit washer (34) and circlip (35) behind the bearing.

Strike rear end of mainshaft with a copper mallet to take up clearance between circlip (35), washer (34) and bearing (32).

Fig. 24. Showing the
abutment plate, Tool
No. S.314, installed in
place of the front cover

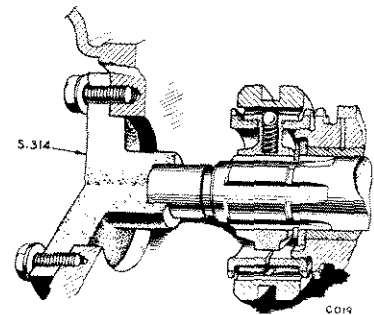
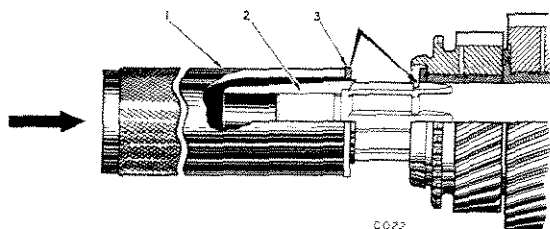
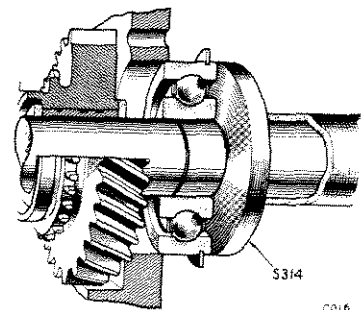


Fig. 25. Using driver,
Tool No. S.314, to
drift the rear bearing
into position



1 Driver S.145 2 Circlip expander 3 Circlip

Fig. 26. Installing the front circlip to the
mainshaft

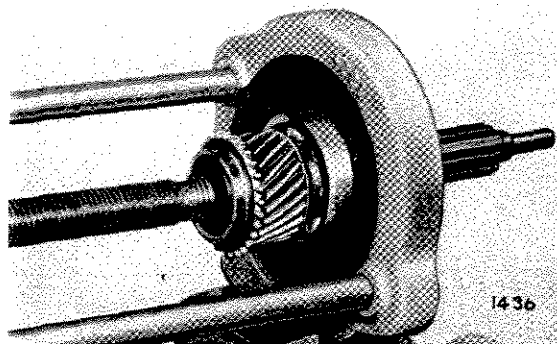


Fig. 27. Fitting the input shaft bearing

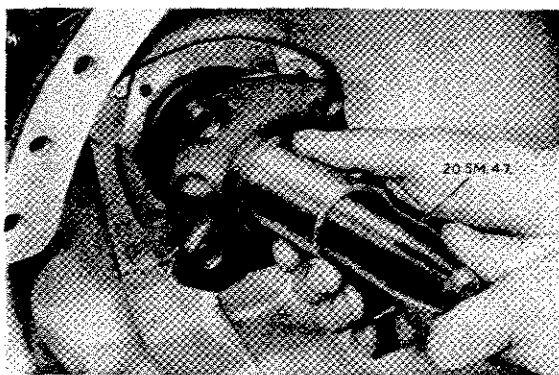


Fig. 28. Fitting the front cover

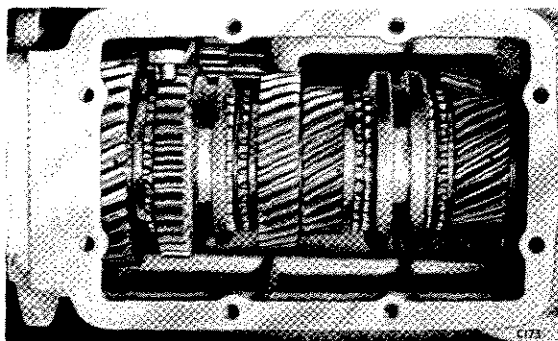


Fig. 29. Mainshaft assembled

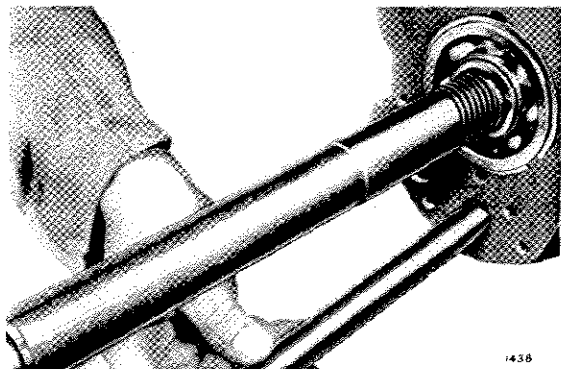


Fig. 30. Using tapered pilot, Tool No. 20.SM.76, to align the countershaft prior to installing the layshaft

Input Shaft Assembly (Figs. 1 and 27)

Assemble to the input shaft (29) :

- disc (28).
- bearing (27), circlip groove to front.
- washer (25).
- circlip (24).

If necessary, fit a new bearing (30) into the input shaft bore, positioning the lettered face outwards.

Fit circlip (26) to the bearing (27) and drift the assembly into position.

Front Cover (Figs. 2 and 28)

Placing the lip of seal towards the gears, use Tool No. 20.SM.73.A to drive a new seal (80) into the front cover (83).

Using Tool No. 20.SM.47 to protect the oil seal, fit gasket (84) and cover. Secure with washers (81) and Wedglok bolts (82).

Countershaft (Figs. 1, 2 and 30)

Insert a tapered pilot tool 20SM.76, as shown in Fig. 30, to align the countershaft and thrust washers. Insert countershaft (51) and eject the pilot tool. Engage the end of the countershaft and reverse gear shafts with the keeper plate (58) and secure with the screw (59). Fit and secure the countershaft cover gasket (88) and cover plate (85) with washers (87) and bolts (86).

Rear Extension (Figs. 1 and 2)

Attach a gasket (95) and rear extension (96) to the gearbox and secure with spring washers and bolts (135).

Fit a distance washer (36) to the mainshaft, and drive the extension ball race (37) into position. Fit a new oil seal (101) with its sealing face facing forwards. Position the driving flange (38) on the mainshaft and fit the washer (39) and slotted nut (40). Tighten the nut to the specified torque before fitting a new split pin (41).

Fit the speedometer drive gear assembly (104 - 107) and secure it with the peg bolt (108).

Top Cover

Re-assembly (Fig. 32)

Assemble the selectors (111) and (134) to their respective shafts and secure with peg bolts (133).

Fit new 'O' rings (67) to recesses in the rear of the top cover and fit the retaining plate (65), securing with screws (63) and spring washers.

Position the interlock plunger (117) in the 3rd/Top selector shaft and insert the shaft in the top cover. Engage the selector fork (75), distance tube and secure the fork with a peg bolt.

Fit the interlock ball (118) between the reverse and 3rd/Top selector shaft bores, retaining the ball with grease.

Slide the reverse selector shaft (119) into the top cover, engaging it with the reverse selector fork (123) and distance tube. Fit the peg bolt to the selector fork (123).

Ensuring that the reverse and 3rd/Top selector shafts are in the neutral position, fit the second interlock ball (118), securing it with grease.

Insert the 1st/2nd selector shaft into the top cover, passing the shaft through the 1st/2nd selector fork (78) and distance tube.

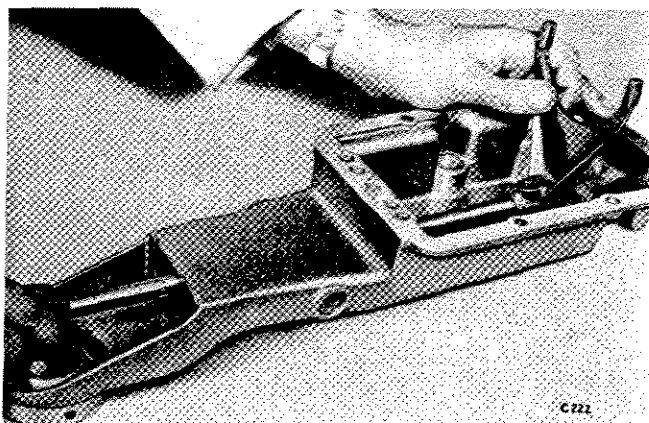


Fig. 31. Installing the Top/3rd selector shaft

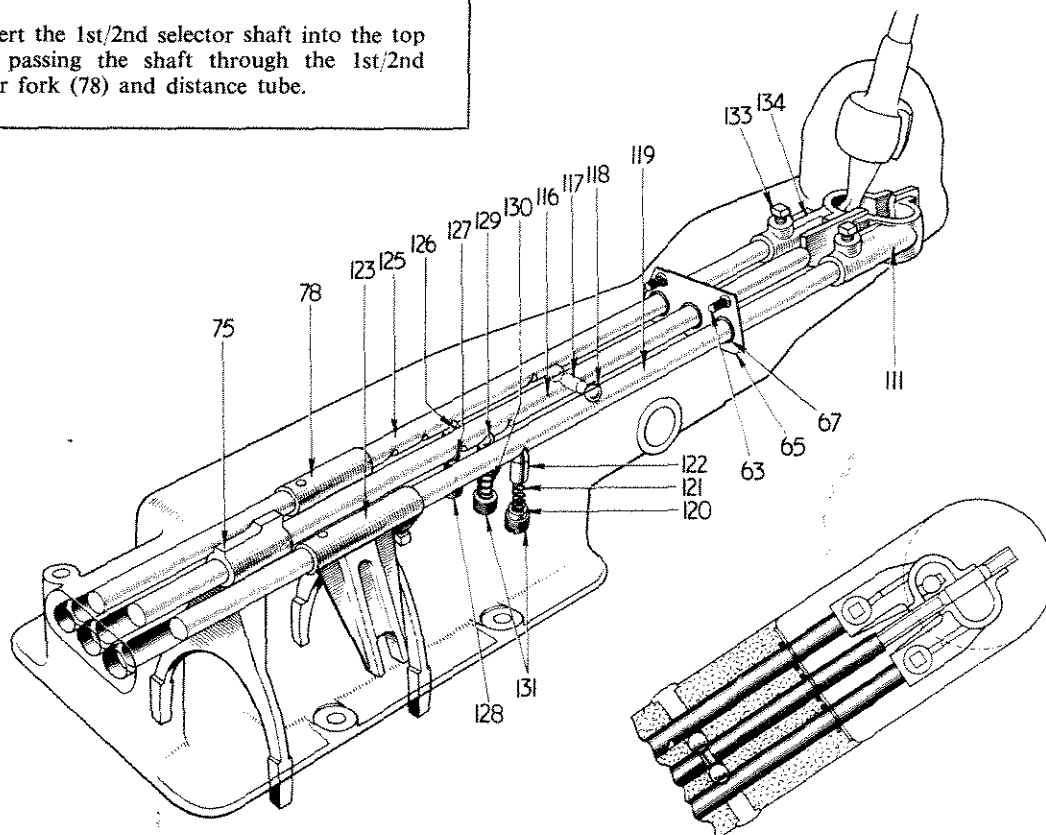
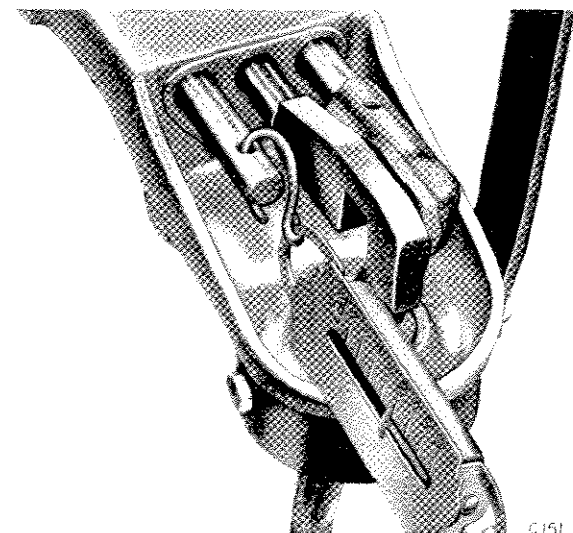
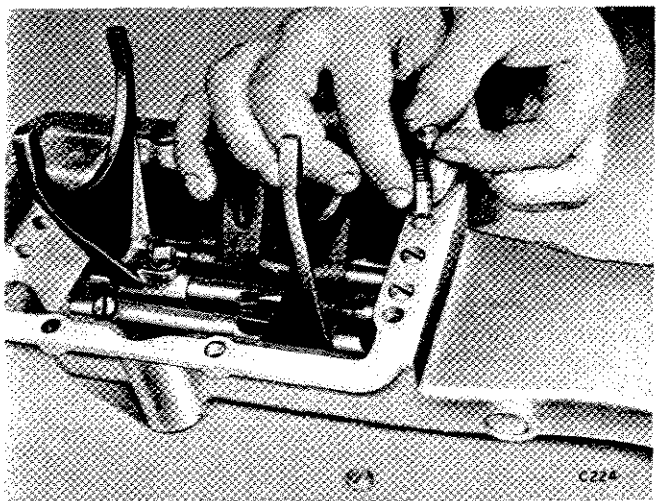
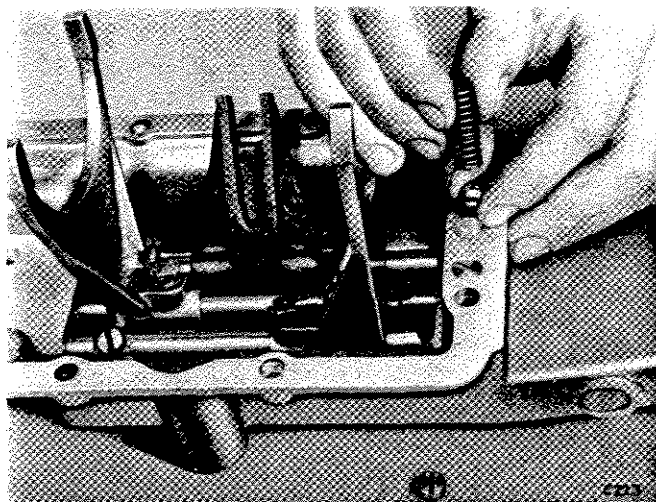


Fig. 32. Top cover details
The key to annotations is given on page 2-204



Top Cover — Reassembly (cont'd.)

Fit the balls (126 - 129) and long springs (127 - 130) to the 1st/2nd and 3rd/Top selector shaft detents, retaining the springs by screwing the plugs (128 - 131) in flush with the machined lower face of the top cover. See note below.

Similarly, fit the plunger (122), short spring (121) and distance piece (120) to the reverse selector shaft detent, retaining the assembly with the plug (131).

Using a spring balance as shown on Fig. 35, check the selector shaft release loads and compare them with those quoted on page 2-203. If necessary, adjust the spring loads by grinding the end of the spring to reduce the release load or by fitting shims between the spring and plug to increase the load.

Referring to Fig. 2 refit the spring (110) and plunger (109) to the lever (114), then assemble the lever, spring (112) and plate (113) to the top cover, depressing the plunger (109) with a screwdriver as the lever end is engaged in the selectors. Secure the lever by fitting the cap (64), cross pin (66) and nut (62).

Using a new gasket (74), refit the top cover assembly to the gearbox, ensuring that the reverse selector fork engages with the actuating lever (55).

Fit the strap (102) beneath the head of the rear mounting bolt.

Note: From gearbox number CT9899, the 3rd/Top selector shaft ball and long spring were replaced by a plunger and short spring identical to the reverse selector shaft plunger and short spring.

Fig. 33. Fitting a ball and spring to the 1st/2nd and 3rd/Top selector shafts. See note above.

Fig. 34. Fitting a plunger, spring and distance piece to the reverse selector shaft

Fig. 35. Using a spring balance to check the selector shaft release loads

OVERDRIVE UNIT — DIMENSIONS AND TOLERANCES

PARTS AND DESCRIPTION	DIMENSIONS NEW	CLEARANCE NEW
PUMP		
Plunger Diameter	0.375" — .004" — .0008"	
Bore for Plunger in Pump Body	0.375" ± .0008" — .002"	+ .0016" + .0002"
Plunger Spring Fitted Load at top of Stroke ..	9 lbs. 12 $\frac{3}{4}$ ozs.	
Valve Spring Load	4 lbs. at $\frac{1}{16}$ " long	
Pin for Roller	0.25" ± .00025"	
Bore for Pin in Roller	0.25" + .002" + .001"	.00225" .00075"
GEARBOX MAINSHAFT		
Shaft Diameter at Steady Bushes	1.15625" — .0009" — .0018"	
Steady Bush Internal Diameter	1.15625" + .003" + .002"	+ .0048" + .0029"
Shaft Diameter at Sun Wheel	1.15625" — .0009" — .0018"	
Sun Wheel Bush Internal	1.15625" + .003" + .002"	+ .0048" + .0029"
Shaft Diameter at Rear Steady Bush	0.625" — .0008" — .0015"	
Rear Steady Bush Internal Diameter	0.625" — .001" — .000"	+ .0025" + .0008"
GEAR TRAIN		
Planet Pinion Bush Internal Diameter	0.4375" + .0020" + .0012"	
Planet Bearing Shaft External Diameter	0.4375" + .0000" — .0005"	+ .0025" + .0012"
End Float of Sun Wheel	0.008" to .014"	
PISTON BORES		
Accumulator Bore	1.125" ± .0005"	
Operating Piston Bore	1.125" ± .0005"	
MISCELLANEOUS		
Clutch Movement from Direct to Overdrive ..	0.080" - .120" allowance for $\frac{1}{8}$ " wear of direct drive clutch	Allowance for wear $\frac{1}{8}$ " overdrive clutch

OVERDRIVE DETAILS

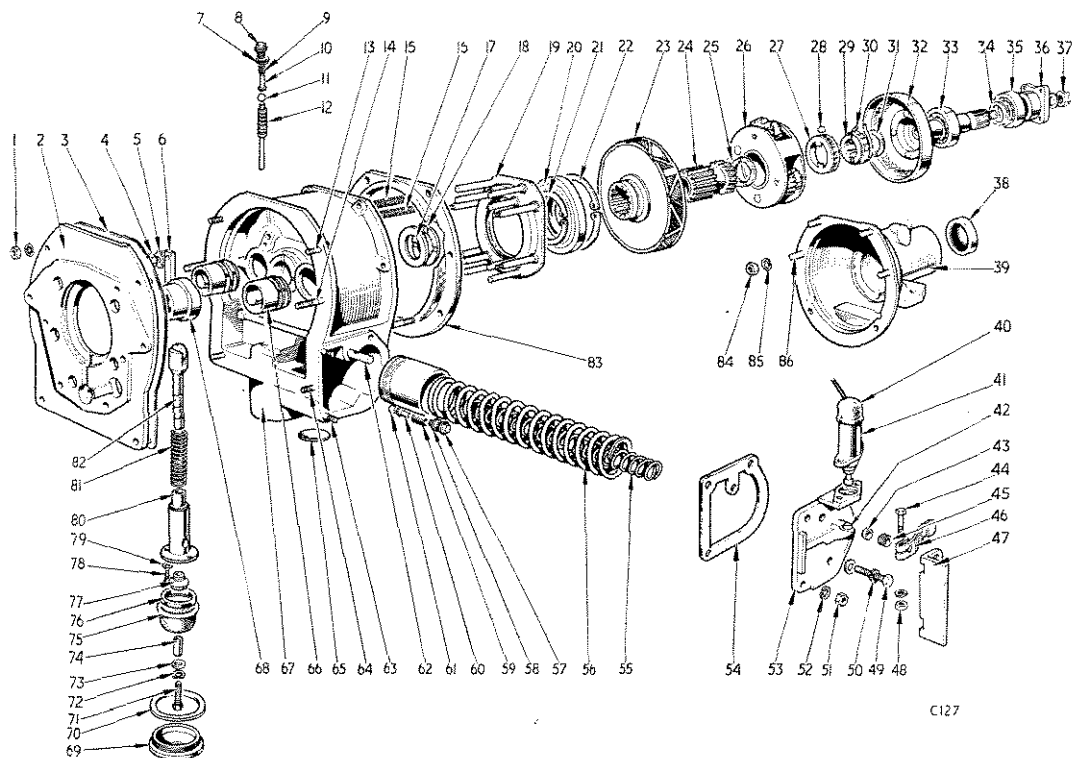


Fig. 1. Overdrive details

Key to Fig. 1

EXPLODED VIEW OF OVERDRIVE UNIT

- | | | |
|--|--------------------------------|--------------------------------|
| 1 Nut | 30 Spring—inner member to cage | 59 Spring |
| 2 Adaptor plate | 31 Thrust washer | 60 Plunger |
| 3 Gasket | 32 Annulus and output shaft | 61 Ball |
| 4 Nut | 33 Ball race (front) | 62 Operating valve cross shaft |
| 5 Tab washer | 34 Distance washer | 63 Stud |
| 6 Bridge piece | 35 Ball race (rear) | 64 Stud |
| 7 Washer | 36 Driving flange | 65 Welch plug |
| 8 Plug | 37 Slotted nut | 66 Piston |
| 9 Spring | 38 Oil seal | 67 Body |
| 10 Plunger | 39 Rear housing | 68 Pump eccentric |
| 11 Ball | 40 Rubber cover | 69 Drain plug |
| 12 Valve | 41 Solenoid | 70 Sealing washer |
| 13 Stud (short) | 42 Rubber stop button | 71 Setscrew |
| 14 Stud (long) | 43 Seal | 72 Spring washer |
| 15 Spring (long) | 44 Pinch bolt | 73 Plain washer |
| 16 Spring (short) | 45 Collar | 74 Distance tube |
| 17 Thrust washer (steel) | 46 Operating lever | 75 Filter gauze |
| 18 Thrust washer (bronze) | 47 Dust shield | 76 Seal |
| 19 Thrust ring assembly | 48 Nut | 77 Pump end plug |
| 20 Thrust race | 49 Setscrew | 78 Screw |
| 21 Circlip | 50 Spring washer | 79 Spring washer |
| 22 Circlip | 51 Nut | 80 Pump body |
| 23 Clutch sliding member | 52 Spring washer | 81 Pump return spring |
| 24 Sun wheel | 53 Cover plate | 82 Pump plunger |
| 25 Thrust washer | 54 Gasket | 83 Brake ring |
| 26 Planet carrier assembly | 55 Inner accumulator spring | 84 Nut |
| 27 Roller cage | 56 Outer accumulator spring | 85 Spring washer |
| 28 Clutch roller | 57 Plug | 86 Stud |
| 29 Uni-directional clutch inner member | 58 Sealing washer | |

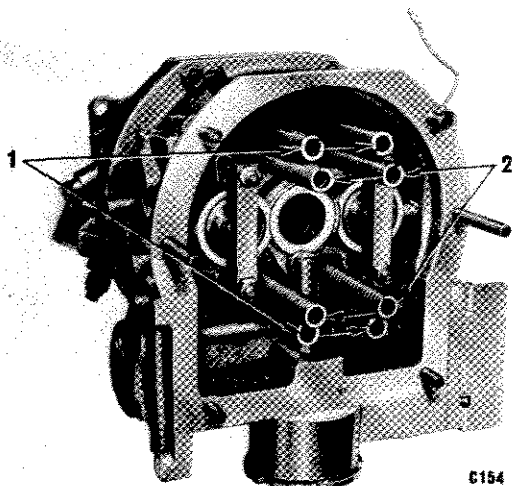


Fig. 2. Overdrive thrust springs
1 Long springs 2 Short springs

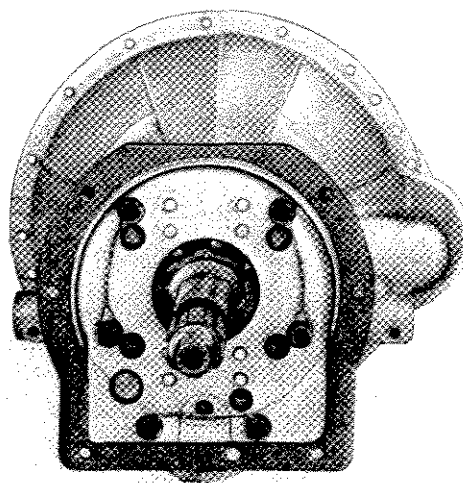


Fig. 3. Showing the wire locking of adaptor plate bolts

Overdrive Assembly to Gearbox

1. Dismantle the gearbox as described on page 2-206 and replace the existing mainshaft with a shorter overdrive mainshaft. Reassemble the gearbox and in place of the normal gearbox rear extension fit the overdrive adaptor and gasket as shown on Fig. 3. Coat a paper gasket on both sides with jointing compound and fit it over the studs on the overdrive mounting flange.
2. Assemble the pump eccentric to the gearbox mainshaft. Mount the overdrive vertically in a vice with its driving flange downwards and, using a spare overdrive mainshaft, align the splines in the overdrive, easing the cone clutch bridge pieces with a screwdriver to facilitate spline alignment.
3. Lower the gearbox onto the overdrive, engaging the gearbox mainshaft splines with those in the overdrive and ensuring that the clutch springs engage with their corresponding locations in the adaptor plate. Tie the reverse gear operating lever in the neutral position and engage top gear to permit rotation of the mainshaft to assist spline alignment whilst lowering the gearbox onto the overdrive.
4. Using one screwdriver to depress the hydraulic pump plunger and a second screwdriver to push the cam into alignment with the plunger roller, engage the pump plunger with the cam face as shown on Fig. 4.
5. Fit and progressively tighten the two nuts on the long studs, compressing the thrust springs and pulling the gearbox adaptor plate against the overdrive unit. Finally secure the two units together by fitting nuts and spring washers to the remaining four studs.

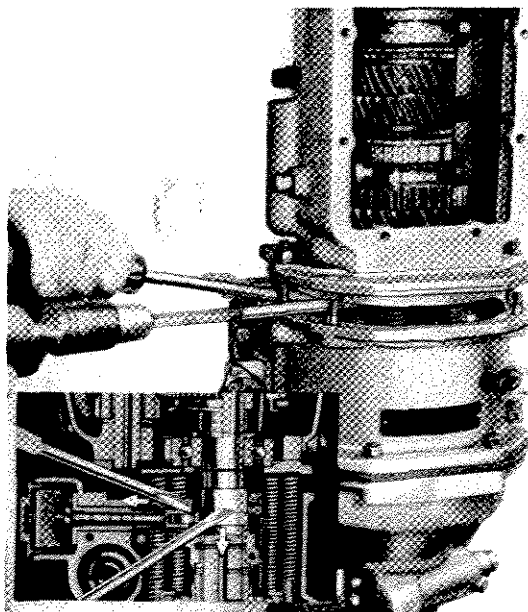
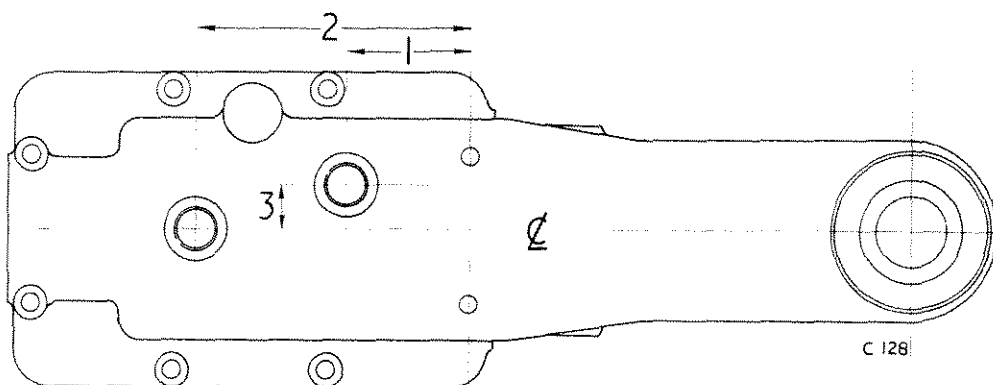


Fig. 4. Assembling the gearbox to the overdrive unit



1 2.25" (57.15 mm.) 2 4.94" (125.5 mm.) 3 0.782" (19.86 mm.)

Fig. 5. Showing the position of the isolator switches

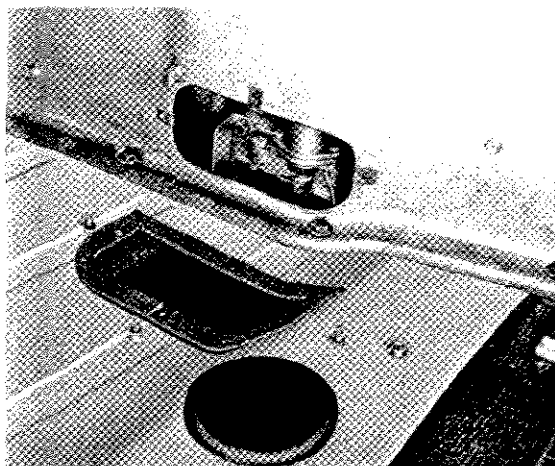


Fig. 6. Cover removed to gain access to the solenoid operating lever

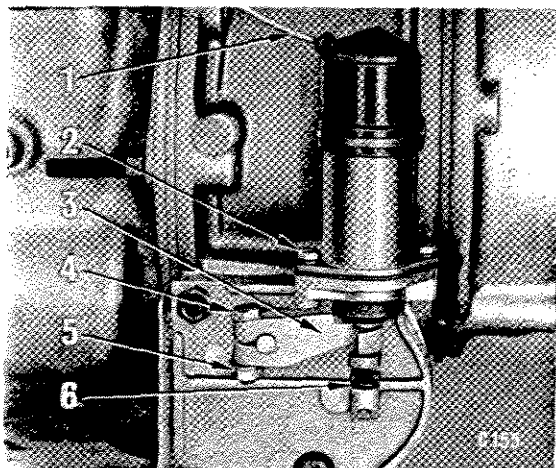


Fig. 7. Overdrive solenoid and operating lever

Overdrive Isolator Switches

Fit the isolator switches and washers to the top cover supplied in the kit. Alternatively, drill and tap two 16 mm. \times 2 mm. pitch holes in the existing cover as shown on Fig. 5.

Dismantle the original top cover and transfer the components to the new cover or re-assemble after tapping the old cover.

Using a new paper gasket, fit the top cover to the gearbox.

Setting the Overdrive Operating Valve

Use a $\frac{3}{16}$ " (4.76 mm.) diameter peg or drill shank to locate the lever with a hole in the casing. With the operating valve cross shaft retained in this position, slacken the pinch bolt on the solenoid operating lever and adjust its position so that when the solenoid is operated, the lever will be pulled approximately $\frac{1}{16}$ " (1.59 mm.) beyond the point at which the shaft is held by the $\frac{3}{16}$ " (4.76 mm.) locating peg.

- 1 Electrical lead to solenoid
- 2 Securing screws
- 3 Operating lever
- 4 Clamp bolt
- 5 Nut and spring washer
- 6 Rubber stop

OVERDRIVE SERVICING

Hydraulic Pressure

A working oil pressure of 490 - 510 lb. per sq. in. (34-428 - 35-853 Kg.cm.²) is required. This is checked by a special pressure gauge connected to an adaptor which screws into the operating valve chamber in place of the normal plug. Low pressure indicates leakage at the pump valve seat, a broken accumulator spring or faulty piston rings.

The Operating Valve

To Remove (Fig. 9)

Remove the carpet and take out the rubber plug in the gearbox cover giving access to the valve retaining plug (Fig. 1). Unscrew the plug (1) and remove the spring (2) and plunger (3) to expose the ball (4), which should lift $\frac{3}{32}$ " (0.8 mm.) off its seat when the operating switch is moved to the overdrive position. If the ball does not lift by this amount, reset the lever as described on page 2-304.

To remove the valve for examination use a magnet to extract the ball (4) and withdraw the valve (9) with the tang of a file, avoiding damage to the ball seat.

Ensure that the restrictor jet (8) at the lower end of the valve is not blocked. If the ball (4) does not seat correctly, gently tap the ball onto its seating with a copper drift and hammer.

The Pump

If the valve is satisfactory and the unit fails to operate, check the pump operation as follows:

Jack up the rear wheels of the car, remove the valve plug and ball, and with the engine ticking over engage top gear. If the valve chamber remains dry, the pump is not functioning.

The pump shown on Fig. 10 delivers oil via a non-return valve to the accumulator. Possible sources of trouble are (1) ineffective non-return valve due to foreign matter on the seat or to a broken valve spring, (2) broken pump plunger spring, and (3) choked air bleed causing air to be trapped inside the pump. If this occurs, remove the pump and clean the flat of the pump body and the bore of the casting into which it fits.

The Pump Valve (Fig. 1)

Access to the pump valve is as follows :

1. Remove drain plug and drain oil.
2. Remove the operating lever (46)
3. Remove the nuts (51), spring washers (52), and gradually slacken the setscrews (49). Remove the end plate (53), gasket (54) and springs (55) and (56). Unscrew the plug (57), washer (58) and withdraw spring (59), plunger (60) and ball (61).

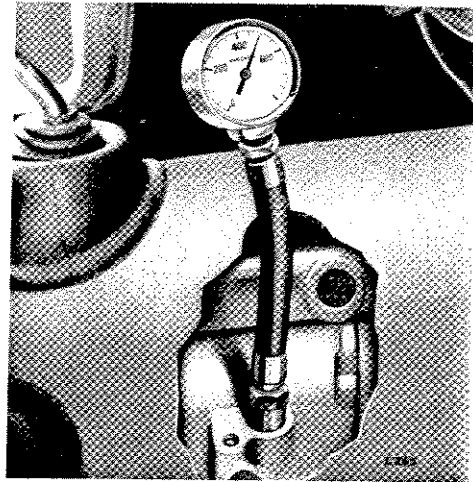


Fig. 8. Using a pressure gauge to check hydraulic pressure

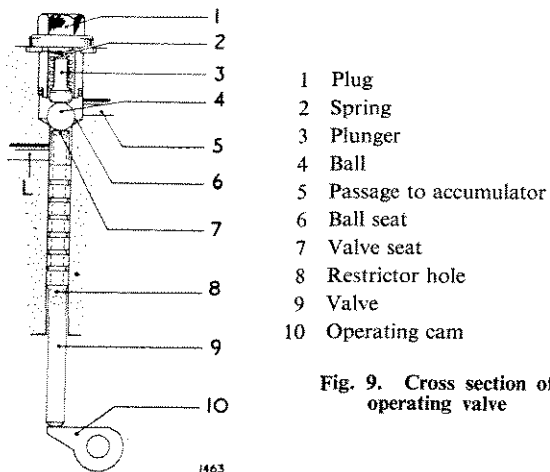


Fig. 9. Cross section of operating valve

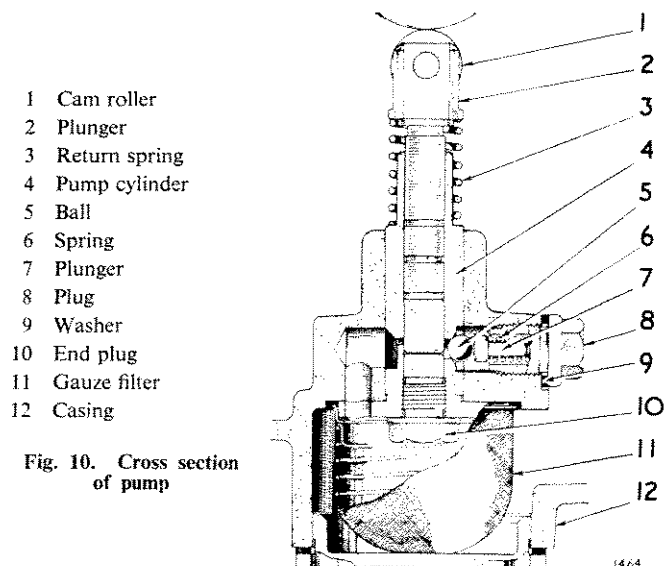


Fig. 10. Cross section of pump

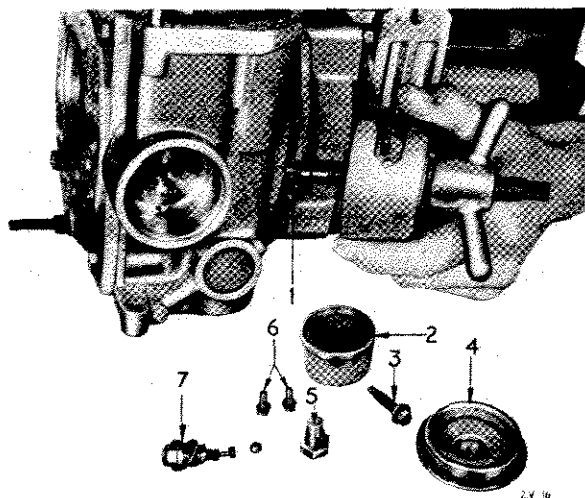


Fig. 11. Showing Tool No. L.18319 prior to screwing item 1 into the pump body

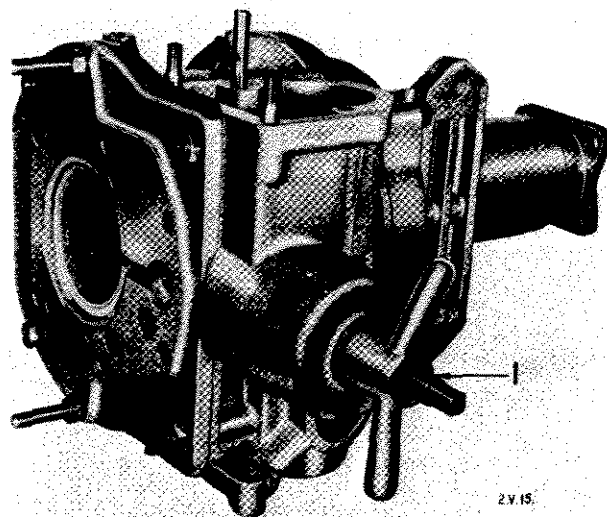
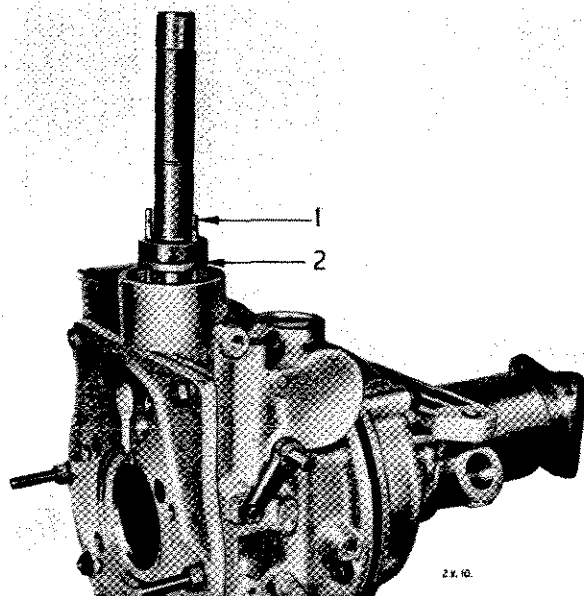


Fig. 12. Extracting the pump



- 1 Guide pins
- 2 Pump body

Fig. 13. Using Tool No. L.184 to replace the pump body

Re-Assembly (Fig. 1)

1. Refit items (61), (60), (59), (58) and (57), tightening the plug to prevent oil leakage.
2. Refit the springs (55) and (56), a new gasket (54) and end plate (53). Tighten the setscrews (49) and fit the nuts (51) and spring washers (52).
3. Fit and reset the operating lever as instructed on page 2-304.

To Remove Pump

Proceed as follows:

1. Remove pump valve as described previously.
2. Unscrew the securing bolt (71) and remove the filter (75).
3. Remove two screws (78) securing the pump body flange and using Churchill Extractor No. L.183A, extract the pump body (80).

To Refit the Pump

Refit the plug in the bottom of the pump body. Line up the pump body so that the inlet port and holes for securing screws register with the corresponding holes in the housing and drive in the pump body.

The pump plunger is prevented from rotating by a guide peg carried in the front casing. When assembling the pump, insert the plunger with the flat of its head facing the rear of the unit. Guide it past the guide peg with a screwdriver inserted through the side of the casing.

To Remove the Accumulator Piston

Screw a 1" U.N.F. bolt into the piston and extract the piston by pulling the bolt.

Dismantling the Unit

Should additional dismantling be necessary, remove the unit from the car as directed on page 2-205.

The unit is attached to the gearbox casing by nuts and six $\frac{1}{8}$ " studs, two of which are extra long. Remove the nuts (Fig. 1) from the short studs (13), then progressively unscrew the nuts from the longer studs (14) and withdraw the unit from the mainshaft.

Remove the eight clutch springs (15), (16) from their pins and the two bridge pieces (6). If necessary, withdraw the two operating pistons (66). Remove the pump valve as described on page 2-305. Remove the nuts (84) securing the two halves of the housing and separate them, removing the brake ring (83). Lift out the planet carrier assembly (26). Remove the clutch sliding member (23) complete with the thrust ring (19), bearing (20), sun wheel (24) and thrust washers (17), (18) and (25).

Take out the inner member of the uni-directional clutch (29), the rollers (28) and cage (27), spring (30) and thrust washer (31).

If necessary, dismantle the planet carrier by extracting the Mills pins from the carrier and drifting out the shafts.

Remove the flange (36) and speedo gear assembly. Drift the output shaft and annulus from the rear. Extract the front bearing (33) and drift the bearing (35) from the housing.

Inspection

Clean and inspect each part after the unit has been dismantled to assess which components require renewal. It is important to appreciate the difference between parts which are worn sufficiently to affect the operation of the unit and those which are merely "bedded in".

Re-Assembly of Overdrive (Fig. 1)

Press the front ball race (33) onto the annulus shaft (32) and insert the assembly into the rear housing (39). Fit a distance washer (34) to the annulus shaft (32) and press the rear ball race (35) into the rear housing. Fit the driving flange (36) and secure it with the slotted nut (37). To prevent bearing pre-load, end float of the annulus shaft when assembled in the rear housing should be 0.005" - 0.010" (0.13 - 0.25 mm.).

Adjust by selective use of the following distance washers.

XN.657E	..	0.146" \pm 0.0005"	(3.71 mm.)
XN.657F	..	0.151" \pm 0.0005"	(3.83 mm.)
XN.657G	..	0.156" \pm 0.0005"	(3.96 mm.)
XN.657H	..	0.161" \pm 0.0005"	(4.09 mm.)

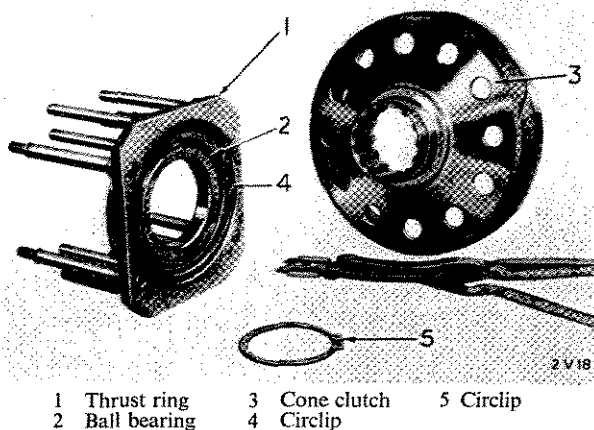
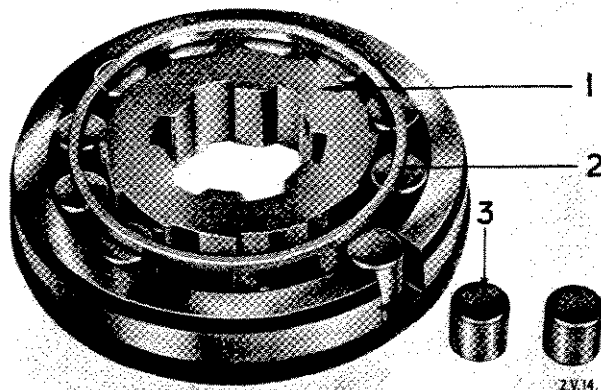


Fig. 14. Sliding clutch member



1 Inner member 2 Cage 3 Rollers
Fig. 15. Using Tool No. L.178 to assemble roller clutch

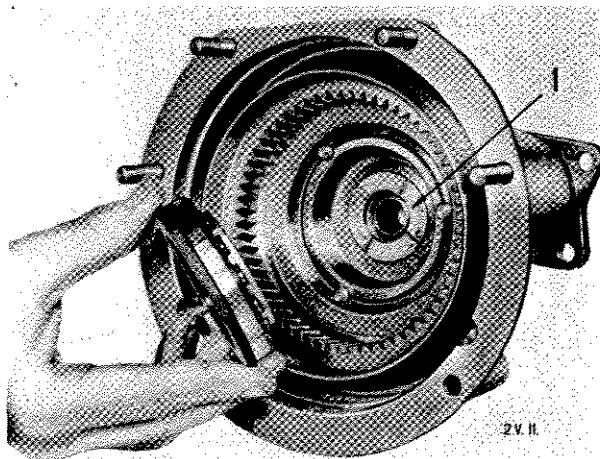


Fig. 16. Transferring the roller clutch to the annulus
Note the thrust washer (1)

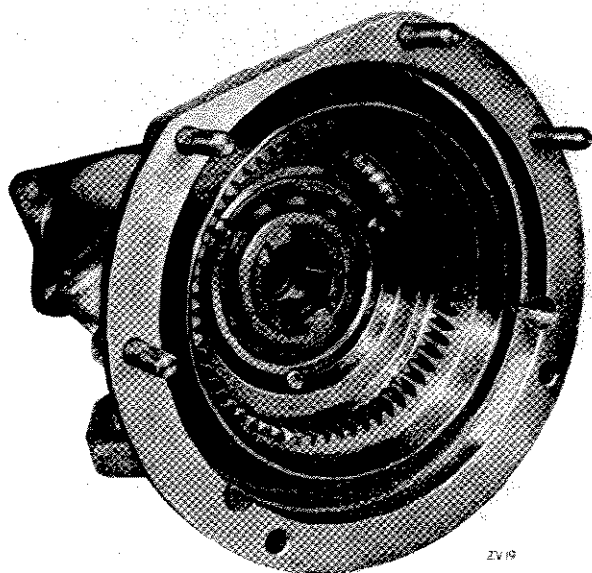


Fig. 17. Rear housing with roller clutch assembled

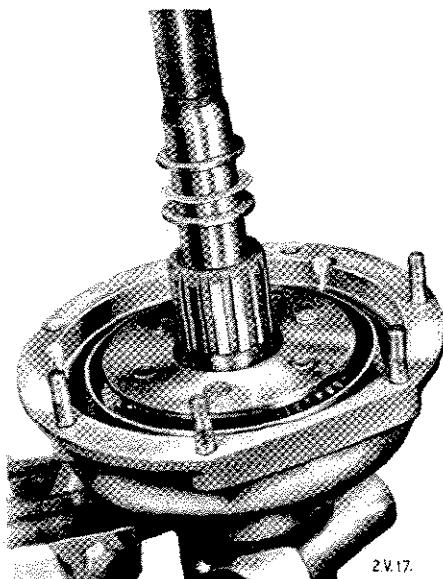


Fig. 18. Fitting sun wheel thrust washers
Note extra thrust washer of known thickness

Placing its sealing lip inwards, fit a new oil seal (38) to the rear housing. Refit the driving flange (36), slotted nut (37) and secure the nut with a split pin. Fit the speedometer drive gear assembly.

Refit the thrust washer (31) and uni-directional clutch inner member (29) with its rollers (28), cage (27) and spring (30). The "Free Wheel Assembly Ring" and "Transfer Ring" shown on Fig. 15, are ideal for assembling the uni-directional clutch, but where these fixtures are not available, assemble the rollers and hold them in place with a strong elastic band.

Ensure that the spring is fitted correctly, i.e., so that the cage urges the rollers up the ramps on the inner member. If an elastic band is being used to assemble the clutch, the assembly should be installed by holding the cage whilst the inner member is rotated against the spring. This causes the rollers to roll down the ramps and so enables the assembly to be inserted into the outer ring. Remove the elastic band.

Prepare the main casing assembly by fitting the oil pump, valve and accumulator assemblies as described on page 2-306.

Utilizing Churchill Tool No. L.179, fit the two operating pistons. Fit the operating valve assembly as shown in Fig. 9.

Assemble the brake ring (83) to the main casing (67). *Do not use jointing compound.*

Sun Gear End Float

To determine the amount of sun gear end float, which should be 0.008" to 0.014" (0.2 - 0.35 mm.) proceed as follows :

Holding the rear housing (39) in a vice as shown in Fig. 18, insert the dummy mainshaft, tool No. L.185A, through the roller clutch and temporarily assemble the following items in the order given:

- thrust washer (25).
- planet carrier (26) and sun wheel (24), placing the marked teeth of the planets radially outwards as shown in Fig. 19.
- thrust washers (18) and (17) plus an additional washer of known thickness.
- brake ring (83).
- front housing assembly (67).

Measure the gap between the flanges of the brake ring (83) and rear casing (39) as shown on Fig. 20.

This gap will be equal to the thickness of the extra washer less the amount of the sun wheel end float. Example :

Thickness of extra washer	..	= 0.078"
Gap between rear casing and brake ring	.. .. .	= 0.062"
Sun wheel end float	.. .. .	= 0.016"

Separate the two casings and leaving the planet carrier in situ, remove the extra thrust washer. If required, replace the steel thrust washer (17) at the front of the sun wheel by one of greater or lesser thickness as required to produce the correct end-float. Ensure that the steel washer is fitted adjacent to the bronze transfer bush.

Washers are available for this purpose in the following sizes :—

Part Number	Size	
	ins.	mm.
SN.667A	0.114	2.9
SN.667B	0.108	2.7
SN.667C	0.102	2.59
SN.667D	0.096	2.44
SN.667E	0.090	2.29
SN.667F	0.084	2.13
SN.667G	0.078	1.98

Sliding Clutch Member (Fig. 1)

Assemble the sliding clutch components as follows :—

Press the ball bearing (20), into the thrust ring (19), and secure with the circlip (22). Press the thrust ring and bearing onto the sliding clutch member (23) and secure the bearing with the circlip (21).

Assemble the sliding clutch unit to the sun gear splines and fit the main casing and brake ring to the rear casing, securing this with spring washers and nuts.

Fit the bridge pieces (6) to the pull rods and secure them with nuts (4) and locking plate (5).

Assemble the clutch thrust springs (15) and (16), ensuring that the four long springs are fitted on the outer guide pegs and the short springs on the inner pegs.

Refit the unit to the gearbox as described on page 2.303.

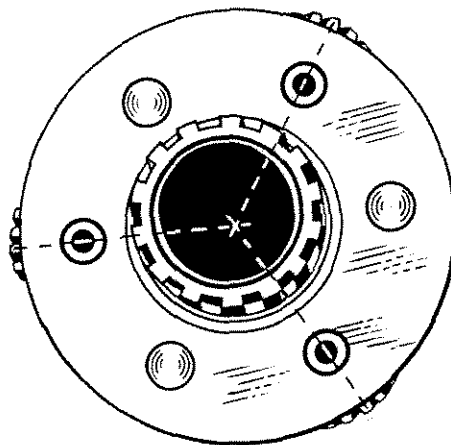


Fig. 19. Showing the position of markings on the planet wheels when assembled to the sun wheel

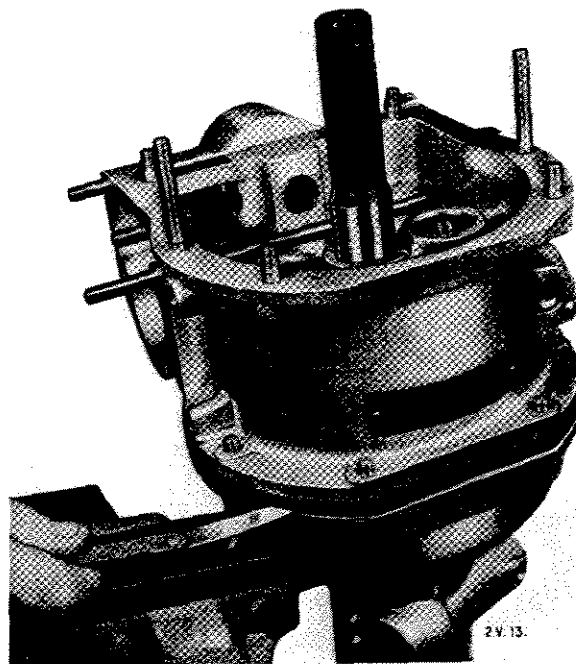


Fig. 20. Measuring sun wheel end float

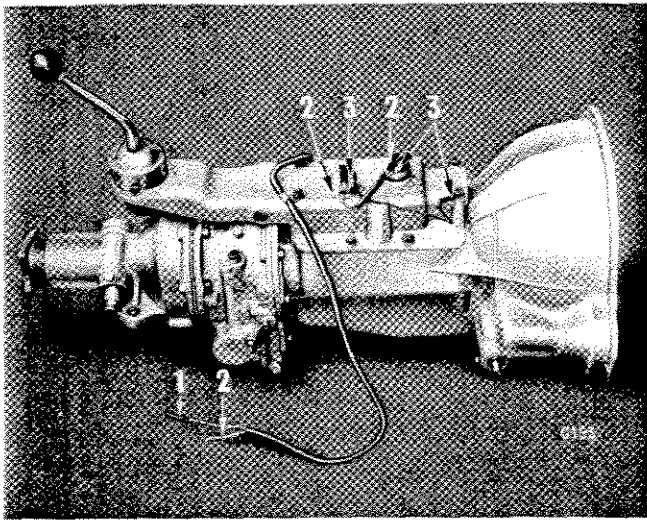


Fig. 21. Colour coding of overdrive cables

- 1 Yellow and purple
- 2 Yellow
- 3 Black (earth)

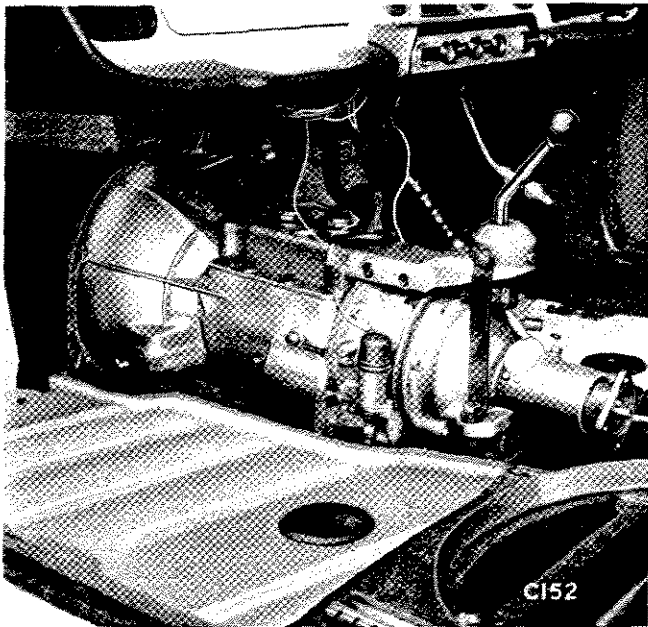
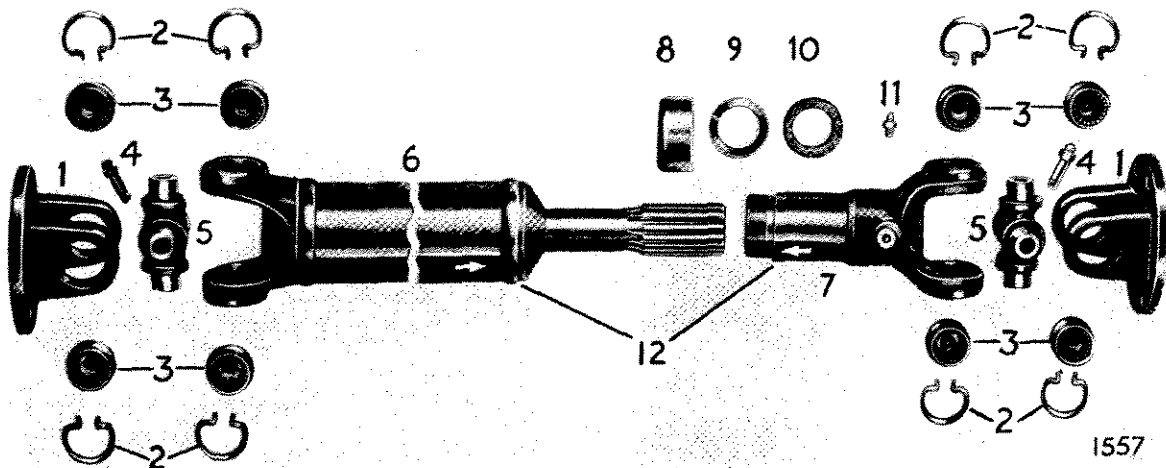


Fig. 22. Overdrive installation

Refitting the Gearbox

1. Pass the gearbox through the near side door of the vehicle. Ensure that the clutch driving plate is centralized on the flywheel by passing a dummy clutch spigot shaft or centralizing tool through the spline centre of the clutch plate. Remove the centralizing tool and manoeuvre the gearbox into position, entering the clutch release lever past the edge of the floor aperture, and slide the unit forward into engagement with the clutch splines. Engaging top gear and rotating the gearbox driving flange will assist in engaging the gearbox input shaft splines with those of the clutch driven plate. Ensure that the clutch flange is fully home against the rear face of the engine before fitting and tightening the flange bolts and nuts.
2. Fit the rear crossmember and mounting to the chassis, lower the engine and gearbox onto the silentbloc rear mounting, and tighten the bolts, engaging the R.H. bolt with the exhaust pipe mounting bracket.
3. Refit the starter motor and clutch cover plate, fit the propeller shaft and fit the longer speedometer cable supplied in the kit. Fit the clutch slave cylinder to the clutch housing flange, securing the slave cylinder stay to the sump bolt. Refit the slave cylinder push rod, securing it with a new split pin. Check and if necessary adjust the clutch release bearing clearance. See page 2-106.
4. Fit the overdrive switch to the steering column, secure the relay unit beneath the fascia and, using the cable harness supplied in the kit, make the necessary electrical connections as described in the electrical section.
5. Refill the gearbox and overdrive with oil. Refit the gearbox casing, passing the overdrive operating cables through the grommetted hole in the casing, bridge piece, heater controls, carpets and seats. Re-connect the battery.



- | | | |
|-----------------|-------------------|------------------|
| 1 Flange yoke | 5 Spider | 9 Steel washer |
| 2 Circlips | 6 Propeller shaft | 10 Washer |
| 3 Cups | 7 Sliding yoke | 11 Grease nipple |
| 4 Grease nipple | 8 Dust cap | |

Fig. 1. Propeller shaft details

PROPELLER SHAFT

Universal Joints

Individual parts of the needle roller bearing assemblies should not be renewed. If replacements are necessary, fit the complete set of bearing parts which comprise : journal complete with oil seals, and retainers, needle bearing assemblies and snap rings.

Renew the bearings as follows :—

Disconnect the propeller shaft and remove it from the vehicle.

Remove circlip (2), pinching the ends together with a pair of circlip pliers. If the circlip does not readily snap out of the groove, remove enamel from the yoke holes and lightly tap the ends of the bearing cup (3) which will relieve pressure against the circlip.

Holding the joint in one hand, tap lightly with a soft hammer on the radius of the lug of the yoke, as shown in Fig. 2. The needle bearing will gradually emerge and can finally be withdrawn using grips. If necessary, tap the bearing race from inside.

Repeat this operation for the opposite bearing and remove the yoke as shown in Fig. 3. Rest the two exposed trunnions on wood or lead blocks and tap the ears of the flange yoke to remove the remaining needle rollers. Remove the rear universal joint by repeating this procedure. Wash all the parts in petrol or paraffin.

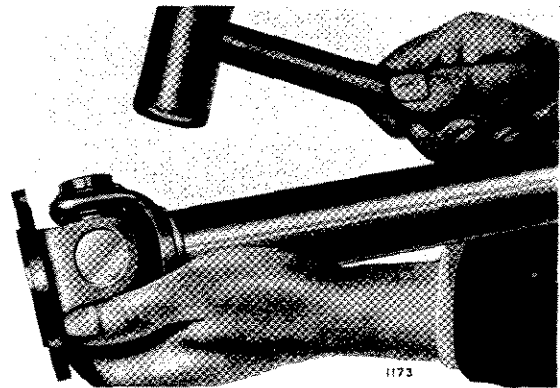


Fig. 2. Tapping bearing cap cups from yoke

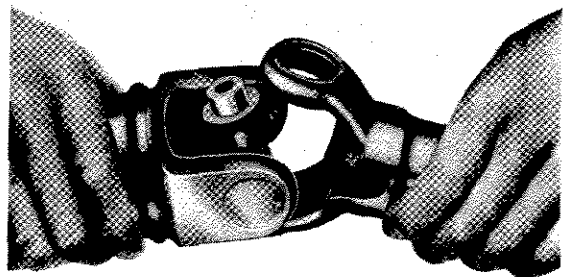


Fig. 3. Removing spider from yoke

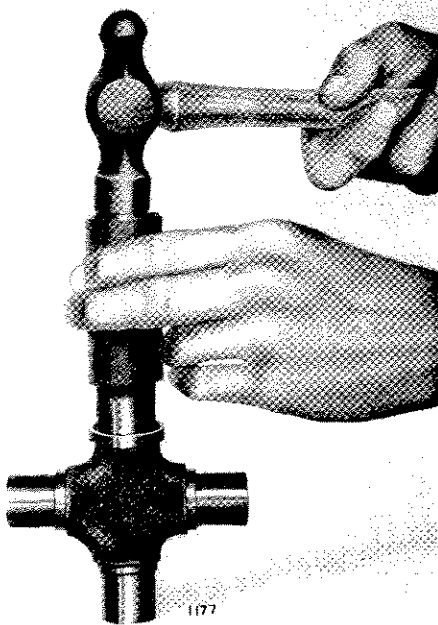


Fig. 4. Fitting spider journal seal retainers

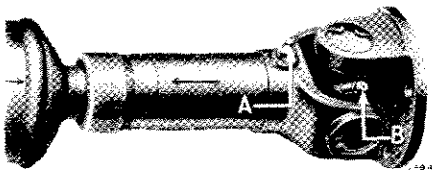


Fig. 5. Sliding yoke alignment

Assembly

Apply jointing compound to the spider journal shoulders and fit the oil seals and the retainers on the trunnion by using a tubular drift as shown on Fig. 4.

Insert the spider journal (5), Fig. 1, into the flange yoke and, using a soft drift, tap the bearing into position. Repeat with the remaining bearings.

Fit new circlips and ensure that these are firmly located in the grooves. If, when assembled, the joint tends to bind, tap the yoke lightly with a wooden mallet to relieve pressure. Re-assemble the other universal joint by repeating the procedure.

To Detach the Sliding Yoke

Unscrew the dust cap (8), steel washer (9) and washer (10).

Withdraw the sliding yoke (7).

To Refit Sliding Splines

Align the arrows (Fig. 5) so that the front and rear universal joints are in the same plane.

TRIUMPH TR4

WORKSHOP MANUAL

GROUP 4

Comprising:

Suspension	Section 1
Steering	Section 2

TR4 WORKSHOP MANUAL

GROUP 4

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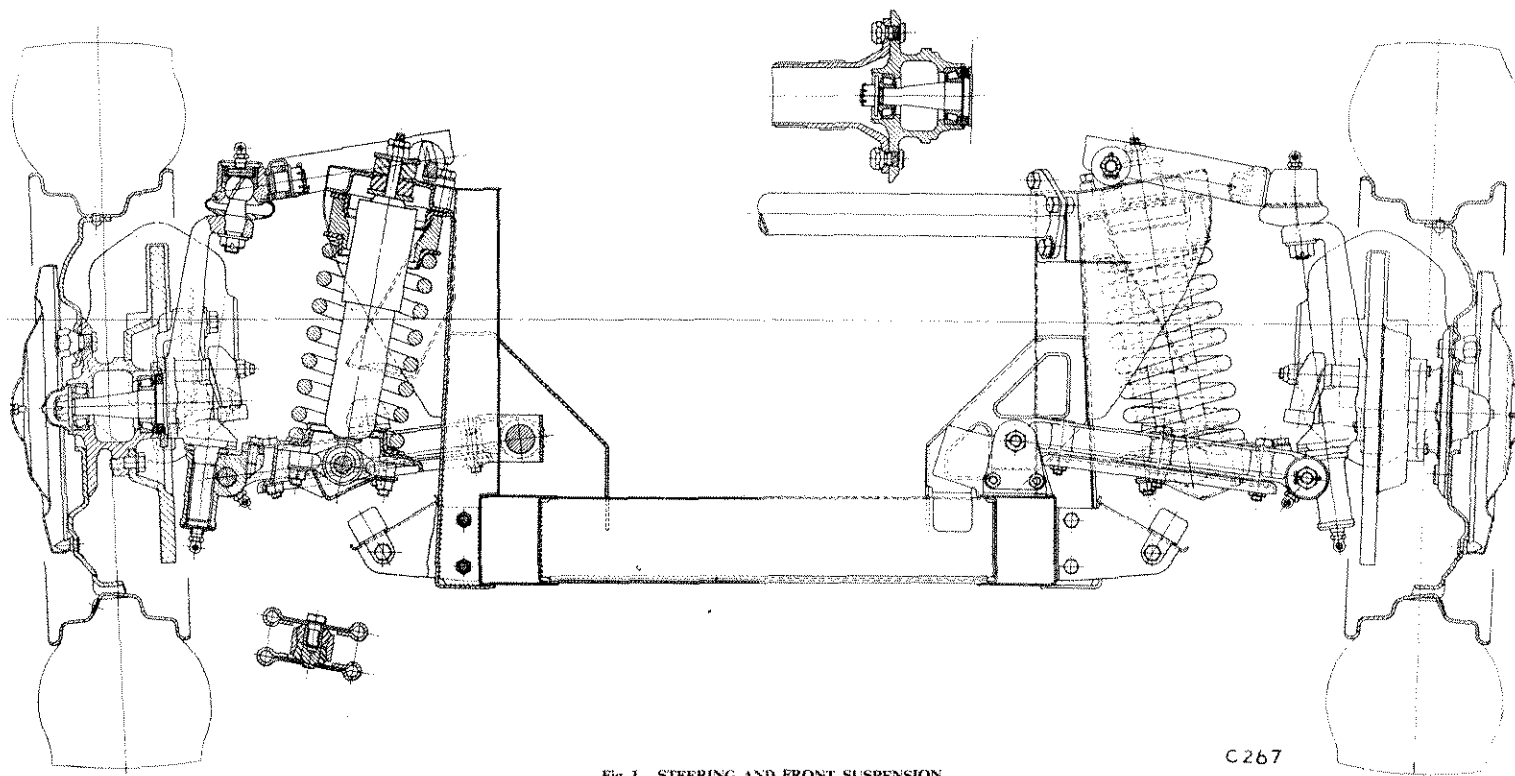


Fig. 1. STEERING AND FRONT SUSPENSION

C 267

Steering axis inclination (static laden)	7°.
Camber angle (static laden)	2° positive.
Turning circle	33 ft. (10.058 metres).
Maximum back lock	30½°.
Maximum front lock	29°.
20° back lock gives 19-25° front lock.	
Front wheel alignment	¼" (3.175 mm.) toe-in (normal tyres).
	⅜" (1.59 mm.) toe-in (Michelin X or Goodyear DFS).
End float of outer shackle pin	0.004"—0.012" (0.1016—0.305 mm.).
Length of tie rods (centre to centre)	8.55" (21.7 cm.).
Distance between outer ball joints	43.0" (109.22 cm.).

Track at ground level (static laden).

Disc wheels	49" (124.46 cm.).
Wire wheels	50" (127 cm.).

Castor angle (static laden).

Up to Commission Numbers	CT. 6344	0° (Wire wheels).
	CT. 6390	0° (Disc wheels).
From Commission Numbers	CT. 6344	3° positive.
	CT. 6390	3° positive.

SUSPENSION

ROAD SPRINGS AND DAMPERS

Road springs and dampers are available for the Triumph TR4 in the following combinations to suit the conditions listed below :

(a) Normal Equipment

					Front	Rear
Road springs	..	..	..	..	201898	208636
Dampers	..	..	..	..	134101	209494 L.H. 209495 R.H.

(b) Export

					Front	Rear
Road springs	..	..	..	..	201898	208636 Driver's side. 208637 Passenger's side { L.H. steering cars only.
Dampers	..	..	..	..	113624	202388 R.H. { U.S.A. Market 202389 L.H. { only.

(c) Competition work

					Front	Rear
Road springs	..	..	..	..	201899	304008
Dampers	..	..	..	..	113556	202390 R.H. 202391 L.H.

Telafla front dampers, Part Number 133150 are available as a special order.

Interchangeability is not affected. An identical damper must be fitted when a single replacement is necessary.

FRONT ROAD SPRINGS

	NORMAL AND EXPORT	COMPETITION
Wire Dia.	0.5" \pm 0.002" (12.7 mm. \pm 0.0508 mm.)	0.52" \pm 0.002" (13.2 mm. \pm 0.0508 mm.)
No. of coils	6 $\frac{3}{4}$	6 $\frac{3}{4}$
Rate	310 lb./in. (3.595 mkg.)	380 lb./in. (4.386 mkg.)
Free length	9.75" (247.65 mm.)	9.19" (233.43 mm.)
Fitted length	6.75" \pm .094" (171.5 mm. \pm 2.38 mm.)	6.75" \pm .094" (171.5 mm. \pm 2.38 mm.)
Fitted load	925 lb. (419.57 kg.)	925 lb. (419.57 kg.)
Part Number	201898	201899

REAR ROAD SPRINGS

	NORMAL AND EXPORT	COMPETITION
Blade thickness	Master. 0.219" (5.56 mm.) Nos. 2-6. 0.188" (4.76 mm.)	Master and No. 2. 0.219" (5.56 mm.) Nos. 3-6. 0.203" (5.16 mm.)
No. of blades	6	6
Rate	128 \pm 5% lb./in. (1.5 mkg.)	155 \pm 5% lb./in. (1.8 mkg.)
Laden camber	0.38"—0.63" neg. (9.65—16.0 mm.)	0.75"—1" neg. (19.05—25.4 mm.)
Fitted load	515 lb. (233.6 kg.)	515 lb. (233.6 kg.)
Part No.	208636	304008

On L.H. drive vehicles, spring Part Number 208637, identical to Part Number 208636, but with two packings on the centre pin above the master blade, is fitted to the passenger's side of the car.

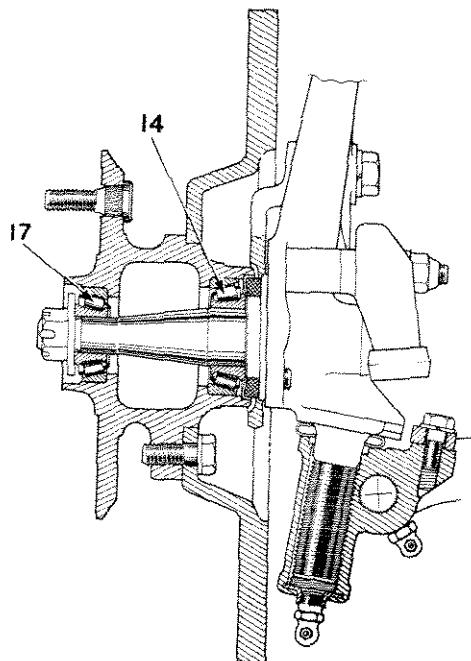


Fig. 2. Section through front hub

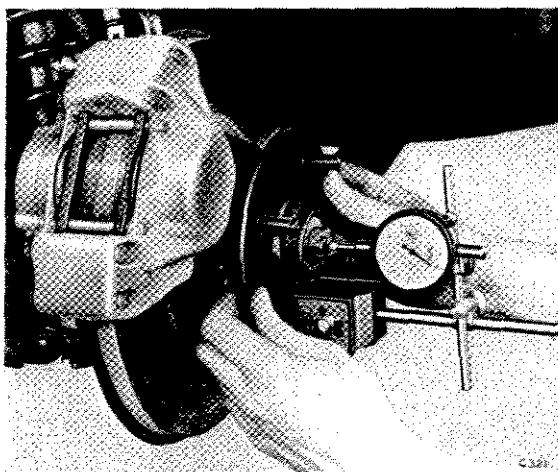


Fig. 3. Measuring front hub end-float

FRONT SUSPENSION

General

Before disturbing any part of the front suspension assembly, jack up the front of the vehicle and lower it on to stands placed under the chassis side members, rearward of the front cross-member. Remove the road wheels and dismantle either the right or left-hand front suspension unit, as follows :

Front Hubs

Removal (Fig. 4)

Unscrew the bolts (1) and remove the caliper assembly. Note the number and position of shims fitted between the caliper and bracket (7). They are used to align the caliper relative to the disc. Support, or tie-up the caliper assembly to prevent its weight being taken by the flexible hydraulic brake hose.

Screw a No. 10 N.F. setscrew into the grease cap (21) and force the cap from the hub. Extract the split pin (20), unscrew the slotted nut (19) and withdraw the hub assembly from the stub axle. Remove the inner member of the bearing (14) from the stub axle.

Dismantling

Remove the bolts (12) with lockwashers (13) and detach the disc from the hub. Using a soft drift, drive the outer rings of the bearings (14), (17), and the grease seal retainer (11), from the hub.

Re-assembly

Fit the outer rings of the bearings (14), (17) to the hub, placing the tapered faces outwards, and refit the disc (15), securing it with the bolts (12) and washers (13).

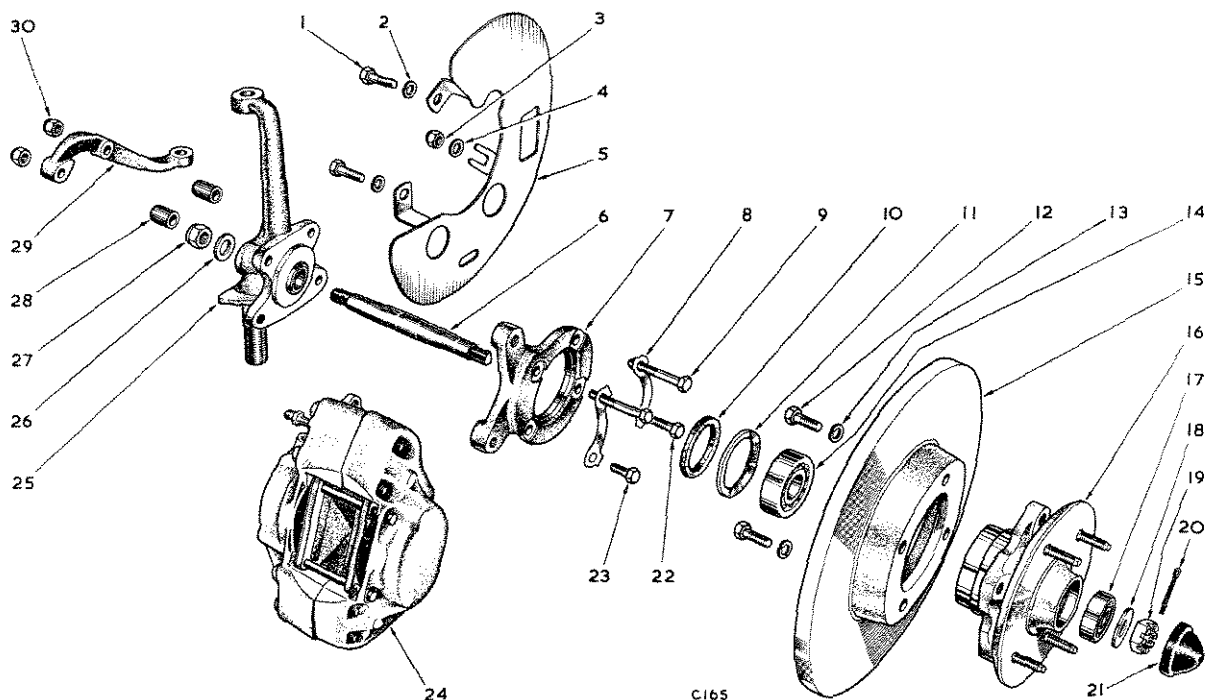
Assemble the inner members of the bearings (14), (17) to the hub (16) and fit the assembly to the stub axle (6). Fit the washer (18), the slotted nut (19), and whilst rotating the hub, tighten the nut only sufficiently to remove slackness. Slacken the nut back to the nearest split pin hole and mark its position by centre punching the nut and stub axle. Remove the hub assembly and pack the bearings with grease.

Attach a new hub sealing felt (10) to the seal retainer (11) with jointing compound. When the compound is dry, soak the seal in engine oil and squeeze out surplus oil. Fit the seal retainer to the hub, placing the felt face towards the centre of the car.

Refit the hub assembly, washer (18) and nut (19) to the stub axle, tightening the nut until the centre punch marks correspond. Secure the nut with a new split pin (20) and refit the cap (21).

Re-attach the caliper assembly, repositioning any shims previously fitted between the caliper and bracket. Refit the road wheel and nave plate, remove the axle stands and lower the vehicle to the ground.

FRONT SUSPENSION DETAILS



- | | |
|---------------------|---------------------|
| 1 Bolt | 16 Hub |
| 2 Spring washer | 17 Outer taper race |
| 3 Nyloc nut | 18 Washer |
| 4 Plain washer | 19 Slotted nut |
| 5 Dust shield | 20 Split pin |
| 6 Stub axle | 21 Hub cap |
| 7 Caliper bracket | 22 Bolt |
| 8 Lock plate | 23 Bolt |
| 9 Bolt | 24 Caliper unit |
| 10 Felt seal | 25 Vertical link |
| 11 Seal retainer | 26 Plain washer |
| 12 Bolt | 27 Nyloc nut |
| 13 Spring washer | 28 Distance pieces |
| 14 Inner taper race | 29 Steering arm |
| 15 Disc | 30 Nyloc nut |

Fig. 4. Arrangement of Disc Brake and Hub Details

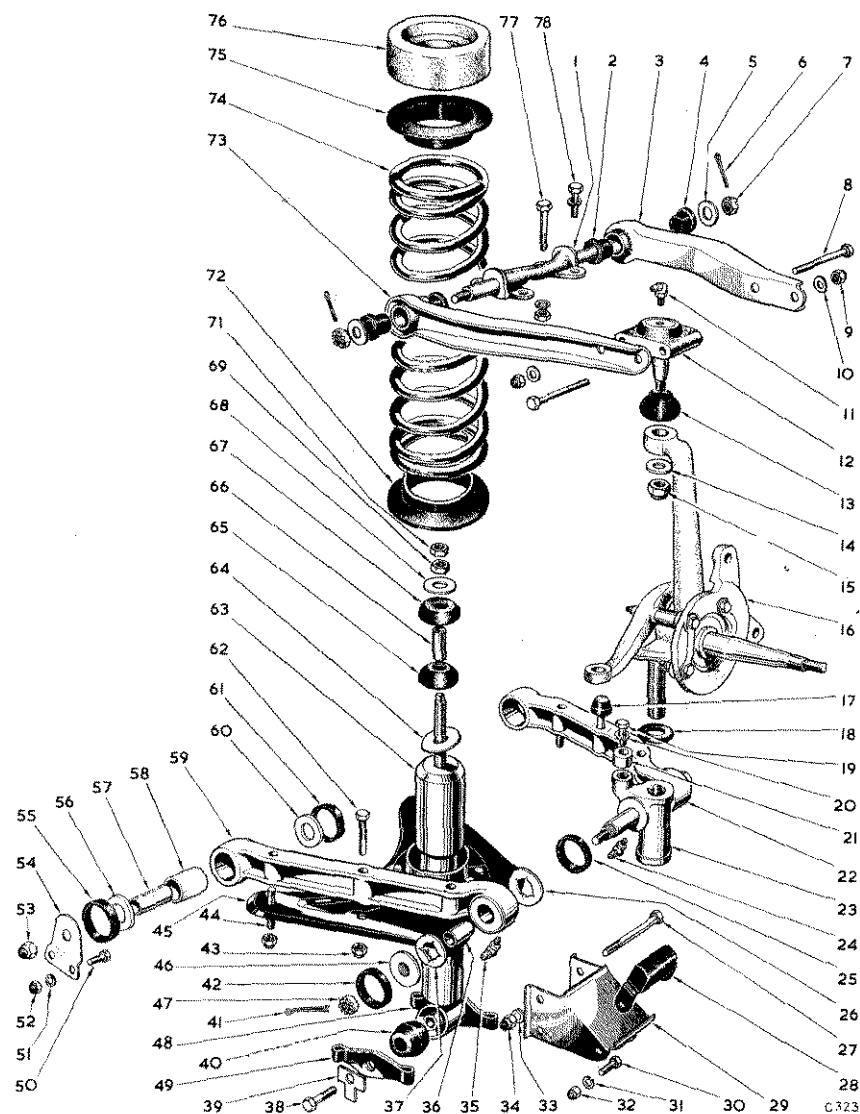


Fig. 5. Front suspension details

KEY TO FIG. 5

- | | |
|--------------------------------------|-------------------------------------|
| 1 Upper inner fulcrum | 40 Rubber bush |
| 2 Rubber bush | 41 Split pin |
| 3 Upper wishbone arm--rear | 42 Rubber seal |
| 4 Rubber bush | 43 Nyloc nut |
| 5 Washer | 44 Stud |
| 6 Split pin | 45 Spring pan |
| 7 Slotted nut | 46 Serrated washer |
| 8 Bolt | 47 Slotted nut |
| 9 Nyloc nut | 48 Damper attachment bracket--rear |
| 10 Plain washer | 49 Damper attachment bracket--front |
| 11 Grease nipple | 50 Bolt |
| 12 Upper ball joint | 51 Spring washer |
| 13 Rubber gaiter | 52 Nut |
| 14 Plain washer | 53 Nyloc nut |
| 15 Nyloc nut | 54 Fulcrum bracket |
| 16 Caliper bracket and vertical link | 55 Rubber seal |
| 17 Bump rubber | 56 Thrust washer |
| 18 Rubber seal | 57 Steel sleeve |
| 19 Bolt | 58 Nylon bush |
| 20 Spring washer | 59 Lower wishbone--front |
| 21 Lock stop collar | 60 Thrust washer |
| 22 Lower wishbone arm--rear | 61 Rubber seal |
| 23 Lower trunnion bracket | 62 Bolt |
| 24 Grease nipple | 62 Damper |
| 25 Rubber seal | 64 Washer |
| 26 Thrust washer | 65 Rubber bush |
| 27 Bolt | 66 Sleeve |
| 28 Rebound rubber | 67 Rubber bush |
| 29 Bracket | 68 Washer |
| 30 Bolt | 69 Nut |
| 31 Spring washer | 71 Locknut |
| 32 Nyloc nut | 72 Rubber collar |
| 33 Plain washer | 73 Upper wishbone arm--front |
| 34 Nyloc nut | 74 Spring |
| 35 Grease nipple | 75 Rubber collar |
| 36 Bush--nylon | 76 Distance piece |
| 37 Thrust washer | 77 Bolt |
| 38 Bolt | 78 Bolt |
| 39 Tab washer | |

Front Spring Damper

Removal (Fig. 6)

Release the lower attachment by removing the nuts (79) and spring washers (80). Remove the locknut (71), nut (69), plain washer (68) and rubber bush (67) from the upper attachment and withdraw the damper unit downwards.

Check the condition of rubber bushes and renew them if required.

Testing

The servicing of telescopic dampers is not generally practicable. Therefore, if a damper unit shows any of the following defects, it should be scrapped and replaced by a new one :

- damage or dented body,
- bent piston rod,
- loosened mounting,
- fluid leakage.

If none of these defects is apparent, hold the unit vertically in a vice and perform the following manual operations :

Slowly extend and compress the damper approximately 10 times, moving it to the limit of its stroke in both directions. **There should be appreciable and constant resistance in both directions.**

Reject damper units having the following defects :

- none, or only slight resistance in one or both directions,
- excessive resistance ; cannot be operated manually,
- pocket of no resistance when reversing direction.

Refitting

After pumping the damper as previously described, keep the damper upright and in the extended condition whilst passing it upwards through the aperture in the spring pan. Secure the upper end by fitting the washer (64), rubber bushes (65) and (67), sleeve (66), washer (68), nut (69) and locknut (71) as shown on Fig. 6.

Insert the rubber bushes (40) into the lower damper eye and push the screwed sleeve, attached to the mounting bracket (48), through the bushes. Fit the bracket (49) and secure it with the bolt (38) and lockplate (39).

Locate the brackets (48) and (49), and the rebound stop plate (81) on the studs (82) and secure the assembly with the washers (80) and nuts (79).

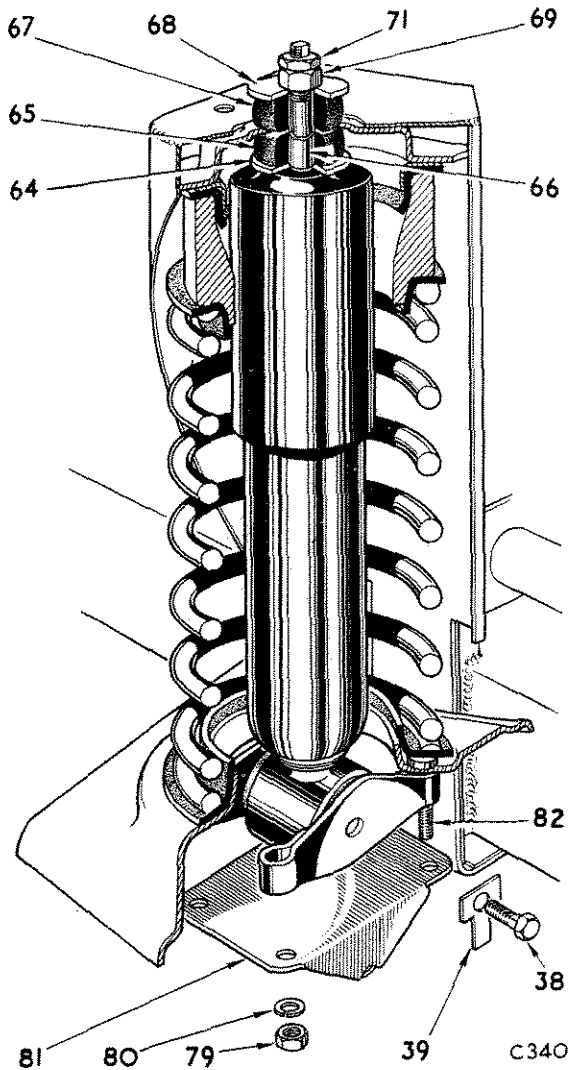


Fig. 6. Attachment of front damper

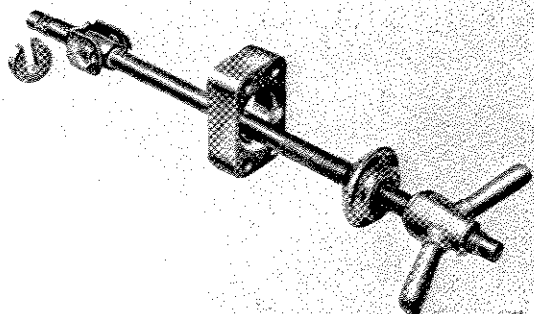


Fig. 7. Front spring compressor tool and adaptor S.112-1

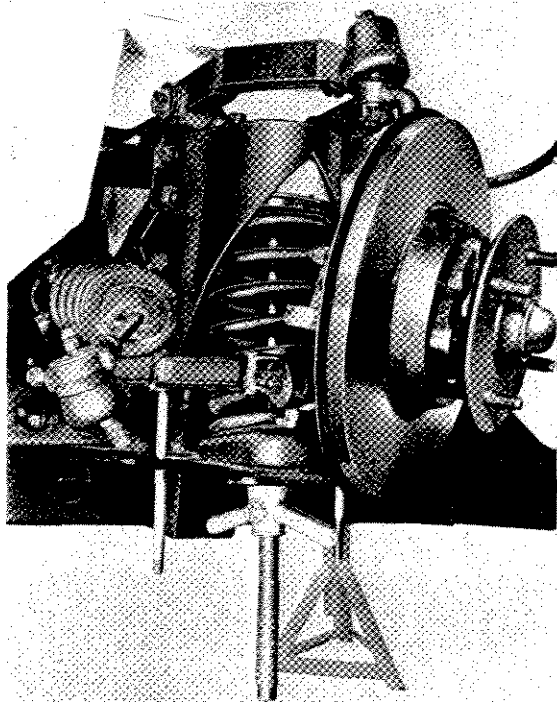


Fig. 8. Releasing the front spring

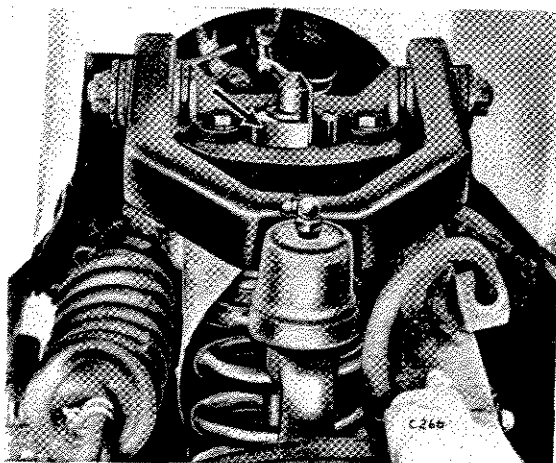


Fig. 9. Position of collar at the upper end of the spring compressor

FRONT ROAD SPRINGS

Removal (Fig. 5)

Remove the front dampers as described on page 4-107.

Jack up under the spring pan to release the spring load from the rebound rubber. Remove the bolts (27) and detach the bracket (29) with rebound rubber (28). Remove the jack.

Assemble the spring compressor tool No. S.112/1 (Fig. 7), by first passing the screwed shaft with adaptor up through the spring pan, spring and turret. Fit the collar to the shaft (Fig. 9) and assemble the adaptor, hemispherical thrust piece and wing nut to the lower end of the shaft.

Compress the spring by tightening the wing nut until the lower wishbone arms are horizontal. Remove the bolts (62) and fit two $\frac{3}{8}$ " \times 6" (9.5 mm. \times 152 mm.) guide rods as shown on Fig. 8.

Whilst supporting the suspension unit by inserting a block of wood between the upper wishbone arms and the spring housing, unscrew the wing nut to release the spring tension. Dismantle the spring compressor and remove the spring pan (45), pads (72) and (75), the spring (74), and packing (76).

Re-assembly

Lift the suspension unit and insert, between the upper wishbone arms and spring housing, a block of wood sufficiently thick to bring the lower wishbone arms to a horizontal position.

Assemble the spring (74), pads (72), (75), packing (76), spring pan (45) and guide pins to the suspension unit and install the spring compressor tool as described for removal.

Tighten the wing nut until the spring pan seats against the lower wishbone arms. Refit two bolts (62), remove the guide pins, and refit the remaining attachments and nuts (43).

If necessary, renew the rebound rubber (28) and assemble the bracket (29) with rubber to the chassis, securing with the bolts (27). Remove the spring compressor and refit the damper unit as described on page 4-107.

Refit the road wheels, remove the chassis stands and lower the vehicle to the ground.

Vertical Link Ball Joint

Vehicles from Commission Number CT.403 (disc wheels) and CT.422 (wire wheels) are fitted with a modified upper wishbone and ball joint assembly.

Early Type (Fig. 10)

To Remove

Support the spring pan with a jack and remove the split pin, slotted nut and plain washer securing the ball joint to the vertical link. Use extractor tool No. S.166 to separate the ball joint from the vertical link as shown.

Remove the split pin, slotted nut, plain washer and detach the ball joint and distance piece from the upper wishbones.

To refit, reverse the removal procedure.

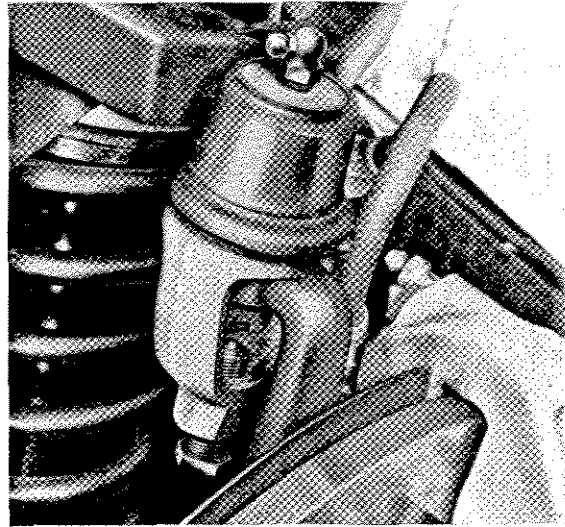


Fig. 10. Using tool No. S.166 to separate early type ball joint

Later Type (Figs. 5 and 11)

To Remove

Support the spring pan with a jack and remove the nyloc nut (15). Using extractor tool No. S.166, separate the ball joint (12) from the vertical link as shown on Fig. 11. Release the ball joint from the upper wishbones by removing the nyloc nuts (9), plain washers (10) and bolts (8).

To refit, reverse the removal procedure.

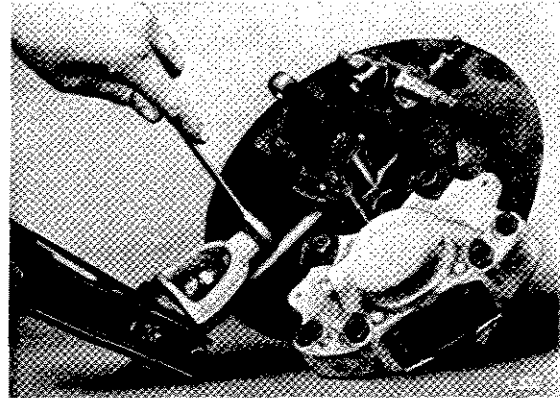


Fig. 11. Showing the later type ball joint

Upper Wishbones

To Remove (Figs. 5 and 12)

Remove the ball joint as described previously. Extract the split pins (6), unscrew the slotted nuts (7) and remove the washers (5), wishbone arms (3), (73) and the rubber bushes (2), (4).

To refit, reverse the removal procedure and ensure that the wishbone arm having the larger amount of "offset" is positioned at the front of the assembly.

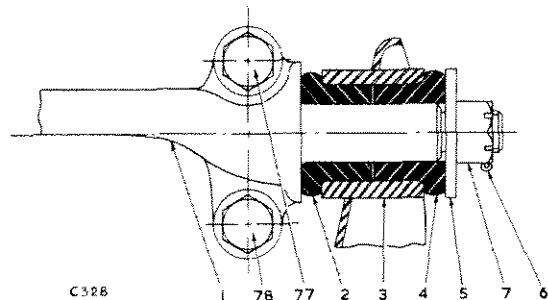


Fig. 12. Section through upper inner fulcrum

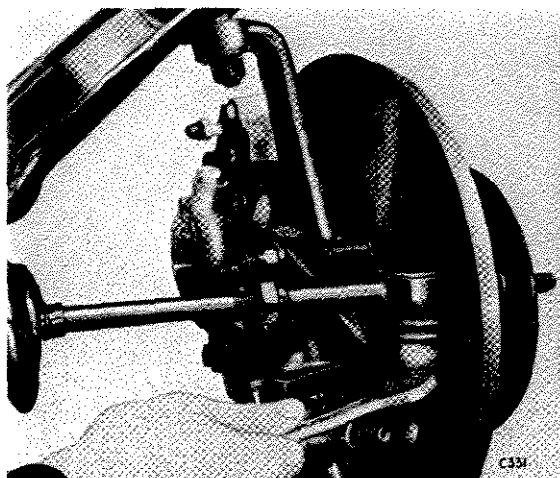


Fig. 13. Removing tie rod

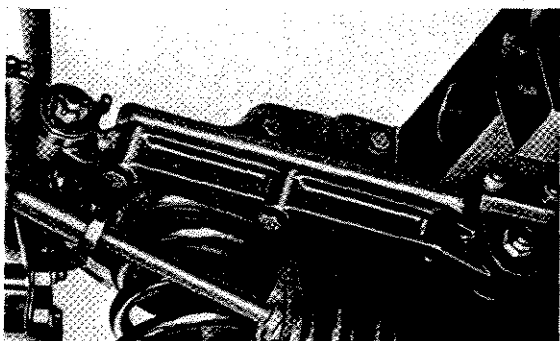


Fig. 14. Lower wishbone arm

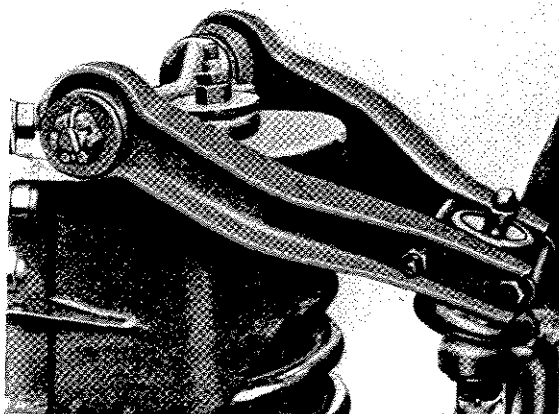


Fig. 15. Upper wishbone and inner fulcrum

Wishbone and Vertical Link Assembly (Fig. 5)

To Remove Lower Wishbones

Detach the brake caliper unit or, alternatively, empty the hydraulic system and disconnect the flexible brake hose at the chassis bracket.

Remove the damper and road spring as described on pages 4-107 and 4-108.

Unscrew the nyloc nut and separate the outer tie-rod ball joint from the steering arm.

Release the lower inner fulcrum pin end brackets by removing the nyloc nut (53), nuts (52), bolts (50) and washers (51).

Withdraw the split pins (41), unscrew the nuts (47) and remove the retainer washers (46), seals (42) and the lower wishbone arms (59) and (22).

To Remove Upper Inner Fulcrum

Remove the nuts, spring washers, bolts (77) and plain washers from the fulcrum inner fixings. Unscrew the setscrews (78) from the outer fixings and lift the assembly from the vehicle.

To Dismantle (Fig. 4)

Remove the caliper and hub assemblies as described on page 4-104. Detach the dust shield (5) by removing the nut (3), and plain washer (4).

Unscrew the nuts (30), bolts (9) and setscrews (22 and 23) to remove the steering arm (29), distance tubes (28), and caliper mounting bracket (7).

Referring to Fig. 5, remove the setscrew (19), spring washer (20) and steering lock stop (21). Unscrew the bottom trunnion assembly (23) and remove the oil seal (18).

Detach the top ball joint (12) from the vertical link and separate the upper wishbone arms (3), (73) as described on page 4-109.

Referring to Fig. 4, remove the nyloc nut (27), washer (26) and press the stub axle (6) from the vertical link (25).

Re-assembly

Fig. 4. Fit the stub axle (6) to the vertical link (25) and secure it with a plain washer (26) and nyloc nut (27).

Assemble the caliper mounting bracket (7), distance tube (28) and steering arm (29) to the vertical link. Tighten the nyloc nuts and secure the bolts (9) by turning up the ends of the lockplates (8) against the bolt heads.

Fig. 5. Screw the lower trunnion (23) with rubber seal (18) on to the vertical link (16). Secure the lock stop collar (21) with a setscrew (19) and spring washer (20). Ensure that the trunnion will swivel easily from stop to stop.

Fig. 4. Fit the dust shield (5), securing the slotted lug beneath the nut (3). Assemble the hub and disc and adjust as described on page 4-104.

Fig. 5. Assemble the top inner fulcrum (1), the rubber bushes (2), (4), both upper wishbone arms (73), (3) and ball joint (12) as shown on Fig. 5 and attach the assembly to the vertical link (16).

Fig. 4. If the hydraulic hose has been disconnected, refit the caliper unit and shim pack, securing with the bolts (1) and spring washers (2).

Offer up the suspension unit and secure the upper inner fulcrum to the spring turret.

Fig. 5. Assemble the lower wishbone arms (22), (59), to the bottom inner fulcrums and trunnion as shown on Figs. 5, 16 and 17. Fit the support brackets (54) and secure them with bolts (50) and nuts (52 and 53).

The outer lower fulcrum bosses must have 0.004"–0.012" (0.1–0.3 mm.) end float. This is obtained by tightening both slotted nuts to a torque of 5 lbs. ft. (0.69 kilogrammetres); then slackening each slotted nut 1 to 2 flats before inserting the split pins (41). Ensure that the suspension is free to move from bump to rebound.

Refit the outer tie-rod ends and secure them with plain washers and nyloc nuts.

Refit the caliper unit with shims (if not already fitted) and if necessary, bleed the hydraulic system.

Refit the road spring, spring pan and damper unit as described on pages 4-107 and 4-108.

Refit the road wheels and nave plates, remove the chassis stands and lower the vehicle to the ground.

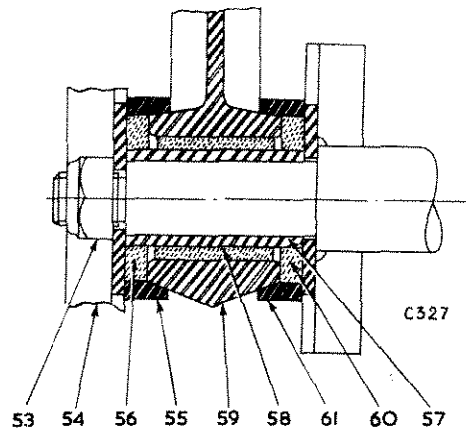


Fig. 16. Section through bottom inner fulcrum

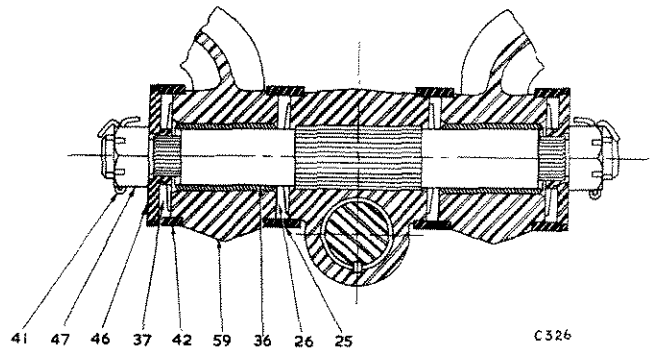


Fig. 17. Section through bottom outer fulcrum

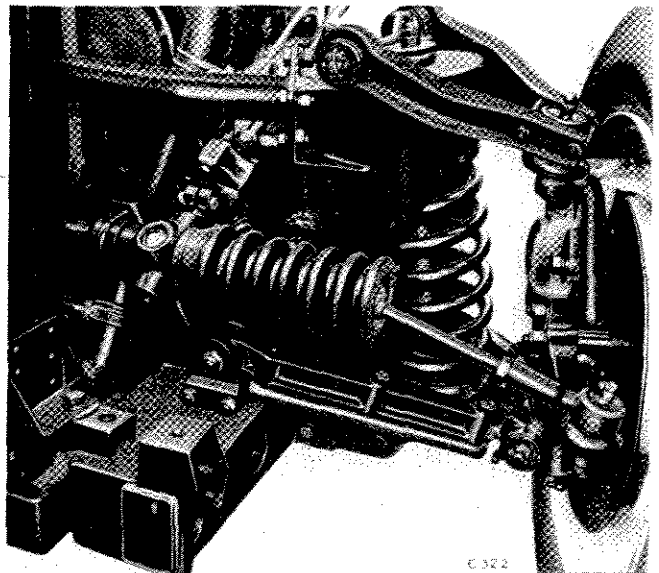


Fig. 18. Front suspension assembly

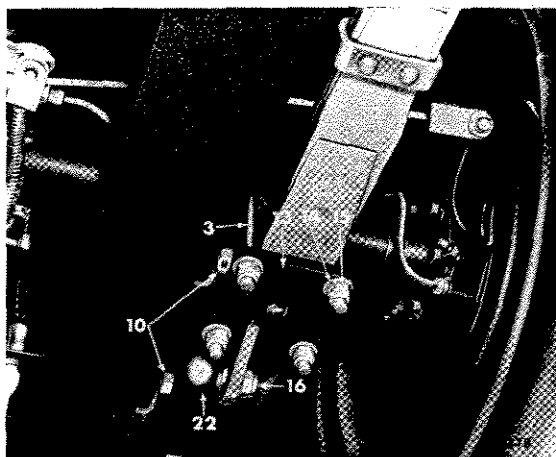


Fig. 19. Rear spring attachments

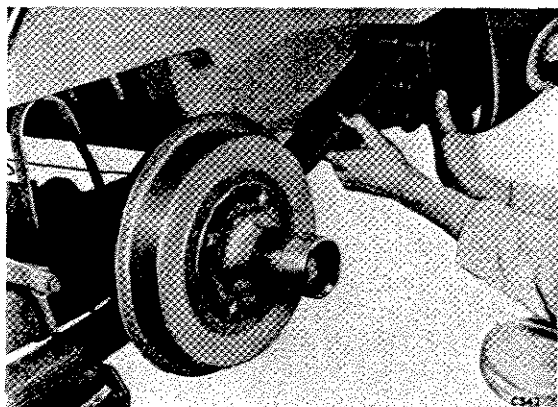


Fig. 20. Removing the rear spring

Rear Road Springs (Fig. 21)

Removal

Jack up the rear of the vehicle and support it on chassis stands.

Remove the road wheels and take the road spring load with a jack placed beneath the spring blades.

Remove the damper link (22) and remove the nuts (15), plain washers (14), spring plate (13), and 'U' bolts (3). Lower the jack to release the road spring tension.

Remove the nuts (4), spring washers (5) and detach the shackle plates (6), (8) and rubber bushes (7) from the spring and chassis bracket.

Remove the split pin (18), slotted nut (19), washer (20) and withdraw the bolt (24) to release the spring (9) from the vehicle.

To Refit

Offer up the spring and fit the pin (24), plain washer (20) and nut (19) leaving the nut slack.

Assemble the rear shackle (6) and (8), with bushes (7), spring washers (5) and nuts (4), leaving the nuts slack.

Jack up the spring blades until they contact the axle pad and fit the 'U' bolts (3), spring plate, (13), plain washers (14) and nuts (15).

Note that on L.H. drive vehicles, two packings are fitted between the R.H. spring and axle pad.

Tighten the nuts (4) and (19) and fit the split pin (18).

Rear Dampers (Fig. 21)

To Remove

Jack up the rear of the vehicle and support on chassis stands. Remove the rear road wheels.

Remove the nuts (11) and (16), washers (12) and (17) and detach the damper links (22).

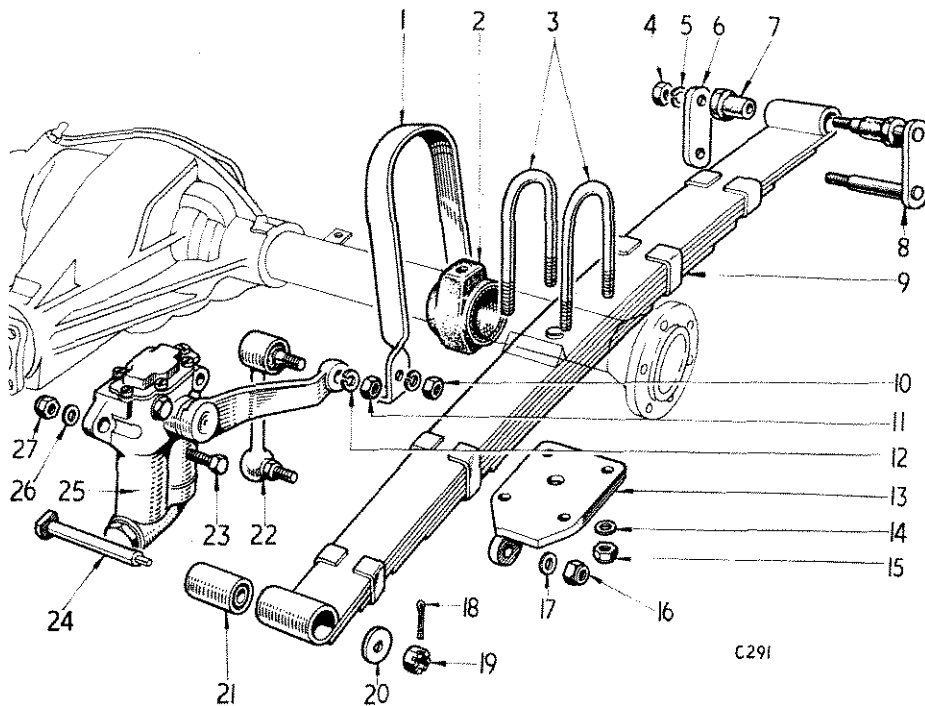
Remove the bolts (23), washers (26), nuts (27) and detach the damper (25).

To Refit

Hold the damper vertical in a vice, and move the arm through its full arc to expel air from the damper cylinder. Remove the filler plug, top up with oil and refit the plug. Maintaining the damper in a vertical position, offer it up to the chassis bracket and secure with bolts (23), washers (26) and nuts (27).

Refit the damper link (22), securing it with nuts (11) and (16) and washers (12) and (17).

Refit the road wheels, remove axle stands and lower the vehicle to the ground.



- 1 Bump strap
- 2 Bump and rebound rubber
- 3 'U' bolts
- 4 Nut
- 5 Spring washer
- 6 Shackle plate
- 7 Rubber bush
- 8 Shackle
- 9 Spring
- 10 Nut
- 11 Nut
- 12 Spring washer
- 13 Spring plate

- 14 Plain washer
- 15 Nyloc nut
- 16 Nyloc nut
- 17 Plain washer
- 18 Split pin
- 19 Slotted nut
- 20 Washer
- 21 Bush
- 22 Damper link
- 23 Bolt
- 24 Shackle pin
- 25 Damper
- 26 Plain washer
- 27 Nyloc nut

Fig. 21. Rear suspension details

ASSESSMENT OF ACCIDENTAL DAMAGE

The following dimensioned illustrations assist in the assessment of accidental damage.

It is suggested that any components which have sustained damage or are suspect in any way, should first be removed from the vehicle as instructed, then cleaned and accurately measured on a surface table.

The measurements obtained should then be compared with those given in the appropriate illustration and a decision made relative to the serviceability of the components.

0° Castor

Rear R.H. and Front L.H. (Part No. 132632)

Front R.H. and Rear L.H. (Part No. 132633)

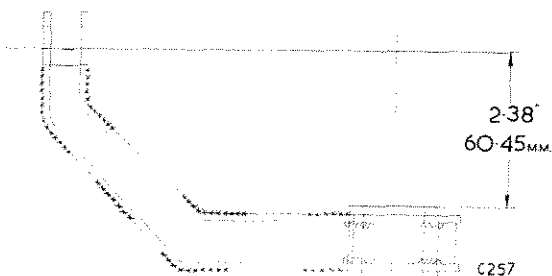
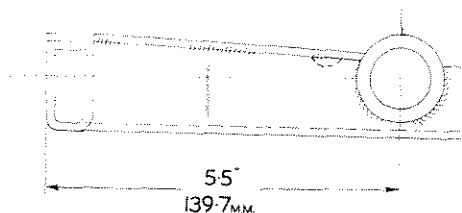
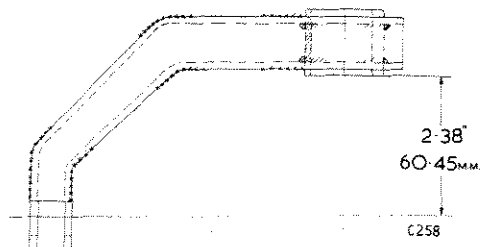
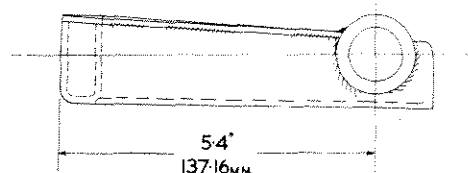


Fig. 22. Upper wishbone dimensions

3° Castor

Front R.H. and L.H. (Part No. 133504).

Dimension	In.	cm.
1	1.687	4.285
2	5.66	14.38
3	1.115	2.832
4	2.03	5.156
5	1.034	2.626

Rear R.H. and L.H. (Part No. 133507).

4	0.98	2.489
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All other dimensions are identical to Part No. 133504.

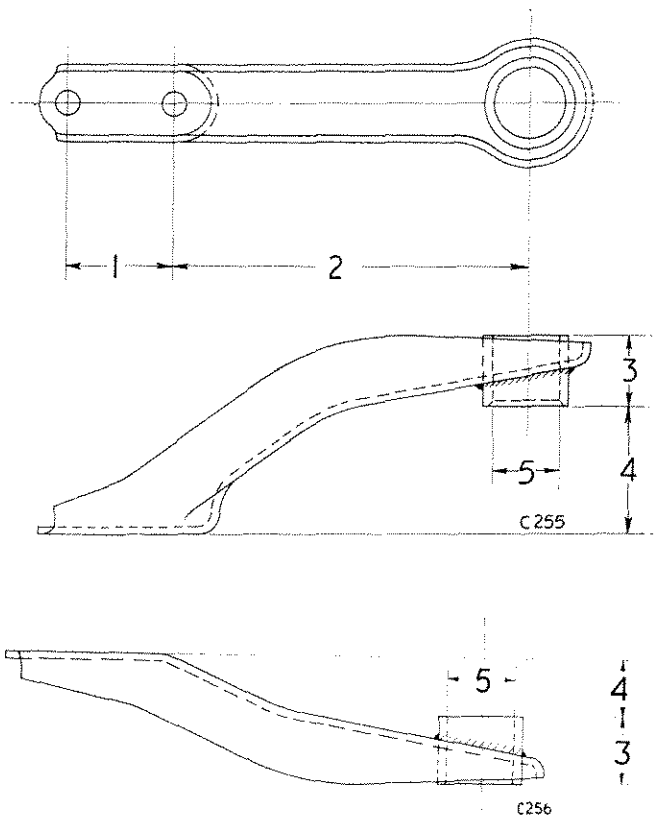


Fig. 23. Upper wishbone dimensions

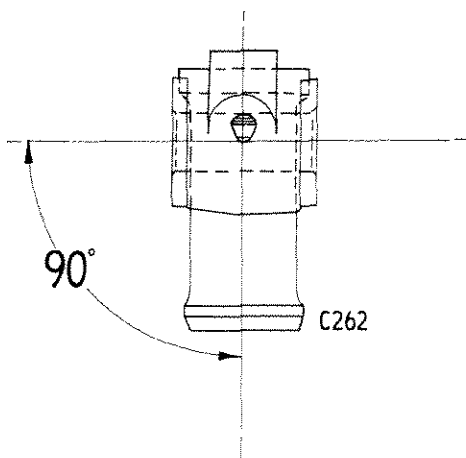


Fig. 24. Lower trunnion bracket 0° Castor

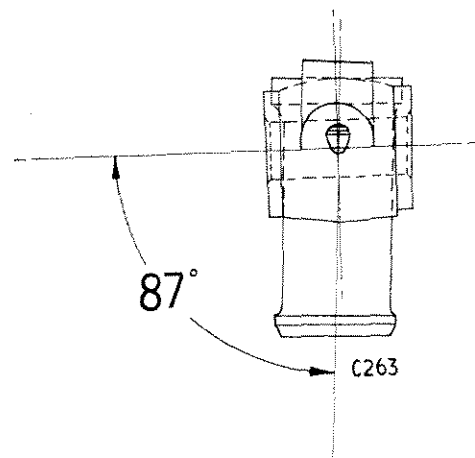


Fig 25. Lower trunnion bracket 3° Castor

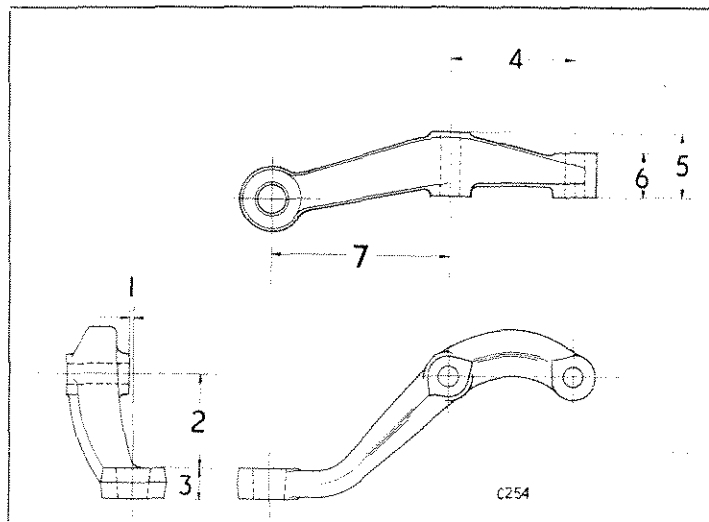


Fig. 26. Tie-rod lever dimensions

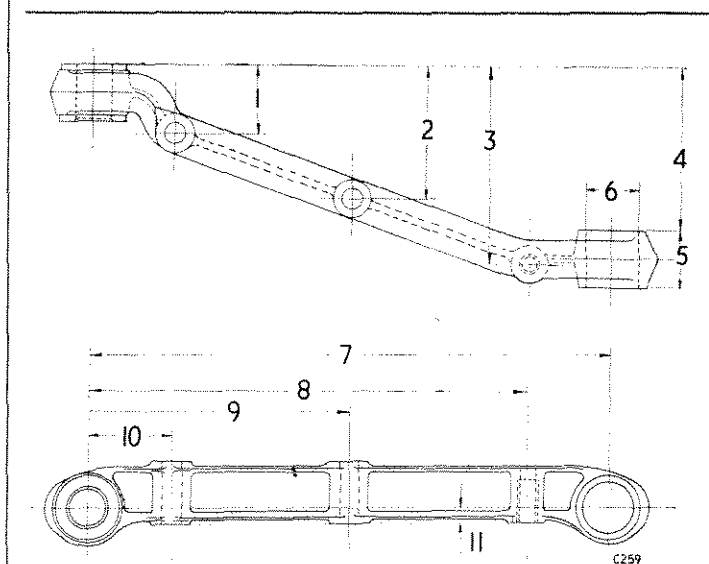


Fig. 27. Lower wishbone dimensions

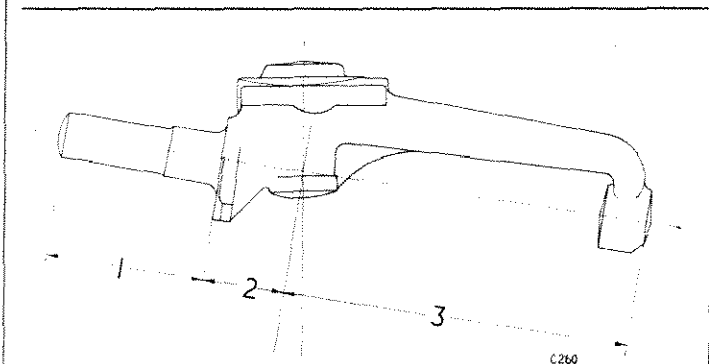


Fig. 28. Vertical link dimensions

0° Castor

Part Number 127830 (R.H.) and 127831 (L.H.).

Dimension	In.	cm.
1	0.06	0.1524
2	1.75	4.445
3	0.56	1.422
4	2.345	5.956
5	1.19	3.023
6	0.81	2.057
7	3.33	8.458

3° Castor

Part Number 129836 (R.H.) and 129837 (L.H.).

Dimension	In.	cm.
2	1.97	5.004

All other dimensions are identical to those given for 0° castor.

0° and 3° Castor

L.H. (Part No. 106577).

R.H. (Part No. 106578).

Dimension	In.	cm.
1	1.38	3.505
2	2.66	6.756
3	3.94	10.080
4	3.31	8.407
5	1.12	2.845
6	1.034	2.626
7	10.25	26.035
8	8.63	21.92
9	5.13	13.03
10	1.63	4.14
11	0.31	0.787

Part Number 201803 R.H. and L.H.

Dimension	In.	cm.
1	2.59	6.579
2	1.53	3.886
3	6.50	16.51

FRONT SUSPENSION

FRONT SUSPENSION

Lower Wishbone

Removal

Firmly apply the handbrake and remove the road spring as described on page 4-108. Proceed as follows to remove and dismantle the lower wishbone:-

Note the number and position of shims (Fig. 30) between the chassis frame and front and rear inner fulcrum brackets. Remove the nyloc nut and washer (Fig. 31) securing each fulcrum bracket to the chassis. Remove the outer fulcrum bolt (1, Fig. 29) to detach both lower wishbone arms.

Servicing

Refer to page 4-122 to check for damage to each component. If necessary fit new inner fulcrum bushes as instructed on page 4-120. Check the outer fulcrum and if necessary fit new nylon bushes (5), steel sleeves (3), thrust washers (2), dust excluders (6) and retainers (4) (see Fig. 29).

Refitting

Reverse the removal procedure and fit the road spring as instructed on page 4-108. Roll the car forwards a few feet in order that the suspension assumes its straight-ahead running position. Accurately check and, if necessary, re-set the Castor and Camber angles by means of the shims between the inner fulcrum brackets and the chassis. Check the toe-in and, if necessary, re-adjust (see pages 4-201 and 4-212).

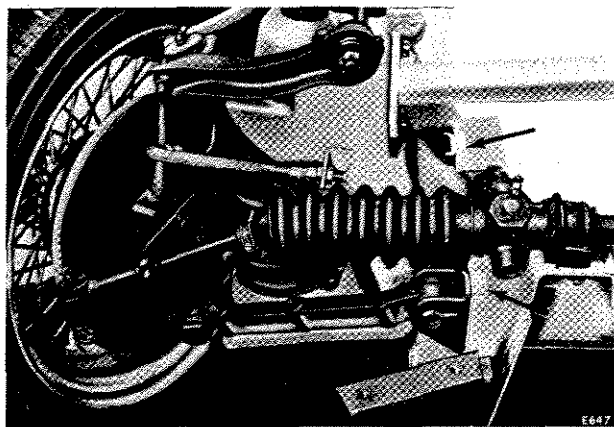


Fig. 30. Location of shims behind fulcrum brackets

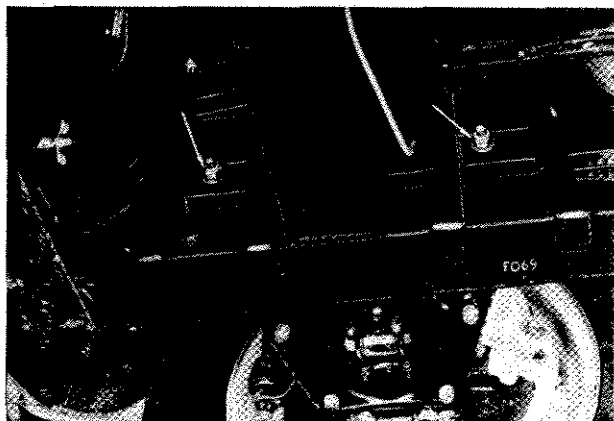


Fig. 31. Fulcrum bracket securing nuts

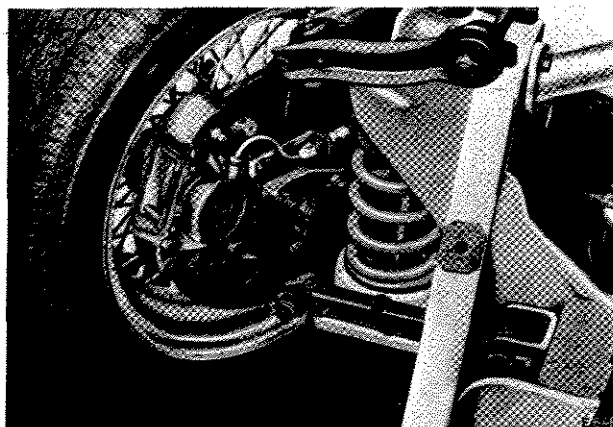


Fig. 32. Position of disc brake caliper

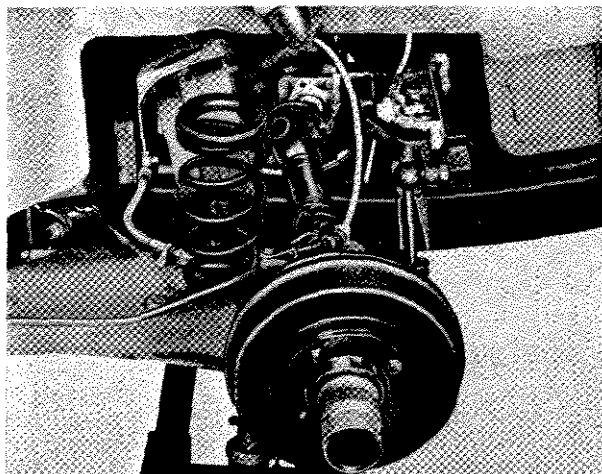


Fig. 33. Removal of rear road spring

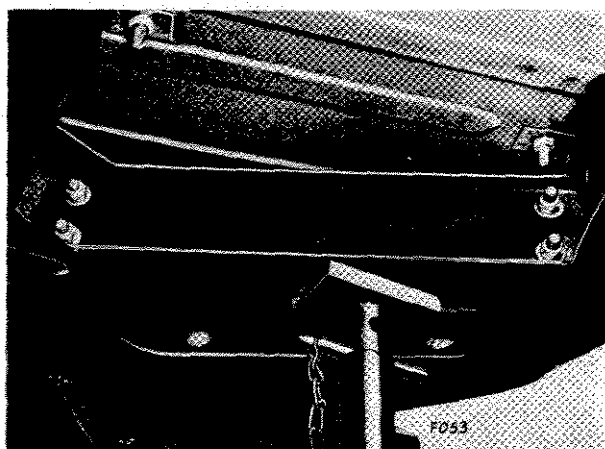


Fig. 34. Suspension pivot attachment nuts

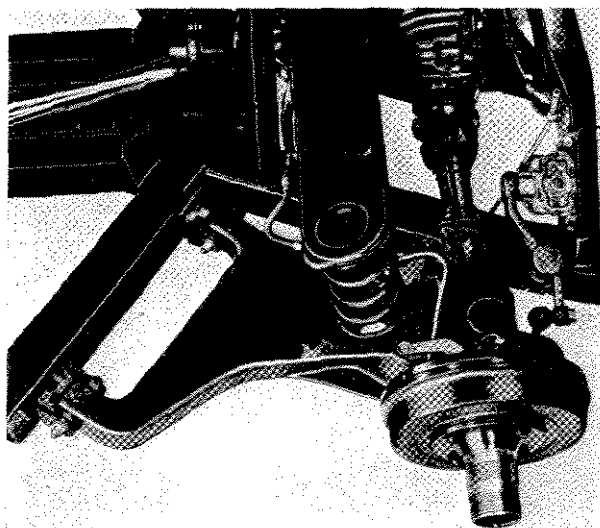


Fig. 35. Rear suspension semi-trailing arm

REAR SUSPENSION

Chock the front wheels back and front in the straight-ahead direction.

Road Spring Removal

Prise off the nave plate and slacken the wheel nuts. Release the handbrake, and with a trolley jack placed under the differential casing, raise the rear of the car onto stands positioned beneath the chassis frame.

Raise the suspension arm with the jack under the spring well; remove the wheel, uncouple the drive shaft and disconnect the damper from the suspension arm. Taking care to avoid straining the brake hose, lower the arm until the spring is just free. Do not disconnect any part of the hydraulic brake system.

Rear Dampers

As in the TR.4, the damper body is secured to the chassis by two bolts.

Renewal of Rubber Bushes

Position the suspension arm above a spacer block resting on the table of a hand press and force out the bush. Thoroughly clean the eye of the suspension arm and, using a liberal amount of Castrol rubber grease, press in a new bush by its centre tube (protecting the end of the tube with a bolt). If available, a tapered guide-in will facilitate the entry of the bush.

Suspension Arm Removal

Remove the road spring as described previously, and temporarily re-connect the damper.

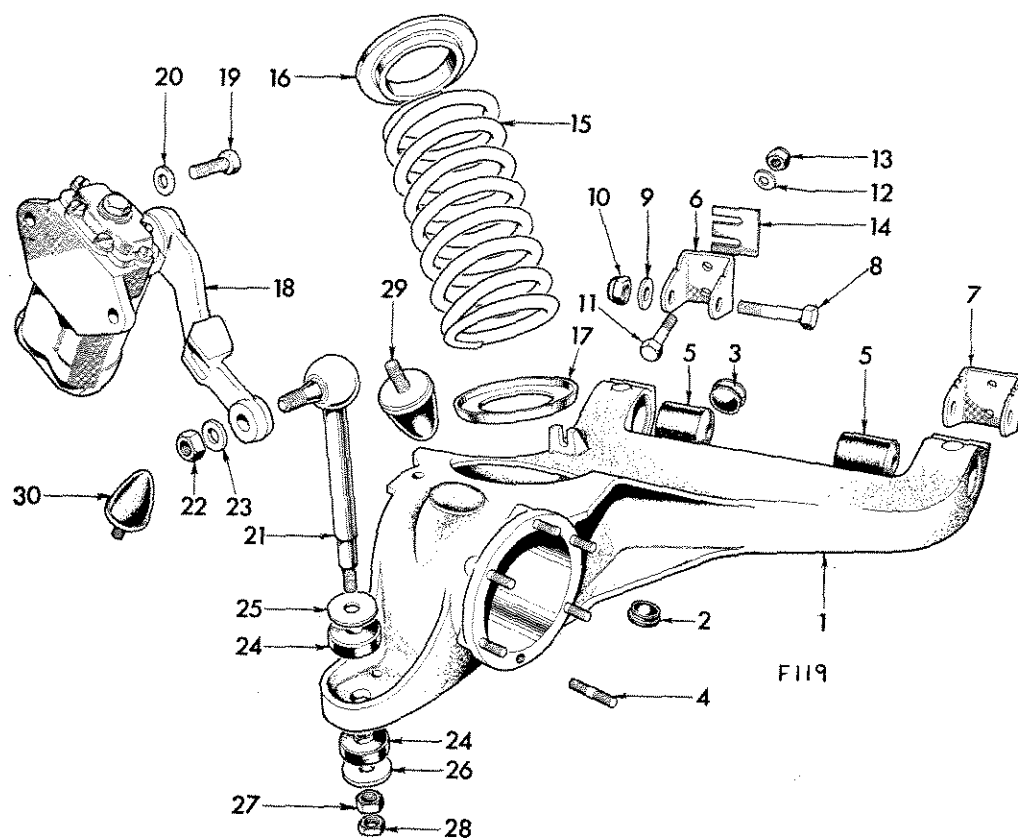
Drain the brake system and disconnect the brake hose. Disconnect the handbrake cable from the backplate and from the suspension arm. Support the suspension arm with a jack under the spring well and disconnect the damper. Release the suspension arm from the chassis by removing the four nuts (Fig. 34), noting the number and location of shims removed.

Installing Suspension Arm

Check that the grooves in the edges of the mounting brackets are uppermost. The bracket having four grooves is the outside pivot and the bracket with only two grooves is the inside pivot.

Reverse the removal procedure and load the vehicle before tightening the bolts which secure the rubber bushes.

Set the rear wheel alignment as described on page 4-212.



- | | |
|--------------------------|---------------------|
| 1 Suspension arm | 16 Rubber insulator |
| 2 Rubber plug | 17 Rubber insulator |
| 3 Rubber plug | 18 Damper arm |
| 4 Stud | 19 Bolt |
| 5 Metalastik bush | 20 Washer |
| 6 Fulcrum bracket, inner | 21 Damper link |
| 7 Fulcrum bracket, outer | 22 Nut |
| 8 Bolt | 23 Washer |
| 9 Plain washer | 24 Rubber buffer |
| 10 Nyloc nut | 25 Backing plate |
| 11 Bolt | 26 Backing plate |
| 12 Plain washer | 27 Nut |
| 13 Nyloc nut | 28 Locknut |
| 14 Shim | 29 Bump stop |
| 15 Road spring | 30 Rebound rubber |

Fig. 36. Rear suspension exploded

ASSESSMENT OF ACCIDENTAL DAMAGE

The following dimensioned illustrations assist in the assessment of accidental damage.

It is suggested that any components which have sustained damage or are suspect in any way, should first be removed from the vehicle as instructed, then cleaned and accurately measured on a surface table.

The measurements obtained should then be compared with those given in the appropriate illustration and a decision made relative to the serviceability of the components.

± 0.005 " (0.127 mm.) except where otherwise stated.

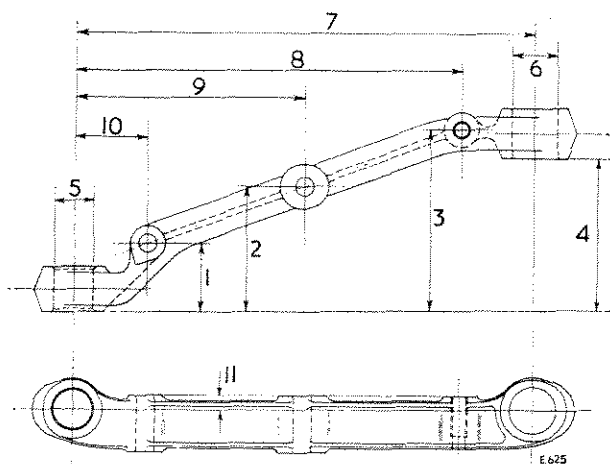


Fig. 37. Lower Wishbone Arm

R.H. rear/L.H. front — as drawn
Part Number 307209.
— opposite hand
Part Number 307210.

Dimension	In.	cm.
1	1.523	3.87
2	2.803	7.12
3	4.083	10.37
4	3.453	8.77
5	0.8750	2.222
	0.8762	2.225
6	1.031	2.619
	1.037	2.634
7	10.25	26.035
8	8.63	21.92
9	5.13	13.03
10	1.63	4.14
11	0.31	0.787

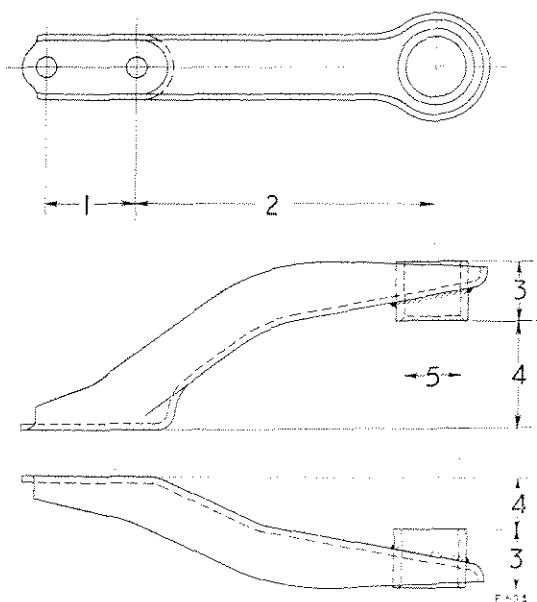


Fig. 38. Upper Wishbone

Front R.H. and L.H. (Part No. 133504).

Dimension	In.	cm.
1	1.687	4.285
2	5.66	14.38
3	1.115	2.832
4	2.03	5.156
5	1.034	2.626

Rear R.H. and L.H. (Part No. 133507).

4	0.98	2.489
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All other dimensions are identical to Part No. 133504.

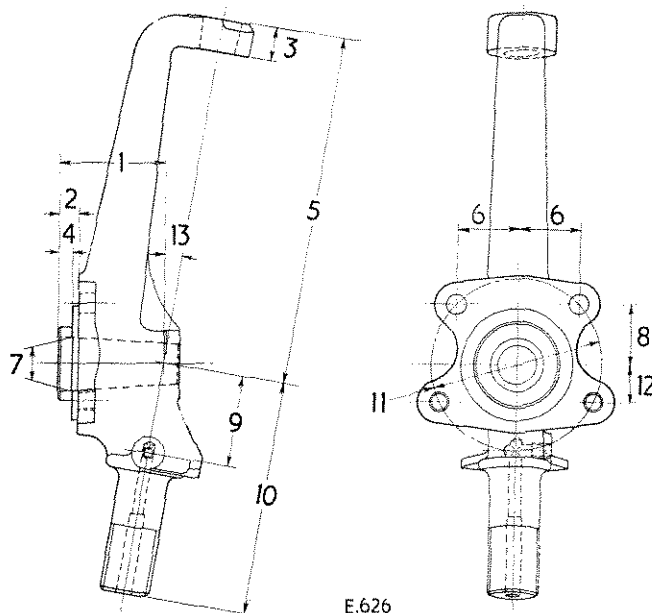
Fig. 39. Vertical Link

Part Numbers R.H. 307215

L.H. 307216

 $\pm 0.005"$ (0.127 mm.) except where otherwise stated.

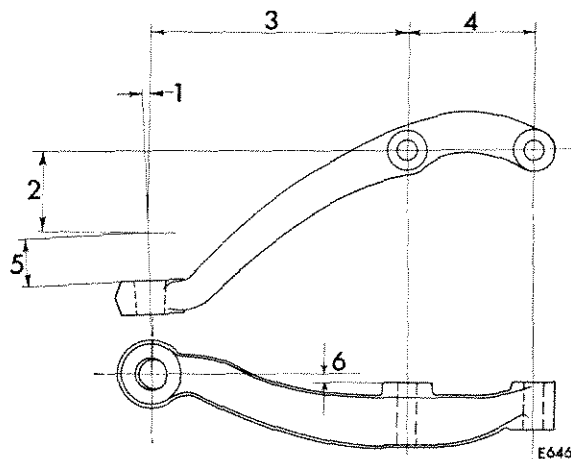
Dimension	in.	mm.
1	1.96	49.78
2	0.38	9.65
3	0.63	16.0
4	0.25	6.35
5	6.5	165.1
6	1.1736	29.81
	1.1716	29.76
7	1.0005	25.413
	0.9995	25.387
8	1.125	28.57
9	1.7	43.18
10	4.38	111.25
11	3.25	82.5
12	0.687	17.45
13	9 degrees	

**Fig. 40. Tie-rod Lever**

Part Numbers R.H. 307211

L.H. 307212

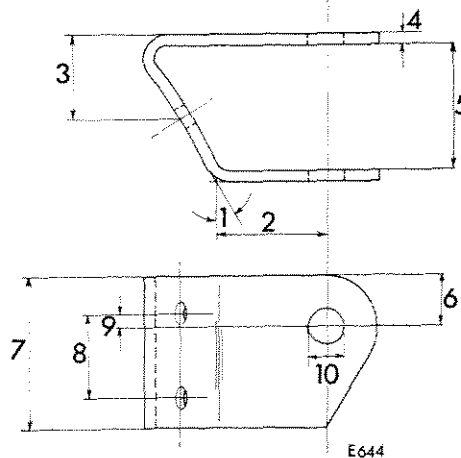
Dimension	in.	mm.
1	3 degrees	
2	1.53	38.86
3	4.81	122.17
4	2.347	59.62
	2.343	59.52
5	0.88	22.35
6	0.17	4.32

**Fig. 41. R.H. Rear Spring Eye Bracket (Live Axle)**

Part Numbers R.H. 142427

L.H. 142426

Dimension	in.	mm.
1	32 degrees	
2	1.97	50.04
3	1.53	38.86
4	0.192	4.88
5	2.25	57.15
6	0.94	23.88
7	2.75	69.85
8	1.50	38.1
9	0.25	6.35
10	0.651	16.53
	0.641	16.28



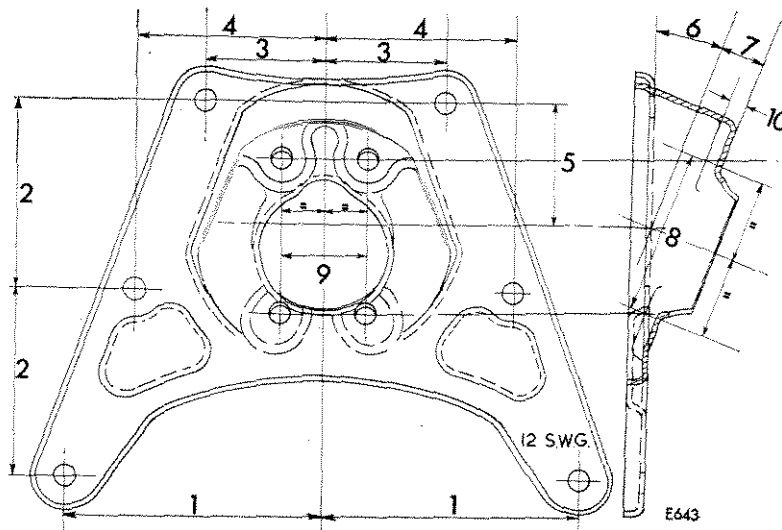


Fig. 42. Lower Spring Pan
Part Number 211811

Dimension	in.	mm.
1	4.81	122.17
2	3.5	88.9
3	2.25	57.15
4	3.53	89.66
5	2.25	57.15
6	20½ degrees	
7	0.81	20.57
8	3.06	77.72
9	1.66	42.16
10	0.324	8.23

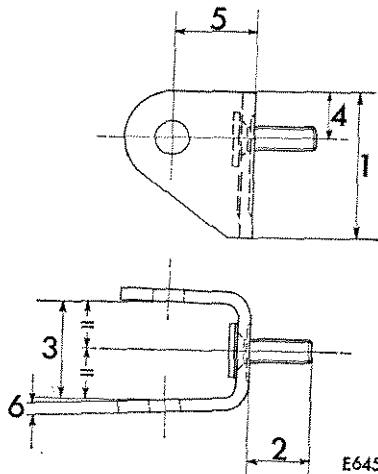


Fig. 43. Lower Wishbone Inner Fulcrum Bracket
Part Number 139715

Dimension	in.	mm.
1	2.38	60.45
2	1.0	25.4
3	1.523	38.68
4	1.508	38.30
5	0.75	19.05
6	1.34	34.04
7	0.192	4.88

STEERING MEASUREMENTS AND ADJUSTMENTS

Before carrying out measurements and adjustments on the front suspension and steering, position the vehicle on a smooth level surface, inflate the tyres to the correct pressures and place a load of 150 lb. (68 kg.) on each seat.

At Commission Numbers CT.16344 (wire wheels) and CT.16390 (disc wheels) the castor angle was changed from 0° to 3° positive. This was achieved by the incorporation of modified upper wishbone arms, ball joints and vertical link trunnions.

Lock Stop Adjustment

Run the front wheels onto Weaver or similar wheel turning radius gauges as shown on Fig. 4 and place wood blocks of equivalent thickness to that of each gauge under the rear wheels. Turn the front wheels to the straight ahead position and zero the gauges.

Slacken the setscrews (19) Fig. 5. Adjust the positions of the eccentricity drilled collars (21) to provide 31° back lock and 28½° front lock. Re-tighten the setscrews (19).

Check that the wheels and tyres do not foul the chassis when on full lock and that the steering unit rack teeth are not at the end of their travel.

Track Adjustment

Centralise the steering unit by turning the steering wheel, counting the number of turns necessary to move the steering from lock to lock and turning the steering wheel back half the number of turns. In this position, the steering wheel spokes should assume a horizontal position.

Using Weaver or similar wheel alignment equipment as shown on Fig. 2, measure the front wheel alignment. If adjustment is required, slacken the tie-rod end lock nuts, the outer gaiter clips and rotate the tie-rods, which are threaded left and right hand, until the correct alignment is obtained. Take one reading, roll the vehicle forward so that the wheels rotate 180°; then obtain a second reading and adjust the tie-rods to a mean of the two readings. This allows for wheel rim run out.

When correct adjustment has been obtained, tighten the tie-rod lock nuts and gaiter clips.

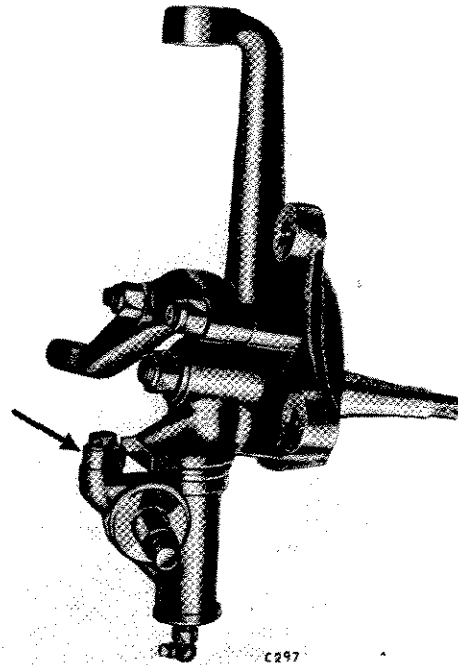


Fig. 1 Vertical link assembly. The eccentric collar for lock stop adjustment is arrowed.

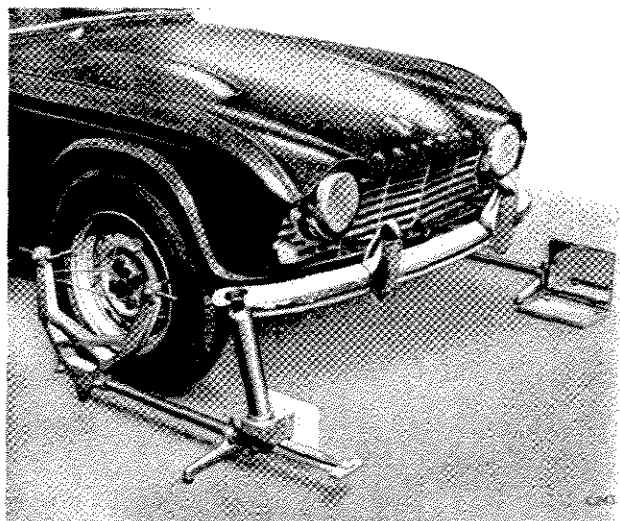


Fig. 2 Checking front wheel alignment.

STEERING UNIT DETAILS

STEERING

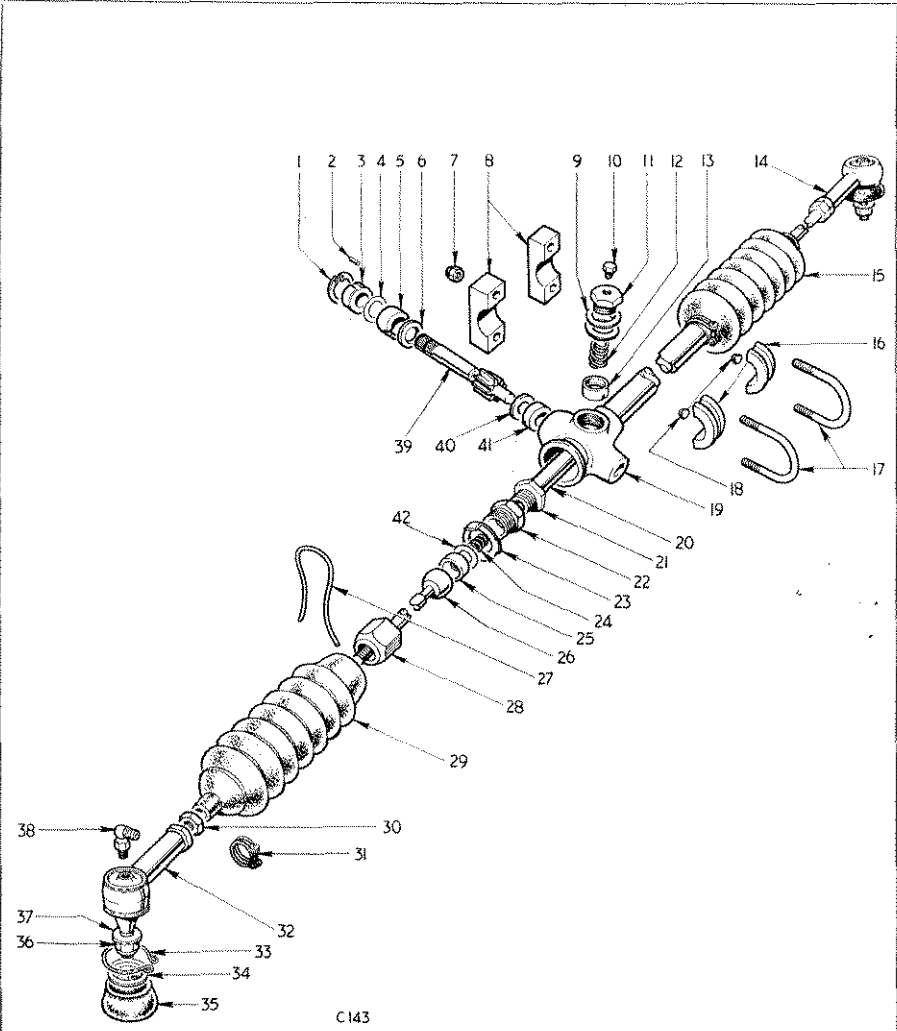


Fig. 3. Steering unit details

STEERING

KEY TO EXPLODED
STEERING UNIT

- | | | |
|-----------------------|-------------------------|----------------------|
| 1 Circlip | 15 Rubber gaiter | 29 Rubber gaiter |
| 2 Peg | 16 Packing pieces—front | 30 Locknut |
| 3 Retainer | 17 'U' bolts | 31 Wire clip |
| 4 Shim | 18 Dowels | 32 Outer tie rod end |
| 5 Bush | 19 Rack tube | 33 Clip |
| 6 Thrust washer | 20 Rack | 34 Washer |
| 7 Nyloc nut | 21 Locknut | 35 Rubber gaiter |
| 8 Packing pieces—rear | 22 Sleeve nut | 36 Nyloc nut |
| 9 Shim | 23 Lockplate | 37 Washer |
| 10 Plug | 24 Spring | 38 Grease nipple |
| 11 Cap | 25 Cup | 39 Pinion |
| 12 Spring | 26 Outer tie-rod | 40 Thrust washer |
| 13 Thrust button | 27 Locking wire | 41 Bush |
| 14 Tie rod ends | 28 Cup nut | 42 Shim |

Castor and Camber Measurement

The following instructions for measuring castor and camber are applicable to the Weaver instrument. Other types of measuring equipment may, however, be equally effective.

Run the front wheels on to Weaver or similar wheel turning radius gauges as shown on Fig. 4 and place wood blocks of equivalent thickness to that of each gauge under the rear wheels. Zero the gauges with the front wheels in the straight ahead position.

Using the No. 10 UNF setscrew supplied in the tool kit, remove the hub cap from the hub.

Ensuring that the split pin does not foul it, place the spacer washer (4) Fig. 5, with flange outwards, and engage the claws of the adaptor (3) on the stub axle thread between two of the nut slots. Secure the spirit level unit (1) to the adaptor and tighten the knurled nut (2).

With the wheels in the straight ahead position, measure the camber from the L.H. scale.

Turn the wheel to 20° back lock and zero the bubble on the R.H. scale.

Turn the wheel to 20° front lock and read the castor angle from the R.H. scale.

Repeat the operations on the opposite wheel. Compare the camber and castor angles with those given on page 4-102. Appreciable differences indicate distorted suspension components, worn suspension bushes or settled front springs.

STEERING UNIT

Removal (Fig. 3)

Jack up the front of the vehicle, support it on chassis stands, and remove the front road wheels. Drain the cooling system and remove the bottom radiator hose.

Remove the bolt (1) from the steering coupling Fig. 6. Remove the nyloc attachment nuts (36) and separate the outer tie rod ball joints from the tie rod levers, as shown on Fig. 3.

Remove the nyloc nuts (7) 'U' bolts (17), aluminium packing pieces (16) and release the steering unit by moving it forwards, to disengage the pinion shaft from the splined coupling. Remove the unit by withdrawing it through the wheelarch.

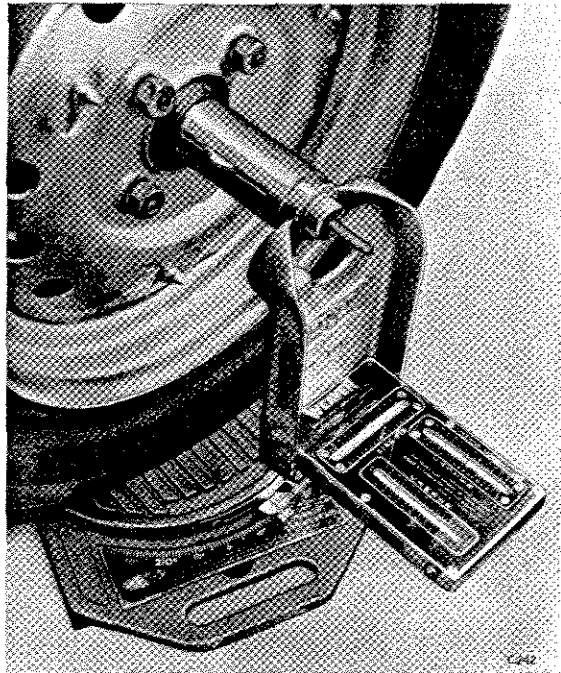


Fig. 4. Measuring castor and camber angles

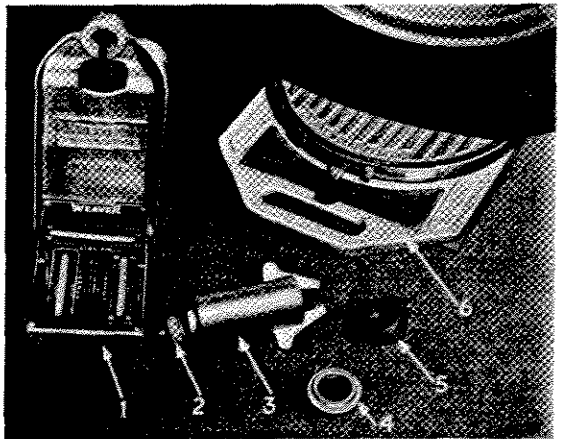


Fig. 5. Weaver measuring equipment

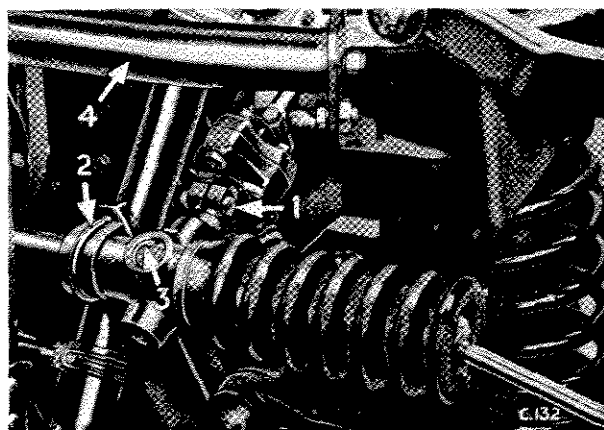


Fig. 6. Steering unit attachment

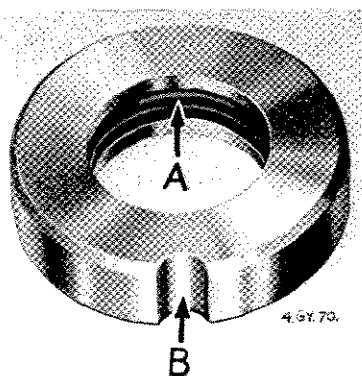


Fig. 7. Pinion retainer showing the seal "A" and dowel recess "B"

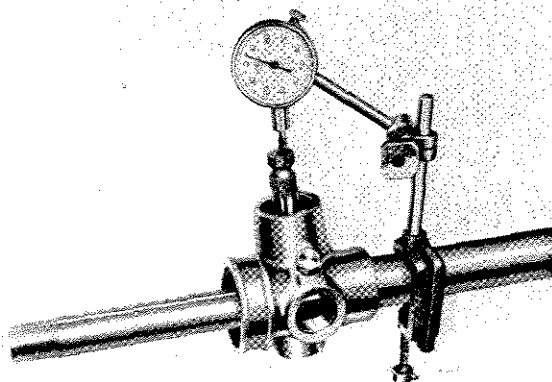


Fig. 8. Measuring pinion end float

Steering Unit (Fig. 3)

Dismantling

Release the clips (31) and (27), and slide both bellows towards the outer ball joints. Slacken the locknuts (21) and unscrew both outer tie rod assemblies from the rack (20). Withdraw the coil spring (24) from each end of the rack.

Release the tabwasher (23), unscrew the sleeve nut (22), and remove the tabwasher (23) shims (42) and thrust pad (25). Slacken the locknuts (30) and unscrew the outer ball joint assemblies (14) and (32) from their respective tie rods.

Remove the locknut (30), rubber bellows (15) and (29), clips (31) and cup nut (28) from each outer tie rod (26).

Remove the locknuts from the ends of the rack. Unscrew the cap (11) and remove the shims (9), spring (12) and pressure pad (13) from the housing.

Remove the circlip (1) and withdraw the pinion assembly, taking care not to lose the dowel peg (2). Remove the retaining ring (3), shims (4), bush (5) and thrust washer (6). Detach the rubber 'O' ring from the annular groove in the retaining ring (3).

Withdraw the rack (20) from the tube (19) and remove the thrust washer (40) and bush (41) from the pinion housing.

Inspection

Clean and examine all components for wear and damage, renewing parts as required.

If necessary, renew the bush in the end of the rack tube by drifting out the old bush and pressing in a new one.

Assembly

Insert the rack (20) into the tube (19) and place the bush (41) and thrust washer (40) into the pinion housing.

Adjust the pinion end float as follows :—

1. Assemble the thrust washer (6), bush (5) and retaining ring (3) to the pinion (39). Insert the assembly into the pinion housing and secure the pinion with the circlip (1).
2. Mount a dial gauge on the tube as shown on Fig. 8. Push the pinion down to its limit and zero the dial gauge. Lift the shaft until the retaining ring contacts the circlip and note the dial reading which represents the total pinion shaft end float. Remove the circlip (1) and withdraw the pinion shaft assembly. Remove the retaining ring (3) and renew its rubber 'O' ring if required.
3. Make up a shim pack to give the minimum end float consistent with free rotation of the pinion shaft. Shims are available in 0.004" (0.102 mm.) and 0.010" (0.254 mm.) thickness.
4. Assemble the shim pack (4) and retainer ring (3) to the pinion. Re-insert the assembly into the housing and finally secure it by fitting the dowel (2) and circlip (1).

Adjust the pinion pressure pad as follows :—

1. Fit the pressure pad (13) and cap nut (11) to the rack tube (19). Tighten the plug to eliminate all end float and using feeler gauges, measure the clearance between the plug and rack tube faces as shown on Fig. 10. Remove the cap nut (11) and pad (13).
2. Make up a shim pack equal to the cap/housing clearance plus 0.004" (0.1 mm.) nominal end float.
3. Pack the unit with grease and assemble the cap nut (11), shim pack (9) spring (12) and plunger (13) to the housing (19) and tighten the cap nut.
4. When the unit is correctly adjusted, a force of 2 lb. (0.91 kg.) is required to rotate the pinion shaft at a radius of 8" (20.3 cm.). If correction is needed, adjust the unit by adding or subtracting shims from beneath the cap nut (10).

Refitting

Having checked that the steering unit conforms to the dimensions given on Fig. 19, count the number of pinion shaft revolutions required to move the rack from lock to lock. Turn the shaft back to centralise the rack, and move the steering wheel to the straight ahead position.

Fit the steering unit by entering the splined pinion shaft into the splined coupling. Assemble the two aluminium packing pieces (8) behind the rack and the two front aluminium blocks (16), entering their dowels (18) into the holes in the rack tube (19). Fit the 'U' bolts (17) and nyloc nuts (7).

Enter the taper pins of the outer tie rod ball joints (32) into the steering levers and fit washers (37) and nyloc nuts (36). Refit the bolt (1) Fig. 6, and nyloc nut to the steering coupling.

Refit the road wheels, lower the vehicle to the ground and check the front wheel alignment as described on page 4201.

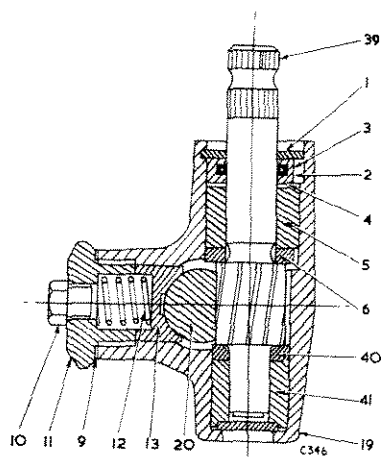


Fig. 9. Section through pinion

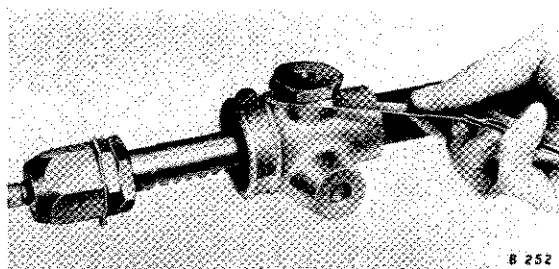


Fig. 10. Using feeler gauges to establish the thickness of shims required under the cap nut

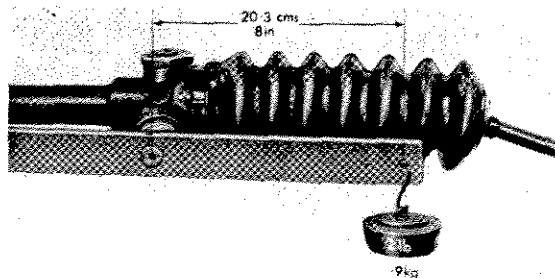


Fig. 11. Measuring the load required to turn the pinion

STEERING COLUMN DETAILS

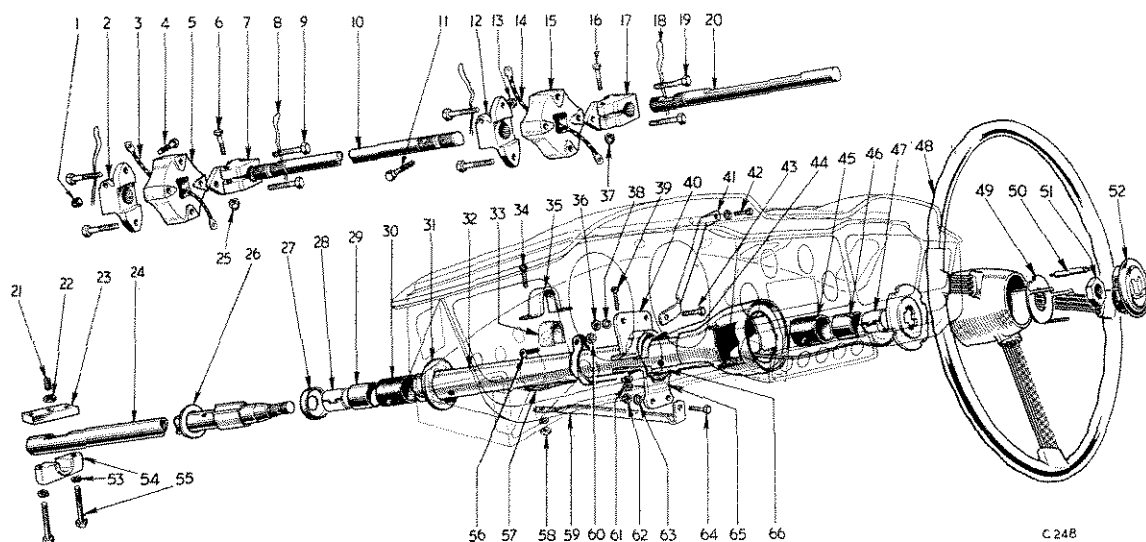


Fig. 12. Steering Column Details

KEY TO FIG. 12

- | | | |
|--------------------------|-----------------------|-------------------|
| 1 Nyloc nut | 23 Impact clamp plate | 45 Rubber bush |
| 2 Adaptor | 24 Upper inner column | 46 Steel bush |
| 3 Earthing cable | 25 Nyloc nut | 47 Nylon bush |
| 4 Pinch bolt | 26 Washer | 48 Steering wheel |
| 5 Rubber coupling | 27 Cap | 49 Clip |
| 6 Pinch bolt | 28 Nylon bush | 50 Horn brush |
| 7 Adaptor | 29 Steel bush | 51 Nut |
| 8 Locking wire | 30 Rubber bush | 52 Horn push |
| 9 Bolt | 31 Rubber grommet | 53 Spring washer |
| 10 Lower steering column | 32 Upper outer column | 54 Impact clamp |
| 11 Pinch bolt | 33 Felt | 55 Bolt |
| 12 Adaptor | 34 Bolt | 56 Screw |
| 13 Nut | 35 Clamp | 57 Felt |
| 14 Earthing cable | 36 Nut | 58 Nut |
| 15 Rubber coupling | 37 Nyloc nut | 59 Stay |
| 16 Pinch bolt | 38 Spring washer | 60 Nut |
| 17 Adaptor | 39 Bolt | 61 Nut |
| 18 Locking wire | 40 Upper clamp | 62 Nut |
| 19 Bolt | 41 Stay | 63 Spring washer |
| 20 Lower column | 42 Bolt | 64 Bolt |
| 21 Allen screw | 43 Bolt | 65 Bracket |
| 22 Locknut | 44 Felt | 66 Cable trough |

STEERING COLUMN

Removal (Fig. 12)

Disconnect the battery, and remove the bolt (4) securing the adaptor (2) to the steering unit pinion shaft. Remove the impact clamp (54) and push the column (20) into the upper inner column (24), to disengage the coupling (2) from the pinion shaft. Move the coupling to one side, pull the assembly from the column (24), and detach the nylon washer (26).

Working inside the car, remove the nuts (58) to release the clamp (35), with felt (33). Remove the stay (41), the upper bracket (40), and felt (44).

Disconnect the horn and direction indicator cables at their snap connectors. Remove the bolt (56) and open the cable trough clip. Pull the steering column and wheel assembly up through the bulkhead grommet (31) and facia aperture, allowing the cable trough (66) to slide off the column.

Dismantling

If necessary, dismantle the universal couplings.

Detach the retaining screws and switch covers from head of the outer column (32). Remove the direction indicator switch, pulling the cables through the apertures in the column head. Withdraw the column (24) and steering wheel assembly from the outer column (32).

Remove the horn button (52), brush (50) and nut (51); then press the inner column (24) from the wheel boss (48).

Remove the end cap (27) and whilst depressing the protrusions on the rubber bush (30), eject the lower bush from the column, using a long shaft. Remove the metal sleeve (29) and nylon bush (28) from the flexible end of the rubber bush (30). Similarly, remove the upper bushes (45), (46) and (47).

Re-assembly

Assemble the nylon bush (28) and steel sleeve (29) to the rubber bush (30) as shown on Fig. 14.

Push the bush assembly into the bottom of the outer column (32), engaging the locating lugs with the holes as shown on Fig. 14. Ensure that the metal reinforcement ring at the end of the bush is positioned towards the lower end of the column. Repeat the upper bush assembly.

Fit the metal cup (27) to the lower end of the column (32).

Fit the steering wheel (48) to the inner column (24), aligning the direction indicator cancelling lugs on the column to correspond with the steering wheel spokes as shown on Fig. 15, and tighten its attachment nut (51). Peen the metal of the nut to the inner column to prevent it unscrewing.

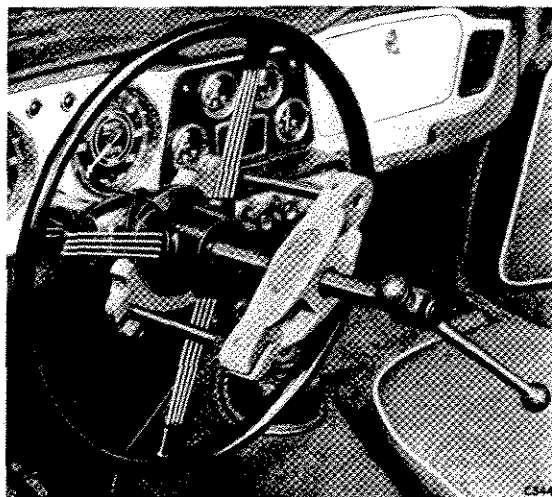


Fig. 13. Using tool No. S. 3600 to remove steering wheel

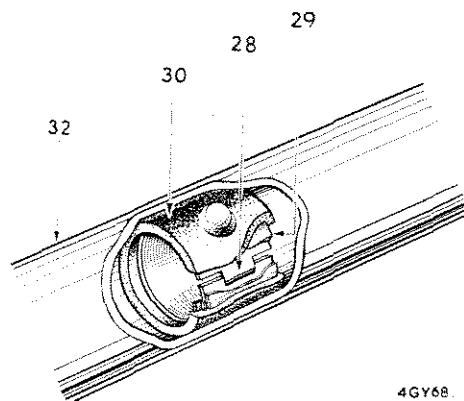


Fig. 14. Section through steering column bush assembly



Fig. 15. Showing the direction indicator cancelling lugs at the top of the inner column aligned with the steering wheel spokes