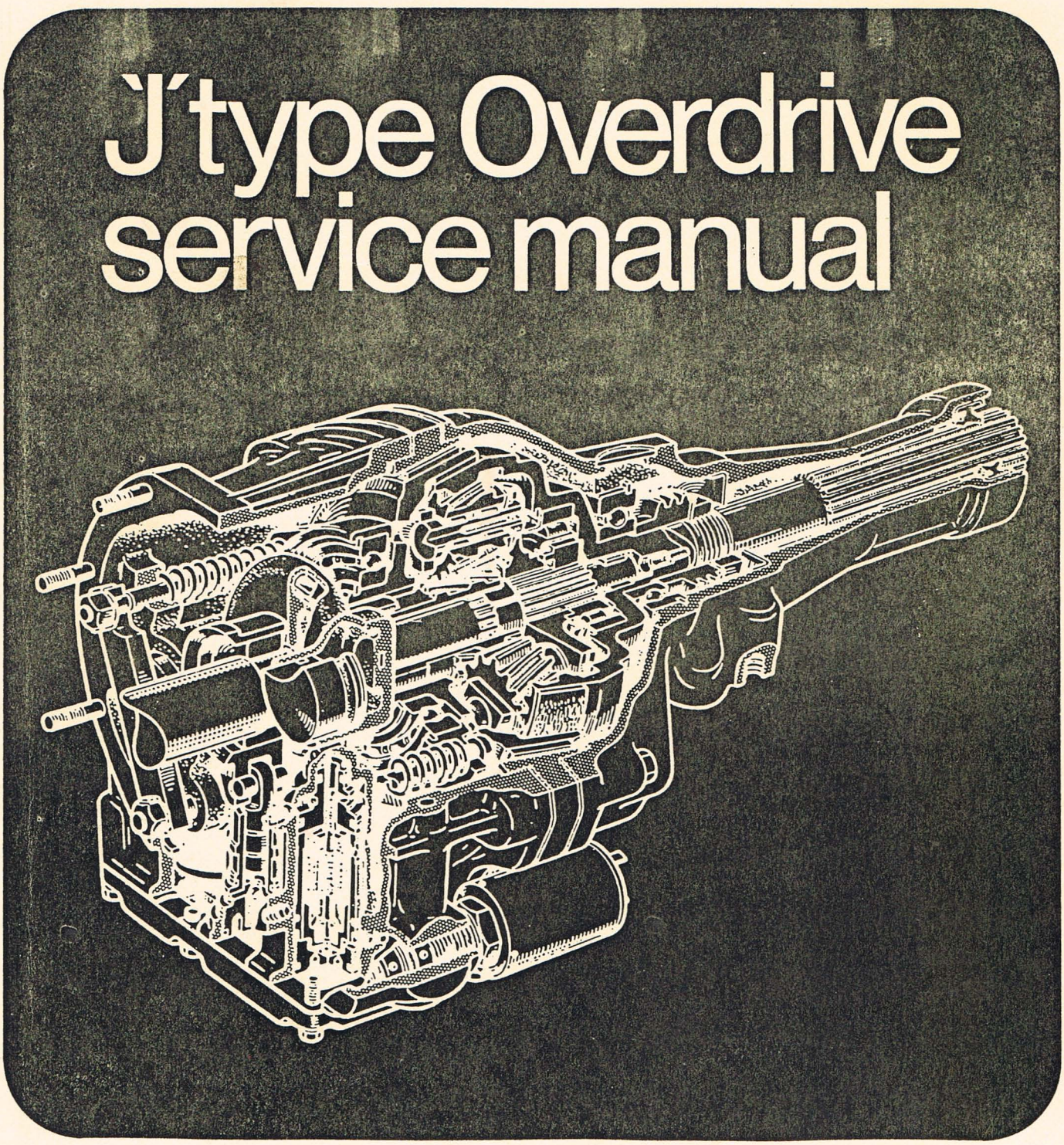
Laycock

J´type Overdrive service manual



Laycock Overdrive

Type J

INDEX

Reference should be made to the Manufacturer's Handbook for all pressures.

Laycock Overdrive Type J

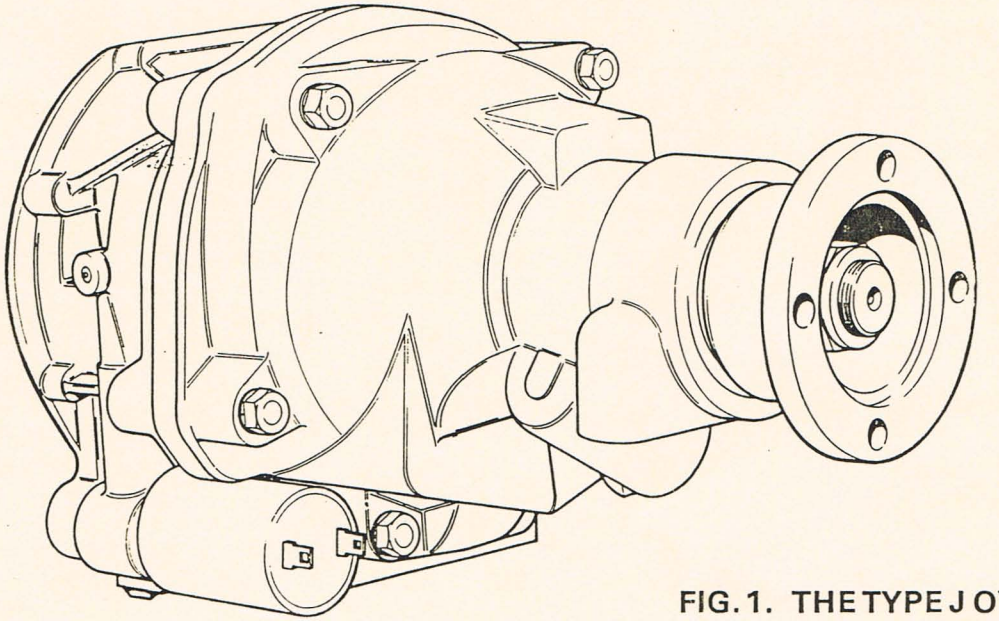


FIG. 1. THE TYPE J OVERDRIVE

INTRODUCTION

The overdrive is an additional gear unit between the gearbox and propeller shaft. When in operation it provides a higher overall gear ratio than that given by the final drive crown wheel and pinion.

The primary object of an overdrive is to provide open road cruising at an engine speed lower than it would be in normal top gear. This reduced engine speed gives a considerable reduction in petrol consumption and increase in engine life. Overdrive may also be used on the indirect gears to enhance performance or to provide easy and clutchless gear changing, for example in town traffic.

The overdrive is operated by an electric solenoid controlled by a switch, usually mounted on the steering column or fascia panel. An inhibitor switch is fitted in the electrical circuit to prevent engagement of overdrive in reverse, and some or all of the indirect gears.

Overdrive can be engaged or disengaged at any speed, but usually above say 30 m.p.h. in top gear. It should be operated without using the clutch pedal and at any throttle opening because the unit is designed to be engaged and disengaged when transmitting full power. The only precaution necessary is to avoid disengaging overdrive at too high a road speed, particularly when using it in an indirect gear, since this would cause excessive engine revolutions.

WORKING PRINCIPLES

The overdrive gears are epicyclic and consist of a central sunwheel meshing with three planet gears which in turn mesh with an internally toothed annulus. All gears are in constant mesh. The planet carrier is attached to the input shaft and the annulus is integral with the output shaft.

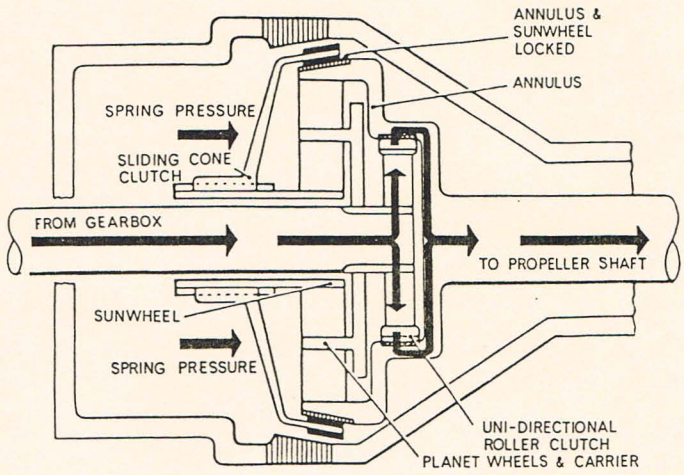
The unit is shown diagrammatically in Figs. 2 and 3.

An extension of the gearbox mainshaft forms the overdrive input shaft. In direct drive Fig. 2, power is transmitted from this shaft to the inner member of a uni-directional clutch and then to the outer member of this clutch through rollers which are driven up inclined faces and wedged between the inner and outer members. The outer member forms part of the combined annulus and output shaft. The gear train is inoperative. A cone clutch is mounted on the externally splined extension of the sunwheel and is loaded on to the annulus by a number of springs which have their reaction against the casing of the overdrive unit. The spring load is transmitted to the clutch member through a thrust ring and ball bearing. This arrangement causes the inner friction lining of the cone clutch to contact the outer cone of the annulus and rotate with the annulus, whilst the springs and thrust ring remain stationary. Since the sunwheel is splined to the clutch member the whole gear train is locked, permitting over-run and reverse torque to be transmitted. Additional load is imparted to the clutch member, during over-run and reverse, by the sunwheel which, due to the helix angle of its gear teeth, thrusts rearward and has for its reaction member the cone clutch.

Fig. 3 shows the position of the cone clutch when overdrive is engaged.

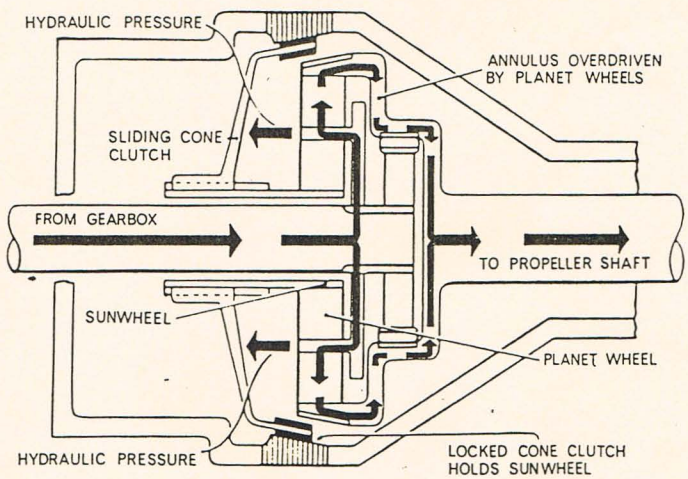
It will be seen that it is no longer in contact with the annulus but has moved forward so that its outer friction lining is in contact with a brake ring forming part of the overdrive casing. The sun-wheel to which the clutch is attached is therefore held stationary. The planet carrier rotates with the input shaft and the planet wheels are caused to rotate about their own axes and drive the annulus at a faster speed than the input shaft. The uni-directional clutch allows this since the outer member can over-run the inner member.

Movement of the cone clutch in a forward direction is effected by means of hydraulic pressure which acts upon two pistons when a valve is opened, by operating the driver controlled selector switch. This hydraulic pressure overcomes the springs which load the clutch member on to the annulus and causes the clutch to engage the brake ring with sufficient load to hold the sunwheel at rest. Additional load is again imparted to the clutch in a forward direction due to the helix angle of the gear teeth.



IN DIRECT DRIVE

FIG. 2



IN OVERDRIVE

FIG. 3

HYDRAULIC SYSTEM

Hydraulic pressure is developed by a plunger type pump, cam operated from the input shaft. The pump draws oil from an air-cooled sump through a suction filter and delivers it via a non-return valve through a pressure filter to the operating pistons, solenoid valve and relief valve. Incorporated in the relief valve is a spring dashpot which ensures smooth overdrive engagement and disengagement under varying conditions. In direct drive a residual pressure of approximately 40 p.s.i. is maintained within the system. When overdrive is engaged this is increased to a pre-determined operating pressure.

ENGAGING OVERDRIVE

When the solenoid is energised, its valve opens and oil which is at residual pressure is directed via passage Z to the bottom of the dashpot piston. This causes the dashpot piston to rise and compress the springs causing a gradual increase in hydraulic pressure until the piston reaches its stop by which time the relief valve spring has been compressed to its working length, thus giving full operating pressure. This pressure causes the operating pistons to move forward, overcoming the clutch return springs and engages the cone clutch in the brake ring.

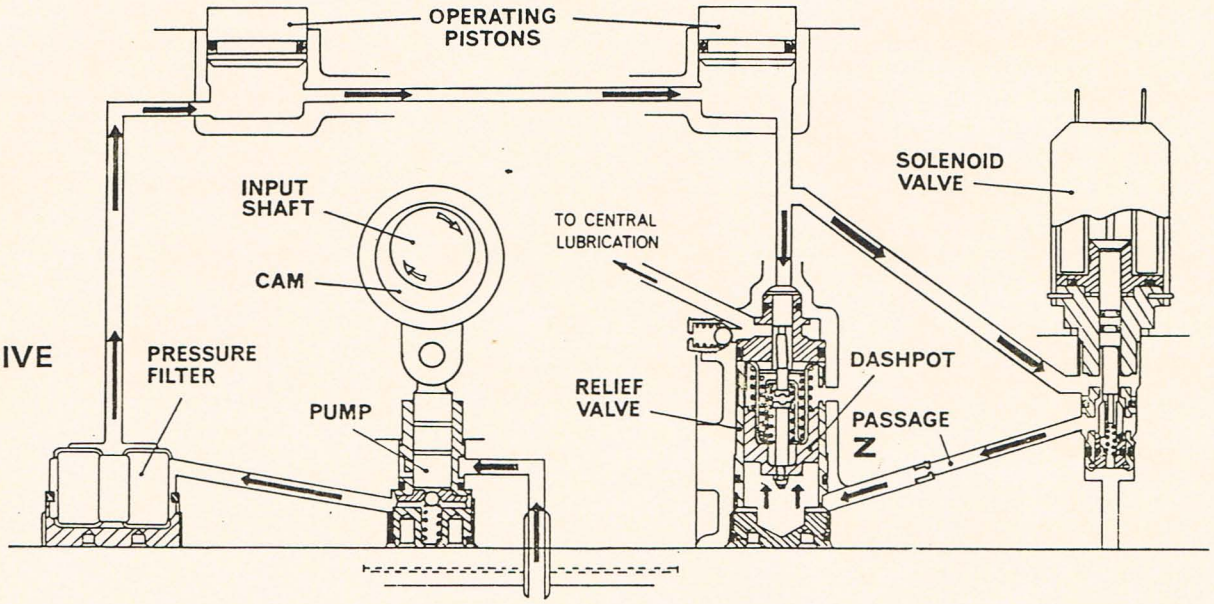


FIG. 4
OVERDRIVE

ENGAGING DIRECT DRIVE

When the solenoid is de-energised its valve is closed by a spring, cutting off the oil supply from the pump to the dashpot. Oil is now exhausted via the control orifice in passage Z which allows the relief valve spring to relax to its direct drive condition. The dashpot springs continue to move the dashpot piston to its stop, allowing the system pressure to progressively drop which enables the clutch return springs to move the cone clutch gently into contact with the annulus.

The residual pressure of approximately 40 p.s.i. is now maintained in direct drive.

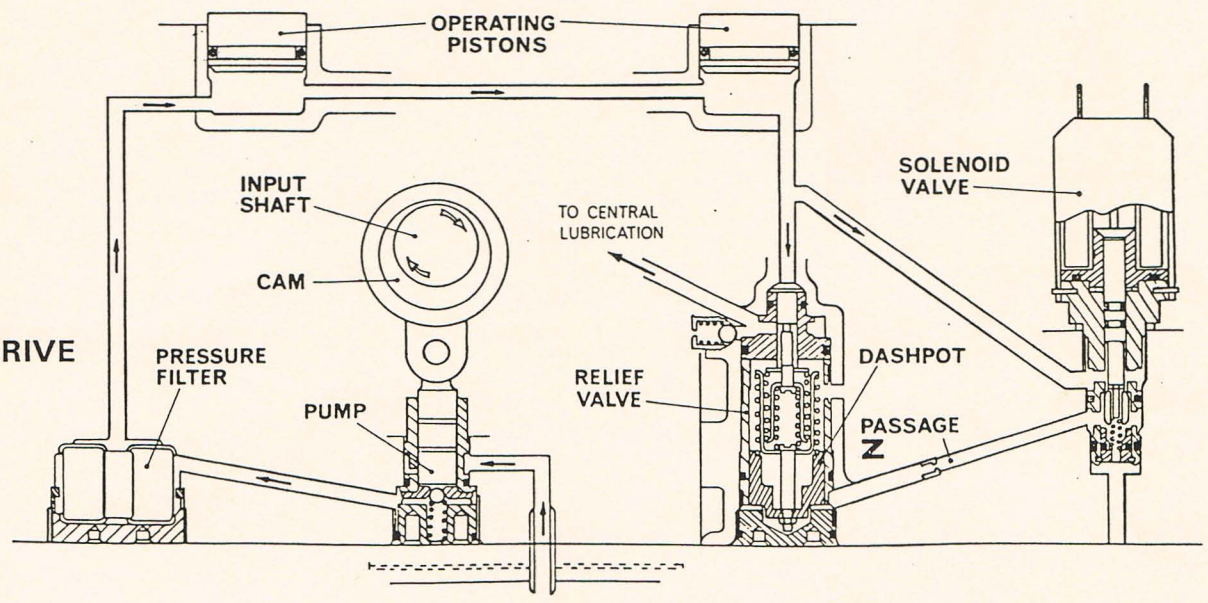


FIG. 5
DIRECT DRIVE

LUBRICATION SYSTEM

Oil is discharged through the relief valve direct to an annular channel in the centre of the main casing and then through drillings in the mainshaft to the annulus spigot bearing. Immediately in front of the spigot bearing a radial drilling passes oil through the uni-directional clutch, from here it is directed by an oil thrower into a catcher disc on the planet carrier and to the planet bearings via the hollow planet bearing pins.

A radial drilling in the annulus meters lubricant from the mainshaft axial drilling to the rear bearing in the Reverse Spline unit. The amount of pressure in the lubrication passage is controlled by the lubrication relief valve.

MAINTENANCE

When the gearbox and overdrive have a common oil supply, the level should be checked at the gearbox. To drain this type of system the sump of the overdrive must be removed as well as the gearbox drain plug. This will provide access to the suction and pressure filters, which should also be removed and cleaned before replenishing with new oil.

When separate oil systems are used for the gearbox and overdrive, an oil filler/level plug is provided for the overdrive in the adaptor plate. Following complete draining and refilling, run the transmission for a short period then re-check the oil level.

It is essential that only the approved lubricant is used for topping up and re-filling. ON NO ACCOUNT SHOULD ANY ANTI FRICTION ADDITIVES BE USED.

CLEANLINESS

Scrupulous cleanliness must be maintained throughout all servicing operations. Even minute particles of dust, dirt or lint from cleaning cloths may cause damage or interfere with the correct operation. When the overdrive and gearbox have a common oil supply, it is naturally as important that the same high standards of cleanliness must be maintained when servicing the gearbox.

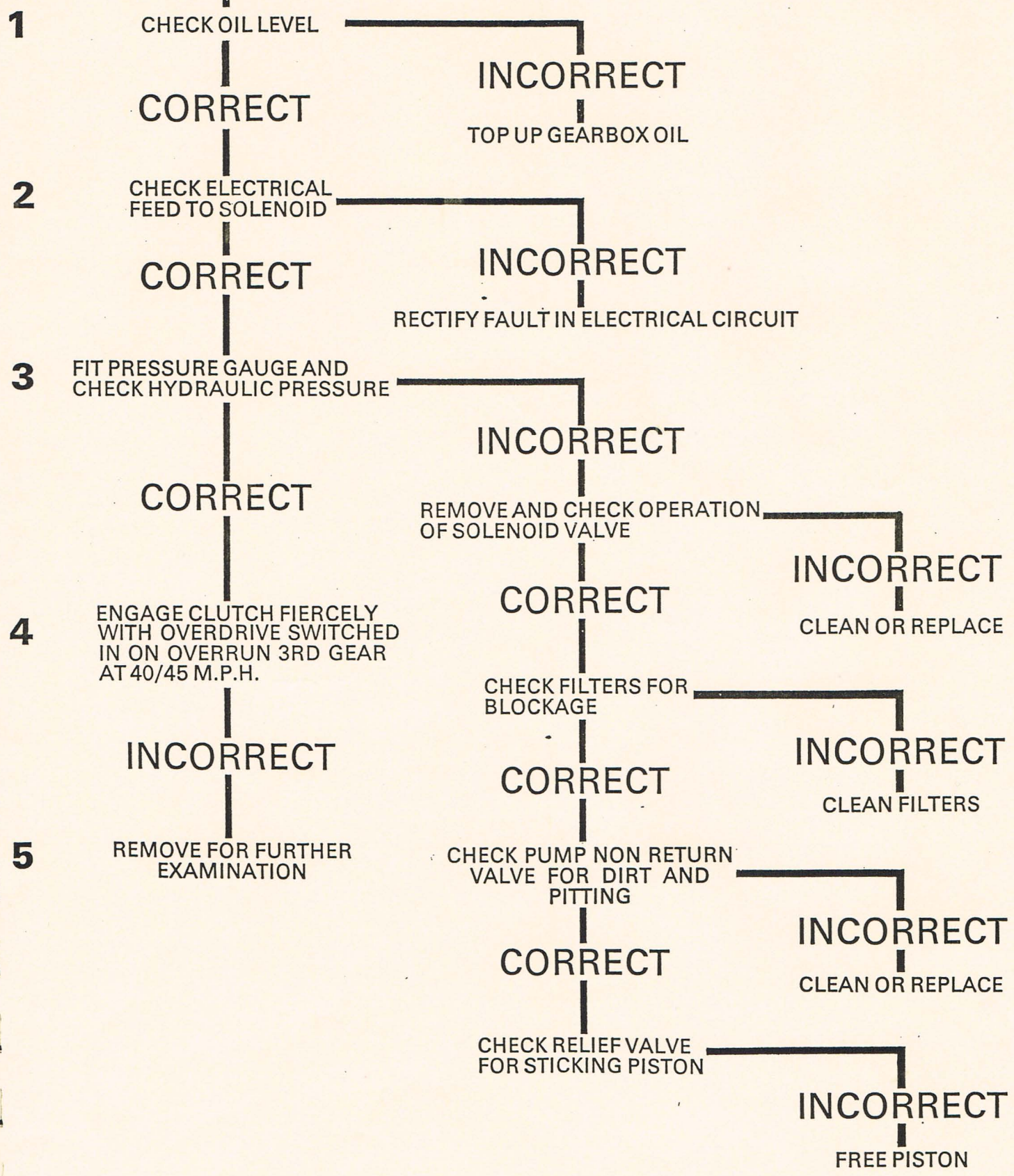
Great care must be taken to avoid the entry of dirt when topping up or re-filling.

For cleaning externally or internally use petrol or paraffin ONLY otherwise damage may occur to oil seals and other parts of the unit.

On no account should water be used during cleaning operations as this will also affect the operation of the overdrive.

FAULT FINDING

OVERDRIVE DOES NOT ENGAGE



OVERDRIVE DOES NOT DISENGAGE

(This calls for immediate attention. Do not reverse car *otherwise extensive damage may be caused)*

1 CHECK ELECTRICAL SYSTEM FOR CLOSED CIRCUIT

- INCORRECT → RECTIFY FAULT IN ELECTRICAL CIRCUIT
- CORRECT

2 FIT GAUGE AND CHECK RESIDUAL PRESSURE (40 P.S.I. APPROX.)

- INCORRECT → REMOVE SOLENOID AND CHECK FOR SEIZED PLUNGER
  - INCORRECT → CLEAN AND FREE-OFF VALVE OR REPLACE SOLENOID ASSEMBLY
  - CORRECT
- CORRECT

3 CHECK FOR STICKING CLUTCH

- INCORRECT → FREE BY GIVING BRAKE RING SEVERAL TAPS WITH A HIDE MALLET
- CORRECT

CHECK RELIEF VALVE FOR STICKING PARTS

- INCORRECT → RECTIFY OR REPLACE RELIEF VALVE IF NECESSARY
- CORRECT

CHECK CONTROL ORIFICE FOR BLOCKAGE

- INCORRECT → CLEAR BLOCKAGE

4 REMOVE OVERDRIVE AND DISMANTLE FOR FURTHER EXAMINATION

OVERDRIVE SLIPS WHEN ENGAGING

1 CHECK OIL LEVEL IN GEARBOX/OVERDRIVE

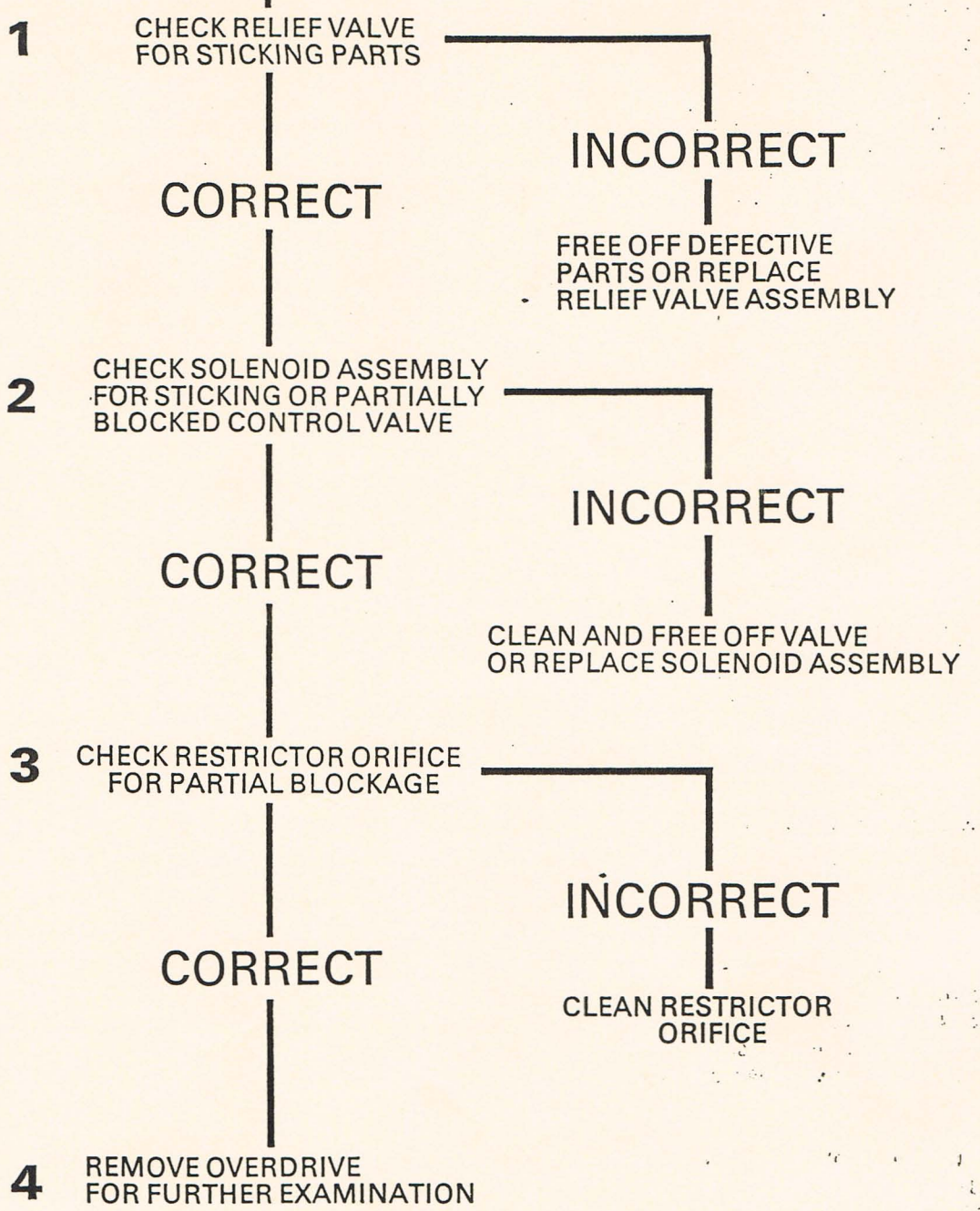
- INCORRECT → FILL TO CORRECT LEVEL
- CORRECT

2 FIT PRESSURE GAUGE AND CHECK HYDRAULIC PRESSURE (WITH OVERDRIVE ENGAGED)

- INCORRECT
  - CHECK FILTERS FOR BLOCKAGE
    - INCORRECT → CLEAN FILTERS
    - CORRECT
  - CHECK PUMP NON-RETURN VALVE FOR INCORRECT SEATING
    - INCORRECT → RE-SEAT VALVE
    - CORRECT
  - CHECK RELIEF VALVE FOR STICKING PISTON
    - INCORRECT → RECTIFY OR REPLACE RELIEF VALVE
    - CORRECT
  - CHECK SOLENOID CONTROL VALVE FOR CORRECT OPERATION
    - INCORRECT → REPLACE VALVE
- CORRECT

3 REMOVE OVERDRIVE AND CHECK FOR WORN OR GLAZED CLUTCH LININGS OR MECHANICAL OBSTRUCTION OF CONE CLUTCH

OVERDRIVE DIS-ENGAGEMENT SLOW AND/OR FREE-WHEELING ON OVERRUN



OVERHAUL OF COMPONENTS ACCESSIBLE WITHOUT REMOVING OVERDRIVE FROM CAR

CHECKING OIL PRESSURE

After first ensuring that the oil level is correct remove the plug adjacent to solenoid and fit hydraulic pressure gauge (L.188) together with adapter (L.188-2). With the car jacked up run the transmission at approximately 25 m.p.h. In direct drive the residual pressure should register on the gauge to approximately 40 p.s.i. When overdrive is engaged, a pressure corresponding with that specified for the car model in the manufacturers handbook should be recorded. Disengage overdrive and the gauge should return to show residual pressure.

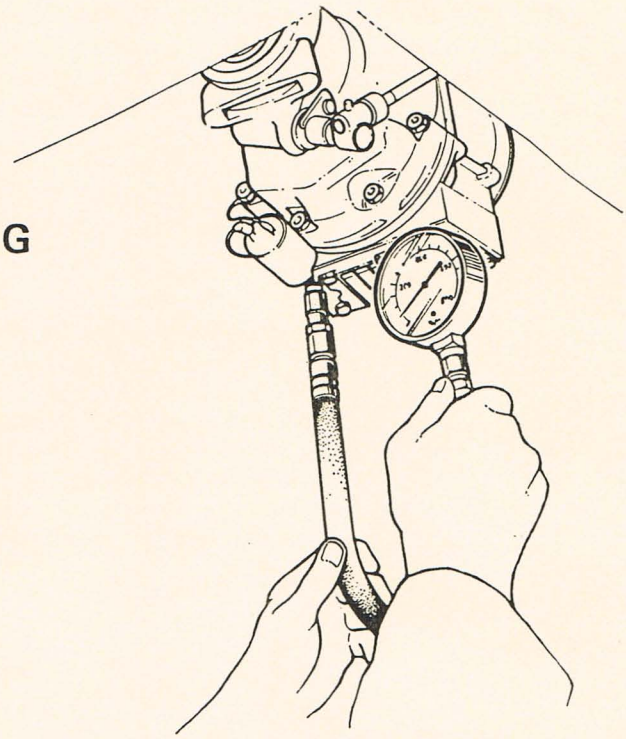


FIG. 6. CHECKING OIL PRESSURE

SOLENOID CONTROL VALVE

The solenoid and operating valve are a self contained factory sealed unit.

REMOVAL

The assembly can be removed by means of a thin 1" (25 mm) A/F open ended spanner. DO NOT ATTEMPT TO REMOVE BY GRIPPING CYLINDRICAL BODY OF SOLENOID VALVE.

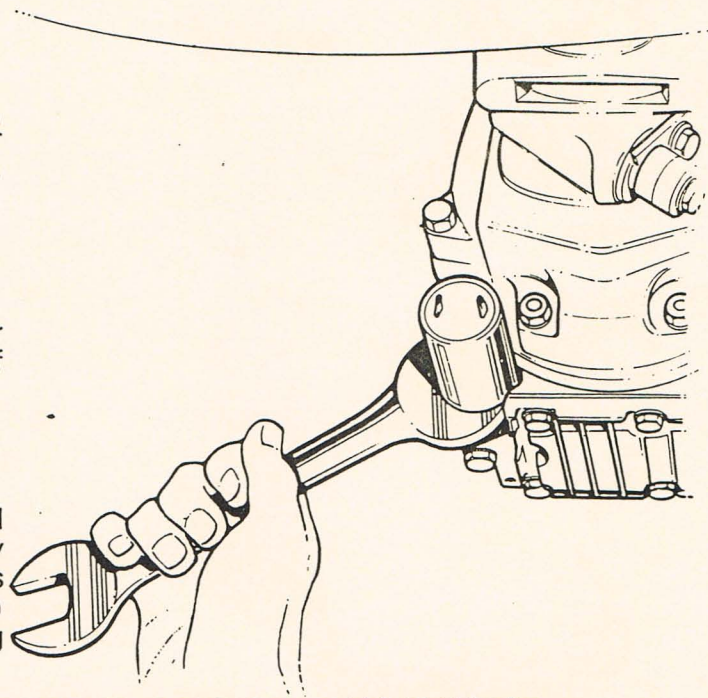


FIG. 7. REMOVAL OF SOLENOID

INSPECTION

Examine the "O" rings on the solenoid valve for damage and renew together with sealing washer if necessary.

TESTING

Test the solenoid coil with a 12v battery and ammeter. The solenoid should draw approximately 2 amps. Check that the plunger in the valve moves forward when the solenoid is energised (arrowed) and is returned to its direct drive position by spring pressure when de-energised.

NOTE: The solenoid does not operate with a loud click as in other types of overdrives.
Should it be necessary to clean the operating valve, immerse this part of the solenoid valve in PARAFFIN until the valve is clean.

If faulty the complete unit must be renewed.

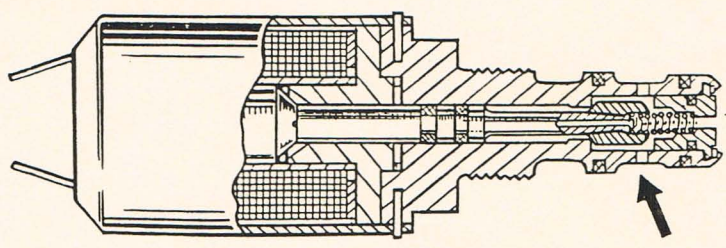


FIG. 8. SOLENOID CONTROL VALVE

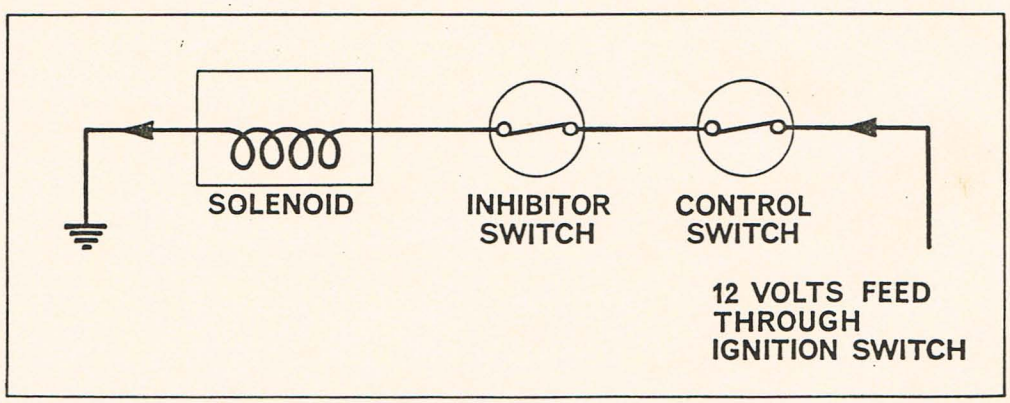
THE ELECTRICAL CONTROL SYSTEM

The solenoid is fed from a control switch in the ignition circuit and has in series a gearbox isolating switch. The isolating switch contacts are controlled by the gearbox selector mechanism, opening them when gears are engaged on which overdrive is not to be used, e.g. first and reverse.

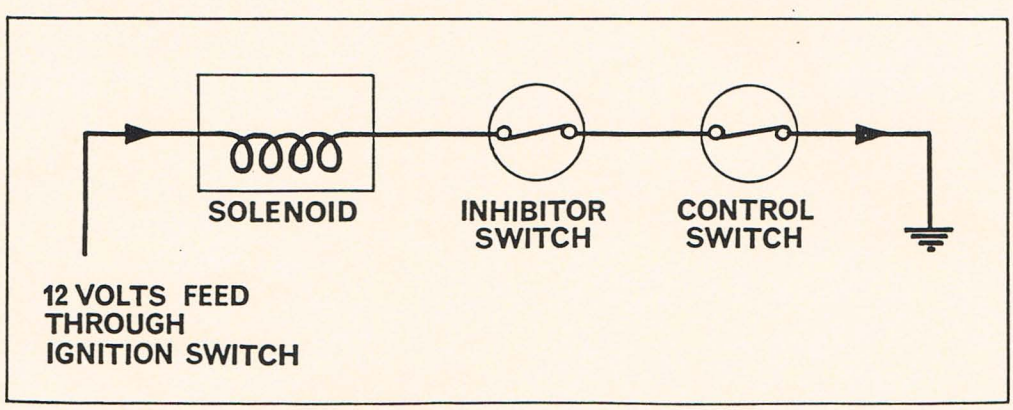
FAULT FINDING

Disconnect the live feed to solenoid and connect a test lamp between this wire and earth. Next engage top gear and with ignition on put the manual switch in the engaged position. The test lamp should now light, if not trace the fault in the electrical system, e.g. wiring, control or isolating switch. If the test lamp remains lit when gears are selected on which overdrive is not used, suspect the isolating switch.

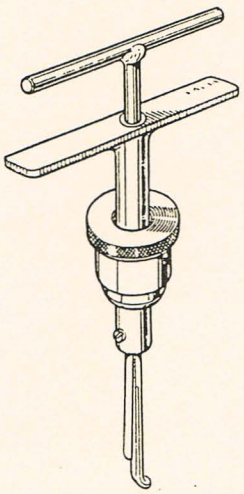
FIG. 10. **ELECTRICAL CIRCUIT DIAGRAM**



The electrical control system may differ according to the car manufacturer's preference and an alternative circuit is shown below.



RELIEF VALVE AND DASHPOT ASSEMBLY



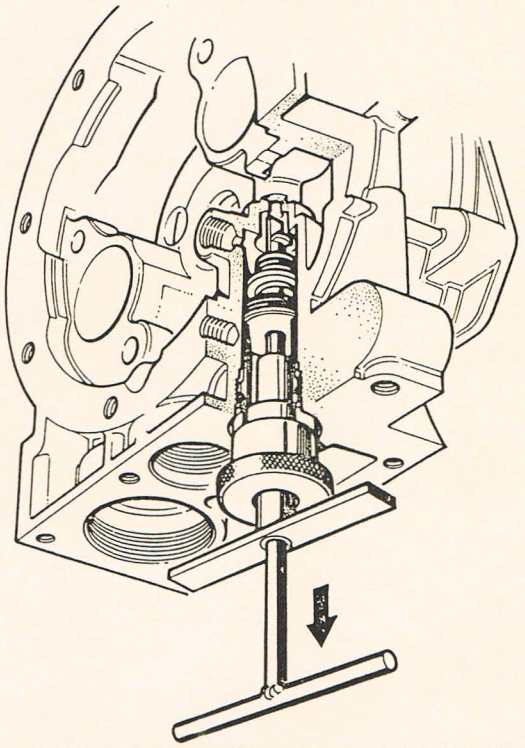


FIG. 11. REMOVAL OF RELIEF VALVE BODY AND SLEEVE

REMOVAL

Access to the relief valve is gained by removing the overdrive sump and gauze filter. If the vehicle has been in recent use care should be taken to avoid burns from the hot oil which will be released. Using Churchill Tool L.354 remove the relief valve plug. Next withdraw the dashpot piston complete with its component springs and cup. followed by the residual pressure spring. (Note this is the only loose spring in the general assembly). The relief valve piston assembly can now be withdrawn by carefully pulling down with a pair of suitable pliers. Next insert tool L.401A into the now exposed relief valve bore (taking care not to damage this) and withdraw the relief valve body together with the dashpot sleeve.

INSPECTION

Inspect the pistons and ensure they move freely in their respective housings. Check that the "O" rings are in good condition.

DO NOT DISMANTLE THE DASHPOT AND RELIEF VALVE PISTON ASSEMBLIES OTHERWISE THE PRE-DETERMINED SPRING PRESSURES WILL BE DISTURBED.

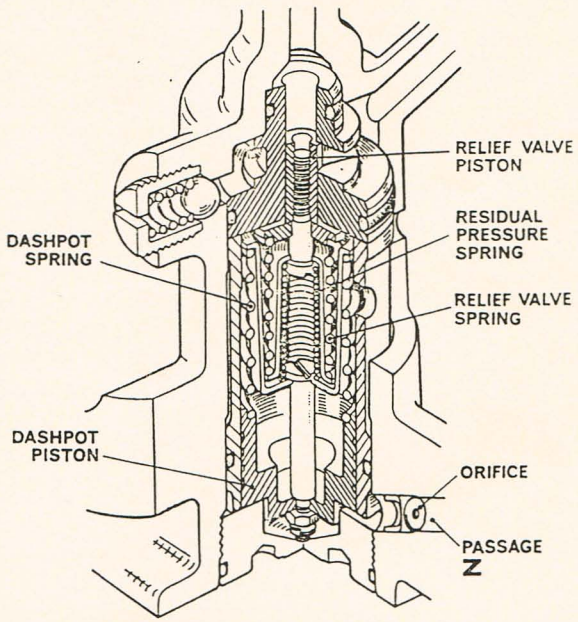


FIG. 12. RELIEF VALVE AND DASHPOT ASSEMBLY

RE-FITTING

Before assembling ensure that all component parts are clean and lightly oiled. Insert the relief body in the bore, and using the relief valve outer sleeve push fully home (NOTE the end with the "O" ring is nearest to the outside of the casing).

Next position the relief valve spring and piston assembly into the dashpot cup taking care that both ends of the residual pressure spring are correctly located. Carefully position these components in the relief valve outer sleeve at the same time engaging the relief valve piston in its housing.

Finally fit the base plug and tighten flush with the casing to 16 lbs. ft.

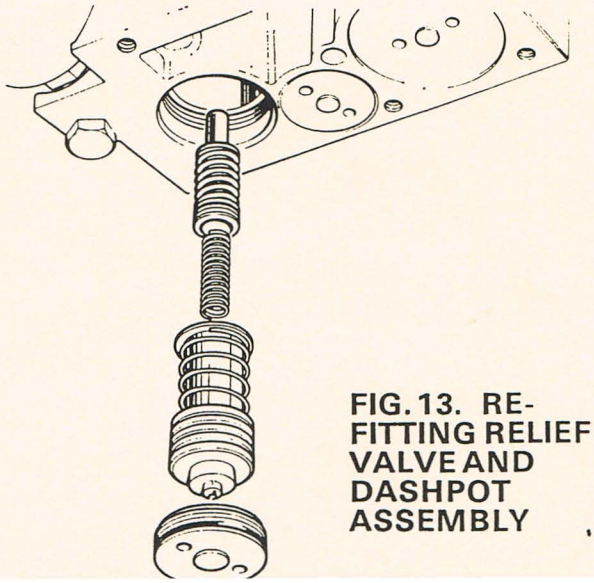


FIG. 13. RE-FITTING RELIEF VALVE AND DASHPOT ASSEMBLY

CONTROL ORIFICE

The control orifice is situated in the angle drilling between the relief valve and solenoid control valve. To gain access remove the solenoid control valve, relief valve and outer sleeve. Clean the orifice with a high pressure air line.

DO NOT ATTEMPT TO CLEAN THE ORIFICE WITH WIRE OR ITS CALIBRATION MAY BE IMPAIRED.

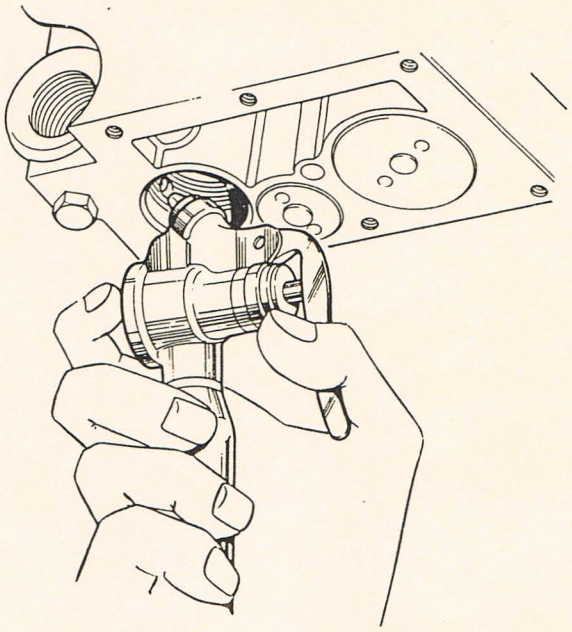


FIG. 14. CLEANING CONTROL ORIFICE

PUMP NON-RETURN VALVE

REMOVAL

Access to the pump non-return valve is gained by removing the overdrive sump and suction filter. Then using Churchill Tool L.354 remove the pump plug taking care not to lose the non-return valve spring and ball. The pump valve seat can now be withdrawn. The pump body will be held in position by its "O" ring. If it is necessary to remove this, rotate the propeller shaft until the pump plunger is at the top of its stroke. Next carefully withdraw the pump body by hooking a piece of wire into the now exposed inlet port.

INSPECTION

Clean and carefully inspect the non-return valve ball and valve seat and ensure that the "O" rings are not damaged.

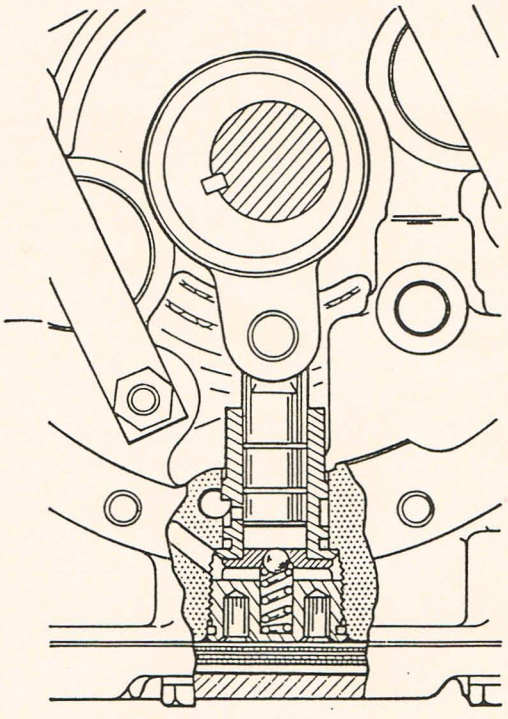


FIG. 15. PUMP ASSEMBLY

RE-FITTING

First place the spring in the non-return valve plug, then position the ball on the spring. The non-return seat can now be located on the ball and the complete assembly screwed into the maincase using tool L.354, and tighten to 16 lbs. ft.

PRESSURE FILTER

To gain access to pressure filter remove sump and suction filter, then using tool L.354 remove pressure filter base plug. The filter element will come away with the plug. Note the aluminium washer which locates on the shoulder in the filter bore.

Remove foreign matter and thoroughly wash the element in petrol or paraffin.

When re-fitting, renew the aluminium washer if there are any signs of damage or scoring. Finally tighten the plug to 16 lbs. ft.

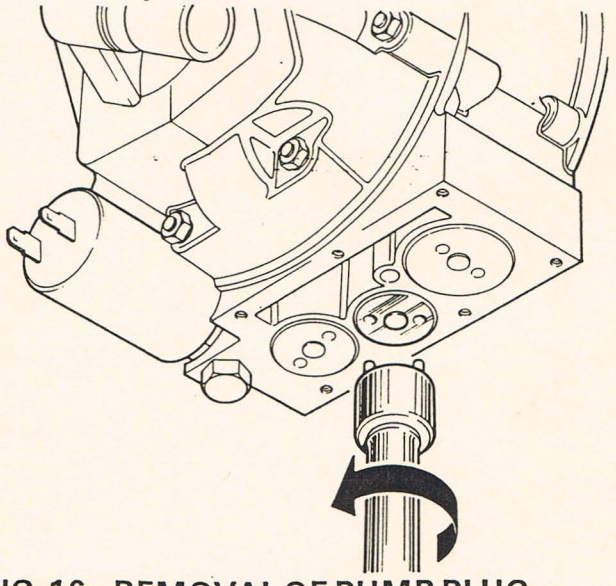


FIG. 16. REMOVAL OF PUMP PLUG

OVERDRIVE UNIT REMOVAL

NOTE: Before commencing overdrive removal it is advisable to drive the car and engage overdrive then disengage with the clutch depressed leaving the overdrive ready for removal. This will release the spline loading between the planet carrier and uni-directional clutch which could make removal difficult.

If this procedure has not been carried out and difficulty is experienced in removing the overdrive from the gearbox shaft proceed as follows. Screw pressure adaptor L.402 into the pressure take-off tapping and then energise the solenoid. A grease gun charged with engine oil can then be used to pressurise the unit via the pressure adaptor thus releasing the spline loading.

To separate the overdrive from the gearbox remove the eight $\frac{1}{4}$" U.N.F. nuts securing the unit to the adaptor plate. The overdrive can now be withdrawn from the mainshaft leaving the adaptor plate in position on the gearbox.

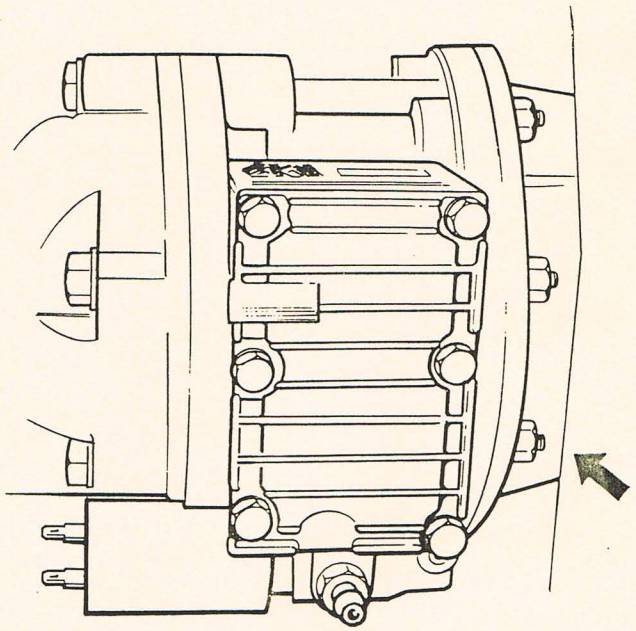


FIG. 17. OVERDRIVE SECURING NUTS (Arrowed)

DISMANTLING

SPECIAL TOOLS

A complete set of special tools can be obtained as listed in Appendix A. Before starting to dismantle the assembly, the exterior of the casings must be thoroughly cleaned.

The overdrive can now be divided into four main sub assemblies as shown in Fig. (18).

1. Main Casing and Brake Ring.
2. Clutch Sliding Member, Sunwheel and Bearing
3. Planet Carrier and Gear Train.
4. Rear Casing and Annulus.

To dismantle into these sub assemblies proceed as follows.

Mount the unit vertically in a vice. The use of jaw protectors is recommended.

Next remove the operating piston bridge pieces.

The six nuts securing the main casing to the rear case can now be removed. These should be undone progressively to release the clutch return spring pressure. Note the position of copper washers which fit on the two studs at the top of the casing. The main casing complete with brake ring can now be separated from the rear case. Next lift out the sliding member assembly complete with sunwheel, followed by the planet carrier assembly, taking care not to damage the oil catcher which is attached to the underside of the carrier.

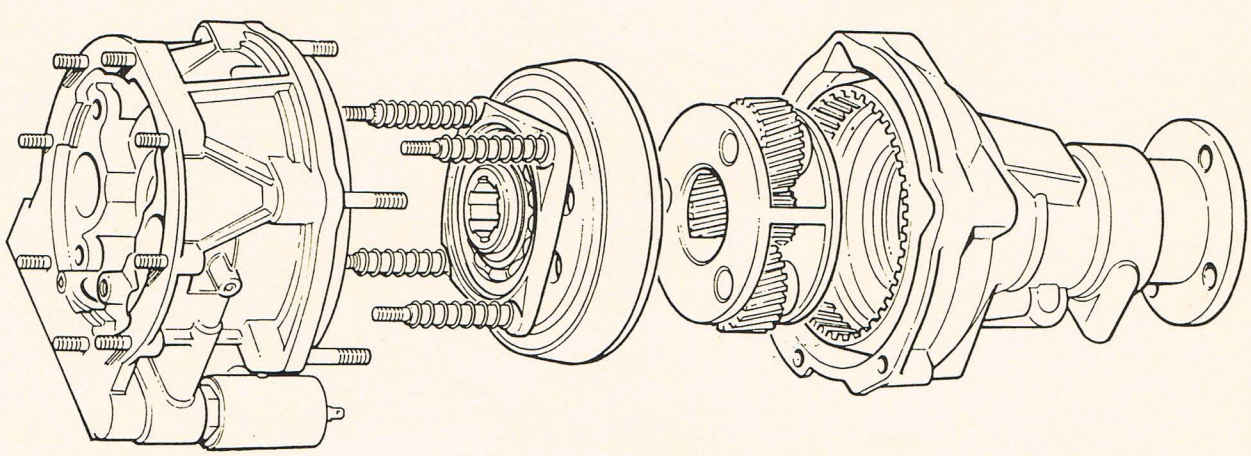


FIG. 18. FOUR MAIN SUB-ASSEMBLIES

DISMANTLING, INSPECTING AND ASSEMBLING THE FOUR MAIN SUB ASSEMBLIES

MAIN CASING AND BRAKE RING

DISMANTLING

Tap the brake ring from its spigot in the main casing with a suitable drift. Using a pair of pliers withdraw the operating pistons. Next remove the sump and suction filter.

The removal, inspection and assembly of the remaining components in the main casing i.e. relief valve assembly, pump body and non-return valve, pressure filter and solenoid control valve, are described under their respective headings on previous pages. The pump plunger assembly can be lifted out after removing pump body.

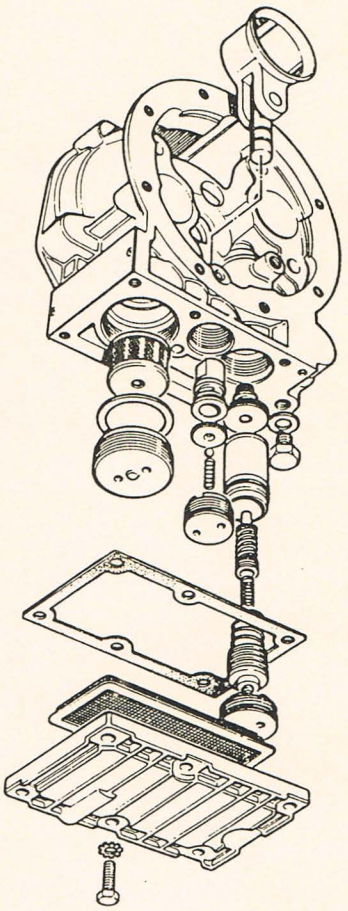


FIG. 19. MAIN CASE DISMANTLED

INSPECTION

Inspect the main casing for cracks or damage. Examine the operating cylinder bores for scores or wear. Check the operating pistons for wear and replace sealing rings if there is any sign of damage. Check the pump plunger assembly, ensuring that the strap is a good fit on the mainshaft cam and that there is no excess play between the plunger and strap.

If the pump plunger assembly is worn or damaged, this must be replaced as a complete assembly.

ASSEMBLY

Lightly smear the operating pistons with oil and re-fit. Next position a new gasket on the main casing and fit the brake ring ensuring it is fully home on its spigot location (NOTE: no jointing compound is required).

Re-fit remaining components as previously described.

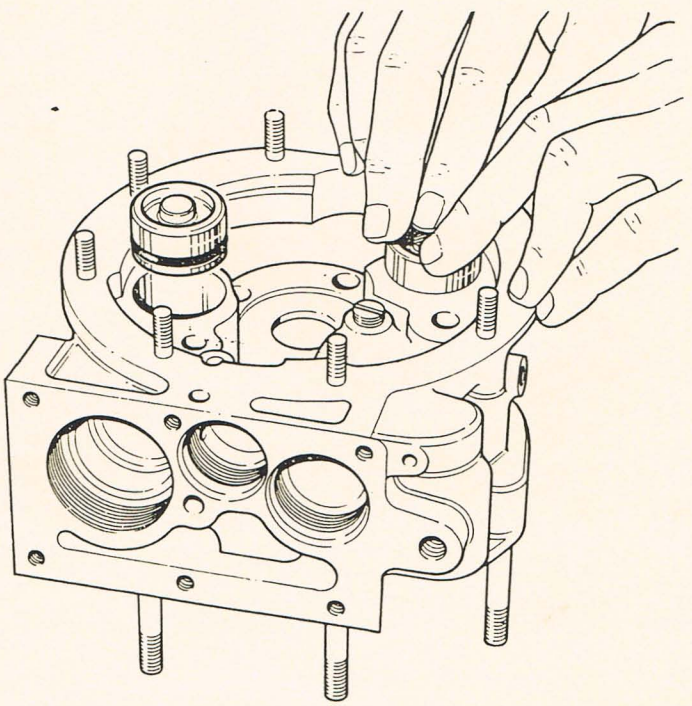


FIG. 20. RE-FITTING OPERATING PISTONS

CLUTCH SLIDING MEMBER ASSEMBLY

DISMANTLING

Remove the circlip from the sunwheel extension and take out the sunwheel. Next remove the circlip from its groove on the cone clutch hub and tap the clutch from the thrust ring bearing using a hide mallet. The bearing can now be pressed from its housing after first extracting the larger circlip which retains it.

INSPECTION

Examine the clutch linings on the sliding member for any signs of excessive wear or charring. If there is any sign of this condition the sliding member assembly complete must be replaced. (It is not possible to fit new linings as these are precision machined after bonding). Check the ball race and ensure that it rotates smoothly as this can be a source of noise when running in direct gear.
Examine the clutch return springs for any signs of distortion or collapse.

Inspect the sunwheel teeth for wear or damage.

ASSEMBLY

Fit the ball race into its housing and secure with the large circlip. Position this assembly onto the hub of the cone clutch and fit the circlip into its groove. Next insert the sunwheel into the hub and fit the circlip on the sunwheel extension.

PLANET CARRIER ASSEMBLY

INSPECTION

Inspect the planet gears for damage or wear. Check the planet gear bearings for any excessive clearance. Examine the oil catcher for damage.

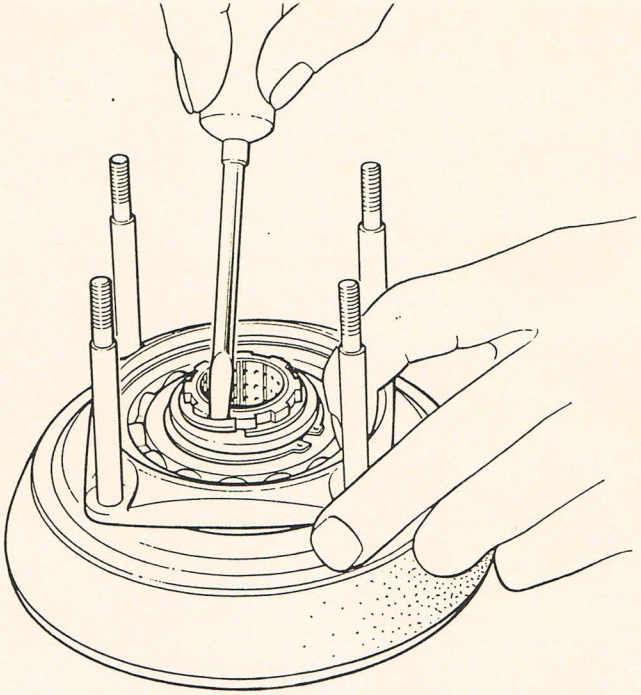


FIG. 21. REMOVING SUNWHEEL CIRCLIP

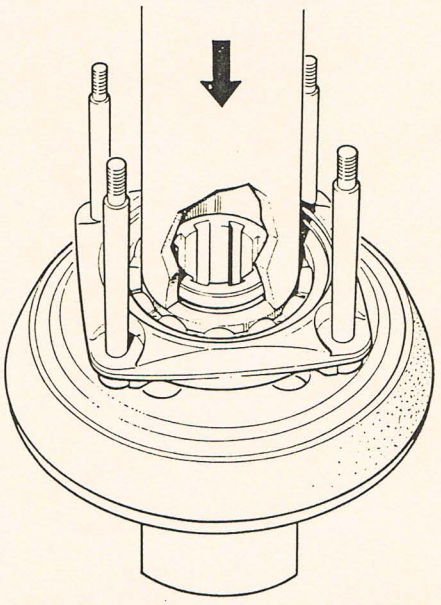


FIG. 22. RE-ASSEMBLY OF SLIDING MEMBER

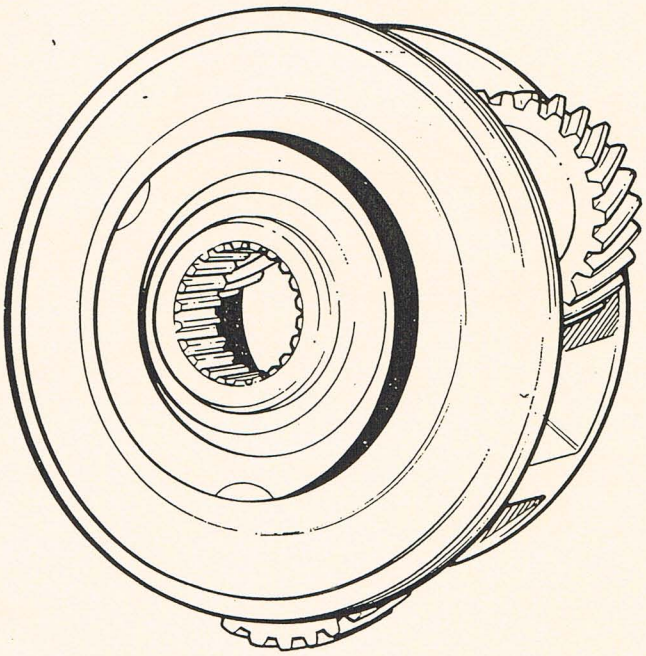


FIG. 23. PLANET CARRIER ASSEMBLY

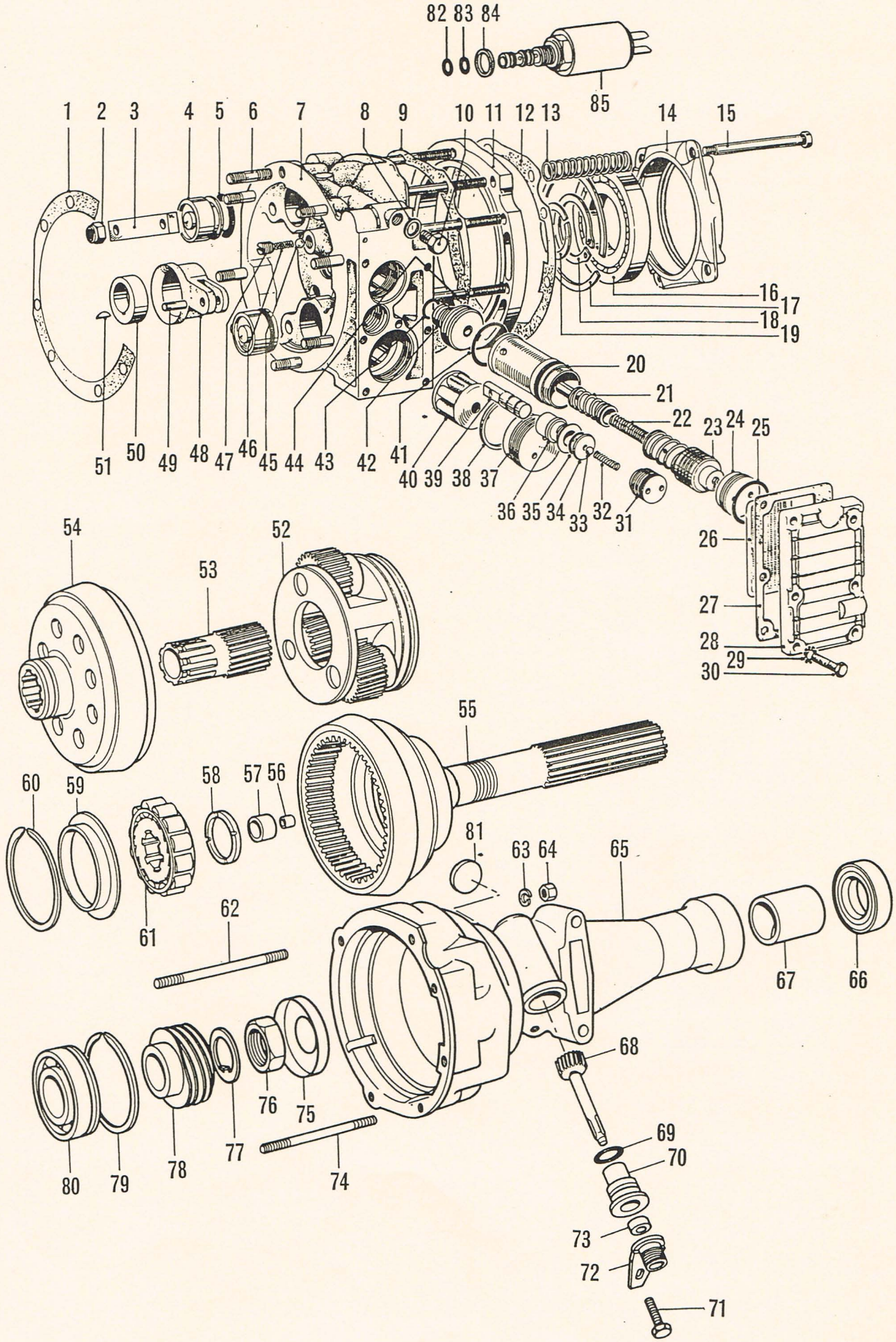
Laycock

'J' Type Overdrive

SERVICE MANUAL

Laycock Overdrive

REVERSE SPLINE MODEL



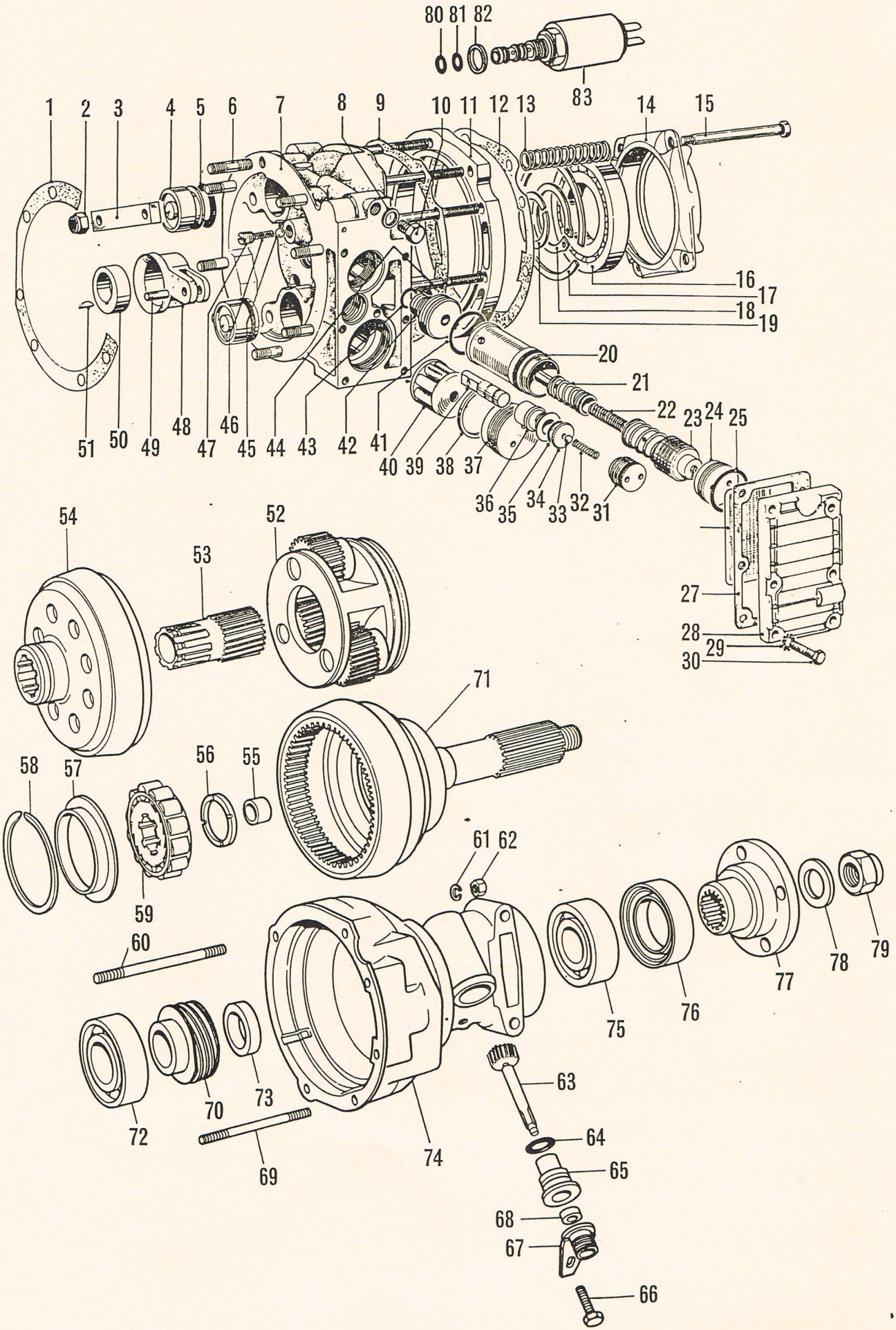
KEY TO EXPLODED DRAWING

Reverse Spline Model

Item no.	Description	Item no.	Description
1.	Gasket	44.	Stud
2.	Self locking nut	45.	Steel ball
3.	Bridge piece	46.	Lubrication relief valve spring
4.	Operating piston	47.	Lubrication relief valve plug
5.	'O' ring	48.	Pump strap
6.	Stud	49.	Pump pin
7.	Main case	50.	Cam
8.	Washer (copper)	51.	Woodruff key
9.	Gasket	52.	Planet carrier assembly
10.	Pressure tapping plug	53.	Sunwheel
11.	Brake ring	54.	Clutch sliding member
12.	Gasket	55.	Annulus
13.	Clutch return spring	56.	Restrictor plug
14.	Thrust ring	57.	Mainshaft support bush
15.	Thrust pin	58.	Thrust washer
16.	Thrust ball race	59.	Oil thrower
17.	Retaining circlip	60.	Circlip
18.	Circlip for sliding member	61.	Uni-directional clutch assembly
19.	Circlip for sun wheel	62.	Stud
20.	Dashpot sleeve	63.	Shakeproof washer
21.	Relief valve assembly	64.	Nut
22.	Residual pressure spring	65.	Rear case
23.	Dashpot piston assembly	66.	Oil seal
24.	Dashpot plug	67.	Bearing bush
25.	'O' ring	68.	Speedo driven gear
26.	Sump filter	69.	'O' ring
27.	Sump gasket	70.	Speedo bearing
28.	Sump	71.	Setscrew
29.	Star washer	72.	Speedo connector
30.	Bolt	73.	Oil seal
31.	Pump plug	74.	Stud
32.	Non-return valve spring	75.	Weir
33.	Steel ball	76.	Locking nut
34.	Non-return valve seat	77.	Speedo tabwasher
35.	'O' ring	78.	Speedo driving gear
36.	Pump body	79.	Annulus ball race circlip
37.	Pressure filter plug	80.	Annulus front ball race
38.	Pressure filter washer	81.	Welch washer
39.	Pump plunger	82.	'O' ring
40.	Pressure filter	83.	'O' ring
41.	'O' ring	84.	Washer
42.	Relief valve body	85.	Solenoid
43.	'O' ring		

Laycock Overdrive

FIXED FLANGE MODEL



KEY TO EXPLODED DRAWING

Fixed Flange Model

Item no.	Description	Item no.	Description
1.	Gasket	43.	'O' ring
2.	Self locking nut	44.	Stud
3.	Bridge piece	45.	Steel ball
4.	Operating piston	46.	Lubrication relief valve spring
5.	'O' ring	47.	Lubrication relief valve plug
6.	Stud	48.	Pump strap
7.	Main case	49.	Pump pin
8.	Washer (copper)	50.	Cam
9.	Gasket	51.	Woodruff key
10.	Pressure tapping plug	52.	Planet carrier assembly
11.	Brake ring	53.	Sunwheel
12.	Gasket	54.	Clutch sliding member
13.	Clutch return spring	55.	Mainshaft support bush
14.	Thrust ring	56.	Thrust washer
15.	Thrust pin	57.	Oil thrower
16.	Thrust ball race	58.	Circlip
17.	Retaining circlip	59.	Uni-directional clutch assembly
18.	Circlip for sliding member	60.	Stud
19.	Circlip for sun wheel	61.	Shakeproof washer
20.	Dashpot sleeve	62.	Nut
21.	Relief valve assembly	63.	Speedo driven gear
22.	Residual pressure spring	64.	'O' Ring
23.	Dashpot piston assembly	65.	Speedo bearing
24.	Dashpot plug	66.	Setscrew
25.	'O' ring	67.	Speedo connector
26.	Sump filter	68.	Oil seal
27.	Sump gasket	69.	Stud
28.	Sump	70.	Speedo driving gear
29.	Star washer	71.	Annulus
30.	Bolt	72.	Annulus front ball race
31.	Pump plug	73.	Spacer
32.	Non-return valve spring	74.	Rear case
33.	Steel ball	75.	Annulus rear ball race
34.	Non-return valve seat	76.	Oil seal
35.	'O' ring	77.	Coupling flange
36.	Pump body	78.	Washer
37.	Pressure filter plug	79.	Self locking nut
38.	Pressure filter washer	80.	'O' ring
39.	Pump plunger	81.	'O' ring
40.	Pressure filter	82.	Washer
41.	'O' ring	83.	Solenoid
42.	Relief valve body		

REAR CASING, ANNULUS AND UNI-DIRECTIONAL CLUTCH (REVERSE SPLINE TYPE)

DISMANTLING

Using a screwdriver blade remove the circlip retaining the uni-directional clutch. The oil thrower ring can now be lifted out. Next place tool No. L.178A over the now exposed undirectional clutch and lift the inner member complete with rollers into the special tool. The bronze thrust washer can now be removed. Next withdraw the speedometer driven gear and bearing. To remove the annulus first drive a punch into the welch plug at the top of the rear casing and lever out. Next using circlip pliers (7066) and plier points (7066L) expand the circlip which secures the annulus bearing. A light blow with a hide mallet upon the end of the annulus will drive out the annulus complete with bearing from the rear casing. Remove the nut securing the speedometer driving gear and with the aid of a universal extractor withdraw the ball race. Note the oil weir (arrowed) is pressed into the rear case to ensure an adequate supply of oil to the rear bush and should not be removed.

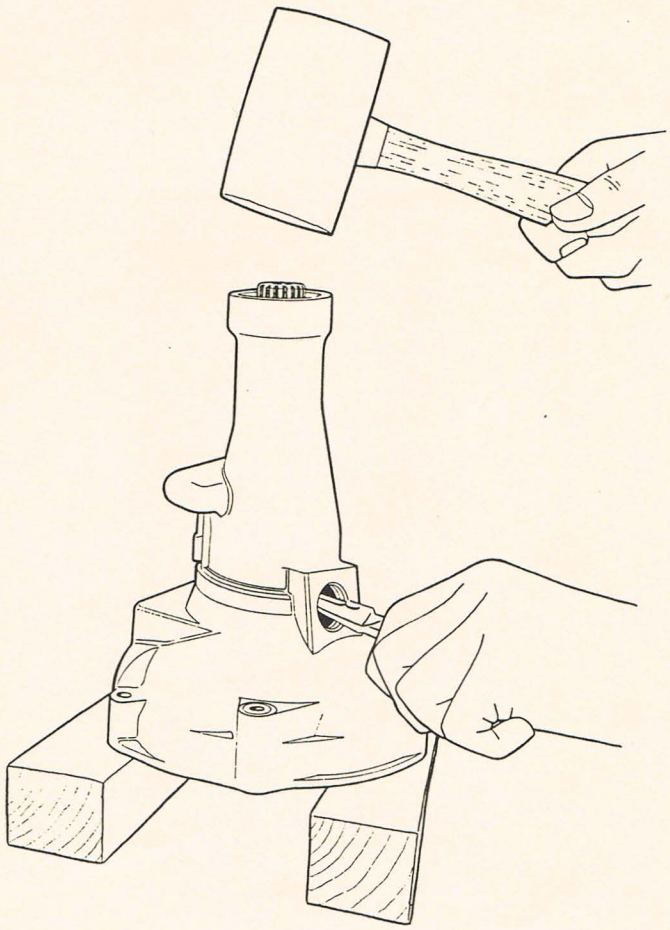


FIG. 24. REMOVING ANNULUS

INSPECTION

Inspect the teeth and cone surface of the annulus for wear. Check that the uni-directional clutch rollers are not chipped and that the inner and outer members are free from damage. Examine the spring and cage for distortion. Ensure the lubrication port to the rear of the annulus (arrowed) is clear. Finally examine the rear casing bush and oil seal for wear or damage.

ASSEMBLY

Fit a new annulus ball race. Next fit the speedometer driving gear with the plain portion facing the ball race and secure with nut and new locking washer. Tighten to 50-60 lbs.ft. Position the ball race circlip in the rear casing and expand using circlip pliers (7066) and plier points (7066L). Next press the annulus through the circlip and into the casing, using a load of 840 lb. max., until the bearing is fully home and the circlip is located in its groove. Care should be taken during this operation not to damage the rear bush and oil seal. Fit a new welch plug and secure by striking lightly in the centre with a suitable size flat faced punch.

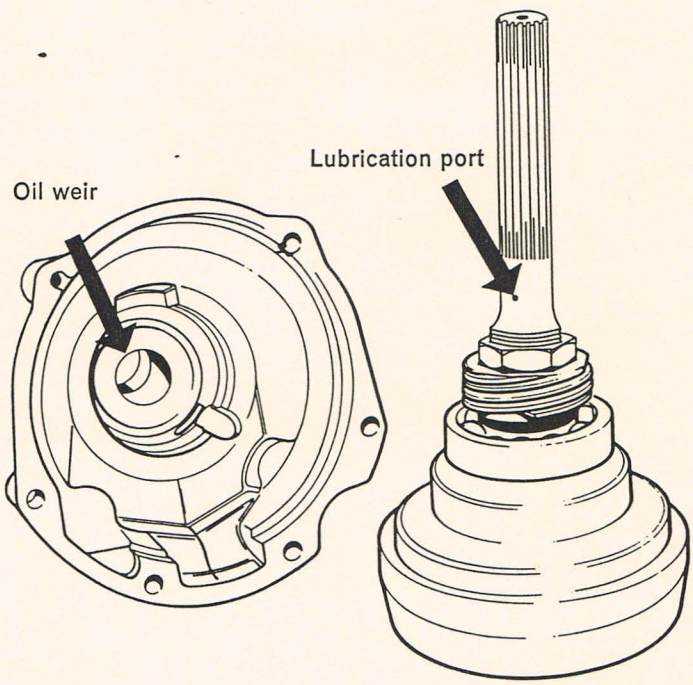


FIG. 25. REAR CASE AND ANNULUS

REAR CASING, ANNULUS AND UNI-DIRECTIONAL CLUTCH (Continued)

ASSEMBLY

Next position the spring and inner member of the uni-directional clutch into the cage, locating the spring so that the cage is spring loaded in an anti-clockwise direction when viewed from the front. Place this assembly into tool 178A with the open side of the cage uppermost and feed the clutch in a clockwise direction until all the rollers are in place. Re-fit the bronze thrust washer in the recess in the annulus. Transfer the uni-directional clutch assembly from the special assembly tool into its outer member in the annulus. Re-fit oil thrower and secure with circlip. Check that the clutch rotates in an anti-clockwise direction only.

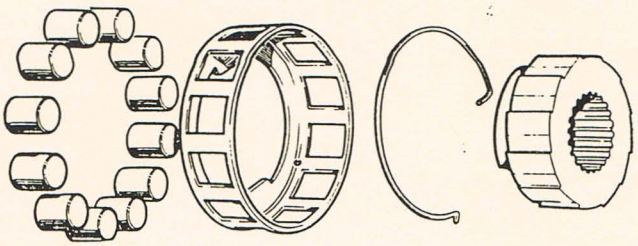


FIG. 26. UNI-DIRECTIONAL CLUTCH COMPONENTS

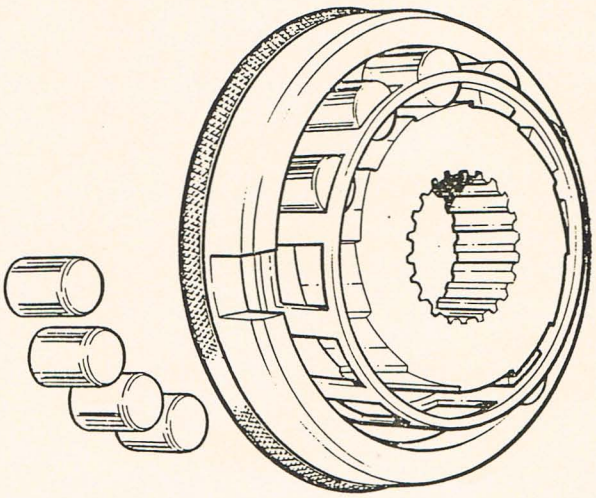


FIG. 27. UNI-DIRECTIONAL CLUTCH ASSEMBLY

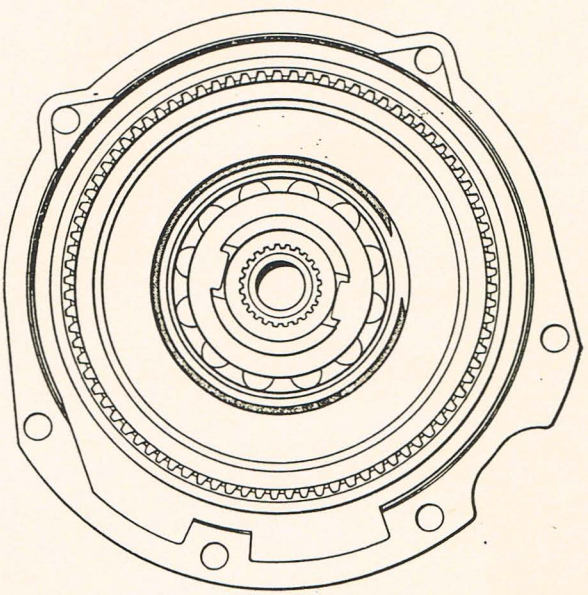


FIG. 28. UNI-DIRECTIONAL CLUTCH IN POSITION

REAR CASING, ANNULUS AND UNI-DIRECTIONAL CLUTCH (Continued)

FIXED FLANGE

DISMANTLING

First remove the uni-directional clutch as previously described. Remove the speedometer driven gear. Next remove the coupling flange nut and washer then withdraw the flange using a suitable extractor. The annulus may now be drifted out using a hide mallet applied to the end of the tail shaft. The front bearing speedometer driving gear and spacer will be withdrawn together with the annulus. The rear bearing and oil seal will remain in position in the rear casing and can now be driven out.

INSPECTION

As previously described under Reverse Spline.

ASSEMBLY

Position the speedometer driving gear in the rear casing with its plain boss facing the front bearing (NOTE: Speedometer driving gear cannot be fitted from the rear of the casing). Next press the front bearing into the rear casing, ensuring that its outer track abuts against the shoulder in the casing. Position the annulus with the inner face resting on a suitable packing piece. Using tool L.186 press the front bearing together with the rear casing and speedometer driving gear onto the annulus until the bearing abuts on the locating shoulder. Next fit the spacer onto the annulus. Using tool L.186 press the rear bearing onto the annulus and into the rear casing simultaneously. Fit the oil seal using tool L.177. Finally press on the coupling flange and secure with washer and self locking nut. Tighten to a torque figure of 120 to 130 lbs.ft.

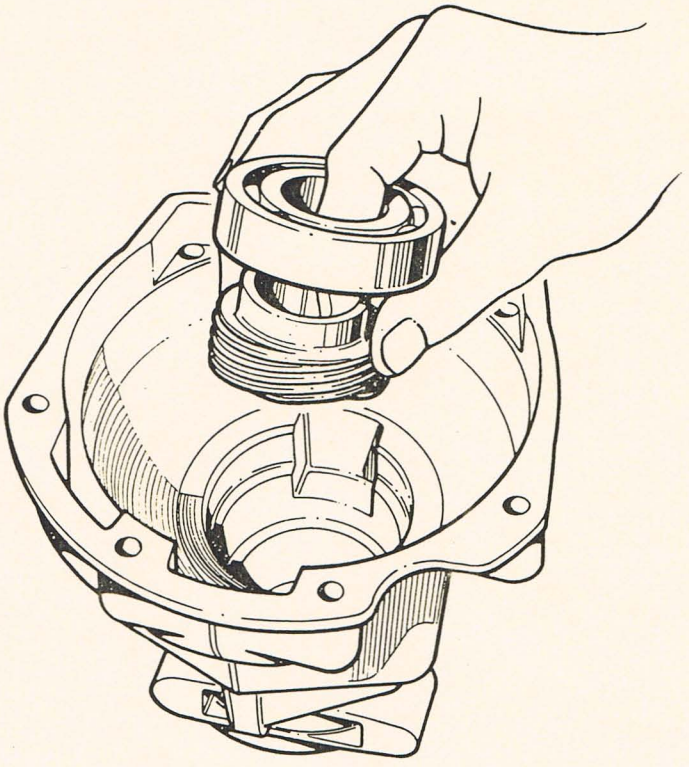


FIG. 29. POSITIONING FRONT ANNULUS BEARING & SPEEDO DRIVING GEAR IN REAR CASING

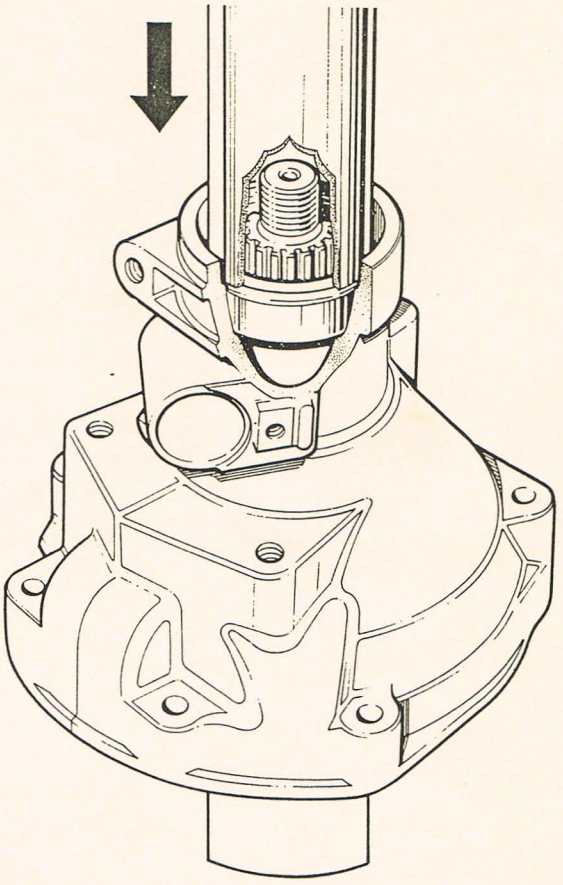


FIG. 30. FITTING ANNULUS USING TOOL L.186

FINAL ASSEMBLY

NOTE: Jointing compound should not be used during assembly.

Mount the rear casing assembly vertically in a vice and insert the planet carrier assembly (Note the gears can be meshed in any position). Next place the sliding member assembly complete with clutch return springs onto the cone of the annulus, at the same time engaging the sunwheel with the planet gears. Fit the brake ring into its spigot in the tail casing using a new joint on both sides. Position the main casing assembly on to the thrust housing pins at the same time entering the studs in the brake ring. Next fit the two operating piston bridge pieces and secure with four new locknuts. Finally fit and progressively tighten the six nuts securing the rear and main casing assemblies, ensuring that the two top studs (arrowed) are coated with Wellseal and have copper washers located on same studs. The clutch return spring pressure will be felt as the two casings go together.

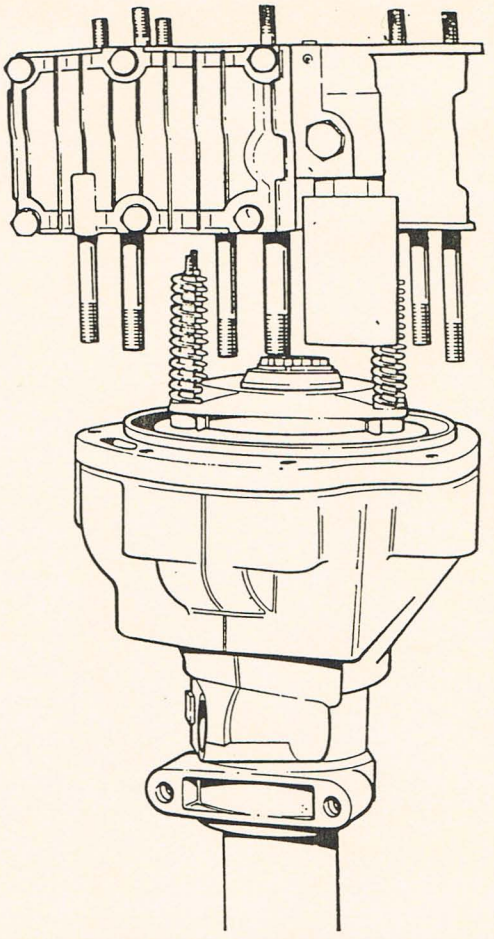


FIG. 31. RE-FITTING MAIN CASE ASSEMBLY

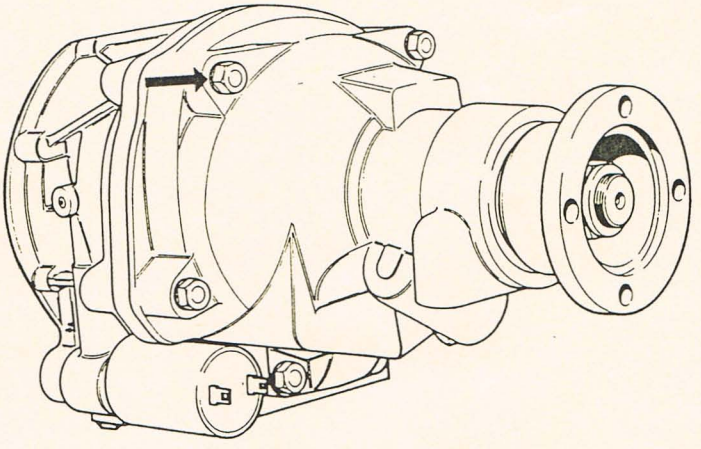


FIG. 32.
RE-ASSEMBLED OVERDRIVE

RE-FITTING TO GEARBOX

Using a screwdriver of suitable length rotate the inner member of the uni-directional clutch in an anti-clockwise direction until the splines of this member are in line with the splines in the planet carrier.

Ensure that the pump cam and planet carrier retaining clip are correctly located on the main-shaft. Next engage bottom gear and after fitting a new joint to the front face of the overdrive offer it up to the gearbox. Rotate the output shaft of the unit in a clockwise direction, at the same time applying slight forward pressure until the splines become engaged.

Ensure that the pump strap assembly rides smoothly onto the cam and that the overdrive pushes home to the adaptor plate face without excessive force. Next fit and tighten the eight nuts which secure the unit.

If the overdrive fails to meet the adaptor plate face by approximately $\frac{5}{8}$" it means that the planet carrier and uni-directional clutch splines have become mis-aligned. In this case remove the unit and re-align the splines.

APPENDIX 'A'

SPECIAL TOOLS FOR TYPE 'J' OVERDRIVE

Tool No.		Type of Unit		Description
		Fixed Flange	Reverse Spline	
†*	L176A	√		Tailshaft Oil Seal Remover Adapter (Use with 7657)
†*	L177	√		Tailshaft Oil Seal Replacer
0†*‡	L178A	√	√	Assembly Ring for Uni-Directional Clutch
†*	L186	√		Tailshaft Bearing Replacer
†*	L187A		√	Tailshaft Front Bearing Remover/Replacer Adaptors (Use with 4221)
0†‡*	L188	√	√	Hydraulic Test Equipment
	L188-2	√	√	Pressure Take-Off Adaptor (Use with L188)
	L401A	√	√	Relief Valve Body and Dashpot Sleeve Remover
	7066		√	Circlip Pliers
	7066L		√	Circlip Plier Points (Use with 7066)
*	P7098		√	Tailshaft Nut Spanner
	CBW46		√	Tailshaft Oil Seal Remover Adaptor (Use with 7657)
0†*	7657	√	√	Oil Seal Remover
	18G134N		√	Tailshaft Oil Seal Replacer Adaptors
0	550		√	Universal Handle
*	L354A	√	√	Plug Spanner
0†*	4221		√	Hand Press
	L402	√	√	Pressure Adaptor – Spline Release

0 These Tools are also suitable for 'D' Type Overdrive.
† These Tools are also suitable for 'A' Type Overdrive.
* These Tools are also suitable for 'LH' Type Overdrive.
‡ These Tools are also suitable for Compact Overdrive.

All the above tools are manufactured by and available from:

V. L. Churchill and Co. Ltd.,
P.O. Box No. 3,
London Road,
DAVENTRY, Northants.

APPENDIX 'B'

DIMENSIONS AND CLEARANCES FOR PARTS WHEN NEW

	Dimensions New	Clearances New
CAM		
Outside Diameter of Cam	1·4590″/1·4600″	·0010″/·0030″
Inside Diameter of Pump Strap	1·4610″/1·4620″	
GEARBOX MAINSHAFT		
Diameter of Oil Transfer	·9640″/ ·9650″	·0010″/·0030″
Inside Diameter of Maincase at Oil Transfer	·9660″/ ·9670″	
Diameter at Sunwheel	·9410″/ ·9430″	·0040″/·0080″
Inside Diameter of Sunwheel Bush (where fitted)	·9470″/ ·9490″	
Diameter at Mainshaft Spigot	·5620″/ ·5625″	·0003″/·0018″
Inside Diameter at Spigot Bearing	·5628″/ ·5638″	
OPERATING PISTONS		
Operating Piston Diameter	1·2489″/1·2496″	·0004″/·0023″
Operating Piston Bore Diameter	1·2500″/1·2512″	
PUMP		
Pump Plunger Diameter	·4996″/ ·5000″	·0003″/·0013″
Pump Body Bore	·5003″/ ·5009″	
RELIEF VALVE		
Outside Diameter of Relief Valve Piston	·2496″/ ·2498″	·0002″/·0009″
Inside Diameter of Relief Valve Body	·2500″/ ·2505″	
Outside Diameter of Dashpot Piston	·9367″/ ·9370″	·0005″/·0018″
Inside Diameter of Dashpot Sleeve	·9375″/ ·9385″	
SPEEDO PINION		
Outside Diameter of Speedo Pinion	·3105″/ ·3110″	·0010″/·0030″
Inside Diameter of Speedo Bearing	·3120″/ ·3135″	

MISCELLANEOUS

Sliding Member Travel from Direct Drive to Overdrive (Measured at Bridge Pieces)	·085″/ ·140″

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