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AUTOMATIC TRANSMISSION

British Leyland MINI, 1100 & 1300

SERVICE MANUAL

£8

AUTOMATIC TRANSMISSION SERVICE MANUAL

FOREWORD

Drivers of every kind would like to eliminate the clutch pedal. This step reduces driving fatigue in towns and on congested roads, helps new drivers to learn quickly and allows experienced drivers to concentrate on the problems of dense traffic.

Whilst some drivers, particularly new drivers, are quite content to have all their gear changing done for them automatically, there are many others who, under certain conditions, prefer to have complete control of the gear ratio being used.

This arises either from a complex set of road conditions or from the mood of the driver, of which no automatic system can be aware. It is with the idea of providing the alternatives of either automatic operation or complete freedom of choice that this transmission system has been devised.

In many peoples minds, automatic transmission is associated with a sacrifice in performance. In this case, however, a torque converter to provide smooth get-away from rest, and four forward gear ratios provide the optimum performance which can be obtained from an automatic transmission associated with a small engine.

For the expert driver there are also advantages, as it is possible with this system to change gear at full throttle by means of the manual control.

Automatic transmission is a great advantage when driving in dense traffic in towns, and in most cases town cars are small cars. Previously, it has been technically difficult to provide such a system for small cars although they have the greatest need for it. Therefore, this breakthrough is an important step forward towards more relaxed and more sophisticated motoring.

CONTENTS

This publication is mainly intended for the garage staff who will be servicing the car, but will also be of general interest as an introduction to small car automatic transmission.

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SECTION 1

INTRODUCTION AND DRIVING INSTRUCTIONS

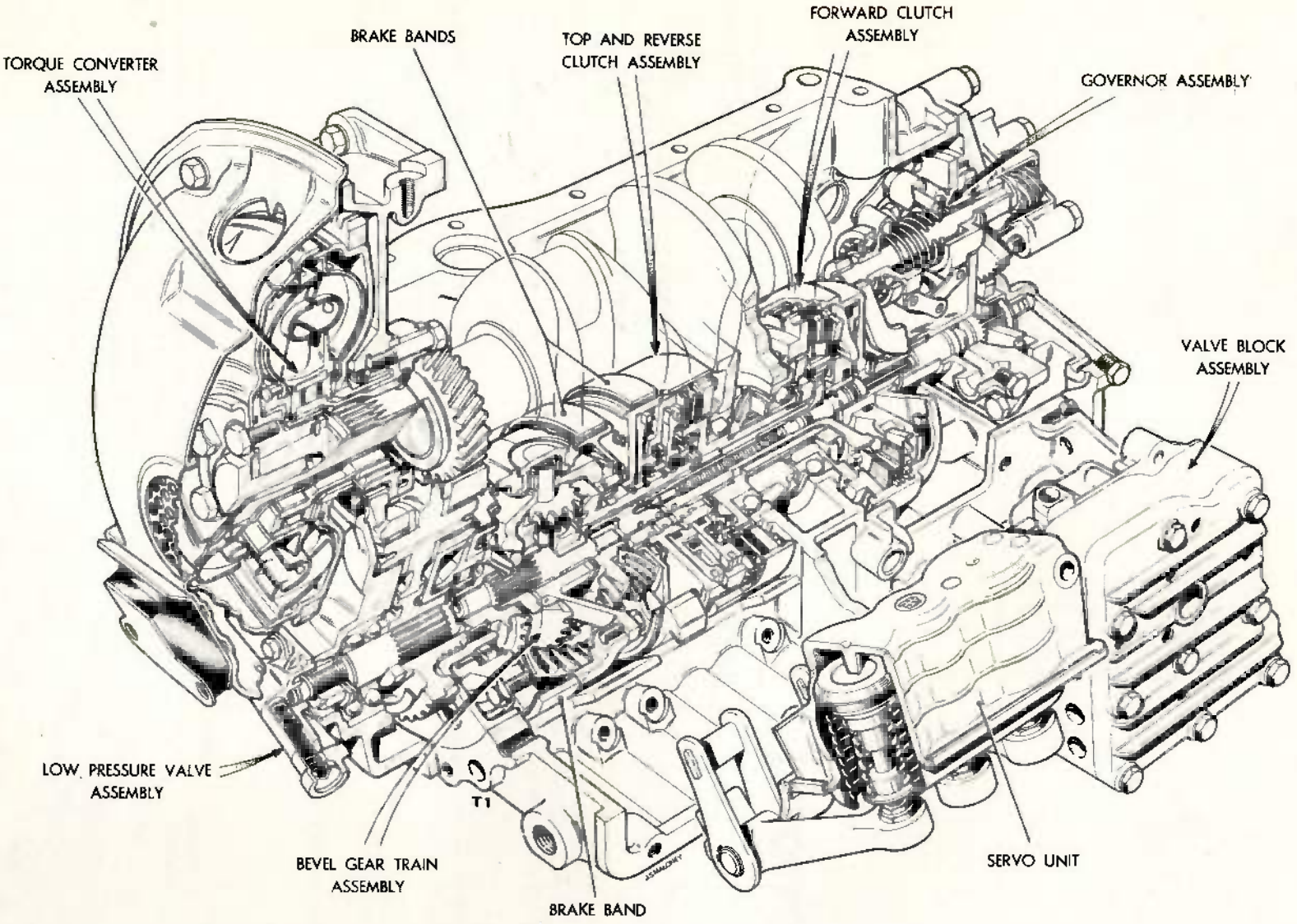


FIG. 1. CUTAWAY VIEW OF TRANSMISSION UNIT

INTRODUCTION

The Automotive Products Company Limited automatic transmission for the B.L. MINI, 1100 and 1300 models has been designed to fit beneath the transverse engine in similar manner to the manual gearbox on these cars.

Power is transmitted to the road wheels through a torque converter, three primary helical gears and a bevel gear train to a conventional differential unit. Coupled to the differential are two half shafts which drive the road wheels through constant velocity joints.

The torque converter takes the place of the conventional clutch and is bolted to the end of the engine crankshaft. The drive is then transmitted by the primary gears to the main bevel gears in the transmission case below the engine.

The bevel gear train may best be described as a differential within a differential, thus making a very compact unit. By holding certain parts of the bevel gear train with three servo-operated brake bands, different gear ratios are obtained.

Two clutches, a "forward" clutch and a "top and reverse" clutch are used to complete the power flow to the final drive. The forward clutch is engaged for all forward gears, and the top and reverse clutch is engaged with the forward clutch for top gear. The top and reverse clutch only is engaged when reverse is selected.

Two hubs then transmit the drive from the clutches to the differential unit and road wheels through a conventional drive shaft arrangement. A shaft from the forward clutch housing drives a governor which controls all automatic gear changes.

An extension of the throttle linkage biases normal action of the governor to permit extra road speed in intermediate gears on "up" changes and a "kick down" into lower ratios for overtaking purposes.

Operation of the clutches and brake bands is hydraulic. The oil used to operate this hydraulic system is the same as used to fill the torque converter and to lubricate the engine so that the need for regular oil and filter changes can be appreciated.

A large oil pump, driven by the engine camshaft, picks up oil through a gauze strainer in the sump and delivers it through internal drillings to a filter mounted on the front cover of the transmission case.

The filtered oil then passes to the valve block where it is redirected to the torque converter and engine. Engine lubrication is the same as in conventional transmission models from this point on, the oil finally draining back to the sump. Oil from the converter passes through a low pressure valve and lubricates the bevel gear train before returning to the sump. Dependent upon the gear selected, oil under pressure regulated within the valve block, is also directed to the clutches and servos for brake band operation.

A more detailed description of the various units is given in the following sections.

DRIVING INSTRUCTIONS

SELECTOR POSITIONS

A selector lever is mounted on the floor between the driver's and passenger's seats, the upper face of the quadrant being marked as in Fig. 2. The positions are:

'R' for Reverse

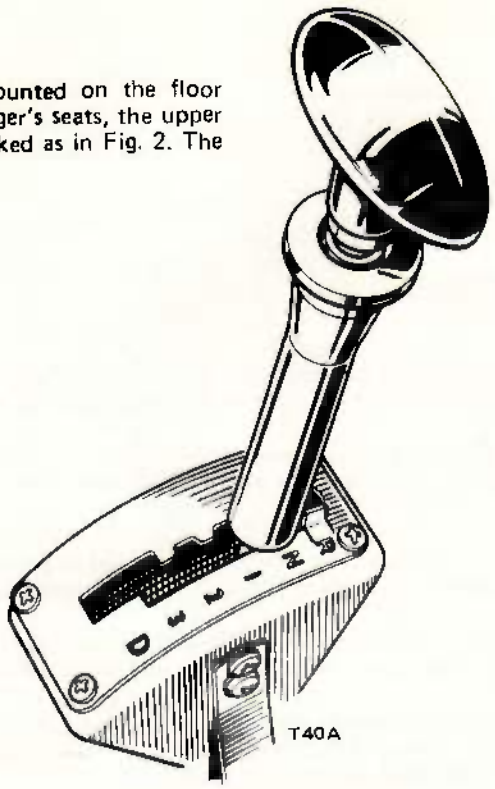
'N' for Neutral

'1' for First Gear

'2' for Second Gear

'3' for Third Gear

'D' for Automatic all forward gears.



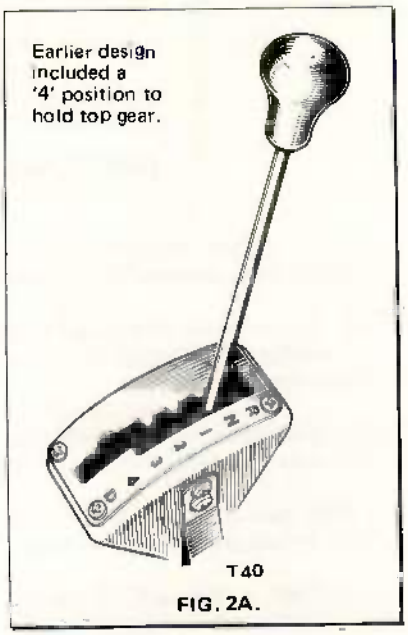


FIG. 2A.

FIG. 2. THE SELECTOR LEVER

STARTING

The engine can only be started with the ignition key when the selector lever is in the N position. An inhibitor switch prevents use of the starter in any other selector position.

With a cold engine it is preferable not to drive off for half a minute so that the choke can be pushed partially in to minimize the effect of the rich setting.

With the car at rest, a gear should not be selected unless the engine is at idling speed. If this precaution is taken, the start will be smooth. In any case, either the hand or foot brake should be applied during selection.

In traffic during the critical period of warming up, it is advisable to check the speed of the car with the left foot on the brake, leaving the right foot to control the throttle and prevent stalling of the engine.

STOPPING

To stop the car, release the accelerator and apply the brakes in the normal manner. During normal traffic stops the selector lever should be left in D or if gears are being selected manually moved to 1 ready for pulling away. It is not necessary, or recommended, to select N Neutral.

PARKING

Stop the car and apply the handbrake, select N and switch off the ignition.

If the vehicle is left with the engine running, N must be selected and the handbrake applied.

AUTOMATIC GEAR SELECTION

To drive the car forward, select D, allow the gear to engage and gently depress the throttle pedal. Gear changes will be made automatically and no further movement of the selector lever is necessary.

It is possible to control the upward change points by the degree of throttle pedal pressure. With light throttle pressure, upward changes will occur at relatively low road speeds. Changes will take place at much higher road speeds at full throttle when maximum performance is required.

When the throttle pedal is released, the car will naturally slow down, the gearbox automatically changing down as necessary.

KICK DOWN

For increased acceleration, e.g. when overtaking, a lower gear can be automatically selected by fully depressing the throttle pedal. This type of gearchange is termed "kick down". The gear selected will depend on the car's speed. If this is too high for a lower gear, no downchange will take place.

MANUAL GEAR SELECTION

One of the features of this gearbox is that manual selection of intermediate gears is possible. Selector positions 1, 2 & 3 give first, second and third gears as with a conventional gearbox. The gear selected is held until the selector lever is moved, no automatic changes taking place.

To drive the car forward, select 1, allow the gear to engage and gently depress the accelerator. To change up, as the road speed increases, simply move the selector lever to 2, 3 and D for top gear. Down changes are made by selecting 3, 2 or 1 as required. Since there are no automatic gear changes when using manual gear selection, it is possible to over-rev the engine or cause excessive converter slip. The car should therefore be driven within the speed ranges shown in figs. 3, 4 and 5.

Earlier cars incorporated a 4 position for manual selection of top gear.

Reverse gear, R should only be selected from rest and never when the vehicle is moving forward. A stop is incorporated on the selector quadrant to prevent accidental selection.

Avoid selection of 3 (or 4 on early vehicles) when pulling away from rest as prolonged use of this technique may cause overheating of the converter and damage to the engine and transmission.

NOTE: It is not necessary to stop the car to change from manual to automatic driving or vice versa. Either can be selected at any time by movement of the selector lever to the desired position.

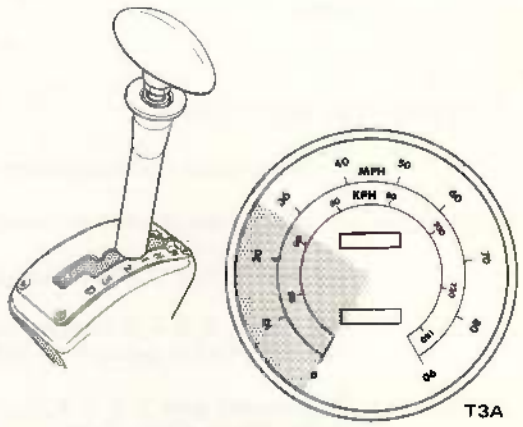


FIG. 3. FIRST GEAR

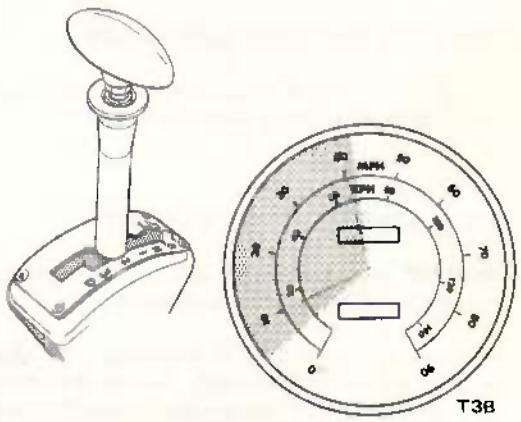


FIG. 4. SECOND GEAR

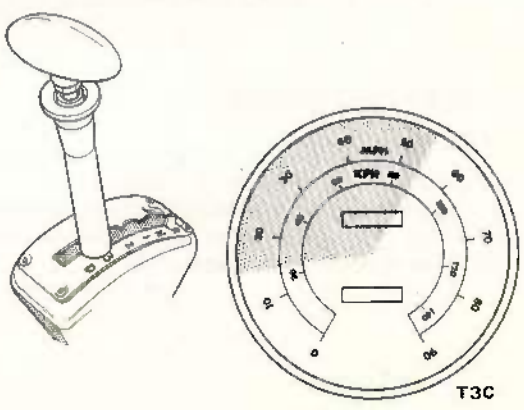


FIG. 5. THIRD GEAR

IT IS RECOMMENDED THAT THE CAR IS DRIVEN WITHIN THE SPEED RANGES INDICATED IN FIGS. 3, 4 & 5 WHEN GEARS ARE SELECTED MANUALLY.

TOW STARTING

Cars with 1, 2, 3, D selector sequence (& 1300 models registered from February 1970 with 4th gear hold position) cannot be tow started and no attempts should be made to do so.

Otherwise, all models with 4th gear hold position on the selector quadrant (1300's before Feb. 1970) may be tow or push started in the following manner.

Select N, switch on the ignition, set the choke if necessary and release the handbrake. Allow the car to attain a speed of approx. 20 m.p.h. (32 kph) and select 2 manually whilst lightly depressing the throttle.

Where the car has been fitted with a new engine it may be more effective to select D and increase the speed up to a maximum of 30 mph.

TOWING FOR RECOVERY

If a transmission fault is suspected the front should be lifted and the vehicle towed on the rear wheels only.

In other circumstances the vehicle may be towed on all four wheels but it is important to note the following procedure:

Cars with 1, 2, 3, D selector sequence. Tow with selector in N – Neutral position.

Cars with 1, 2, 3, 4, D selector sequence. Tow in 1.
(including 1300's before Feb. 1970)

1300 models with 1, 2, 3, 4, D (registered from Feb. 1970) — Tow in 1, but keep towing speed below a max. of 20 mph. Speeds in excess of this will cause the transmission to drive the engine.

DRIVING ON SOFT SURFACES

When the driving wheels fail to grip due to snow, ice, mud or sand, the car may be rocked backwards and forwards by alternately selecting R and 1.

HILL ASCENT AND DESCENT

ASCENT When ascending hills with the selector in D, down changes can be made by fully depressing the throttle pedal to bring the kick down into operation.

When going uphill, and it is necessary to stop in traffic for more than a few seconds, the brakes should be used to prevent the car rolling back. Gentle depression of the throttle will hold the car and enable a smooth restart to be made but prolonged use can lead to overheating.

DESCENT To obtain engine braking during the descent of a hill, manually select 3 or 2.

NO ENGINE BRAKING IS AVAILABLE IN 1 – FIRST GEAR

CARAVAN TOWING

The vehicle manufacturers recommendations as to maximum weights and weight distribution should be observed. The correct oil level is important and should be maintained. Although automatic gear selection, and kick down if necessary will provide the right gears, the manual gear selector positions can be used to advantage to keep the engine speed up or provide engine braking for maximum control. The most important point is not to let the engine labour, particularly when ascending gradients.

SECTION 2

DESCRIPTION AND OPERATION

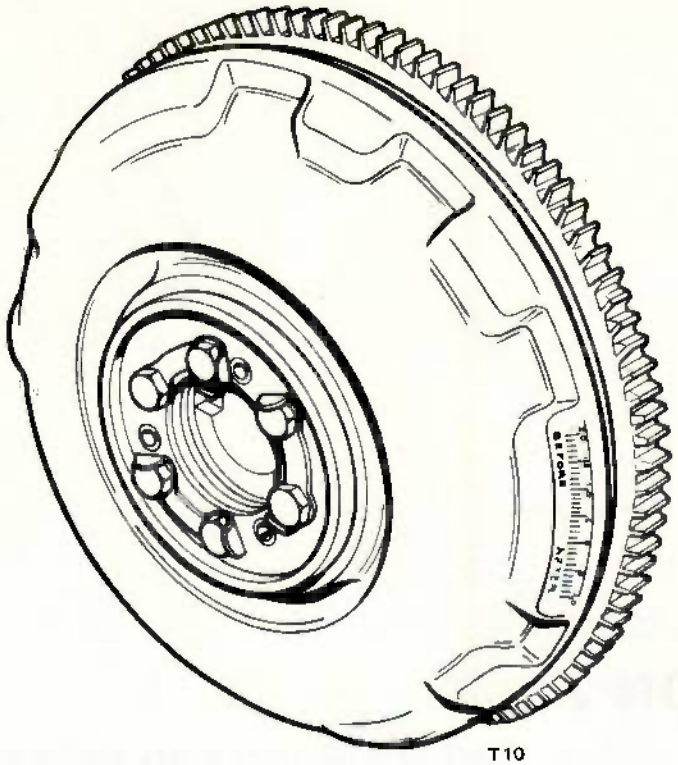


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FIG. 6. EXTERNAL VIEW OF TORQUE CONVERTER

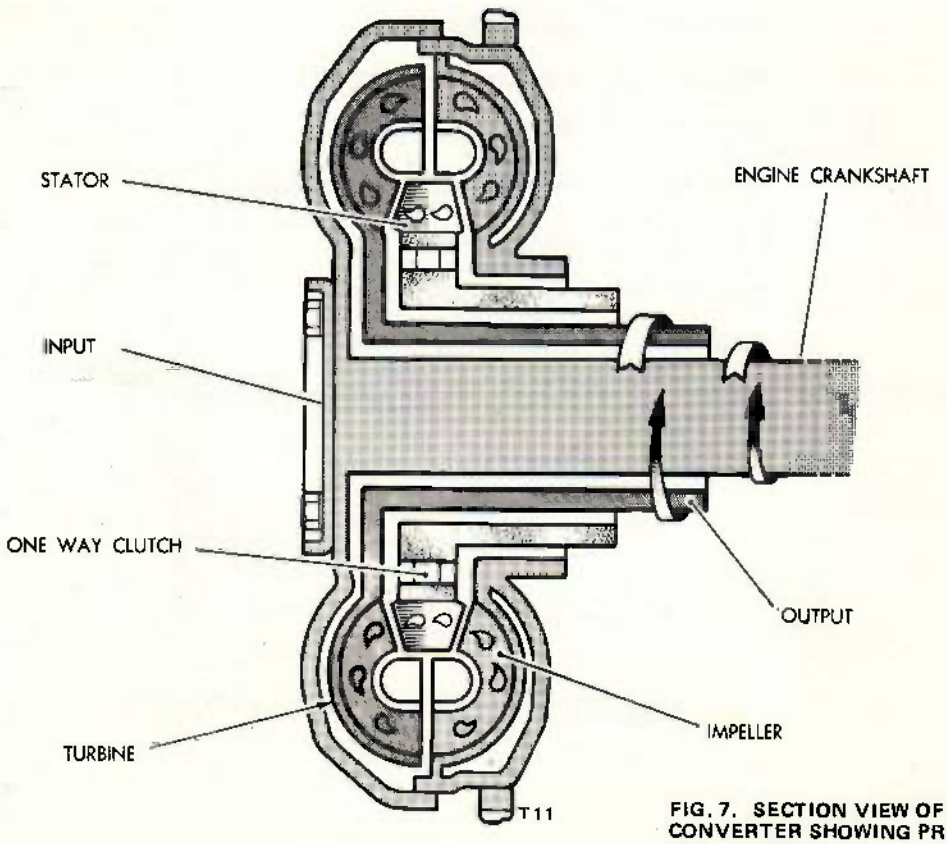

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FIG. 7. SECTION VIEW OF TORQUE CONVERTER SHOWING PRINCIPLE OF OPERATION

TORQUE CONVERTER

DESCRIPTION

The torque converter is a three element type, comprising an impeller, a turbine and a stator. A hub forms part of the converter outer casing to enable the converter to be bolted to the tapered end of the engine crankshaft. The impeller having 26 blades, is welded into the converter casing so that it rotates with the crankshaft. The turbine with only 23 blades, is also contained within the converter casing, but independent except for its attachment through a splined hub to an output gear wheel forming part of the primary drive gear train. Between the impeller and the turbine, mounted on a free-wheel device and independent of both is the stator. This unit also features a splined hub extension which mates into a carrier rigidly attached to the converter housing.

Oil under pressure, is directed into the centre of the converter via a rear case or collector ring, which mates with the stator carrier. This same rear case accepts surplus oil from the converter to pass it via a low pressure valve, eventually, into the gear train for lubrication and return to sump. The low pressure valve maintains a suitable oil pressure in the converter.

OPERATION

Oil flowing into the converter is picked up by the rotating impeller blades so that it is accelerated by centrifugal force whilst being redirected by the blade form. This redirected oil passing into the turbine gives up its velocity in overcoming the inertia of the transmission to which the turbine is attached, and the blades of the turbine convey this oil back into the centre of the converter. Altered in direction of rotation by the turbine blade form, the oil then passes to the stator blades which are shaped to turn it once more in the direction of impeller rotation. Stator movement at this stage is prevented by the action of the sprag clutch on which it is mounted.

The oil cycle recommences, and the speeding up of the transmission by the turbine eventually reaches a peak where full coupling is achieved between impeller and turbine at approximately 2200 r.p.m. It is at this stage with the oil smoothly passing from impeller to turbine and back, that the stator blades are superfluous and would impede oil flow. The free-wheel action of the sprag clutch allows the stator blades to idle freely in the same sense of rotation as the converter.

Torque multiplication is a maximum at turbine stall and slightly above 2 : 1, varying infinitely as turbine speed increases to a 1 : 1 ratio fully coupled.

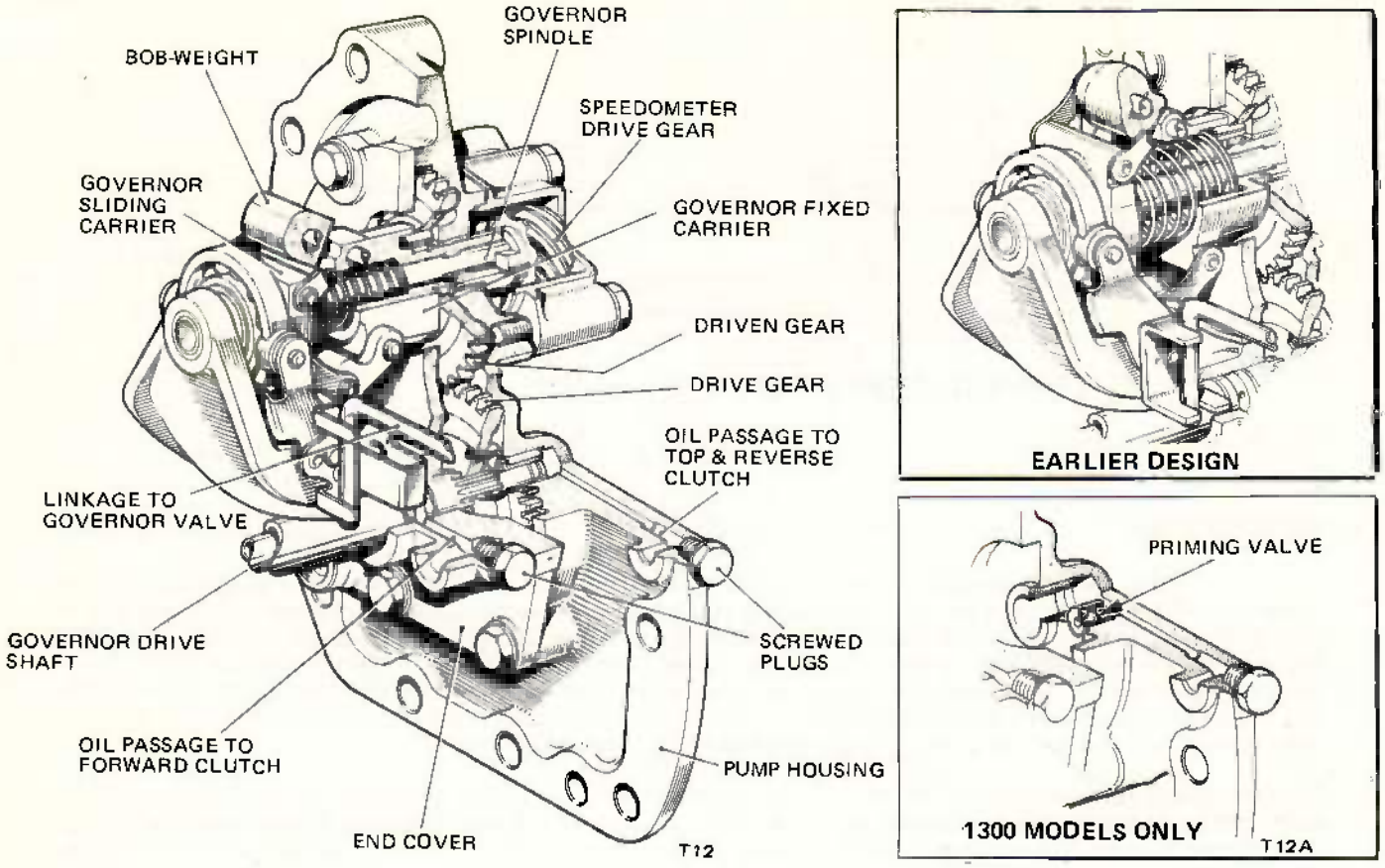


FIG. 8. CUTAWAY VIEW OF GOVERNOR UNIT

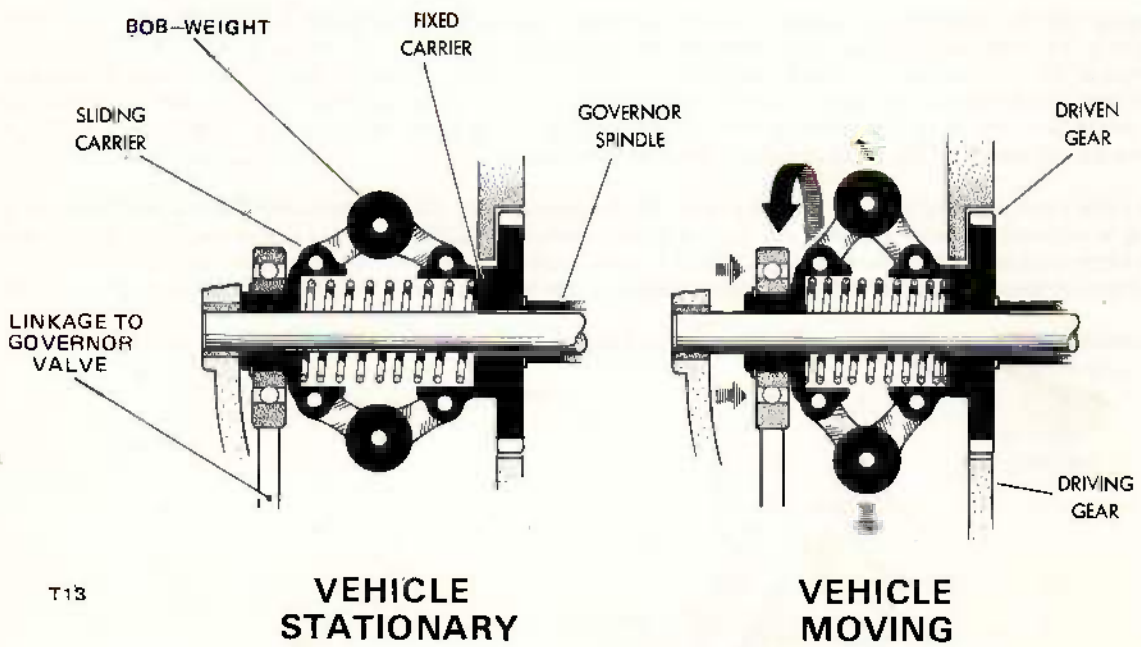


FIG. 9. SCHEMATIC DIAGRAM OF GOVERNOR SHOWING PRINCIPLE OF OPERATION

GOVERNOR UNIT

The purpose of the governor is to regulate automatic gear changes, and its operation is dictated by vehicle road speed.

The unit consists of two housings bolted together, the governor being carried in one and the drive gears in the other.

The governor assembly is located on a drive spindle which is supported by bushes, one in each housing. This spindle also provides the speedometer drive.

A shaft extending from the forward clutch provides the drive to the unit through splines in the driving gear, and then via the driven gear and pins which engages holes in the governor fixed carrier.

The fixed carrier is connected to a sliding carrier by links between which are fitted two bob weights. The sliding carrier is machined to carry a ball race which is secured by a retaining ring. The end of the fixed carrier is slotted to drive the speedometer skew gear. A compression spring is fitted between the fixed and sliding carriers.

The governor assembly is connected to the governor valve by an operating bracket and connecting arm, and also to the external 'kick down' control by a lever which is indirectly connected to the sliding carrier.

When the vehicle is stationary, the governor is at rest. The internal spring loads the sliding carrier, keeping it at the opposite end of the speedometer gear spindle to the fixed carrier.

As the road wheels start to turn, the governor rotates causing the bob weights to be thrown outwards. The sliding carrier is drawn along the speedometer gear spindle, towards the fixed carrier against the load of the spring, operating the mechanical linkage and moving the governor valve.

Governor speed increases in proportion to road speed, controlling the travel of the governor valve and subsequently the automatic gear changes.

On earlier units the two gear wheels formed an auxiliary pump to provide the hydraulic and lubrication requirements for the transmission and engine, when tow starting. Since the drive for the governor is taken indirectly from the road wheels, the auxiliary pump became operative as soon as the car was in motion enabling the engine to be started through the transmission. As soon as the engine starts the main oil pump is operative and the auxiliary pump discharges its oil to the sump.

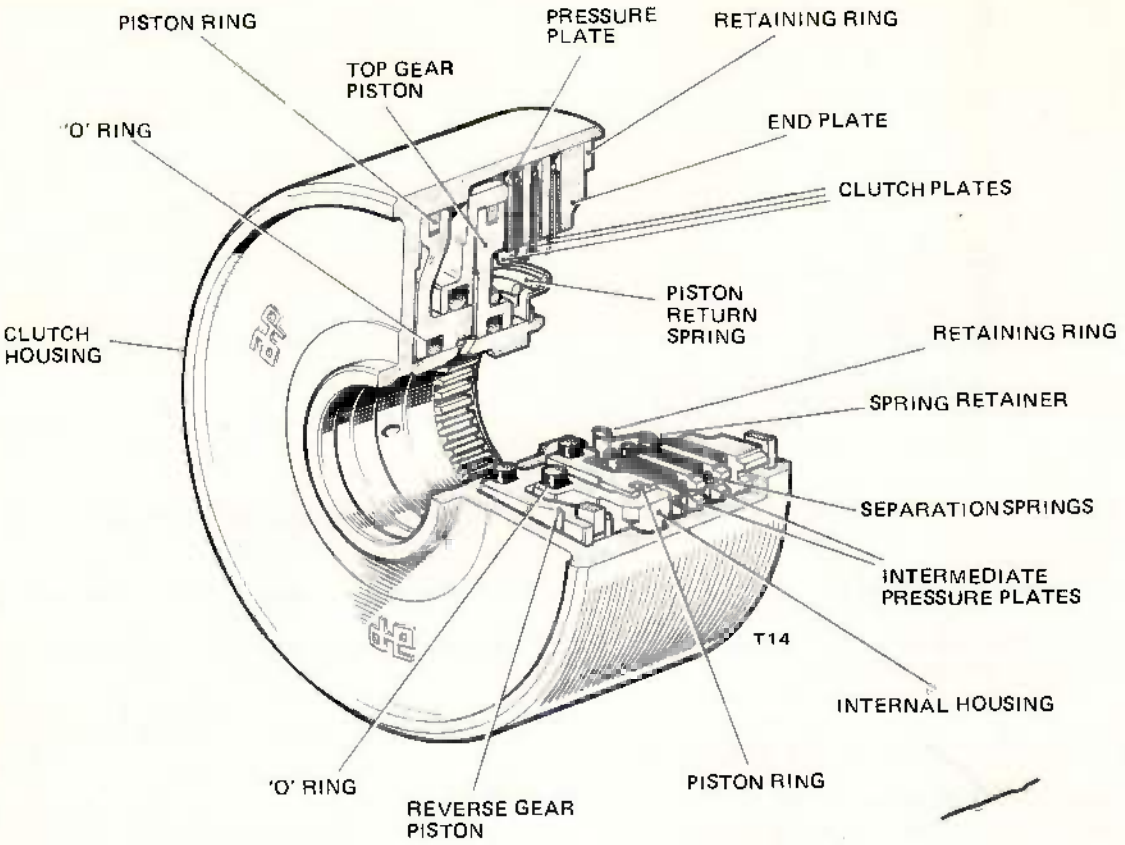
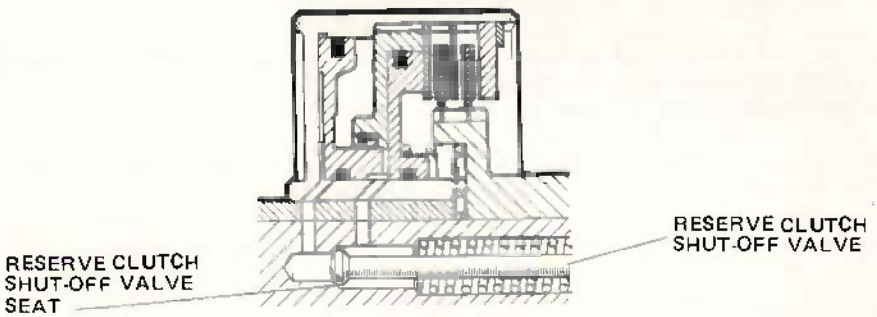
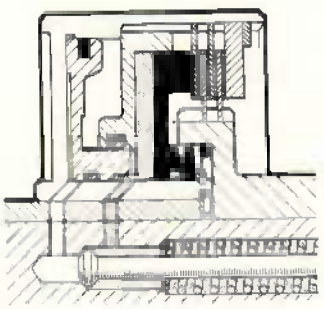


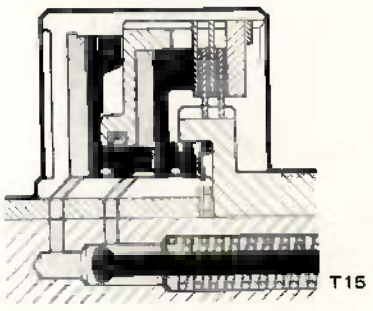
FIG. 10. CUTAWAY VIEW OF TOP AND REVERSE CLUTCH



DISENGAGED



TOP GEAR ENGAGED



REVERSE GEAR ENGAGED

FIG. 11. SECTION VIEWS OF TOP AND REVERSE CLUTCH, AND REVERSE CLUTCH SHUT-OFF VALVE SHOWING PRINCIPLE OF OPERATION

TOP AND REVERSE CLUTCH

DESCRIPTION

The top and reverse clutch assembly is of multi plate design in order to produce a clutch capable of handling high torque at all engine speeds. Hydraulically operated, it has two pistons and is extremely compact. The clutch housing is made from a drum-like steel forging, and is formed to accommodate a piston and booster piston. At its open end, it is gear tooth formed to carry the pressure, intermediate and end plates.

The teeth on the pressure plates engage in the clutch housing, while the teeth on the clutch plates engage the teeth on the top and reverse hub.

In top gear, the driven plates are clamped within the clutch by a piston which operates in an internal housing; whilst in reverse gear, to accommodate the higher torque transmitted, a booster piston adds its greater clamping load to the clutch plates.

Both pistons are sealed externally by piston rings and internally by rubber oil seals. The internal clutch housing is also fitted with an oil seal to prevent fluid leakage between the two pistons.

The pistons are held in the "off" position by a coil spring which locates over the boss inside the clutch housing and abuts the smaller hydraulic piston. The spring is held in position by a pressed cap which is retained by a retaining ring. When the clutch is disengaged, the pressure plates are separated from the clutch plates by 'waved' separator springs to prevent drag.

The clutch plates and pressure plates are retained in the clutch housing by a large retaining ring fitted in a groove machined in the open end of the clutch housing.

OPERATION (TOP GEAR)

With the forward clutch engaged, fluid under pressure passes through the reverse clutch shut-off valve piston and into the clutch housing between the internal clutch housing and the rear face of the small diameter piston. Under the influence of hydraulic pressure, the piston moves forward and overcomes the pressure of the piston return springs to clamp the driven plates between the clutch plates.

During this operation the booster piston is not operated, since the reverse gear shut-off valve is closed, preventing the flow of fluid to the rear of the booster piston.

OPERATION (REVERSE GEAR)

The selector valve cuts off the hydraulic pressure to the forward clutch which remains disengaged, the drop in pressure then allows the reverse gear shut-off valve piston to move along its bore, opening the shut-off valve and allowing hydraulic pressure to build up behind the booster piston. Simultaneously, pressurised fluid passes into the internal clutch housing in the same manner as for top gear. The clamping effort on the driven plates is greatly increased by the effort from both pistons. This allows the increased torque which is developed in reverse gear to be transmitted by the clutch to the final drive. Disengagement of the clutch takes place in both top and reverse gear when the hydraulic pressure drops and the influence of the piston return spring displaces the pistons back along their respective bores.

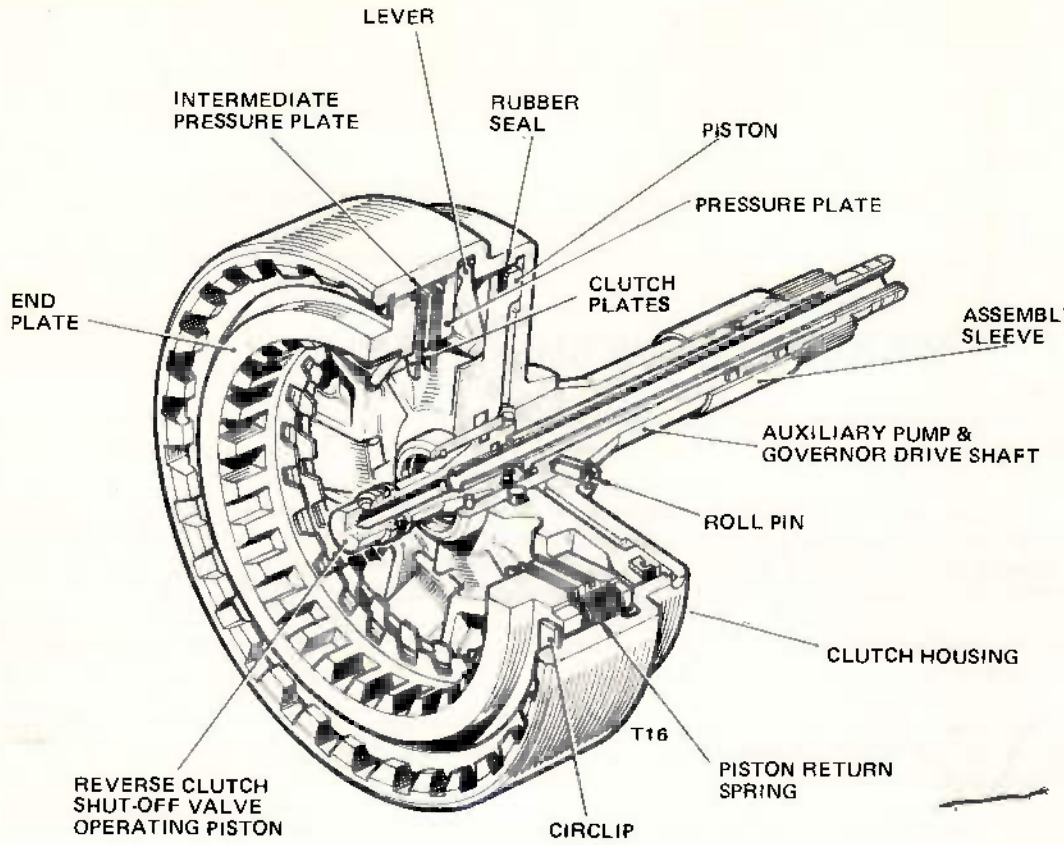


FIG. 12. CUTAWAY VIEW OF FORWARD CLUTCH

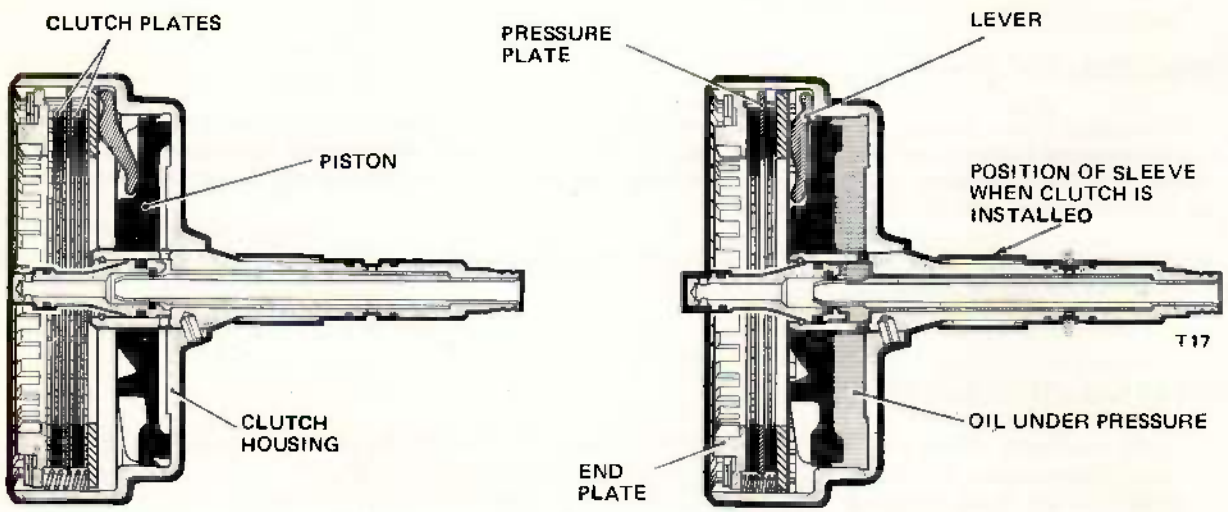


FIG. 13. SECTION VIEWS OF FORWARD CLUTCH – PRINCIPLE OF OPERATION

FORWARD CLUTCH

The forward clutch assembly is very similar to the top and reverse clutch, being of multi plate design.

The clutch has plates carrying friction facings which are clamped between a pressure plate, intermediate pressure plate and an end plate by means of a hydraulic piston located in the clutch housing behind the pressure plate. The drive for both pressure and clutch plates is again of gear tooth form. The teeth on the pressure plates engage teeth in the clutch housing while the teeth on the clutch plates engage teeth on the end of the forward shaft.

The inner end of the clutch housing is bored to accommodate the hydraulic piston. The piston is formed with six slots for location of levers, and bored to slide over the end of the auxiliary pump drive shaft, an integral part of the clutch housing. Another piston located in the end of this shaft operates the reverse clutch shut-off valve in the end of the forward shaft.

The six levers which are located between the pressure plate and hydraulic piston are formed with radii at each end and with a cam at the point of contact with the pressure plate. The inner end of each lever locates in a slot in the face of the piston, while the outer end pivots on a shouldered portion of the clutch housing. The clutch is held in the disengaged position by piston return springs, which operate between the pressure plate and the end plate. There are two oil-ways in this clutch, one formed by a length of tubing running internally the length of the auxiliary pump drive shaft. The other is the space left between the outside of this tube and the shaft bore, and is fed by a radial port in the shaft. This is sealed by two metal rings on the shaft on either side of the port.

A small bleed hole in the clutch body prevents oil trapped behind the piston applying the clutch through centrifugal force when the vehicle is being towed.

Operation of the forward clutch is portrayed in diagrammatic form in Fig. 13

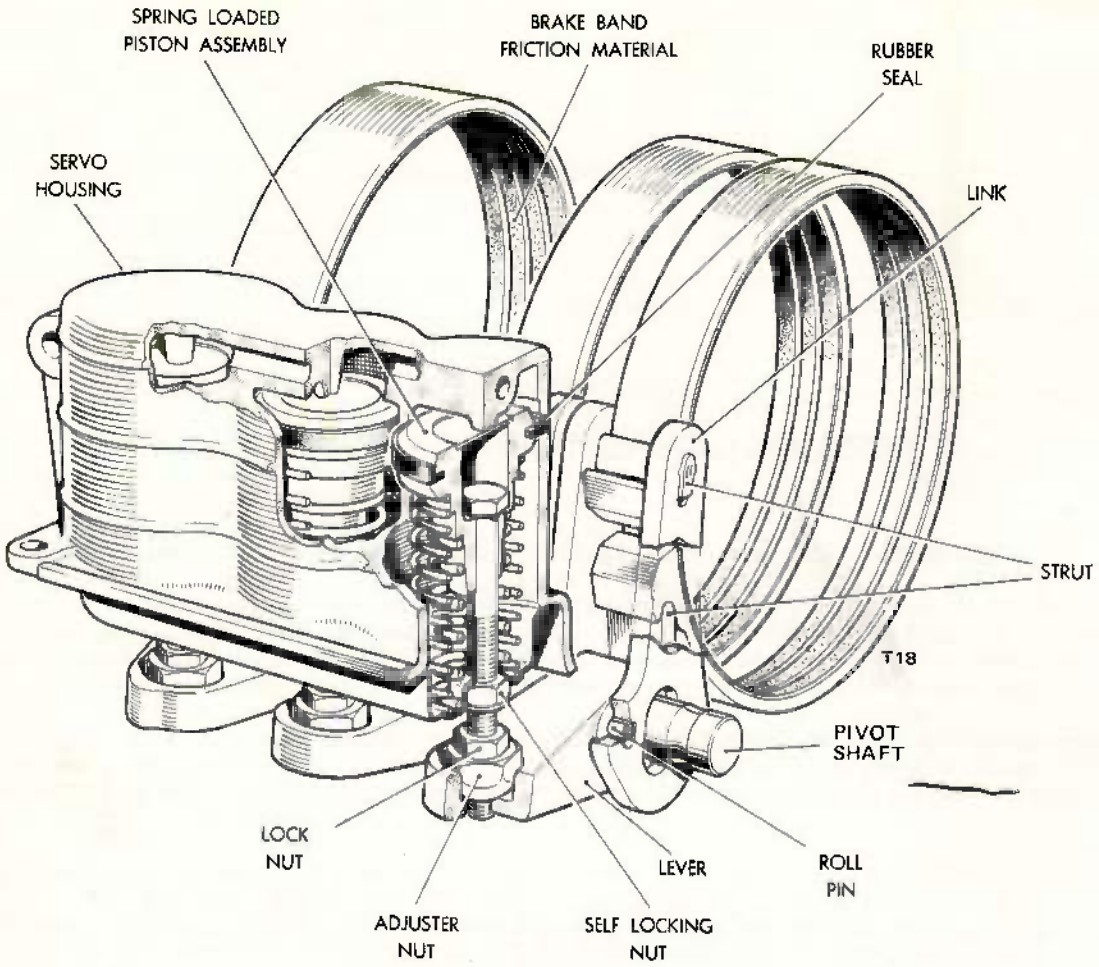


FIG. 14. CUTAWAY VIEW OF SERVO AND BRAKE BANDS

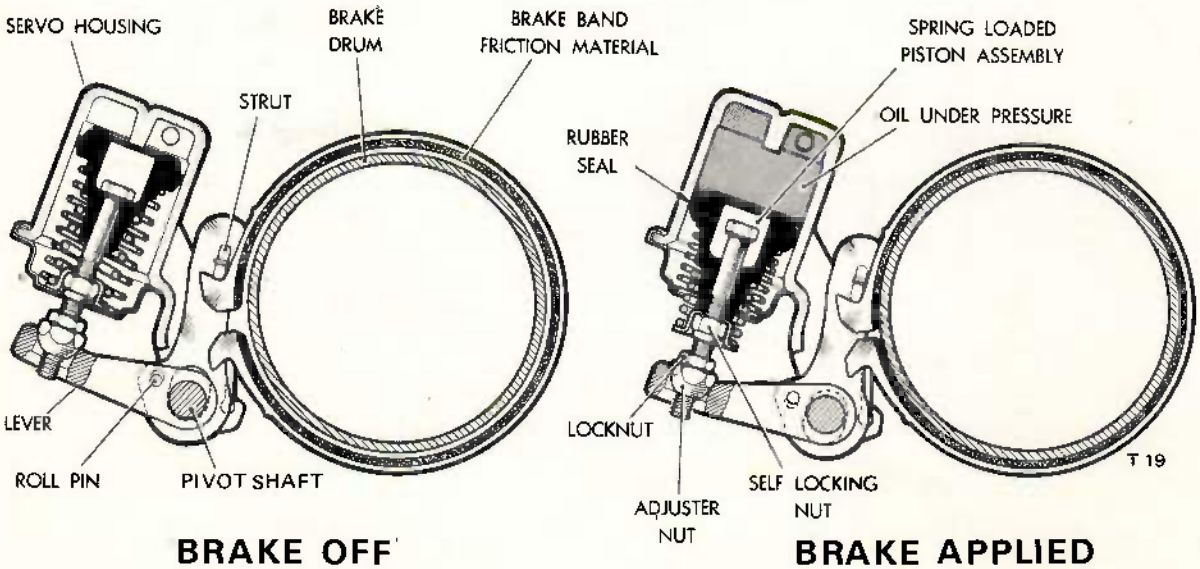


FIG. 15. SECTION VIEW OF SERVO AND BRAKE BANDS SHOWING THE PRINCIPLE OF OPERATION

SERVO AND BRAKE BANDS

DESCRIPTION

The servo incorporates a bank of three hydraulic cylinders and is used to operate the brake bands through a mechanical linkage.

The cylinders, grouped within a light alloy housing, each have a piston fitted with a rubber seal and drilled to accept a push rod. The pistons are also shouldered to provide location for two coil springs of different diameters. An expansion plug is fitted to the head of each piston to prevent fluid leakage. The larger diameter spring acts as a piston return spring and is retained in the servo cylinder by a spring cup, while the small diameter spring acts as a damper to prevent excessive shock loading being applied to the mechanical linkage.

Screwed to the end of each push rod is a spherical nut and lock nut. The spherical nut locates in a seat in a lever sub-assembly and is used to adjust the brake bands through the operating linkage.

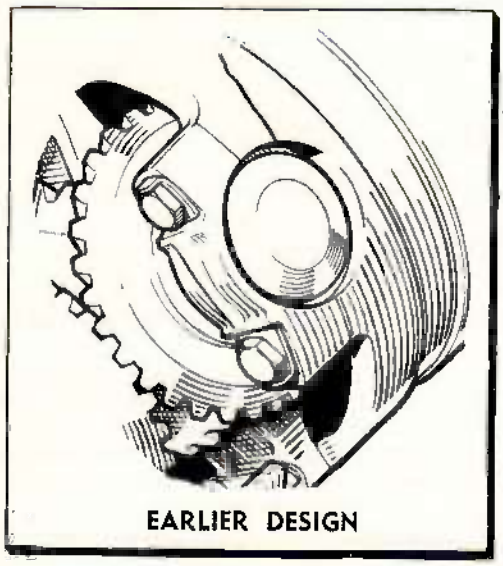
The brake bands are fabricated from steel and lined with friction material; the two ends of each brake band are formed with hook shaped lugs for attachment to the operating linkage.

OPERATION

Oil under pressure from the valve block enters the respective servo cylinder to move the piston down its bore against the load of the return spring. The pushrod thus operates the mechanical linkage which pulls the ends of the brake band towards each other applying a squeezing action to bring the band into contact with its drum.

Load is then progressively applied through the heavier spring until a mechanical stop allows full clamping to be effective. In the case of the reverse band only, the linkage permits self-energisation.

When the hydraulic pressure is released, the piston return spring forces the piston back along its bore, drawing the push-rod with it. Spring tension in the brake band forces the linkage to follow the push-rod back to its original position and thus releases the brake band from its drum.



EARLIER DESIGN

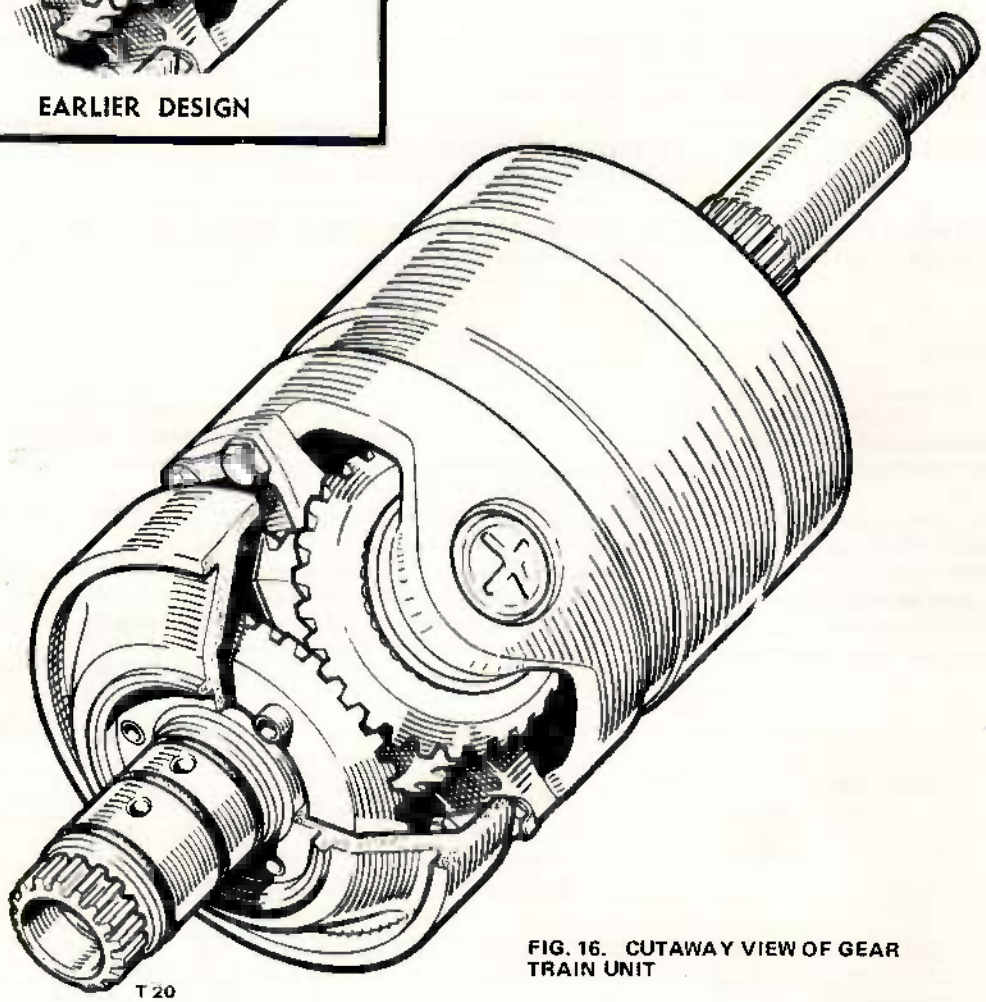


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FIG. 16. CUTAWAY VIEW OF GEAR TRAIN UNIT

GEAR TRAIN

The gear train is of the epicyclic type and has eight spiral bevel gears as follows:—

INPUT GEAR WITH 29 TEETH—A.

FORWARD OUTPUT GEAR WITH 29 TEETH—B.

REVERSE OUTPUT GEAR WITH 29 TEETH—C.

3rd REACTION GEAR WITH 29 TEETH—D.

2 LARGE IDLER GEARS WITH 35 TEETH.*

2 SMALL IDLER GEARS WITH 13 TEETH.*

*The idler gears are in pairs. A pair consists of a large gear and a small gear welded together.

In conjunction with the reation brakes and one-way clutch, the following gear ratios are provided:—

1st GEAR	.. ..	2.69 : 1
2nd GEAR	.. ..	1.85 : 1
3rd GEAR	.. ..	1.46 : 1
TOP GEAR	.. ..	1.00 : 1
REVERSE GEAR	..	2.69 : 1

Operation of the gear train is portrayed in the power flow diagrams on the following pages.

NEUTRAL

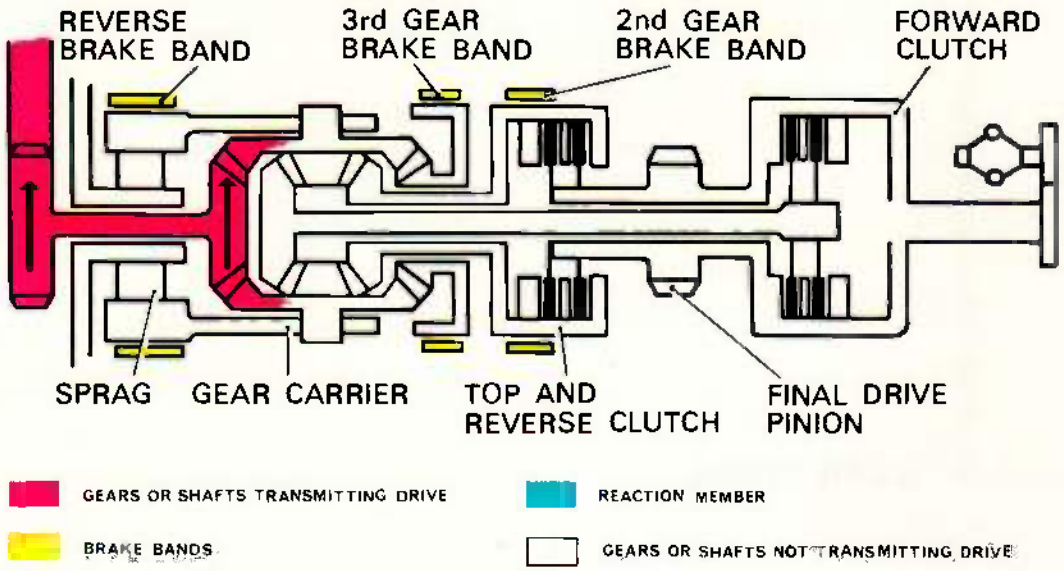


FIG. 17

1ST

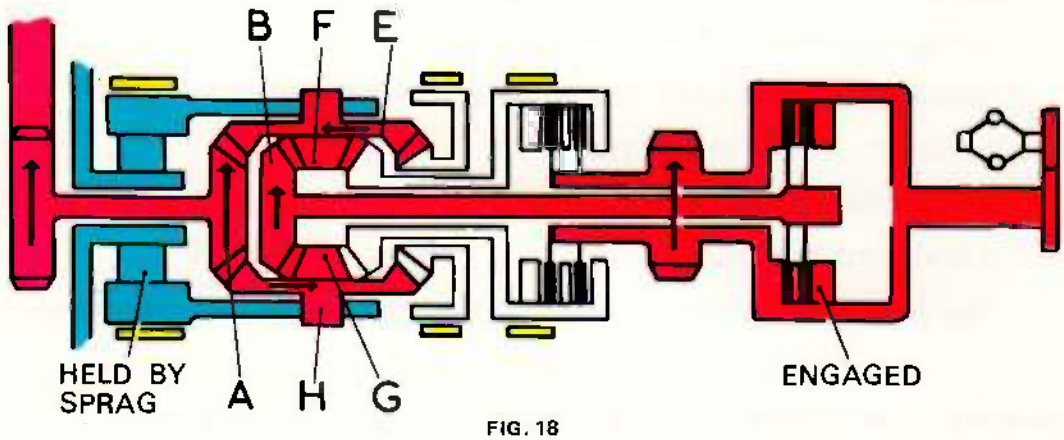


FIG. 18

2ND

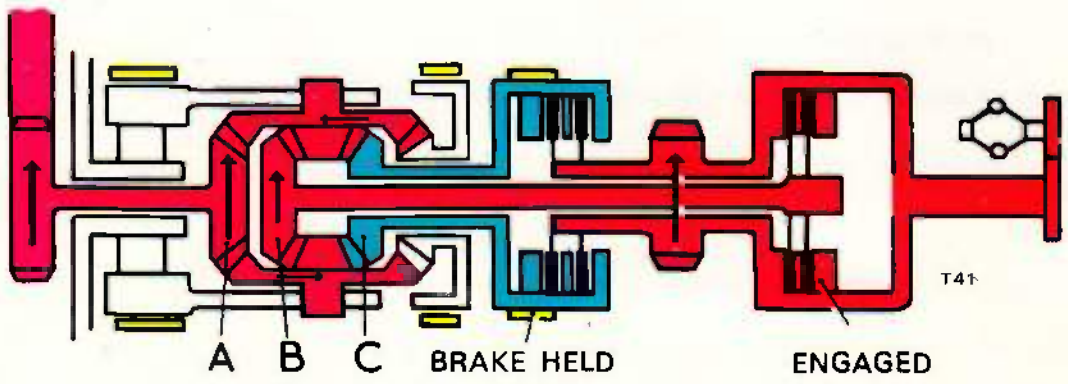


FIG. 19

1st GEAR

When 1st gear is engaged, either manually through selection with the gear shift lever, or automatically due to governor valve position, oil under pressure is directed from the valve block into the forward clutch so that its engagement connects the gear train with the final drive.

With gear A rotating in an anti-clockwise direction the idler gears E, F, G and H ensure that gear B must turn in the same direction. With the forward clutch engaged, torque through gear B and associated shaft will try to move the vehicle forward. Reaction from this torque attempts to turn the gear carrier clockwise. However, it is prevented from doing so by the influence of a sprag (one-way clutch), located in a housing bolted to the carrier. One-way clutch reaction is taken by a dowel in the transmission case.

All the gears are, therefore, turning on their axis with the carrier stationary and a simple reduction is obtained from A through the idler gears to B. All the other gears are turning but not transmitting torque.

2nd GEAR

As in the case of 1st gear, actual gear selection may be manual through the gear shift lever position or automatic due to governor valve position.

The forward clutch remains engaged as for 1st gear, but additionally the 2nd gear reaction band is applied to the drum integral with gear C. This gear is now providing a torque reaction by being held stationary. With gear A still rotating in an anti-clockwise direction and gear C being held, the idler gears together with the gear carrier will rotate to transmit drive to gear B and the forward clutch.

3RD

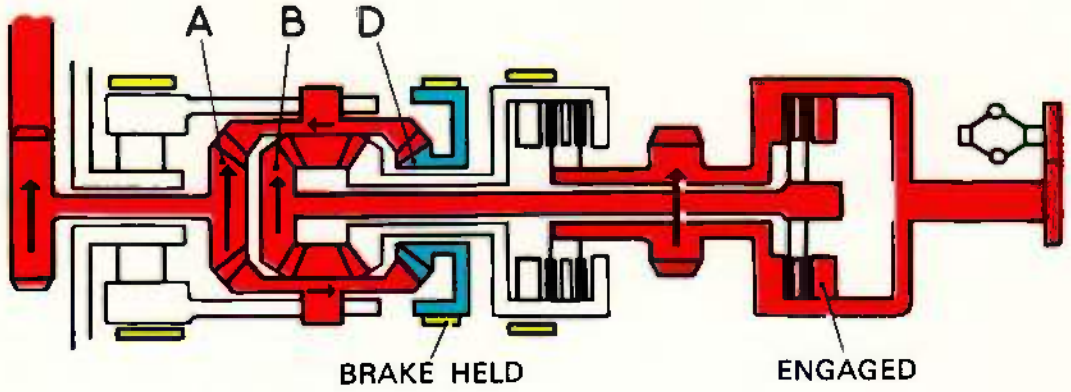


FIG. 20

TOP

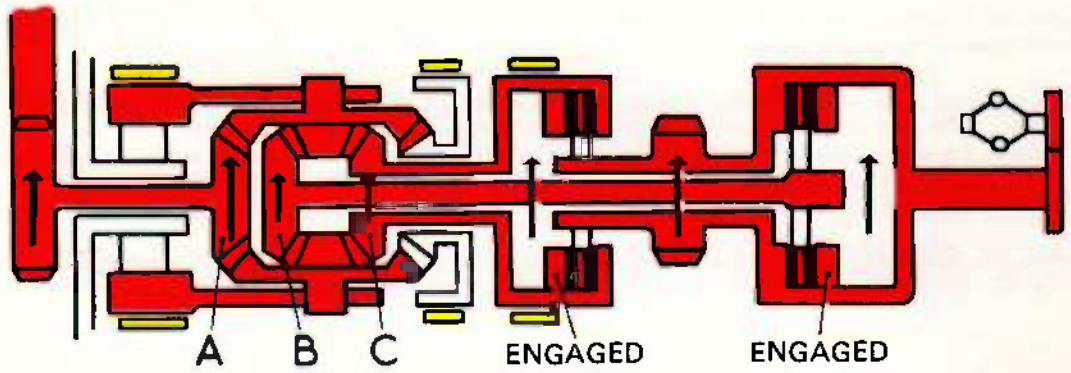


FIG. 21

REVERSE

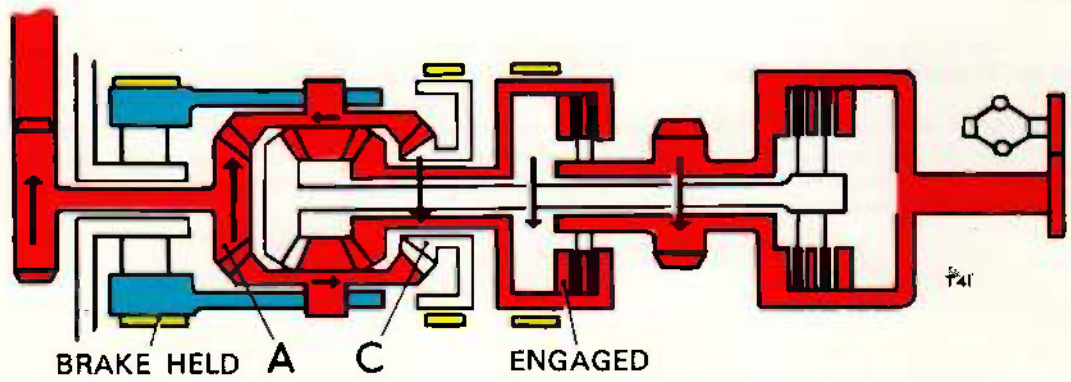


FIG. 22

3rd GEAR

Gear selection is either manual by movement of the gear shift lever or automatic as the governor valve, influenced by further increase in road speed, takes up another position.

Oil pressure ensures that the forward clutch remains engaged, but the oil pressure within the servo unit applies the 3rd gear brake band.

The 3rd gear brake band holds gear D stationary. This serves to increase the speed of the carrier to produce the 3rd gear ratio.

TOP GEAR

Selection of this gear is either manual with the gear shift lever or automatic by further movement of the governor valve, due to increased road speed.

All the brake bands are released, the forward clutch remains engaged, and in addition to this the top and reverse clutch is engaged.

This combination has the effect of locking all gears together, thus holding the idler gears stationary within the gear carrier. Gear A, the gear carrier, and gears B and C rotate as one giving a top gear ratio of 1 : 1;

REVERSE GEAR

Manual selection of reverse is from neutral only.

The reverse band is applied to prevent the gear carrier from turning, the top and reverse clutch is engaged by oil pressure and the forward clutch is disengaged.

Gear A rotates in an anti-clockwise direction and with the carrier held stationary by the brake band, the idler gears rotate gear C in the opposite direction to gear A, transmitting reverse drive through top and reverse clutch to the final drive.

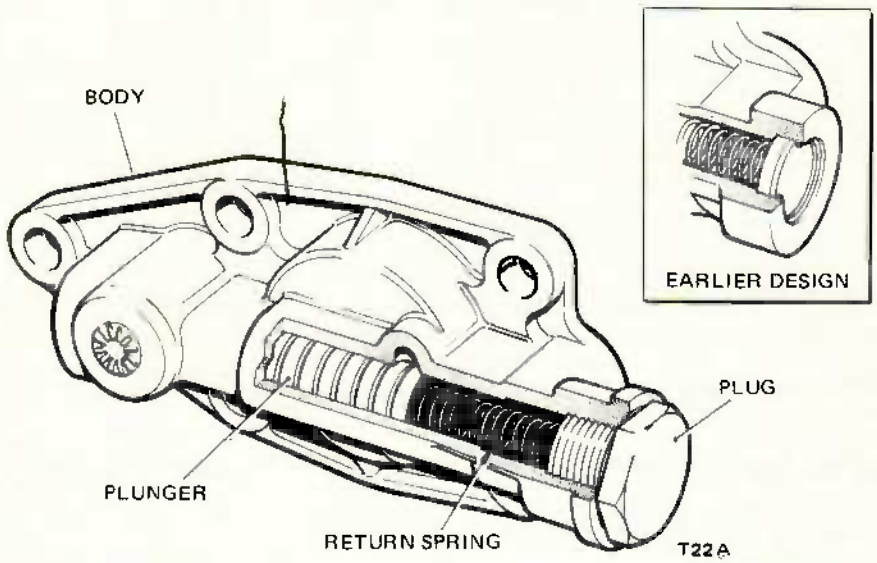


FIG. 23. CUTAWAY VIEW OF LOW PRESSURE VALVE

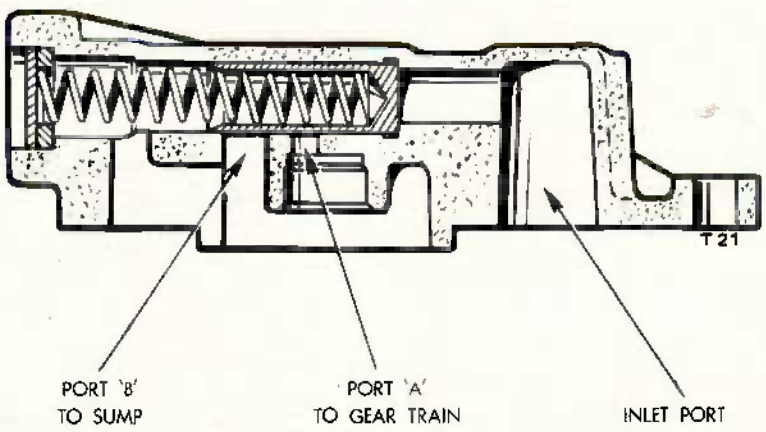


FIG. 24. SECTION VIEW OF LOW PRESSURE VALVE

LOW PRESSURE VALVE

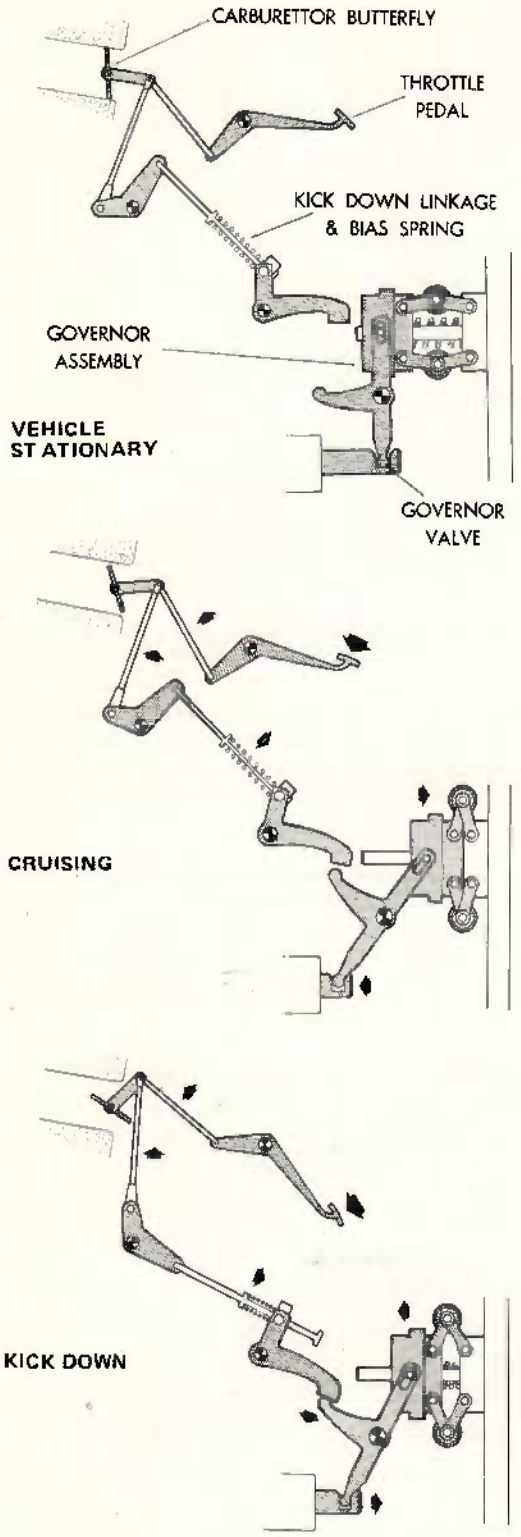
The low pressure valve is bolted to the converter housing directly below the torque converter.

It comprises a light alloy body which is bored to accommodate a spring-loaded plunger. One end of the spring locates within the hollow plunger, while its other end is held central within the body by either a locating washer retained in the mouth of the bore by an expansion plug, or a recess machined in the end of a screwed plug.

The body is cast with three ports which align with similar ports in the converter housing, a paper gasket being fitted between the two to provide an oil-tight seal.

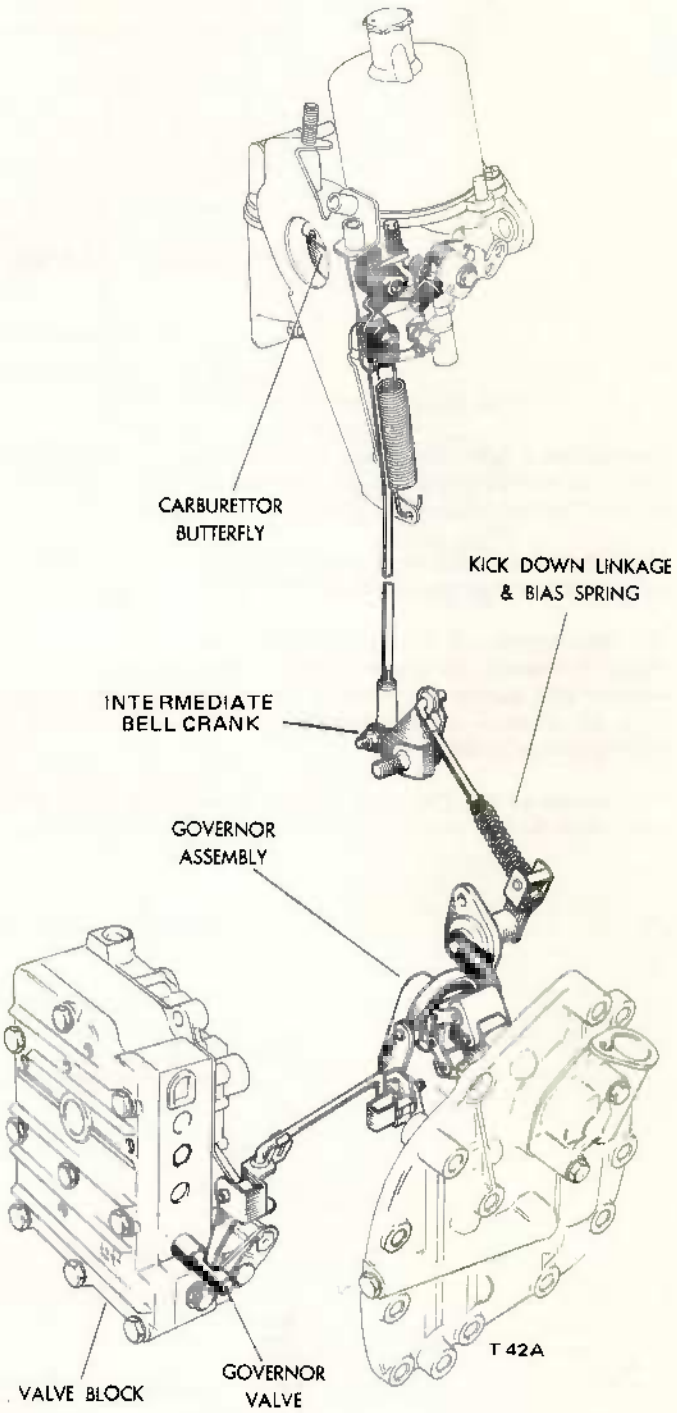
The main object of the low pressure valve is to control the oil pressure within the torque converter. When the engine is started, oil under pressure from the converter passes into the low pressure valve via its inlet port. This pressure acts against the head of the plunger causing its displacement along the bore against the load of the spring. When oil pressure reaches approximately 30 p.s.i., port 'A' is uncovered allowing the oil to lubricate the gear train before passing to the sump.

The purpose of the 2nd port 'B' is to allow direct return of excess oil to the sump when an increase in pressure moves the plunger further along the bore. This relief valve restricts pressure to a limit of approximately 40 p.s.i.



SCHE MATIC DIAGRAM OF KICK DOWN LINKAGE

FIG. 25.



KICK DOWN LINKAGE

KICK DOWN LINKAGE

To enable maximum speeds and maximum acceleration in the intermediate gears to be used, while still retaining automatic gear changes, a 'kick down' linkage is provided. This linkage connects the governor to the accelerator pedal via the throttle control on the carburettor and by biasing the movement of the governor enables higher road and engine speeds to be achieved before the next gear is automatically engaged.

When the accelerator is pressed, a pull rod from the carburettor turns an intermediate bell crank lever which pushes a short control rod. This is connected through a spring to a lower bell crank assembly, the lever of which acts on a lever on the governor. The lower bellcrank assembly is mounted in a Delrin moulding bolted to the transmission case.

On light throttle openings, there is clearance between the inner lever and the governor lever. Accordingly, automatic changes are controlled by the governor spring above.

As the accelerator pedal is pressed further down and the gap closed, the bias spring is compressed effectively increasing the strength of the governor spring. To overcome this extra load a higher governor speed is required and consequently gear changes will be delayed up to a maximum at full throttle.

If the transmission is already in a high gear at low road speed, a down shift will occur on full throttle opening to give the optimum gear for the acceleration required.

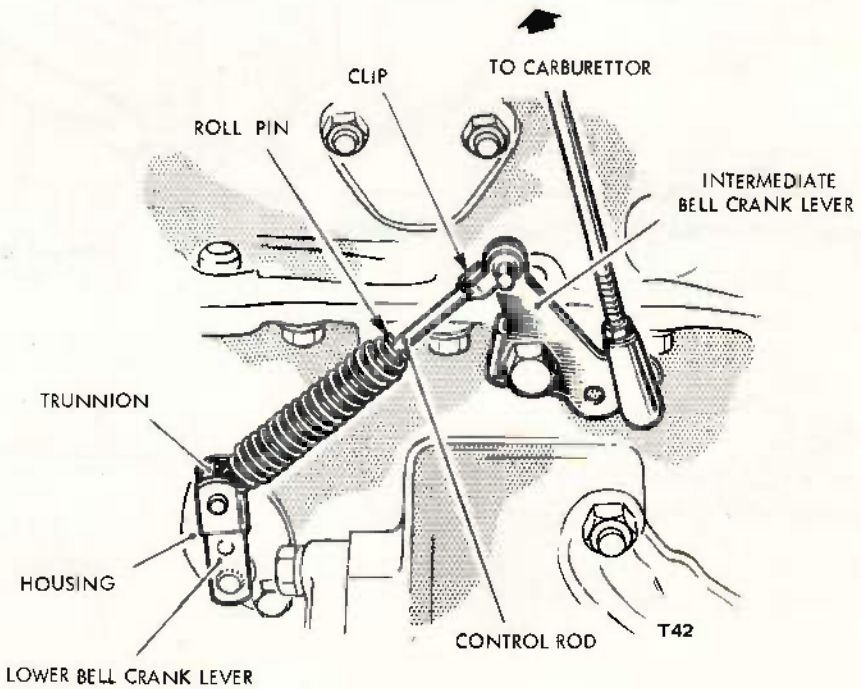
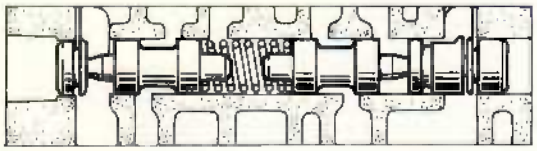


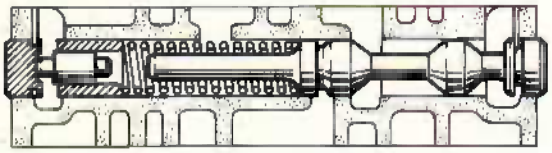
FIG. 26

DUMP VALVE & 3rd GEAR VALVE

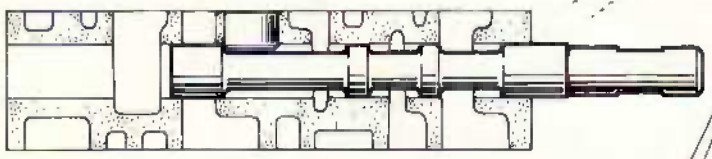


TOP & 2nd GEAR VALVES

ENGAGEMENT CONTROL PRESSURE VALVE



REGULATOR VALVE



GOVERNOR VALVE

SELECTOR VALVE

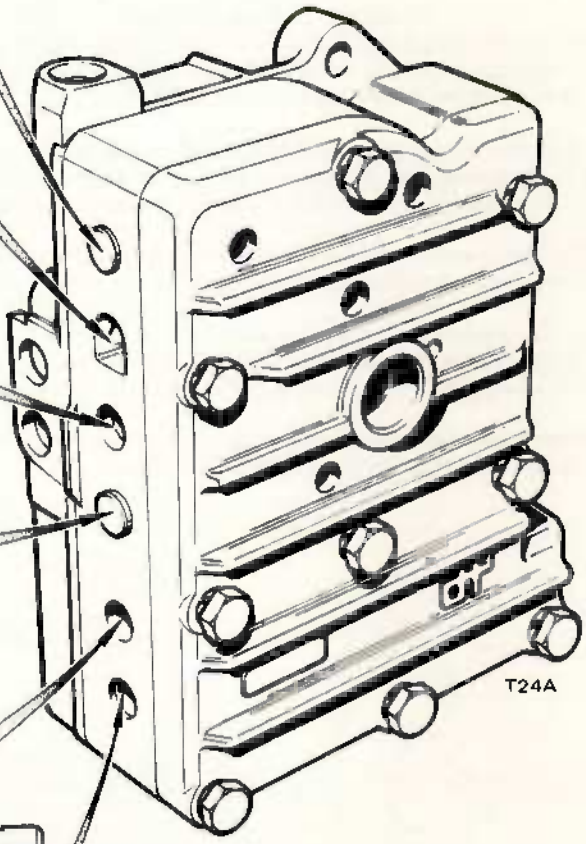


FIG. 27

ARRANGEMENT OF VALVES IN VALVE CHEST MK. IIB

VALVE BLOCK ASSEMBLY MK IIB

It is important to note that the valve block assembly can be one of 3 different types depending on the vehicle age and model. The assembly shown here, incorporating engagement control, is used on transmissions with 1, 2, 3, D selector sequence and is known as MK IIB.

On subsequent pages the earlier valve block assembly used on MKs I and II transmissions is shown.

A modified version of this, known as MK IIA, was fitted with engagement control and used on 1300 vehicles, with 1, 2, 3, 4, D selector sequence, from February 1970.

The valve block assembly consists of three pressure die castings sandwiched together and is situated in a compartment in the transmission case. The three components are termed the pipe chest, the valve chest and the valve chest lid.

The pipe chest provides outlet connections for the distribution of oil to all parts of the engine and transmission; details of the connections can be seen in Fig 41. The pipe chest houses the detent rod which, controlled by the selector lever, determines the position of the selector valve within the valve chest. It also carries the governor valve linkage and houses two sets of valves and their oil galleries.

The valve chest is an intricate casting embodying the majority of the oil galleries necessary for the distribution of the oil. Six honed bores house the various valves, details of which are given below. A steel plate between the pipe chest & the valve chest separates the two sets of oil galleries.

The valve chest lid closes the other side of the oil galleries in the valve block and incorporates a port for the main oil inlet from the filter.

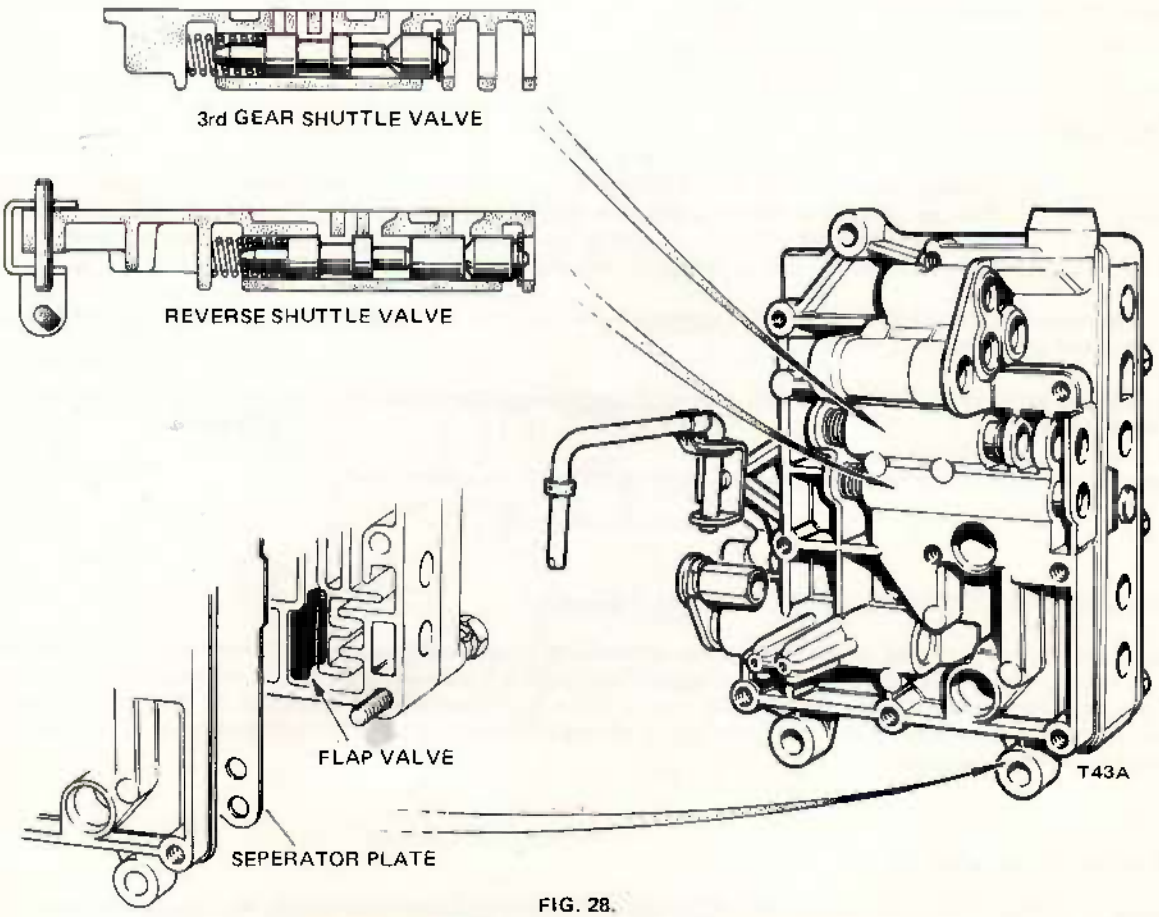


FIG. 28.

ARRANGEMENT OF VALVES IN PIPE CHEST. MK IIB,

Viewing from top to bottom of Figs. 27 & 28, the various valves are:—

3rd GEAR & ONE WAY DUMP VALVES
2nd & TOP GEAR VALVES

These valves are operated hydraulically. Depending on whether manual or automatic gear selection is employed, the valves accept oil from the selector or governor valve and direct it to the appropriate servo or clutch and provide an exhaust path through the valve block for oil from disengaged gears. During automatic selection they allow an overlap of 2nd and 3rd, and 3rd and top gears to prevent the engine speed rising.

The one way dump valve bypasses a restrictor in the reverse servo line to allow rapid exhaust of the reverse servo.

ENGAGEMENT CONTROL PRESSURE VALVE

This valve is only in operation during the engagement of forward gears from neutral, its function being to delay the feed to the forward clutch until a pre-determined pressure is reached.

REGULATOR VALVE

This valve is also operated hydraulically against a spring, and, as the name implies, regulates the pressure of the oil in the transmission system to a set figure.

When reverse gear is selected, the extra torque reaction requires a greater clamping load in the clutch and on the brake band. This is provided by the pressure of oil behind a small booster piston augmenting the action of the regulator valve spring. Accordingly, a greater load is required to move the regulator valve thereby increasing the oil pressure in the transmission system.

GOVERNOR VALVE

This is operated mechanically by the governor and the governor position is influenced by road speed and throttle operation. It is only in use when 'D' is selected and directs oil under pressure to the various servos and clutches according to road speed.

SELECTOR VALVE

The selector valve controls the oil supply to the transmission components when the gears are selected manually and is connected directly to the gear lever in the car. Selection of neutral cuts off the oil supply to the clutches and servos. When the gear lever is in 1, 2, 3 or R, oil is directed to the clutches or servos as appropriate. In all these positions, however, no oil is directed to the governor valve.

In 'D' the valve supplies oil direct to the forward clutch and governor valve, gear selection being due to the influence of the car's speed on the governor valve.

Oil is supplied at all times to the converter and to engine lubrication, engine oil pressure being separately regulated by the engine relief valve.

To appreciate these descriptions, reference should be made to the hydraulic charts.

ENGAGEMENT CONTROL SHUTTLE VALVES

These valves are incorporated in the pipe chest, and during forward gear engagement from neutral are held shut by their springs to allow a direct feed from the selector valve to the 3rd and reverse servos. As the engagement is completed they are opened hydraulically to exhaust the reverse servo and allow normal operation of 3rd gear as required by either the governor or selector valve. As reverse gear is selected the piston is operated independently of the valve to close off the forward gear galleries.

ONE-WAY FLAP VALVE

Designed as a simple flat plate closing off a hole, the function of this valve is to bypass the engagement control circuit and allow rapid exhaust of the forward clutch when Neutral is selected.

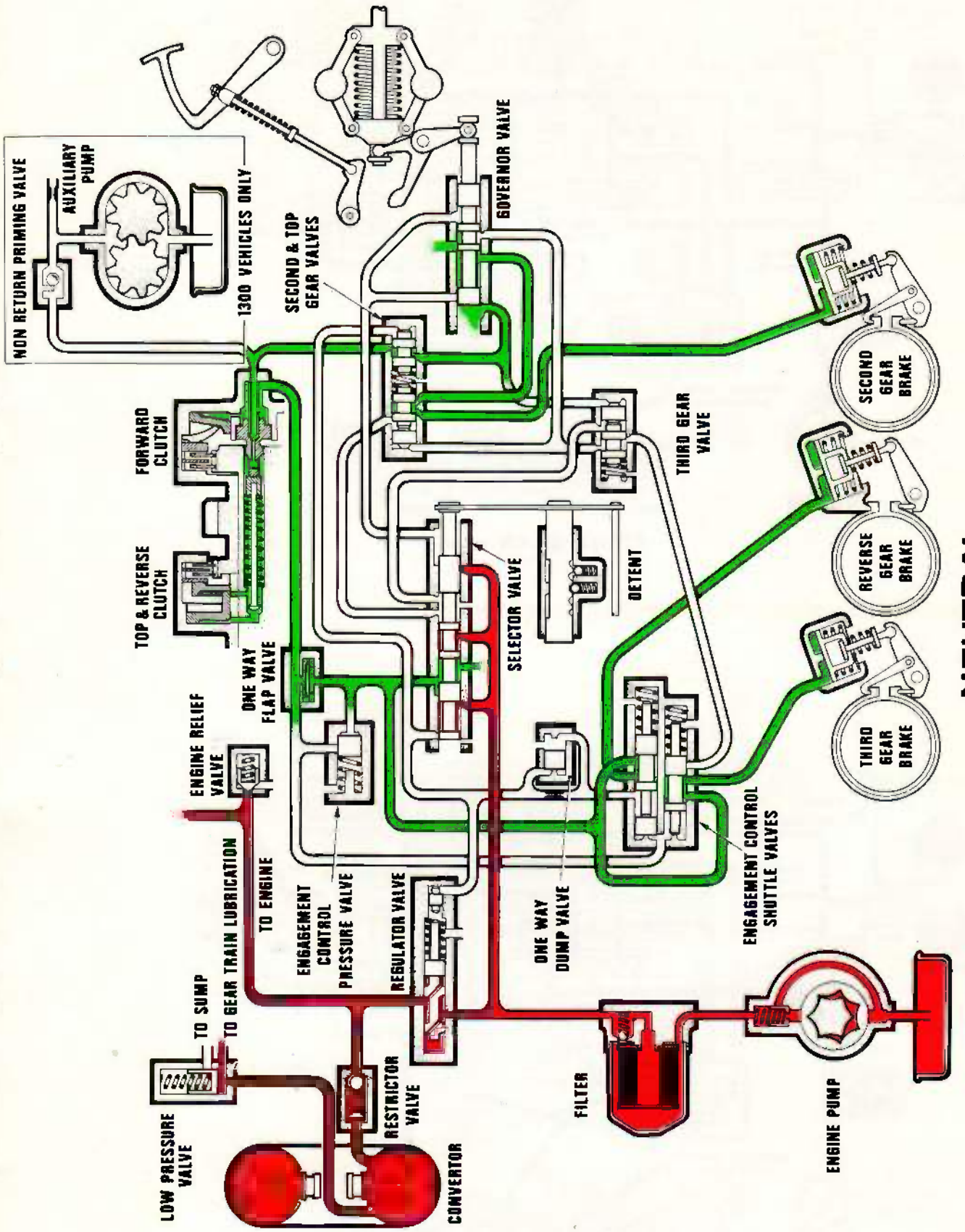
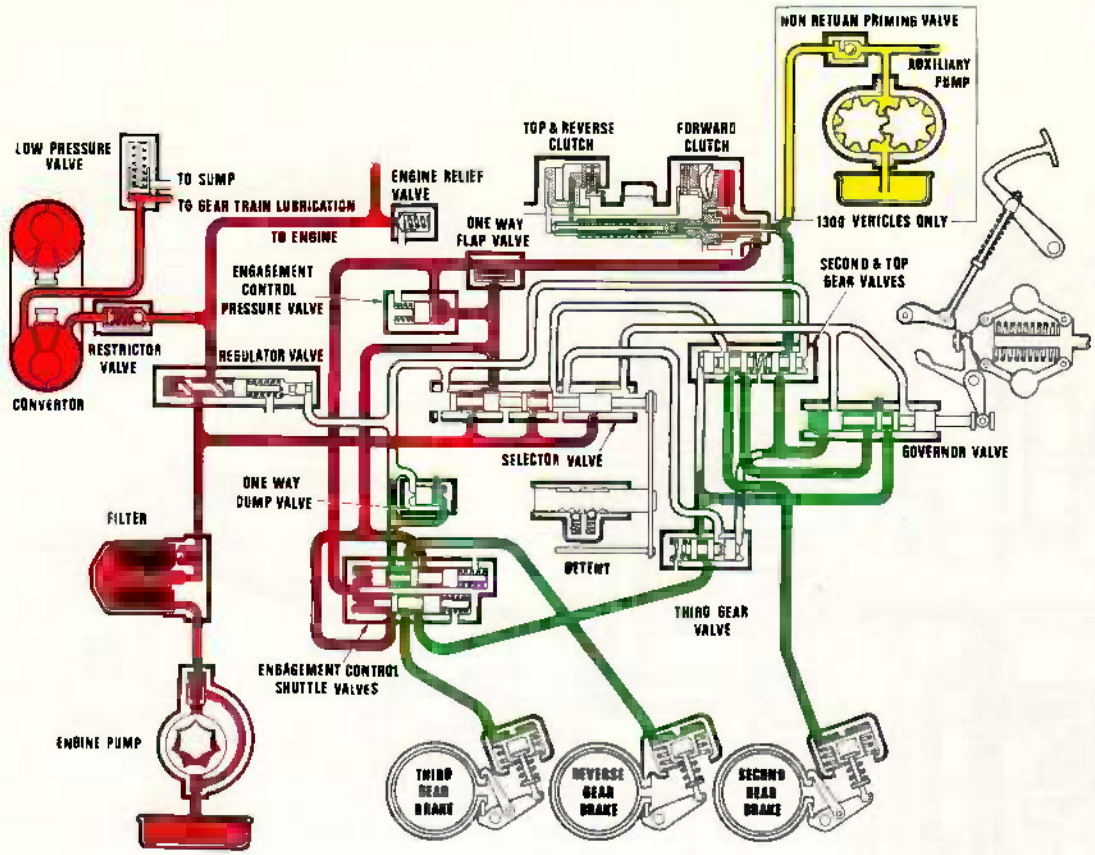
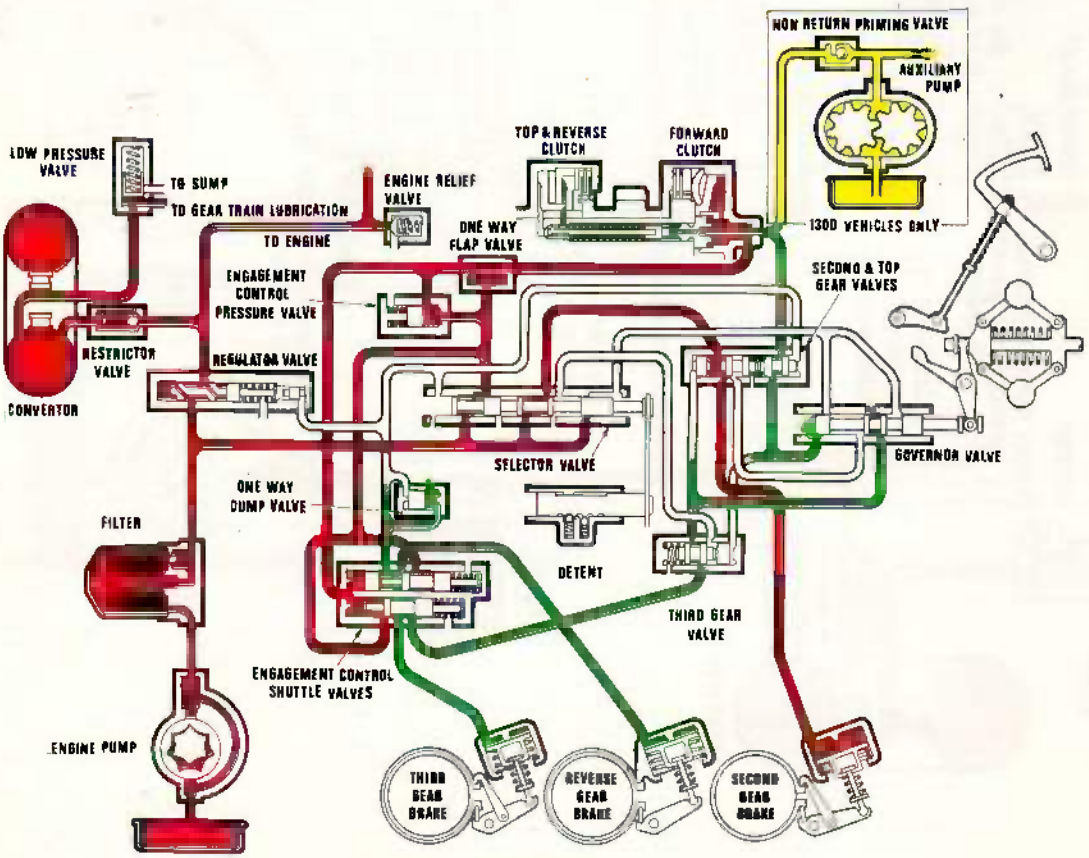


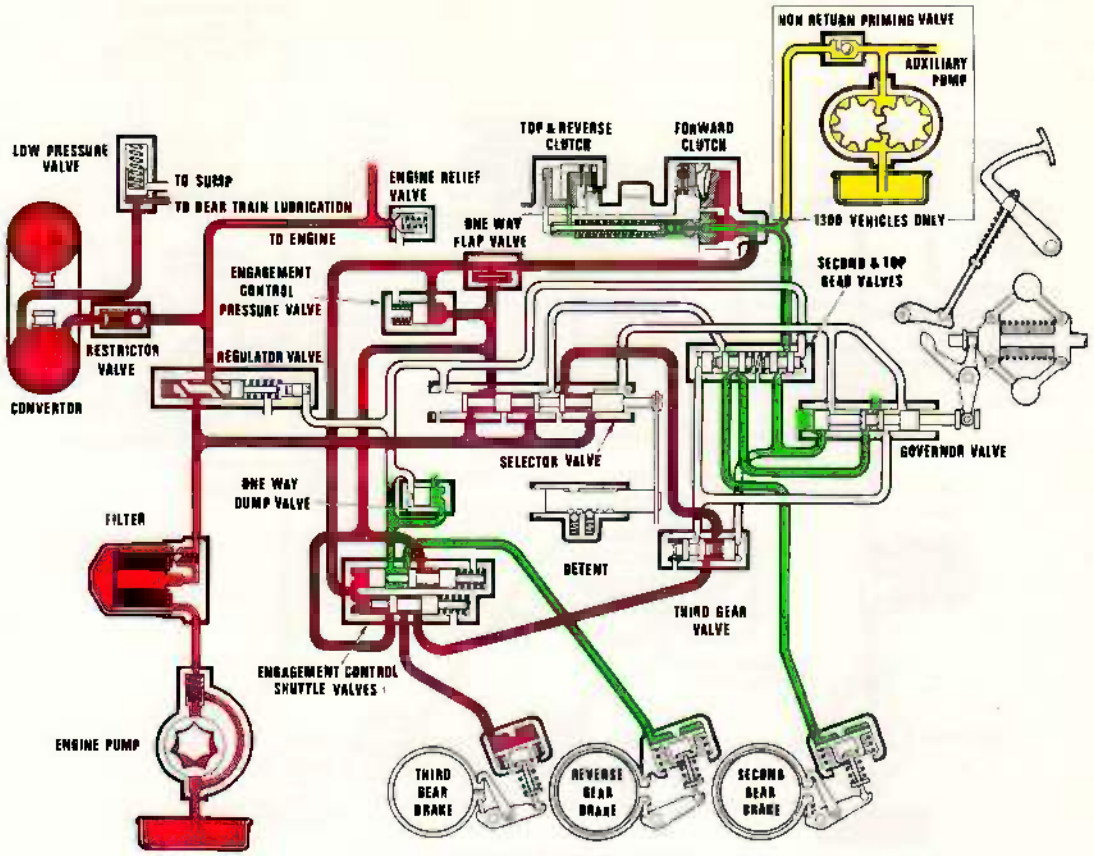
FIG. 29



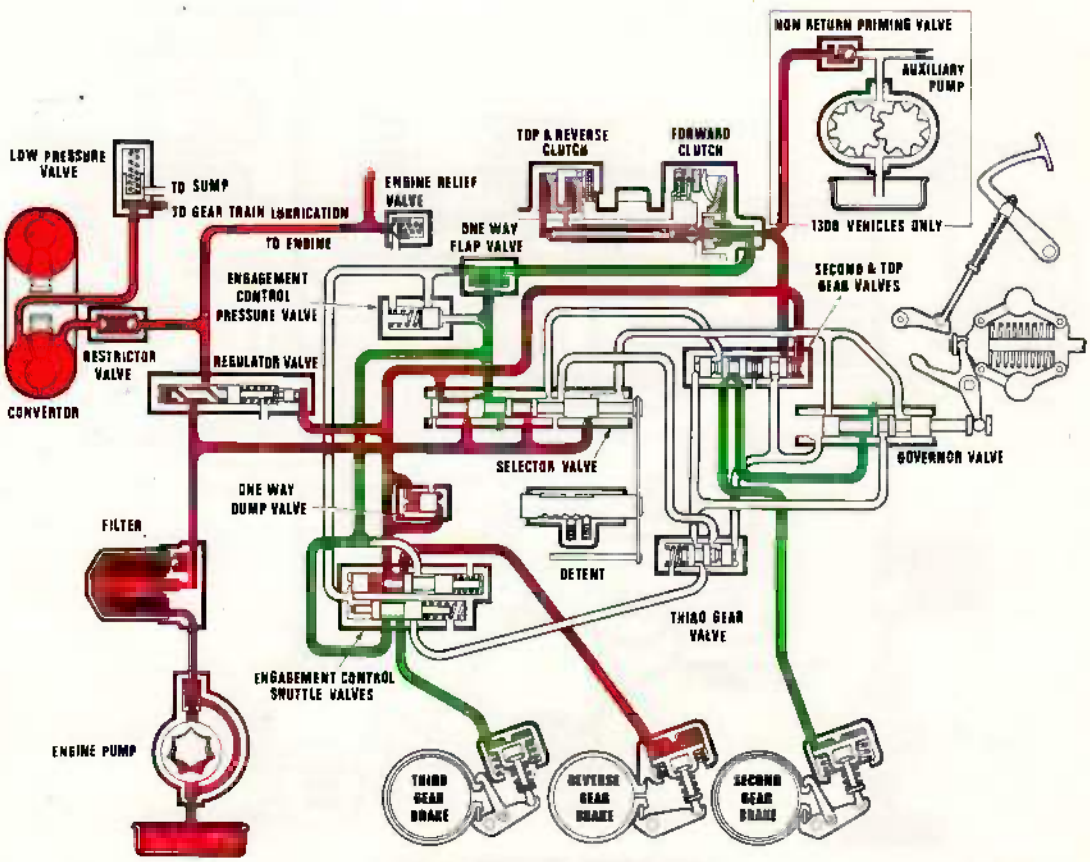
FIRST GEAR *MANUAL* FIG. 30.



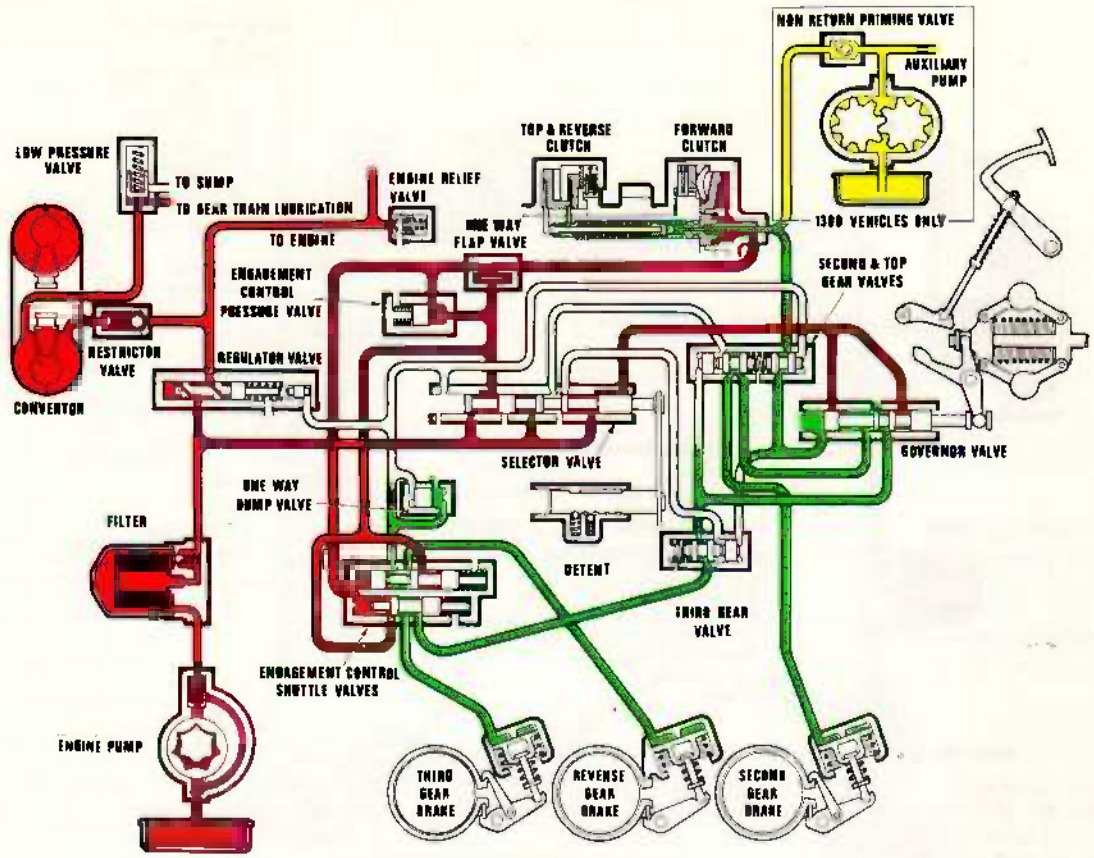
SECOND GEAR *MANUAL* FIG. 31.



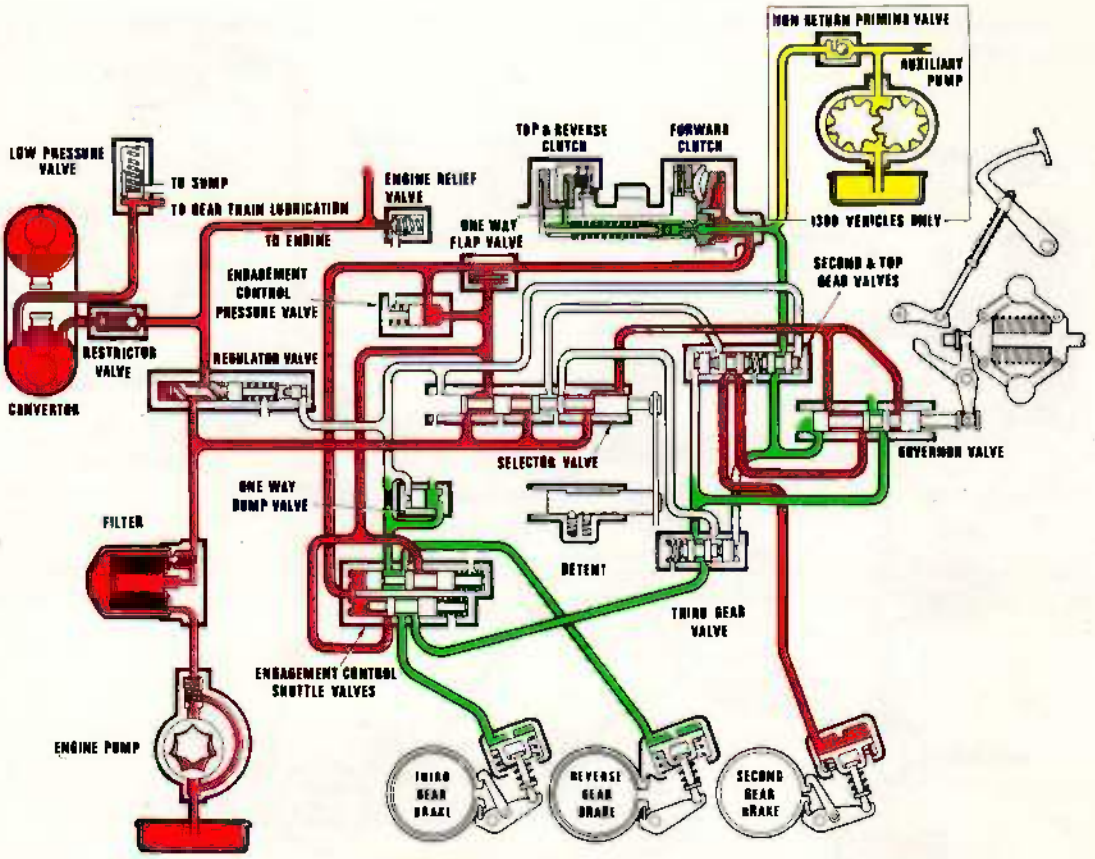
THIRD GEAR *MANUAL* FIG. 32.



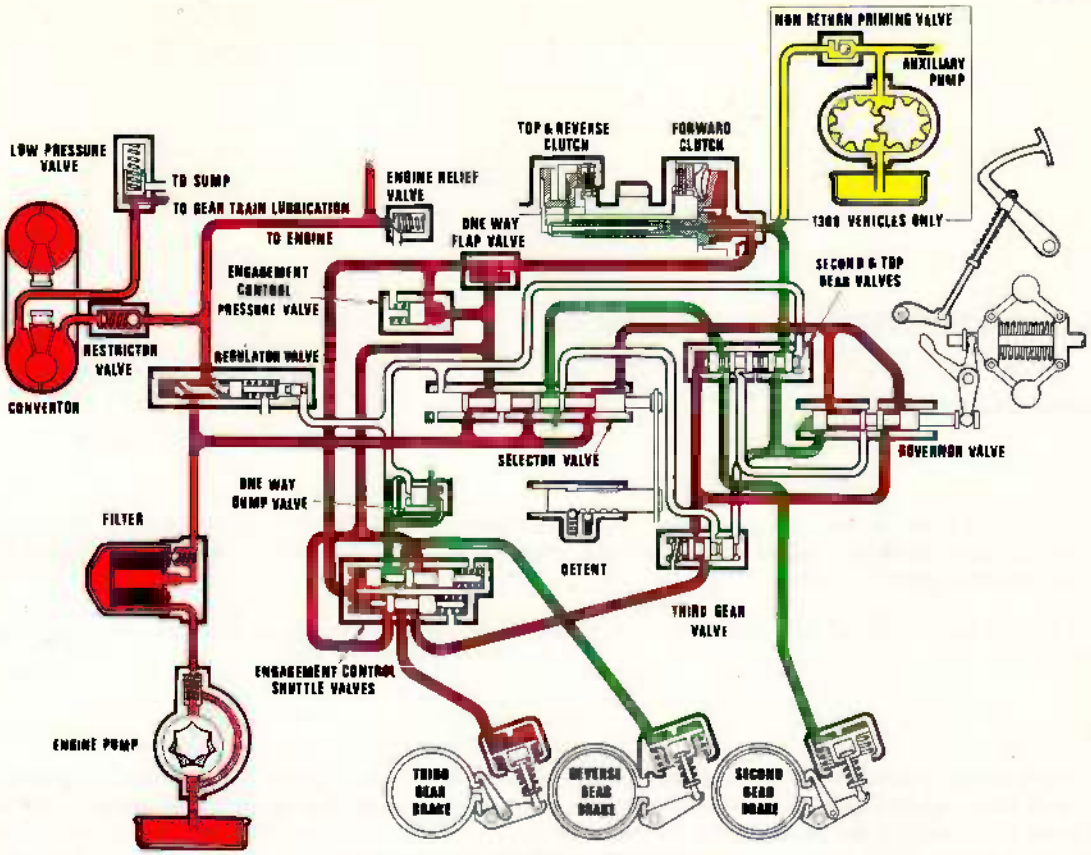
REVERSE GEAR FIG. 33.



FIRST GEAR *AUTOMATIC* FIG. 34.

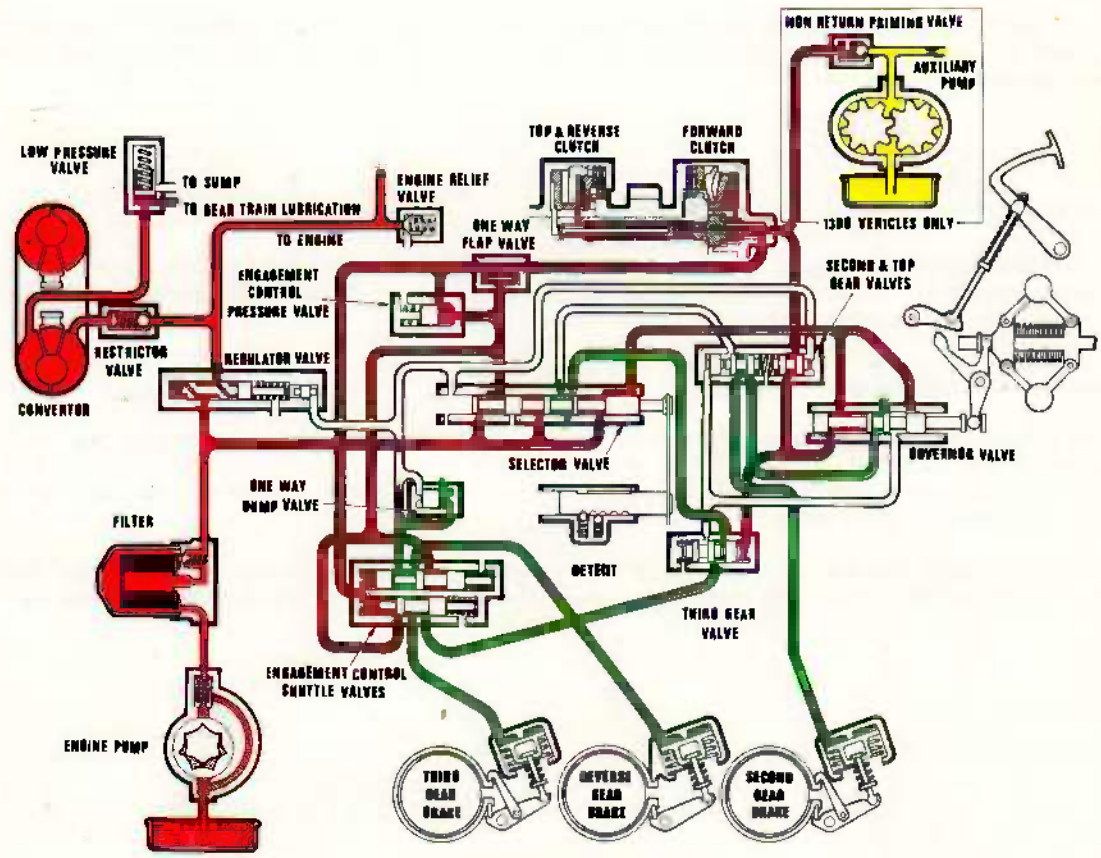


SECOND GEAR *AUTOMATIC* FIG. 35.



THIRD GEAR *AUTOMATIC*

FIG. 36.



TOP GEAR

FIG. 37.

ENGAGEMENT CONTROL SEQUENCE MK IIB.

Engagement of Forward gear

FIG. 38

Starting in N, the driver selects a forward gear moving the selector valve which feeds oil to close the flap valve. This directs oil through the shuttle valves to the 3rd and Reverse servos, applying the brake bands bringing the rotating parts in the gearbox gently to rest.

This can be felt by the driver as a reduction in tick-over speed. Simultaneously oil flows to the engagement control pressure valve.

FIG. 39

At a predetermined pressure – approx. 60 psi – the pressure valve opens allowing oil to fill the forward clutch. Since the clutch is being applied against stationary parts the engagement is imperceptible. Oil also feeds to the back of the shuttle valve unit, moving the valves across to allow the 3rd and Reverse servos to exhaust. The Reverse servo exhausts through the one way dump valve, via the shuttle valve, and the 3rd gear servo through the governor valve via the shuttle valve. Note that the dump valve bypasses the restrictor allowing the Reverse servo to exhaust quickly to prevent the reverse brake band hanging on. With the shuttle valves open, the flap valve and engagement valve are by-passed leaving the forward clutch fed directly from the selector valve.

As the brake bands are released engine torque is passed through the forward clutch to the road wheels and is felt by the driver as the nose of the car lifts slightly on the suspension.

The oil pressure required to hold the shuttle valves open is approx. 20 psi. Once the engagement sequence is completed the forward clutch will remain engaged during normal fluctuation in oil pressure and irrespective of the positions of the pressure valve and flap valve.

Selection of Neutral

The driver, selecting Neutral, moves the selector valve cutting off the oil supply. Oil from the forward clutch opens the flap valve to allow exhaust, and the pressure and shuttle valves close under spring pressure completing the cycle.

Engagement of Reverse gear

With the selector moved to Reverse, oil operates the Reverse Boost Piston and feeds through the restrictor to the reverse servo. The restrictor controls the rate of filling of the servo to ensure soft engagement. Oil also feeds into the one way dump valve, closing the exhaust port, and then into the shuttle valve. The piston and valve seperate to allow free passage of oil to the servo.

When neutral is again selected, oil is exhausted back along the same route through the dump valve. When pressure drops below 20 psi the shuttle valve piston moves back under spring pressure and exhaust continues via the selector valve.

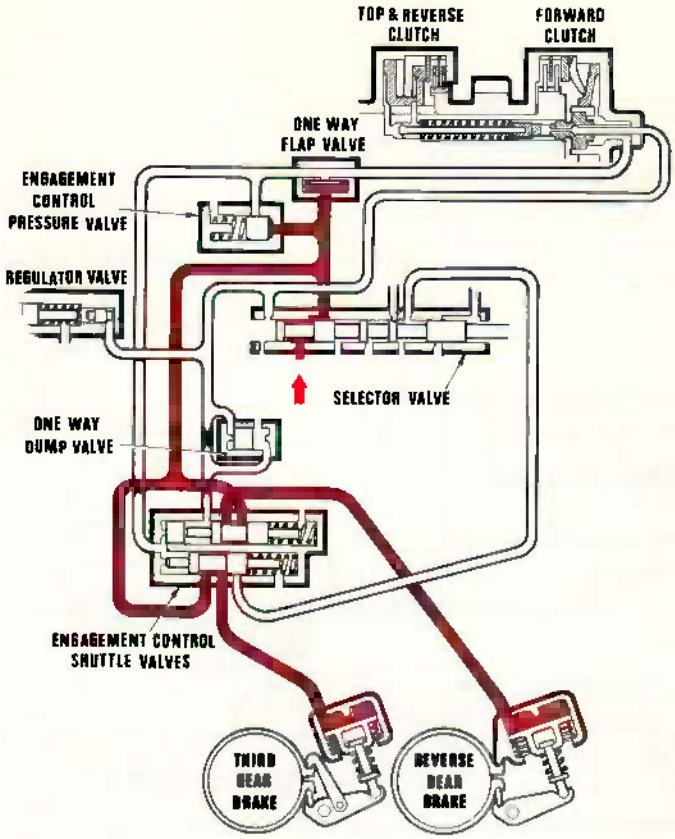


FIG. 38

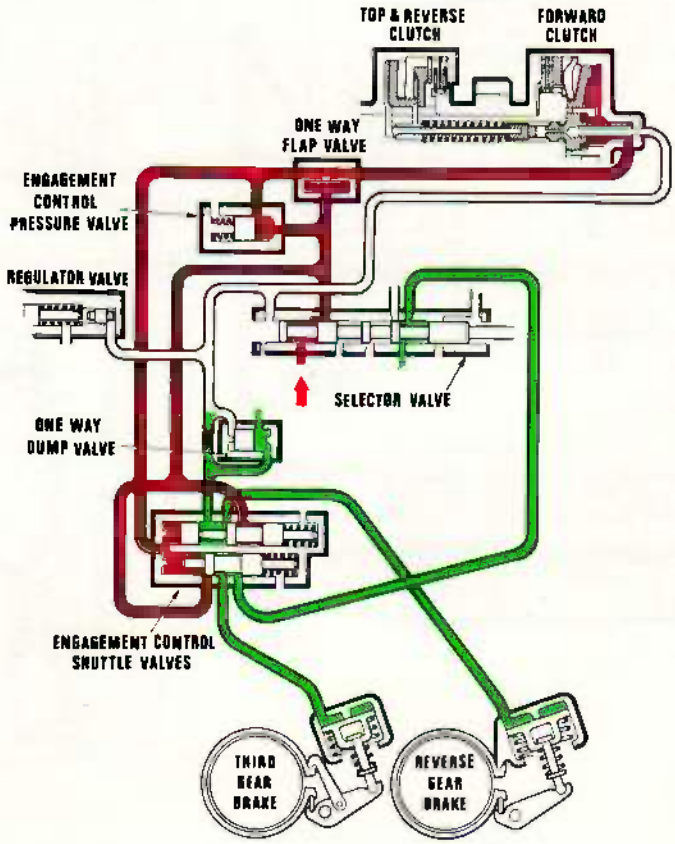


FIG. 39

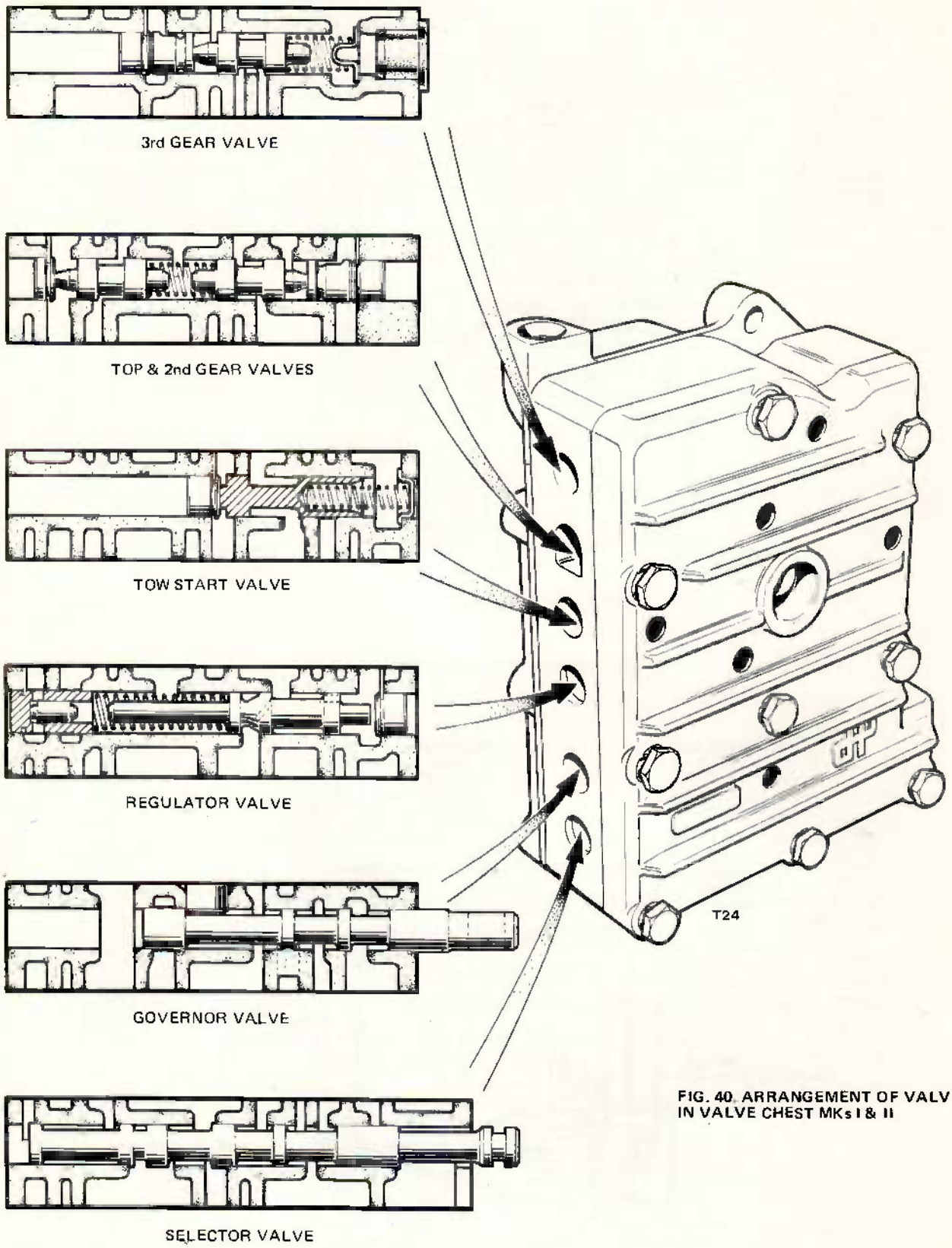


FIG. 40. ARRANGEMENT OF VALVES IN VALVE CHEST MKs I & II

VALVE BLOCK ASSEMBLY MKs I & II

The valve block assembly consists of three pressure die castings sandwiched together and is situated in a compartment in the transmission case. The three components are termed the pipe chest, the valve chest and the valve chest lid.

The pipe chest provides outlet connections for the distribution of oil to all parts of the engine and transmission. Details of the connections can be seen in Fig. 41. The pipe chest houses the detent rod which, controlled by the selector, determines the position of the selector valve within the valve chest. It also carries the governor valve linkage and its inner surface acts as a cover for the oil galleries within the valve block assembly.

The valve chest is an intricate casting embodying the oil galleries necessary for the distribution of the oil. Six honed bores house the various valves, details of which are given below.

The valve chest lid closes the other side of the oil galleries in the valve block and incorporates a port for the main oil inlet from the filter.

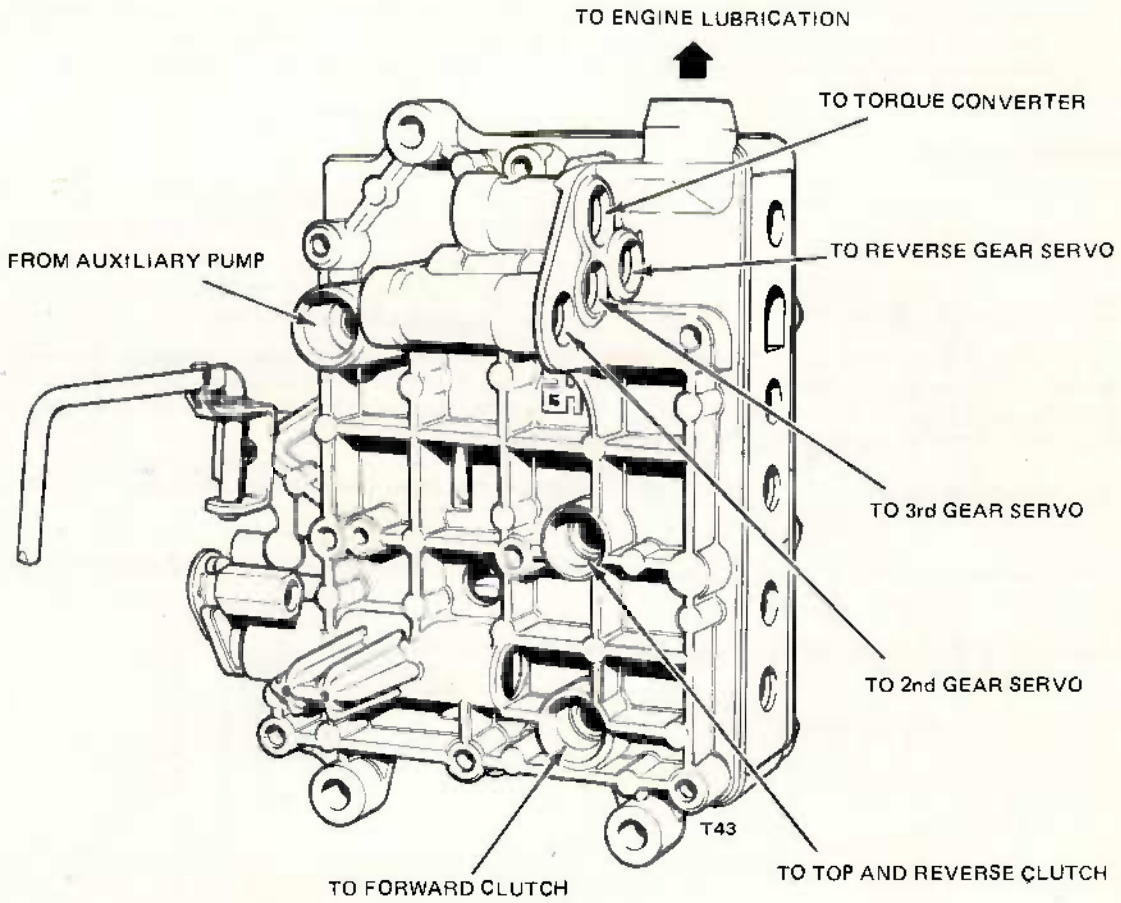


FIG. 41 REAR VIEW OF VALVE BLOCK SHOWING VARIOUS HYDRAULIC CONNECTIONS

Viewing from top to bottom of Fig. 40, the various valves are:—

3rd GEAR VALVE

2nd GEAR VALVE & TOP GEAR VALVE

These valves are operated hydraulically. Depending on whether manual or automatic gear selection is employed, the valves accept oil from the selector or governor valve and direct it to the appropriate servo or clutch and provide a return passage for oil to the sump during gear changes.

TOW START VALVE

Under normal conditions this valve is operated by hydraulic pressure from the main oil pump, allowing the oil to pass to the regulator valve. In this position, when the vehicle is moving, the valve directs the delivery from the auxiliary pump back into the sump.

When the engine is not running the valve is closed by a spring. Forward movement of the vehicle when towed, causes operation of the auxiliary pump and the valve allows the oil delivered to pass through to the rest of the hydraulic system. When the engine oil pump is brought into operation, i.e. when the engine starts, the valve moves across and conditions revert to those of the previous paragraph.

REGULATOR VALVE

This valve is also operated hydraulically against a spring, and, as the name implies, regulates the pressure of the oil in the transmission system to a set figure.

When reverse gear is selected, the extra torque reaction requires a greater clamping load in the clutch and on the brake band. This is provided by the pressure of oil behind a small booster piston augmenting the action of the regulator valve spring. Accordingly, a greater load is required to move the regulator valve thereby increasing the oil pressure in the transmission system.

GOVERNOR VALVE

This is operated mechanically by the governor and the governor position is influenced by road speed and throttle operation. It is only in use when D is selected and directs oil under pressure to the various servos and clutches according to road speed.

SELECTOR VALVE

The selector valve controls the oil supply to the transmission components when the gears are selected manually and is connected directly to the gear lever in the car. Selection of neutral cuts off the oil supply to the clutches and servos. When the gear lever is in 1, 2, 3, 4 or R, oil is directed to the clutches or servos as appropriate. In all these positions, however, no oil is directed to the governor valve.

In D the valve supplies oil direct to the forward clutch and governor valve, gear selection being due to the influence of the car's speed on the governor valve.

Oil is supplied at all times to the converter and to engine lubrication, engine oil pressure being separately regulated by the engine relief valve.

To appreciate these descriptions, reference should be made to the hydraulic charts.

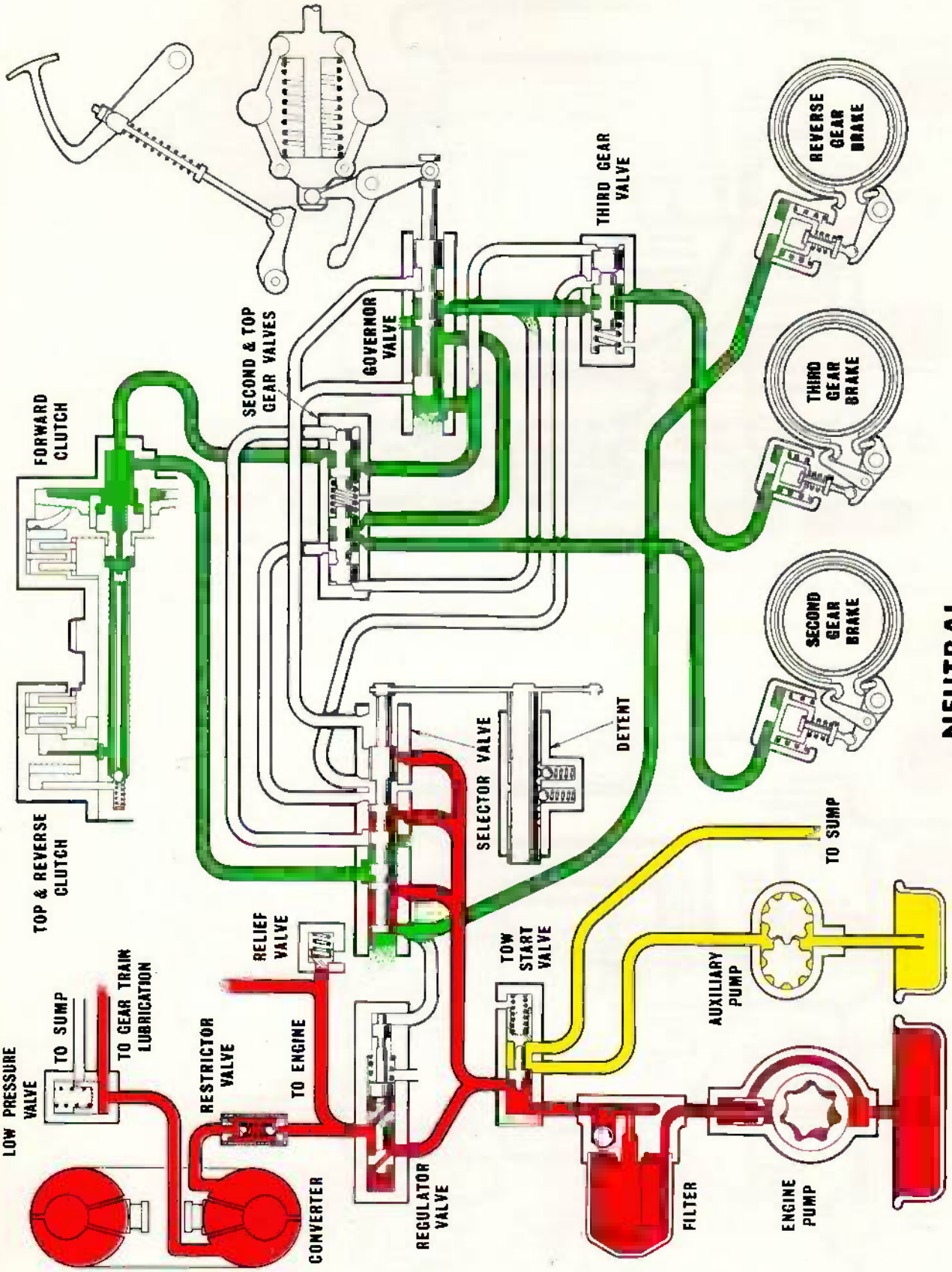
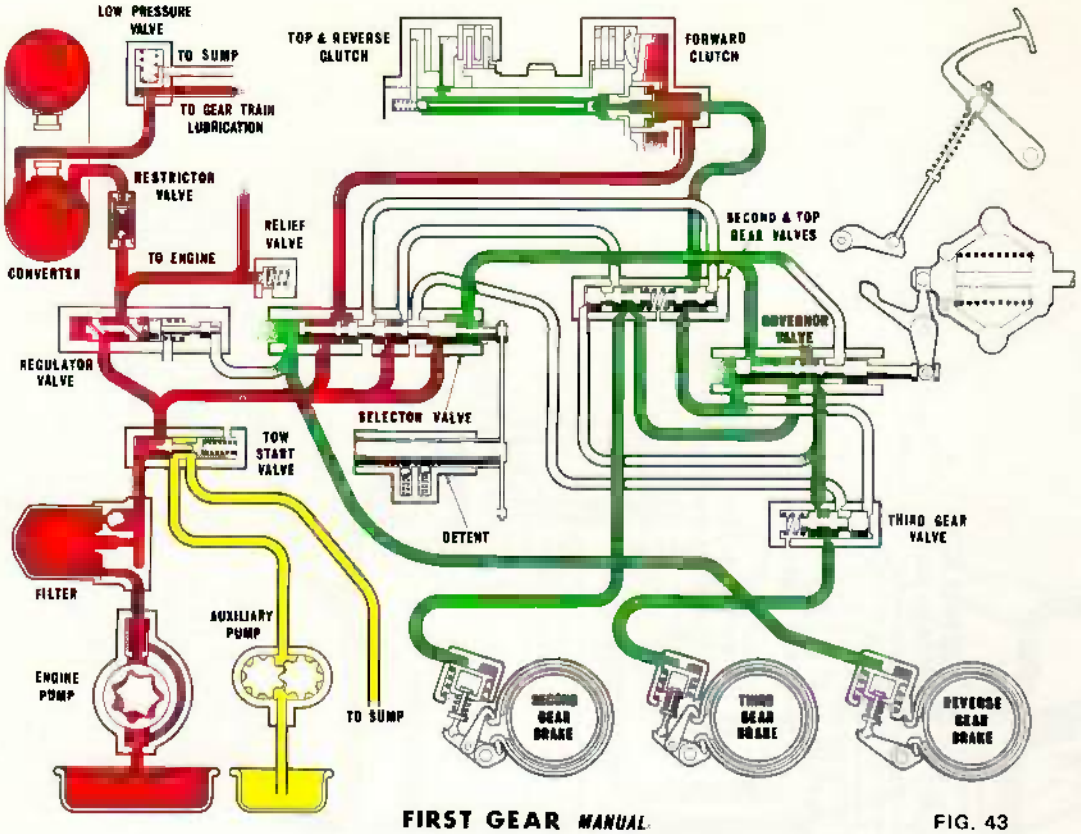
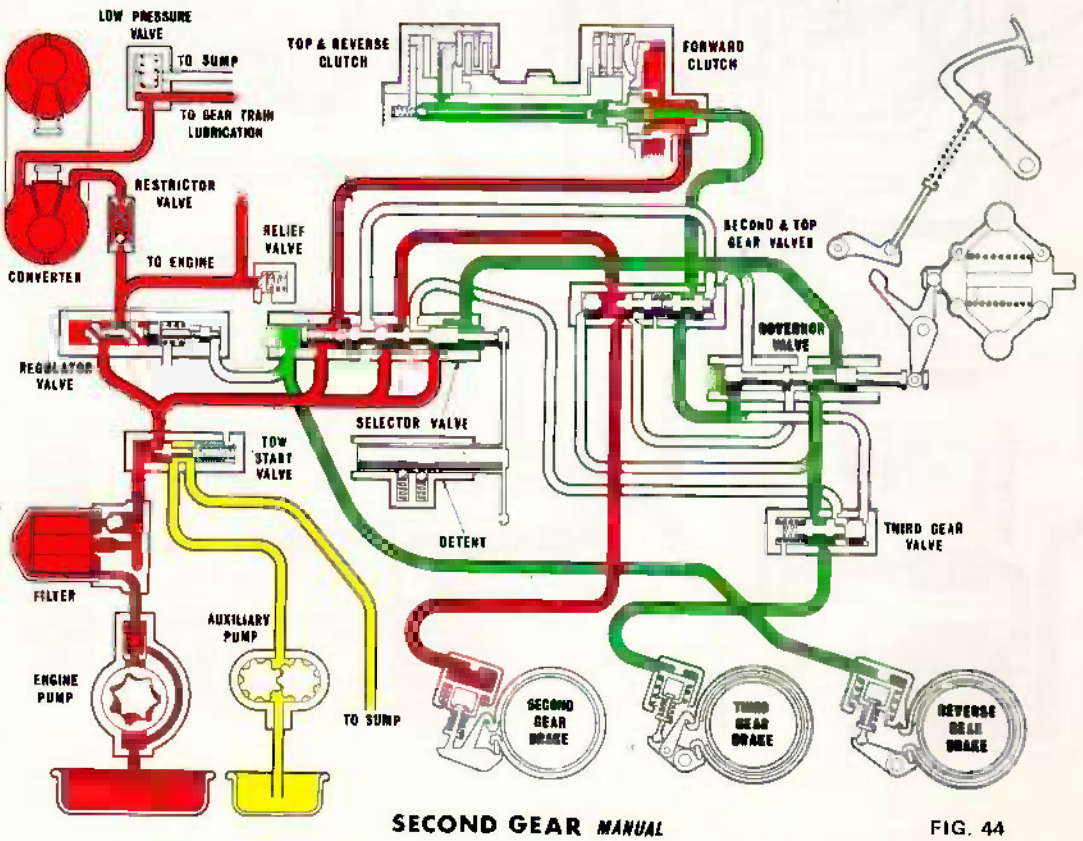


FIG. 42



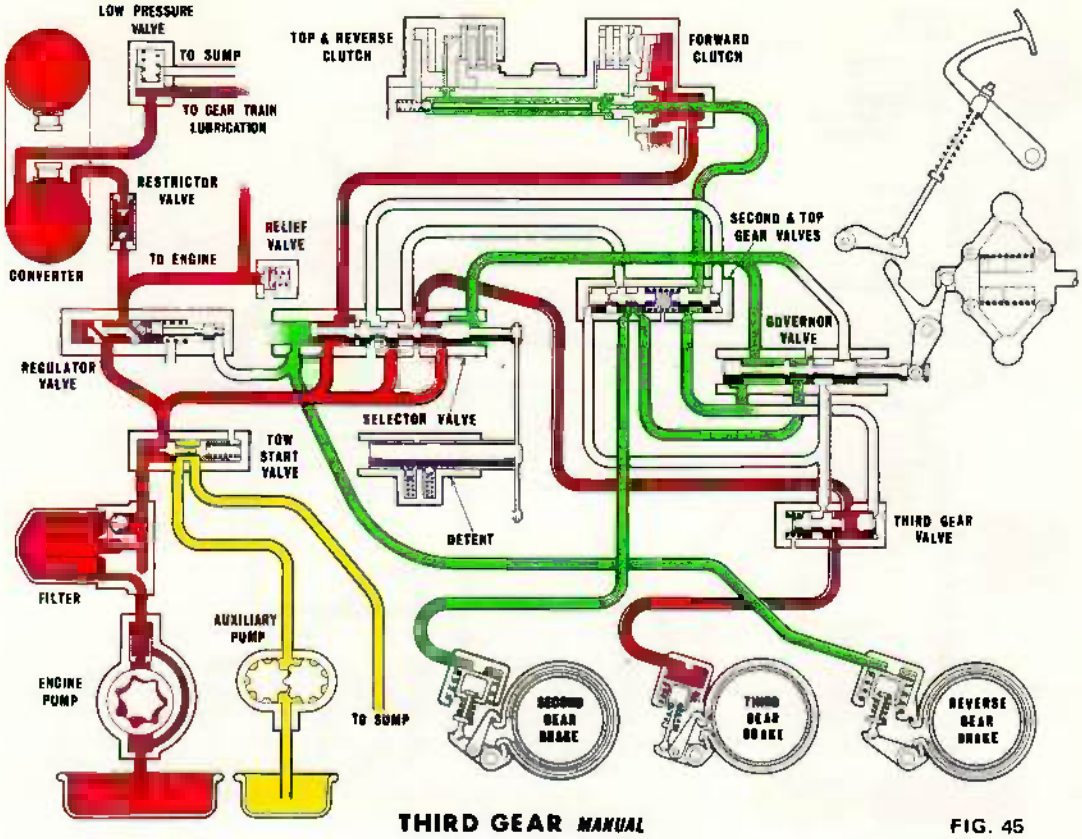
FIRST GEAR *MANUAL*

FIG. 43



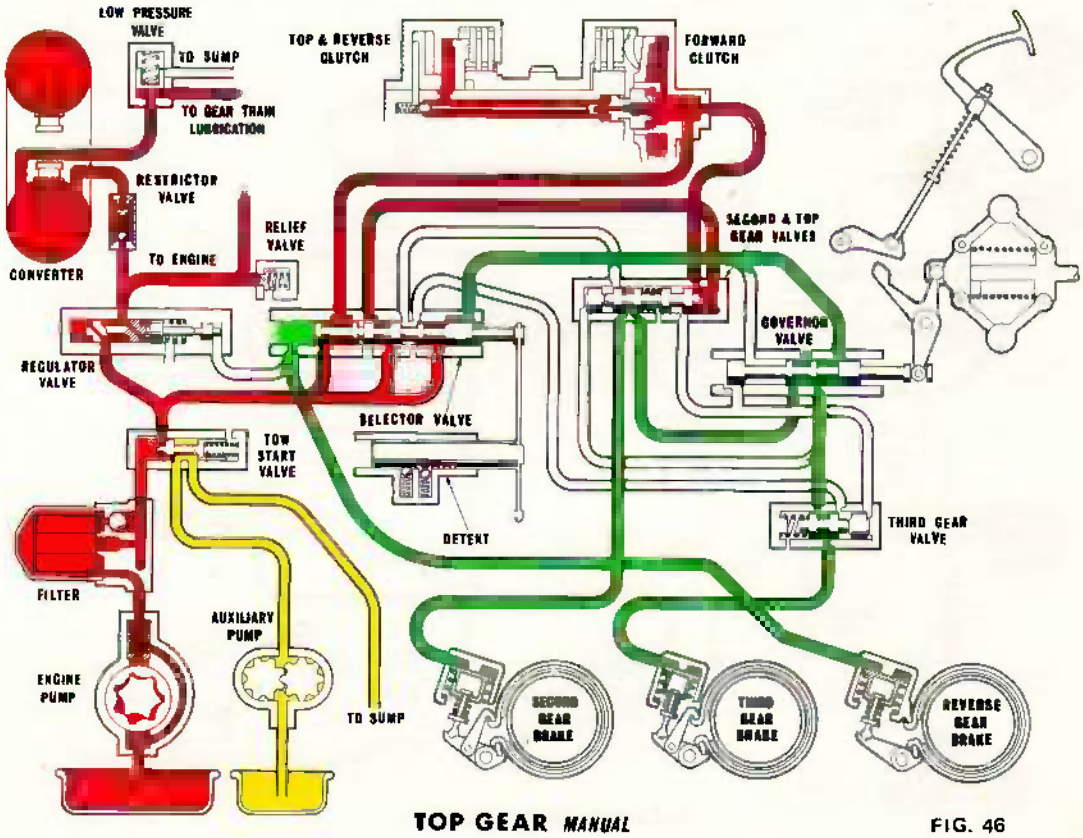
SECOND GEAR *MANUAL*

FIG. 44



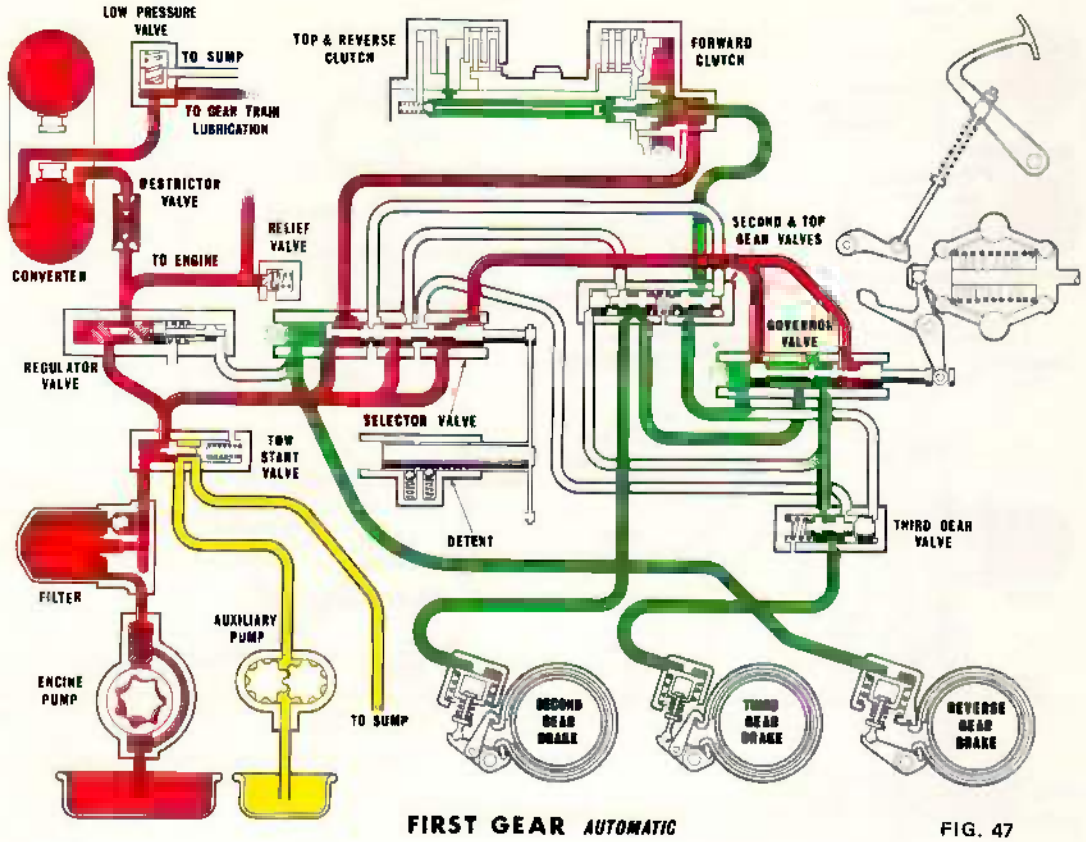
THIRD GEAR *MANUAL*

FIG. 45



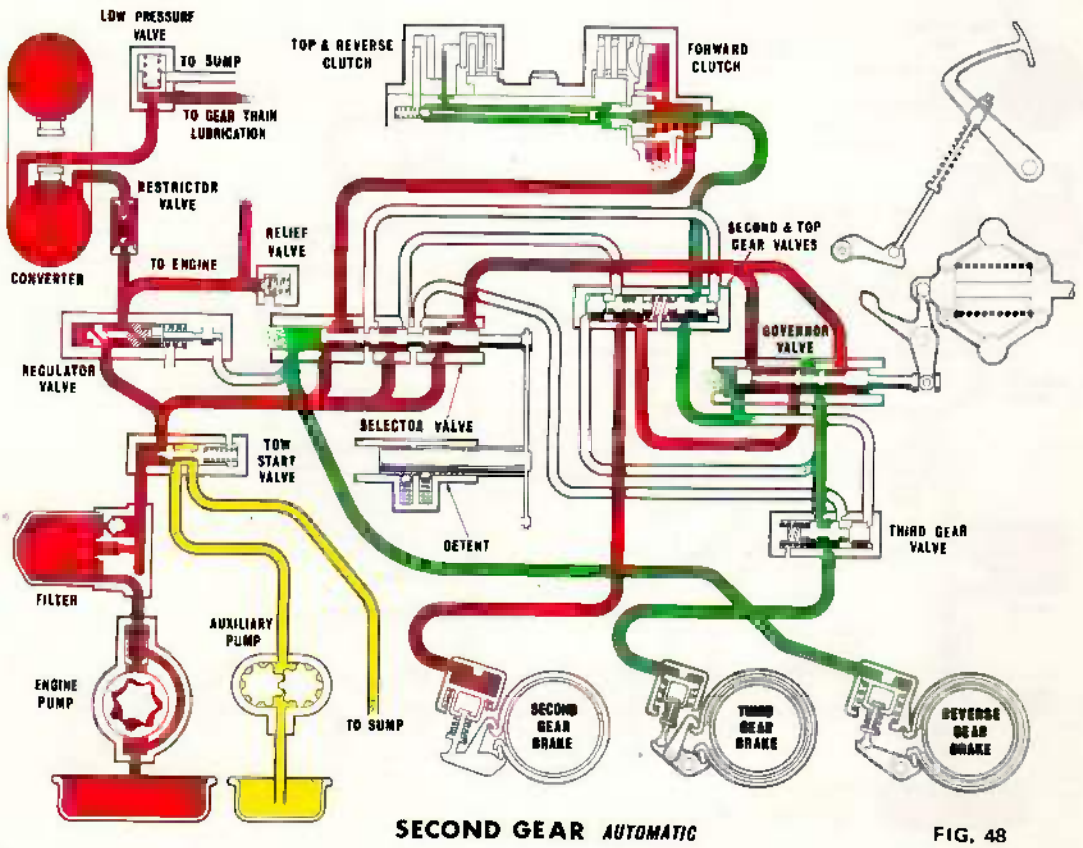
TOP GEAR *MANUAL*

FIG. 46



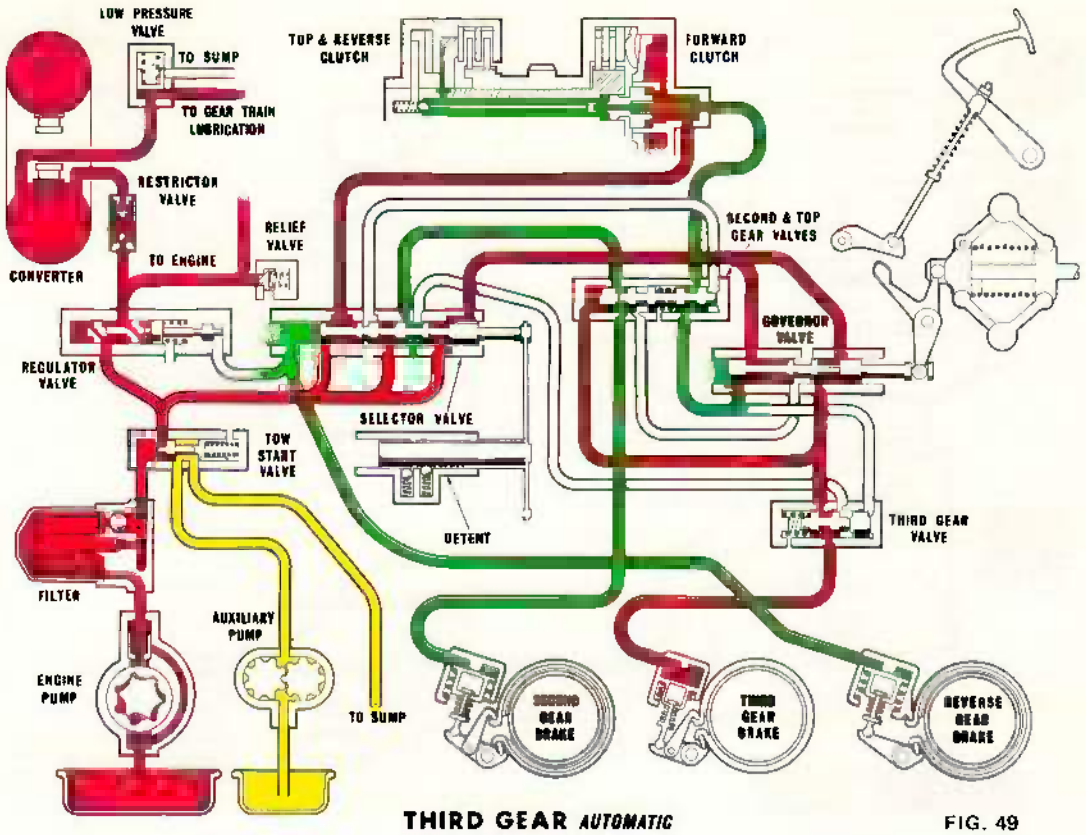
FIRST GEAR *AUTOMATIC*

FIG. 47

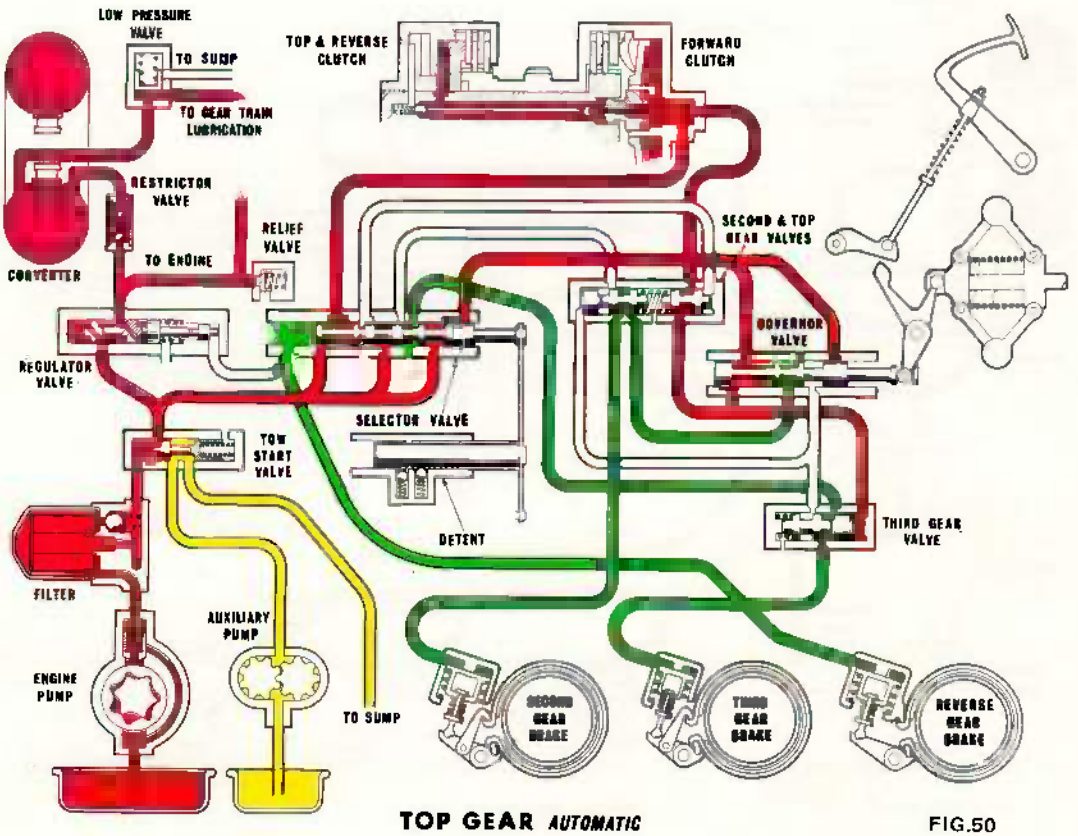


SECOND GEAR *AUTOMATIC*

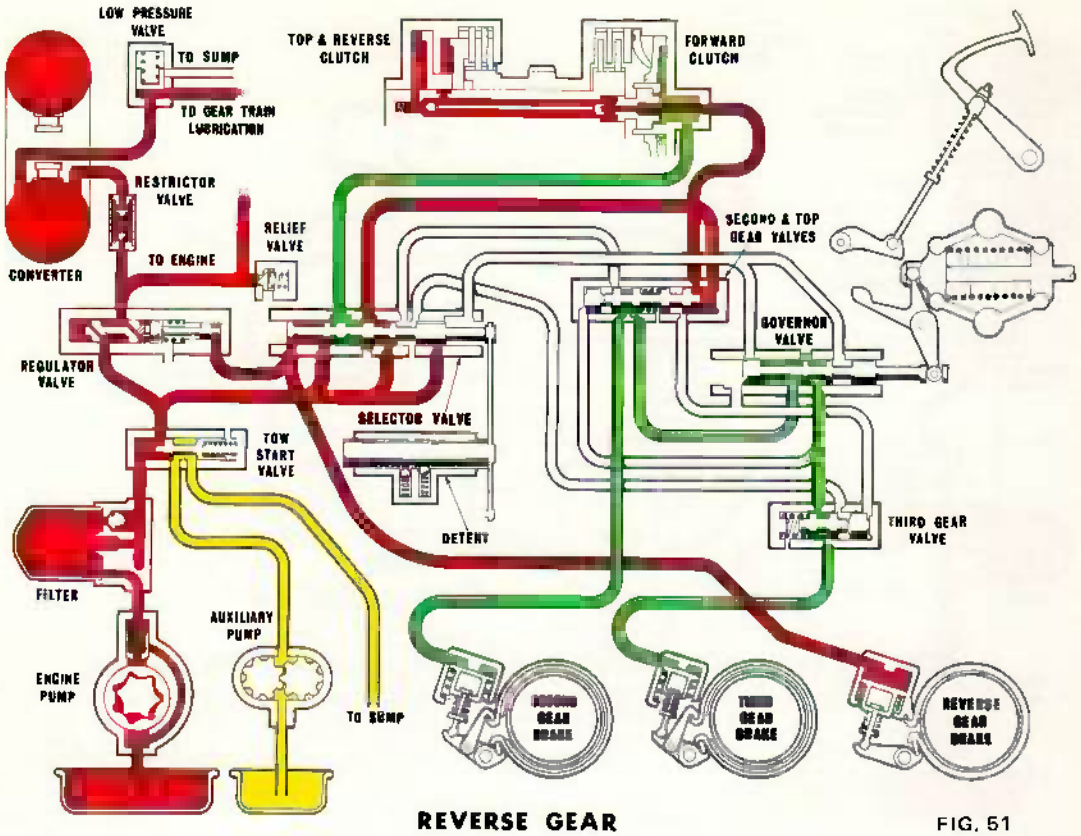
FIG. 48



THIRD GEAR *AUTOMATIC* FIG. 49

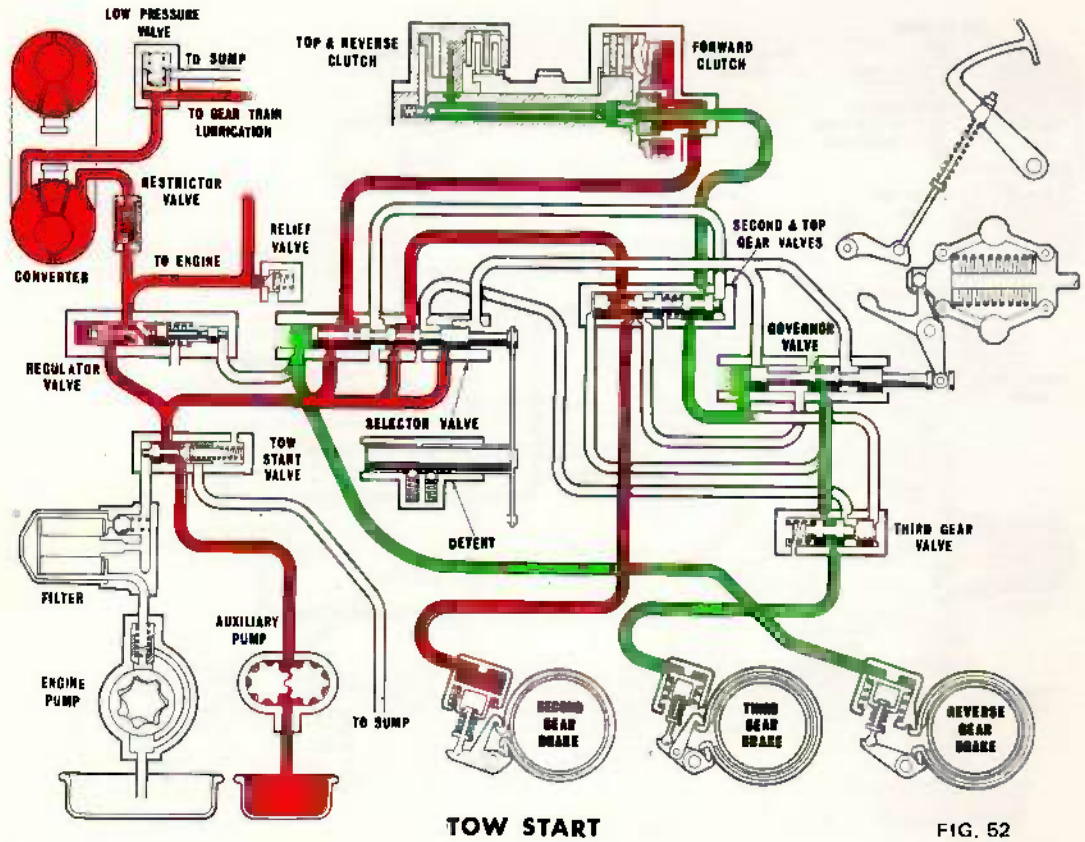


TOP GEAR *AUTOMATIC* FIG.50



REVERSE GEAR

FIG. 51



TOW START

FIG. 52

ENGAGEMENT CONTROL MK IIA

To improve the engagement of forward gears from neutral the additional valves as shown below were used in conjunction with a slightly modified valve block. The engagement valve, mounted in the transmission case above the auxiliary pump strainer is introduced into the hydraulic circuit between the valve block and the forward clutch and prevents oil reaching the forward clutch until a pre determined pressure is reached. The shuttle valves, both in one body fitted behind the pipe chest, are hydraulically positioned between the valve block and the Reverse and 3rd Servos.

Their function is to direct oil from either the forward clutch feed or the normal 3rd and Reverse feeds into the appropriate servo.

In addition a larger reverse boost piston is fitted to the regulator valve and a stronger return spring to the reverse servo.

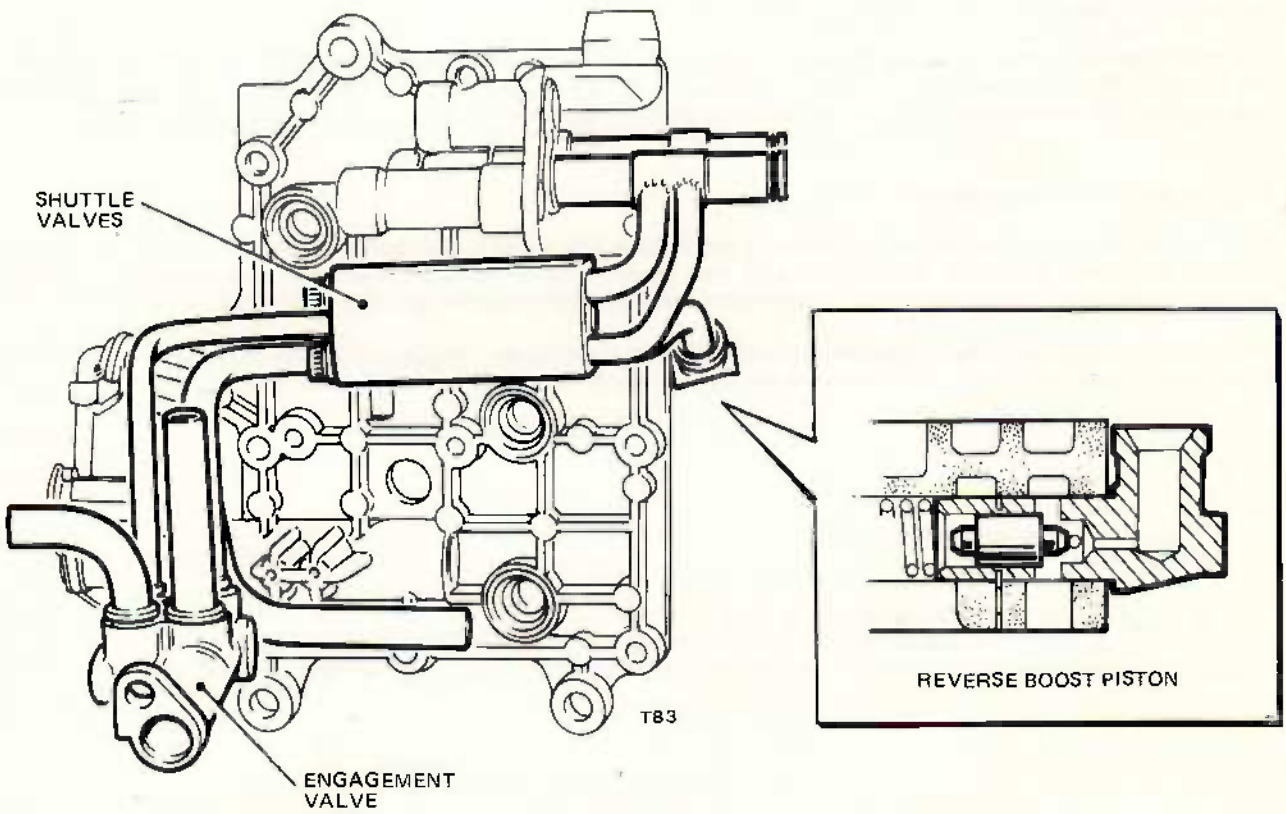


FIG. 53.

ENGAGEMENT CONTROL SEQUENCE MK IIA

Engagement of Forward gear

1 Starting in N, the driver selects a forward gear moving the selector valve which feeds oil through the shuttle valves to the 3rd and Reverse servos. This applies the 3rd and reverse brake bands bringing the rotating parts in the gearbox gently to rest. Simultaneously oil flows to the engagement control valve, but is prevented from reaching the forward clutch by a small ball valve in the assembly, and a spring loaded engagement valve with a large ball.

2 At a predetermined pressure – approximately 60 psi – the larger ball moves down its bore pushing the engagement valve with it and opening the feed to the clutch. Since the clutch is being applied against stationary parts the engagement is imperceptable.

With the engagement valve open, oil also feeds back to the shuttle valve unit, moving the valves across and exhausting the 3rd and reverse servos through the selector valve, thus releasing the brake bands to complete the operating sequence. As the brake bands are released, engine torque is passed through the forward clutch to the road wheels and is felt by the driver as the nose of the car lifts slightly on the suspension.

As the engagement valve bore diameter is greater than the bore diameter for the larger ball, the oil pressure required to hold the engagement valve open is approximately half the 60 psi necessary to operate it initially. This arrangement ensures that the forward clutch remains engaged even though the oil pressure may fluctuate, quite normally, below 60 psi.

Selection of Neutral

The driver, selecting Neutral, moves the selector valve cutting off the oil supply. Oil from the forward clutch unseats the small ball in the control valve, allowing initial exhaust of oil until the engagement valve closes under spring pressure opening the main exhaust port. The shuttle valves are pushed back under spring pressure to complete the cycle.

Engagement of Reverse Gear

With the selector moved to Reverse, oil operates the Reverse Boost Piston and feeds through the restrictor and shuttle valve to the reverse servo. The restrictor controls the rate of filling of the servo to ensure a soft engagement, and the oil pressure seperates the piston and the reverse shuttle valve to allow free passage of oil to the servo.

When Neutral is again selected, oil is exhausted back along the same route. When pressure drops below 20 psi, the shuttle valve piston moves back under spring pressure and exhaust continues via the selector valve.

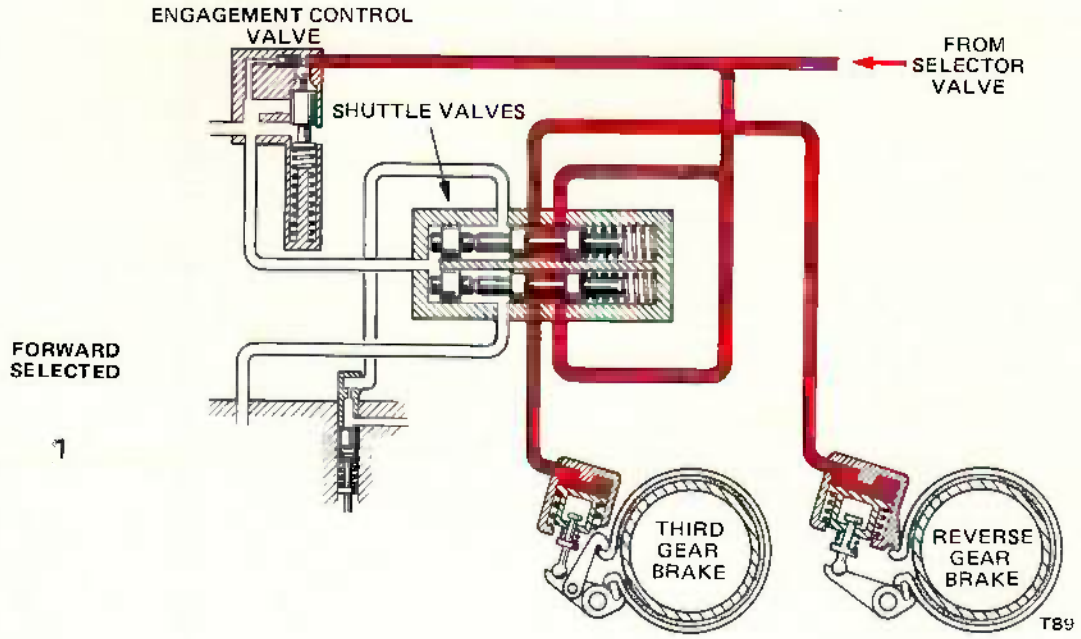


FIG. 54

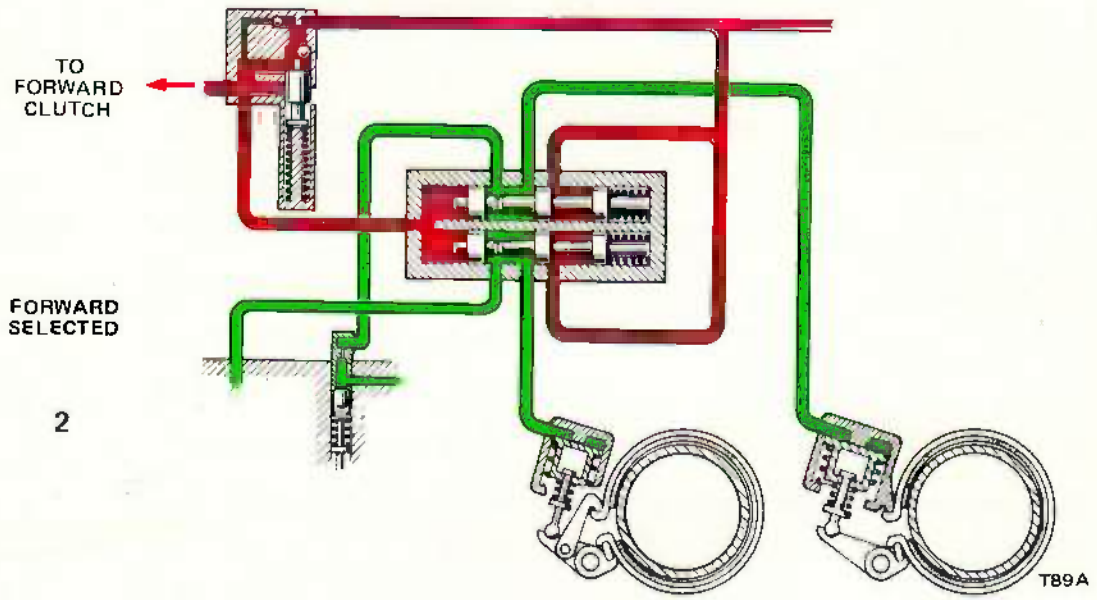


FIG. 55

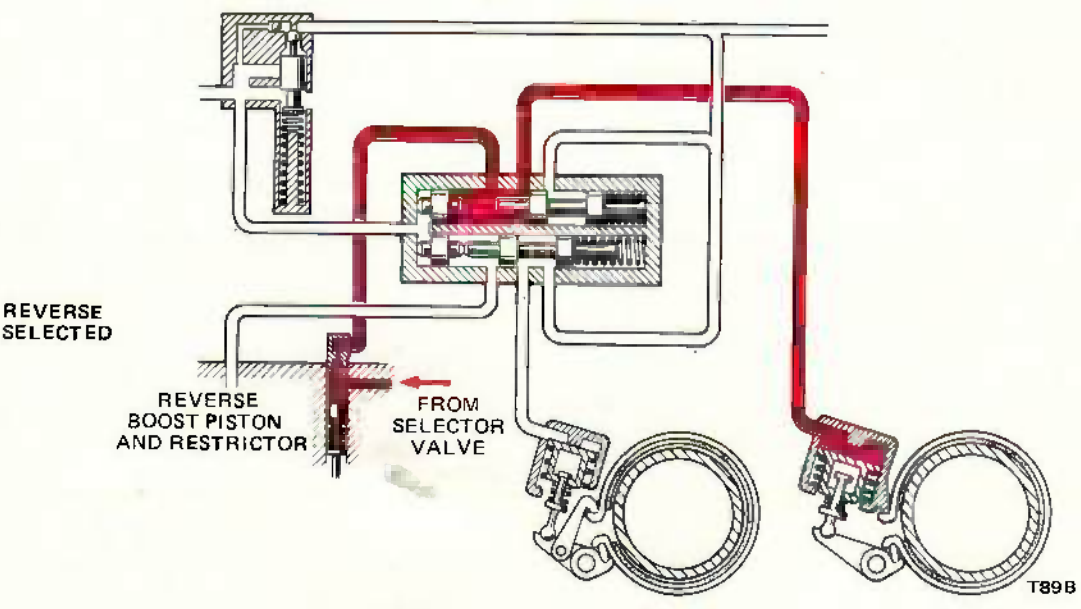


FIG. 56

SECTION 3

GENERAL DATA, TEST PROCEDURE AND FAULT DIAGNOSIS

GENERAL DATA

Oil capacity	Normal oil change	10 pts
	Dry Fill	14 pts

Change oil and filter at 500 miles and thereafter at 6000 mile intervals or every 6 months.

FOR FULL SERVICE DETAILS SEE VEHICLE MANUFACTURER'S HANDBOOK.

To check oil level.

With the engine at normal working temperature run for 2 minutes, switch off and leave for 1 minute then check the oil level. Top up as necessary. 1 pint of oil raises the level from minimum to maximum on the dipstick.

NOTE. If a preliminary check is made after the vehicle has been standing for some hours e.g. overnight, and before starting the engine, the oil level may prove to be approx. ½" above the maximum mark. This is normal and is due to oil draining from the converter and oil galleries into the sump. Should the level be low, the sump should of course be topped up before running the engine and rechecked at normal working temperature.

Recommended oils. See driver's handbook

Filter elements. Purolator – part numbers MF 524A – Mini
MF 586A – 1100 and 1300

ON NO ACCOUNT SHOULD ADDITIVES BE USED IN ENGINE AND TRANSMISSION OIL

Recommended Engine idle speeds in Neutral	Tickover	650 r.p.m.
	Fast idle	1050 r.p.m.
Adjustments	Selector cable Starter inhibitor switch Kick down rod	SEE APPROPRIATE SECTION FOR DETAILS
Normal engine oil pressure	60 p.s.i. approx. 15 p.s.i. idling	

The above figures are for the engine oil pressure gauge when fitted. Figures for a pressure test are given in the appropriate test section.

GEAR CHANGE SPEEDS

	THROTTLE POSITION	GEAR CHANGE	MINI AND EARLY 1100 MODELS M.P.H.	1100 MODELS FROM ENGINE No. 10AG/A/H1208 AND 1300 MODELS. M.P.H.
A	Light throttle 'D' selected	From 1 to 2	12 ±2	13 ±2
		From 2 to 3	17	18
		From 3 to 4	22	24
B	Full throttle 'D' selected	From 1 to 2	29 ±2	31 ±2
		From 2 to 3	41	43
		From 3 to 4	53	56

Do not select 3rd gear at speeds greater than 50 mph
Do not select 2nd gear at speeds greater than 40 mph

When checking the full throttle change speeds, the most important change to note is 3 to 4. The 'kick down' linkage should be adjusted to give this change at 53 or 56 mph (+ 4 mph) as appropriate to the vehicle. The other changes, 1 to 3 and 2 to 3, cannot be adjusted individually and should fall within the speeds quoted if the 3 to 4 change is correct.

In addition, when this 3 to 4 change speed as obtained, the speeds at which 'kick down' changes can be made should be below about 43, 35 and 22 mph for 4 to 3, 3 to 2 and 2 to 1 changes respectively. These figures are only intended as a guide and may vary slightly from vehicle to vehicle.

With regard to closed throttle automatic down changes, the speeds at which these take place are not so important as ensuring that first gear is selected just before the vehicle comes to rest. As a guide, these changes should occur at about 18, 12 and 6 mph respectively.

TEST PROCEDURE

When possible the static and road test procedure outlined below should be carried out in full in order to obtain as much information as practicable before the vehicle is immobilised.

STATIC TEST

(1) Check that the starter will only operate when the selector is in N.

If incorrect, check the inhibitor switch adjustment (Page 69) or check for a fault in the electrical circuit.

(2) Check the engine oil level and top up as necessary (Page 54).

(a) Low oil level could cause brake band or clutch slip or loss of drive.

(b) High oil level could affect performance.

Connect a pressure gauge and tachometer as detailed on pages 56 and 57.

(3) Carry out a transmission pressure test as detailed on page 56.

If the oil pressure is low in:—

(a) All the selector positions — suspect the oil pump, filter, interconnecting pipes, converter feed pipes and seals, or the engine lubrication system.

(b) All forward gear selector positions — suspect the forward clutch or forward clutch feed.

(c) 2, 3 or R — suspect appropriate servo or servo feed.

(d) 4 or R — suspect top and reverse clutch or feed.

(4) Check the torque converter by carrying out a stall test (Page 57).

IMPORTANT: Stall test should not be carried out for periods longer than 10 seconds.

ROAD TEST

(1) Check automatic gear changes and compare with the speeds given in tables A & B on page 54.

If the gear change speeds are found to be incorrect — suspect throttle travel, the kick down linkage, governor and governor valve. Kick down adjustment procedure is given on page 70.

(2) Drive the car in D and check for 'flare-up' or 'tie-up' during automatic gear changes.

If 'flare-up' occurs i.e. increase in engine speed during gear changes, suspect low oil pressure.

If 'tie-up' occurs i.e. engine drags during gear changes, suspect incorrect selector cable adjustment.

(3) Drive the car using manual gear positions to check for correct selection.

If flare-up or tie-up occurs suspect the selector cable adjustment.

(4) With the car facing uphill, manually select 1st, 2nd, 3rd and 4th gears at 0, 10, 20 and 30 mph respectively, and check for brake band and clutch slip.

Check reverse gear for brake band or clutch slip with the car facing downhill.

Reference should also be made to the diagnosis chart on Page 58.

PRESSURE TEST

IMPORTANT: Engine should be at normal running temperature.

(1) Check engine oil level as detailed in general data.

(2) Remove the small plug on the filter head and insert the straight adaptor supplementary to the test pack. DO NOT OVERTIGHTEN. Connect the oil pipe to the adaptor and connect the tachometer as shown in Fig. 58. Place the test pack where it can be seen from the driving seat.

(3) Check that the handbrake is ON and apply the footbrake. Start engine.

(4) Check the oil pressure in all gears, maintaining engine speed at 1,000 rpm.

Gauge readings should be:-

MINI Between 76–84 psi in 1, 2, 3, (4) D & N. 114–126 psi in R.
1100 & 1300 95–105 psi in 1, 2, 3, (4) D & N. 142–158 psi in R.
1300 (from Feb. 1970 with 4th gear selector position) 161–179 psi in R.

If incorrect readings are obtained, consult diagnosis chart.

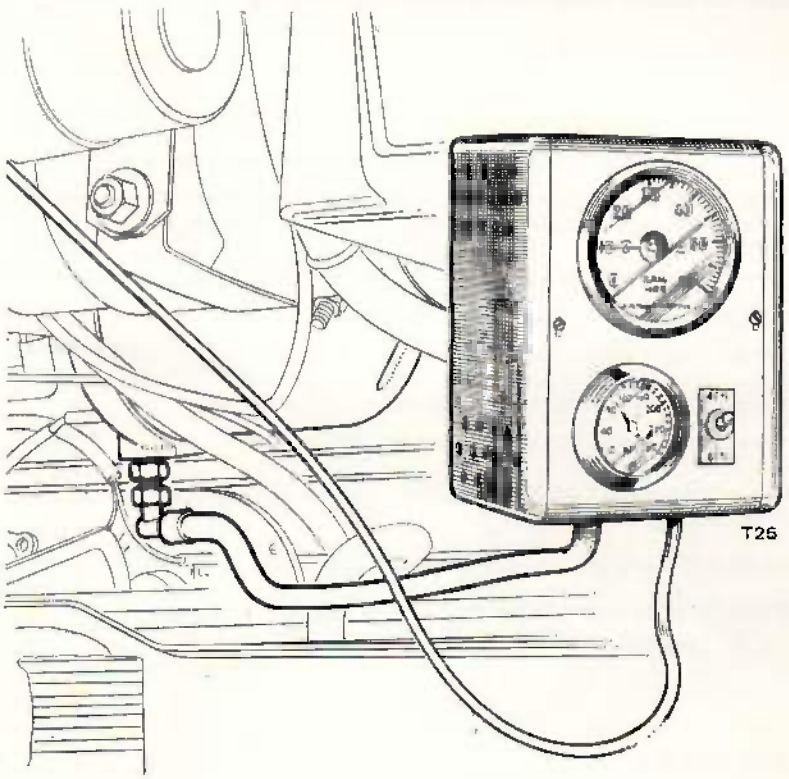


FIG. 57. PRESSURE GAUGE CONNECTED TO THE FILTER HEAD

STALL TEST

Before attempting a stall test, it is essential that the engine is capable of developing full power. A stall test carried out on a car where the engine is not developing full power will produce misleading test results. It is also important to ensure that the oil level is correct as a low oil level will also produce misleading results.

It is important that the engine is allowed to reach its normal running temperature before test.

Connect the tachometer to the engine, and place the test pack where it can be seen from the driving seat as shown in Fig. 58.

Chock the wheels, apply the handbrake and firmly depress the footbrake pedal.

With the engine running, select 1 or R and FOR NOT MORE THAN TEN SECONDS fully depress the throttle pedal. Note the tachometer reading and compare with the figures below.

MINI	848 c.c. engine	1300–1400 r.p.m.
MINI	1000 c.c. engine	1400–1500 r.p.m.
1100		1600–1700 r.p.m.
1300		1700–1800 r.p.m.

Speeds below the minimum could indicate substandard engine performance. Speeds above the maximum could indicate either a faulty converter or transmission slip.

IMPORTANT: **Stall tests should not be carried out for periods longer than 10 seconds. Otherwise, the engine and transmission will become overheated.**

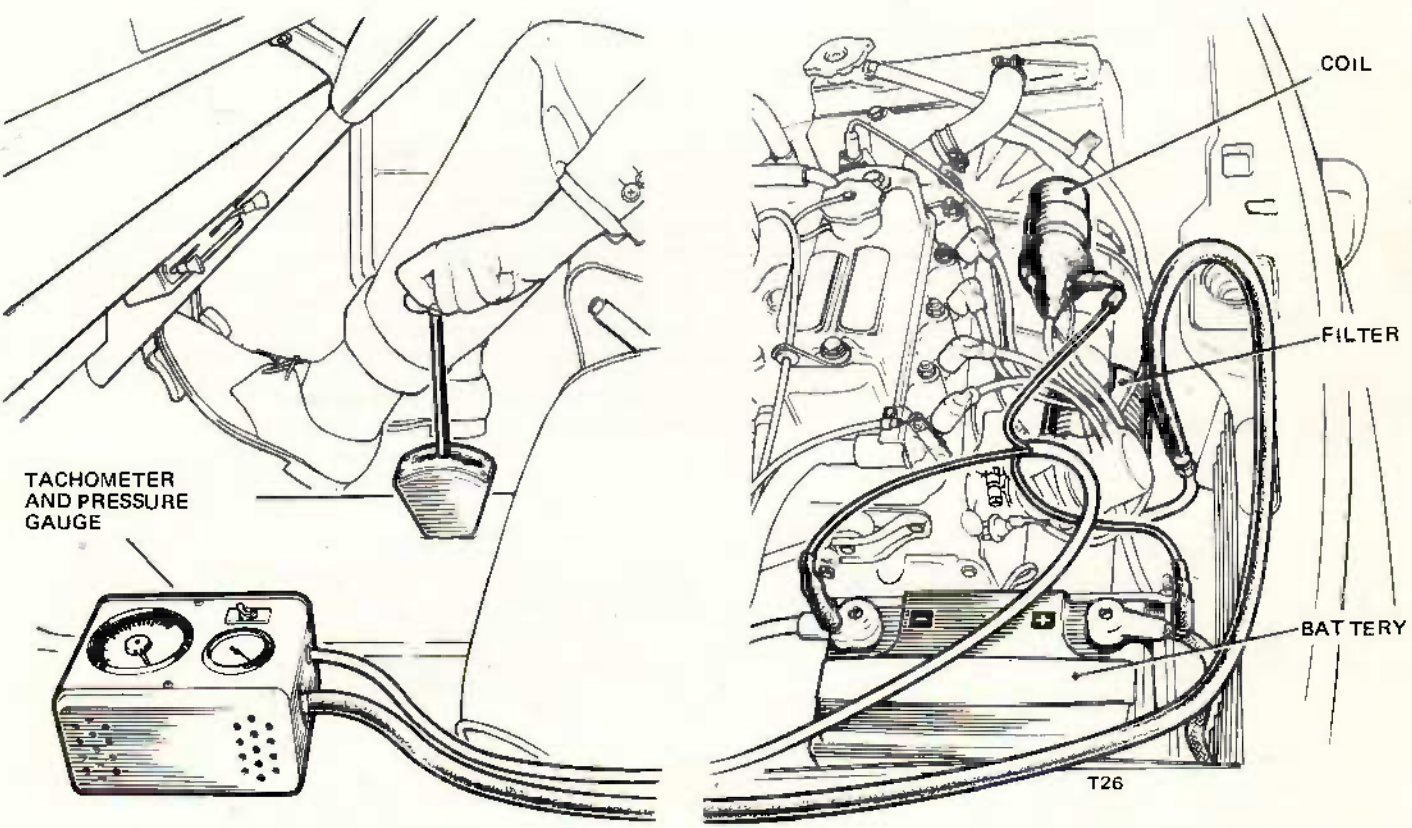


FIG. 58. TEST PACK CONNECTED READY FOR STALL TEST

DIAGNOSIS CHART

The chart shown below is intended as a guide when tracing transmission faults and as an aid to compiling test reports.

The illustrations shown on the following pages indicate the hydraulic flow and the sealing arrangements of the transmission and should be referred to in conjunction with the diagnosis chart.

SYMPTOM	POSSIBLE CAUSE
(1) Incorrect gear selection.	(a) Faulty selector adjustment. (b) Selector cable worn.
(2) Engine stalls when a gear is selected.	Engine idle speed too low.
(3) Excessive creep when a gear is selected.	Engine idle speed too high.
(4) Slip or no drive in all forward gears.	Forward clutch or oil feed pipes faulty.
(5) Slip or no drive an R.	(a) Reverse band or top and reverse clutch worn. (b) Clutch or oil feed pipes leaking.
(6) Slip or no drive in 1.	(a) One way clutch faulty. (b) One way clutch reaction peg sheared.
(7) Slip or no drive in 2.	'2'nd gear brake band or servo or oil feed pipe faulty.
(8) Slip or no drive an 3.	'3'rd gear brake band or servo or oil feed pipe faulty.
(9) Slip or no drive in 4 or R.	Top and reverse clutch or oil feed pipe faulty.
(10) Slip or no drive in all gears.	(a) Low oil level or pressure. (b) Converter seals leaking. (c) Faulty oil pump.
(11) No drive in 1 accompanies by judder, tie up or drag in 2, 3, 4 and D – car drives only in R.	Incorrect assembly of one way clutch.
(12) Car pulls away in either 1, 2, 3, or 4 with D selected, accompanied by no automatic gear changes.	(a) Governor or governor valve sticking in 1, 2, 3 or 4th gear applied positions. (b) Governor valve not connected to governor.
(13) Oil pressure warning light glows with engine running.	(a) Pressure switch faulty. (b) Engine relief valve sticking open. (c) Internal oil leak.
(14) Engine labours in R accompanied by creep in N.	Forward clutch seized or dragging.
(15) Engine labours in 1, 2 or 3, with D selected.	(a) Incorrect selector cable adjustment. (b) Top and reverse clutch seized or dragging. (c) Selector cable worn.
(16) Automatic gear changes occur at high engine revs. only, irrespective of throttle pedal position.	(a) Kick down linkage out of adjustment. (b) Oil level too high. (c) Stiff governor operation.
(17) Automatic gear changes occur at low engine revs. irrespective of throttle pedal position.	(a) Kick down spring weak or broken. (b) Kick down linkage incorrectly adjusted, or disconnected. (c) Full throttle not obtainable at the carburettor.
(18) Erratic automatic gear changes.	Governor or governor valve not smooth in operation.
(19) No tow start (if fitted).	(a) Tow start valve sticking in engine pump supply position. (b) Auxiliary pump worn. (c) Oil feed pipes faulty.
(20) Low max. speed. Poor top gear performance and high oil temperature.	Converter stator seized.
(21) Poor acceleration from rest. Extremely low stall speed.	(a) Poor engine tune. (b) Converter stator slipping.

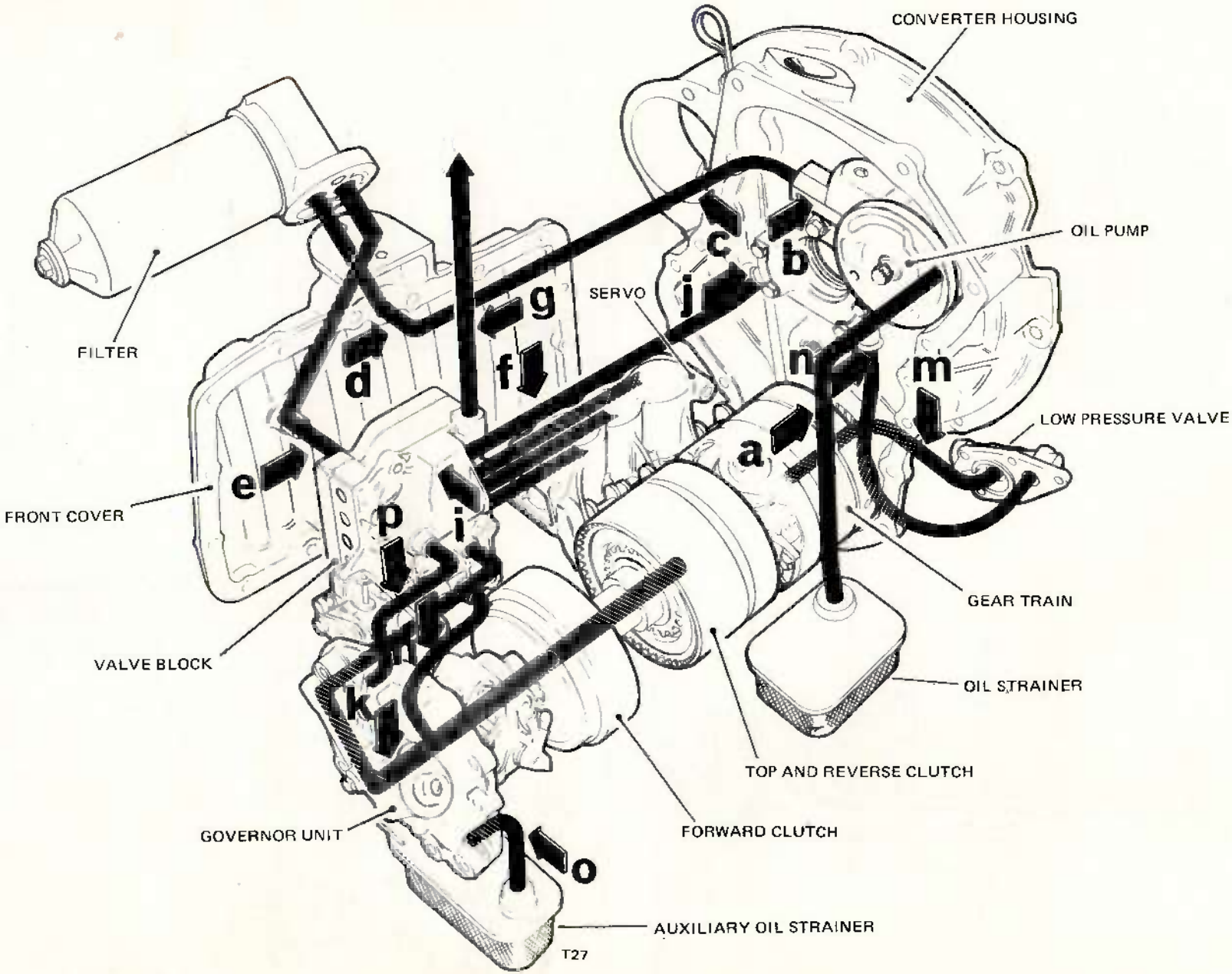
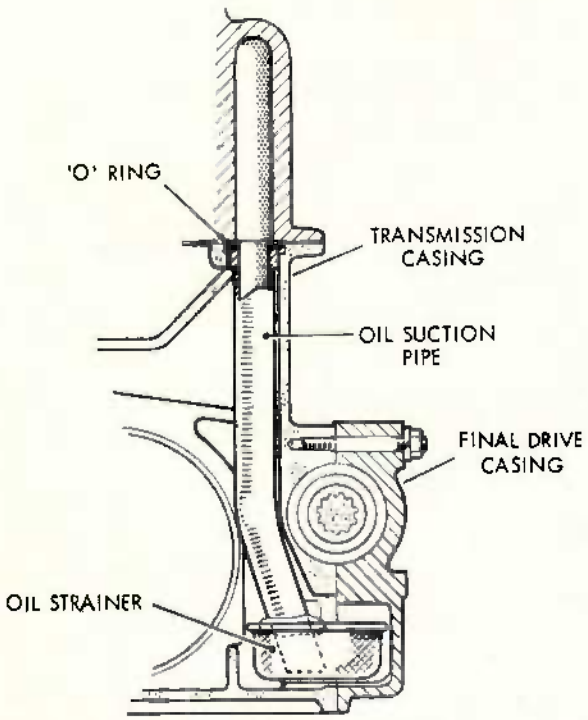


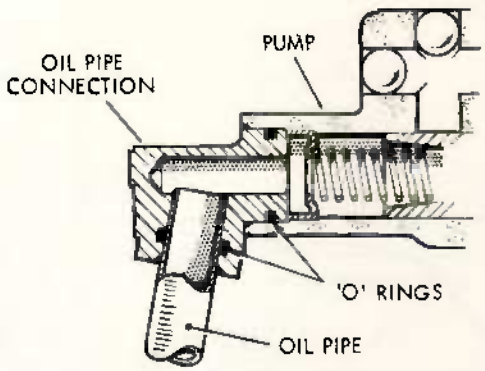
FIG. 59 LAYOUT OF MAIN TRANSMISSION COMPONENTS SHOWING INTERCONNECTING OIL PIPES AND GALLERIES

THE LETTERS REFER TO THE CORRESPONDING SECTION DRAWINGS ON THE FOLLOWING PAGES

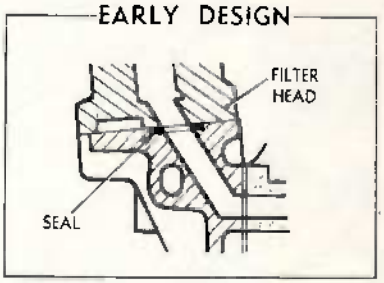
VARIOUS SECTION VIEWS SHOWING SEALING ARRANGEMENTS

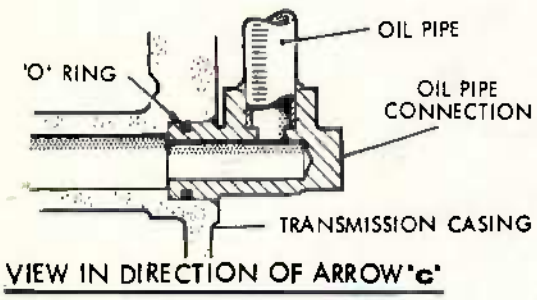


VIEW IN DIRECTION OF ARROW '**a**'

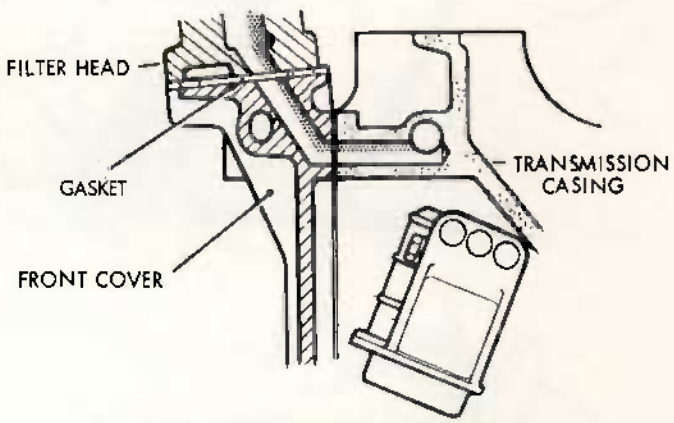


VIEW IN DIRECTION OF ARROW '**b**'

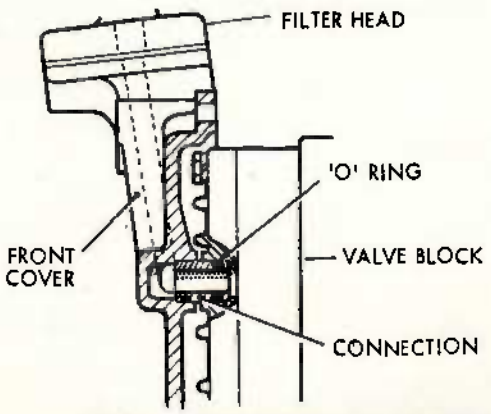




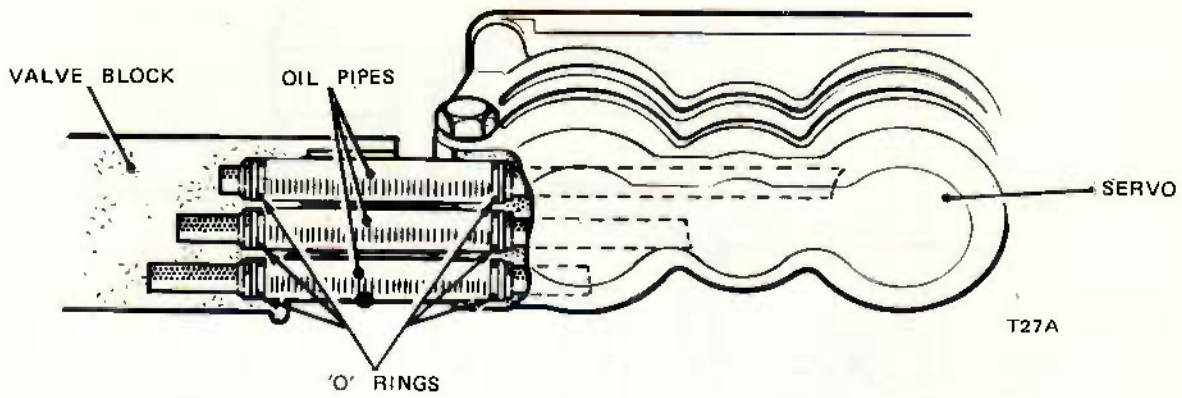
VIEW IN DIRECTION OF ARROW '**c**'



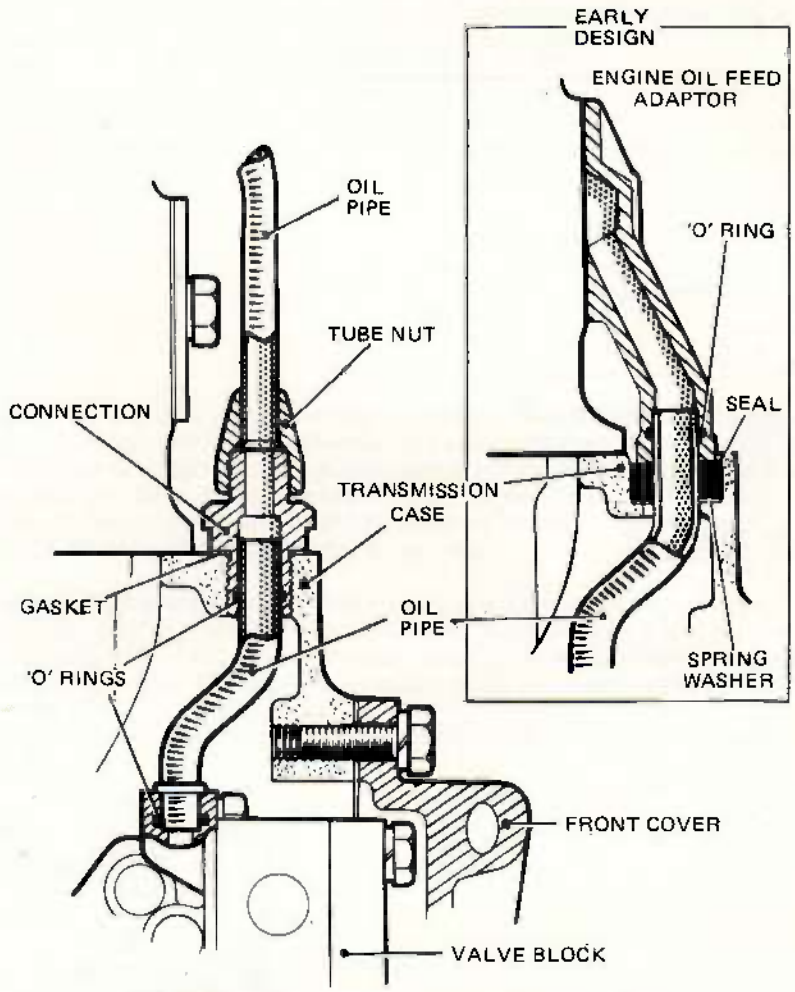
VIEW IN DIRECTION OF ARROW '**d**'



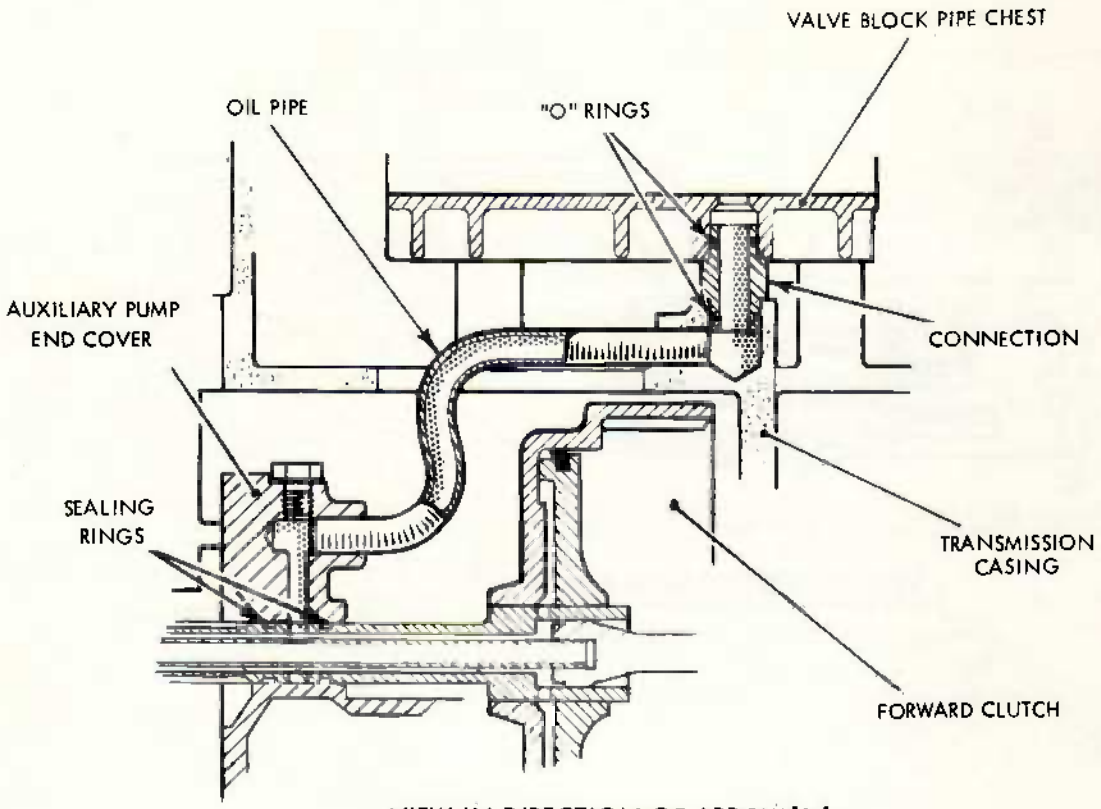
VIEW IN DIRECTION OF ARROW '**e**'



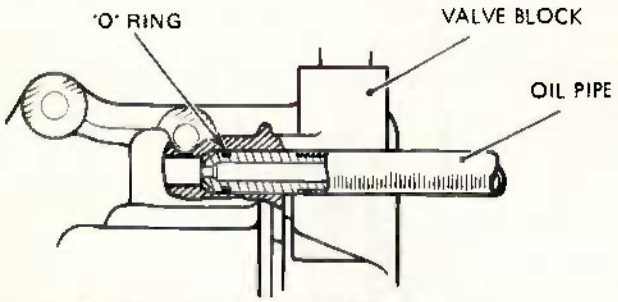
VIEW IN DIRECTION OF ARROW '1'



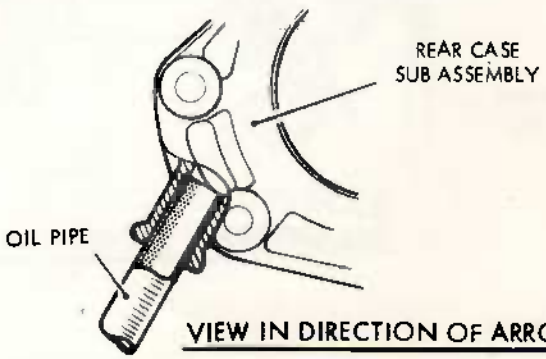
VIEW IN DIRECTION OF ARROW 'g'



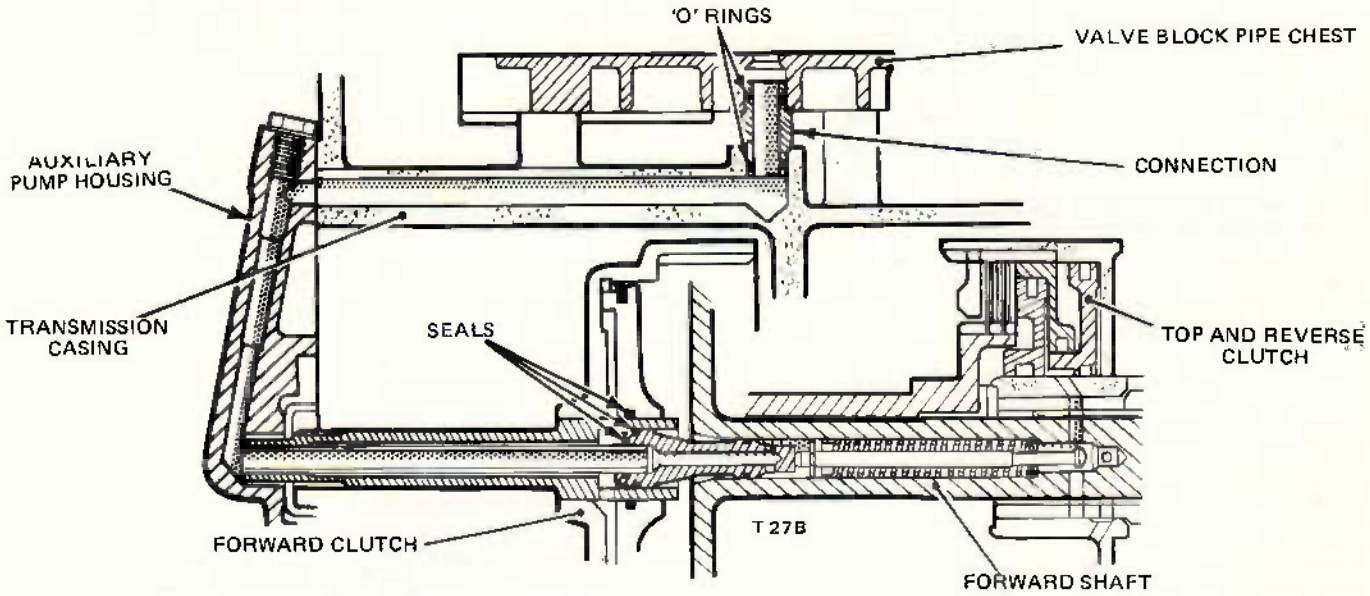
VIEW IN DIRECTION OF ARROW **'h'**



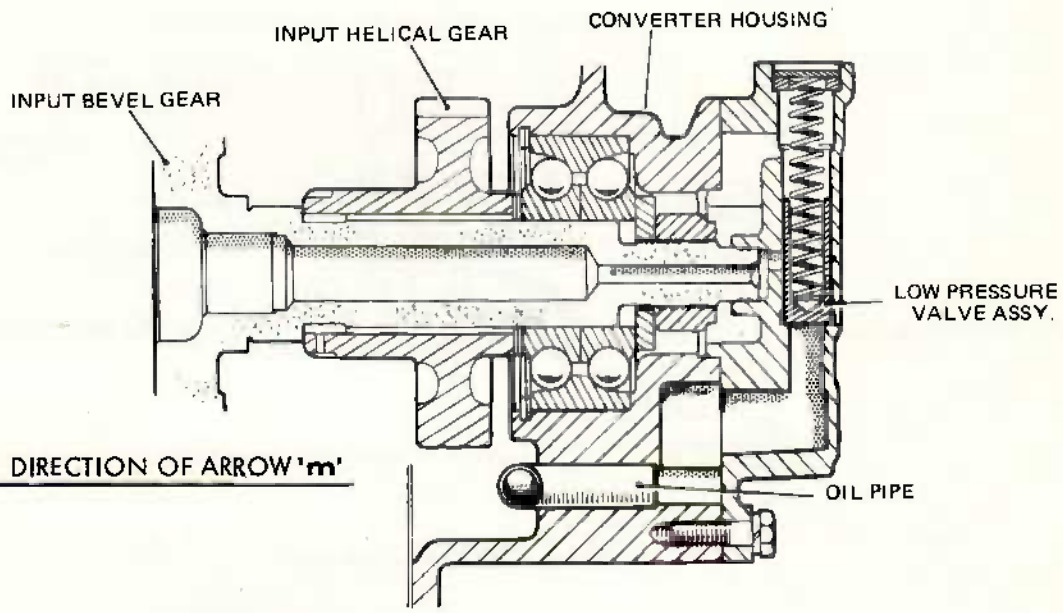
VIEW IN DIRECTION OF ARROW **'i'**



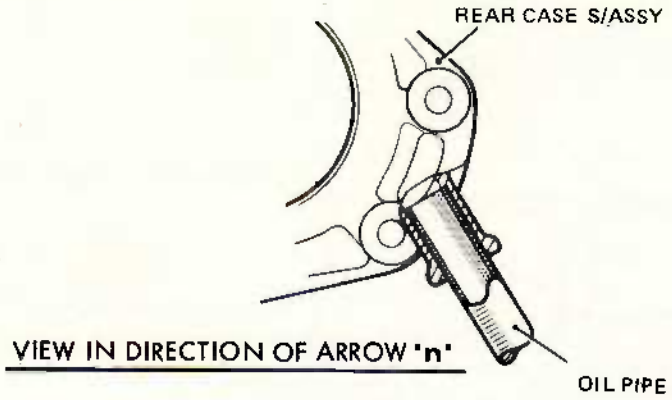
VIEW IN DIRECTION OF ARROW **'j'**



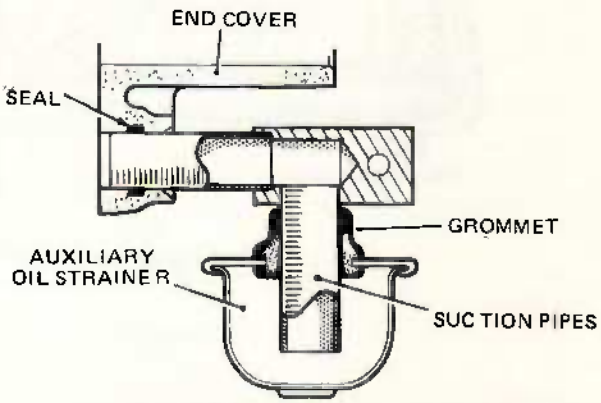
VIEW IN DIRECTION OF ARROW '**k**'



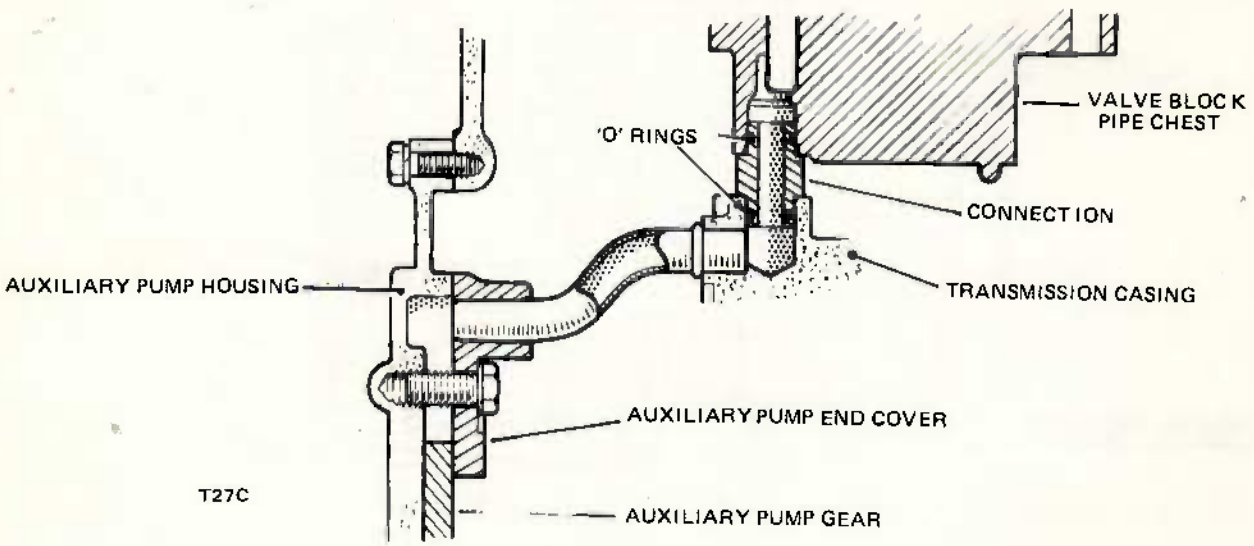
VIEW IN DIRECTION OF ARROW '**m**'



VIEW IN DIRECTION OF ARROW 'n'



VIEW IN DIRECTION OF ARROW 'o'



VIEW IN DIRECTION OF ARROW 'p' (IF FITTED)

SECTION 4

SERVICING

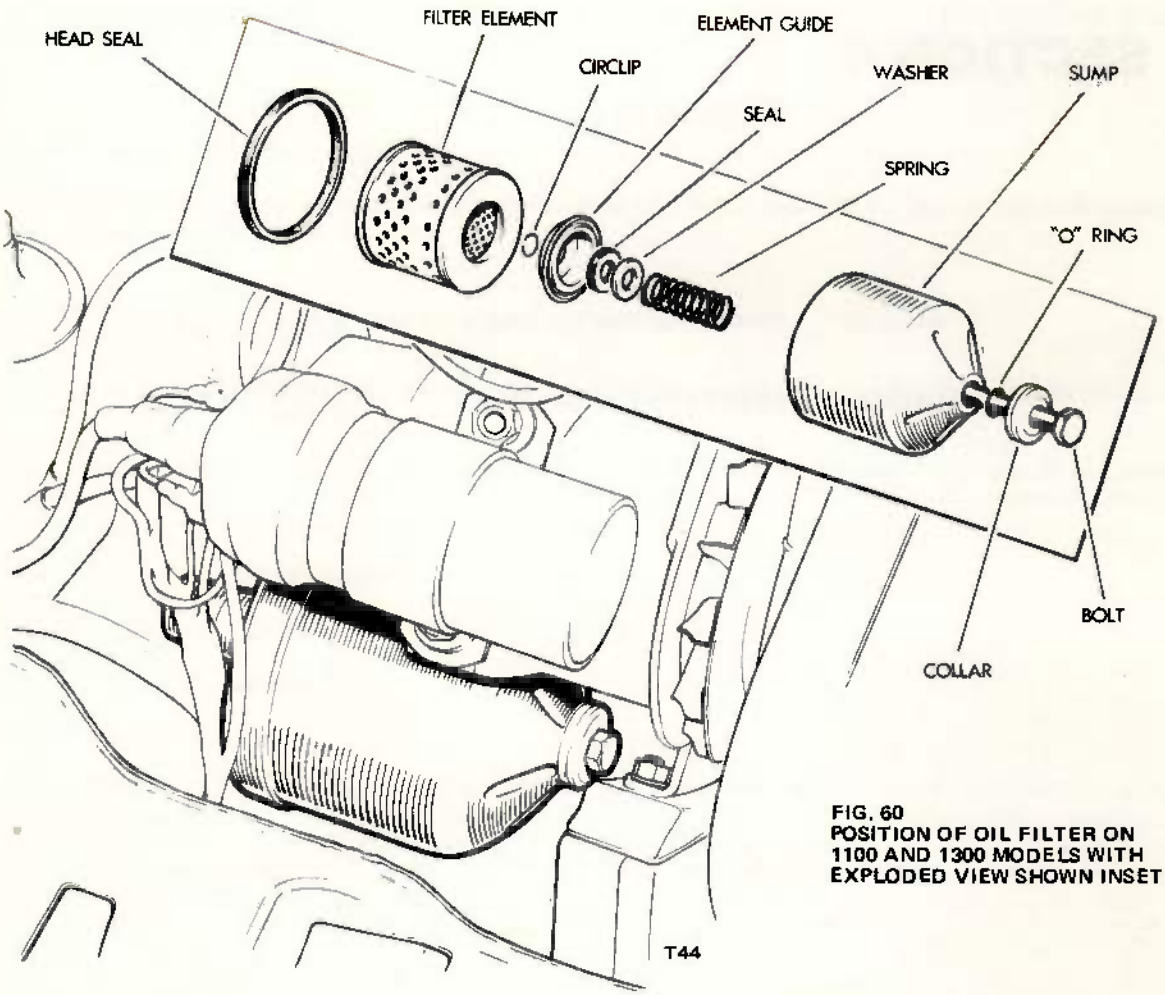


FIG. 60
POSITION OF OIL FILTER ON 1100 AND 1300 MODELS WITH EXPLODED VIEW SHOWN INSET

CHANGING THE OIL AND FILTER ELEMENT

6,000 MILE SERVICE

The engine and transmission oil and the filter element should be changed every 6,000 miles – or every 6 months – whichever occurs first, and it is advisable to carry out these operations when the engine is warm and left standing for a while with the engine switched off. This will allow the filter to drain.

Place a suitable container directly below the drain plug in the transmission casing, unscrew and remove the plug and allow the oil to drain.

While the engine and transmission are draining, clean the area surrounding the filter, unscrew the centre bolt and withdraw the filter sump and element complete from the filter head.

Discard the old element and thoroughly clean the inside of the sump. If it is found necessary to remove the internal parts within the filter sump, ensure that they are assembled in correct order.

A certain amount of oil will always remain in the torque converter even though the oil has been completely drained from the transmission case.

Extract the rubber seal from the filter head, clean the groove with a piece of lint-free cloth and fit the new rubber seal supplied with the new filter element.

It is important that the replacement element is the same type and quality as the one originally fitted to ensure that the engine and transmission are provided with maximum protection; therefore, always use a PUROLATOR element as supplied originally to the vehicle manufacturer.

Position the new element in the filter sump ensuring that it locates correctly on the element guide within the sump.

Refit the sump and element to the filter head, making sure that the element locates centrally on the seat provided in the filter head.

Screw in the centre bolt but before tightening the bolt, first ensure that the sump locates centrally on the rubber seal in the filter head, then tighten the bolt sufficiently to prevent leakage. Do not over-tighten.

Using only the oil as recommended by the vehicle manufacturer, fill the transmission case with new oil to the maximum mark on the dipstick. The oil filler is provided with a quick release cap and is situated on the rocker cover adjacent to the radiator.

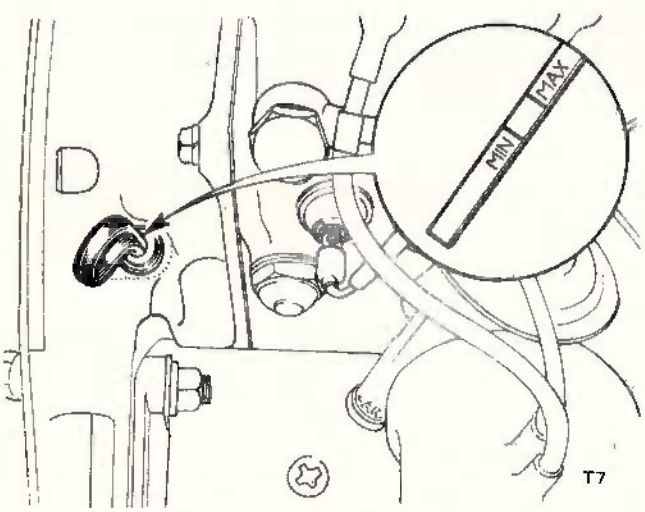


FIG. 61. DIPSTICK POSITION AND MARKINGS

When the engine has been filled with sufficient oil to show 'full' on the dipstick, run the engine and check for any leakage around the filter head and centre bolt seal.

Switch off the ignition, allow the oil to drain back into the transmission case. **Re-check the oil level and top up as necessary. A certain amount of oil will have to be added due to displacement into the torque converter and filter. This may have to be repeated 2 or 3 times to ensure correct oil level.**

It is of paramount importance that **no additives should be used with the engine oil** under any circumstances whatsoever.

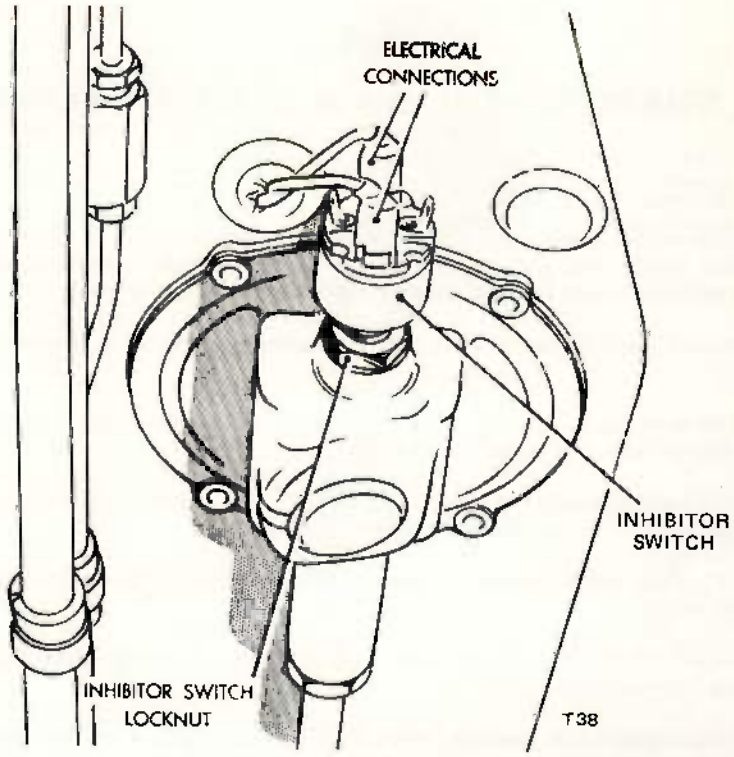


FIG. 62 SHOWS THE POSITION OF THE INHIBITOR SWITCH ON 1100 AND 1300 MODELS. THE SWITCH ON MINI MODELS IS INSIDE THE CAR

CHECKS & ADJUSTMENTS

INHIBITOR SWITCH

CHECKING. If there is no apparent cause of the starter failing to energise with N selected, or it operates in other gear positions, the starter inhibitor switch in the base of the selector turret, FIG. 62, needs adjustment.

ADJUSTMENT

Remove the clevis pin, or bolt, from the fork end of the selector cable FIG. 63. This ensures that the gear selector cable, which also could be in need of adjustment, is not influencing the setting of the switch. Never start the engine with the selector linkage disconnected.

Select N at the gear lever. Remove the starter solenoid wires from terminals 2 and 4 of the inhibitor switch. Slacken the locknut, and unscrew the switch almost out of the housing.

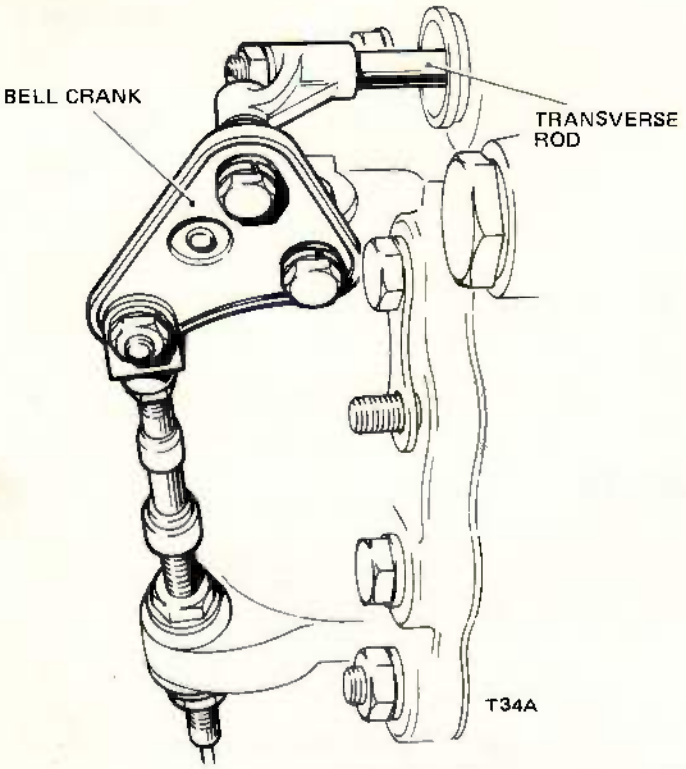
Connect a test lamp or meter across the exposed terminals 2 and 4. Screw the switch into the housing until the circuit is made. Mark the body of the switch. Continue screwing in the switch, counting the number of turns until the circuit breaks. Remove the test lamp or meter leads, unscrew the switch half the number of turns counted, and tighten the locknut against the housing.

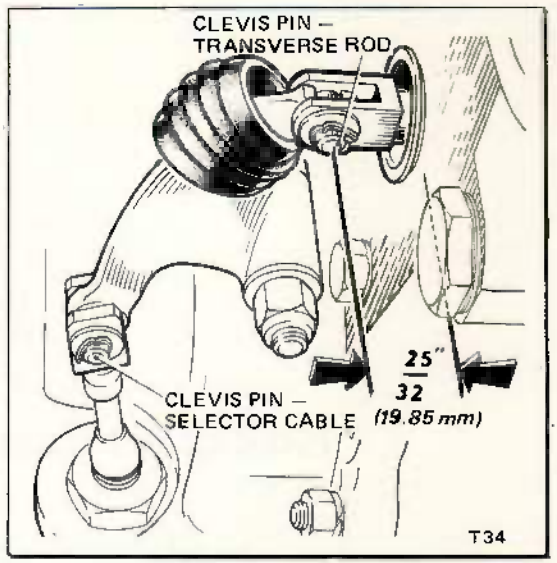
Replace the starter solenoid wires on the correct terminals. Refit the selector cable. Apply the handbrake and footbrake and check that the engine will only start in N. If it will not start in N or starts in any other selected gear position the adjustment is incorrect.

SELECTOR LINKAGE

CHECKING. Apply the handbrake and footbrake and start the engine.

Select R and check that the gear is engaged. Slowly move the selector lever towards N and check that the gear is disengaged as soon as or just before the lever drops into the N position. As the gear disengages there will be a slight rise in engine rpm. Select 2 and as before move the lever slowly towards N and check that the gear is disengaged as soon as or just before the lever drops into the N position. Should either gear remain engaged the selector linkage requires adjustment.





EARLIER DESIGN

FIG. 63 SELECTOR BELLCRANK ARRANGEMENTS

ADJUSTMENT

Disconnect the bellcrank from the transverse rod and selector cable.

First, check the transverse rod assembly. This is not adjustable but it is necessary for the rod to rotate slightly during normal movement of the bellcrank. To allow for this screw up the rod finger tight then unscrew approximately ¼ turn. Reconnect the bellcrank to the transverse rod.

NOTE. Early vehicles. The transverse rod assembly is adjustable on early vehicles – check adjustment as follows: Check that the rod is screwed tightly into its captive nut. Push the rod fully into the transmission case, and check that the distance from the machined face of the case to the centre line of the hole in the rod fork end is 25/32" (.781" or 19.84 mm) Fig. 63 refers.

Adjust the length of the rod, if necessary, by first slackening the locknut then turning the fork end in the appropriate direction. Re-tighten the locknut and check the new setting. Ensure that the bellcrank lever is free on its pivot and that it slides freely in the transverse rod fork and before fitting the clevis pin.

Adjust the selector cable as follows:

Select N in the valve block by pulling the transverse rod fully out (6 detents) and pushing back 2 detents only.

NOTE. On early vehicles with 1 2 3 4 D gear selector sequence, push back 1 detent only.

Select N at the gear lever. Slacken the locknuts on the selector cable where it passes through the boss on the selector housing. Fig. 64. Alter the position of the cable as necessary to align the holes in the selector cable fork end and the bellcrank lever. Refit the bolt (or clevis pin) and tighten the cable locknuts.

Re-check the selector linkage adjustment as detailed under 'CHECKING'

Fine adjustment may be carried out leaving the selector cable connected and moving the locknuts 2 flats at a time and repeating the checking procedure.

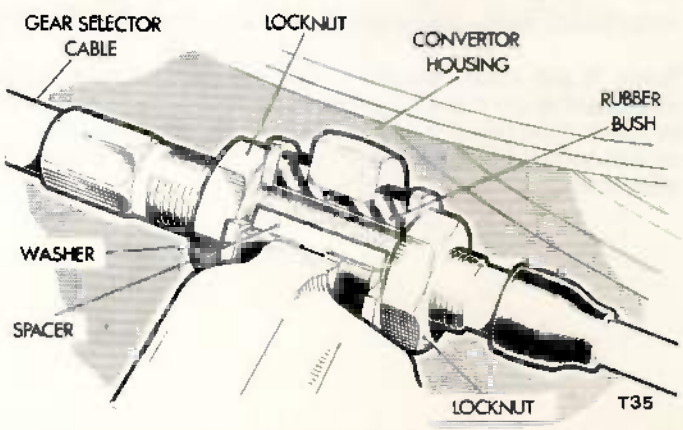


FIG. 64 SELECTOR CABLE ADJUSTMENT

KICK DOWN LINKAGE

If the linkage has been dismantled, initial setting is achieved with the aid of a small setting peg.

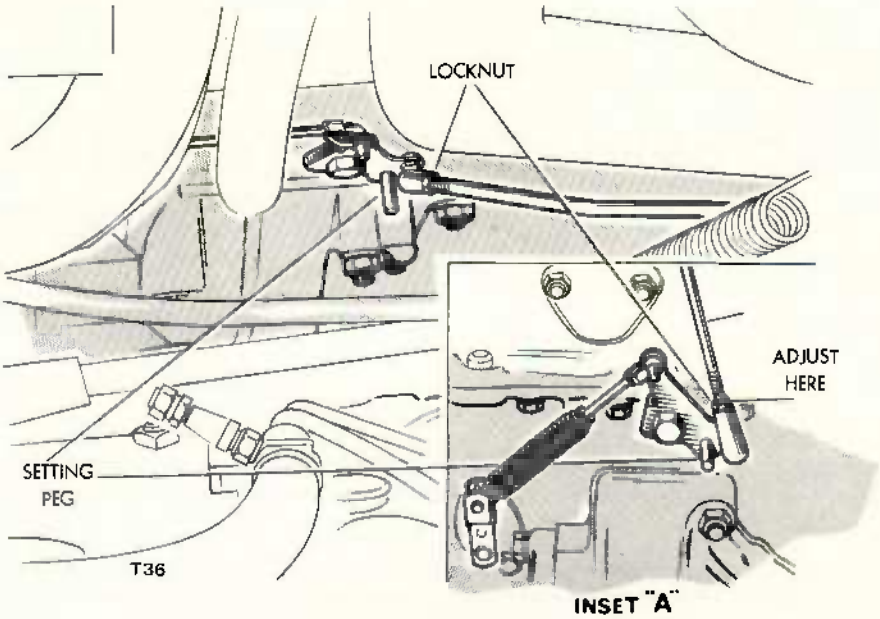


FIG. 65. KICK DOWN LINKAGE SHOWING SETTING PEG IN POSITION

Disconnect the pull rod from the carburettor butterfly spindle lever by removing the clevis pin. Insert a setting peg (0.245 in. dia.) through the hole in the intermediate bellcrank lever and locate in the hole in the transmission case.

Slacken the locknut at the lower end of the pull rod and turn the rod in the desired direction to re-engage the clevis pin in the carburettor butterfly spindle lever at the closed throttle position.
Tighten the locknut and remove the setting peg.

ADJUSTMENT

Adjustment is affected by lengthening or shortening the pull rod with the carburettor butterfly closed.

With the engine and transmission at normal operating temperature, adjust the engine idling speed to approx. 650 r.p.m.

Road test the car and compare automatic change speeds with the table on page 54.

If full throttle change speeds are LOW, check that full throttle opening is available at the carburettor, otherwise disconnect the pull rod from the butterfly spindle, slacken the locknut at the lower end of the pull rod and turn the rod CLOCKWISE (i.e. SHORTEN the pull rod) to increase the bias on the governor.

Conversely, if full throttle change speeds are HIGH, turn the rod ANTI-CLOCKWISE (i.e. LENGTHEN the pull rod) to decrease the bias on the governor.

Tighten the locknut and replace the clevis pin.

Road test to check that correct speeds can now be obtained.

S.700/5

ap

AUTOMATIC TRANSMISSION

British Leyland MINI, 1100 & 1300

SERVICE MANUAL