Daimler

SERVICE MANUAL

for

THE 'FLEETLINE' CHASSIS

ISSUED BY

DAIMLER TRANSPORT VEHICLES LIMITED COVENTRY
ENGLAND

Telephone
COVENTRY 27626

Bus Service Department,
KINGFIELD ROAD, COVENTRY
TEL. COVENTRY 89423

Telegraphic Address
"DAIMLER PHONE COVENTRY"

Publication No E/1003/4

Published June 1969

INDEX TO SECTIONS

OPERATION AND MAINTENANCE

SECTION A

INDEX

The reversing light will automatically be illuminated when the reverse gear is selected

Stopping the Vehicle
Release the accelerator pedal and apply the footbrake. Select neutral and apply the handbrake. During traffic halts, it is possible because of the Daimler fluid Flywheel, to wait in a low gear rather than in neutral and applying the brake

Gear Change Speeds
It is recommended that gear changes are effected at the following speeds:-

1st to 2nd	6-8 M.P.H.	(9.6 – 14 K.P.H.)
2nd to 3rd	14 M.P.H.	(22.5 K.P.H.)
3rd to 4th	20-23 M.P.H.	(32-37 K.P.H.)

according to passenger load or gradient.

THE MAINTENANCE SCHEDULE
The maintenance Schedule has been compiled to show at a glance the essential service requirements of the CRG6 and SRG6 "FLEETLINE" chassis.
Methodical and efficient service to the details mentioned will maintain the vehicle in good condition and ensure economical and trouble free usage.
The Maintenance operations are detailed below together with the Section reference in which will be found the recommended sequence of the maintenance work to be effected.
For all Routine Maintenance on the engine refer to the manufacturers Service Manual.

	section
DAILY	
Check radiator coolant level	C
Check engine oil level	D
Check contents of fuel tank	E
Drain and refill Anti-freezer (when fitted)	K
Check build up of air pressure	K
WEEKLY	
Check level of hydraulic fluid in accelerator reservoir	E
Check condition of flexible hydraulic reservoir hose	E
"Pump" gear box gears	H
Check condition of brake flexible hoses	K
Drain air pressure reservoir	K
Check all tyre pressures	–
Check security of road wheel nuts	–
Check electroliyte level in battery	R
Check specific gravity of battery electrolyte	R
FIRST 250 MILES (400 KM)	
Check all chassis frame nuts and bolts	P
FIRST 500 MILES (800 KM)	
Check centrifugal cut-out clutch gland seal (when fitted	G
FIRST 1,000 MILES (1,600 KM)	
Drain and refill gearbox and clean oil filter element	H
Drain and refill transfer box	H
Drain and refill rear axle	J
FIRST 2,500 MILES (4,000 KM)	
Check the oil level in the fluid flywheel	G
Check end float of rear wheel hubs	J
Check condition of brake linings	K
Check end float of front wheel hubs	M
EVERY 2,500 MILES (4,000 KM)	
Top up automatic chassis lubricator oil reservoir (if fitted)	B
Check tension of fan and compressor belts	C
Lubricate all engine controls	D
Check first and second fuel oil filters	E
Check the gearbox oil level	H
Check transfer box oil level	H
Lubricate cardan shaft universal joints	I
Check rear axle oil level	J
Check foot brake control valve for leaks	K
Lubricate single brake valve push rod pivot pin	K
Clean anti-freezer gauze filter (when fitted)	K
Check air pressure regulator for leaks	K
Lubricate brake pedal linkage	K
Lubricate handbrake linkage	K
Check unloader valve for leaks	K
Check brake chambers for leaks	K
Lubricate front wheel swivels (not if auto-lubrication system is fitted)	M
Lubricate steering ball joints (not if auto-lubrication is fitted)	N
Lubricate all road spring shackles (not if auto-lubrication system is fitted)	Q
FIRST 5,000 MILES (8,000 KM)	
Check all spring/axle mountings	O
EVERY 5,000 MILES (8,000 KM)	
Check automatic chassis lubricator pipe unions for leaks (when fitted)	B
Clean the engine air cleaner element	D
Drain oil from gearbox air cylinders	H
Clean transfer box air breather filter element	H
Drain oil from electro pneumatic valve block	H
Clean gearbox air breather filter element	H
Spray all road springs	O
Check the fluid level of the front dampers	O
Lubricate the electrical generator	R
Check air limiting valve for leaks	H
Check all chassis frame mountings	P
FIRST 10,000 MILES (16000 KM)	
Check and tighten the lock-up flywheel gland seal securing nuts (when fitted)	
EVERY 10,000 MILES (16,000 KM)	
Examine engine mountings for signs of deterioration and security of mounting bolts	D
Lubricate fan pulley bearings	C
Check the condition of all engine water hoses	D

Check the fluid flywheel oil level	G
Check the trailing link coupling setscrews	G
Clean oil filter element (replace if in bad condition)	H
Check cardan shaft flange nut and bolts	I
Check the rear axle mountings	J
Check the pressure setting — air regulator valve	K
Check footbrake linkage	K
Clean unloader valve inlet filterr	K
Check the front wheel alignment	M
Check steering lever and tie rods	N
Steering box oil level	N
Check all road spring shackles for end float	O

EVERY 20,000 MILES (32,000 KM)

Check rear hub bearings for end float and adjust as necessary.	J
Check front hub bearings for end float and adjust as necessary	M

EVERY 25,000 MILES (40,000 KM)

Drain sediment from fuel oil tank	E
Lubricate relay lever	N
Drain and refill transfer box	H
Drain and refill gearbox and replace oil filter element	H
Renew gearbox air breather filter element	H
Renew transfer box air breather filter element	H

EVERY 40,000 MILES (64,000 KM)

Drain and refill the rear axle unit	J
Remove, clean and re-lubricate rear wheel hubs	J
Remove, clean and re-lubricate front wheel hubs	M

EVERY 50,000 MILES (80,000 KM)

Check magnetic fan coupling units (when fitted)	C
Overhaul the air pressure regulator valve	K
Overhaul the footbrake control valve	K
Overhaul the unloader valve	K
Overhaul the brake chambers	K
Check all wiring connections	R

EVERY 75,000 MILES (120,000 KM)

Overhaul gear selector switch	H
Overhaul electro-pneumatic valve block	H

EVERY 250,000 MILES (400,000 KM)

Renew magnetic fan coupling unit (when fitted	C
Overhaul gearbox	H
Overhaul transfer box	H

LUBRICATION

SECTION B

INDEX

LUBRICATION

It is important that all oils and greases used in the maintenance of the vehicle should conform to those listed in the RECOMMENDED LUBRICANTS chart.
If it is desired to make any departure from those recommended, approval of the brand and viscosity should first be obtained from Daimler Transport Vehicles Ltd., to avoid affecting the guarantee.
In respect of the Gardner engine reference should be made direct to Messrs. Gardner Engine (Sales) Ltd.,
Since oil of different brands may not mix satisfactorily, draining and refilling is preferable to topping up if the brand of oil in the unit is unknown.

RECOMMENDED LUBRICANTS

	Engine Fluid Flywheel Oil Bath Cleaner	Rear Axle Transfer Box	Gear Box	Steering Box Automatic Lubrication	Hubs Cardan Shaft	Power Assisted Steering
B.P.	**Energol DS120W or Energol DS1 Multigrade**	**Gear Oil SAE 90 EP 90EP**	**Energol DS1-20W**	Gear Oil S.A.E. 140EP	Energrease L.2	Automatic Transmission Fluid Type A.
ESSO	**Esso Fleet HDX20**	**Esso Gear oil GP90/140**	**Esso Fleet HDX.20**	Esso Gear Oil GP90/140	Esso T.S.D.1186 or Esso Multi-Purpose Grease H	Esso Automatic Transmission Fluid
MOBIL	**Delvac Oil 920**	**Mobilube GX90**	**Delvac Oil 920**	Mobilube C.140	Mobil-grease MP	Mobil-fluid 200
REGENT Caltex/ Texaco	**Super RPM Delo Special SAE20**	**Multigrade Lubricant EP90**	**Super RPM Delo Special SAE20**	Multigear Lubricant EP.140	Marfax All-Purpose	Texa-Matic Fluid
SHELL	**Rotella T 20/20W or Rotella Multigrade**	Spirax 90EP	**Rotella T 20/20W**	Dentax 140	Retinax Grease A	Shell Donax T.6
*CASTROL	**Castrol CR20**	**Castrol Hypoy**	Castrol CR.20	Castrol D	Castrolease L.M.	Castrol T.Q.
DUCKHAM	**HD.20/1 or Fleetol 10W 30/1**	**Hypoid**	H.D.20/1	C.G.140	L.B.10	Q-matic

AUTOMATIC CHASSIS LUBRICATION

The Clayton Dewandre R.P. Automatic chassis lubrication system is fitted as an alternative if required and replaces the grease gun and nipple system fitted as standard equipment.

SPECIFICATION AND DATA

Type	Clayton Dewandre R.P. Air pressure operated
No. of points lubricated	24
Capacity of Reservoir	1 gallon (4.546 litres)

DESCRIPTION

The air pressure operated lubricator automatically delivers a measured independant supply of oil to each selected bearing point irrespective of any variation in resistance, with each application of the foot brakes.

If excess resistance is encountered at any point pressure is accumulated in the individual feed line until the resistance is overcome without effecting any of the other feeds.

Should a feed line be broken or disconnected, only the one particular point is effected.

The supply tank is mounted on brackets attached to the right-hand side of the main frame. Access to the filler is provided for by the Coachbuilder.

The pump is mounted on an outrigger bracket on the right-hand side of the main frame beneath the driver's compartment.

The oil feed supply pipes are of heavy gauge nylon, grouped together in P.V.C. tubing and securely clipped to the frame and the various units. Twenty-three chassis points are lubricated, the twenty-fourth connection being for the lubrication of the actuating cylinder and piston.

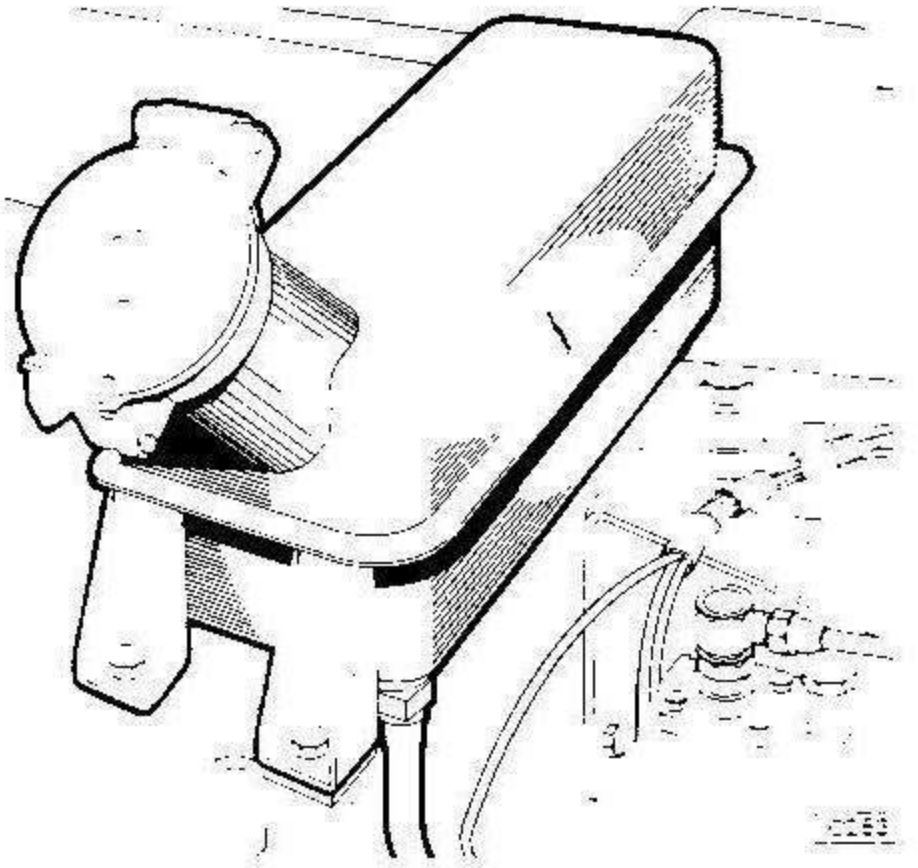


Fig. 1 Location of the chassis lubrication pump reservoir

ROUTINE MAINTENANCE

EVERY 2,500 MILES (4,000 KM)

Top up the oil reservoir with the recommended lubricant.

EVERY 5,000 MILES (8,000 KM)

Inspect delivery pipe unions for any possible leaks and re-tighten if necessary.

LUBRICATOR

The lubricator can be expected to outlast the life of the vehicle without requiring any replacements but service units are available if required from the manufacturers.

Removal

1. Disconnect the main oil feed pipe by removing the banjo union bolt. Note the two sealing washers and drain the oil into a suitable clean container.
2. Disconnect the air pressure pipe from the lubricator cylinder.
3. Disconnect the lubricator pipe from cylinder junction.
4. Remove the six bolts, nuts and washers securing the delivery plate to the main body.
5. Remove the main body taking care to retain the joint.

Refitting

Refitting is the reverse of the removal procedure. Replace the joint between the delivery plate and body if damaged.

NOTE: Before refitting the unit the piping must be primed.

Priming

Since there is only a very small quantity of oil delivered to the feed pipes at each impulse of the lubricator unit, it would take some considerable time to initially fill all the feed pipes by this method. Priming is therefore necessary to charge the pipes to ensure that the oil reaches each of the lubrication points without delay at the commencement of service.

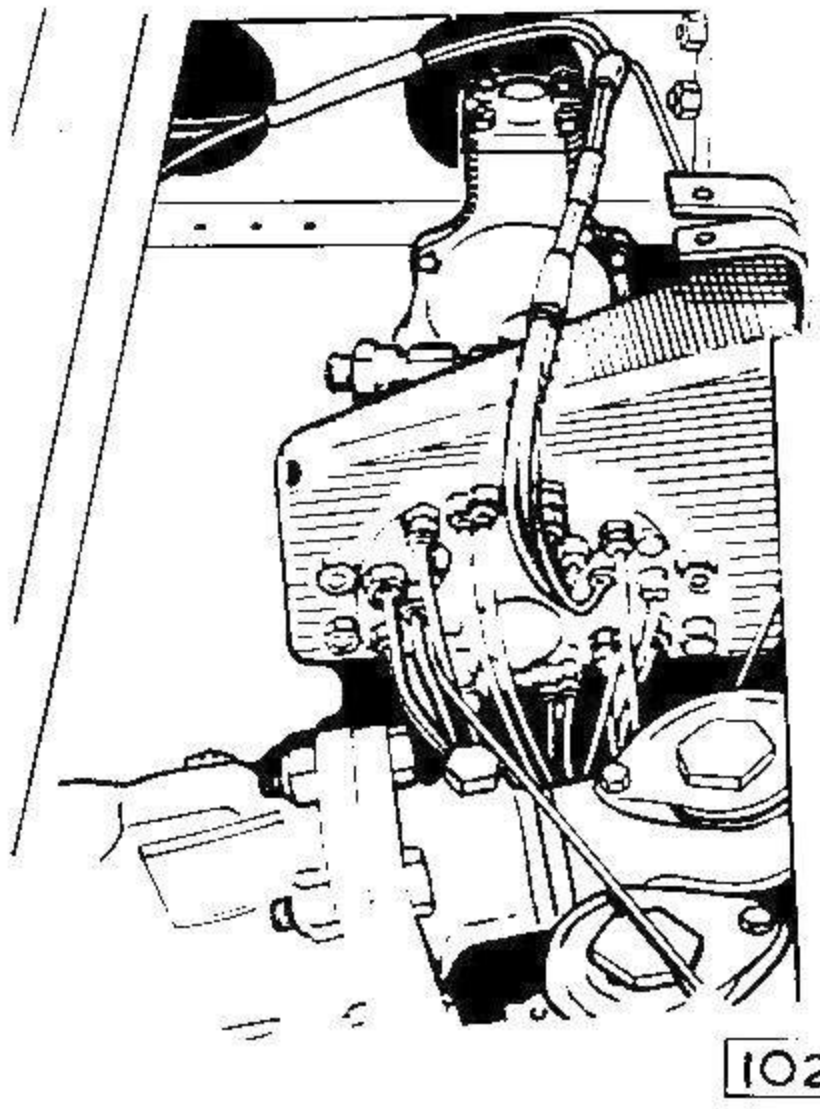


Fig. 2 Location of lubricator-pump

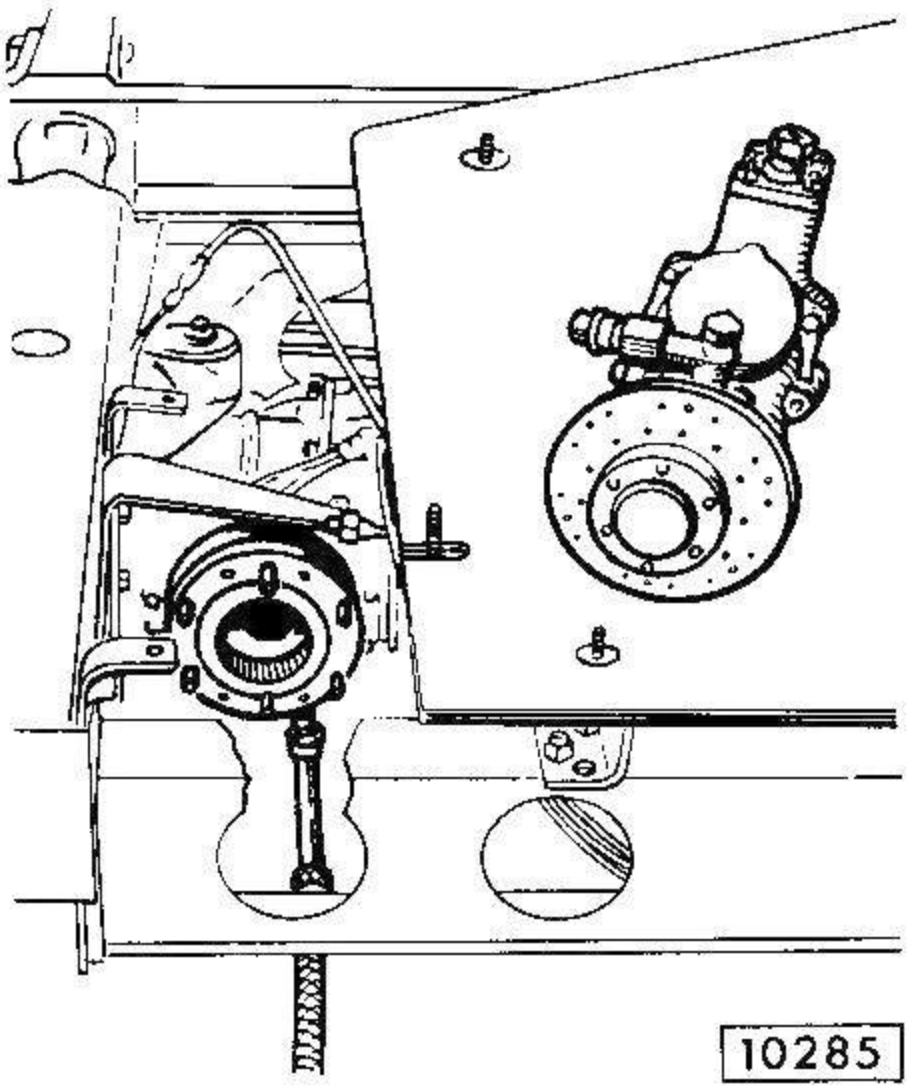


Fig. 3 Priming plate in position.

Priming can be effected by either of the two methods given below.

The special priming plate required by the first method has twenty-three nipples which coincide with the feed pipes. The feed line leading from the remaining distributor plate union is disconnected from the operating cylinder union and can be primed separately.

Priming – Plate Method

1. Remove the lubricator body after withdrawing the six bolts, nuts and washers securing the body to the delivery plate as described under "Removal". Disconnect the oil feed supply pipe and the lubricator pump connection (number 24 on the location chart) and blank off the unions.
2. Bolt the priming plate to the delivery plate.
3. Using an oil gun, pump oil into each of the priming plate nipples in turn until the corresponding pipe line is full, as determined by observation of the bearing point to which is is attached.
4. When the system is completely charged, remove the priming plate, remount the lubricator body onto the delivery plate. Refit the feed pipe to the operating cylinder and reconnect the pipes from the oil supply tank and air pressure system.
5. Fill the oil reservoir tank with the recommended grade of fluid.

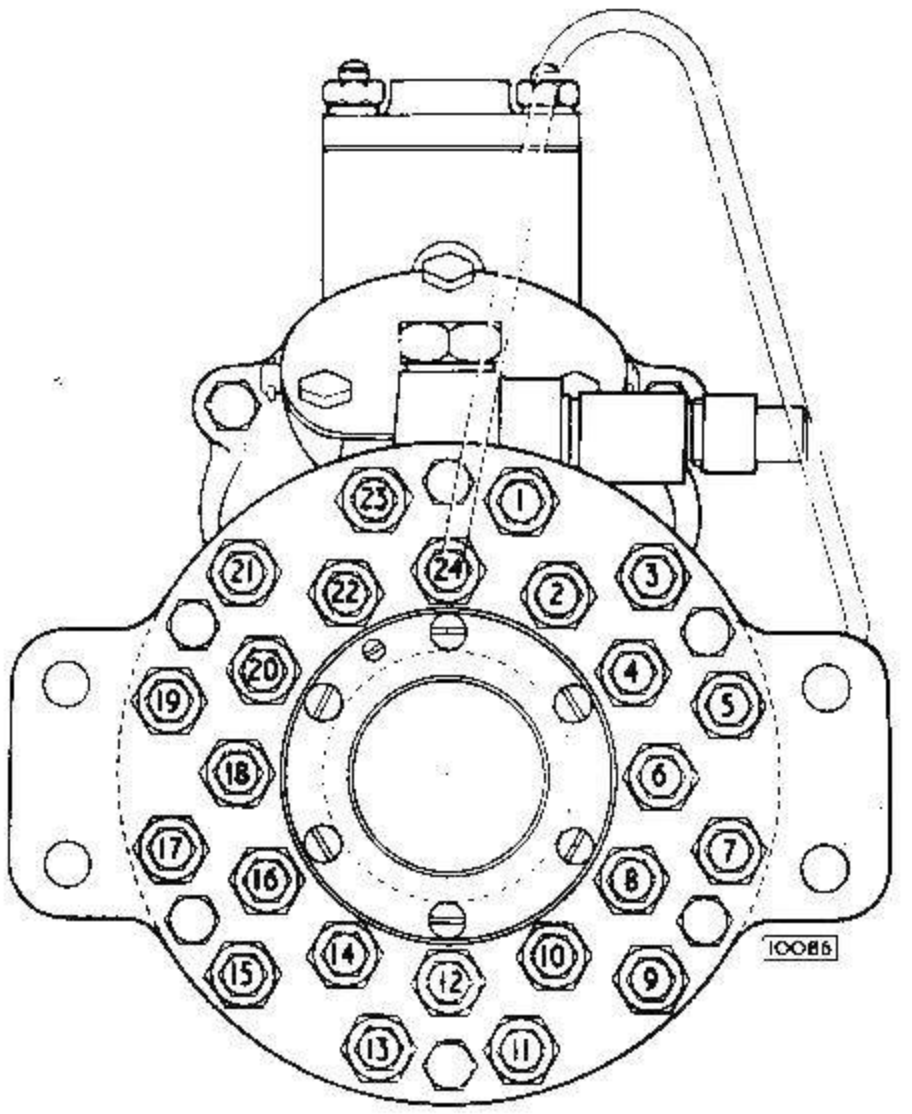


Fig. 4 *End view of lubricator pump showing connections numbering sequence.*

LUBRICATION

Priming – Delivery Union Method
The feed pipes from the 23 bearing points are connected to the distributor plate in accordance with the following table, Number 1 being the first union following the top centre fixing bolt in a clockwise direction. Odd numbers are arranged on the outer ring and even numbers on the inner ring.

CHASSIS POINT LOCATION

Distributor Point No:	Distributor Point No.
1. Steering Relay Lever	14. Rear Spring Rear Shackle – Bottom Pin Right-Hand Side
2. Front Steering Side Rod – Front Right-Hand Side	15. Rear Spring Rear Shackle – Bottom Pin Left-Hand Side
3. Front Steering Side Rod – Rear Right-Hand Side	16. Rear Spring Rear Shackle – Top Pin Left-Hand Side
4. Front Spring – Front Spring Pin Right-Hand Side	17. Rear Spring – Front Spring Pin Left-Hand Side
5. Rear Steering Side Rod – Front Right-Hand Side	18. Front Spring Rear Shackle – Bottom Pin Left-Hand Side
6. Rear Steering Side Rod – Rear Right-Hand Side	19. Front Spring Rear Shackle – Top Pin Left-Hand Side
7. Swivel Pin – Top Right-Hand Side	20. Track Rod – Left-Hand Side
8. Swivel Pin – Bottom Right-Hand Side	21. Swivel Pin – Bottom Left-Hand Side
9. Track Rod – Right-Hand Side	22. Swivel Pin – Top Left-Hand Side
10. Front Spring Rear Shackle – Top Pin Right-Hand Side	23. Front Spring – Front Spring Pin Left-Hand Side
11. Front Spring Rear Shackle – Bottom Pin Right-Hand Side	24. Lubricator Pump
12. Rear Spring – Front Spring Pin Right-Hand Side	
13. Rear Spring Rear Shackle – Top Pin Right-Hand Side	

1. Disconnect No. 1 union from the delivery plate.
2. Release the feed pipe union from the bearing point.
3. Using a pressure gun or other suitable means, charge the pipe with oil from the lubricator end until all air is expelled and oil seeps from the connection point.
4. Tighten the bearing point union and reconnect the delivery plate union.
5. Repeat the operation to the remaining 22 feed pipes.

Testing
1. Check all connections and ensure that they are secure.
2. Check that the oil reservoir is full and that the vent hole in the filler is clear.
3. Slacken off the inlet pipe banjo union until the oil is seen to flow from the joint and re-tighten.
4. Withdraw the three set bolts and remove the circular top cover plate to expose the operating lever chamber of the lubricator. Fill the chamber with oil of the specified grade, to the level of the gauze breather in the side of the chamber.
Release one pipe at the distributor plate and operate the brake pedal until oil is delivered at the disconnected union. Re-tighten the union. During this operation it will be necessary to maintain the air pressure in the braking system.
Test the vehicle on the road and apply the brakes frequently. Check all unions for leaks and tighten if necessary.

Adjustment
The lubricator is set initially to give the maximum quantity of lubricant per oil impulse at the maximum piston stroke; after a period of service oil should be showing at each lubrication point.
When service conditions are such that the chassis requires less lubrication adjustment should be made as follows: Release the locknut and screw in the stop screw, located at the bottom of the operating cylinder.

COOLING SYSTEM

SECTION C

INDEX

COOLING SYSTEM

COOLING SYSTEM

SPECIFICATION AND DATA

Type of cooling system	Pressurized, thermostatically controlled impeller pump assisted thermo-syphon
No. of fan blades	8
Type of drive	Vee belt and jack shaft
Speed of fan – GLX Engine	.94 times engine speed
GLXB Engine	
Cooling system capacity	6 gallons 6 pints (30.5 Litres)
Thermostat opens at	135°F (57°C)
fully open at	168°F (75°C)
Type of radiator	Vertical flow, fixed or removable tube type block
Normal running temperature	165° – 170°F (73.9° – 76.7°C)
Pressurized to	4 lbs per sq. in (0.28 kg/cm^2)
Drive belt tension – Fan	½" – (13 mm) at 4 lb. tension
Compressor	½" – (13 mm) at 6 lb. tension
Coolant level	To bottom edge of filler neck

GENERAL DESCRIPTION

The cooling system, pressurized and thermostatically controlled, consists of the following components.

(i) A vertical flow radiator unit resiliently mounted on steel and rubber bonded bushes at the right hand side of the engine compartment. A pressure relief valve incorporated in the overflow pipe connection and a hinged flap type radiator cap, the latter held closed by a spring catch pressurizes the system to 4 lbs per sq. inch. Radiators may also be fitted with an expansion chamber to suit operator's requirements and have a pressure release incorporated in the radiator cap. The pressure is released by turning the small knurled knob anti-clockwise before opening the radiator cap.

(ii) A 21.0" (533.4 mm) diameter eight bladed cooling fan runs in a special housing which is attached to the inside face of the radiator by its two vertical sides. Included in the fan housing assembly is a large diameter drive pulley which drives the cooling fan through three vee belts.

(iii) Two jack shafts which connect the cooling fan drive pulley to a pulley at the top of the timing chest situated on the left hand side of the engine unit.

(iv) An impellor type coolant pump situated at the rear bottom left hand corner of the engine unit.

(v) A thermostat mounted in a housing situated on the front top left hand side of the engine. Before the engine reaches its normal working temperature the coolant by-passes the radiator through an external pipe to the water pump.

(vi) A temperature warning device operating a warning light on the instrument panel and/or a buzzer in the switch panel is fitted as standard equipment. No routine maintenance or adjustment, with the exception of occasional contact adjustment of the buzzer, is necessary or provided for.

ROUTINE MAINTENANCE

DAILY

Checking the Radiator Coolant Level.

Check the level of the coolant in the radiator daily, and if necessary top up to the bottom of the filler neck.

Use water that is as soft as procurable, hard water produces scale which in time will impair the cooling efficiency of the system.

NOTE: It is dangerous to open the radiator cap while the engine is HOT as the escaping pressurised steam may cause scalding of the hands.

If the radiator cap is fitted with the pressure release control turn the small knurled knob anti-clockwise to release the steam pressure generated in the system before releasing the radiator cap spring catch. Fully close when refilling.

Rapid lowering of the water level should be investigated and the whole system checked for leaks.

EVERY 2,500 MILES (4,000 KM)

Checking the Fan Belt Tension

Check the fan and compressor drive belts. When correctly adjusted the deflection of the belts should be no more

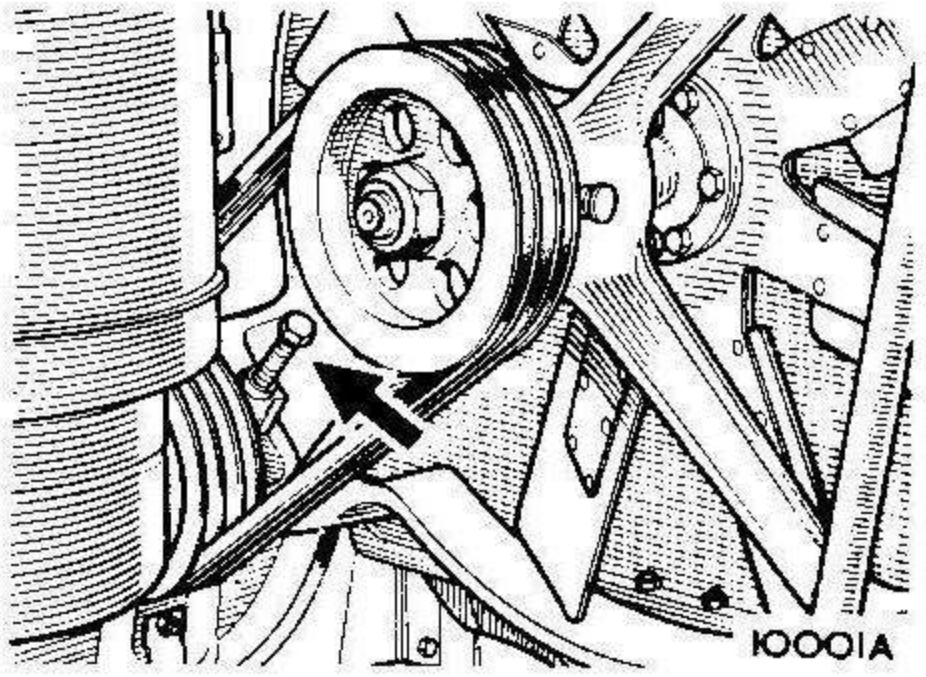


Fig. 1 Location of fan belt adjuster

than ½" (13 mm) with a pressure of 4.0 lbs (1.8 kg) applied between the pulleys.

Adjustment

Fan Belts

Release the two self-locking nuts securing the drive pulley bearing block to the mounting bracket.

Release the locknut locking the adjuster screw, and turn the screw in a clockwise direction to tighten the fan belts. Re-tighten the locknut and the two self-locking nuts.

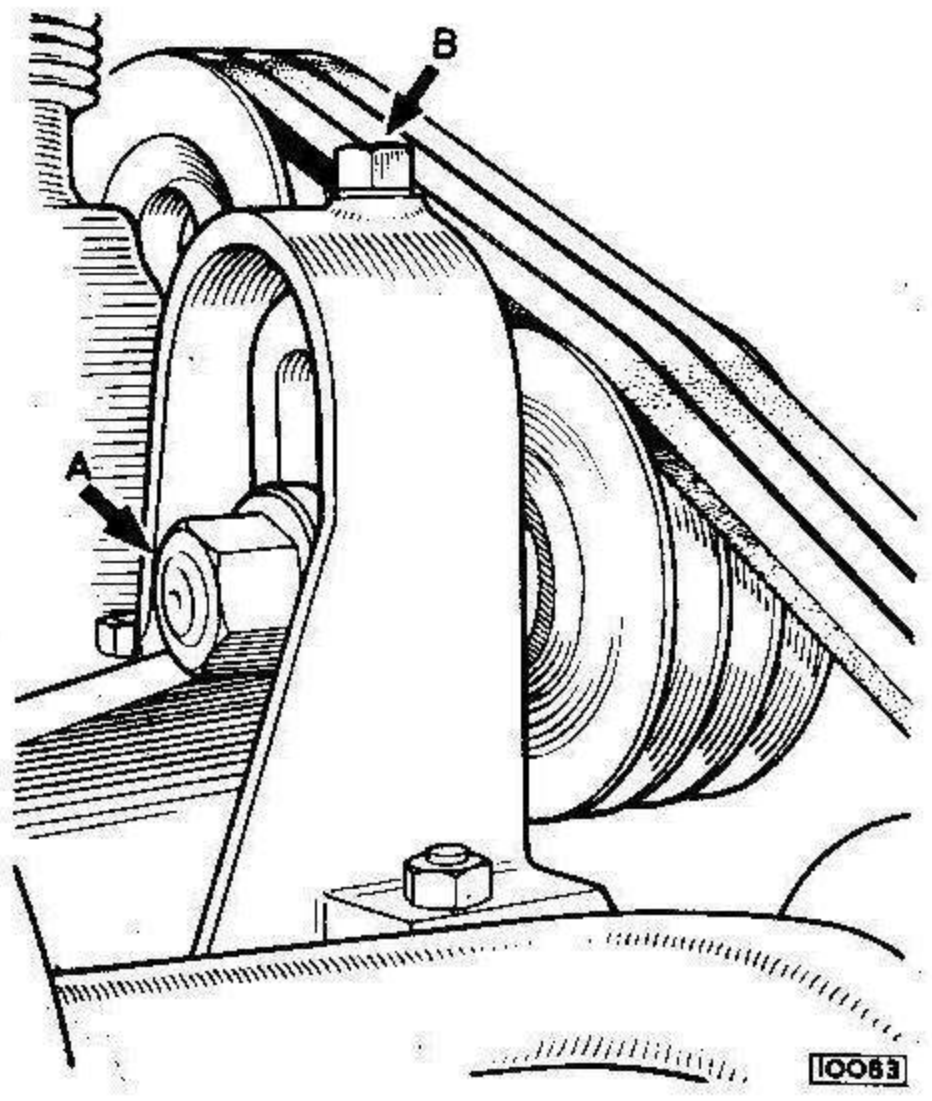


Fig. 2 Location of compressor belt adjuster

NOTE: Do not tighten the belts beyond the limits specified. Any undue load will create wear in the pulleys bearings.

Compressor Belts

Release the large nut securing the jockey pulley bearing block to the mounting bracket. Turn the adjuster screw located in the centre of the mounting bracket in a clockwise direction to tighten the belts. Re-tighten the large nut.

NOTE: Do not tighten the belt beyond the limits specified in "Fan Belt – Adjustment."

EVERY 10,000 MILES (16,000 KM)

Lubrication

Apply the grease gun to the grease nipples located in the fan pulley bearing and the drive pulley boss and inject a small quantity of grease.

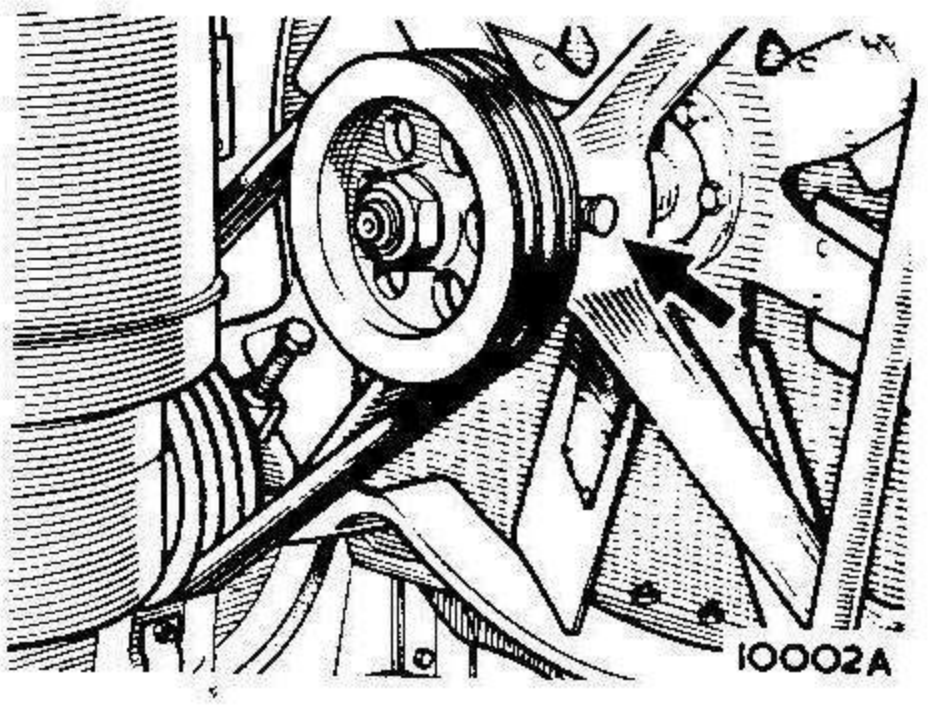


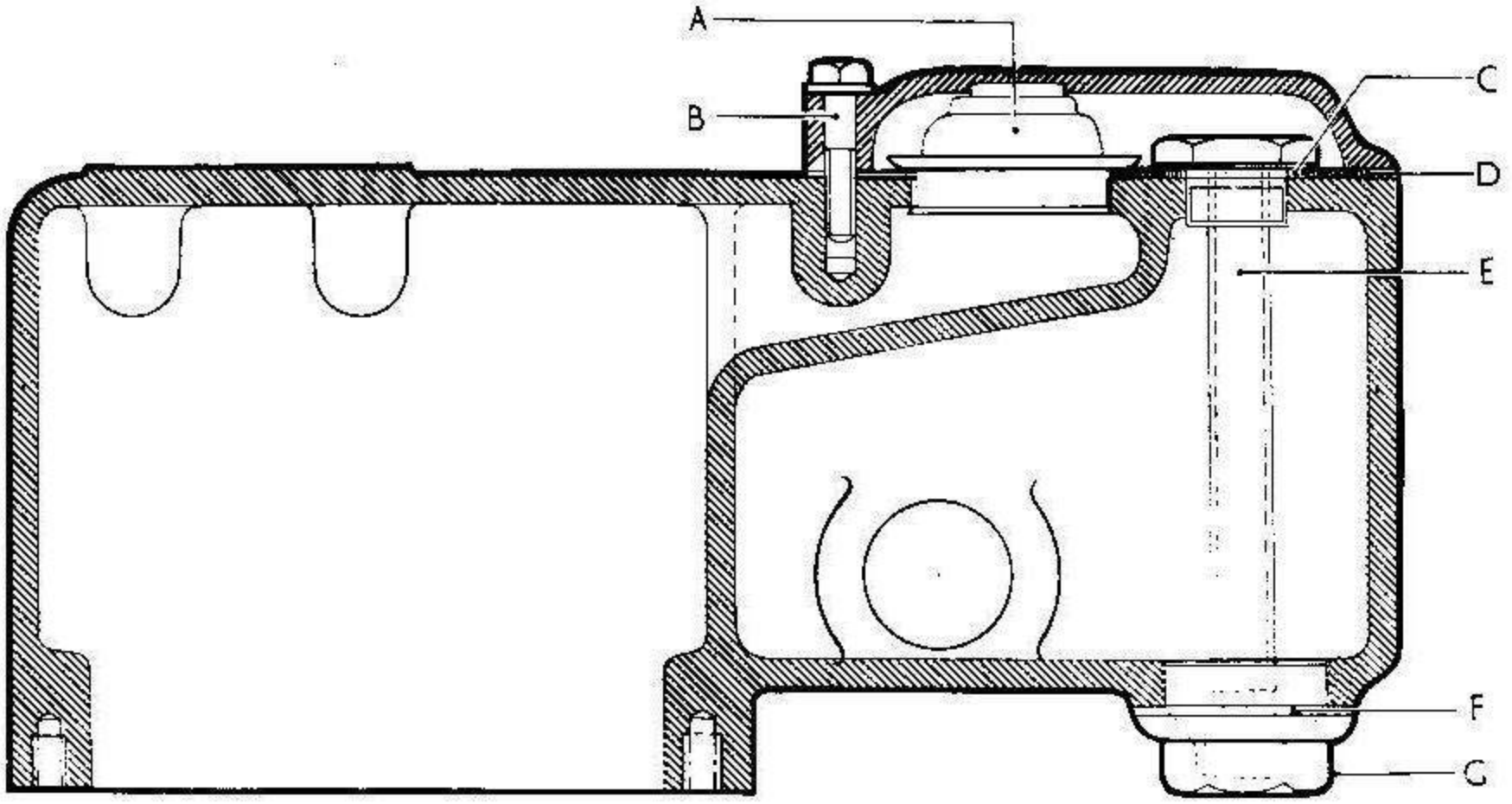
Fig. 3 Fan bearing grease nipple

Warning: Do not pack the bearing with lubricant. Any excess grease will be thrown out of the bearings by centrifugal action and may contaminate the fan belts.

PERIODICALLY

Care of the Cooling System

The entire cooling system should occasionally be flushed out to remove sediment. Remove the plug situated in the radiator bottom water pipe and open the taps in the cylinder inlet pipe and water pump. Insert a water hose in the radiator filler neck and allow the water to flow freely with the engine running at a fast idle speed (1,000 r.p.m.) to cause circulation until the water runs clear.



10104

Fig. 4 Sectioned view of radiator expansion chamber

A Release valve
B Cover retaining screw
C Gasket
D Cover joint
E Expansion chamber tube
F Gasket
G Drain plug

Since deposits in the water will in time cause fouling of the surface of the cooling system with consequent impaired efficiency, it is desirable to retard this action as much as possible by using water as nearly soft as possible. If the cooling system incorporates an expansion chamber remove the large brass plug in addition to the items previously noted when flushing.

Water Pump – Lubrication
Refer to the Gardner Handbook for all details concerning the lubrication of the water pump.

Jack Shafts – Lubrication
The jack shaft assembly driving the fan drive pulley is comprised of two shafts connected by a flexible coupling. For the lubrication of the main shaft bearings refer to the Gardner Service Manual. The sliding joint on the coupling shaft should only require lubricating after a lengthy period of service.

FROST PRECAUTIONS

Anti-freeze – Important
During the winter months it is strongly recommended that an anti-freeze compound with an inhibited ethylene glycol base is used in the proportions laid down by the anti-freeze manufacturers. Before adding the anti-freeze solution the cooling system should be cleaned by flushing. The cylinder head gaskets must be in good conditions and the cylinder head nuts pulled down to the correct torque, refer to the Gardner Service Manual for correct torque figures. Check all water hoses and connections, water pump and manifold joints.
To ensure satisfactory mixing measure the recommended proportion of water and anti-freeze solution in a separate container and fill the system from this receptacle rather than add the anti-freeze direct to the system.

COOLING SYSTEM

FAN AND COMPRESSOR BELTS

Worn or damaged fan or compressor belts should always be replaced as soon as possible.

Fan Belts – Removal

Release the two self-locking nuts securing the drive pulley bearing block to the mounting bracket. Release the locknut locking the adjust screw and turn the screw in an anti-clockwise direction until the fan belts can be withdrawn clear of the pulley.

Remove the two screws securing the jack shaft flexible coupling to the fan drive pulley and slide back the sliding joint to allow the belts to be withdrawn.

Refitting

Refitting is the reverse of the removal procedure. Adjust the belts to the correct tension as detailed in the 2,500 miles maintenance service.

Compressor Belts

Removal

Release the large nut securing the jockey pulley bearing block to the mounting bracket. Turn the adjuster screw, located in the centre of the mounting bracket in an anti-clockwise direction until the jockey pulley is clear of the belts. Remove the belts.

Refitting

Refitting is the reverse of the removal procedure. Adjust the belts to the correct tension as detailed in the 2,500 miles maintenance service.

FAN

Removal

Remove the fan belts as detailed under "Fan Belt – Removal"

Remove the eight bolts securing the fan carrier bracket to the radiator. Withdraw the two bolts and nuts securing the radiator stays to the fan carrier. Remove the fan and carrier as a complete unit.

Dismantling

Remove the nut securing the fan to the fan spindle and extract the woodruff key. Remove the nut securing the pulley to the spindle and extract the key from the keyway.

Remove the four bolts and self-locking nuts securing the bearing and caps. Remove the caps taking care not to damage the oil seals. Extract the two bearing housings and withdraw the spindle.

To remove the fan blades from the centres boss extract the six bolts and nuts.

NOTE: The holes in the fan and centre boss are offset to facilitate correct re-assembly

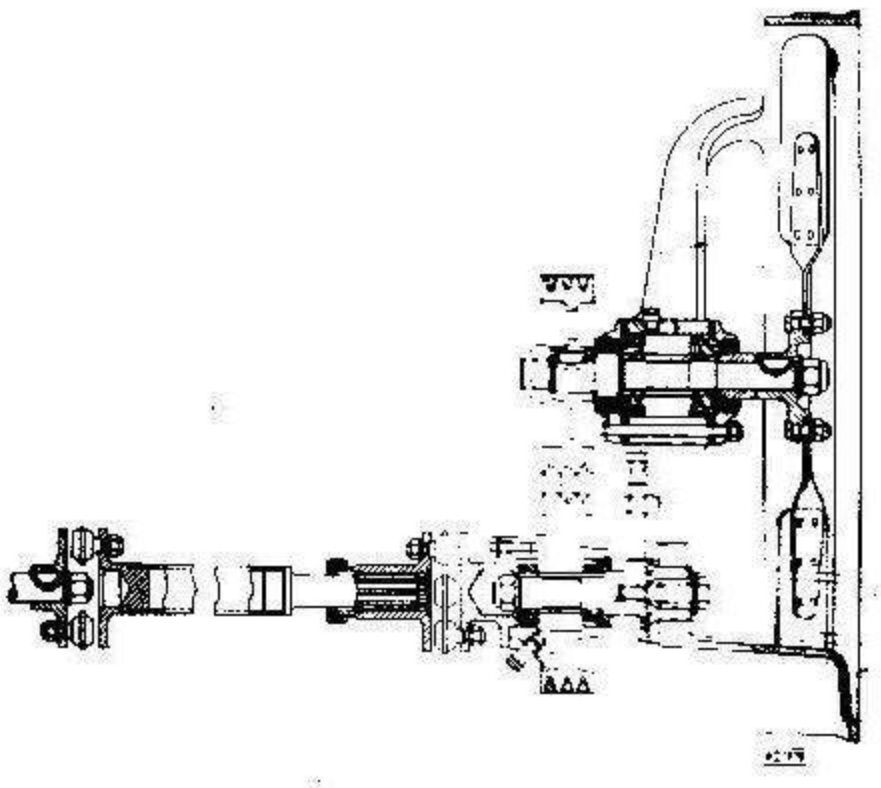


Fig. 5 Sectioned view of the fan assembly

Assembling

Assembling is the reverse of the dismantling procedure. Renew the two oil seals if worn or damaged.

Refitting

Refitting is the reverse of the removal procedure.

HIGH SPEED RADIATOR FAN.

High speed (gear driven) radiator fans are available as alternative equipment for "FLEETLINE" vehicles operating in countries with a normal high ambient temperature.

The fan is belt driven through a shaft and two bevel gears, the shafts being supported on ball bearings.

Routine Maintenance

Routine maintenance is confined to periodically checking the oil level in the unit and drive belt adjustment.

Removal

Remove the fan, drive belt and carrier as an assembly as detailed on this page.

Dismantling

Remove the plug and drain the oil from the unit.

Remove the self-locking nut and washer securing the fan to the spindle, withdraw the fan and extract the key.

Withdraw the sleeve from the shaft.

Remove the split pin, nut and washer securing the pulley to the drive shaft, withdraw the pulley and extract the key.

Withdraw four bolts and lockwashers and detach the fan spindle bearing housing from the drive shaft housing.

Remove four bolts and lockwashers and detach the bearing cap from the fan spindle housing.

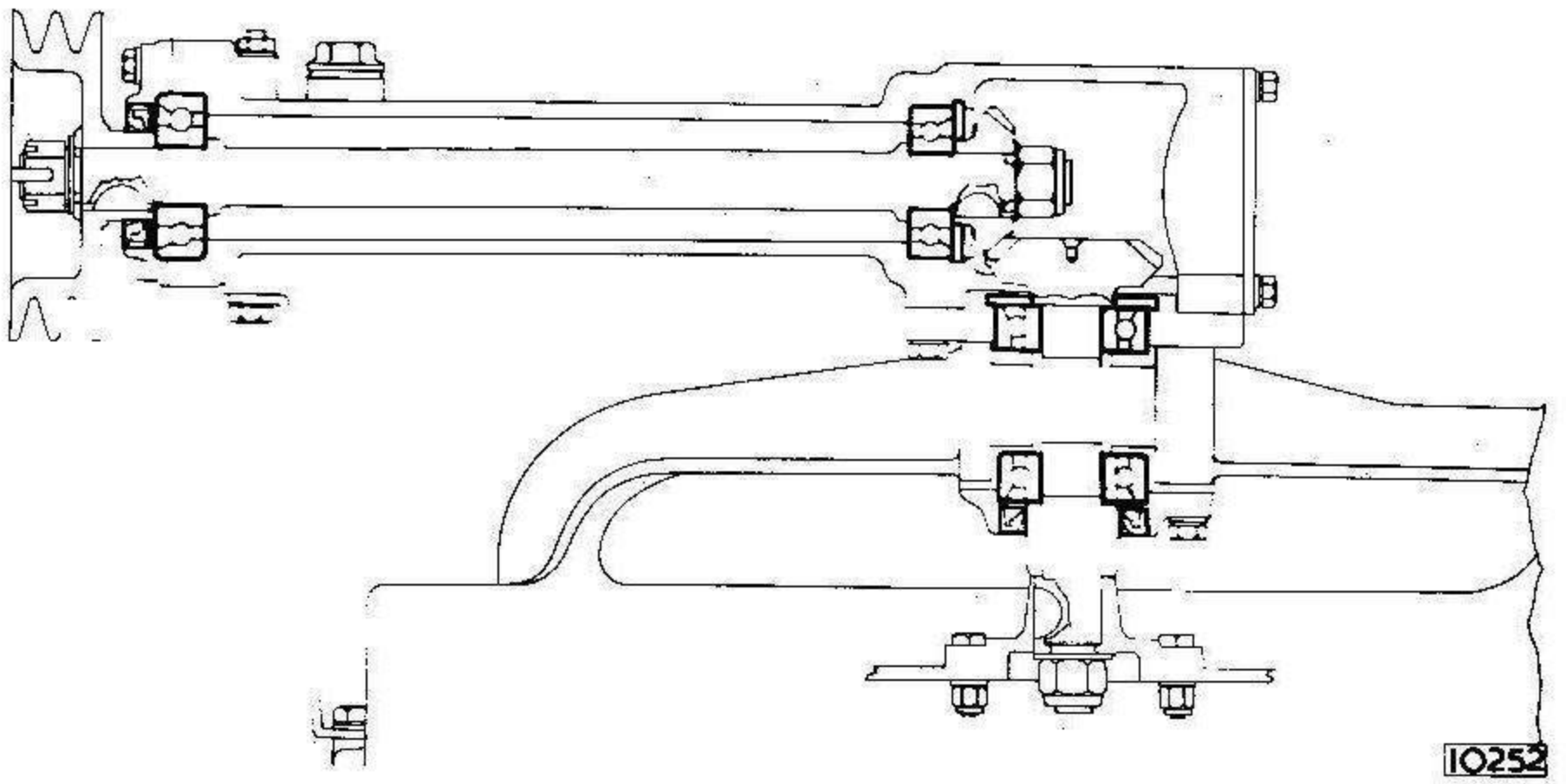


Fig. 6 Sectioned view of the high speed fan assembly

Withdraw the outer bearing and housing.
With a soft mallet drift the pinion shaft through the inner bearing and extract the inner bearing.
Remove the bearing cap from the drive shaft housing and withdraw the outer bearing.
Remove the end cover plate and drift the drive shaft through the inner bearing. Extract the inner bearing.
Note the location and number of shims fitted when removing the bearings for reference when reassembling.
Check the condition of the pinion teeth and renew the pinions if worn or damaged. The drive pinion may be removed from the shaft after removing the nut.
Renew the oil seals and gaskets.

Reassembling
Reassembling is the reverse of the dismantling procedure.
Add or subtract shims until all end float is removed from the bearings.
Refill the unit with the recommended grade of lubricant (S.A.E.140).
The capacity is approximately ¾ Imp: pints. (.42 Litres).

RADIATOR

Removal
Raise the engine cover to the open position. Remove the engine compartment right hand panel as detailed under Section Q "Engine Compartment Covers".
Drain away the coolant by removing the drain plug located in the bottom water pipe, conserving the coolant if an anti-freeze is in use.
Disconnect the bottom water tank hose and the air filter hose from the bracket attached to the top tank.
Remove the two bolts and nuts securing the radiator

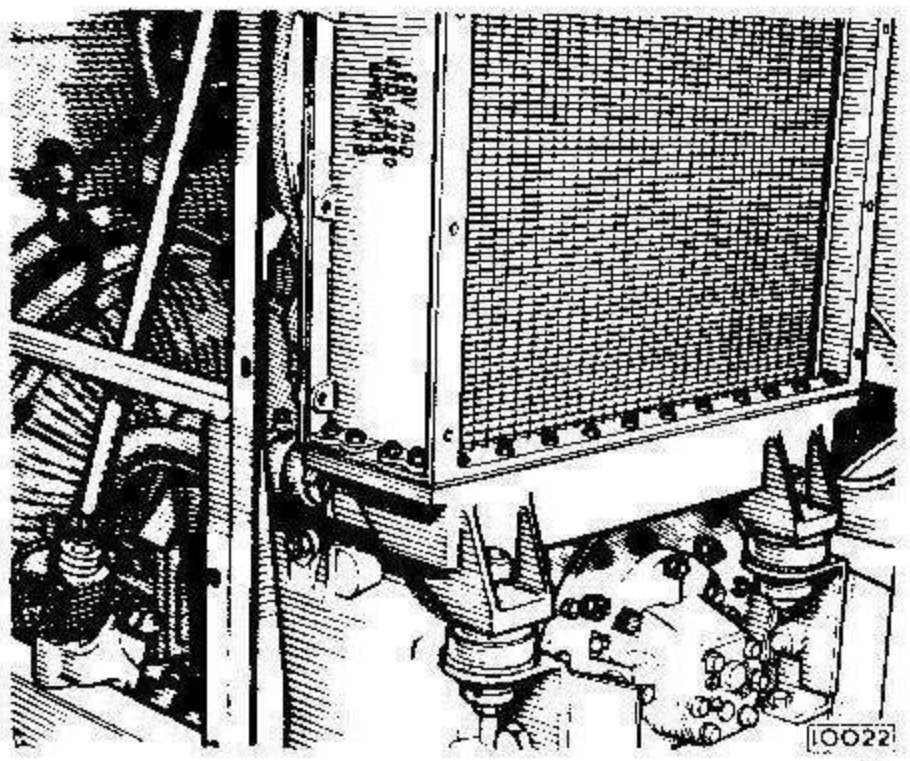


Fig. 7 Radiator lower mounting points

bottom mountings. Disconnect the jack shaft flexible coupling from the fan drive pulley by removing the two setscrews.
Remove the two bolts and nuts securing the radiator stays to the radiator top mounting and lift away the radiator complete with the fan assembly.
Note the two rubber pads fitted between radiator upper mountings and the two rubber pads and cup washers fitted between bottom mounting and bolt head.
Refitting
Refitting is the reverse of the removal procedure.

THERMOSTAT
For all information and data concerning the thermostat refer to the Gardner Service Manual.

MAGNETIC FAN COUPLING

Vehicles may be equipped with a magnetic fan coupling to operator's requirements.
The following is a brief description of the operation and maintenance necessary to the coupling and associate parts.
For fuller details, parts list and guarantee details, operators are advised to apply to the components manufacturers (address below) for a copy of their Service Manual covering the Daimler "Fleetline" vehicle.

SMITHS MOTOR ACCESSORY DIVISION
Service Department,
55, Oxgate Lane,
London, N.W.2.

DATA

DESCRIPTION			OPERATION
Coupling Unit		Nominal voltage	24V – D.C.
		Coil resistance	19 ohms.
		Coil insulation	10 Meg ohms at 500V
		Torque	8 lbs/ft. (min:)
Relay		Nominal voltage	24V – D.C.
		Contact current rating (Max)	10A at 24V non-conductive
		Pull-in voltage	16V (max)
		Drop-out voltage	3.5V (min)
		Contact gap	.040"
Thermal Switch			
	Primary	Operating temperature	60°C – 70°C (140° – 158°F)
	Secondary	Operating temperature	70°C – 80°C (158° – 176°F)

DESCRIPTION

The Magnetic Fan Coupling provides a means of automatically regulating the operation of the cooling fan by accurately sensing the engine coolant temperature through a thermal switch as shown in the electrical control circuit diagram.
The switch contacts close and the fan coupling engages drive by being energised through the relay, only when operating conditions demand extra cooling beyond the thermal dissipation of the radiator under ram air conditions. As the thermal switch permits the fan coupling to remain disengaged until such additional cooling is necessary, the circuit is in-operative with a cool engine. The fan coupling installation has a safety control circuit incorporated as shown by the dotted line in the circuit diagram. The principle of operation is similar to that already described in that the primary thermal switch initiates control of the normal running circuit but in the event of failure of this circuit, control is taken over by the secondary switch and relay.
The two switches are set at slightly different operating temperatures to avoid simultaneous control; the safety switch (second), marked with a blue spot, being the higher.
Failure of the normal primary running circuit will be indicated by a warning lamp installed in the cab and if a failure is indicated the defective circuit must be serviced as soon as possible.

ROUTINE MAINTENANCE

The magnetic fan coupling components are sealed units, therefore no routine maintenance is necessary.

NOTE: It is advisable, when carrying out a major engine overhaul, or at 250,000 miles, to obtain a replacement fan coupling.

IMPORTANT

Although these couplings are sealed units it is important that they are not allowed to become excessively covered with grease or lubricating oil. If it is necessary to clean an external part of a unit only Trichlorethylene must be used and this sparingly to avoid leakage through the joints.

UNITS MUST NEVER BE UNPACKED FROM THEIR CARTONS UNTIL THEY ARE ACTUALLY REQUIRED FOR USE.

EVERY 50,000 MILES

Carry out operational tests on the units incorporated in the fan coupling installation as detailed under their respective headings.

Thermal Switch

Disconnect the battery supply.

Drain sufficient coolant from the system to enable the switch to be removed. Conserve the coolant if an anti-freeze is in use.

Loosen the clip and slide the rubber cover clear of the terminals. Disconnect the two cables.

With a spanner on the hexagon of the switch body unscrew (right-hand thread) the switch from the adaptor.

NOTE: If the thread is tight due to corrosion work the switch backwards and forwards to clear and so avoid unnecessary damage.

Connect the switch to a 2.5 volt battery with a 2.5 volt bulb wired in series.

Immerse the lower (threaded) portion of the switch in a pot of water. Raise the temperature of the water and note the exact point when the bulb lights up. Check temperature with an accurate thermometer.

Lower the temperature of the water and note the point at which the light goes out.

Check the switch operating temperatures with that given in the "DATA" section.

The switch cannot be adjusted and must be replaced if faulty.

Refit by reversing the removal procedure. Renew the joint washer.

Lightly coat the inside of the switch cover with a silicone grease to ensure water tight sealing before replacing.

Relay

Remove the plastic cover from the terminal block on the relay base and disconnect the wires from the terminals. Clearly mark the cables before removing to ensure correct reconnecting.

Remove the relay after unscrewing the two retaining screws.

To test for correct operation connect the coil terminals through a variable resistance across a 24 volt battery. At full voltage check with a 2.5 volt battery and battery and bulb wired in series between the relay contact terminals that the contacts are closed and the bulb lights up.

If satisfactory, check by means of the variable resistance that the contact pull-in and drop-out voltages are correct as stated under "DATA".

If it is necessary to remove the relay cover in order to check the contact gap ensure on refitting that it is seating correctly and seal by using air drying varnish.

If the relay fails these tests it must be replaced with a new or reconditioned unit.

Refit by reversing the removal procedure.

Fan Coupling

Before attempting to remove the coupling check that the wiring, relay and thermal switches are working satisfactorily.

Check the coupling for any signs of damage or extremely heavy deposits of oil or grease on the coupling. Any such contamination could adversely affect the coupling performance.

If the above is in order, then the coupling when energised from a 24 volt battery supply should engage with sufficient torque to drive the fan.

To establish the correct torque value proceed as follows:

NOTE: It is necessary before checking the torque value to ensure, by the following method, that the magnetic powder within the coupling is evenly distributed. Rotate the coupling and at the same time briefly energise and de-energise the coupling coil by shorting out the thermal switch.

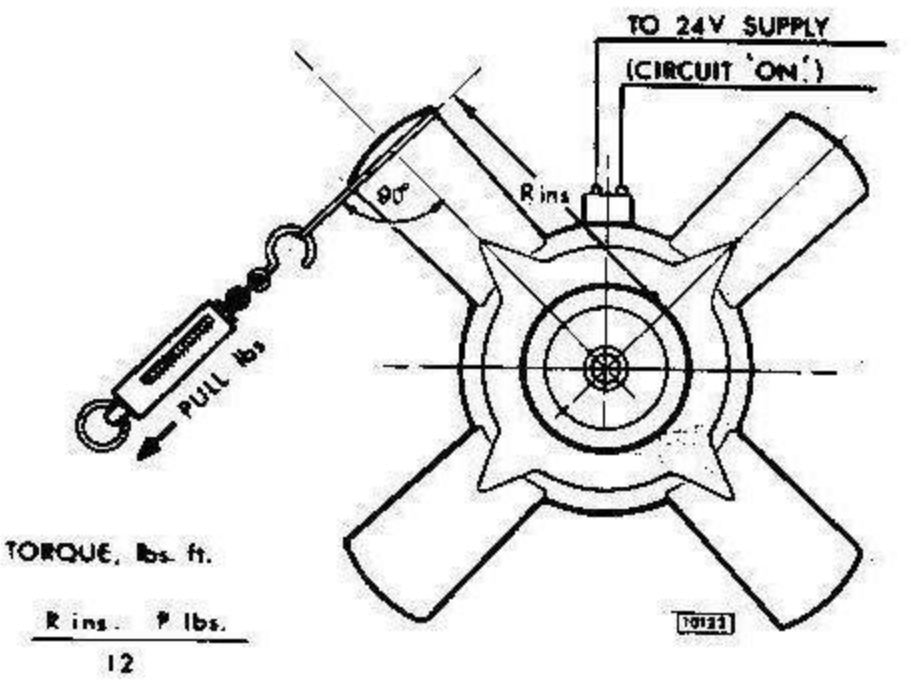


Fig. 8 Checking the torque of the fan coupling

Attach a spring balance to the tip of one of the blades and carry out the test as illustrated in Fig. 8. The resultant figure obtained should be – 8 ft/lbs (min).

Check the coil resistance by disconnecting the supply leads from the unit and connecting an ohmsmeter in circuit with the unit terminals. The resistance value obtained should be 10 ohms.

Check the coupling insulation by disconnecting the supply leads and connecting a MEGGA test instrument between either terminal and the case. Insulation value obtained should not exceed 10M.ohms at 500 volts.

In the event of failure in any of the above tests the coupling unit must be replaced.

COOLING SYSTEM

FAULT DIAGNOSIS

Before diagnosing faults, the engine must be cool (below 60°C), the control circuit should then be in the normal condition with the start switch "ON" as shown in Fig. 8. In this normal condition the thermal switch contacts are open, the relay is de-energised with its contacts open and the coupling is also de-energised with the fan free.

A visual examination of the installation, with the engine stationary, should first be carried out before investigating the symptoms in the following table.

Ensure that:—

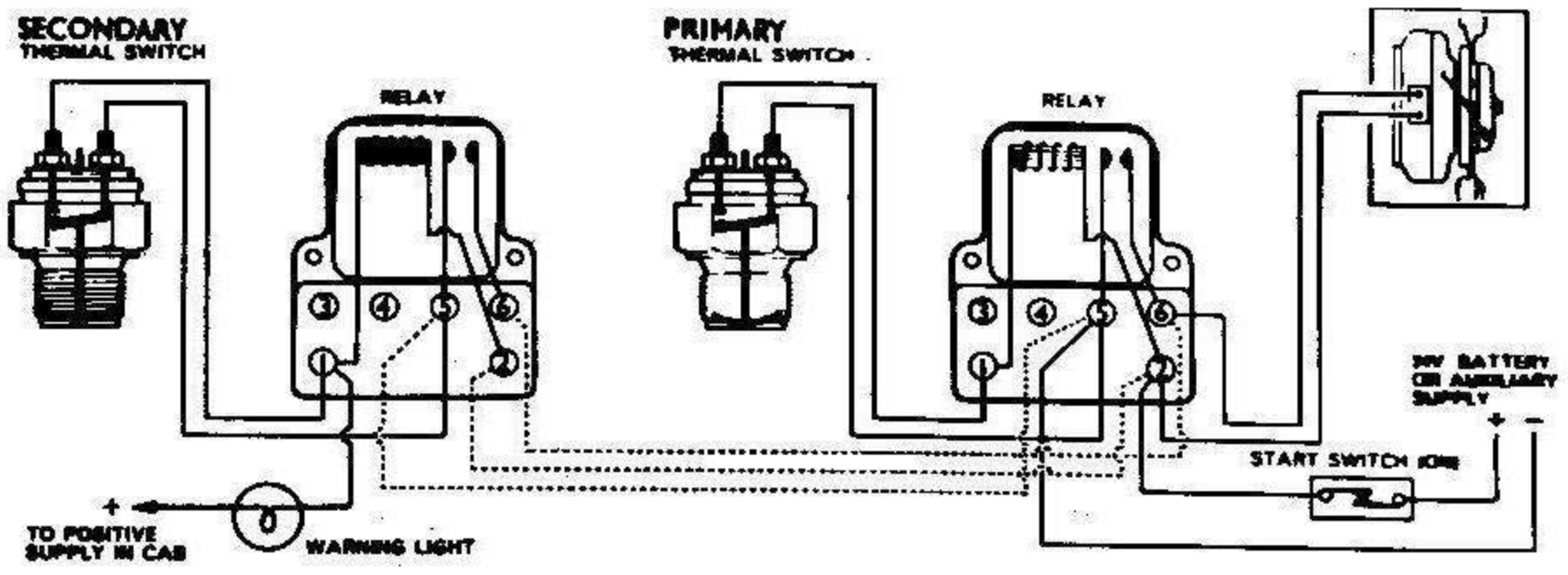
(a) The belt drive to the fan coupling is in order.

(b) The fan will rotate freely by hand.

(c) There is electrical continuity to terminal No. 2 of the relay from the battery supply.

(d) The wiring is free from damage and correctly installed, the terminals are clean and tight and also there is electrical continuity between the coupling units.

Obvious faults must be rectified.



10121A

Fig. 9 Electrical control circuit

DIAGNOSIS CHART

	SYMPTOM	FAULT	ACTION
1.	Engine overheating. (i.e. the fan will not rotate when required).	Thermal Switch	With engine stationary, remove rubber cover from thermal switch and connect together the two terminals. If the fan engages with sufficient torque (see torque test, page C. 9) then a fault is indicated in the thermal switch and this must be replaced. To remove switch see under "THERMAL SWITCH".
		Relay	If the fan remains free when the switch terminals are connected then confirm that there is battery potential across the coupling terminals. No or low voltage assuming the wiring is satisfactory, indicates a faulty relay. To test relay see page C. 9 and to remove see under "RELAY". If a fault is indicated then the relay must be replaced.
		Coupling Unit	If battery potential is recorded at the coupling terminals then confirm the resistance and insulation of the coil within the coupling unit by using ohmeter and megga-tester. An incorrect recording indicates a faulty coil, correct recordings would at this stage mean a mechanical failure within the coupling. In both cases the coupling must be replaced. To remove coupling see Manufacturers Service Manual.

DIAGNOSIS CHART

NOTE: If the complete system appears to be satisfactory but "Engine Overheating" persists, then the thermal switch must be tested (see page C. 9) as it may be operating above its calibrated temperature.

	SYMPTON	FAULT	ACTION
2.	Engine Overcooling (i.e. fan rotates permanently).	Coupling Unit	With the engine cool, check with start switch "ON", that the fan will rotate freely by hand, if not disconnect the two wires from the coupling terminals. NOTE: – wires may be live. If fan does not then rotate freely a fault is present in the coupling and it must be replaced. To remove coupling see Manufacturer's Service Manual.
		Thermal Switch	If by removal of the coupling wires, the fan does rotate freely then reconnect the two wires and disconnect the two wires from the thermal switch. If this now frees the fan then a fault is indicated in the switch and must be replaced. To remove switch see under "THERMAL SWITCH".
		Relay	If fan remains engaged when thermal switch wires are disconnected a fault in the relay is indicated. To test relay see page C. 9 and to remove see under "RELAY". If a fault is indicated then the relay must be replaced.

NOTE: If the complete system appears to be satisfactory but "Engine Overcooling" persists, then the Thermal Switch must be tested (see page C. 9) as it may be operating below its calibrated temperature.

RADOLARM WATER LEVEL WARNING SYSTEM

DESCRIPTION

The "RADOLARM" water level warning system is available as optional equipment to Operator's requirements.

The complete unit consists of a probe inserted in the radiator top tank, a transistorised control unit, a warning buzzer or warning light and the necessary wiring cables.

The circuit diagram for the "Radolarm" system is shown on the main wiring diagram on page R.27.

DATA

Operating Voltage	24 volts
Operating current when dormant	0.5 m.A
Operating current when giving alarm	50 m.A–100 m.A

Operation

Lowering of the coolant level to below the base of the probe due to water vapour loss or damaged wiring or connections, will cause the warning light or buzzer or both (if fitted) to operate when remedial action should be taken immediately.

Routine Maintenance

No routine maintenance is necessary. Periodically check that all connections are clean and tight.

Test Procedure

Check that the operating voltage (24 Volts) is available at the transistor pack terminal.

Check that operating current 0.5 m.A. is available at the probe terminal.

Check that the buzzer is operating correctly.

Further tests to probe and transistor pack should be carried out by substition.

ENGINE UNIT

SPECIFICATION AND DATA

Type of Engine Unit	Gardner 6 LX
	Gardner 6 LXB (Alternative)
Bore	4.75" (120.6 mm)
Stroke	6.00" (152.4 mm)
No. of cylinders	6
Swept Volume	638 cu. ins (10.45 Litres)
B.H.P. – 6LX	150 at 1,700 r.p.m. (Max.)
	(Lower settings available to operators' requirements)
– 6LXB	180 at 1,850 r.p.m.
Firing order	1, 5, 3, 6, 2, 4
Governed speed – 6LX	1,760 r.p.m.
– 6LXB – 6LXB	1,980 r.p.m.
Idling Speed	420 r.p.m.
Oil Sump Capacity	4 gallons (18 Litres) approx.
Valve tip clearance	0.004" (0.1 mm) inlet, 0.011" (0.279 mm) exhaust cold
Mounting	4 point

GENERAL DESCRIPTION

The Gardner 6 LX or 6LXB, as fitted to the Daimler "Fleetline" chassis is resiliently mounted on four rubber and steel bonded pads, to a sub-frame attached to the chassis at the rear. For a full description of the engine and its components refer to the Operations Manual issued by the manufacturers, to which reference should also be made for all Routine Maintenance concerning the engine unit.

The accelerator control is hydraulically operated; the engine stop control being electrically operated through a solenoid relay and switch.

An oil bath air cleaner is fitted in the engine compartment attached to the right hand side of the bulkhead.

The 6LXB power unit is available as an alternative to the 6LX engine for the single deck coach chassis.

ROUTINE MAINTENANCE

For all routine maintenance and servicing details concerning the engine unit refer to the Operating Manual issued by the manufacturers.

DAILY

Oil Level – Checking

Check with the vehicle standing on level ground and with the engine stationary. Withdraw the engine dipstick, located on the rear side of the engine, wipe dry on a clean lintless wiper, re-insert and withdraw, note the level of the mark indicated on the dipstick. Top up with the recommended grade of lubricant to the correct level.

EVERY 2,500 MILES (4,000 KM)

Engine Controls – Lubrication

Lubricate with oil from an oil can, all the engine control rod joints. Clean the spindle of the engine stop solenoid and smear lightly with grease.

Engine Air Cleaner – Cleaning

Lower the air filter container body away from the filter head after removing the two brass cap nuts. Withdraw the filter element located on the underside of the filter. Wash the gauze filter element in clean petrol. Drain the oil away from the canister and the container, wash in petrol and dry with a clean cloth. Refit the canister to the filter element and fully tighten the thumb nut.

Replenish the canister body with clean oil to the level mark indicated by the arrow. Replace the filter element in the container body and refit to the filter head with two cap nuts and washers.

NOTE: Before replacing the filter unit examine the two rubber sealing rings located on the underside of the filter head. Replace if worn or damaged.

Important: If vehicles operating in very dusty conditions the air filter should be cleaned at more frequent intervals.

EVERY 10,000 MILES (16,000 KM)

Engine Mountings – Examination

Examine engine mountings for signs of deterioration and security of mounting bolts.

Water Hoses – Checking

Check the condition of all engine water hoses and replace if worn or damaged.

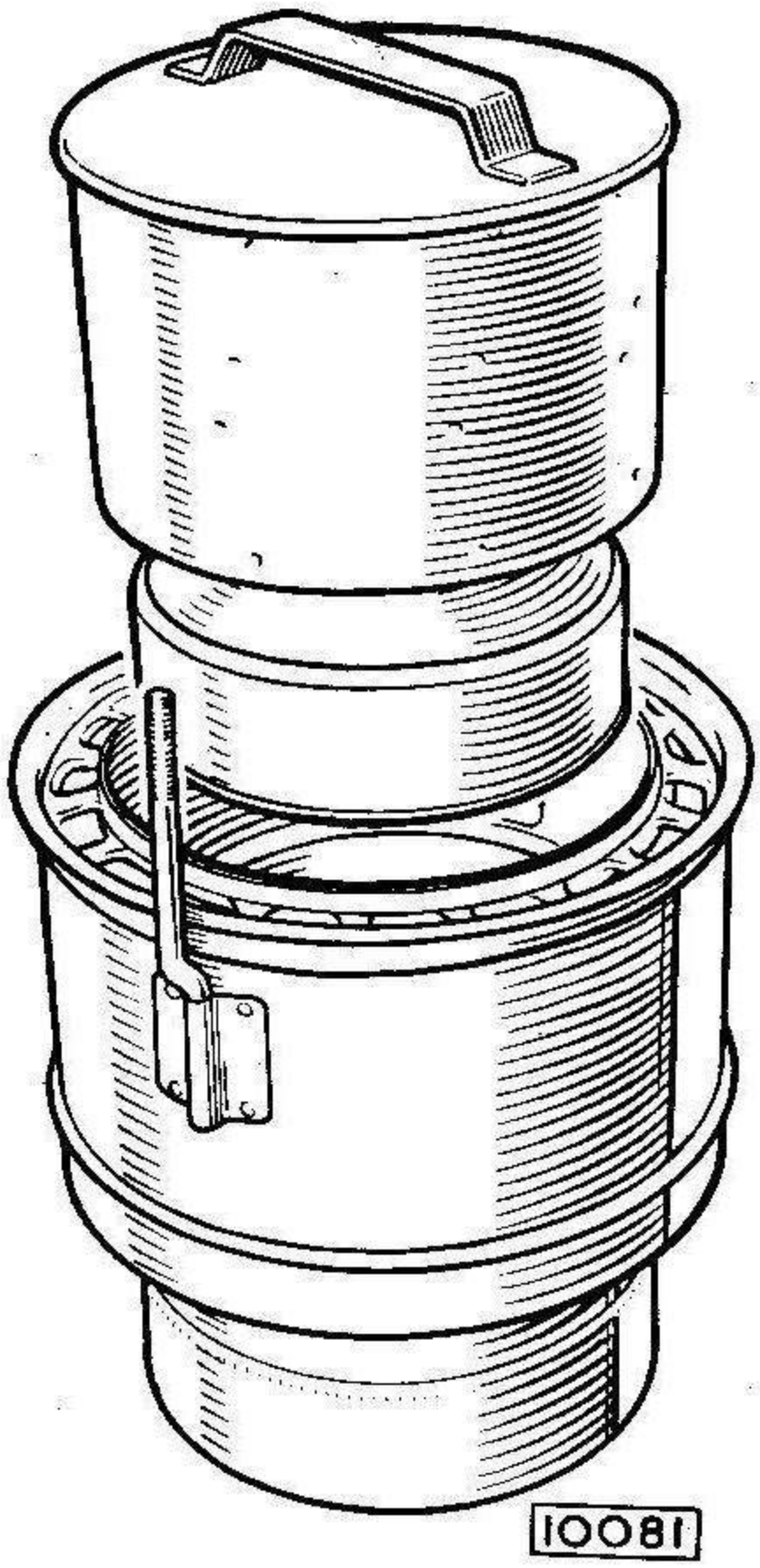


Fig. 1 Exploded view of the air cleaner

THE ENGINE UNIT (Double deck chassis)

Removal

1. Raise the engine cover to the fully open position.
2. Disconnect the battery system by rotating the master battery switch to the "OFF" position.
3. Drain the radiator, conserving the coolant if an anti-freeze is in use.
4. Remove the engine compartment covers, as detailed in Section Q "The Engine Compartment Covers".
5. Detach the air cleaner body by removing the two brass cap nuts and washers and lowering the container away from the head unit. Detach the air cleaner flexible ducts from the cleaner unit after releasing the clips.
6. Release the top water pipe hose clips and disconnect the hoses from the engine and radiator top tank.
7. Disconnect the fuel feed and fuel return pipes from the bulkhead and blank off the unions to prevent the ingress of dirt.
8. Release the two unions and detach the accelerator fluid pipes; remove the flexible pipe unions from the support bracket and blank off the unions.
9. Disconnect the electrical cables from the high and low pressure indicator switches, engine stop solenoid and relay.
   Disconnect the cables from the generator and starter motor. The latter is accessible after removing the central panel in the lower portion of the engine bulkhead.
10. Remove the left hand panel situated in the lower portion of the bulkhead.
11. Disconnect the bottom water pipe flange from the water pump; release the two clips securing the water pipe central hose and slide away hose until the joint between the two pipes is broken.
    Remove the two clamps securing the bottom pipe to the mounting brackets and remove the water pipe.
12. Remove the fan drive coupling shaft after removing the self-locking nuts securing the shaft to the fan drive pulley and jackshaft flanges.
13. Release the two clips securing the flexible portion of the exhaust pipe and slide the pipe clear of the exhaust manifold.
14. Remove the flywheel/gearbox coupling as follows:
    Tap back the locking plate and remove the four 5/16" bolts securing each bush housing to the respective yoke ends.
    Tap back the locking plates and remove the two 7/16" bolts securing each bush carrier to the centre piece.
    Remove the two halves of the coupling the centre piece can be withdrawn when the engine has been removed.

    NOTE: Before dismantling, note the assembly of the coupling links and yokes. When refitting, the trailing end of the link must always be connected to the gearbox yoke.
15. Disconnect the air compressor output at the flexible joint, located adjacent to the water pump.
16. Disconnect the engine left hand mountings by withdrawing the four bolts, nuts and washers securing the mounting brackets to the rubber/steel bonded pads.
    Disconnect the right hand mountings by withdrawing the two bolts and self-locking nuts securing the mounting brackets; the nuts are accessible from underneath the vehicle.
17. Remove the two valve cover right hand centre securing bolts, identified by the large washers fitted

under the bolt head and replace with the two eye-bolts supplied as part of the engine kit.
When lifting the engine the eye nuts must be screwed home finger tight only and NOT TIGHTENED BY MEANS OF A BAR OR LEVER. Overtightening the nuts in this manner may cause the cylinder head studs to become loosened or partially withdrawn when the eye nuts are removed. Should the nuts require turning in order to engage the slings unscrew the nuts slightly in preference to tightening further.
Pass the sling through the eyebolts, raise the engine to clear the sub-frame and withdraw.

NOTE: If lifting with a single hook hoist, fit a spacing bar between the two eye bolts to prevent a bending movement being applied to the cylinder head studs.

Refitting
Refitting is the reverse of the removal procedure. Care must be taken to ensure that the flywheel/gearbox coupling is assembled correctly: that is, with the trailing end of the links connected to the gearbox yoke.
Bleed the accelerator control slave cylinder and pipe line as detailed in The Fuel System Section E.
Before attempting to start the engine the fuel system must be primed as detailed in the Operation Manual issued by the engine Manufacturers. Check that the radiator has been refilled and the engine sump has been filled to the correct level with the recommended grade of lubricant. Run the engine and check the operation of the instruments and ancillary equipment.
Check for leaks at all joints and tighten as necessary.

Removal – Single Deck Chassis
The engine installed in the 36' 0" (single deck) chassis cannot be removed as detailed on Page 4 for the double deck vehicle due to the overhang of the body preventing the use of a lifting crane.
A wheeled trolley, with blocks to support the engine, must be available before removal of the unit can be attempted.
Disconnect the battery.
Remove the engine coverpanels after disconnecting any rear lamps which may be mounted on the panels.
NOTE: On some vehicles the panels may open fully to allow complete access to the engine without removal.
Disconnect all electrical cables, oil fuel and air pressure pipes after exhausting the pressure from the brake system.
Drain the coolant, conserve if anti-freeze is in use, and remove the radiator as detailed in Section C.
Remove the air cleaner and anti-freeze unit (if fitted).
Jack up the chassis on both sides at a point forward of the rear sub-frame and place the wheeled trolley with suitable blocks under the engine sump. Place blocks also under the gearbox/transfer box unit if this is not to be removed.
Lower the jacks until the engine and gearbox are supported firmly on the blocks.
Disconnect the flywheel/gearbox coupling as detailed in Section G.
Remove the engine mountings.
Detach and remove the sub-frame from the main chassis and withdraw the engine.

Refitting
Refitting is the reverse of the removal procedure.
Reference should be made to the points detailed under 'Refitting' for the double deck chassis.

FUEL SYSTEM

SECTION E

INDEX

FUEL SYSTEM

SPECIFICATION AND DATA

Fuel tank capacity	35 Imp. gallons (159 Litres)
Level of fluid in accelerator pedal reservoir	½" (13 mm) below bottom of filler orifice
Accelerator fluid	"LOCKHEED Super Heavy Duty brake fluid (S.A.E. 70 R3)"
Free travel of accelerator pedal	3/8" (9.5 mm) (1/8" (3 mm) at slave cylinder)
Fuel injection equipment	C.A.V./GARDNER

GENERAL DESCRIPTION

The 35 gallon (159 Litres) fuel tank is fitted to the right hand side of the chassis frame and is supported between two outrigger brackets mounted direct to the frame, by two hinged straps.

Nylon piping is used for both feed and return lines to and from the fuel tank and the engine compartment.

A C.A.V./GARDNER fuel injection pump is mounted on the rear face of the engine and is driven by a jack shaft from the timing chest.

The fuel pump is fitted with a centrifugal weight governor and full control of the engine speed is maintained from an idling speed of 420 r.p.m. to a maximum speed of approximately 1.760 r.p.m. (6LX) or 1.580 r.p.m. (6LXB) at no load through a hydraulically operated accelerator control.

Governor spring load at maximum r.p.m. (6LX) – 1072lb. (48.5 kg) and (6LXB) – 130 lb (58.9kg).

Fuel oil is drawn from the fuel tank by an AMAL diaphragm type lift pump incorporated in the fuel pump, and reaches the latter after passing through two replaceable paper element filters and a fuel SHUT OFF cock.

A solenoid actuated engine stop control, mounted on a bracket attached to the engine is connected by means of a fork joint and clevis pin to the stop lever on the fuel pump.

A stop button is mounted on the drivers switch panel with a second button mounted externally in the rear of the vehicle above the left hand top corner of the engine compartment.

The accelerator control is hydraulically operated, the fluid reservoir being mounted in the driver's cabin.

ROUTINE MAINTENANCE

DAILY

Fuel Oil Tank

Check the contents of the fuel oil tank before taking the vehicle into service.

WEEKLY

Accelerator Control

Check the level of the fluid in the accelerator control reservoir and top up to the specified level if necessary with fluid of the recommended grade.

Check the condition of the flexible hydraulic reservoir hose.

EVERY 2,500 MILES (4,000 KM)

Fuel Oil Filters

Check the condition of the first and second fuel oil filters and renew if necessary.

EVERY 25,000 MILES (40,000 KM)

Drain sediment away from the fuel tank by opening the drain tap and allowing a quantity of fuel oil to drain away into a suitable container. Under dusty conditions or where good fuel storage or filling conditions cannot be arranged, carry out this service every 20,000 miles (32,000 km). For all "ROUTINE MAINTENANCE" service on the fuel injector pump and equipment refer to the GARDNER Service Manual.

THE FUEL TANK

Removal

Drain away all fuel oil into a suitable container by opening the drain tap. Release the filler cap when draining. Fully close the drain tap on completion.

Release the nuts securing the fuel feed and return pipes to the tank and remove the unions.

Position wooden blocks to support the weight of the tank and release the two support straps by removing the two nuts and upper packing pieces. Withdraw the strap studs and collect the lower packing pieces. The nuts are accessible from the top of the outrigger support brackets. Lower the straps away from the tank. Remove the support blocks and lower the tank to the floor and withdraw clear of the vehicle.

FUEL SYSTEM

Note: On certain bodies it may be necessary to jack up the vehicle before the tank can be withdrawn.

Refitting
Refitting is the reverse of the removal procedure.

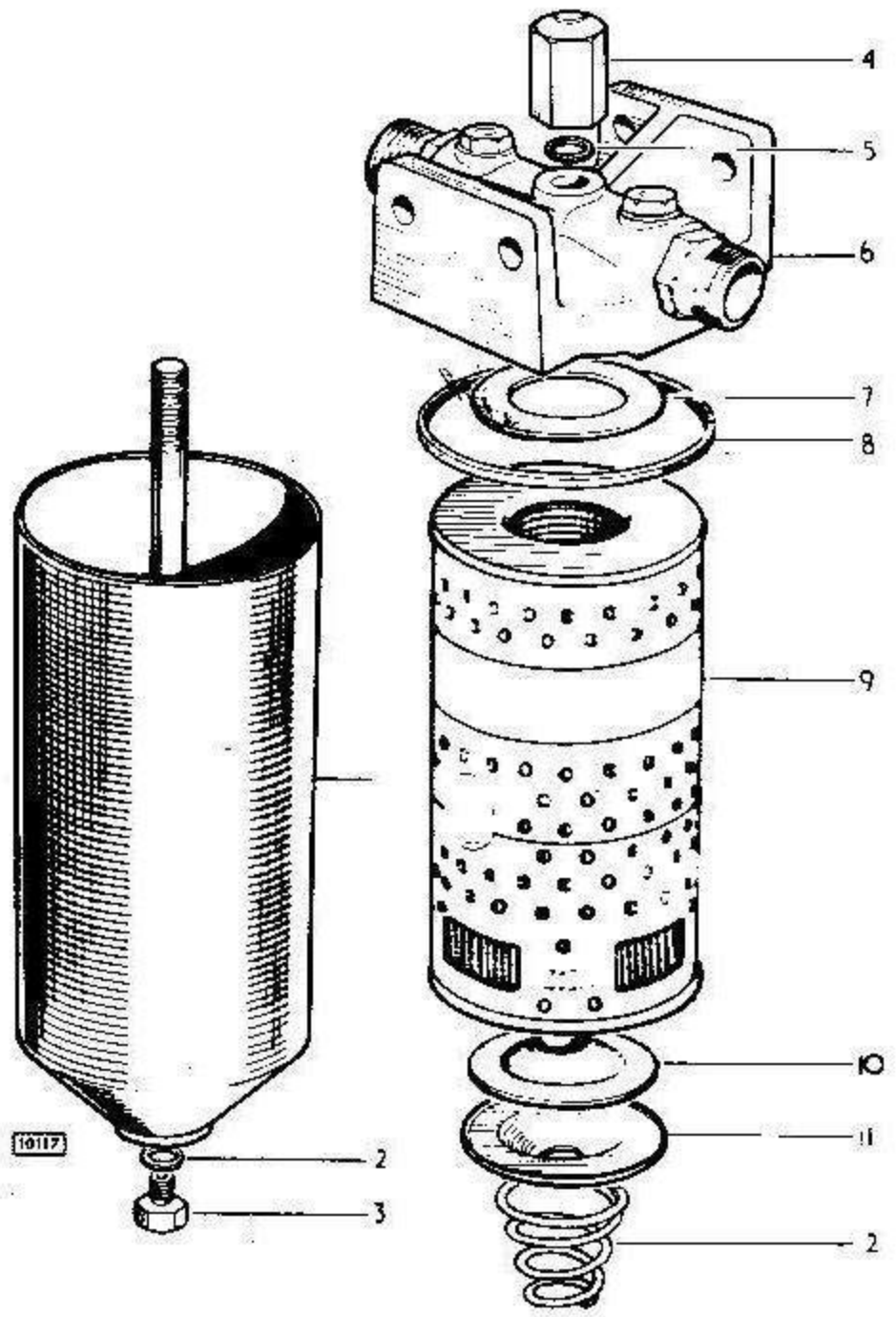


Fig. 1 Exploded view of the first fuel oil filter

1 Element canister
2 Washer
3 Drain plug
4 Retaining nut
5 Washer
6 Filter head
7 Clamping plate
8 Sealing ring
9 Filter element
10 Pressure plate
11 Spring plate

THE FUEL OIL FILTERS

The First Filter
The first fuel oil filter is located in the left-hand bottom corner of the engine compartment below the air compressor. To remove the element from the filter unit, release the top centre nut fixing and detach the filter body. Empty out any fuel oil and discard the element. Wash out the filter body. Renew the rubber seal and re-assemble the unit with a new element. It will be necessary to prime the fuel system after refitting as detailed in the Gardner Service Manual.

The Second Filter
The second fuel oil filter is attached to No. 1 cylinder block. To remove the element from the unit, remove the drain plug and drain the fuel oil into a suitable container. Release the cover centre fixing nut and remove cover, spring and filter element. Renew the rubber seal and re-assemble unit with a new element. Prime the fuel system after refitting as detailed in the GARDNER Service Manual. See Section A Fig. 1.

THE FUEL SHUT OFF COCK

A fuel shut off cock is incorporated in the fuel line system and is mounted adjacent to the second fuel filter.

Operation
Rotate clockwise to turn the fuel oil "OFF" and anti clockwise to turn "ON".
Access to the fuel cock is gained by opening the engine compartment.

THE HYDRAULIC ACCELERATOR CONTROL

Checking
Check that full movement of the fuel injection pump rack lever is obtained when the accelerator pedal is operated. To adjust, release the fork and locknut on the master cylinder operating rod, remove the clevis pin and adjust the fork end as required, refit the clevis pin and split pin and tighten the locknut. Adjust to give .030" (.76 mm) free travel measured on the operating rod between the master cylinder and the operating lever under the accelerator pedal attachment.

TO BLEED THE SYSTEM

Bleeding the system will only become necessary if the fluid container has been allowed to become empty or, if any of the pipes or units have been removed.
To ensure complete exclusion of air from the system it is advisable to utilize an external pressure pump when bleeding.
Suitable pressure bleeding equipment for carrying out the operation is available from various manufacturers, or, if desired can be fabricated utilizing a Lockheed hydraulic

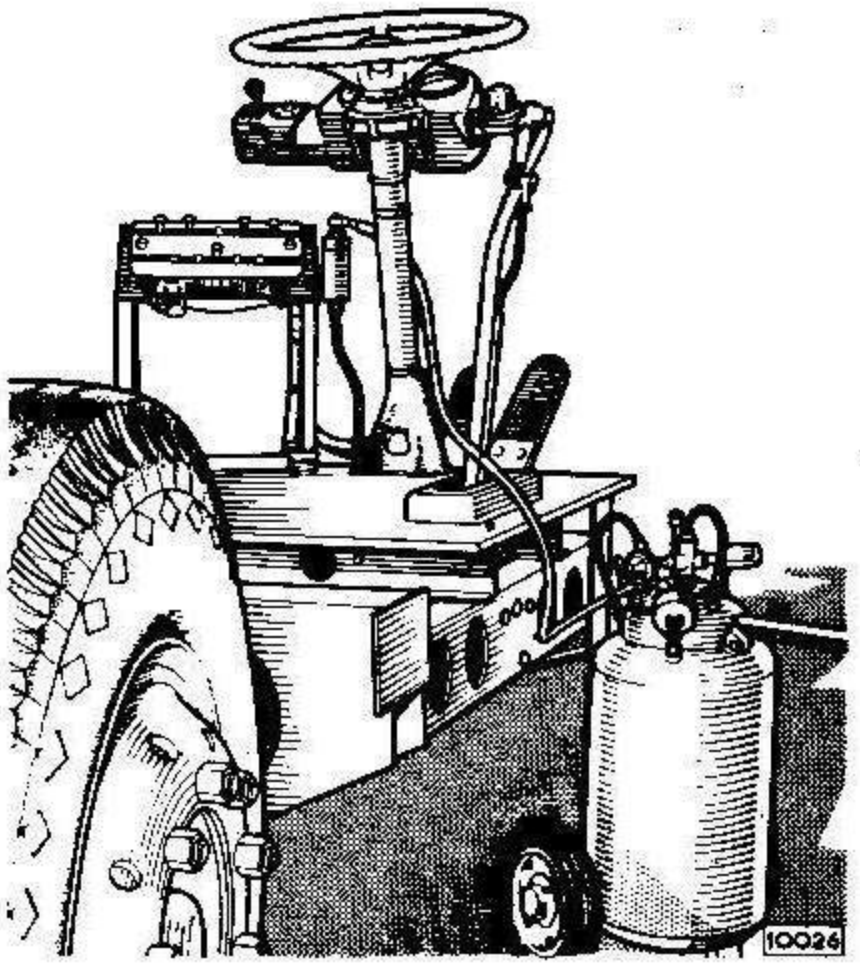


Fig. 2 Utilizing pressure operated equipment when bleeding the accelerator control line

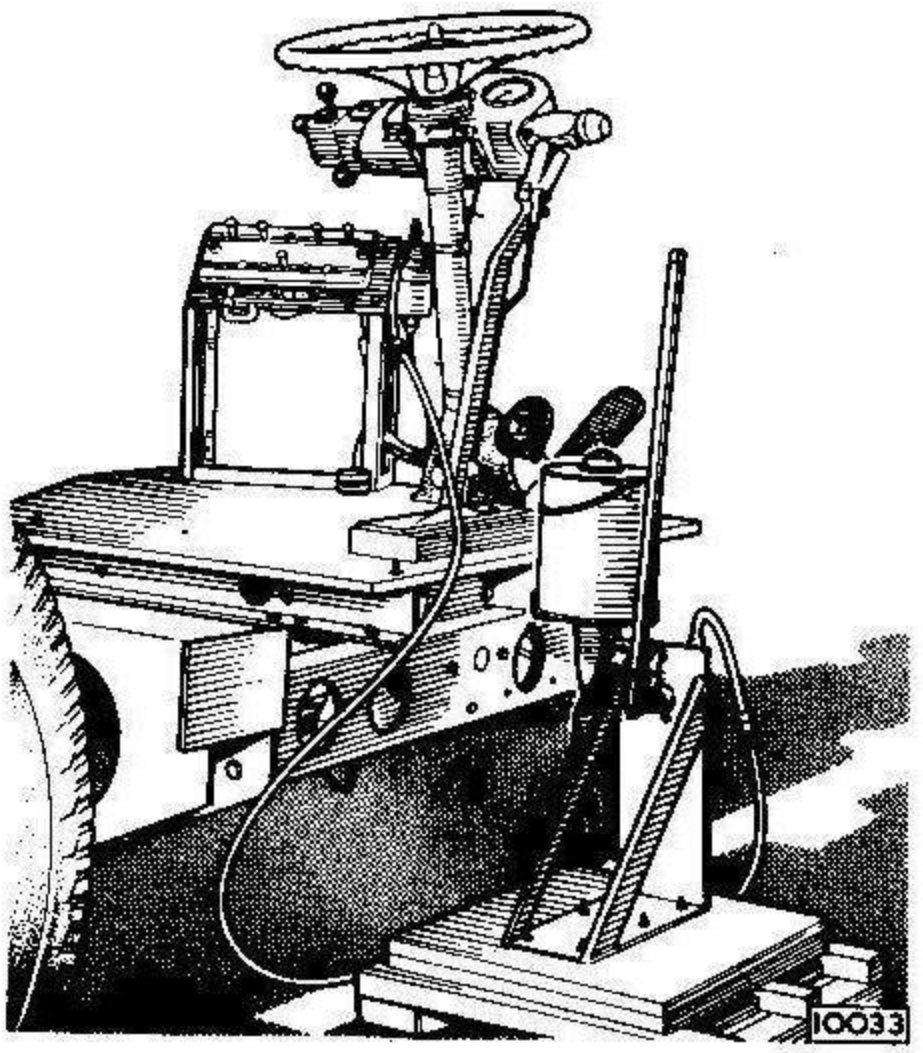


Fig. 3 Utilizing hand operated equipment when bleeding the accelerator control line

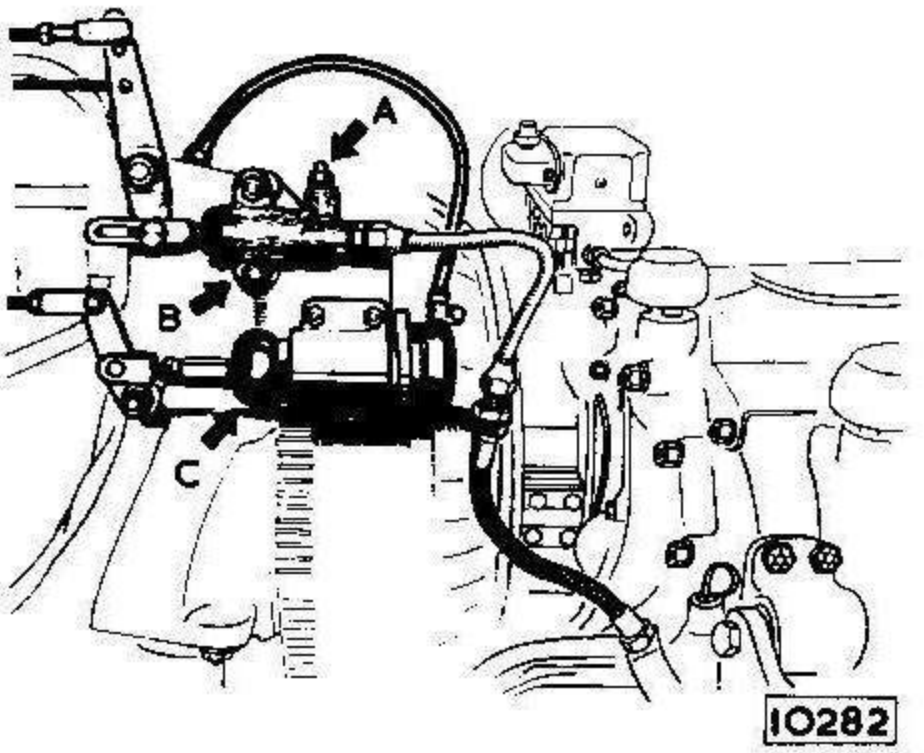


Fig. 4 Location of slave cylinder and stop solenoid

A Bleed nipple
B Slave cylinder
C Engine stop solenoid

master cylinder in conjunction with a supply tank of 1½ pints (.75 litres) minimum capacity and a pivotted lever connected to the master cylinder operating rod.

To bleed the system remove the cap from the fluid container on the vehicle and replace with the adaptor attached to the pump assembly outlet tubing.

Ensure that both containers (vehicle and pump) are filled with the correct fluid as specified under "DATA".

Clean the nipple on the slave cylinder, located in the engine compartment, attach a length of rubber tubing to the nipple and submerge the opposite end of the tubing in a small quantity of hydraulic fluid contained in a glass jar and open the nipple one full turn.

Operate the pump apparatus while observing the fluid

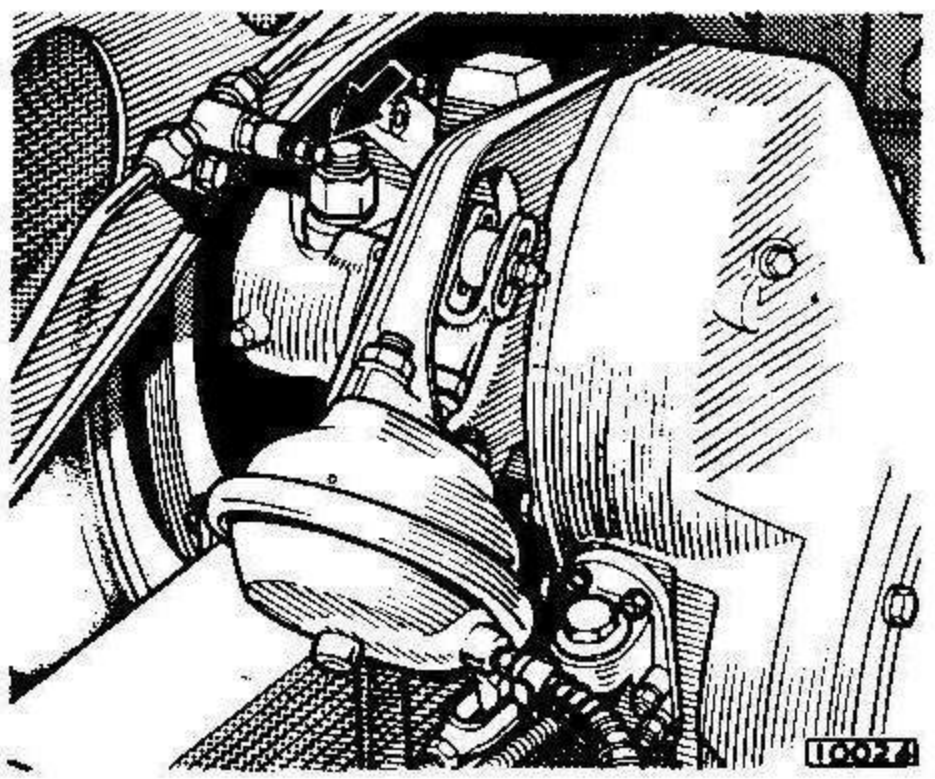


Fig. 5 Location of pipe line bleed nipple

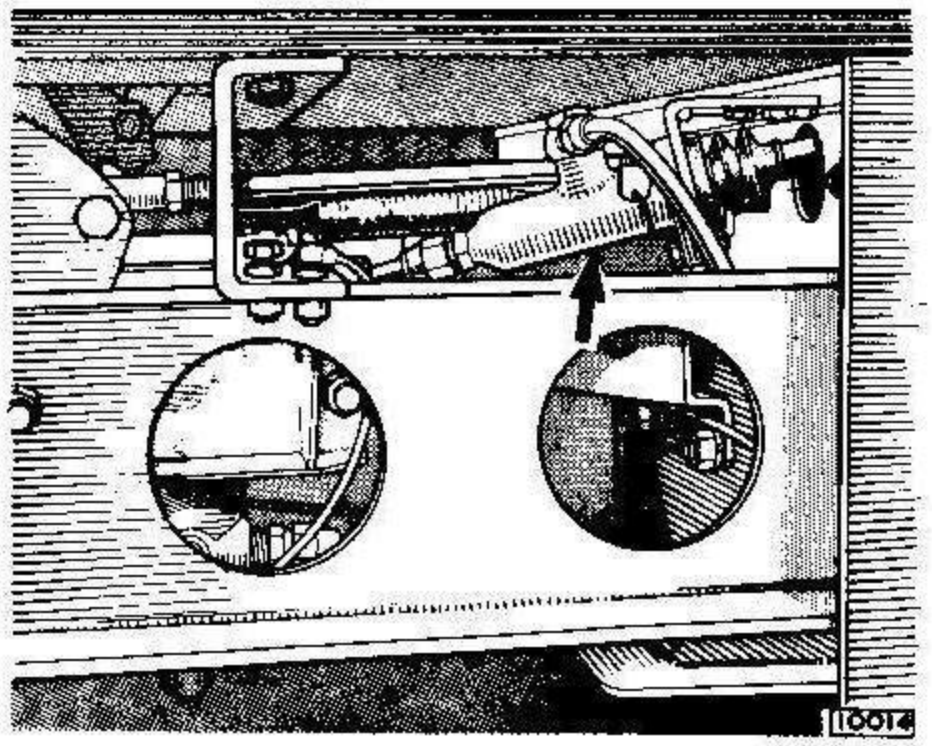


Fig. 6 Location of accelerator control master cylinder

issuing from the tube submerged in the glass jar.
Continue the operation until the fluid is free of air bubbles, close the nipple and remove the rubber tube.
Repeat the operation to the nipple located in the pipe line above the right-hand wheel arch until all air trapped in the junction is expelled and tighten the nipple.
Remove the pumo apparatus and top up the vehicle fluid container to the correct level and replace the cap.

NOTE: It is essential that the accelerator pedal control remains closed during the operation.

THE ENGINE STOP SOLENOID

For all servicing details concerning the engine stop solenoid, see Section R "The Electrical Equipment".

EXHAUST SYSTEM

SECTION F

INDEX

EXHAUST SYSTEM

The exhaust system consists of a branched manifold, a flanged down pipe, flexible pipe, lower extension pipe, an elbow, silencer and tail pipe extension. The silencer is suspended from a bracket attached to the chassis frame and is flexibly mounted by means of rubber suspension blocks.

At frequent intervals check all flange nuts and pipe clips and tighten if necessary. Renew all blown gaskets at the first opportunity. Check rubber mountings and renew if worn or damaged.

Access to the exhaust manifold and flexible connections is gained by removing the centre and right hand inspection panels in the engine bulkhead; while access to the elbow, silencer and tail pipe is obtained from beneath the vehicle.

The inspection panels are accessible from inside the vehicle.

FLUID FLYWHEEL AND TRAILING LINK COUPLING

SECTION G

INDEX

FLUID FLYWHEEL AND TRAILING LINK COUPLING

SPECIFICATION AND DATA

Type	Open Circuit
Diameter	19.0" (48.2 cm)
Oil Capacity	3.18 Imp. Gallons (14.2 Litres)
Trailing Link Coupling	METALASTIK

GENERAL DESCRIPTION

The Fluid Flywheel
The fluid flywheel is of the open circuit type which gives decreasing slip over the entire speed range and also reduces the oil content temperature thus increasing the overall efficiency of the flywheel.
The rear casing and runner are manufactured from aluminium alloy castings, the front casing from steel. Oil sealing is effected by a metal bellows type seal in which a ground bronze ring on the end of the bellows mates with the polished face of a steel disc fitted on the runner output shaft.

The Trailing Link Coupling
The trailing link coupling incorporates metal and rubber bonded bushes in its construction and is fitted between the flywheel and the gearbox coupling yokes.

ROUTINE MAINTENANCE

FIRST 2,500 MILES (4,000 KM)

The Fluid Flywheel – Checking the Oil Level
To check the oil level raise the engine compartment cover and proceed as follows.
Rotate the flywheel so that one of the two plugs is in the 12 o'clock position. Clean and remove the plug and sealing washer and top up with oil of the recommended grade to the bottom of the orifice.
Refit the plug with a new sealing washer.

EVERY 10,000 MILES (16,000 KM)

The Fluid Flywheel
Check the oil level as detailed under the first 2,500 miles maintenance service.

The Trailing Link Coupling
Check the trailing link setscrews and tighten if necessary. Tighten to a torque of 38-42 lb.ft. (5.2 – 5.8 kg.m).

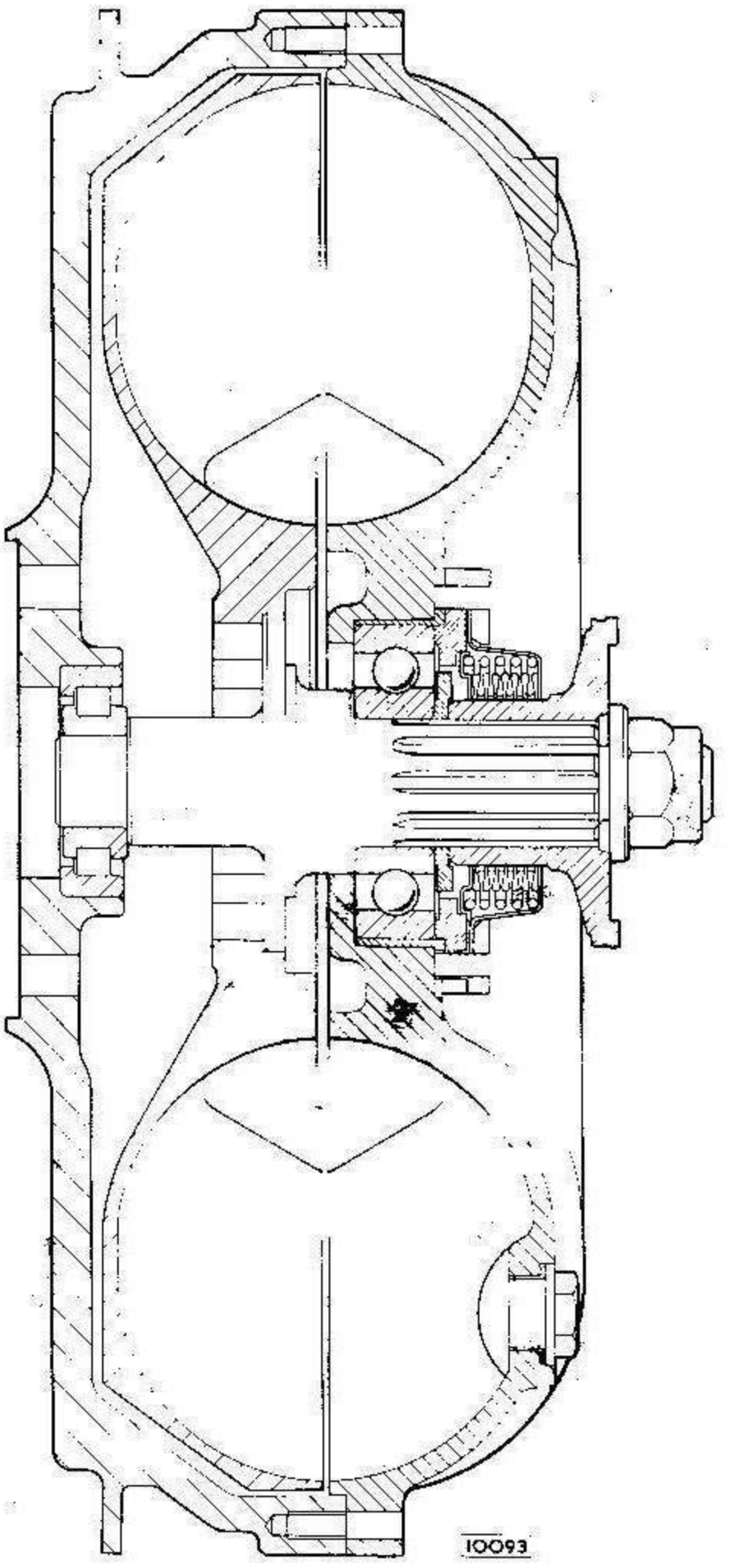


Fig. 1 Sectioned view of the fluid flywheel showing the gland seal

THE FLUID FLYWHEEL

Removal
Remove the gear-box unit as detailed in Section H "The Gear-Box and Transfer Box".

FLUID FLYWHEEL & TRAILING LINK COUPLING

To remove the flywheel from the engine proceed as follows:
Rotate the flywheel until the plugs are on the 12. o' clock and 6. o' clock positions. Place a clean container under the lower plug and drain away all oil by removing both plugs.
Remove the trailing link yoke by removing the self-locking nut and withdrawing from the splined shaft.
Remove the gland seal from the centre of the flywheel by withdrawing the gland seal flange securing screws.
Remove all the setscrews from the periphery of the flywheel, insert two 5/16" U.N.C. extractor screws in the tapped holes provided. Turn to remove the flywheel rear casing with the runner. Withdraw the runner from the casing.

Refitting
Assemble the rear casing as a unit with the runner and refit the gland seal. If the gland seal is damaged, it should be replaced with the necessary new parts.
Front and rear cases are marked with serial numbers which should coincide when refitting the rear casing.
Clean all surface faces and coat lightly with "Hylomar" jointing compound before assembly. Refit all setscrews and tighten down evenly to ensure a perfect joint.
Refit the trailing link yoke and refill the flywheel with oil of the recommended grade to the level of the filler plug.

THE CENTRIFUGAL (LOCK-UP) FLUID FLYWHEEL/ CLUTCH UNIT

DESCRIPTION

Vehicles may be equipped with a centrifugal clutch, incorporated in the fluid flywheel, to operator's requirements The complete assembly is also referred to as the lock-up" flywheel.
Basically the clutch consists of four brake shoes, with friction material facings, pivotted at one end to a dished plate. This plate is attached to the output shaft and the complete is housed in the flywheel casing.
In action, acceleration of the engine produces automatic take up through the fluid coupling with maximum smoothness. As the output shaft speed rises the friction clutch shoes are thrown outwards so making contact with the flywheel drum.
The centrifugal clutch then provides a positive drive between the engine and the gearbox and so eliminating the inherent slip (1-2%) present in all fluid couplings when the engine is operating in the higher speed range.
Due to the necessity of restricting the overall dimensions of the unit, the fluid coupling is reduced in section, leaving a space between the runner and the inside of the flywheel proper.
This reduces the volume of the fluid present in the flywheel with the result that the transfer of kinetic energy is less for any given speed and consequently the idling drag is therefore less.

ROUTINE MAINTENANCE

FIRST 500 MILES (800 KM)

Flywheel Gland Seal-Checking
Check and tighten the six self-locking nuts securing the flywheel gland seal.

FIRST 2,500 MILES (4,000 KM)

Checking the Oil Level

Rotate the flywheel until one of the four plugs is in the 12 o'clock position. Clean and remove the filler plug and sealing ring and top up with oil of the recommended grade to the bottom of the orifice.

FIRST 10,000 MILES (16,000 KM)

Check and tighten the flywheel gland seal securing nuts.

EVERY 10,000 MILES (16,000 KM)

Check the oil level as detailed under the first 2,500 miles maintenance service.

THE CLUTCH UNIT

Removal
Remove the gearbox unit as detailed in Section H "The Gearbox and Transfer Box".
Remove the flywheel unit as follows:–
Rotate the flywheel until two of the plugs are in the 12 o'clock and 6 o'clock positions respectively.
Place a clean container under the lower plug and drain away all oil after removing both plugs.
Remove all setscrews (6) and washers (5) from the periphery of the flywheel, insert extractor screws in the holes provided and withdraw the rear casing (7) complete with associate parts.
Withdraw the securing bolts and remove the front casing from the crankshaft.

Refitting
Refitting is the reverse of the removal procedure.
Assemble the rear casing as a unit with the runner and associate parts. Clean all the surfaces, coat lightly with jointing compound and renew the gasket between the front and rear casings.
The front and rear cases are marked with serial numbers which must coincide when refitting.
Refit all setscrews and lockwashers and tighten down evenly to ensure a perfect joint.
Refit the trailing link yoke and refill the flywheel with oil of the recommended grade to the level of the top filler plug.

Dismantling

To dismantle the rear casing and shaft assembly proceed as follows:-

Remove the nut (15) and washer (17) and remove the coupling (18).

Remove the nuts (21), stiffener ring (12) and withdraw the gland seal (13) followed by the joint (11), spacing ring (22), joint (10) and rubbing washer (19).

Press out the shaft and runner assembly and withdraw bearing (32) and bearing housing (23).

Dismantle the shaft and runner assembly.

Remove the nuts (35) from the bolts (33) and withdraw the shaft.

Remove the nuts (39), washers (40) from the bolts (41) and withdraw the runner (27) and baffle plate (25) from the reaction member (4).

The clutch shoe assembly (42) can now be removed from the reaction member (4) by withdrawing the garter spring (31).

Re-assembling

Re-assembling is the reverse of the removal procedure.

Check that all components are clean and suitable for further service. Particular attention must be paid to the condition of the gland seal (13) and rubbing washer (19).

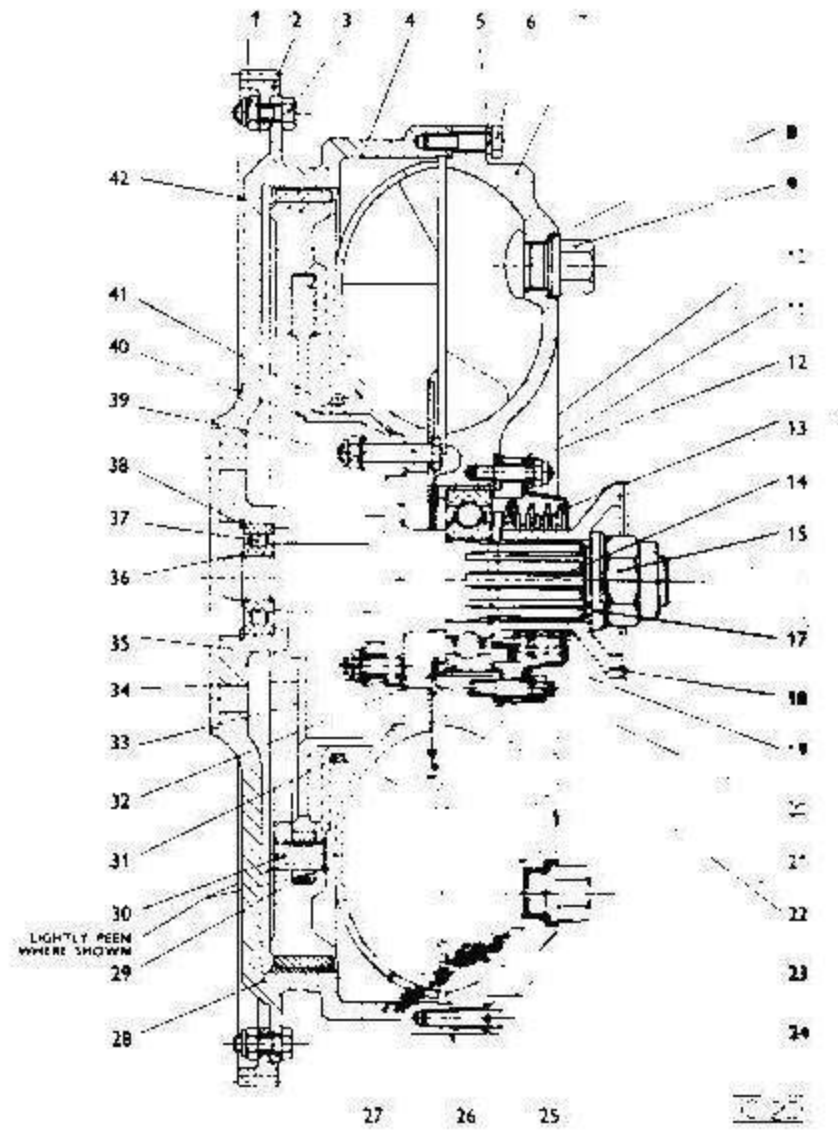


Fig. 2 Sectioned view of the centrifugal (lock-up) fluid flywheel/clutch unit

1 Nut
2 Starter ring
3 Bolt
4 Reaction member
5 Spring washer
6 Bolt
7 Rear casing
8 Washer
9 Plug
10 Joint
11 Joint
12 Stiffener ring
13 Gland seal
14 Shaft
15 Slotted nut
16
17 Washer
18 Coupling
19 Rubber washer
20 Joint
21 Nut
22 Spacing ring
23 Bearing housing
24 Stud
25 Baffle plate
26 Gasket
27 Runner
28 Front casing
29 Insert block
30 Pin
31 Garter spring
32 Bearing
33 Bolt
34 Ferrule
35 Nut
36 Circlip
37 Bearing
38 Circlip
39 Nut
40 Washer
41 Bolt
42 Clutch shoe assembly

GEARBOX AND TRANSFER BOX

SECTION H

INDEX

GEARBOX AND TRANSFER BOX

SPECIFICATION AND DATA

GEARBOX

Type		DAIMLER, Semi or fully automatic, direct air pressure operated.
No. of Speeds		Four forward and one reverse
Oil capacity		15 Imp. Pints (8.53 Litres)
Gear Ratios		D/D / S D
	Top	1.00 : 1 / 1.00 : 1
	3rd	1.64 : 1 / 1.64 : 1
	2nd	2.53 : 1 / 2.53 : 1
	1st	4.5 : 1 / 4.5 : 1
	Rev.	5.53 : 1 / 5.53 : 1
Final Drive		By attached transfer box through spur and bevel gear trains.
Suspension		Four detachable lugs, with pressed in "Metalastick" bushes No. 13/897.
Bearings		
Gearbox	— top gear clutch	HOFFMANN 380 AC — F088
	— driving shaft	HOFFMANN 555
	— Reverse brake drum	HOFFMANN LS21V3
Air Cylinder Bores		
1st and Rev. gears		3.00" — 2.99" (76.2 — 76.175 mm)
2nd, 3rd and top		2.00" — 1.99" (50.8 — 50.775 mm)
Piston Diameters		
1st and Rev. gears		2.997" — 2.996" (76.137 — 76.111 mm)
2nd, 3rd and top		1.997" — 1.996" (50.736 — 50.711 mm)
Piston Seals		
1st and Rev. gears		DOWTY PD 2850 — 488
2nd, 3rd and top		DOWTY PD 2850 — 962
Air Cylinder Base Seals		
1st and Rev. gears		BURTONWOOD 6 — 312
2nd, 3rd and top	2nd, 3rd and top	BURTONWOOD 6 — 212

GEARBOX AND TRANSFER BOX

Top Gear Clutch Springs	
Free length	2.50" (63.5 mm)
Thickness of	
Clutch bearing thrust ring	.350" – .340" (8.89 – 8.64 mm)
3rd speed sun wheel bush flange	.125" – .120" (3.19 – 3.02 mm)
Steel thrust washer	.180" – .170" (4.57 – 4.318 mm)
Bronze thrust washer	.104" – .102" (2.64 – 2.59 mm)
Sun wheel thrust washer	.155" – .150" (3.97 – 3.8 mm)
2nd gear drum bush	.100" – .098" (2.5 – 2.49 mm)
3rd speed annulus washer	.100" – .098" (2.5 – 2.49 mm)
1st & 2nd speed distance piece	.100" – .098" (2.5 – 2.49 mm)
1st & 2nd speed sun wheel thrust washer	.076" – .074" (1.93 – 1.86 mm)
1st gear drum bushes	.100" – .098" (2.5 – 2.49 mm)
Reverse gear drum bushes	.100" – .098" (2.5 – 2.49 mm)
Brake drum clearances	
Reverse and 1st gear	.012" – .008" (.305 – .202 mm)
1st and 2nd gear	.015" – .012" (.381 – .305 mm)
2nd and 3rd gear	.015" – .012" (.381 – .305 mm)
Running Gear end float	0.040" (1 mm)
Adjusting Washers (alternatives)	
1.	.128" (3.22 mm)
2.	.064" (1.626 mm)
3.	.048" (1.219 mm)
4.	.036" (0.911 mm)
5.	.020" (0.508 mm)
Tail pin setting	.50" (12.7 mm)
Brake Band Adjuster Stop Bolt Setting	
Reverse gear	.75" (19.50 mm)
1st gear	.700" (17.780 mm)
2nd gear	.700" (17.780 mm)
3rd gear	.800" (20.30 mm)
4th gear	.550" (12.970 mm)
Internal dia. of Oil Pump Body	1.13" – 1.285" (28.7 – 28.664 mm)
Diameter of Oil Pump Gears	1.1265" – 1.1240" (28.613 – 28.575 mm)
Depth of **Oil Pump** Body	0.5006" – 0.4994" (12.715 – 12.684 mm)
Thickness of **Oil Pump Gears**	.4984" – .4979" (12.659 – 12.646 mm)
Backlash between **Oil Pump** Driver and driven gears	0.012" – 0.008" (0.305 – 0.203 mm)
Diameter of Oil Pump **Driven Gear** Spindle	0.4993" – 0.4983" (12.682 – 12.657 mm)
Internal Diameter of Driven **Gear Bush**	0.5004" – 0.4996" (12.710 – 12.690 mm)

Oil Pressure at 1,500 engine RPM	15–18 lbs per sq.in. (1.05kg/cm^2) (1.26kg/cm^2)
Oil Filter Element	PUROLATOR No. M.F.26

TRANSFER BOX

Oil Capacity	7 Imp. pints (3.9 Litres)
Bearings	
Pinion (small)	TIMKEN 462 – 453 X
Pinion (large)	TIMKEN 55G – 552 A
Outshaft (small)	TIMKEN 3780 – 3720
Output shaft (large)	TIMKEN 559 – 552 A
Output sleeve (G/Box)	HOFFMANN 2L19LV3
Trailing Link coupling	HOFFMANN RL16E
Oil Seals	
Transfer Box – Speedo Drive	GACO G350350 or BURTONWOOD 250 – 350
Output Sleeve (Gearbox)	GACO MIS 32 or BURTONWOOD 312 – 412
Driving Shaft (Gearbox	GACO MIS 114 or BURTONWOOD 187–262–12
Trailing Link	GACO G40C300 or BURTONWOOD T8/300–400
Spur Gear Ratios (Alternatives)	1.026 : 1
	0.925 : 1
	0.883 : 1
Bevel Gear Ratio	1.043 : 1
Overall Ratio (Transfer box – rear axle)	5.68 : 1
	5.12 : 1
	4.61 : 1

AIR PRESSURE EQUIPMENT

Auxiliary reservoir air pressure	105 lbs/sq.ins (7.4 kg/cm^2)
Working pressure taken at outlet of air pressure limiting valve	80 lbs/sq.ins (5.624 kg/cm^2)

GEAR ENGAGING EQUIPMENT (ELECTRICAL)

Make	C.A.V.
Gear selector switch contact gap	0.070" (1.778 mm)
Relay contact gap	0.059" (1.270 mm)
Relay armature back spring angle	11½° approx.

pull in current	1.2 to 1.25 amperes
Contact unit terminal location	R : Reverse A : 1st gear B : 2nd gear C : 3rd gear D : 4th gear
Selector switch terminal location	R : Reverse A : 1st gear B : 2nd gear C : 3rd gear D : 4th gear
Electro-pneumatic valve unit air valve clearance	0.010" (0.254 mm)

GEARBOX UNIT

GENERAL DESCRIPTION

The DAIMATIC gearbox is of the epicyclic direct air operated type providing a reverse and four forward speeds.

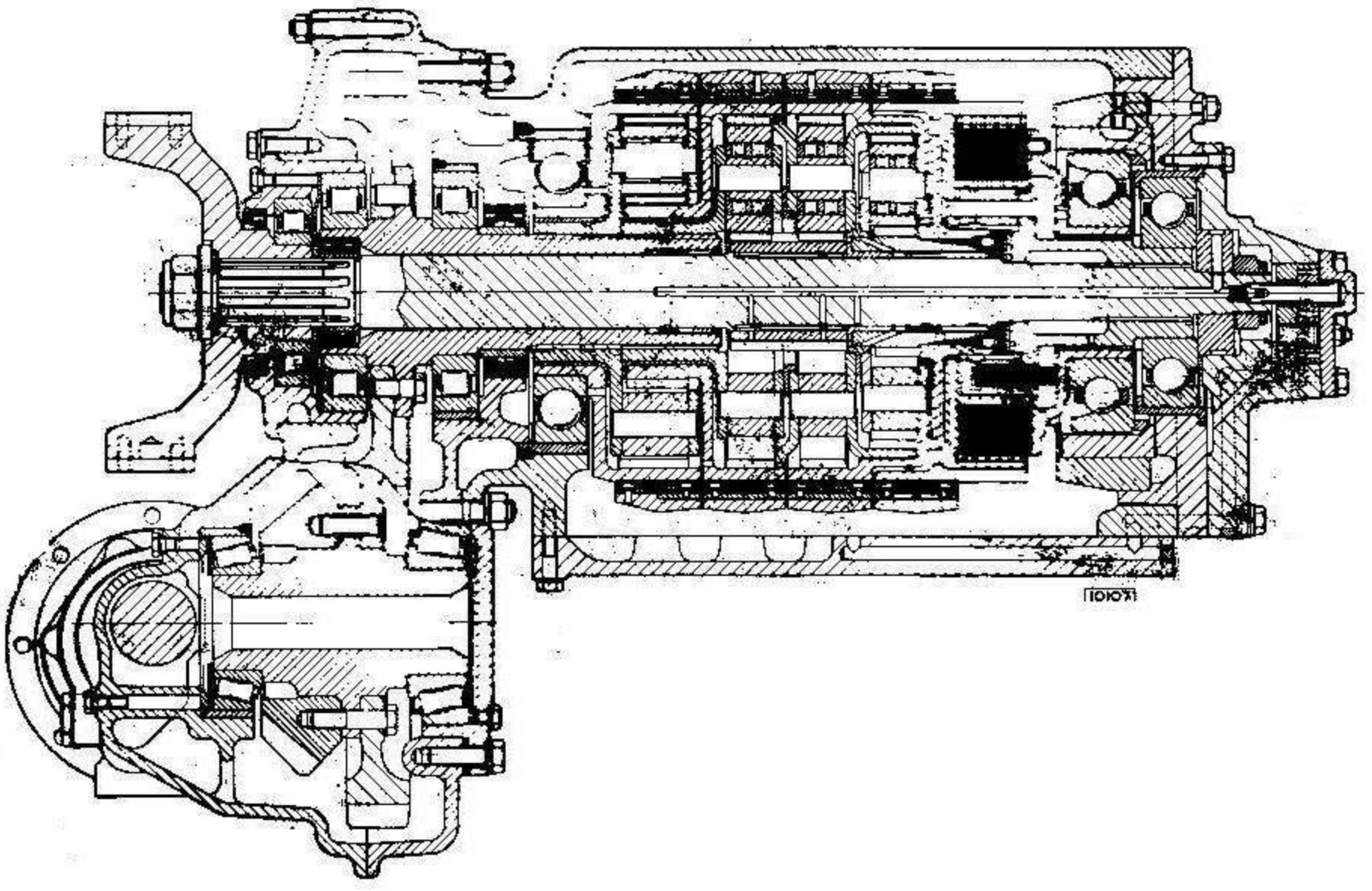


Fig. 1 Sectioned views of the "Daimatic" gearbox and transfer box

Semi or fully automatic gear engagement is controlled by a C.A.V. electro-pneumatic control system.
The first gear is obtained by applying a brake to the annulus of a simple epicyclic gear train, the planet carrier being attached to the driven shaft. The second and third gears are obtained by compounding further gear trains to that of the first gear. Application of a brake to any specific gear train result in the first gear revolving at a controlled speed in the same direction as the driving shaft so reducing the original ratio. Apart from the first gear there are no individual gear sets as in a sliding type gearbox.
The reverse gear is obtained by compounding a further gear train to that of the first gear in its freely revolving condition. In this condition the first gear annulus is revolving slowly in the opposite direction to the driving shaft and by connecting the sunwheel of the reverse gear train to this annulus the change of direction and part of the gear reduction is obtained.
The top gear is obtained by closing a multi-plate clutch which effects the locking of the driving and driven shafts together.
The running gear, comprising the gear trains, oil pump assembly and the gearbox front cover is mounted on three large capacity ball races. It is built up as an assembly and fitted into the gearbox casing and bottom cover assembly with the specified amount of end float.
The brake gear and actuating mechanism is built up on the bottom cover which is then fitted to the underside of the gearbox casing before the running gear assembly is fitted. Replacement brake band assemblies cannot be fitted without removing the gearbox from the chassis and the withdrawal of the running gear and bottom cover assemblies from the gearbox casing.
Continuously filtered lubrication is provided for the running gear and other working parts by a gear type oil pump driven from the mainshaft. Before the oil enters the running gear it passes through a full flow replaceable filter accessible from beneath the vehicle. The filter can be renewed without draining the gearbox oil.
The air operating cylinders, which are cast integrally in the top face of the bottom cover, have pressed in pre-finished steel liners.
The pistons are of aluminium alloy and are fitted with two Dowty heat resisting synthetic rubber seals. The bottom extremities of the air cylinders are sealed with rubber 'O' rings and individual cover plates which incorporate the air restrictor valves, the air nozzles and cylinder drain plugs.
Gear selection is made with a C.A.V. electro-pneumatic system whether for a fully or semi-automatic installation. The C.A.V. equipment used with the semi-automatic application is a finger tip gear selector switch situated adjacent to the steering wheel and an electro-pneumatic valve unit attached to the gearbox. A warning light is incorporated in the gear selector switch to indicate that the electrical power is switched on and neutral gear is selected. To engage any gear, the selector switch lever is moved to the appropriate position and the accelerator depressed; there is no gear engaging or clutch pedal.
The output drive of the transverse mounted gearbox is by means of a spur and bevel geared transfer box incorporated in the gearbox and cover.
An air limiting valve is installed between the auxiliary air pressure tank and the gearbox electro-pneumatic valve unit mounted on a bracket attached to the gearbox. The valve, as its name implies, limited the amount of air available to the gearbox and auxiliary components on the body. Air pressure setting 80 lbs. per sq.in. (5.6 kg/cm^2).

Operation

The Gearbox

In the following paragraphs reference is made to the top gear clutch and the various epicyclic gear trains of the running gear assembly. It must be realised that the individual gear trains are not used independently as in a sliding type gearbox. It is by compounding the reverse or second epicyclic gear train to that of the first gear train that reverse or second gear is obtained and by further compounding the third gear train to that of the second and first trains that the third gear is obtained.

First Gear

The first speed gear is obtained by using a basic epicyclic gear train. The sunwheel mounted on the driving shaft. The outer periphery of the annulus acts as a brake drum to which the gear brake is applied. The planet gears, between the sunwheel and the annulus are attached to the planet carrier which is splined to the output shaft.
The gear brake is applied holding the annulus stationary, and the sunwheel rotates the planet gears inside the annulus thus turning the planet carrier in the same direction as the sunwheel at a reduced speed.

Second Gear

The second gear is obtained by allowing the first gear annulus to revolve at a controlled speed while its planet gears are still being driven by the sunwheel thus reducing the original ratio.
This is effected by introducing a second gear train, the planet of which is connected to the annulus of the first gear. Hence the rotation of the second gear planet carrier, which the brake is applied, is imparted to the annulus of the first gear train.

Third Gear

The third gear is obtained by speeding up the annulus of the first gear again thereby reducing the original ratio still further.
This is effected by connecting the third gear planet carrier to the annulus of the second gear and the third gear annulus to the second gear planet carrier and constructing the third gear sunwheel so that the brake can be applied.

GEARBOX AND TRANSFER BOX

It will be realised that as the second gear planet carrier is connected to the first gear annulus, any rotation of the third speed annulus will be imparted to the first gear annulus because of their connection with the second gear planet carrier. The sizes of the various gears are designed to effect an increase of speed to the first annulus above that of the second gear.

Top Gear

The top gear is obtained by closing the multi-plate clutch between the third gear sunwheel and the driving shaft, locking the third gear sunwheel to the first and second gear sunwheel on the driving shaft together. The running gear will then rotate as a solid unit as the driving shaft has become locked to the first gear planet carrier which is splined to the driven shaft.

Reverse Gear

The drive is taken through the reverse gear train and as the first gear annulus is free to rotate it will revolve slowly in the opposite direction to that of its sunwheel. The first gear annulus connects with the reverse gear sunwheel and so this change of direction and speed reduction is transferred to the latter. The gear brake being applied to the reverse gear annulus holds it stationary. The sunwheel causes the planet gears to rotate around the now stationary annulus thus turning the planet carrier and the driven shaft to which it is splined in the same direction as the contra-rotating reverse gear sunwheel but again at a slower speed.

The Transfer Box

The transfer or right angle drive box is mounted integral with the gearbox, its function being to convert the gearbox transverse drive into a longitudinal drive to the rear axle. The lubrication system is separate from that of the gearbox and an individual dipstick is provided for oil level checking purposes.

The initial stage of the output drive is by spur gears, the second stage being by bevel gears. Three alternative ratios are available and reference must always be made to the component list number plate attached to the engine bulkhead top rail, located in the engine compartment, when ordering replacement parts.

Also included in the transfer box is the drive for the electrical speedometer generator.

The Limiting Valve

Westinghouse System

High air pressure enters the valve via the inlet port and passes the valve disc to the outlet port and the by-pass passage to the underside of the diaphragm.

As the air pressure rises sufficiently to overcome the spring setting the diaphragm moves upwards allowing the valve disc to seat and so shutting off a further supply of air

When air is used from the low pressure side, the resultant drop in pressure allows the main spring to re-assert itself and unseat the valve disc thus repeating the cycle.

Should the low pressure build up beyond the operative setting the increased deflection of the diaphragm will allow the hollow stem to move away from the valve disc letting the air through the cover to bleed away to atmosphere.

Clayton-Dewandre System

High air pressure enters the valve via the inlet port and passes through the open inlet valve to the outlet port chamber and outlet port.

A metered hole is provided in the guide plate and as air pressure builds up in the chamber is passes through this hole and acts on the diaphragm. When the pressure reaches the pre-determined spring setting limit the diaphragm overcomes the action of the spring and the inlet valve seats cutting off further supply from the reservoir.

Should the pressure rise above that of the valve setting, increase diaphragm movement opens the release valve and excess pressure is released through the centre of the diaphragm assembly and the holes in the top cover to atmosphere. This continues until the correct pressure setting is reached.

ROUTINE MAINTENANCE

IMPORTANT It is essential that the oil and filter change services are carried out as detailed under "Routine Maintenance".

Any deviation may result in sludge formation in the gearbox which can in extreme cases be forced under exhausting pressure into the electro-pneumatic gear change valve unit causing faulty gear selection and extensive consequential damage to the gearbox.

WEEKLY

Pumping the Gears

To ensure that the automatic adjusters in the gearbox are working correctly the gears should be 'pumped' weekly as follows:

(1) Start the engine to recharge the air pressure system
(2) Stop the engine
(3) With the "START" switch "ON" move the gear selector lever in and out of each gear position about twelve times.

FIRST 1,000 MILES (1,600 KM)

The Gearbox — Changing the Oil

Drain and refill with the recommended grade of lubricant. The draining of the gearbox is best effected when the oil is at its thinnest, when the vehicle has just returned from

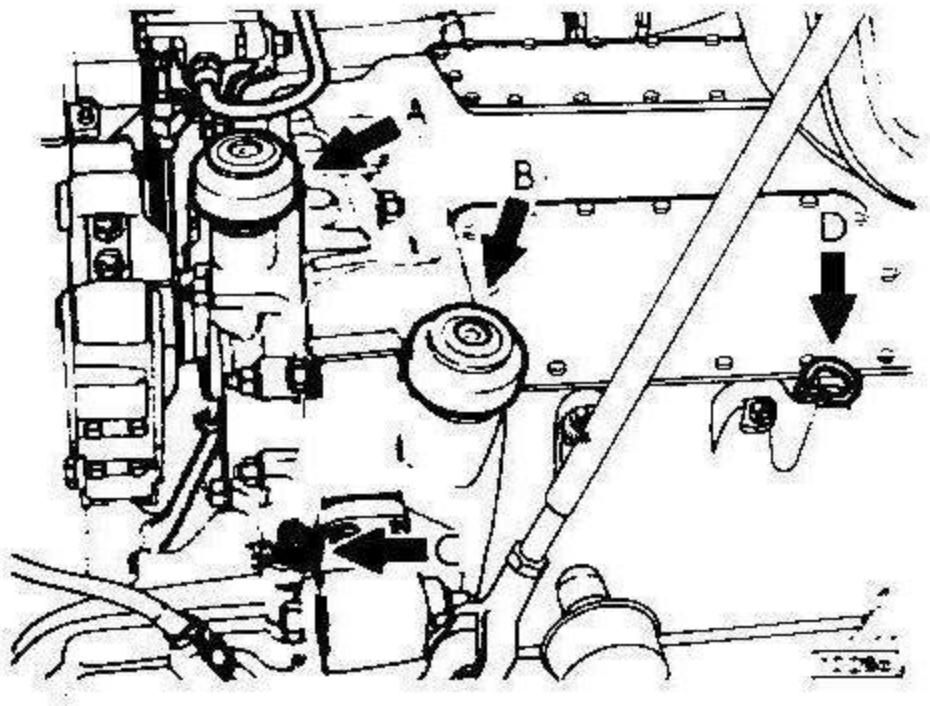


Fig. 2 Location of transfer box and gearbox filler plugs and dip sticks.

A Transfer box filler plug.
B Gearbox filler plug.
C Transfer box dip stick.
D Gearbox dip stick.

service. It will then have much of the impurities in suspension and so will assist in flushing out the unit. The drain plug is located in the bottom cover. Clean the area around the plug before removing.
Remove the gearbox filler plug, located in the rear left hand top corner of the gearbox case and refill with the recommended grade of lubricant.
Check the level by withdrawing the dipstick, wiping clean, re-inserting and withdrawing a second time. Fill up to the level mark on the dipstick. Clean the area around the filler plug and the dipstick before removal.
NOTE: An air breather is incorporated in the gearbox filler plug.

Cleaning the Oil Filter Element
Clean the road dirt from around the filter cover on the underside of the gearbox and position a drip tray beneath to catch any escaping oil.
Remove the filter cover by withdrawing four setscrews. Remove the filter element from the outer tube, wash element and all metal parts in flushing oil. Clean the interior of the oil filter housing. Refit the spring to the centre tube, fit the spigotted rubber washer to the top of the filter element, and the rubber washer and spigotted metal washer to the bottom of the element. Position the element assembly on the centre tube and feed the element and cover into the housing secure with the four setscrews and washers.

The Transfer Box — Changing the Oil
Drain and refill with the recommended grade of lubricant. The draining of the transfer box is best effected when the oil is at its thinnest; when the vehicle has just returned from service.

The drain plug is located in the bottom of the casing. Clean the area around the plug before removing.
Remove the filler plug, located in the top of the casing and refill with the recommended grade of lubricant.
Check the level by withdrawing the dipstick, wiping clean, re-inserting and withdrawing a second time. Fill up to the level mark on the dipstick. Clean the area around the filler plug and dipstick before removal.
NOTE: An air breather is incorporated in the transfer box filler plug.

EVERY 2,500 MILES (4,000 KM)

Checking the Oil Level
Check the level of the oil in the gearbox when the vehicle is standing on level ground. Top up to the level mark on the dipstick, if necessary with the recommended grade of lubricant.

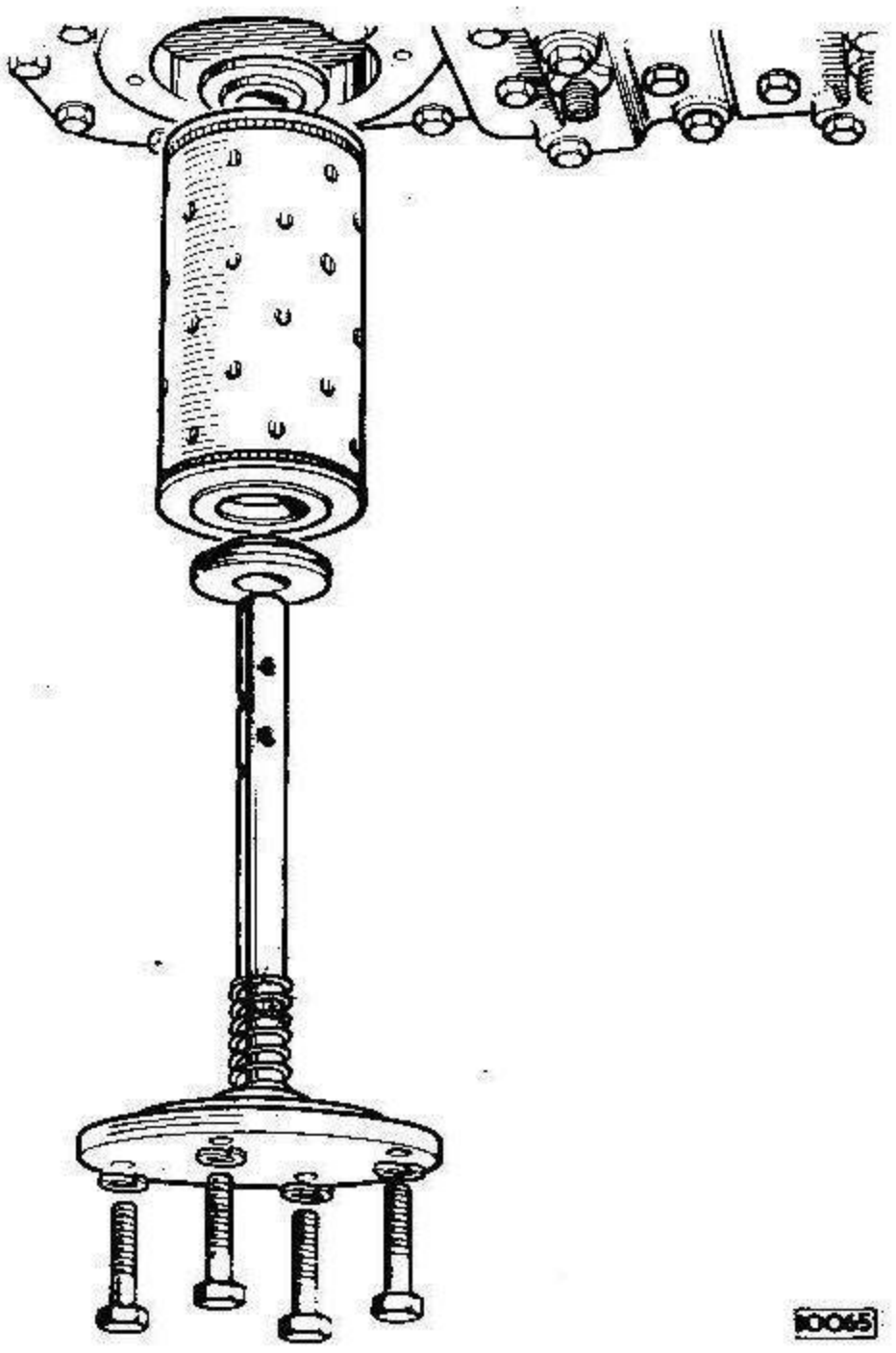


Fig. 3 Exploded view of the oil filter

GEARBOX AND TRANSFER BOX

The Transfer Box—Checking the Oil Level
Check the level of the oil in the transfer box when the vehicle is standing on level ground. Top up to the level mark on the dipstick if necessary with the recommended grade of lubricant.

EVERY 5,000 MILES (8,000 KM)

Gearbox
Cleaning the Air Breather Filter Element
Wash the air filter element in the gearbox filler plug in petrol and dry in clean air. Carry out this service more frequently if the vehicle is operating in dusty territories.

Air Cylinder — Oil Draining
Remove the five air cylinder drain plugs from the base of the gearbox and drain away any oil sediment which may have collected in the piston cavities.
The draining of the oil is best effected when the oil is at its thinnest, when the vehicle has just returned from service.
Apply air pressure to each cylinder by selecting each gear in turn whilst the corresponding drain plug is removed.

Electro-pneumatic Valve Unit—Draining
Remove the drain plugs in the base of the E.P. unit and drain away any contaminated oil and moisture which may have accumulated in the high pressure gallery.
To ensure maximum discharge from the E.P. unit when the drain plugs are removed air pressure should be applied by selecting any position on the gear control switch.
Perform this routine maintenance service more frequently if the vehicle is operating under very humid climatic conditions.

Transfer Box
Cleaning the Air Breather Filter Element
Wash the air filter element in the transfer box filler plug in petrol and dry in clean air. Carry out this service more frequently if the vehicle is operating in dusty territories.

Limiting Valve — Checking
Apply a soap solution to the cover joint and unions and check for leaks.
Check that the breather hole in the cover is not restricted.

EVERY 10,000 MILES (16,000 KM)

Gearbox — Cleaning the Oil Filter Element
Remove, clean and refit the oil filter element as detailed under "First 1,000 miles (1,600 km) Service".
Renew if in bad condition.

EVERY 25,000 MILES (40,000 KM)

Gearbox
Changing the Oil
Drain and refill with the recommended grade of lubricant as detailed in the "First 1,000 miles (1,600 km) Service".

Changing the Air Breather Filter Element
Renew the air filter element in the gearbox filler plug.

Transfer Box
Changing the Oil
Drain and refill with the recommended grade of lubricant as detailed in the "First 1,000 miles (1,600 km) Service".

Changing the Air Breather Filter Element
Renew the air filter element in the transfer filler plug.

EVERY 50,000 MILES (80,000 KM)

Limiting Valve — Overhaul
Westinghouse System
Exhaust all air pressure and remove the valve unit.
Remove the setscrews and washers and detach the main spring cover and lift out the diaphragm assembly.
Extract the securing screw and ease away the end cover.
Withdraw the valve disc now exposed.
Clean all metal parts in cleansing solvent and wash the diaphragm assembly, O ring and valve disc in soap and water. Dry all parts in a clean air jet and inspect the diaphragm and O ring for signs of hardening or cracking.
Check the valve disc for pitting, renew as necessary.
Check the condition of the valve spring for sufficient tension to seat the valve disc.
Lightly smear the stem of the diaphragm assembly with a good grade grease such as John Etherington's Paragon Artic.
Re-assemble the valve and install in the vehicle. Pressurize the system and test the cover joint and unions for leaks with a soap solution.
Insert a pressure gauge in the delivery line and check for correct delivery pressure, 80 lbs. per sq.in. (5.6 kg/cm^2).
Adjust by releasing the locknut and turning the adjuster clockwise to increase and anti-clockwise to decrease the pressure.

Clayton-Dewandre System
Exhaust all air pressure and remove the valve unit.
Remove the four setscrews and washers and detach the main spring cover.
NOTE: When removing, the cover will be under the pressure of the spring.
Withdraw the top spring guide and spring.
Carefully lift off the diaphragm assembly.
Remove the circlip and withdraw the guide plate.
Unscrew the plug from the base of the valve and remove the grommet from the plug.

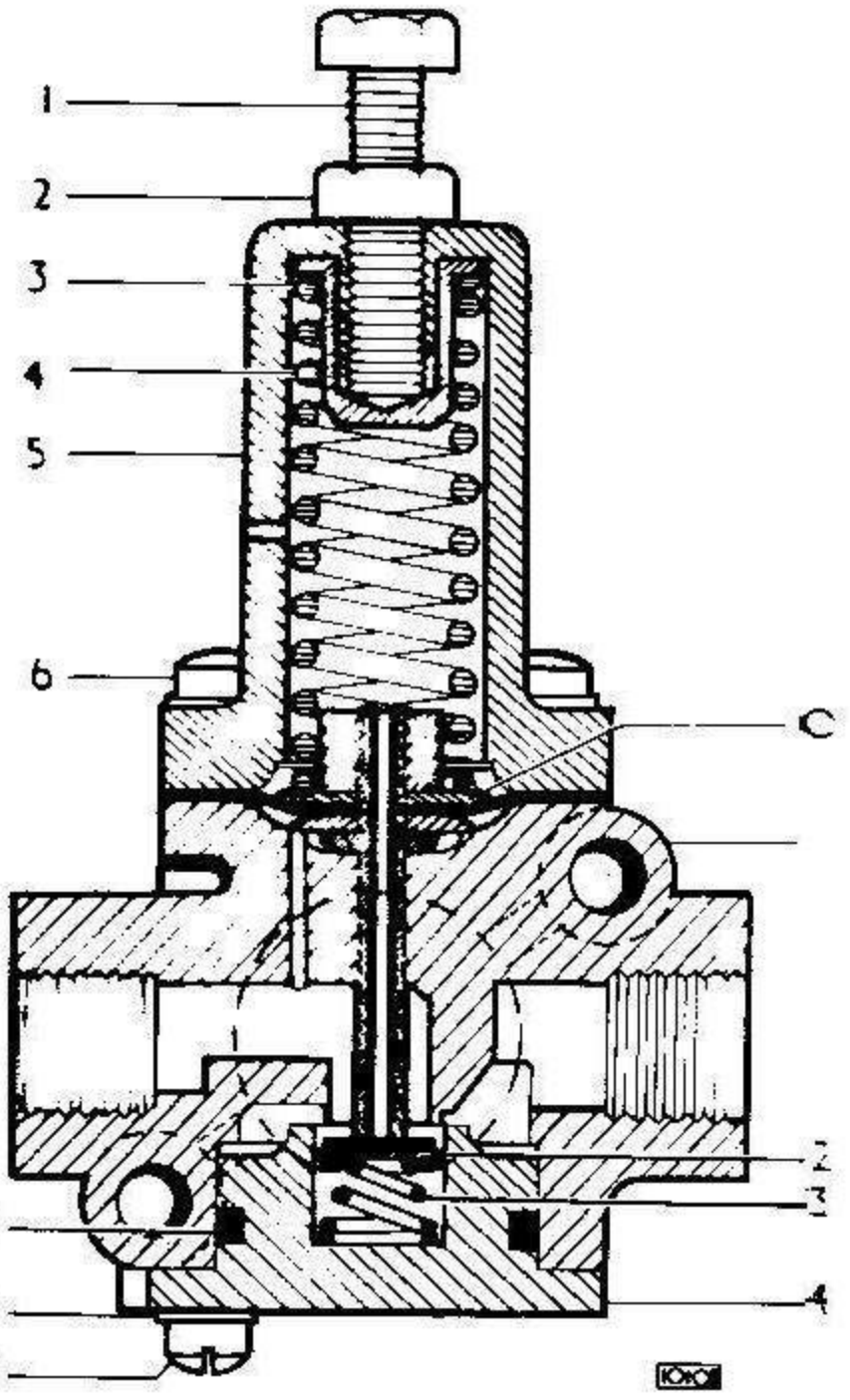


Fig. 4 Sectioned view of the Westinghouse limiting valve

1 Adjuster screw
2 Locknut
3 Mainspring
4 Spring seat
5 Spring Cover
6 Cover screw
7 End cap 'O' ring
8 Lockwasher
9 End cap screw
10 Diaphragm assembly
11 Valve body
12 Valve disc
13 Valve spring
14 End cap

Unscrew the retaining nut and lift off the release valve.
NOTE: The joint beneath the valve must be retained.
Withdraw the valve guide and vlave return spring.
Remove the inlet valve and stem.
Clean all metal parts in cleansing solvent and wipe clean the rubber faces of the valves. Renew the valves if damaged or indented.
Examine the diaphragm assembly for damage, or, deterioration, renewing as necessary.
Check that the base plug and guide plate grommets are in perfect condition, renew as necessary.

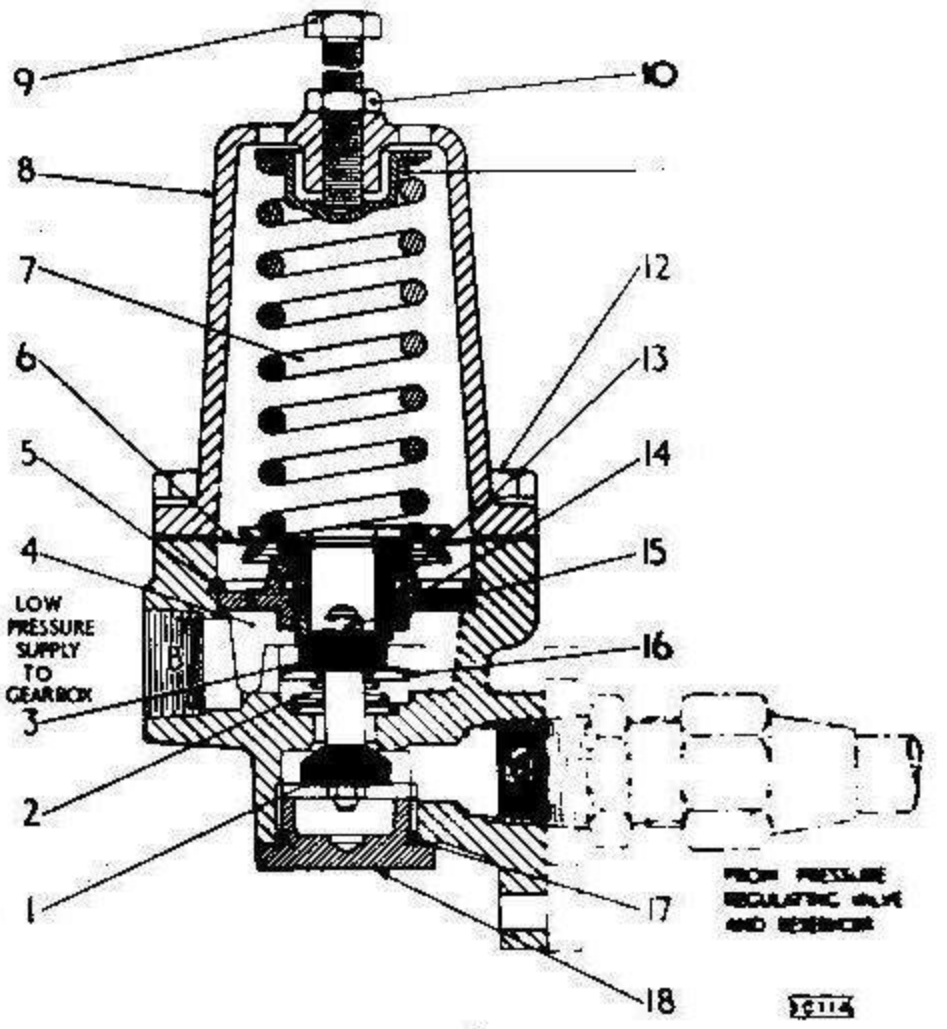


Fig. 5 Sectioned view of the Clayton—Dewandre reducer (limiting) valve

1 Inlet valve
2 Return spring
3 Release valve
4 Outer chamber
5 Circlip
6 Diaphragm assembly
7 Main spring
8 Cover
9 Adjuster screw
10 Locknut
11 Spring guide
12 Cover setscrew
13 Grommet
14 Guide plate
15 Valve locknut
16 Valve guide
17 Grommet
18 Plug

Ensure that the metered hole in the guide plate is unobstructed.
Check the bearing surfaces of the diaphragm assembly and guide plate for wear.
Re-assemble the valve and install in the vehicle.
Pressurize the system and test the cover joint and unions for leaks with a soap solution.
Insert a pressure gauge in the delivery line and check for correct delivery pressure, 80 lbs. per sq.in. (5.6 kg/cm^2).
Adjust by releasing the locknut and turning the adjuster screw clockwise to increase and anti-clockwise to decrease the pressure.

EVERY 75,000 MILES (120,000 KM)

Gear Change Selector Switch — Overhaul
Remove, overhaul and refit as detailed on page H.24