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SECTION 4 — AUTOMATIC CONTROL

The automatic gear changes are controlled by hydraulic pressure, regulated according to road speed and accelerator position and directed through shift valve ports to the appropriate clutch and servo pistons. A pressure dependent upon engine power is obtained by connecting a hydraulic valve with the engine throttle. An indication of road speed is given by a governor controlling two hydraulic valves. The driver superimposes his requirements on the automatic control by means of a selector valve.

The oil flow to the servos and clutch pistons is controlled by three shift valve assemblies, each one positioned by governor and throttle pressures to control a gear change; the 1–2 shift assembly controls the gear change between first and second gear, the 2–3 valve assembly controls the change between second and third and the 3–4 valve assembly controls the three to four change. As each valve moves to change gear, ports are opened to permit main pressure to act on the appropriate clutch and servo pistons until in fourth gear all the shift valves have moved across (see Fig. 8). The process is reversed for the down change.

Oil pressure is generated by the two oil pumps, one driven by the input shaft and the other one by the output shaft, thus ensuring that oil pressure is available whenever the engine is running or the car is moving.

The two pumps draw oil from the gearbox sump through a common wire mesh scavenger filter and feed it at approximately 70 lb./sq. in. to 100 lb./sq. in., into a common outlet passage leading to a governor and to a manually operated selector valve unit. A spring-loaded non-return valve is interposed between the two pumps to prevent loss of oil when one pump is not working. Oil is also delivered to the fluid coupling and provides lubrication for the bearings of the gearbox, as explained later.

The governor, driven by the gearbox output shaft provides a signal of road speed in terms of oil pressure It indicates two pressures which increase at different rates to provide accurate control at high and low road speeds. Oil from the governor is prevented from passing to the automatic control valve unit when the car is stationary, but when the car begins to move the centrifugal force of the governor weights causes valve ports

	FRONT BAND	FRONT CLUTCH	REAR BAND	REAR CLUTCH	REVERSE CLUTCH
Neutral	Off	Off	Off	Off	Off
Reverse	On	Off	Off	Off	On
1st Gear	On	Off	On	Off	Off
2nd Gear	Off	On	On	Off	Off
3rd Gear	On	Off	Off	On	Off
4th Gear	Off	On	Off	On	Off

to open and oil is permitted to flow to the control valve unit at pressures increasing progressively with car speed.

In addition to the selector valve and the automatic control valves, the valve unit contains a throttle valve connected by rods and levers to the engine throttle; this provides a signal of engine power in terms of oil pressure. When the selector valve is in any of the drive positions, oil at pump pressure is directed to the throttle valve ports which are opened and closed with the throttle, thus providing an oil pressure which increases progressively with throttle opening.

This oil pressure is passed into the valve unit to oppose the force of governor pressure acting on each of the shift valve assemblies. These valves are therefore positioned to direct oil pressure to apply the lowest gear ratio when governor pressure is nil (road wheels not turning) and move to select higher gear ratios as the governor pressure increases and overcomes the opposing throttle pressure to move the shift valve. It will be seen also that lower gear ratios will be selected whenever increasing throttle opening causes throttle pressure to overcome governor pressure and move the valve the other way.

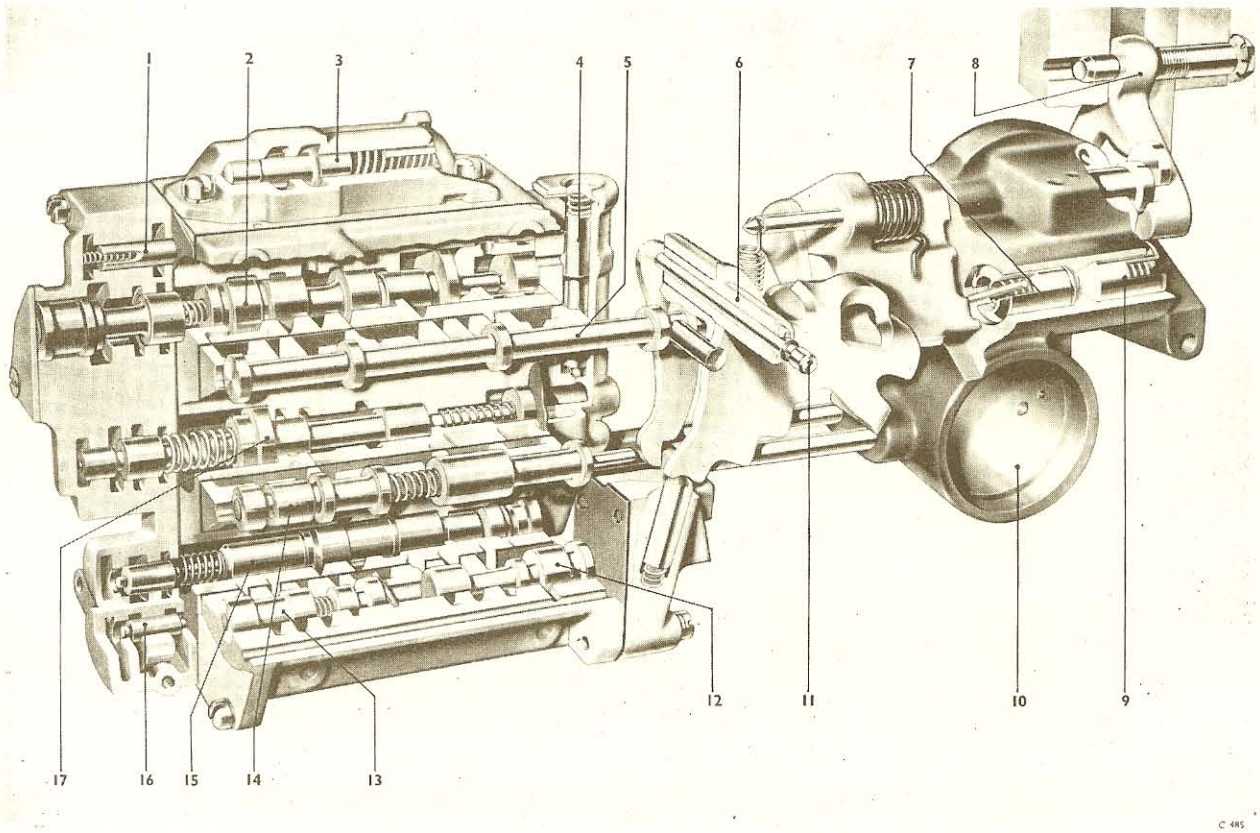

Fig. 8 Control valve assembly

1 T.V. REGULATOR VALVE
2 2–3 SHIFT VALVE GROUP
3 3–2 TIMING VALVE
4 OVERSPEED VALVE
5 SELECTOR VALVE
6 SELECTOR SHAFT
7 REVERSE BLOCKER PISTON
8 PARKING PAWL
9 PARKING BLOCKER PISTON
10 GOVERNOR SLEEVE
11 THROTTLE SHAFT
12 TRANSITION VALVE
13 COMPENSATION VALVE
14 THROTTLE VALVE GROUP
15 3–4 SHIFT VALVE GROUP
16 3–4 SHUTTLE VALVE
17 1–2 SHIFT VALVE GROUP

When selecting the gear ratios in the above manner, the shift valves are positioned to direct oil to the servos and clutches which engage or disengage the clutches and apply or release the friction bands in various combinations as shown in the table on Page 11. In addition, the hydraulic holding force of the friction bands is increased by compensator pressure as the torque increases.

These results are obtained by intermediate oil pressures which act on various relay, timing and locking valves and plugs, some of which are solely positioned by oil pressure and others by oil and spring pressures.

The function of the oil pressures may be summarized as follows

The main pressure is applied through the shift valve ports to the clutch pistons and band servos, while the compensator pressure is applied direct to the band servos.

The throttle pressures act on the shift valves in opposition to governor pressures, the shift valves are therefore positioned to permit the main pressure to pass to the appropriate servo and clutch pistons.

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