

## GIRLING VACUUM SERVO UNIT

### DESCRIPTION (Fig. 15)

The Girling vacuum servo unit is placed in the hydraulic system so that the master cylinder outlet is connected to the servo inlet port (9) and the servo outlet port (14) is connected to the wheel cylinders.

Air when required, is taken from the atmosphere through a filter (12). Vacuum is obtained from the inlet manifold, when the engine is running, and is applied to the servo vacuum inlet (19). A non-return valve and flame trap is fitted in this line.

This servo uses the suspended vacuum system; that is the vacuum piston (5), when at rest, has vacuum applied to both sides. The force required to multiply driver's effort is obtained by venting one side of the piston to atmosphere, so that the pressure difference produces a thrust which is used to increase hydraulic pressure at the wheel cylinders.

This whole operation is controlled by master cylinder line pressure, so that the final pressure applied at the wheel cylinders is directly related to the driver's effort at the brake pedal.

The servo unit is a "fail safe" design; if the engine is stalled, the vacuum in the vacuum cylinder is a sufficient reserve to make two or three brake applications. If, due to a fault, no vacuum is available the brakes work direct from the master cylinder without power assistance.

### OPERATION

The servo may be considered in three parts although in operation all functions occur almost instantaneously. The parts are:—Vacuum piston and piston rod (5 and 15): hydraulic control piston, air and vacuum control valves (10, 30 and 20): The output piston (25).

When the engine is running and the brakes are not in use the hydraulic control piston is at rest, the air valve is closed and the vacuum valve to the thrust side of the vacuum piston is open, so vacuum is applied to both sides of the vacuum piston.

As soon as the brakes are applied, master cylinder pressure is applied to the control piston at both ends (10 and 13). As the low pressure end of the control piston is of greater area than the high pressure end and the pressure is the same at both ends, the piston moves down the cylinder

When the piston has moved sufficiently the 'T' lever (11) closes the vacuum valve (20) and opens the air valve (30). Air enters the thrust side of the vacuum piston via the transfer tube (16) and the initial movement of the vacuum piston seats the nose of the piston rod (15) in the port of the output piston to seal the output cylinder and the high pressure end of the control piston from the low pressure input side of the servo.

Movement of the vacuum piston continues to drive the output piston down its bore until pressure on the high pressure end of the control piston (13) just overcomes the master cylinder pressure at the low pressure end. The control piston moves back until both the air and vacuum valves are shut (30 and 20).

The vacuum piston is then suspended in its cylinder and the pressure applied to the wheel cylinders remains constant until the driver either increases pressure on the brake pedal or releases the brakes.

Increased pedal pressure increases master cylinder line pressure to act as previously to increase pressure at the wheel cylinders and at the high pressure end of the control piston until a new point of stabilisation is found.

On release of the brakes, the master cylinder line pressure collapses and the control piston in the servo is driven back to the 'at rest' position by the hydraulic pressure on its high pressure end (13); the air valve (30) is closed and the vacuum valve (20) opens so that pressure and then vacuum equalises on both sides of the vacuum piston and the piston return spring (6) aided by hydraulic pressure and the output piston spring (25) returns the vacuum piston to its 'at rest' position.

Movement of the output piston is stopped by a circlip (24) and the vacuum piston makes its last movement aided by its return spring (6) only. This opens the port in the output piston to the low pressure side of the servo and permits rapid recuperation in preparation for the next application of the brakes.