The suction space is filled with fuel constantly kept under a gauge pressure of 1 to 1.5 atm. by the feed pump. If the pump plunger is at the bottom dead center, the control port (6) is opened and the pressure space is filled with fuel. During the upward motion the plunger closes the control port (6) and presses the fuel through the pressure valve into the pressure line. The delivery begins (see Figure 07–4/4).

The delivery ends as soon as the upper control edge has reached the control port (6), because the pressure space is now connected with the suction space via the compensating hole (4) in the plunger (Figure 07–4/4) or at the former units via the longitudinal groove, thus bringing about an equalization of pressure.

As already mentioned, the discharge rate is varied by the turning of the plunger. Figure 07–4/4 clearly shows that the plunger opens the control port sooner or later during the discharge stroke depending on the respective turning position. The output is largest if the plunger is turned full clockwise, the output becomes smaller if the plunger is turned counter-clockwise. In order to reach the zero output position (stop position) the plunger must be turned fully counter-clockwise. In this position the upper control edge immediately opens the control port (6). Thus the pressure space (5) is continuously connected with the suction space (8) and there will therefore be no discharge (Figure 07–4/1). The feed begin of the injection pump is constant, excepting the injection pumps (e.g. Model RS 204) with pump plungers with additional upper ("double") control edge. The end of delivery, however, depends on the discharge rate and/or the turning position of the plunger.

II. Pressure Valve

The pressure valve has the task of closing the top of the pressure space and relieving the pressure line. Relieving of the pressure line is necessary to allow a fast closing of the nozzle needle and to prevent dribbling of fuel into the combustion chamber. This is simply and safely achieved by the special design of the pressure valve, as can be seen in Figure 07–4/5.

The stem (5) of the pressure valve is guided in the valve seat (1). During the discharge stroke the valve is lifted off the seat, so that the short cylindrical stem section (3) (small plunger) leaves the bore and opens the way for the fuel which enters the pressure line via the annular groove (4) and the longitudinal groove (6).

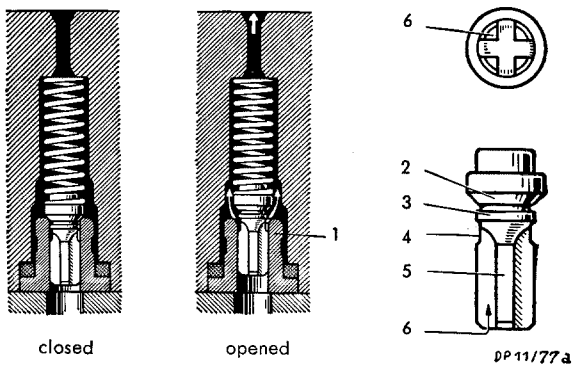

Figure 07–4/5
Pressure valve

1 Valve seat
2 Valve cone
3 Plunger
4 Annular groove
5 Stem
6 Longitudinal groove

As soon as the control edge opens the control port, the pressure drops in the pump cylinder. The higher pressure in the line and the valve spring press the pressure valve on its seat. The pressure valve closes the pressure line against the pump cylinder until the fuel output starts again during the next discharge stroke.

At the end of discharge the small plunger located above the valve seat first enters the bore and closes the pressure line against the pressure space. Only then, the cone drops on the seat.

During this procedure the available colume in the pressure line is increased by the displacement of the valve plunger. The fuel in the pressure line is thereby relieved very quickly and the nozzle needle closes immediately.

III. Pneumatic Governor

The injection pump of the Model OM 636 is equipped with a pneumatic governor or a centrifugal governor depending on the intended use of the engine. The pneumatic governor is controlled by the vacuum in the intake manifold and consists of 2 major parts, the throttle duct and the diaphragm unit.

The injection pump, in connection with the diaphragm unit and the throttle duct, has the task of supplying the engine with the optimal fuel quantity depending on the respective load. In addition, the pneumatic governor, independent of the respective load, must prevent surpassing of the permissible maximum speed and, during coasting (exploitation of the full engine braking effect) with closed throttle butterfly in the throttle duct, stop injection, guarantee a constant idling speed and must keep the speed selected with the gas pedal and/or control lever as constant as possible.

The vacuum in the intake manifold of the engine is transferred via the throttle duct to the diaphragm unit and, by moving of the control rod, causes a change in discharge rate.

a) Throttle Duct

The throttle duct is only installed in engines with pneumatic governor and is mounted on the intake manifold. The throttle duct has the task of tranferring the vacuum present in the intake manifold to the diaphragm unit and controlling the vacuum and the engine speed by the respective position of the throttle butterfly. By moving the throttle butterfly with the accelerator, the vacuum in the governor can be influenced via the vacuum line and consequently the engine speed is controlled. The throttle duct is a venturi pipe, meaning it becomes gradually wider in direction of intake (starting at the narrowest point). A pivoted throttle butterfly, an auxiliary venturi pipe and the connector of the vacuum line are situated at the narrowest point. The throttle butterfly is connected with the gas pedal via the linkage and the adjusting lever.

A calibrated air jet for the vacuum connection is installed in the auxiliary venturi pipe and protrudes about to the middle of the latter (see Figure 07–23/2). The bore diameter and the protruding length of the air jet in the auxiliary venturi pipe influence the vacuum and therefore the governing. The air jet should not be modified (also see Job No. 07–23 Checking and Repairing Throttle Duct).

The velocity of flow in the throttle duct increases or decreases according to the position of the throttle butterfly and the speed of the engine. The same is true for the vacuum behind the throttle duct and in the vacuum chamber. If the vacuum is strong enough to overcome the pressure of the control spring, governing sets in.

The position of the diaphragm and the control rod depends on the force of the difference in pressure between the vacuum chamber and the chamber open to the atmosphere. This difference in pressure is controlled by the position of the throttle butterfly and the engine speed.