14.1 BACKGROUND

This equipment was developed for use in roof support systems in coal mines (although it is expected to find numerous applications in other industries).

The roof support shields are used to control the overlying strata, at the coal face, and thus protect the operators of the coal-cutting and conveying equipment. During mining operations the shield canopy is raised hydraulically against the mine roof; later it can be lowered and the shield moved laterally with a hydraulic ram; thus the shield is self-advancing.

Prior to about 1968-9, the control of such equipment was direct. That is, there was an enormous valve unit, with the main hydraulic pipes entering it, and a plethora of external pipe work resulted. Much of this traditional maze has been eliminated by development of the Dowval system. In this, a pilot hydraulic circuit is used to control the main hydraulics of the roof support system, and the gasket is a component of this control valve. The pattern of perforations on the gasket creates the circuitry. By changing gaskets the control circuits can be changed without modifying the manifold or valves.

14.2 THE HYDRAULIC CONTROL VALVE

This is illustrated in Fig. 14.1. Its essential features are:

(a) Manifold blocks, with channels for the individual circuits to be controlled.
(b) Face-to-face sealing between blocks.
(c) Gaskets at the face-to-face seal, capable of withstanding the working pressure of the system.
(d) Working pressures originally 34.5 MNm\(^{-2}\) (345 bar or 5000 psi) now tending towards 51.7 MNm\(^{-2}\) (517 bar or 7500 psi).

14.3 THE PRINTED GASKET

The gasket at the face-to-face seals of the control valve comprises a perforated metal plate, the perforations being shaped and positioned for the circuitry required. Around each perforation is a bead of polyurethane
Printed gaskets

elastomer, which forms the seal when the gasket is compressed between the manifold block and the valve block - see Fig. 14.1.

This study is concerned with the polyurethane (PU) seal. A gasket is shown in Fig. 14.2.

Fig. 14.1 Valve pack system shows use of printed circuit gaskets between manifolds and multi-bore pilot hose connection

Fig. 14.2 Section of a gasket