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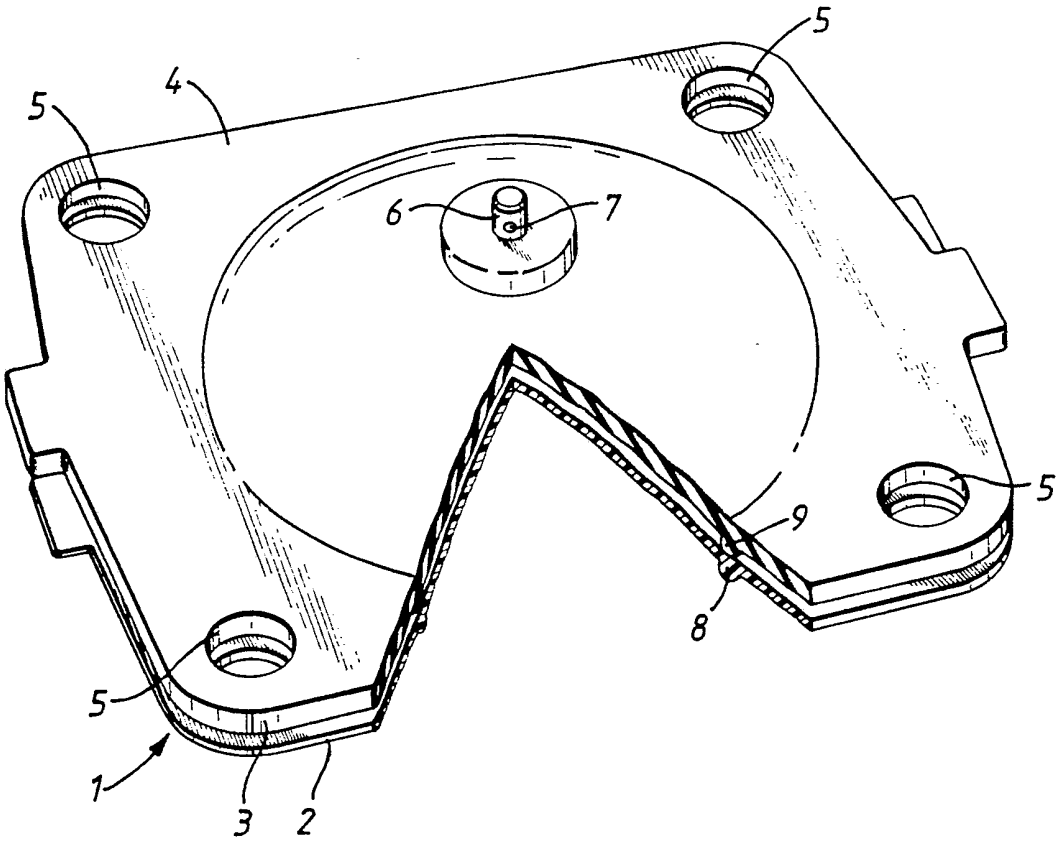
(54) Diaphragm for diaphragm valves

(57) A diaphragm (1) for a diaphragm valve comprises a thin flexible retatively hard facing layer (2) preferably moulded from PTFE and a relatively soft resilient backing layer (3) e.g. of reinforced rubber. The facing layer, preferably in its peripheral zone (4), is formed with a sealing bead (8) which, in use, is clamped against the body flange of a diaphragm valve body. The backing layer 3 is formed with a pressure bead (9) which overlies the facing preferably in the vicinity of the sealing bead (8), to increase local pressure on the facing layer.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25 (1) of the Patents Rules 1982.

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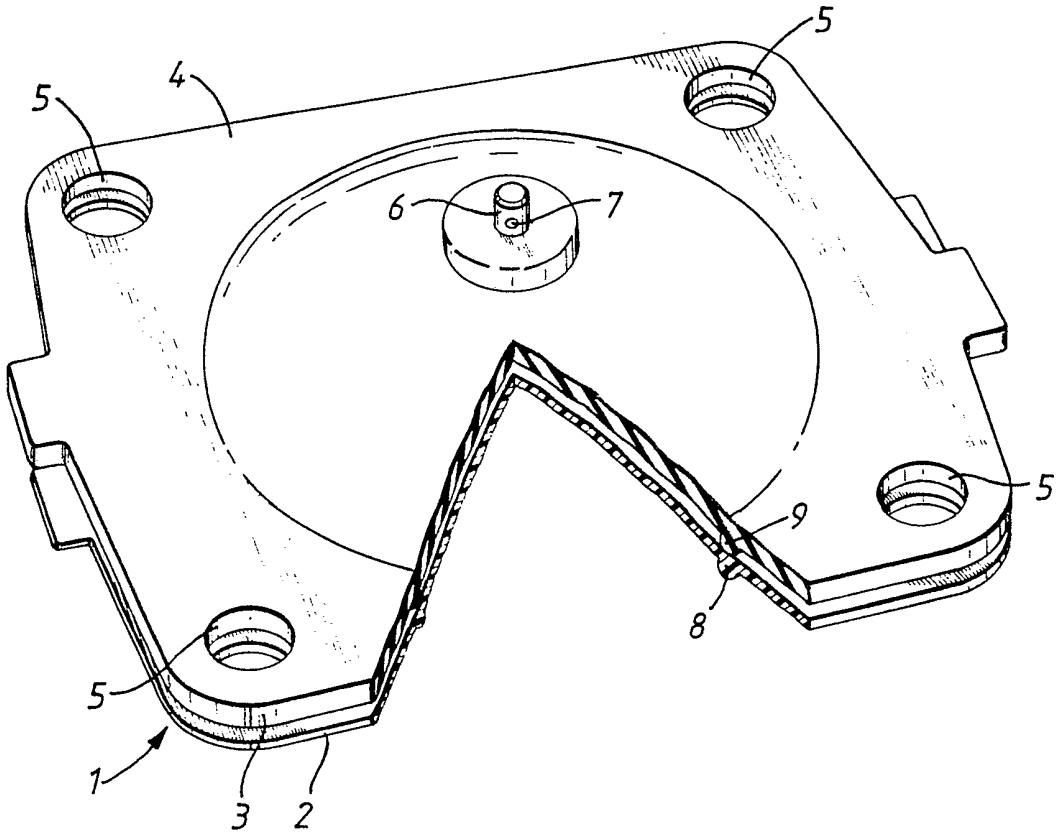
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DIAPHRAGM FOR DIAPHRAGM VALVES

This invention relates to a diaphragm for use in a diaphragm valve, that is to say in a valve which includes a flow passage partly defined by the diaphragm, the diaphragm being movable between a closed position in which the diaphragm engages a seat to prevent flow through the valve, and an open position in which the diaphragm is spaced from the seat to permit flow through the valve.

In a conventional diaphragm valve the periphery of the diaphragm is clamped between a flange provided on the valve body and a flange provided on the bonnet or operating mechanism of the valve. The flanges are secured together by suitable means, for example nuts and bolts, to compress the periphery of the diaphragm therebetween, thereby forming a fluid tight-seal between the diaphragm and the valve body.

It is known to provide a diaphragm for a diaphragm valve in two parts, namely a facing part and a backing part. This technique is employed where a PTFE faced diaphragm is required. In this case, the two part

diaphragm comprises a relatively thin facing layer of moulded PTFE and a backing layer of rubber, the backing layer being substantially co-extensive with the facing layer. The backing layer acts to reinforce the facing layer against line pressure, and as a cushion between the facing layer and the compressor. In such two-part diaphragms it is known to form a circular sealing bead on the face of the PTFE to engage the body flange of the valve. When the diaphragm periphery is clamped between the bonnet and body flanges the bead is forced into engagement with the body flange with the intention of forming a fluid seal.

It has been found, however, that in certain sizes of valves operating at high pressures the provision of a sealing bead on the face of the PTFE is not sufficient to provide an adequate seal between the facing and the body. This can under certain circumstances lead to leakage of line fluid between the facing and the body flange. Bearing in mind that PTFE faced diaphragms are in general only used when a chemically aggressive line fluid is being handled, any leakage of line fluid between the facing and the valve body flange is highly undesirable.

We have now found that the seal between the facing of a two-part diaphragm and the flange of a valve body can be substantially improved if the facing of the diaphragm is provided with a sealing bead, and the backing is provided with a pressure bead which substantially overlies the sealing bead of the facing and applies local pressure to the surface of the facing remote from the sealing bead when the diaphragm is in use.

Accordingly, the present invention provides a diaphragm for a diaphragm valve comprising a thin flexible relatively hard facing layer and a relatively soft

resilient backing layer wherein the facing layer is provided on the surface thereof which in use engages the flange of a valve body with a sealing bead, and the backing layer is provided with a pressure bead on the surface thereof which is adjacent the facing layer, the pressure bead being positioned to apply local pressure to the adjacent surface of the facing layer when the diaphragm is clamped to a valve body in use.

The invention will be better understood from the following description of a preferred embodiment thereof, given by way of example only, reference being had to the accompanying drawing wherein the single Figure is a partly broken away perspective view of a preferred embodiment of diaphragm according to the present invention.

Referring to the drawing, the diaphragm 1 comprises a facing layer 2 moulded from PTFE and a backing layer 3 of reinforced resilient rubber. In use, the peripheral zone 4 of the diaphragm is clamped between the body flange and bonnet flange of a diaphragm valve, the flanges being clamped together by means of bolts or studs which pass through clearance holes 5 provided in the diaphragm.

A pin 6 includes a head (not shown) moulded into the PTFE of the facing layer 2. The pin 6 is a sliding fit within a bore provided in the backing layer 3 whereby relative movement between the pin and the backing layer is permitted in use. The backing layer and facing layer are separately formed, and are assembled together by inserting the pin 6 through the aperture provided in the backing layer. A bayonet pin 7 is then inserted into a cross-bore provided in the pin 6 to facilitate connection of the diaphragm to a compressor assembly, and to prevent

accidental removal of the backing layer from the facing layer.

As is conventional with PTFE faced diaphragms, a sealing bead 8 is moulded on the exposed face of the facing layer for contacting the body flange of the valve.

In the prior art the face of the backing layer adjacent to the facing layer was smooth and locally flat. As a result, when the periphery of the diaphragm was clamped between the bonnet flange and body flange the sealing bead 8 was forced against the flat surface of the body flange and, because PTFE is a relatively hard material, this caused a ridge to appear on the reverse face of the facing (i.e. the face adjacent the backing), this ridge being accommodated by local resilient deformation of the backing material. As a result, the bead 8 was forced against the surface of the body flange with the intention of forming a fluid tight seal.

It has been found, however, that the seal provided by the prior art arrangement is not satisfactory under all circumstances.

We have now found that if a pressure bead 9 is moulded on the surface of the backing layer 3 adjacent the facing layer 2 in the vicinity of the sealing bead 8 substantially improved sealing characteristics between the bead 8 and the body flange are obtained. Compression of the diaphragm periphery will still result in a ridge being produced on the reverse face of the facing, and this ridge will still be accommodated by resilient deformation of the backing. The pressure bead 9 will accordingly be distorted when the diaphragm is clamped in position and will exert a substantially higher local pressure on the reverse face of the facing than was present in the prior art arrangement.

This has been found substantially to improve the seal obtained between the bead 8 and the body flange.

A pressure bead may be provided on the backing to overlie any sealing bead provided on the front face of the facing. For example, if a sealing bead is provided on the facing to engage the seat against which the diaphragm in use seals, a corresponding pressure bead may be provided on the backing.

CLAIMS

1. A diaphragm for a diaphragm valve comprising a thin flexible relatively hard facing layer and a relatively soft resilient backing layer wherein the facing layer is provided on the surface thereof which in use engages the flange of a valve body with a sealing bead, and the backing layer is provided with a pressure bead on the surface thereof which is adjacent the facing layer, the pressure bead being positioned to apply local pressure to the adjacent surface of the facing layer when the diaphragm is clamped to a valve body in use.

2. A diaphragm according to claim 1 wherein the facing layer is provided on the surface thereof which in use engages a seat provided on the valve body to prevent flow through the valve with a sealing bead, and the backing layer is provided with a pressure bead on the surface thereof which is adjacent the facing layer, the pressure bead being positioned to apply local pressure to the adjacent surface of the facing layer when the diaphragm is forced against the seat to close the valve to fluid flow.

3. A diaphragm according to claim 1 or claim 2 wherein the facing layer is of PTFE and the backing layer is of rubber.

4. A diaphragm for a diaphragm valve, substantially as hereinbefore described with reference to the accompanying drawing.

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