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GB A 2145482 GB 1245109 GB 0944769  
GB 1471211 GB 1103944 GB 0814022

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F2V  
Selected US specifications from IPC sub-class F16K

(54) Butterfly valve

(57) A butterfly valve is characterised in that the valve disc (2) is circumferentially surrounded by a metallic sleeve (S) comprising, successively along its length, a constant diameter part (6) in contact with the valve disc (2), a first radially outwardly projecting annular corrugation (7) and a second radially outwardly projecting corrugation (8) which is of increased diameter and axial length compared with the first corrugation (7) and intended to deform resiliently into sealing engagement with the valve seating (3) when the valve disc (2) is turned to its bore closing position. If desired there may be associated with the sleeve (S) a sealing ring (R) made of PTFE or other material having a low friction co-efficient compared with that of said metallic sleeve. Two sleeves (S) may be mounted on the disc (2) so as to face in opposite directions.

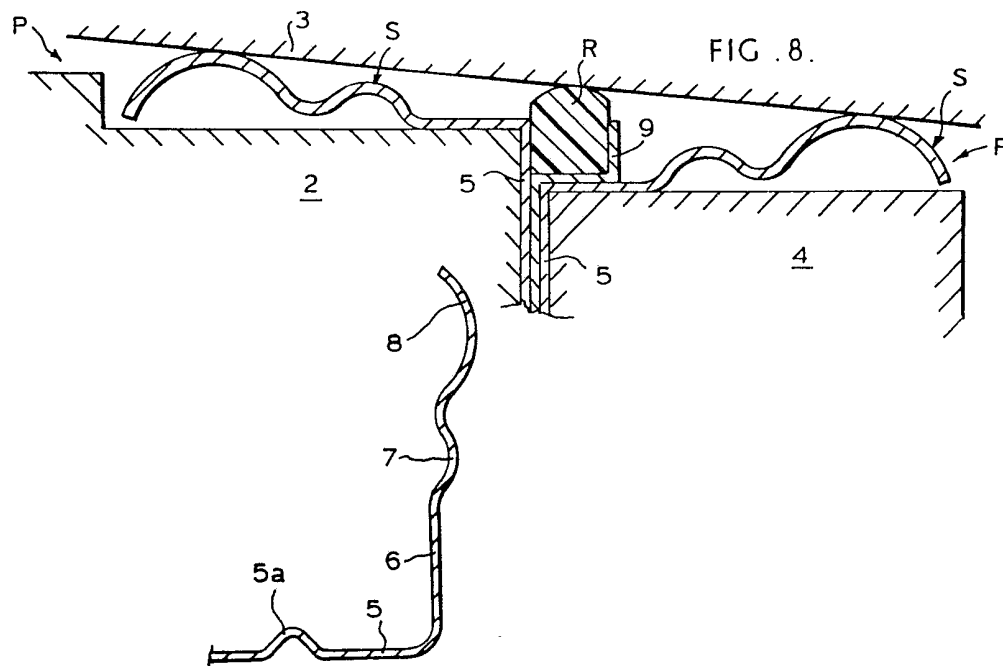
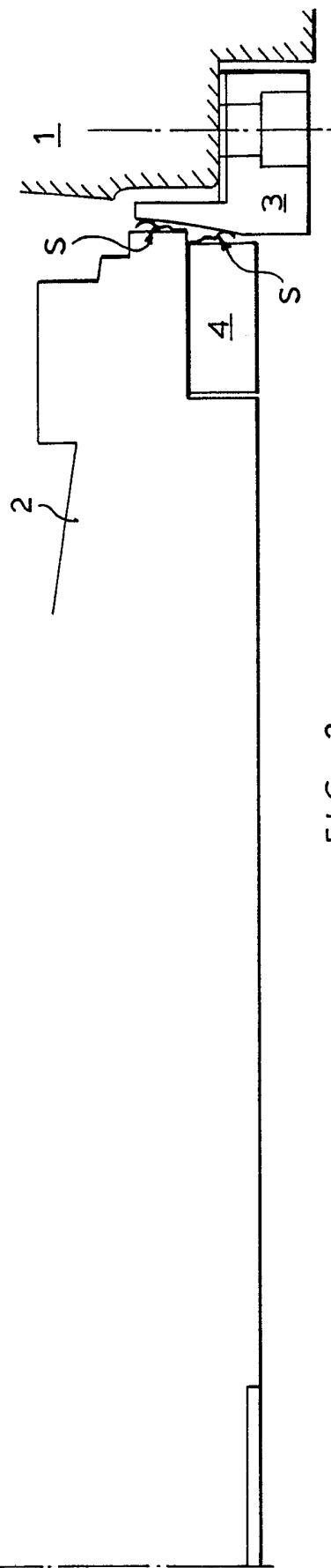
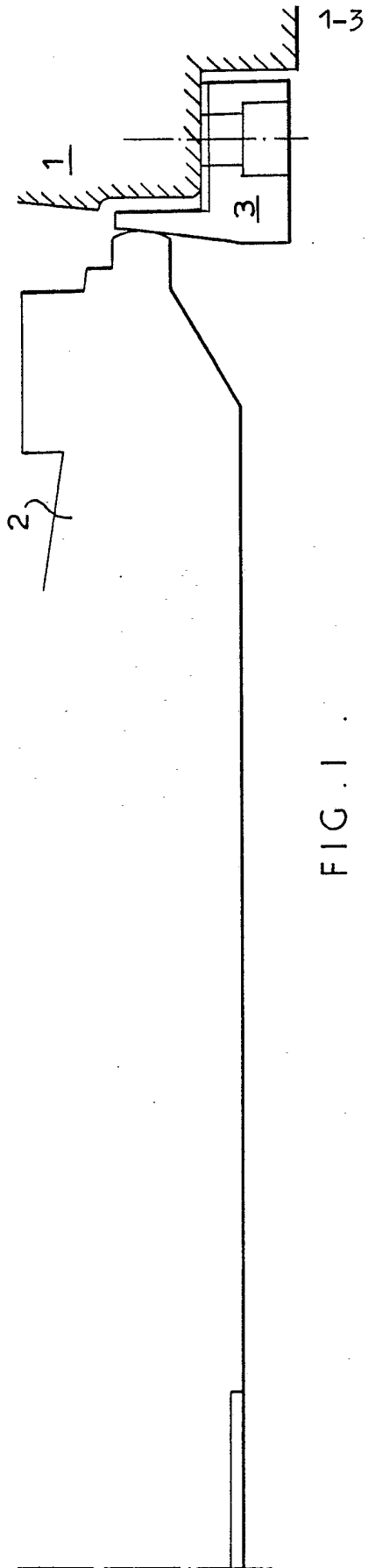


FIG. 5.

The drawing(s) originally filed was/were informal and the print here reproduced is taken from a later filed formal copy.



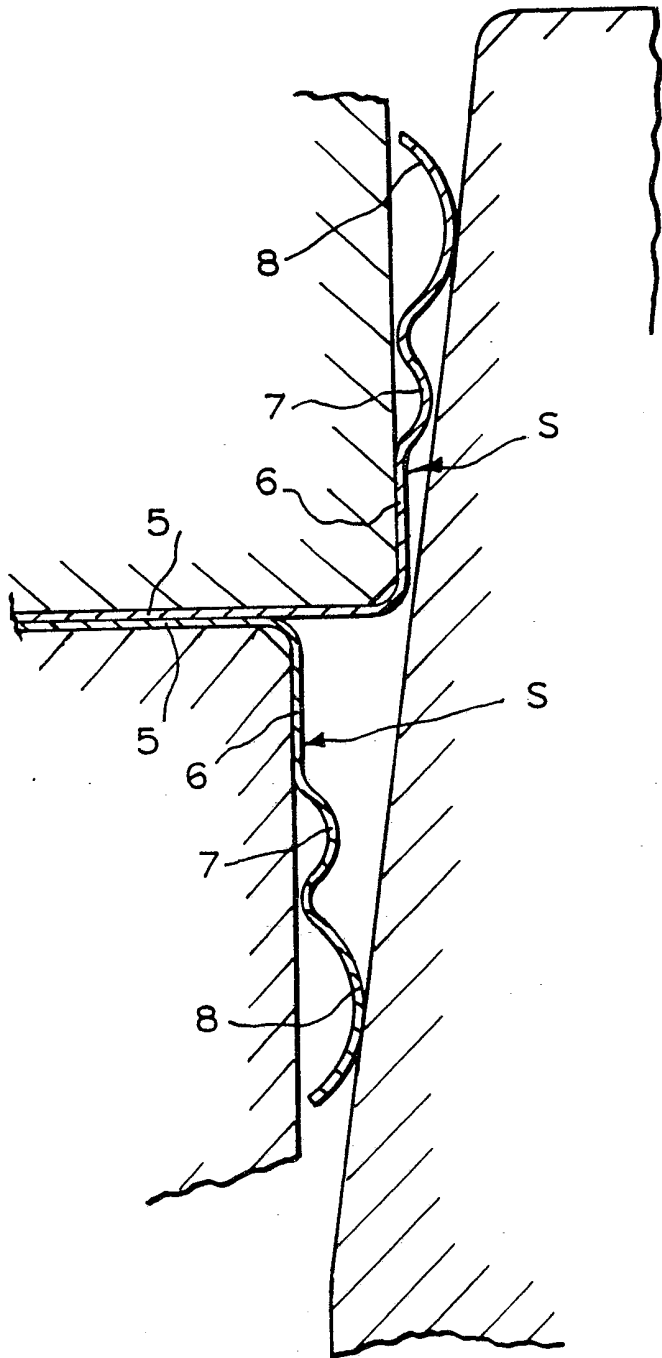


FIG. 3.

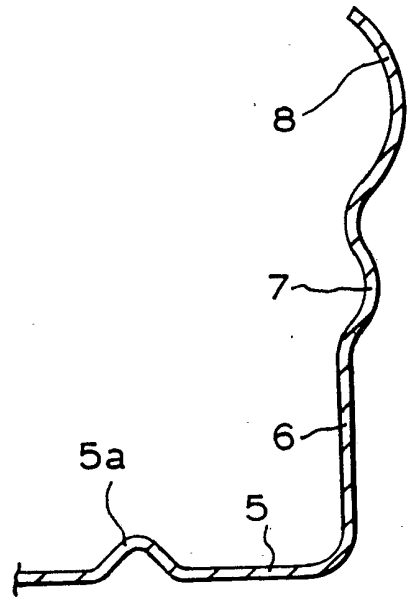


FIG. 5.

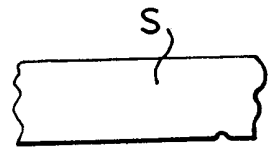
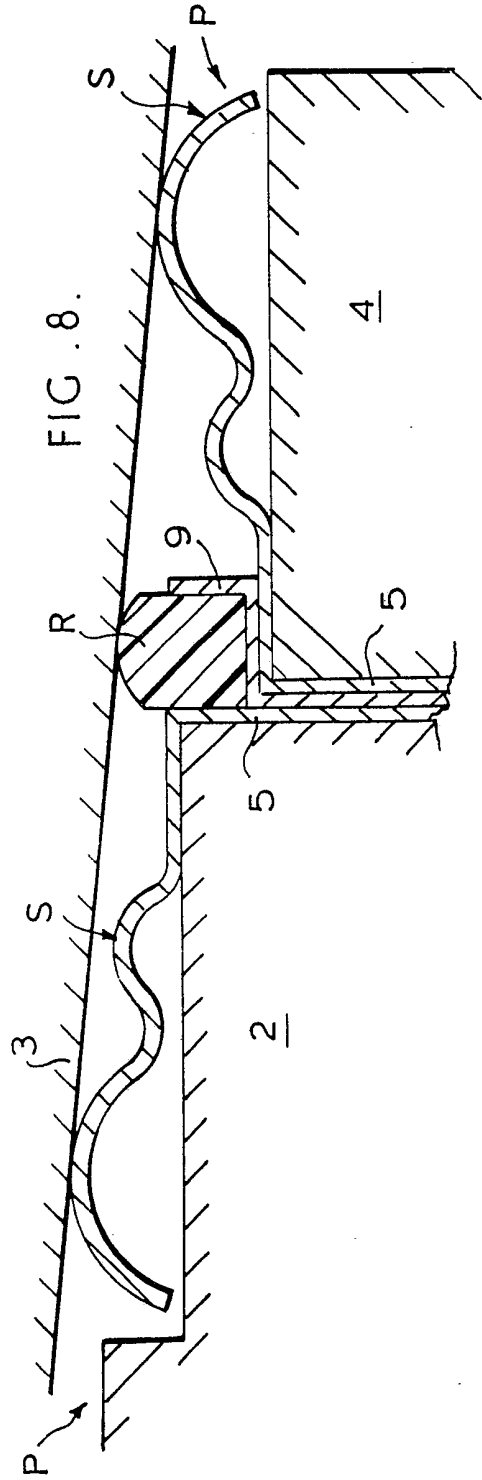
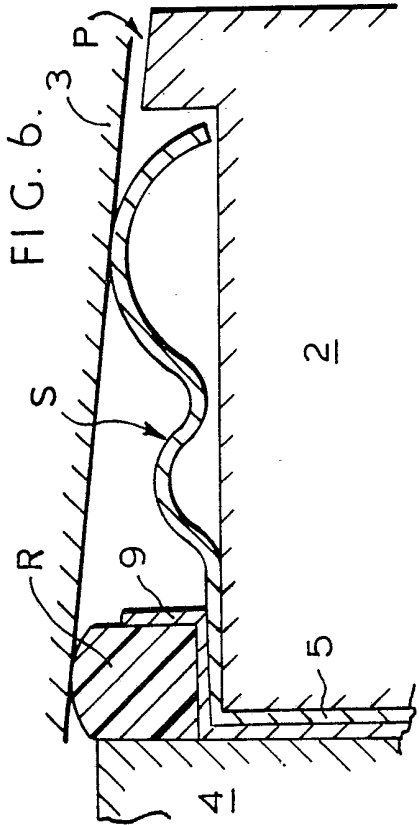
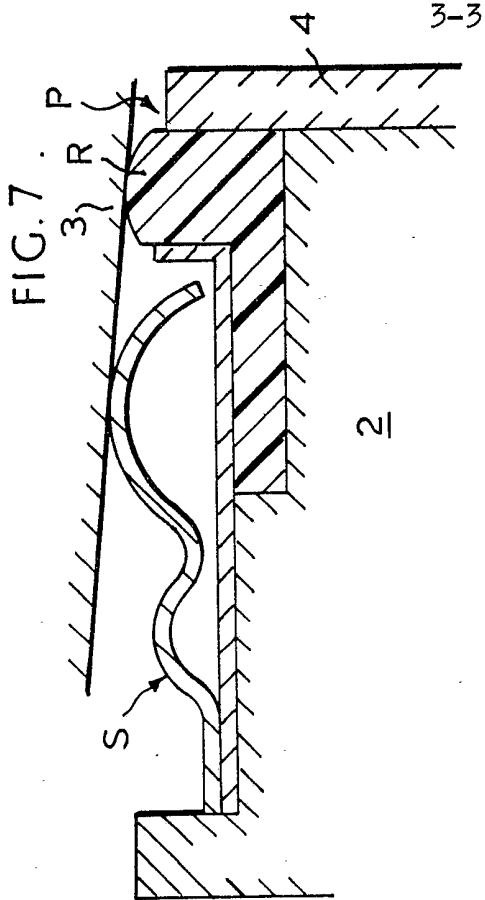


FIG. 4.



## SPECIFICATION

**Butterfly valves**

5 This invention relates to butterfly valves for controlling the flow of fluids in pipes and in particular to an arrangement for improving the seal between the rim of a butterfly valve disc and its seating when the valve is closed.

10 The invention is based on the discovery that a metal sleeve having the general characteristics disclosed in our published British Patent Application 2145482 can be usefully combined with the valve disc of a butterfly valve to achieve the above mentioned improved sealing effect.

In accordance with the invention a butterfly valve comprised of a disc which is pivotally mounted in a bore for movement about an axis transverse to the bore into and out of engagement with an annular seating in the bore, is characterised in that the disc is circumferentially surrounded by a metallic sleeve comprising successively along its length a constant diameter part in contact with the disc, a first radially outwardly projecting annular corrugation and a second radially outwardly projecting annular corrugation which is of increased diameter and axial length compared with the first corrugation and intended to deform resiliently into sealing engagement with the seating when the disc is turned to its bore closing position.

If desired two sleeves as aforesaid, facing in opposite directions, may be fitted to the disc. Further, the or each sleeve may have, at its constant diameter end, an annular radially inwardly directed part by which it is clamped or otherwise secured to the disc.

40 Further, there may be associated with the rim of the disc at various alternative locations adjacent the sleeve a suitable shaped auxiliary sealing ring made of polytetrafluorethylene (PTFE) or similar low friction co-efficient material.

The nature of the invention should however become more clearly apparent from the following description of some preferred embodiments which are illustrated by way of example in the accompanying drawings.

In these drawings:-

Fig. 1 is a transverse view partly in section of a known butterfly valve;

Fig. 2 is a view similar to Fig. 1 showing the same valve when adapted in accordance with one embodiment of the invention;

Fig. 3 is an enlarged scale sectional view of part of Fig. 1;

Fig. 4 is a part section of a sealing sleeve;

60 Fig. 5 is an enlarged scale section of Fig. 4; and

Figs. 6, 7 and 8 are transverse radial sections of three different embodiments which incorporate the invention and include PTFE sealing rings.

70 Referring now to the drawings Fig. 1 shows a body 1, which defines a bore containing a valve disc 2 which is pivotally mounted in the bore for movement about a diametric axis to and from the illustrated closed position in which the rim of the disc 2 engages the tapered surface of a seating 3 which is secured to the body 1.

75 Figs. 2 and 3 show how the valve of Fig. 1 has been adapted in accordance with the invention by the provision of a pair of specially shaped identical sleeves S which face in opposite directions and which have radially inwardly extending annular flanges by which they are fixed to one end face of the valve disc 2 by a clamping plate 4. Thereby a double seal is achieved.

80 As shown most clearly in Fig. 3 each sleeve is made of metal of uniform thickness and successively comprises the aforesaid annular flange 5, a cylindrical constant diameter part 6, a first radially outwardly projecting arcuate corrugation 7 and an adjoining larger radius corrugation 8 which is of greater diameter and axial length than the corrugation 7. The dimensioning of the sleeve is such that when the valve disc is in its bore-closing position one or each sleeve S is deformed so as to be a slight interference fit with the seating 3, the seal being enhanced, in one direction or the other, by the fluid pressure prevailing in the bore.

The sleeves S may be made of various metals and alloys such as stainless steel and any of the exotic high nickel alloys. A preferred alloy is NIMONIC 80 A (British Standard Specification HR 201). This is fully age hardened, after final forming, for 4 hours at about 750°C in a vacuum.

105 To reduce wear and friction between the sleeves S and the seating 3 the sleeves are coated with electroless nickel having a PTFE inclusion, which would then be baked at 300°C for a predetermined time. This results in a very hard wear-resistant surface and, because of the PTFE inclusion, a very substantial reduction in the torque required to open and close the valve. For valves which have to withstand extremely high temperatures the PTFE inclusion may be replaced with electroless nickel.

The use of sealing rings of PTFE, or other material of lower friction co-efficient than that of the sleeve, in conjunction with the metallic sealing sleeves on the butterfly valve disc 2 is illustrated in Figs. 6, 7 and 8.

120 Thus Fig. 6 shows an arrangement in which a valve disc 2 is recessed to accommodate a single metal sleeve S and is surrounded at the constant diameter end of the latter by a PTFE sealing ring R which is held firmly in place by a cranked metal carrier 9 which is sandwiched between the disc 2 and the clamping plate 4. The direction of fluid pressure is indicated by the arrow P.

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The arrangement shown in Fig. 7 differs from that of Fig. 6 in that the metal sleeve S does not have an inwardly extending flange and is self-retaining in a recessed part of the disc 2. Underlying the sleeve S is a radially flanged metal carrier 9 which, in conjunction with a retainer plate 10, securely locates a PTFE sealing ring R which is, in this instance, of L-shaped radial cross-section.

Finally, in Fig. 8 there is illustrated a butterfly valve arrangement which is capable of sealing under fluid pressure P in either direction along the bore and which resembles the embodiment shown in Fig. 3 with the addition of a PTFE sealing ring R mounted between one of the sleeves S and a cranked metal carrier 9 which is held between the disc 2 and the clamping plate 4.

## 20 CLAIMS

1. A butterfly valve comprising a disc which is pivotally mounted in a bore for movement about an axis transverse to the bore into and out of engagement with an annular seating in the bore, characterised in that the disc is circumferentially surrounded by a metallic sleeve comprising, successively along its length, a constant diameter part in contact with the disc, a first radially outwardly projecting annular corrugation and a second radially outwardly projecting annular corrugation which is of increased diameter and axial length compared with the first corrugation and intended to deform resiliently into sealing engagement with the seating when the disc is turned to its bore closing position.

2. A butterfly valve according to Claim 1 wherein there is secured to said disc two of said sleeves which face in opposite directions along the axis of the bore.

3. A butterfly valve according to Claim 1 or Claim 2, wherein the, or each, said sleeve has a radially inwardly extending flange by which it is secured, by a clamping plate, to the disc.

4. A butterfly valve according to any of Claims 1 to 3 wherein there is associated with the, or each, said sleeve an annular sealing disc made of PTFE or other material of lower friction co-efficient than that of said sleeve.

5. A butterfly valve constructed and adapted to operate substantially as hereinbefore described with reference to, and as shown in, any of Figs. 2 to 8 of the accompanying drawings.