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VALVE CLOSURE MEMBERDESCRIPTION

This invention relates to an improved closure member for taps and similar control devices. Whilst the following description is particular to use of the closure member in taps it is not so limited. Typically
5 the closure member may be used in other devices e.g. globe valves.

Fluid valves in the form of taps usually contain a closure member comprising a valve disc attached to a valve stem. The disc is provided with a sealing
10 washer adapted to cooperate with a valve seat in the tap body, the valve seat surrounding an opening through which fluid can flow. The valve stem is received within an axial bore of the tap spindle. The sealing washer provides the actual contact with the valve seat and
15 thus stops the flow of fluid. To open the tap the disc is raised by rotating the spindle thus taking the force off the disc. The valve lifts off its seat by pressure of the fluid flowing through the valve. Counter-rotation of the spindle brings the valve disc
20 sealing washer into contact with the valve seat and thus closes the tap.

Known fluid valves are provided with a sealing washer fixed to the valve disc by a screw or rivet.

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Another known fluid valve is manufactured entirely from plastics (e.g. nylon), thus not requiring a separate sealing washer. These valves do not seal well if the valve seat is worn or rough. Known fluid valves discussed above usually have a high wear rate necessitating frequent replacement. Another source of wear arises from friction between spindle and valve stem, causing rotational "skidding" of the sealing washer on the valve seat.

10 It is the object of this invention to provide a valve closure member with enhanced durability and lower rate of wear and greater capacity to seal worn or rough seat surfaces.

This object is achieved by a valve closure member
15 comprising:

- (1) a stem;
- (2) a disc having:
 - (a) a first face from which the stem extends and
 - 20 (b) a second face having an annular recess therein;
- (3) a plate disposed in the annular recess and defining an annular channel between the periphery of the plate and a side wall of
25 the recess; and
- (4) an annular seal disposed in the channel; the plate having a passageway communicating with the annular recess to permit ingress of fluid into the channel to exert pressure on the seal and thereby to
30 cause the seal to project from the second face of the disc.

It has been found that some configurations of the invention produce noise in certain circumstances. Substantial reduction of such noise may be achieved
35 by providing a closure member wherein the outer peripheral edge of the second face of the disc is chamfered.

In another preferred embodiment the channel has a depth less than the depth of the annular seal so that the seal projects from the lower surface of the valve disc.

5 In a further preferred embodiment the channel has an opening in the second face of the disc which is narrower than the width of the annular seal. This arrangement ensures the seal is retained in the annular recess securely.

10 To facilitate the last mentioned preferred embodiment it is desirable to undercut the channel to enable sufficient space for the bulk of the annular seal to be accommodated. Similarly, it is convenient to bevel the periphery of the plate to form an undercut
15 surface. Typically the channel in these instances adopts a trapezium cross-sectional shape. However, it is clear the exact cross-sectional shape of the channel is not so limited. For instance it may have curved walls.

20 In another preferred embodiment the passageway of the plate communicates with the annular recess to permit ingress of fluid into a region of the channel distant from the second face of the disc.

Preferably, the plate means is spaced from the
25 floor of the disc recess to provide communication between the passageway and the said channel region. In this arrangement the passageway communicates with the channel to give a throttling effect and prevent rapid build up of pressure behind the annular seal, thus reducing
30 the possibility of forcing the seal out of the channel.

In another preferred embodiment a spacer, typically of plastic material, is provided on the valve stem and is engageable with the first face of the disc. In a tap, this reduces friction between the valve closure member

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and the tap spindle to further reduce wear of the closure member.

In another preferred embodiment the second face of the disc has a second sealing surface.

5 The invention also provides a valve, preferably a tap provided with any valve closure member defined above.

The invention will now be described with reference to the drawing in which:

10 Figure 1 is a side elevation of a valve closure member embodying the invention;

Figure 2 is a vertical cross-sectional view of a closure member of Figure 1 in a conventional tap;

15 Figure 3 is a cross-sectional view of a portion of the closure member of Figures 1 and 2;

Figure 4 is a partial cross-sectional view of a portion of a modified valve closure member.

The drawings show a valve closure member 10 having a stem 11 and a disc 12. The stem 11 is receivable
20 in the bore 13 of axially movable tap spindle 14 (see Figure 2). The stem 11 is provided with a plastic spacer 15 which engages the end 16 of spindle 14 and reduces friction therebetween. Reducing friction at this point reduces rotation of the closure member on
25 the valve seat 17 of the tap thus reducing wear on the sealing means.

The disc 12 is provided with an annular recess which is undercut at its periphery, as indicated by numeral 19. A circular retaining plate 20 having a
30 bevelled periphery 21 is arranged to fit in annular recess by means of a deformed extension 22 (see Fig. 2) of the valve stem, or by means of a screw or nut. The recess and retaining plate 20 form a trapezium shaped channel 23 to accommodate an O-ring seal 24. A passage-
35 way 25 is provided through the annular retaining plate

20.

The valve closure member operates in the following manner. To close the tap, spindle 14 is rotated until the ring seal 24 contacts the valve seat 17. This
5 contact provides the primary seal. However, on contact an increase in water pressure at the retaining plate 20 forces the fluid through passageway 25 and into a clearance 18 to the rear of the O-ring seal as illustrated by the arrows. This forces the O-ring
10 seal 24 harder onto the valve seat 17 to provide additional sealing. Clearance 18 produces a throttling effect to the water pressure to prevent rapid build up of pressure to force the O-ring seal out of its groove. After long use when the tap is fully closed
15 an additional sealing effect can be provided by metal to metal contact between valve disc 12 and valve seat 17.

In the modification of Figure 4, the disc 12 is provided at its lower periphery with a chamfer 26. This chamfer reduces the venturi effect present with
20 a square edge, and thereby reduce noise when the tap is partly open.

Advantages of a valve closure member constructed in accordance with the invention include the feature that should the ring seal fail or deteriorate, a metal
25 to metal seal is still available to substantially close the tap. Similarly, with an O-ring seal the small contact area effectively seals on scored or worn tap seats. The spacer on the closure member stem reduces friction between spindle and valve, and also gives a
30 "soft" feel to the tap action and prevents jamming if the tap is over-tightened. The ring seal is also protected in the event of over-tightening, and the softer rubber of the ring and its shape can more readily cope with particles between the closure member and the
35 seat without the seat or closure member being damaged.

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CLAIMS

1. A valve closure member comprising:

(1) a stem;

(2) a disc having:

(a) a first face from which the
stem extends and

(b) a second face having an annular recess
therein;

(3) a plate disposed in the annular recess and
defining an annular channel between the
periphery of the plate and a side wall
of the recess; and

(4) an annular seal disposed in the channel;

the plate having a passageway communicating with the
annular recess to permit ingress of fluid into the channel
to exert pressure on the seal and thereby to cause the
seal to project from the second face of the disc.

2. A valve closure member according to claim 1,
wherein the outer peripheral edge of the second face
of the disc is chamfered.

3. A valve closure member according to claim 1
or 2, wherein the channel has a depth less than the depth
of the annular seal.

4. A valve closure member according to any one
of claims 1 to 3, wherein the channel has an opening
in the second face of the disc which is narrower than
the width of the annular seal.

5. A valve closure member according to any one
of claims 1 to 4, wherein at least one channel side wall,
or a portion thereof adjacent the second disc face, is
undercut.

6. A valve closure member according to claim 5,
wherein the plate has a bevelled periphery forming the
undercut side wall or portion.



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7. A valve closure member according to claim 5 or 6, wherein the said portions only of both side walls of the channel are undercut.

8. A valve closure member according to any one of claims 1 to 7, wherein the passageway of the plate communicates with the annular recess to permit ingress of fluid into a region of the channel distant from the second face of the disc.

9. A valve closure member according to claim 8, wherein the plate means is spaced from the floor of the disc recess to provide communication between the passageway and the said channel region.

10. A valve closure member according to any one of claims 1 to 9, including a spacer located on the stem and engagable with the first face of the disc.

11. A valve closure member according to any one of claims 1 to 10, wherein the second face of the disc has a second sealing surface.

12. A valve closure member substantially as hereinbefore described with reference to the drawing.

13. A valve including a valve closure member according to any one of claims 1 to 12.

14. A valve according to claim 13 which is a tap.
