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"FAUCET FLUID COMPRESSION VALVE"

BACKGROUND OF THE INVENTION

5 This invention relates to tap washers for use in common domestic, agricultural and commercial water taps.

Tap washers in common use typically comprise a disc-like seal which overlies the valve seat, and a stem which extends from the disc-like seal and locates within the tap spindle. Closing the tap by rotating its handle
10 causes the tap spindle to move towards the valve seat so as to bring the disc-like seal into engagement with the valve seat and thereby stop the flow of water through the tap body.

Such disc-like seals have a number of
15 disadvantages such as their proclivity for rapid wear and their inability to firmly seat should particulate matter be trapped on the disc. These disadvantages lead, respectively, to limited life span and dripping of the tap.

20 OBJECT OF THE INVENTION

It is an object of the invention to provide a tap washer which is not so prone to wear and dripping caused by debris entrapment, and which at least provides the public with a useful alternative.

25 SUMMARY OF THE INVENTION

According to the present invention, there is provided a tap washer comprising a resiliently deformable plug having a dome shaped portion with a recess, which dome portion is dimensioned for snug location within a
30 valve seat.

Preferably, the plug has a substantially cylindrical configuration with the dome shaped portion projecting from one end thereof. Suitably, the dome shaped portion has a smaller base than the end of the
35 cylindrical section so that there is a uniform dimensioned ledge formed around the end of the cylinder which can seal against the top seating surface of the tap.



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The recess within the dome shaped portion is ideally centrally located with respect thereto and preferably comprises a cylindrical bore hole extending substantially from one side of the dome shaped portion to the other. A rolled flange may be integrally formed around the opening in the recess to increase the sealing function as hereinafter described.

The tap washer can be used with a specially designed holder comprising a rigid housing with associated rigid stem, or, more preferably formed as an integral unit with a rigid planar cap and rigid stem extending therefrom, as in conventional tap washers.

The resiliently deformable plug is suitably moulded in one piece from a non-toxic material which shows sufficient resiliency to form a fluid tight seal at the valve seat. That is, the material must be able to deform upon compression and be able to return to its original configuration upon the compressive forces being removed, while at the same time not being overly deformable which could lead to retention within the valve seat. Suitable materials are natural and synthetic rubbers with appropriate additives, plastics materials and composite materials.

To assist the shedding of compression forces when downward pressure is applied to the plug, a compression groove is preferably centrally located on the perimeter. Further compression can be shed by one or more vertical grooves located around the upper portion of the plug.

The rigid cap to which the plug is preferably integrally joined can be fabricated from a conventional metal or metallic alloy used in tap washers, for instance, copper, stainless steel or brass; or from plastics material such as high density polypropylene and nylon®; or from composite materials. Jointing may be effected between the plug and cap by the use of a non-toxic adhesive, heat or electronic welding, the use of clips, or by a crimping or like method.

The stem, which is suitably integrally formed with the rigid cap, will generally be of similar composition to the cap.

5 In an alternative embodiment the rigid cap acts as a housing in which replaceable plugs may be inserted. Such a housing will, for instance, be open on one side to enable a plug to be screw-threaded or otherwise fitted to the housing in a secure manner.

10 In a further modification, to prevent the possibility of fluid hammer occurring in the tap, the stem is designed so that it fits snugly into the tap's spindle. To effect this close union a number of strategically placed longitudinal or circumferential fins, raised surface sections or the like are preferably
15 located around the perimeter of the stem. This enables the stem to rotate minimising any sideways movement or slap.

The cap and stem with which the resiliently deformable plug are associated locate within the tap
20 spindle and enable the plug to be guided toward and away from the seat of the tap in a conventional manner. When the tap is turned off, the resiliently deformable plug is pressed onto and around the inner section of the tap seat, while the lip of the recess inverts and expands to
25 press against the lower inner wall of the tap seat.

The effectiveness of the seal is assisted by the internal fluid pressure exerted through the recess of the plug. This pressure causes the dome portion to expand outwardly and assume a concave configuration which
30 presses tightly against the inner wall of the tap seat, as is clearly illustrated in the drawings to be hereinafter described.

The preferred form of the tap washer effectively provides a triple sealing action by sealing
35 above, within and below the tap seat. That is, in the seated configuration, the resiliently deformable plug restricts fluid flow by providing a fluid tight seal around the upper surface of the tap seat, whilst

simultaneously sealing the inner wall and lower wall surface of the tap seat. Such an action reduces wear - as sealing is spread over three regions - and minimises the possibility of debris entrapment being the cause of leakages.

A preferred embodiment of the invention will now be described with reference to the accompanying drawings, in which:-

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a cross-sectional elevation of a tap washer with cap and stem according to one aspect of the present invention,

Figure 2 is a cross-sectional elevation of a tap washer with cap and stem according to another aspect of the present invention,

Figure 3 is a partly cut-away side view of an open tap incorporating the tap washer of Figure 1, and

Figure 4 is a partly cut-away side view of a shut tap incorporating the tap washer of Figure 1.

In all of the drawings, like reference numerals refer to like parts.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring firstly to Figure 1, the tap washer depicted is adapted for use with a domestic half inch water tap and comprises a resiliently deformable plug 10 fitted to a cap 11 with integral axially located stem 12. The resiliently deformable plug 10 has a cylindrically shaped upper body portion 13 and a dome shaped lower body portion 14. The upper body portion has a compression groove 15 formed about its perimeter mid-way between the ends of the cylinder.

The dome shaped lower body portion 14 has an axially located cylindrical recess 16 which extends substantially the entire depth of the dome. The entry to the recess has a rolled flange configuration 17.

A ledge 18 of uniform width is formed at the perimeter of the dome shaped body portion 14, on the end of the cylindrically shaped upper body portion 13. The

ledge acts as one of the seating regions for the washer.

The resiliently deformable plug 10 is manufactured from a natural rubber material reinforced with carbon black and containing mineral fillers of china clay and zinc oxide. An example of such a material is "material 047" manufactured by Lasslett Rubber Pty Ltd Victoria, Australia. It has a Shore A hardness of 85° - 90°,- a density of 1.69 gm/cc, a tensile strength of 8.0 MPa minimum, and an elongation at breaking of 130% minimum. It is a non-toxic food grade material.

The cap 11 is typically a circular disc with the stem 12 being moulded integrally therewith. This combination is formed from high density polypropylene and/or nylon ®.

The resiliently deformable plug 10 is connected to the cap 11 with an elastomer-solvent adhesive.

Figure 2 is a variation of the arrangement depicted in Figure 1 in which the resiliently deformable plug 10 is mechanically connected to the cap 20. In this embodiment the cap 20 comprises a housing, the outer wall 21 of which has an inwardly projected lip 22. A compression groove 23 is formed around the resiliently deformable plug and the lip 22 locates in this groove.

Reference will now be made to Figures 3 and 4 which illustrate the tap washer *in situ* in a standard 12mm domestic water tap. The arrows show the direction of the water flow through the tap. The tap spindle is shown at 30. The seat of the tap is illustrated at 31.

Figure 3 shows the tap open. This arrangement is achieved by turning the tap handle 33 anticlockwise to raise the spindle 30. Water flows into the tap by way of water inlet 34 and flows into the tap body 35. The pressure of the water here forces the resiliently deformable plug 10 upwards from the seat 31 so that the water has free passageway to the outlet 36.

Upon turning the tap handle clockwise, the spindle 30 is brought downwardly towards the seat 31. This simultaneously forces the stem 12 and the associated

resiliently deformable plug towards the seat 31. The force exerted by the spindle 30 together with the opposing pressure of water, causes the resiliently deformable dome shaped portion to open out the recess and come into contact with the side wall 37 of the tap seat as shown in Figure 4. Simultaneously, the upper cylindrical portion of the resiliently deformable plug is caused to bulge to a certain degree however the majority of the bulging is minimised by being distributed by the compression groove 15. The groove is suitably a 1 x 1mm channel cut-out in the wall of the resiliently deformable plug.

Upon firmly seating the tap washer, the rolled flange 17 on the opening to the recess 16 expands outwards against the lower inner face of the tap seat and forms an additional sealing point within the tap body.

CLAIMS:

1. A tap washer comprising a seal for sealing against a valve seat of a tap and a stem for locating within a hollow spindle of the tap for aligning the seal with the seat, wherein the seal comprises a resiliently deformable cylindrical body with an integrally formed dome-shaped end having a smaller diameter than the diameter of the cylindrical body so that a uniform ring-shaped ledge is formed about the end of the cylindrical body, which ring-shaped ledge is adapted, in situ, to locate and seal on an outlet side of the valve seat; said dome-shaped end having an axially aligned recess which extends as far as the cylindrical body and which enables the dome-shaped end to splay open when the ring-shaped ledge of the cylindrical body locates on the valve seat and there is fluid pressure within the recess, to thereby produce a secondary seal with an inner surface of the valve seat.
2. A tap washer as claimed in claim 1, wherein one or more compression grooves is formed in the cylindrical body of the seal.
3. A tap washer as claimed in claim 2, wherein the compression groove extends around the cylindrical body as a circular depression.
4. A tap washer as claimed in any one of the preceding claims and wherein a flange is integrally formed about the recess in the dome-shaped end of the seal.
5. A tap washer as claimed in any one of the preceding claims which is manufactured from a natural rubber composite material.
6. A tap washer as claimed in claim 5, wherein the natural rubber composite comprises natural rubber reinforced with carbon black and containing mineral fillers of china clay and zinc oxide.
7. A tap washer as claimed in claim 5 or claim 6, wherein the natural rubber composite is a non-toxic food grade compound having a Shore A hardness of 85° - 90°, a

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density of 1.69 gm/cc, a tensile strength of 8.0 MPa minimum, and an elongation at breaking of 130% minimum.

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