PATENT REQUEST: STANDARD PATENT/PATENT OF ADDITION

We, being the persons identified below as the Applicant, request the grant of a patent to the person identified below as the Nominated Person, for an invention described in the accompanying standard complete specification.

Full application details follow.

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[54] Invention Title: FAUCET FLUID COMPRESSION VALVE

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ASSOCIATED PROVISIONAL APPLICATION DETAILS
[60] Application Number and Date: PN1019 filed 9 February 1995
Drawing number recommended to accompany the abstract: Figure 1

DATED this 24th day of January 1996

CAMBRI PTY. LTD.

By: [Signature]

Registered Patent Attorney

TO: THE COMMISSIONER OF PATENTS
AUSTRALIA
NOTICE OF ENTITLEMENT

We, Cambri Pty. Ltd. of Suite 8, 23 GlenAffric Street, The Gap, Queensland 4061, Australia, being the applicant and nominated person in respect of the attached application, state the following:-

The person nominated for the grant of the patent has entitlement from the actual inventors John Caleb Wells Biggers and Henry George Brock by virtue of the following:

The said inventors assigned their rights in the invention to CAMBRI PTY. LTD.

The person nominated for the grant of the patent has entitlement from the applicant of the basic application listed on the patent request form

The basic application listed on the request form is the first application made in a Convention country in respect of the invention

CAMBRI PTY. LTD.
By their Patent Attorneys
CULLEN & CO.

RON HALIDAY

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Title
FAUCET FLUID COMPRESSION VALVE
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Prior Art Documents
EP 536047
AU 53429/86
US 3904174

Claim

1. A tap washer having a seal for sealing against a valve seat of a tap and a stem which locates 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 an axially aligned opening therein which extends substantially from one side thereof to the other, which dome-shaped end is dimensioned for snug location within a valve seat.
AUSTRALIA
Patents Act 1990

COMPLETE SPECIFICATION
FOR A STANDARD PATENT

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Invention Title: FAUCET FLUID COMPRESSION VALVE

Details of Associated Provisional Applications:
Nos. PN1019 filed 9 February
1995

The following statement is a full description of this invention, including the best method of performing it known to us.
"FAUCET FLUID COMPRESSION VALVE"

BACKGROUND OF THE INVENTION

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 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 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.

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.

SUMMARY OF THE INVENTION

According to the present invention, there is provided a tap washer having a seal for sealing against a valve seat of a tap and a stem which locates 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 an axially aligned opening therein which extends substantially from one side thereof to the other, which dome-shaped end is dimensioned for snug location within a valve seat.

Suitably, the dome shaped portion has a smaller base than the end of the 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.
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.

Preferably, one or more compression grooves are located on the perimeter of the plug to assist in the shedding of compressive forces when downward pressure is applied to 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.

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.

In a further modification, the cap may have an associated resilient pad on its upper surface which acts as an intermediary between the cap and the tap spindle for the purpose of preventing the possibility of any fluid hammer occurring in the tap. Such a pad may be formed separate from or integrally with the cap.

The cap and stem with which the resiliently deformable plug are associated locate within the tap 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 press against the lower inner wall of the tap seat.

The effectiveness of the seal is achieved 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 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 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.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A tap washer having a seal for sealing against a valve seat of a tap and a stem which locates 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 an axially aligned opening therein which extends substantially from one side thereof to the other, which dome-shaped end is dimensioned for snug location within a valve seat.

2. A tap washer as claimed in claim 1 wherein the dome-shaped end has a smaller diameter than the diameter of the cylinder so as to produce a uniform ledge around the end of the cylinder.

3. A tap washer as claimed in claim 1 or claim 2 wherein a compression groove is formed on the perimeter of the cylindrical plug.

4. A tap washer as claimed in any one of the preceding claims and wherein a rolled flange is formed around the opening of the recess.

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

8. A tap washer as claimed in any one of the preceding claims and including a rigid cap fitted thereto from which projects a rigid stem.

9. A tap washer with rigid cap and stem,
substantially as herein described with reference to the accompanying drawings.

Dated this 8th day of September 1997
CAMBRI PTY. LTD.
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By their Patent Attorneys
CULLEN & CO.
ABSTRACT

A tap washer comprising a plug (10) manufactured from a resiliently deformable material such as rubber composite, has a domed end portion (14) with a recess (16). The washer is connected to a rigid disc (11) which has an integrally formed stem (12). The washer forms a three way seal on the tap seat (31) when the tap is in the closed position.