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Queensland, Australia

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"QUARTER TURN TAP"

The present invention relates to tapware and, in particular to restricted turn tapware.

Conventional tapware requires that the handle and its accompanying
5 spindle be rotated through several revolutions to enable the threaded
handle spindle to longitudinally move to a degree sufficient to open or
close the valve structure of the tap. The degree of longitudinal rotation
depends upon the pitch of the threaded engagement between the handle
spindle and the valve body. In some circumstances, the need to rotate the
10 handle through several revolutions between full on and full off flow can be
a disadvantage, particularly in public lavatories, and like public places,
where members of the general public may be reluctant to, or simply lazy
enough not to, turn a tap fully off. As a consequence, a very substantial
volume of water can be wasted and this must be paid for by the authority
15 providing the public convenience.

Quarter turn taps are known which utilize ceramic discs as the valve
opening and closing mechanism. Such ceramic disc taps are relatively
expensive and suffer from a number of other operational disadvantages. In
particular, they can sometimes lock up especially with high water pressures
20 and are also subject to problems with grit or dirt being present in the
water. Furthermore, often the maximum flow rate obtainable with the
quarter turn tap utilizing a ceramic disc is substantially reduced relative
to the flow rate of a conventional tap.

It has also been previously proposed to convert a conventional tap
25 into a quarter turn tap simply by restricting the spindle to only a quarter
turn by means of two bosses or like projections. This arrangement suffers
from a number of disadvantages. In particular, the flow is substantially
restricted because the valve washer is not lifted well clear of the valve
seat in the maximum flow position. Furthermore, no allowance is made for
30 wear of the valve washer and thus the movement permitted by the restricted
quarter turn may not be sufficient to closingly seal a worn valve washer
against the valve seat.

It is an object of the present invention to substantially overcome,
or ameliorate, the abovementioned disadvantages by the provision of a
35 reduced turn valve which preferably takes the form of a quarter turn water
tap.

According to one aspect of the present invention there is disclosed a reduced turn valve for use with fluid taps, said valve comprising a valve body, a handle spindle mounted for threaded rotation relative to said valve body, and a valve carrier slidably mounted within said valve body and shaped to receive a valve closure member, wherein at least one of said handle spindle and said valve carrier is provided with a cammed surface whereby rotation of said handle spindle through only a fraction of a turn results in substantial longitudinal movement of said valve carrier relative to said valve body. Preferably both the handle spindle and the valve carrier are cammed in opposite, or complementary senses. In addition, the cam surfaces are preferably provided with steps which restrict the permissible turning arc of the handle spindle.

Two embodiments of the present invention will now be described with reference to the drawings in which:

Fig. 1 is an exploded perspective view of a simplified quarter turn tap construction in accordance with a first embodiment of the present invention,

Fig. 2 is a longitudinal cross sectional view through the tap of Fig. 1 illustrating the closed position,

Fig. 3 is a view similar to Fig. 2 but illustrating the tap open position, and

Figs. 4-6 are identical to those of Figs. 1-3 but illustrating a second, preferred, embodiment.

As seen in Figs. 1-3, the quarter turn tap of a simple embodiment of the present invention is made up from a substantially conventional valve body 1, which is able to be threadably engaged with a spindle 3. The spindle 3 at its upper end carries splines 4 which engage with a tap handle (not illustrated).

At the lower end of the spindle 3 is located a generally cylindrical body 5 which is cut at an angle of approximately 70° relative to the longitudinal axis of the spindle 4 in order to form an upper camming surface 6 which is elliptical when viewed in plan. The cylindrical body 5 rotates with the spindle 3 and carries an O-ring 7 which seals the spindle relative to the valve body 1.

Also located within the valve body 1 is a valve carrier 8 which has a central aperture 9 and a longitudinally extending slot 10. The valve

carrier 8 is also of generally cylindrical configuration but has a lower surface 11 square to the carrier's longitudinal axis. The carrier 8 also has an inclined surface 12 which forms a lower camming surface and which, like the surface 6, is preferably inclined at an angle of approximately 70° to the longitudinal axis of the spindle 3 and forms an ellipse when viewed in plan.

The valve carrier 8 is able to slide within the valve body 1 but is prevented from rotation about the longitudinal axis of the spindle 3 by means of engagement of a pin 13 with the slot 10.

10 A conventional T-shaped tap washer 15 has its shaft 16 carried in the central aperture 9. The tap washer 15 is able to rotate relative to the valve carrier 8. A washer 17 which seals the valve body 1 against the conventional tap valve seat (not illustrated) completes the arrangement.

15 It will be apparent to those skilled in the art that the cylindrical body 5 and valve carrier 8 are notionally formed by cutting the conventional arrangement into two along a plane inclined at an angle of approximately 70° to the longitudinal axis of the spindle 3. The rotation of the spindle 3 can be restricted to only a quarter turn by any convenient means such as a protruding lug and a pair of cooperating bosses (not 20 illustrated).

The operation of the tap construction of the first embodiment will now be described with reference to Figs. 2 and 3. As seen in Fig. 3, the valve is shown in a maximum flow position. In this position water pressure acting against the tap washer 15 forces the valve carrier 8 to slide 25 upwardly into the valve body 1. The upper and lower camming surfaces 6, 12 are in contact but the orientation of the spindle 3 relative to the valve carrier 8 permits the valve carrier 8 to slide into the valve body 1 to a maximum extent.

If now the spindle 3 is turned, the lower most portion of the upper 30 camming surface 6 moves around the inclined surface 12 thereby forcing the valve carrier 8 downwardly as seen in Fig. 2 until, preferably, the maximum permitted movement of the pin 13 within the slot 10 is approached. Prior to reaching this maximum permitted longitudinal movement of the valve carrier 8 the tap washer 15 comes up hard against the conventional seat 35 (not illustrated) to close the tap.

It will be apparent to those skilled in the art that the camming

surfaces 6, 12 convert a quarter turn rotational movement of the spindle 3 into a very substantial longitudinal movement of the valve carrier 8. The same degree of longitudinal movement of the equivalent item of the conventional tap construction would only be achieved as a result of rotation of the spindle 3 through several revolutions.

A second embodiment of the present invention will now be described with reference to Figs. 4-6 in which the arrangement is substantially as before, save that there is a modification to the upper and lower camming surfaces 6, 12. As best seen in Fig. 4, the lower camming surface is not formed as a plane but rather is formed as a spiral 112 having a small step 113. The upper camming surface 106 is likewise formed with a similar step 107.

As seen in Figs. 5 and 6, the spirals 106 and 112 function in relation to the general opening and closing of the tap by converting rotational movement of the spindle 3 into longitudinal movement of the valve carrier 8 is as before. However, it will be appreciated that in moving from closed position illustrated in Fig. 5 into the maximum flow position illustrated in Fig. 6, the steps 107 and 113 abut each other thereby preventing further turning in the tap opening direction. This restricts the degree of rotation of the spindle 3 in that direction.

During tap closing, that is moving from the position illustrated in Fig. 6 into the position illustrated in Fig. 5, the longitudinal movement of the valve carrier 8, and hence the rotational movement of the spindle 3, is restricted only by the abutment of the washer 15 against the valve seat (not illustrated). As a consequence, any slight wear in the washer 15 is automatically compensated for by allowing further rotation of the spindle 3.

Experiments conducted to date using a water supply having a pressure of 200kpa (30psi) showed a flow rate of 28-29 litres/minute for a conventional tap requiring several turns to move between the tap closed and tap fully opened positions. When the same style of tap was modified in accordance with the present invention a maximum flow rate of 27 litres/minute was achieved with the same supply. This compares very favourably with conventional ceramic quarter turn taps which are only able to achieve maximum flow rates in the range of from 9 to 15 litres/minute for supplies of that order of pressure.

It will be apparent to those skilled in the art that the above described arrangement provides for a number of very substantial advantages. Firstly, the construction of the tap body is entirely conventional and thus of low cost. Furthermore, the production of the
5 spindle 3 with its cylindrical body 5 and the valve carrier 8 are not unduly difficult and therefore are not expected to increase the production cost of the tap to any significant degree. Finally, low cost conventional tap washers 15 are able to be used again reducing the cost of the total
10 arrangement and not providing any difficulties in relation to the provision of spare parts. Clearly, the major advantage to be obtained is that the tap is able to be opened between fully closed and fully on within approximately a quarter of a turn and that the full flow rate able to be achieved by a conventional tap set is also able to be achieved by the quarter turn tap.

15 The foregoing describes only two embodiments of the present invention and modifications, obvious to those skilled in the art, can be made thereto without departing from the scope of the present invention. For example, the slot 10 can be provided either with the configuration illustrated in Figs. 1-3, or with the configuration illustrated in Figs. 4-6.



CLAIMS:

1. A reduced turn valve for use with fluid taps, said valve comprising a valve body (1), and a handle spindle (3) mounted for threaded rotation relative to said valve body (1), characterised in that a valve carrier (8) is slidably mounted within said valve body (1) and shaped to receive a valve closure member (15), wherein at least one of said handle spindle (3) and said valve carrier (8) is provided with a cammed surface (6,12) whereby rotation of said handle spindle (3) through only a fraction of a turn results in substantial longitudinal movement of said valve carrier (8) relative to said valve body (1).

2. A valve as claimed in claim 1, characterised in that both said handle spindle (3) and said valve carrier (8) include cam surfaces (6,12) which complement each other.

3. A valve as claimed in claim 2, characterised in that said cam surfaces (106,112) are provided with steps (107,113) which restrict a permissible turning arc of said handle spindle (3).

4. A valve as claimed in claim 1, 2 or 3, characterised in that said valve further comprises means (13,10) for preventing rotation of said valve carrier about the longitudinal axis thereof.

5. A valve as claimed in claim 4, characterised in that said means for preventing rotation comprises a longitudinally extending slot (10) in said valve carrier (8) and a pin (13) transversely mounted in said valve body (1) and extending into said slot (10).

6. A valve as claimed in claim 5, characterised in that said slot (10) extends the length of said valve carrier (8).

7. A valve as claimed in claim 5, characterised in that said slot (10) ends in an abutment surface at a location adjacent said cammed surface(s) (12).

8. A valve as claimed in any one of the preceding claims, characterised in that said valve carrier (8) includes a central aperture (9) adapted to receive a shaft (16) of said valve closure member (15).

9. A tap including a reduced turn valve as claimed in any one of the preceding claims.

QUARTER TURN TAP

ABSTRACT

5 A valve for use with a fluid tap is disclosed having a valve body (1), a handle spindle (3) which is termed to open and close a valve closure member (15). A valve carrier (8) is slidably mounted within the valve body (1) and includes an aperture (9) which receives a shaft (16) of the valve closure member (15). At least one of the handle spindle (3) and/or the valve carrier (8) is provided with a cammed surface (6,12) such that rotation of the handle spindle (3) through only fraction of a turn results in substantial longitudinal movement of the valve carrier (8), and subsequently, the valve closure member (15), relative to the valve body (1).

Fig. 2

FIG. 1

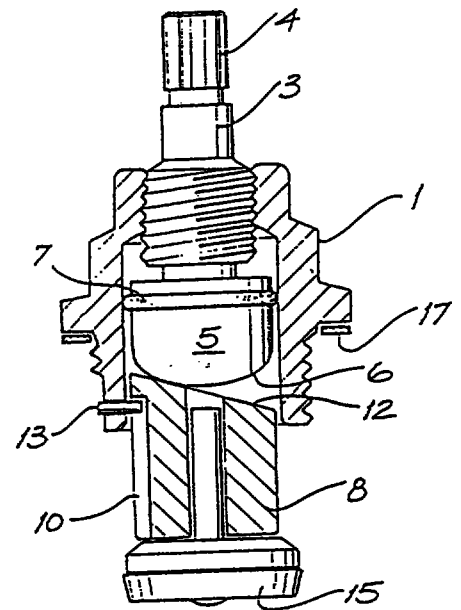
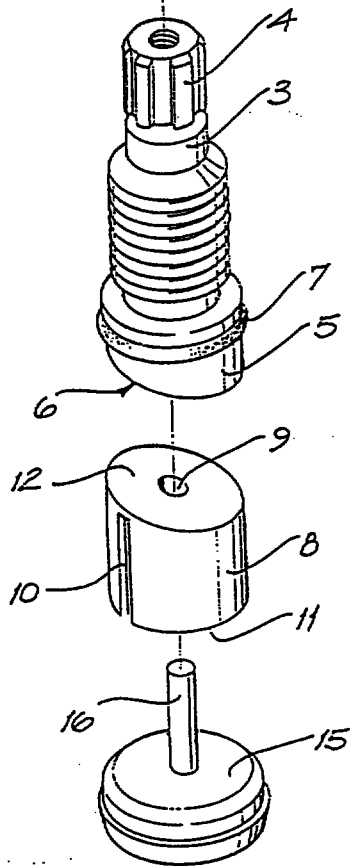
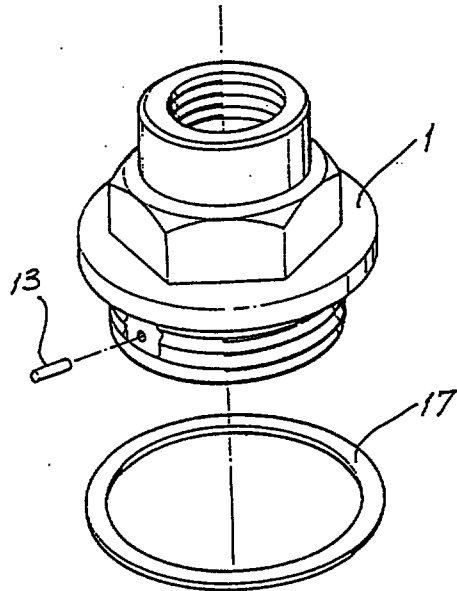


FIG. 2

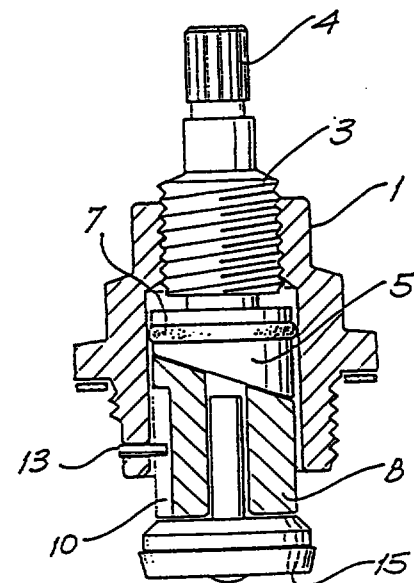


FIG. 3

FIG. 4

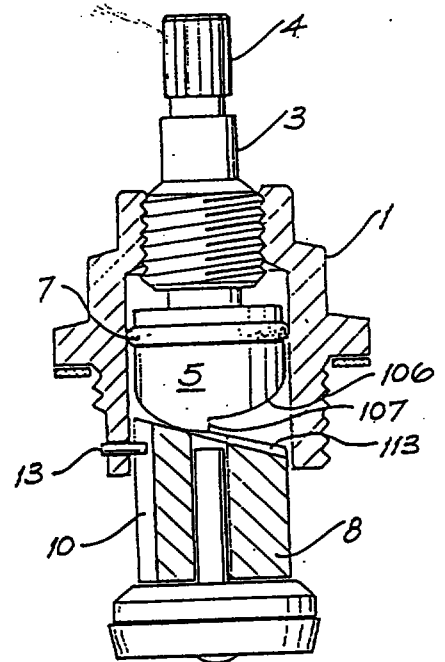
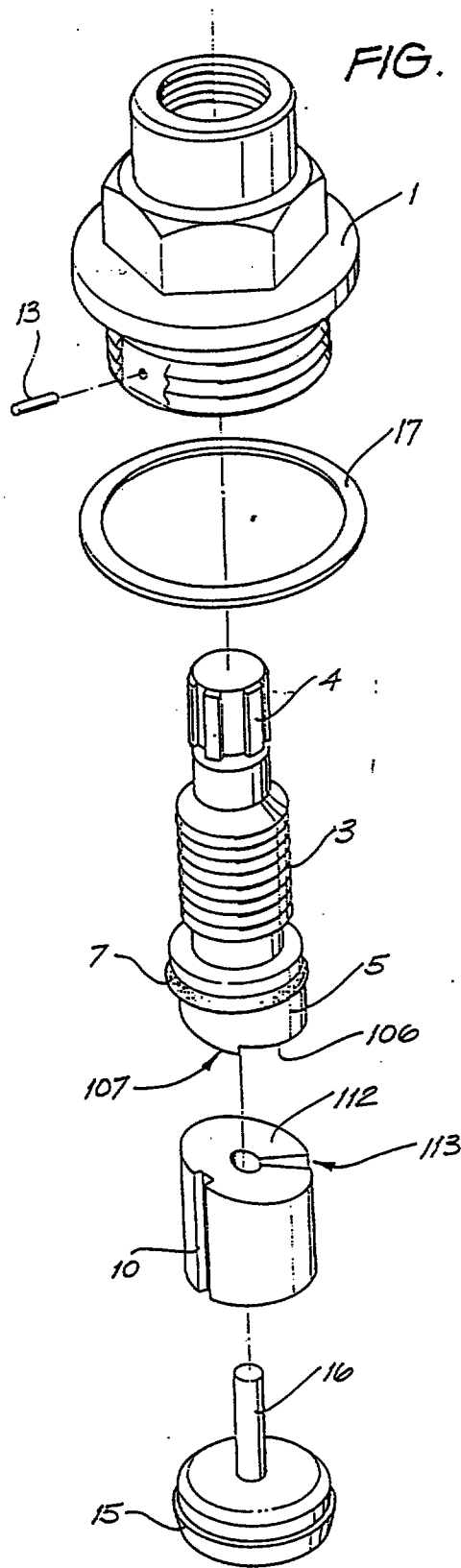


FIG. 5

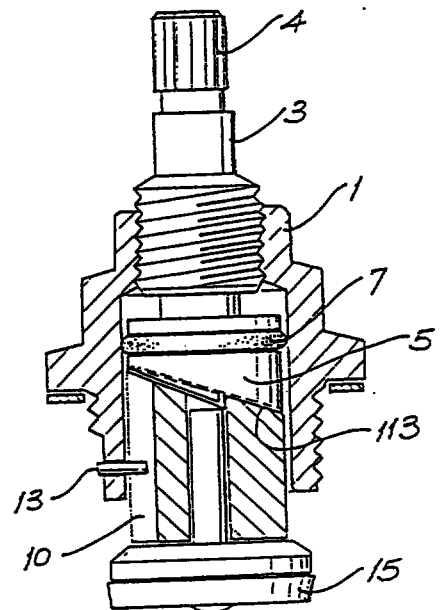


FIG. 6