Oct. 5, 1965 P. C. SYMMONS 3,210,013

SHOWER HEAD

Filed Sept. 19, 1963

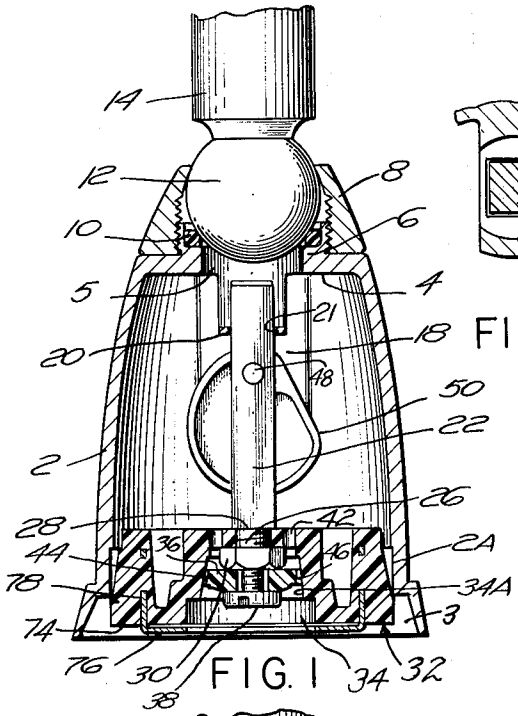


FIG. 1

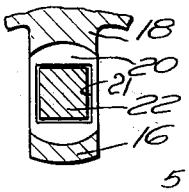


FIG. 3

FIG. 2

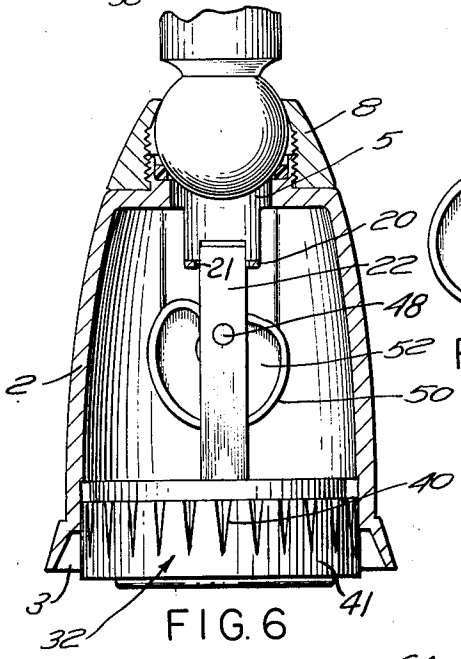


FIG. 6

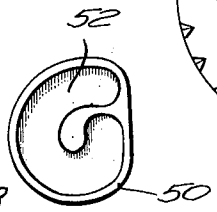


FIG. 4

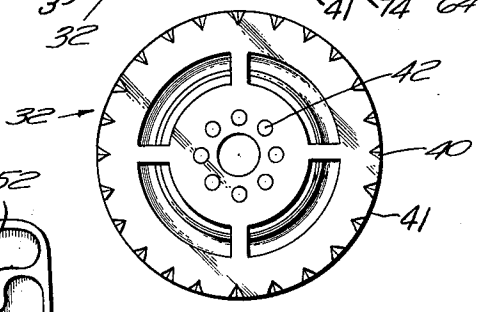


FIG. 5

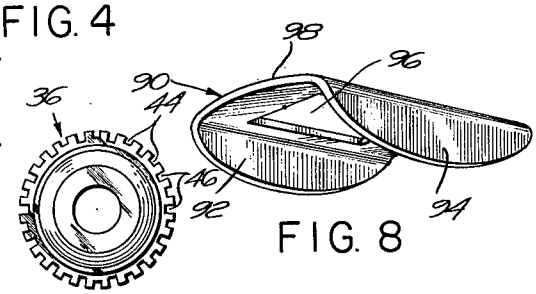


FIG. 8

FIG. 9

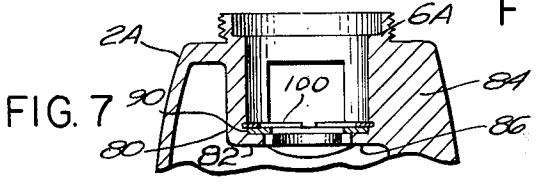


FIG. 7

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United States Patent Office

3,210,013
Patented Oct. 5, 1965

3,210,013

SHOWER HEAD

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Filed Sept. 19, 1963, Ser. No. 309,944
5 Claims. (Cl. 239—460)

The present invention relates to shower heads and more particularly to an improved shower head whose output is easily adjustable.

The primary object of the present invention is to provide a shower head having improved means for adjusting the pattern and also the intensity of the spray output. Heretofore, various types of adjustable shower heads have been available but they have not been wholly satisfactory because of failure to comply with the following requirements: (1) readily accessible means for adjusting the spray pattern without the need to use a tool such as a screwdriver or wrench; (2) comparable ease of operating under varying water pressures; (3) good resolution in spray pattern adjustment; (4) lack of creep of shower head adjustment under varying water pressures so that a selected spray pattern will remain unchanged; (5) ease in disassembling parts to clean out dirt-clogged orifices; (6) compactness; (7) competitive in cost; and (8) attractive design.

Accordingly, another important object of the present invention is to provide a shower head having easily operated manual means for adjusting the spray pattern, the manually operated means being so constructed as not to creep when set in a selected position and also to provide substantially smooth even motion of the spray defining element so as to permit a broad selection of spray patterns from coarse to fine and vice-versa.

Still another specific object of the invention is to provide a shower head construction which does not easily clog with dirt and, which, in the event that it does become clogged, can be disassembled readily without damage to the shower head.

A further specific object of the present invention is to provide an easily adjustable shower head having a rugged, yet simple construction and which embodies a spray-defining valve member which is adapted to provide stable spray control over a broad range of water temperatures.

Other objects and advantages of the present invention will become more readily apparent as reference is had to the accompanying drawing wherein:

FIG. 1 is a longitudinal sectional view of a preferred form of shower head embodying the present invention;

FIG. 2 is a longitudinal sectional view of the same shower head taken at right angles to the view of FIG. 1;

FIG. 3 is a sectional view taken along 3—3 of FIG. 2;

FIG. 4 is a front view of a cam element embodied in the shower head of FIG. 1;

FIG. 5 is a top end view of a valve member embodied in the construction of FIG. 1;

FIG. 6 is a view similar to FIG. 1 but showing the valve member in an extended position;

FIG. 7 is a fragmentary view similar to FIG. 2 of a second form of the invention;

FIG. 8 is an enlarged perspective view of an element embodied in the construction of FIG. 7; and

FIG. 9 is a bottom view of a plastic spray member embodied in the illustrated embodiments of the shower head.

Turning now to FIGS. 1 to 3, the preferred form of the invention comprises a metal bell-shaped shower head body **2** having an enlarged opening **3** at its bottom end. It also has an end wall **4** at its top end provided with a center hole **5** surrounded by a reduced diameter neck section **6** which is threaded to receive a nut **8**. The neck **6** is provided with an O ring **10** against which a ball element **12** is held by the nut **8**. The ball **12** is formed on

the end of a pipe **14** which is adapted to be connected to a water supply line (not shown) leading to a hot and cold water supply. In this connetion it is to be observed that the ball **12** is hollow and is provided with a hole at its bottom (not visible in the drawings) whereby water may pass from the pipe **14** into the shower head body. The nut **8** retains the ball against the O ring **10**, causing the latter not only to act as a seal preventing water from passing up between the nut and the ball element, but also acting as a frictional grip on the ball **12** so that the shower head will be retained in a selected angular position. In this connection it is to be observed that the inner surface of nut **8** is smooth at the top so as to provide a bearing portion that facilitates angular adjustment of the shower head relative to the pipe **14**.

Formed integral with the end wall **4** is a depending portion **16**. A similar portion **18** is formed integral with end wall **4** and also the side wall of body **2**. These portions are bridged by a thin plate **20** formed integrally therewith. The plate **20** is centrally located with respect to the body **2** and also extends at a right angle to the longitudinal axis of said body. It is provided with a substantially rectangular aperture **21** in which is reciprocally mounted one end of an elongated rod **22** of rectangular cross-sections. The surfaces defining aperture **21** cooperate with the surfaces of rod **22** to prevent the rod from rotating on its longitudinal axis. As used herein, the term "rectangular" is intended to include a square configuration, which is the precise configuration shown in the drawings. The opposite end of bar **22** has a turned end portion **26** of circular cross-section so as to form a shoulder **28**. The turned end portion is threaded to receive a nut **30**.

Fitting on the end portion **26** and held against the shoulder **28** by the nut **30** is a plastic valve member identified generally as **32**. This valve member has a central aperture for the threaded end portion **26** and a double counterbore **34** to accommodate the nut **30** and a circular plastic fixed spray member **36** which is held in place by a screw **38** received in a tapped hole provided in the end of rod **22**. Details of spray member **36** are described hereinafter.

The total spray pattern is formed by (1) valve member **32** acting in concert with the surrounding cylindrical surface **2A** of body **2** and (2) spray member **36** acting in concert with a tapered inner surface **34A** formed by the double counterbore **34**. In connection with the former it is to be noted that the valve member is provided with a series of identical axially extending grooves **40** on its outer or peripheral surface **41** which lies close against the cylindrical surface **2A**. Grooves **40** are essentially V-shaped in cross-section but are tapered with their widest ends at the top and their narrowest ends at the bottom. In practice, these grooves come to a point, as seen best in FIGS. 2 and 6. Accordingly, the effective cross-sectional area of the passages defined by grooves **40** and surface **2A** will vary according to the position of the valve member **32** relative to surface **2A**. In other words the volume of water discharged and the shape and intensity of the spray pattern formed by grooves **40** will depend upon the position of valve member **32**, decreasing in volume and intensity as the valve member is withdrawn and varying oppositely as it is extended. In the illustrated embodiment, when the valve member is withdrawn into the body **2** to the position shown in FIGS. 1 and 2, the narrow bottom ends of the grooves **40** will project slightly below the body **2** so that only little thin streams or jets of water are discharged, these thin streams or jets forming a soft and fine spray with a relatively wide pattern. On the other hand, when the valve member is extended to its outermost position such as the position shown in FIG. 6, then large streams of water will be discharged via grooves **40**, these large streams forming a heavy and coarse spray with a

somewhat narrower pattern. Of course, the spray will vary with intermediate positions of the valve member within the body 2, decreasing in intensity as it is withdrawn and increasing as it is extended.

In connection with spray member 36, it is to be observed that it is interposed in the path of water flowing out of the interior of body 2 via a series of holes 42 arranged in a circular array about the center of valve member 32. The water discharged by holes 42 is converted into two discrete fine spray patterns. This is achieved by two series of alternately occurring slots 44 and 46 of substantially U-shaped cross-section formed in the outer surface of spray member 36 which is tapered to fit snugly against the tapered surface 34A. Screw 38 is tightened so as to substantially prevent any passing of water between the spray member and tapered surface 34A except via slots 44 and 46. Slots 44 are formed with their bottom walls extending parallel to the tapered exterior surface of spray member 36, that is, the cross-section of each slot 44 is constant throughout its length. On the other hand, slots 46 are formed with their bottom walls extending parallel to the center axis of spray member 36, that is, the cross-section of each slot 46 increases along its length and is greatest at its discharge end. The water passing through slots 44 and 46 tends to be concentrated at and flow parallel to the bottoms of the slots. As a consequence, slots 44 and 46 create two discrete conical spray patterns, the water discharged from slots 44 forming a spray pattern which is slightly larger than and, therefore, surrounds the spray pattern formed by slots 46. Thus the total spray pattern produced by the shower head comprises three concentric conical spray patterns, the outer one of which is adjustable in volume and coarseness by adjustment of the position of valve member 32.

The means for positioning the valve member 32 comprises a cam follower in the form of a pin 48 which is secured to the rod 22 and projects laterally therefrom, and a rotatable cam member 50. The latter is formed of metal and has a spiral groove 52 in one face thereof in which rides the pin 48. The cam member 50 is provided on its rear side wtih a shaft extension or spindle 56 that extends through a side opening 57 formed in a thickened portion 58 of the body 2. The shaft extension has a peripheral groove to accommodate an O ring 60 and also has a tapered end portion provided with a tapped hole to receive a screw 62 that operates to hold in place a handle 64. The cam member 50 is provided with a shoulder portion 66 which abuts the thickened portion 58 of the wall of the body 2. The handle 64 is provided with an extension 70 that fits in a counterbore 72 formed in the body 2 and cooperates with the shoulder 66 to prevent the cam member 60 from moving to the left or to the right (as seen in FIG. 2) while leaving it free to rotate.

The groove 52 formed in the face of the cam member 50 has a spiral shape adapted to apply a camming force to pin 48 so rod 22 will move up and down with a linear motion when handle 64 is rotated. Because of the shape of groove 52, rotation of handle 64 will cause the valve member to move up or down, as the case may be, smoothly and without any hesitation or jerks. Thus, the operator can adjust the valve with almost infinite resolution so that any desired spray pattern can be easily selected within the limits determined by the length of groove 52. As is apparent from FIG. 4, groove 52 extends through an angle greater than 180 degrees.

What is even more important is the fact that the cam member functions to lock rod 22 (and thus, the valve member 32) in any selected position so that it will not creep. In this connection it is to be observed that the rotary to reciprocal motion translation afforded by the cam member 50 and its follower pin 48 is unidirectional. In other words, they provide rotary to linear motion translation to move valve member 32 by operation of handle 64, but will not provide linear to rotary motion translation to rotate the cam member by force applied to the valve member. Thus, any change in water pressure will not cause the valve member to change its position, even when the change in water pressure may be abrupt or substantial. In addition to being free from creep, the illustrated arrangement provides good mechanical advantage so that the amount of force required to turn the handle 64 to adjust the valve member 32 is relatively small under all conditions of water pressure normally incurred and regardless of whether the valve member is being extended or retracted.

FIGS. 1–3 show still another feature of the invention. As seen best in FIG. 1, attached to the bottom or outer end face 74 of the valve member 32 is a metal retaining member 76 in the form of an annular ring having a cylindrical peripheral flange 78. The flange 78 is embedded in the valve member. The retaining member 76 functions as an ornamental face plate for the valve member 32 as well as providing strength to minimize radial expansion and contraction of the valve member 32. This is an important feature of the invention since the valve member will have a tendency to expand or contract with variations in water temperature. The expansion will occur with increased water temperature and the contraction will occur with decreased water temperature. Without plate 76, if the valve member is made so as to just fit within the body 2 when at room temperature, then when it is subjected to hot water it will expand tightly against the body 2 and will "freeze," i.e., it will be stuck and movement thereof will be made only with difficulty. On the other hand, if the valve member is made so that there is sufficient clearance between it and the metal body 2 when subjected to hot water, then at cold or luke warm water temperature the spacing between the valve member and the surrounding body 2 will be excessively great and the valve member will be unable to provide a fine spray pattern via the grooves 52. The plate 76 prevents wide excursions of valve member size due to changes in water temperature so that the valve member can be designed to make a close sliding fit within the body 2 to give optimum spray control.

Another important feature of the invention is the use of Delrin [1] plastic for making the valve member 32. Delrin is especially useful in this respect since it combines two excellent qualities: (1) a low temperature coefficient of expansion and (2) a low affinity for picking up dirt particles. The former characteristic is important since it augments the metal plate 76 so that the latter is required to oppose smaller degrees of contraction and expansion than would be the case if a plastic with a higher temperature coefficient of expansion were used. The latter characteristic is noteworthy because it helps prevent the shower head from clogging rapidly due to dirt in the water supply.

FIGS. 7 and 8 relate to a modified form of the invention. In this case the bell shaped body 2A is the same as the body 2 shown in FIGS. 1 and 2 except for the means for slidably supporting the elongated rod 22. In this case the body 2A has a depending portion 80 which has a round inner surface and an internal flange 82 which has two straight side edges and a curved inner edge. At 84 diametrically opposite the depending portion 82 of the wall of the body 2A has an increased thickness with a curved inner surface and a flange 86 corresponding to that of portion 80. The edges of flanges 82 and 86 are spaced apart a distance more than sufficient to accommodate the elongated rod 22. Flanges 82 and 86 act to support a removable collar member identified generally at 90. As seen in FIG. 8, collar member 90 is essentially a circular washer which is bent at diametrically opposed areas to form a pair of depending parallel ears 92 and 94. It also has a rectangular central

[1] Registered trademark for acetal resins.

aperture **96** to slidably receive the rod **22**. Collar member **90** fits on top of flanges **82** and **86** with its ears **92** and **94** disposed along the opposite side edges of the flanges to prevent it from shifting laterally in one direction. Lateral movement in the other direction is prevented by engagement of its two curved edge portions **98** with the curved inner surfaces of depending portion **80** and the thickened portion **84** of the body wall. The collar member is held in place by a snap ring **100** which is snapped into like grooves formed in the curved inner surfaces of the portions **80** and **84**.

The embodiment of FIGS. 7 and 8 offers the advantage of being able to remove the rod **22** from the body without first detaching the valve member, this being possible by first taking out the snap ring **100** which frees the collar member **90**. When the latter is removed, the rod **22** can be moved laterally free of the cam member. However, the embodiment of FIGS. 1–5 still is to be preferred since it is capable of relatively easy disassembly and additionally it offers the advantage of incorporating fewer parts. The entire body **2** is cast as one piece and only a little machining is required to achieve the specific body construction shown in FIGS. 1–3.

Obviously, many other modifications and variations of the present invention are possible in the light of the foregoing teachings. Thus the valve member may be designed so that when it is withdrawn to its innermost position (FIG. 1), the tapered slots **40** will be above the bottom edge of cylindrical surface **2A** by an amount sufficient to substantially prevent discharge of water therethrough, whereby the total spray pattern will consist of only two concentric sprays—the ones provided by slots **44** and **46** of spray member **36**. It is to be understood, therefore, that the invention is not limited in its application to the details of construction and arrangement of parts specifically described or illustrated, and that within the scope of the appended claims, it may be practiced otherwise than as specifically described or illustrated.

What is claimed is:

1. A shower head comprising a metallic body of bell-shaped construction, means at the smaller end of said bell-shaped body providing a connection to a supply pipe, an elongated member within said body, said elongated member disposed along the axis of said body, a valve member attached to one end of said elongated member and substantially fully occupying the larger end of said body, said valve member having an outer end face and a peripheral surface, said peripheral surface having a series of tapered grooves cooperating with said body to define a series of passageways whose effective cross-section is a function of the position of said valve member within said body, said valve being provided with a coaxial metal retaining member, said metal retaining member including a first cylindrical portion and a second annular portion, said first cylindrical portion coaxially embedded in said valve member and said second annular portion overlying said outer end face and forming an ornamental face plate for said valve member, guide means within said body supporting the opposite end of said elongated member for reciprocal motion within said body along said axis, whereby said elongated member and said valve member can move in and out to adjust the effective size of said passageways, said guide means and said elongated member having cooperating means for preventing rotation of said elongated member on its longitudinal axis, a cam follower projecting from one side of said elongated member, a cam having a spiral cam groove, said cam disposed within said body with said cam follower extending into said groove, a spindle rotatably disposed in the side of said body, said cam secured to said spindle whereby said cam will rotate with said spindle, said cam surface shaped to force said follower to cause said elongated member to move in a straight line along the axis of said body when said spindle and cam are rotated, and a handle on the outer end of said spindle whereby to permit manual adjustment of the position of said valve member by way of said cam and cam follower.

2. A shower head comprising a hollow body provided with means at one end for making a connection to a water supply pipe, said body having an enlarged opening at the end opposite said connection, an elongated member within said body, guide means attached to said body slidably supporting one end of said elongated member for reciprocal movement along its own longitudinal axis within said body, said guide means and said elongated member having cooperating means for preventing rotation of said elongated member on its own longitudinal axis, the other end of said elongated member having an exteriorly threaded portion, a valve member mounted on said other end of said elongated member and secured thereto by a nut screwed onto said exteriorly threaded portion, said valve member substantially fully occupying said enlarged body opening, said valve member having a peripheral surface and an outer end face, said peripheral surface having a series of tapered grooves cooperating with said body to define a first series of water passageways whose effective cross-section is a function of the position of said valve member within said body, a plurality of holes formed in said valve member in radial spaced relation to said elongated member, a coaxial bore in said outer end face of said valve member, said plurality of holes connecting said coaxial bore with the interior of said body, a spray member disposed in said bore and secured to said elongated member, said spray member having a plurality of slots in its periphery which cooperate with the surrounding portion of said valve member to define a second series of water passageways of fixed cross-section, a pin projecting from said elongated member at a right angle thereto, a cam member disposed within said body, said cam having a spiral groove in one face thereof and a spindle projecting at a right angle from an opposite face thereof, said spindle rotatably mounted in the wall of said body at a right angle to said elongated member, and a handle on the outside of said body releasably secured to said spindle, said pin riding in said spiral groove to cause reciprocal movement of said elongated member as said cam is rotated by said handle, whereby when said elongated member moves to an extended position the passageways of said first series will have maximum size and when said elongated member is withdrawn the passageways of said first series will have minimum size.

3. A shower head comprising a body provided with means for making a connection to a water supply pipe, said body having an enlarged opening at the end opposite said connection, an elongated member within said body, said elongated member capable of reciprocal axial movement within said body, guide means cooperating with said elongated member to prevent it from rotating on its longitudinal axis, said guide means comprising a collar member having a polygonal opening and also a snap ring for releasably securing said collar member to the interior of said body, said elongated member slidable within said collar member and having a portion whose exterior shape is adapted to cooperate with said polygonal opening to prevent rotation thereof on said longitudinal axis, a vlave member disposed in said enlarged opening and attached to one end of said elongated member, said valve member having a plurality of tapered grooves in its peripheral surface, said tapered grooves cooperating with the surrounding portion of said body to provide passageways through which water can pass to form a fine spray, a cam follower pin affixed to and projecting from said elongated member, a spindle rotatably mounted in said body at a right angle to said elongated member, a handle outside of said body affixed to said spindle, and a cam on said spindle within said body, said cam having a spiral groove extending about the axis of said spindle, said cam follower pin disposed in said spiral groove and influenced thereby

to cause reciprocal movement of said elongated member as said spindle is rotated by said handle, whereby when said elongated member moves to an extended position the passageways formed by said tapered grooves and said body will have maximum size and when said elongated member is withdrawn said passageways will have minimum size.

4. A shower head comprising a hollow body provided with means for making a connection to a water supply pipe, said body having an enlarged opening at the end opposite said connection means and also a side opening, an elongated member within said body, said elongated member capable of reciprocal axial movement within said body, guide means in said body cooperating with said elongated member to prevent it from rotating on its longitudinal axis, a valve member disposed in said enlarged opening and attached to one end of said elongated member, said valve member having a plurality of tapered grooves in its peripheral surface, said tapered grooves cooperating with the surrounding portion of said body to provide passageways through which water can pass to form a fine spray, a cam follower pin affixed to and projecting laterally of said elongated member, a cam member disposed within said body, said cam member having a spiral groove in one face thereof and a spindle projecting at a right angle from an opposite face thereof, said spindle projecting into said side opening from the interior of said body and supported by said body at a right angle to said elongated member, said spindle rotatable in said side opening, said cam member having a shoulder portion which abuts the wall of said body and thereby prevents axial movement of said spindle away from said elongated member, a handle outside of said body affixed to the end of said spindle, said handle having a portion which abuts the wall of said body and thereby prevents axial movement of said spindle toward said elongated member, said spiral groove extending about the axis of said spindle through an angle greater than 180 degrees, said cam follower pin disposed in said spiral groove and influenced thereby to cause reciprocal movement of said elongated member as said spindle is rotated by said handle, whereby when said elongated member moves to an extended position the passageways formed by said tapered grooves and said body will have maximum size and when said elongated member is withdrawn into said body said passageways will have minimum size.

5. A shower head as defined by claim 4 wherein said valve member is made of plastic and has an outer end face, and further including a metal retaining member comprising a first cylindrical portion coaxially embedded in said valve member and a second annular portion overlying said outer end face and forming an ornamental face plate for said valve member.

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