March 15, 1932. J. FRASER 1,849,517

SHOWER HEAD

Filed July 9, 1930

Fig. 1

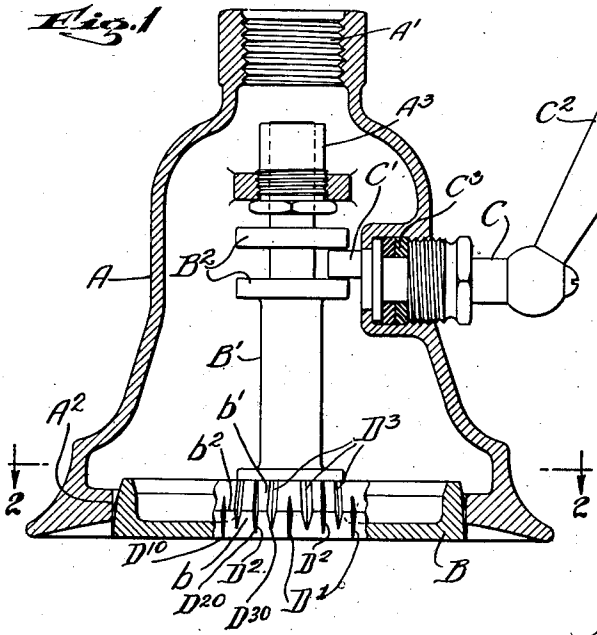



Fig. 3

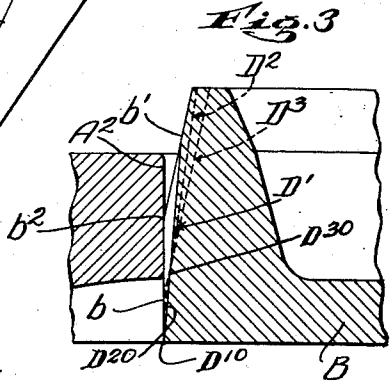



Fig. 4

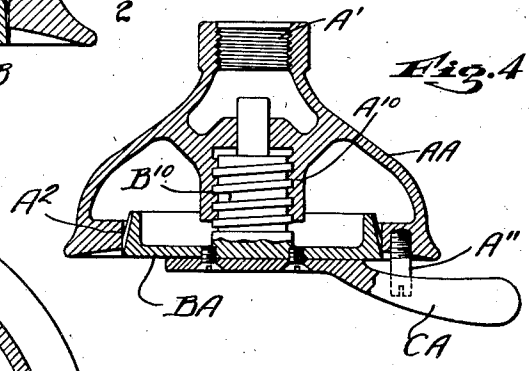



Fig. 2

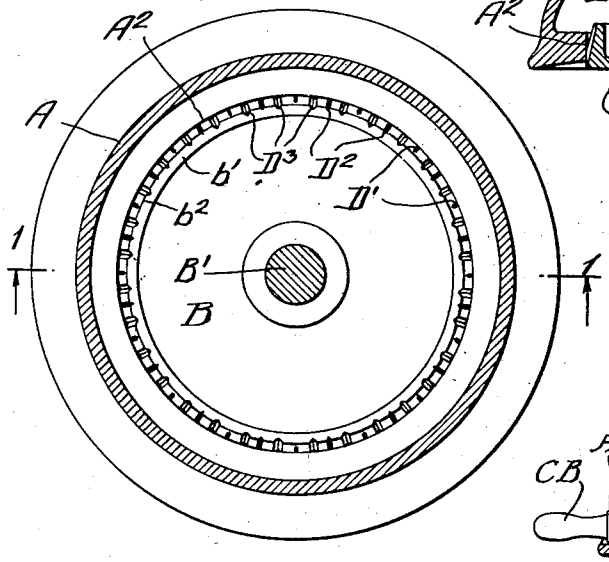
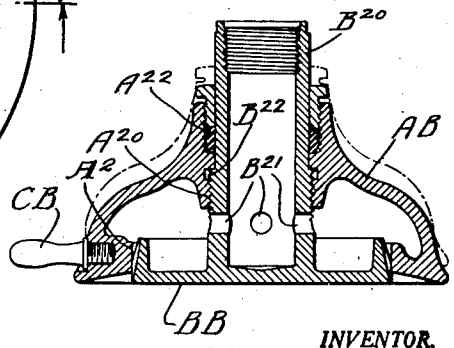



Fig. 5

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# UNITED STATES PATENT OFFICE

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## SHOWER HEAD

Application filed July 9, 1930. Serial No. 466,625.

My present invention relates to the type of shower or spray heads for shower bath use previously invented by me, and disclosed and claimed in my prior application, Serial No. 307,801, filed September 24, 1928, which was issued November 3, 1931, as Patent No. 1,830,694. The shower head constructions of my said prior application are characterized by the elimination of the previously customary multiplicity of small discharge ports of fixed diameter formed in a wall of the shower head shell or casing, and the use in lieu thereof, of a multiplicity of regulable discharge orifices or channels, each of which is formed by a groove in a flow obstructing device extending into, and axially adjustable in a shower head casing or shell opening of much greater cross sectional area than the maximum cross sectional area of an individual discharge orifice or channel. The said grooves extend axially of the flow obstructing device in which they are formed and vary in cross section along their lengths, so that axial adjustment of each such device, varies the volume and intensity of the jets discharged through its grooves, and by an extreme adjustment of each such device, the cross sectional area of the flow space through the opening into which the device extends, may be enlarged to flush out sand or other matter collecting in the shower head and tending to clog the spray channels or orifices.

The general object of the present invention is to provide a shower head construction which embodies general principles, and possesses general advantages of the shower head constructions of my said prior application, and which comprises improvements making it practically possible to increase the range of jet or spray regulation while keeping the shower head structure desirably simple. In the shower head constructions illustrated in my prior application, the various discharge grooves or channels are shown as all similar in form and in disposition relative to the shower head casing or structure, so that in general all of the jets discharged in any one adjustment of the apparatus are the same. In accordance with the present invention some of the discharge grooves or channels of each shower head differ from others in form, or in disposition, or both in form and disposition. In a preferred embodiment of the present invention, some of the grooves are inclined to the longitudinal axis of the corresponding flow obstructing device in which they are formed, at an angle different from the corresponding angle for other grooves. Also, in a preferred embodiment of the present invention, the outer ends of some of the grooves terminate in a plane transverse to the axis of the flow obstructing device which is different from the parallel plane in which the outer ends of other grooves terminate.

The use of grooves differently inclined to the axis of the flow obstructing device in which the grooves are formed, tends to increased dispersion of the individual spray jets through the space traversed by the spray jets. An arrangement of the grooves so that their outer ends terminate in different planes transverse to the axis of adjustment of the flow obstructing device in which the grooves are formed, makes it possible to vary the number of grooves actually serving as flow discharge channels at any time, by the axial adjustment of the flow obstructing device in which the grooves are formed.

In what I now regard as the preferred form of my invention, the grooves which discharge jets at the greatest angle to the axis of the flow obstructing device opening are those which are the last to be brought into use when the flow obstructing device is adjusted to progressively increase the volume of spray discharge. Such an arrangement of the differently inclined grooves tends to prevent or minimize contraction of the space traversed by the jets otherwise experienced as a result of the aspirating action of the jets and the consequent tendency to an air pressure within the said space which is somewhat less than the pressure of the atmosphere.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, and the advantages possessed by it reference should be had to the accompanying

drawings and descriptive matter in which I have illustrated and described a preferred embodiment of the invention.

Of the drawings:—

Fig. 1 is an elevation of a shower head, in section on the line 1—1 of Fig. 2;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a partial section taken similarly to Fig. 1 but on a larger scale;

Fig. 4 is a view taken similarly to Fig. 1, illustrating a modified construction; and

Fig. 5 is a view taken similarly to Fig. 1 and Fig. 4, illustrating a third construction.

In the drawings, and referring first to the construction shown in Figs. 1, 2 and 3, A represents the shell or body of a shower bath spray head of conventional bell shape, formed at its smaller and normally upper end with an inlet opening A′ which is threaded for connection to a water supply pipe. At its opposite end, the shell A is formed with an outlet opening $A^2$, which may be approximately as large in diameter as the maximum internal diameter of the shell, though advantageously the internal diameter of the shell immediately adjacent the inner end of the opening $A^2$ is slightly larger than the diameter of the outlet opening.

Extending into the opening $A^2$ from the outer end of the latter, is a flow obstructing device B, shown as comprising a disc-like body with a marginal flange and a central stem B′ at its inner side. The peripheral surface of the disc-like body and marginal flange of the device B comprises an outer cylindrical portion $b$ and an inner conical portion $b'$, the base of which merges into the cylindrical surface portion $b$ along the circumferential line $b^2$.

The flow obstructing device B is held in proper relation to the shower head casing or shell and is adjusted axially in the opening $A^2$ by guiding and adjusting means shown as comprising a guide sleeve $A^3$ carried by the shell A and in which the stem B′ is slidingly received, and a crank shaft C extending through and journalled in the side wall of the shower head shell and provided within the latter with a crank pin C′ working between transverse guide collars $B^2$ formed on the stem B′. At its outer end the shaft C carries a handle $C^2$, and the mounting for the shaft includes stuffing box provisions $C^3$ for preventing leakage out of the shell along the shaft.

The flow obstructing device B is shown as formed with three sets of longitudinally extending peripheral grooves D′, $D^2$ and $D^3$. As shown, the grooves of each set are spaced at equal intervals about the circumference of the device B. Preferably, and as shown, each of these grooves merges at its outer end into the cylindrical surface $b$ of the device B, and progressively increases in depth and width with its distance from its outer end, between the latter and the line $b^2$. As shown, the points $D^{10}$ at which the grooves D′ terminate and merge into the cylindrical surface $b$ are at the extreme outer or lower end of the latter. The points $D^{20}$ at which the grooves $D^2$ terminate and merge into the surface $b$ are located along the line of intersection with that surface of a plane transverse to the axis of the member B and located between the outer end of the member B and the line $b^2$. The outer ends of the grooves $D^3$ terminate and merge into the surface $b$ along the line of intersection with that surface of a second plane transverse to the axis of the member B and lying between the line $b^2$ and the plane in which the outer ends of the grooves $D^2$ terminate.

In consequence of the above described groove arrangement, when the flow obstructing device is so far retracted or drawn into the shower head shell, that the outer ends of the grooves D′ are at the inner side of, or are flush with the plane of the outer end of the opening $A^2$, the latter is substantially filled by the device B, and no definite spray or jet discharge can then occur. It is not necessary, however, to so carefully fit the parts that no leakage can then occur through the joint between the device B and the surrounding cylindrical wall of the opening $A^2$, since the above described retracted position of the member B, is not a normal or practically operative position.

As the flow obstructing device B is moved outward from said retracted position, a definite jet or spray discharge will commence as soon as the outer ends of the grooves D′ project significantly beyond the outer end of the opening $A^2$. As the outward adjustment of the device B is continued, the effective discharge areas of the grooves D′ and the volume of discharge therethrough, are increased, and the volume of discharge is further increased as the grooves $D^2$ and $D^3$ have their outer ends successively advanced beyond the outer end of the opening $A^2$, until finally the maximum discharge condition is attained. The last mentioned condition is attained in the intended operation of the construction shown in Figs. 1, 2 and 3, with the line $b^2$ still at the inward side of the plane of the outer end of the opening $A^2$ but in close proximity to that plane.

As shown the grooves $D^2$ are inclined at one angle, the grooves D′ are inclined at a lesser angle, and the grooves $D^3$ are inclined at a greater angle, to the axis of the flow obstructing device B. The inclination of the different grooves is plainly indicated in Fig. 3, wherein the bottom lines of the grooves D′, $D^2$ and $D^3$ are shown as they would appear if they were all actually in the plane of Fig. 3. The jet of water discharged by each groove has an initial direction of flow approximately coincident with the direction of

the bottom of the outer end portion of the groove through which the jet is discharged. The jets collectively discharged through the grooves $D^2$ thus define a hollow cone of jet discharge which surrounds and diverges away from the generally similar but smaller hollow cone of discharge formed by the jets discharged through the grooves D', and which is, itself, surrounded by the somewhat larger hollow cone of discharge defined by the jets discharged through the grooves $D^3$.

The jets exert an aspirating effect tending to create an air flow in the direction of the jets, and hence tending to maintain an air pressure within the zone or space traversed by the jets, which is slightly less than the pressure of atmosphere. In consequence, each jet is deflected towards the axis of the discharge by the pressure of the air at the outer side of the jet.

The tendency to the contraction of the cones of jet discharge thus resulting from the aspirating effect of the jets, increases with the volume of discharge. With the arrangement shown in which as the discharge is increased, jets are discharged by the grooves $D^2$ only after the discharge through the grooves D' reaches or approaches its maximum, and jets are discharged through the grooves $D^3$ only after the maximum discharge through the grooves D' and $D^2$ is reached or approximated, the progressively greater angles of the cones of discharge defined by the outer and intermediate jets tend to maintain, and may even increase, the total volume of the space traversed by the jets, as the volume of discharge is increased, notwithstanding the increasing contraction of the cones of discharge formed by the jets.

The jets are also subject to gravital deflection the nature of which depends upon whether the axis of the opening $A^2$ is vertical, or is inclined to the vertical. As those skilled in the art will understand, however, exact mathematical relations between the directions of the different jets and the disposition of the grooves through which they are discharged, is not especially desirable. Some non-uniformity or irregularity in jet direction tends to desirably augment the dispersion of the jets across the space collectively traversed by the jets.

As those skilled in the art will also understand, the proportions of the parts, and in particular, the number and angular disposition of the grooves D', $D^2$ and $D^3$, may be varied through wide limits dependent upon, the conditions of use and upon the shower head designer's ideas of the best manner in which to meet those conditions. Merely for the purpose of illustration and by way of example and not by way of limitation it is noted that in the particular shower head design illustrated in Figs. 1, 2 and 3, the diameter of the cylindrical surface *b* is approximately 2¾ inches, and there are 90 grooves D', 90 grooves $D^2$, and 90 grooves $D^3$, and the grooves D', $D^2$ and $D^3$ are inclined to the axis of the flow obstructing member B at angles of 5°, 9° and 13°, respectively.

While the use of a single discharge opening $A^2$ and a single cooperating flow obstructing device effective to secure a total jet discharge of adequate volume and suitably dispersed, tends to mechanical simplification, when conditions make it desirable the novel groove arrangement of the present invention may be employed in a shower head having a plurality of discharge outlet openings and flow obstructing devices, as do the shower head constructions illustrated in detail in my above mentioned prior application.

The axial adjustment of a flow obstructing device relative to the discharge opening into which it extends, may be effected by other means than the crank shaft C shown in Fig. 1, and in Figs. 4 and 5 I have illustrated two other arrangements for effecting such adjustment. In Fig. 4 the flow obstructing member BA, which may have its externally grooved body portion shaped exactly like that of the device B, is formed with an enlarged externally threaded stem portion $B^{10}$ which is screwed into an internally threaded socket portion $A^{10}$ of the shower head shell AA, the latter being generally like the shell A of Figs. 1, 2 and 3. When the device BA of Fig. 4 is rotated relative to the shell AA, the threaded connection between the parts produces the desired axial adjustment of the device BA in the discharge opening $A^2$. To facilitate the rotation of the device BA, the latter may well be provided with a handle or knob, and so shown a handle bar CA is secured to the outer face of the member B and projects radially therefrom. A stop $A^{11}$ shown as detachably secured to the shower head body AA, limits the normal rotative movement of the member BA to a little less than one complete turn. The pitch of the thread on the stem $B^{10}$ is steep enough to give the member BA its full normal range of axial adjustment with the turning movement normally permitted by the handle CA and the stop $A^{11}$.

In the form of construction shown in Fig. 5, the body portion of the flow obstructing device BB may be exactly like the corresponding portions of the devices BA and B. In Fig. 5, however, the stem portion $B^{20}$ of the device BB is tubular, and is threaded at its upper end for attachment to the shower head water supply pipe (not shown). The water entering the tubular stem $B^{20}$ at its upper end, passes outward into the surrounding space within the shower head shell AB through ports $B^{21}$ formed in the wall of the tubular stem. The shower head casing AB is formed with a discharge opening $A^2$ receiving the body portion of the device BB, and with a central aperture threaded at $A^{20}$

to receive an externally threaded portion $B^{21}$ of the stem $B^{20}$. In consequence of the threaded connection between the parts AB and BB, the rotation of the shower head body or shell member AB about its axis moves the member AB longitudinally of said axis between the dotted and full lines shown, thus effecting a suitable axial adjustment of the member BB relative to the wall of the outlet opening $A^2$. To facilitate such rotation of the shell part AB, the latter, as shown in Fig. 5, is provided with a radially projecting handle CB. To prevent leakage of water through the joint between the tubular stem $B^{20}$ and the wall of the opening in the casing part AB through which the stem extends, the casing is provided with stuffing box provisions conventionally illustrated at $A^{22}$.

While in accordance with the provisions of the statutes, I have illustrated and described the best form of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of my invention as set forth in the appended claims and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:—

1. In a shower bath spray head, the combination with a shower head body formed with an outlet opening, of a flow obstructing device extending into and adjustable longitudinally of said opening and formed with grooves in its surface adjacent the marginal wall of said opening, the outer ends of different ones of said grooves terminating in different planes transverse to the axis of said opening whereby the jet discharge through said grooves may be varied by axial adjustment of said device in said opening.

2. In a shower bath spray head, the combination with a shower head formed with an outlet opening, of a flow obstructing device extending into and adjustable longitudinally of said opening and formed with grooves in its surface adjacent the marginal wall of said opening, some of which are inclined to the axis of said device at an angle different from the corresponding angle for other grooves.

3. In a shower bath spray head, the combination with a shower head body formed with an outlet opening, of a flow obstructing device extending into and adjustable longitudinally of said opening and formed with grooves in its surface adjacent the marginal wall of said opening, the outer ends of different ones of said grooves terminating in different planes transverse to the axis of said opening whereby the jet discharge through said grooves may be varied by axial adjustment of said device in said opening, and the outer end portions of said grooves being inclined away from the axis of said device.

4. In a shower bath spray head, the combination with a shower head body formed with an outlet opening, of a flow obstructing device extending into and adjustable longitudinally of said opening and formed with grooves in its surface adjacent the marginal wall of said opening, the outer ends of different ones of said grooves terminating in different planes transverse to the axis of said opening whereby the jet discharge through said grooves may be varied by axial adjustment of said device in said opening, and a threaded connection between said body and device whereby their rotation effects said axial adjustment.

5. In a shower bath spray head, the combination with a shower head body formed with an outlet opening at one side and a smaller aligned opening in its opposite side, of a flow obstructing device comprising an enlarged portion normally extending into said outlet opening from the outer side of the latter and formed with a tubular stem projecting through said aligned opening and adapted to be connected to and to form a tubular extension of the shower head water supply pipe, said stem having ports through which water may flow from its interior into the space within said body, said body and device having a threaded engagement whereby rotation of said body effects axial adjustment of said portion in said outlet opening, said portion being formed with peripheral axially extending grooves, the outer ends of different ones of said grooves terminating in different planes transverse to the axis of said outlet opening whereby the jet discharge through said grooves may be varied by the axial adjustment of said device in said opening.

6. In a shower bath spray head, the combination with a shower head formed with a circular outlet opening, of a flow obstructing device comprising a cylindrical portion fitting in and adjustable axially of said opening and formed with two or more sets of grooves in its peripheral wall, each of said grooves extending in the general direction of, but having its outer end portion inclined away from said axis, the grooves of each set being distributed about said axis and having their outer end portions inclined to said axis at an angle different from the corresponding angle for each of the other sets, whereby the grooves of the different sets discharge jets of water diverging at different angles from said axis, and means for adjusting said device axially of said opening to thereby vary the jet discharge.

7. In a shower bath spray head, the combination with a shower head formed with a circular outlet opening, of a flow obstructing

device comprising a cylindrical portion extending into said opening from the outer side thereof and a conical portion at the inner end of said cylindrical portion, the large end of said conical portion being adjacent said cylindrical portion, said device being provided with two sets of peripheral grooves with each groove extending in the general direction of the axis of said device and having its outer end portion inclined away from said axis so that the outer end of the groove merges in the peripheral wall of said cylindrical portion, the grooves of each set being distributed about said axis and the outer end portions of the grooves of one set being more sharply inclined to said axis than are the outer end portions of the grooves of the other set, and means for adjusting said device axially of said outlet opening.

Signed at Wilmington, in the county of New Castle and State of Delaware, this seventh day of July, A. D. 1930.

JAMES FRASER.