

[54] SPRAY DEVICE

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[52] U.S. Cl.239/490, 239/553.5, 239/497,
239/565

[51] Int. Cl. B05b 1/34

[58] **Field of Search**...239/548, 565, 553.5, 497, 490,
239/552

[56] **References Cited**

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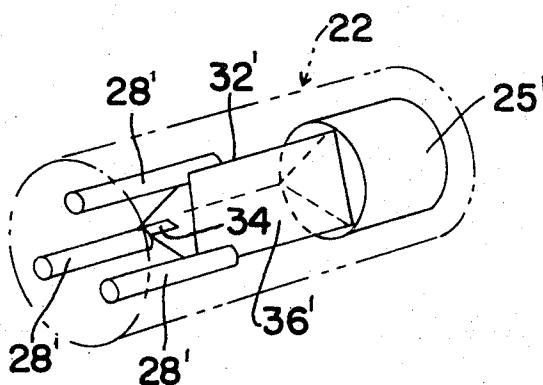
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[57] **ABSTRACT**

A spray head for discharging a spray pattern in which the entire inner portion of the pattern has liquid atomized therein. A plurality of orifice channels receive fluid radially from a relatively large central supply channel.

Preferred embodiments are disclosed in which the spray head is a unitary molded component having no moving parts. Other preferred embodiments are disclosed in which the spray head includes an adjustment feature whereby a two-part molded head provides a desirable cone-shaped spray pattern at either relatively high or relatively low through-puts, thereby eliminating "dribble" at relatively low through-puts.

3 Claims, 13 Drawing Figures



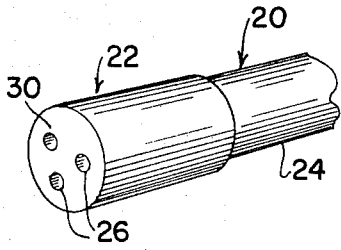


FIG. 1

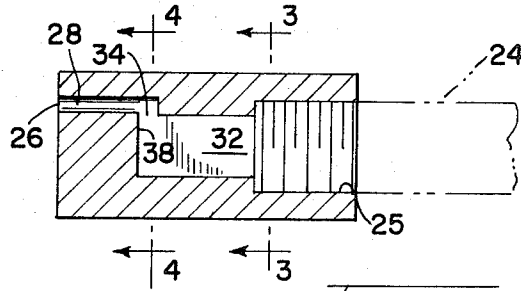


FIG. 2

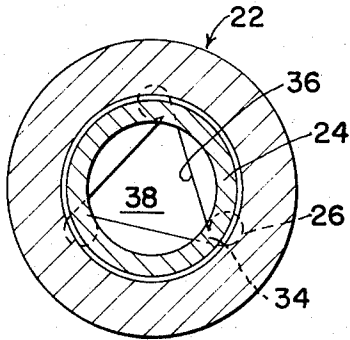


FIG. 3

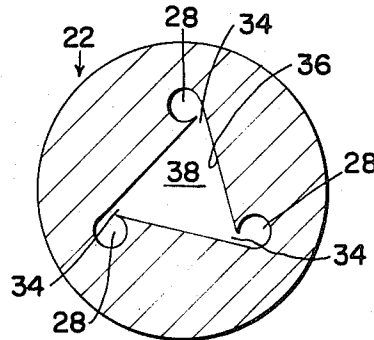


FIG. 4

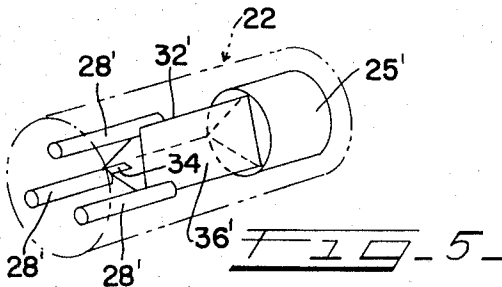


FIG. 5

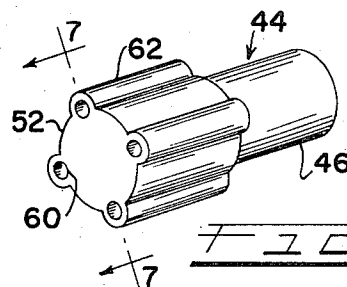


FIG. 6

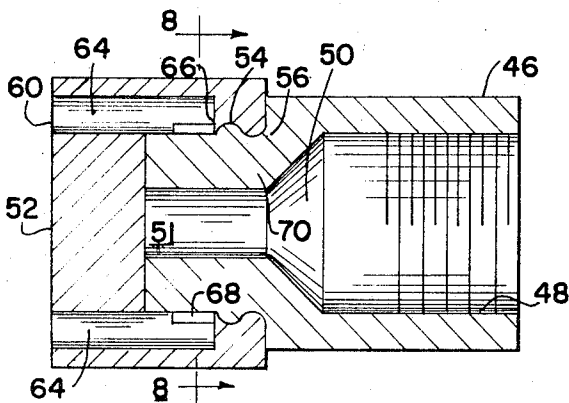


FIG. 7

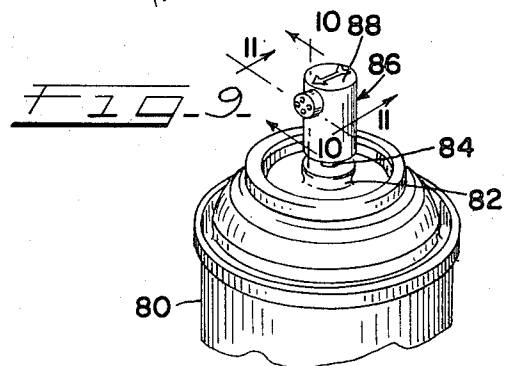


FIG. 9

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FIG. 8A.

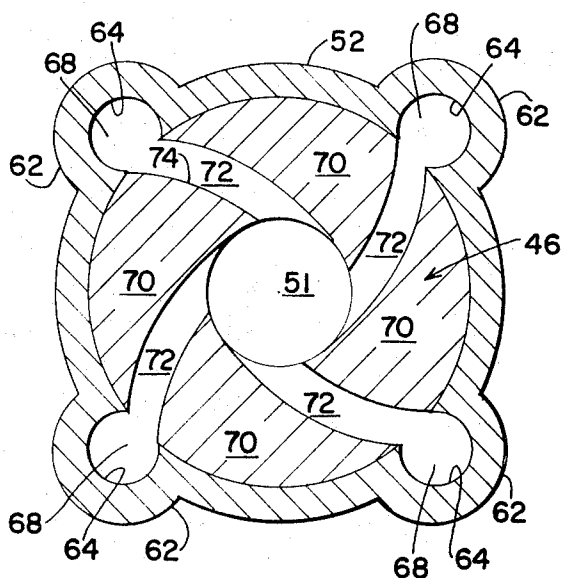


FIG. 8B.

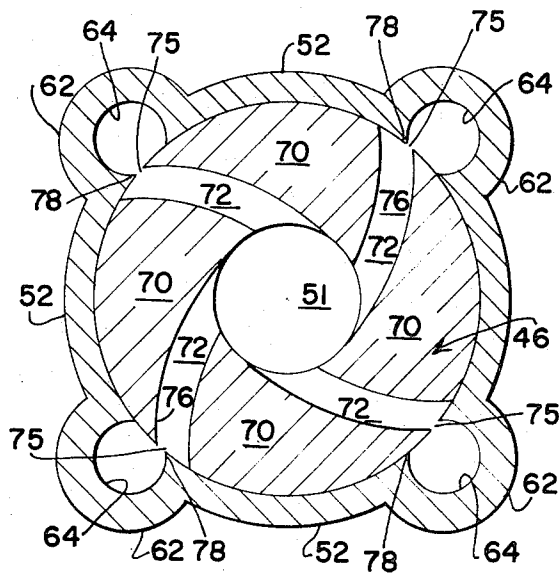


FIG. 11A.

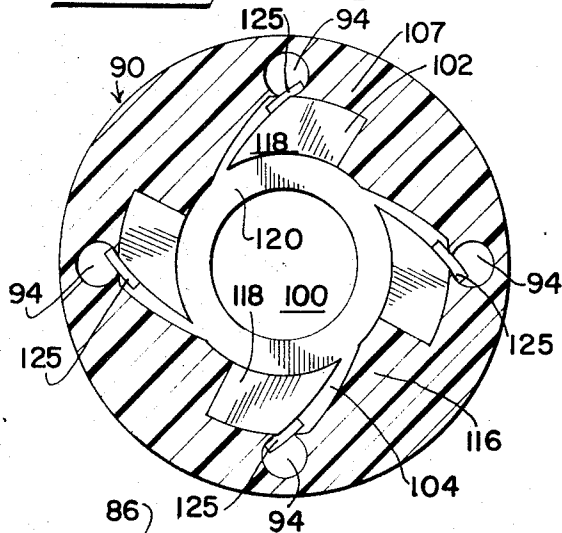


FIG. 11B.

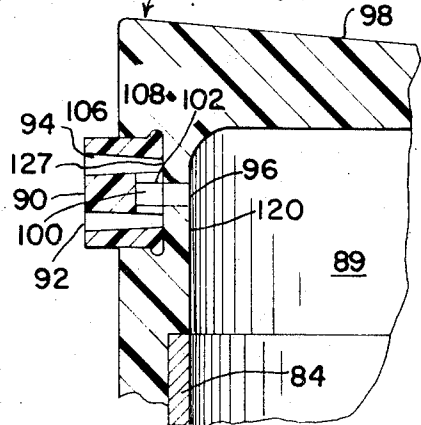
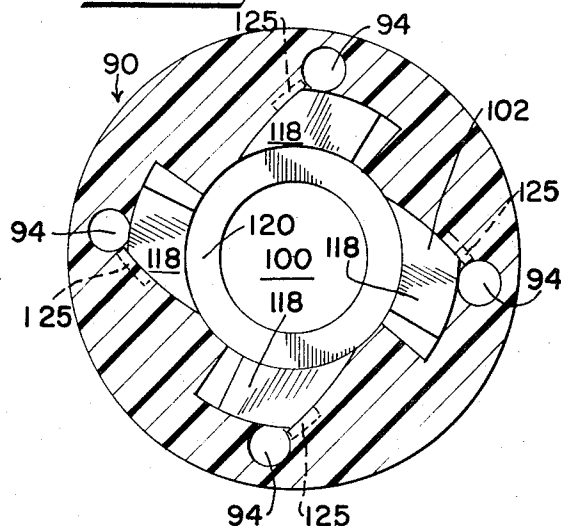


FIG. 10.

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1

SPRAY DEVICE

This invention relates to the manufacture of molded spray heads generally, and includes embodiments which are especially adapted for use in connection with aerosol dispensers, and the like. Nonetheless, spray heads of this invention are readily adapted for use in bathroom showers, equipment-cleaning sprays, horticultural spray equipment, insecticide spray equipment, carburetion equipment and the like.

It is an object of this invention to provide spray heads which can be integrally molded from corrosion-free plastic materials, and to provide spray heads which can be manufactured by relatively inexpensive molding operations. It is a further object of this invention to provide spray heads which, though of apparently simple construction, provide highly efficient break-up of a stream of fluid, such as water, to provide an even spray pattern. It is a further object of this invention to provide an adjustable spray head which, even at extremely low fluid flow rates, produces a highly desirable spray pattern. It is another object of this invention to provide a spray head in which the spray pattern includes atomized fluid passing through the entire interior regions of the cone.

The invention is described in general, and in connection with particular preferred embodiments thereof with the aid of the accompanying drawings in which:

FIG. 1 is a perspective view of a spray head of this invention adapted for use as a shower spray;

FIG. 2 is a longitudinal cross-sectional view of the embodiment shown in FIG. 1;

FIG. 3 is a cross-sectional view taken approximately along the line 3—3 of FIG. 2;

FIG. 4 is a cross-sectional view taken approximately along the line 4—4 of FIG. 2;

FIG. 5 is a schematic illustration showing the open interior region of the embodiment shown in FIG. 1 and suggesting the construction of coring elements which are used in the molding of the spray head of FIG. 1;

FIG. 6 is a perspective view of an alternative embodiment adapted for use as a shower head;

FIG. 7 is a cross-sectional view taken approximately along the line 7—7 of FIG. 6;

FIG. 8A is a cross-sectional view taken approximately along the line 8—8 of FIG. 7;

FIG. 8B is a view of the elements shown in FIG. 8A in which the parts have been moved with respect to the position shown in FIG. 8A;

FIG. 9 is a fragmentary perspective view showing an aerosol dispenser with a mechanical break-up button;

FIG. 10 is a cross-sectional view taken approximately along the line 10—10 of one embodiment of this invention;

FIG. 11A is a cross-sectional view taken approximately along the line 11—11 of an embodiment which is an alternative to the embodiment shown in FIG. 10;

FIG. 11B is a cross-sectional view taken approximately along the line 11—11 of the same embodiment shown in FIG. 11A except that some of the parts have been moved relative to the position shown in FIG. 11A.

In FIG. 1, a shower assembly is generally indicated at 20. It includes a shower head generally indicated at 22, and supply pipe 24. It is to be understood, of course, that auxiliary valving equipment (not shown because conventional) is to be used with this shower head.

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Shower head 22 includes a plurality of orifices 26 which are supplied through respective orifice channels 28. It is noted that the plurality of orifices 26 are evenly spaced apart on end face 30 of spray head 22. It is also noted that the discharge orifice channels 28 are parallel and extend in a direction which is parallel to the axis of the shower head 22. Orifice channels 28 are connected radially with central supply channel 32. Channel 32 extends axially connecting with the conduit pipe 24. In FIGS. 3 and 4 it is apparent that the central supply channel 32 is substantially triangular in cross section and that respective passageways 34 connecting central supply channel 32 with respective orifices 26 occur at the apex of adjacent sides 36 of central supply channel 32 with the opening 34 constituting an opening at the axial end 38 of channel 32 along one wall which is adjacent the respective discharge orifice 28. Thus the other wall is substantially a tangent, in the disclosed preferred embodiment, to the circular wall of the respective discharge orifice 28. This relationship is perhaps more clearly appreciated from a consideration of FIG. 5 in which the exterior of the shower head 22 is shown in broken lines, and the extent of the hollow interior passageways is shown in solid lines.

In the manufacture of the spray head 22 illustrated in FIGS. 1-5 two sets of axially extending core elements are utilized in cooperation with a conventional mold (not shown) in the injection molding manufacture of spray head 22. A first core element, corresponding to conduit 25 and central supply channel 38, is inserted axially into a conventional mold and a second set of core elements corresponding to conduit channels 28 are extended axially from the opposite direction into the mold cavity as suggested in FIG. 5. It is noted that end portions of the rounded core elements 28', corresponding to discharge orifice channels 28, have a flat lateral end portion 34' which butts against a face 36' of the central supply channel core element. This shut-off abutment results in the formation of passageways 34.

A first alternative embodiment of this invention is shown in FIG. 6 in which a two-piece molded shower head assembly is generally indicated at 44. Assembly 44 includes a stationary member 46 which is fitted with socket 48 for sealingly engaging a conventional plumbing pipe, and the like. Socket 48 extends axially into central supply channel 50 which extends into coaxial supply region 51. Rotatable orifice-containing face member 52 is rotatably retained on stationary member 46 by mating lip 54, 56 on members 46, 52, respectively. Assembly 44 utilizes four discharge orifices 60 which are positioned, in the illustrated embodiment, coaxially with axial bosses 62 which assist in gripping rotatable member 52 for manual rotation thereof. Each respective orifice 60 is supplied by its respective orifice discharge channel 64. Channels 64 dead-end in axially inward extreme 66, as in the previously described embodiment, and entry to discharge orifice channel 64 is gained through axially extending slits 68. Vanes 70 extend radially outwardly from axially inward central supply region 51.

In FIG. 8A it will be better appreciated that the general configuration of structural elements comprising stationary member 46 are circular, and snugly fitting within the circular interior configuration of rotatable member 52. In the cross-sectional view of

FIG. 8A, it is apparent that interior central supply region 51 is connected with each discharge orifice 64 through a passageway 72 between adjacent vanes. It is further noted that the general path of passageways 72 are somewhat spiraled, i.e., non-linear, from central supply region 51 and that the relatively shorter edges 74 of the passageways are positioned to form a substantially tangential line with substantially circular discharge orifice 64. Moreover, it is appreciated from a consideration of FIG. 8A that fluid flowing substantially radially outwardly through passageways 72 will be ejected from passageways 72 into the discharge orifice channel 64 in a path which is off-center with respect to the central axis of discharge orifice channel 64, when the relative positions shown in FIG. 8A prevails.

In FIG. 8B the relative positions of stationary member 46 and rotatable member 52 are changed. It is noted, however, that, although relative rotation is illustrated, internal elements 46 appear to have been pivoted whereas, in fact, outer element 52 is the movable member.

In the position shown in FIG. 8B passageways 72 have been moved with respect to discharge orifices 64 so that a relatively narrow gap 75 remains between the outer extreme of longer edge 76 and the opposing edge 78 of external member 52. However, it is also appreciated from a consideration of FIG. 8B that fluid flowing generally radially outwardly through channel 72 tends to be ejected into discharge orifice channel 64 in a direction which is off-center with respect to the axial center of discharge orifice 64. The sweeping curve of elongated passageway side 76 is substantially tangential to the wall of discharge orifice 64 as indicated in FIG. 8B when wall 76 approaches the opposing corner 78 of the movable member.

The capability of reducing gap 75 by manually rotating rotatable member 52 around stationary member 46 is important in the operation of the spray head of this invention at relatively low flow rates. Thus, at high flow rates, the operation of the spray head with the configuration shown in FIG. 8A is eminently satisfactory since the entryway 68 to discharge orifice channel 64 is completely unobstructed. Thus with high flow rates liquid is discharged into discharge orifice 64 in a radial direction thus imparting a helical or swirling motion to the liquid as it moves generally axially outwardly in discharge orifice 64. At relatively low flow rates, however, if fluid were to pass at low velocity through radially outwardly directed channels 72, very little circular, helical, or swirling component is imparted to the motion of the liquid moving axially outwardly through discharge orifice channel 64. At low flows, shower heads, generally, tend to "dribble." However, at low flows, adjustment of the gap 75, as shown in FIG. 8B requires that, even at such low flow, the fluid passing through gaps 75 move at relatively high velocity into the orifice discharge channel 64. This relatively high velocity assures a helical pattern as liquid moves generally axially outwardly in discharge orifice channel 64.

Thus, in accordance with this preferred adjustable embodiment of this invention illustrated in FIGS. 6, 7, 8A and 8B a highly desirable gentle atomized center-filled spray pattern is achieved at very low flow through-puts. Further rotation of rotatable member 52 stops the flow of fluid into discharge orifice channel 64.

FIG. 9 illustrates an aerosol dispenser can 80 equipped with conventional valve elements enclosed within collar 82. Fluid is discharged at will from can 80 through hollow valve stem 84 which is sealingly joined to mechanical break-up button assembly generally indicated at 86. Finger pressure in a downward axial direction at top 88 of button 86 causes axially downward movement of valve stem 84 which results in a fluid-release configuration within the valve assembly 82 (not shown because conventional). Fluid passes upwardly through valve stem 84 into central region 90 of break-up button 86. In FIG. 9 button assembly 86 is equipped with a break-up insert 90. It should be emphasized that two embodiments of insert 90 are shown. A first embodiment shown in FIG. 10 is a one-piece embodiment which is analogous to the one-piece embodiment of FIGS. 1-5. The second embodiment illustrated in FIGS. 11A and 11B is analogous to the embodiment illustrated in FIGS. 6, 7, 8A and 8B in which the stationary port provides stationary elements. However, in the embodiment of FIGS. 11A, and 11B, a complete shut-off feature is provided by providing one vane on the stationary element and an opposing vane on the rotatable element to define the side walls of the conduit through which fluid is channeled to the discharge orifice channel 94.

Insert 90 is retained in socket 106 in main body portion 98 of button assembly 86 by the mating of radially outwardly extending projection 108 as it mates with undercut detent 110 in socket 106.

In a simplified version of the insert button which is illustrated in FIG. 10 a view taken approximately along the line 11-11 in FIG. 10 shows the configuration presented in FIG. 11A, inasmuch as central supply region 100 connects with discharge orifice channels 94 through passageways 104 between vanes 102. In the embodiment of FIG. 10, all vanes are molded into a one-piece button. However, in a preferred alternative, as illustrated in FIG. 11A, vanes 102 forming opposing sides of channels 104 are provided, in part, by insert button vanes 116 which are rotatable with insert button 90 and stationary vanes 118 which are stationary projections from wall 120 around channel 98 into central supply region 100. Thus, in the adjustable embodiment illustrated in FIGS. 11A and 11B button 90' corresponds to button 90, except that in the adjustable embodiment half of the vanes defining passageway 104 are provided by the stationary wall 120 of main body portion 98. As rotatable button 90' is rotated to bring opposing side walls of vanes 116, 118 on opposite sides of channels 104 into abutment as indicated in FIG. 11B it will be appreciated that the passageway connecting discharge orifice with central supply region is effectively sealed. Thus, the invention is particularly useful in embodiments in which it is desirable to seal the interior of break-up button assembly 86 between uses in order to prevent hardening, e.g., solids formation induced by slow evaporation of a solvent, of potentially clog-forming materials within the interior of mechanical break-up button assembly 86.

In the preferred embodiment, as illustrated in FIGS. 11A and 11B wall 120 is provided with indent region 125 which is positioned to lay at the inner extreme of passageway 104 adjacent stationary vanes 118. It will be appreciated by comparing FIGS. 11A and 11B that recess 125 extends under the axial end 127 of discharge

orifice channel 94 when the vanes are in the position indicated in FIG. 11A. However, when the button insert 90 is rotated to provide the configuration of 11B at which opposing walls of vanes 116, and 118 which define channel 104 have approached each other, and finally abut to seal off the channel, the rotation will have carried discharge orifice channel 94 beyond and away from super-imposition over recess 125. Thus, any fluid trapped in recess 125, as a result of the operation of the mechanical break-up spray button of this invention, is also sealed off when the rotatable insert 90 is rotated to the seal position indicated in FIG. 11B. Should mechanical break-up button assembly 86 be axially depressed while insert button 90 is in the "closed" or seal configuration of 11B, substantially nothing happens which will be apparent to the consumer. However rotation of rotatable button 90 to the "open" configuration of 11A carries the axially inward end of discharge orifice 94 to register with recess 125. Thus, should liquid retained in discharge orifice channels 94 become dried out the generation of pressure against the mass within discharge orifice channel 94 in an axial direction through boss 124, which now serves as a conduit, assists in the axial ejection of solidified material in discharge orifice channel 94. Thus any liquid retained between uses in recess 125 is sealed and consequently recess 125 serves as a hydraulic conduit to develop pressure exerted in an axial direction against the axially inward extreme portions of any solidified materials remaining in discharge orifice channel 94.

In all the preferred embodiments disclosed herein, the supply channel is greater in cross section than the total cross-sectional area of the discharge orifice channels. The spray head of this invention permits efficient break up through a plurality of orifices with a compact, streamlined component.

Although the invention is particularly applicable to molded plastic spray heads, it is also applicable to metal spray heads used in burner nozzles, and the like.

I claim:

1. A one-piece spray head comprising a centrally positioned supply chamber having a plurality of planar side walls meeting at axially extending side wall junctions; a plurality of axially extending circular cross-sectional discharge orifice channels extending partially laterally with respect to said supply chamber, said discharge orifice channels each being continuous with said central supply channel along a respective wall at a respective junction between a respective first and second wall, wherein a passageway between said central supply chamber and said discharge orifice extends axially in said first wall, and wherein said second wall is tangential with respect to said discharge orifice.
2. A one-piece spray head of claim 1 having three of said discharge orifice channels, and three of said walls.
3. A one-piece spray head comprising: a centrally positioned supply chamber having a plurality of axially extending side walls; a plurality of axially extending circular cross-sectional discharge orifice channels extending partially laterally with respect to said supply chamber, said discharge orifice channels each being continuous with said central supply chamber between a respective first and second wall thereof, wherein a passageway between said central supply chamber and said discharge orifice extends axially in said first wall, and wherein said second wall is tangential with respect to said discharge orifice, wherein each of said passageways is positioned to discharge fluid into said discharge orifice channel generally transversely to said axis, and off-center with respect to the axial center of said discharge orifice channel.

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