

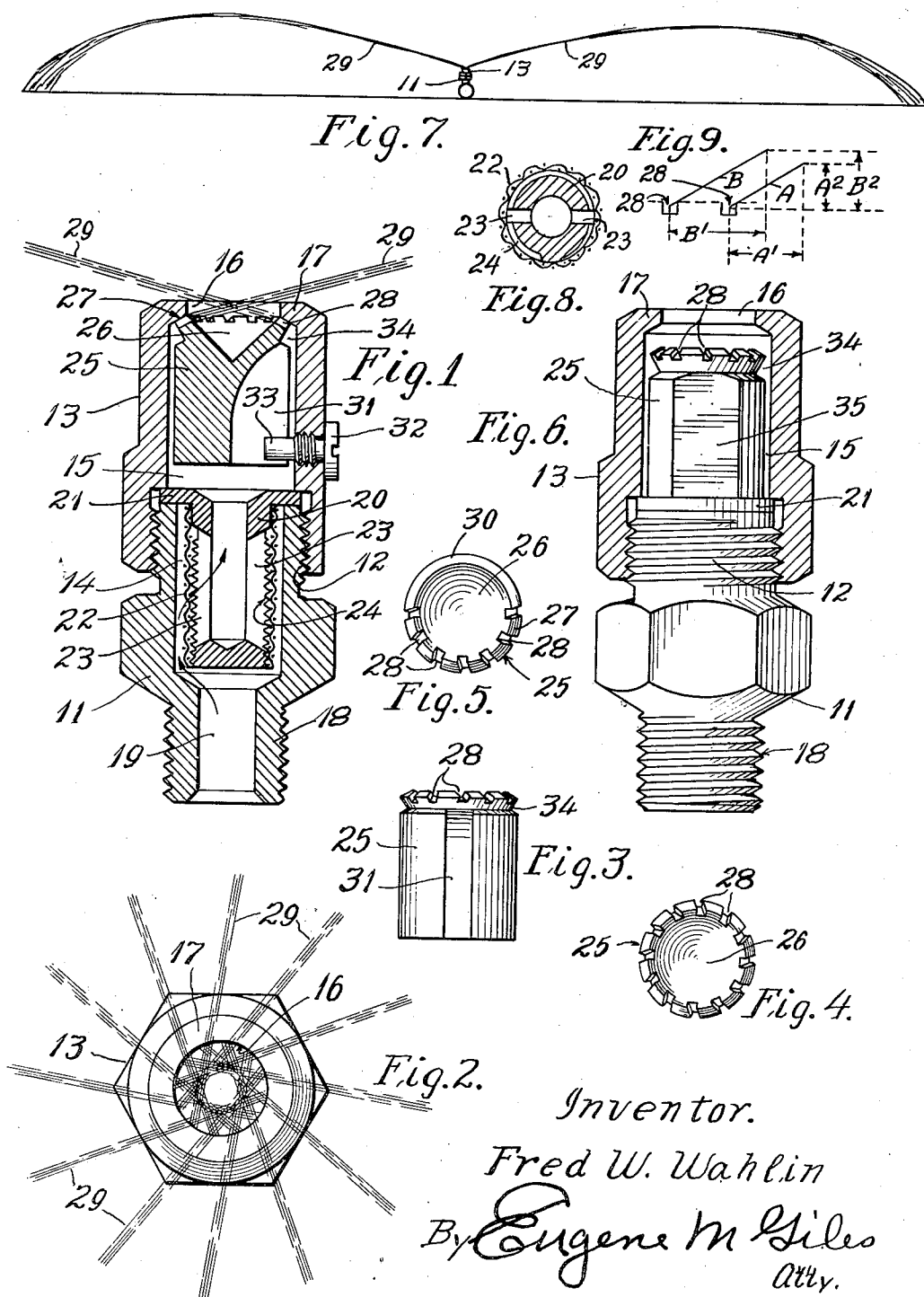
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SPRAY NOZZLE

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SPRAY NOZZLE

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My invention relates to liquid spraying nozzles for producing a flat umbrella type spray and has reference more particularly to a construction in which an internal member is seated against the peripheral wall of the nozzle opening to form approximately radial passageways through which the liquid is directed inwardly in individualized streams across and through the nozzle opening.

The principal objects of my invention are to provide an improved wide angle or umbrella type spray nozzle having greater efficiency, wider range, and better distribution than previous nozzles; to produce the spray with a circular series of individualized inwardly directed streams; to discharge the individualized streams through the nozzle opening without change of direction; to avoid conflict of the individualized streams with one another; and to permit construction of the nozzle with self cleaning facilities; these and other objects being accomplished as pointed out hereinafter and as disclosed in the accompanying drawing in which:

Fig. 1 is a vertical sectional view of a nozzle constructed in accordance with my invention;

Fig. 2 is a top view of the nozzle of Fig. 1;

Fig. 3 is a side view of the reciprocable plug or core employed in the nozzle;

Fig. 4 is a top view of the reciprocable plug or core of Fig. 3;

Fig. 5 is a view similar to Fig. 4 but showing a modified plug or core for half circular spray;

Fig. 6 is a side view, with a part thereof in vertical section, of a modified nozzle;

Fig. 7 is a miniature side view of the nozzle showing the form of spray produced therewith;

Fig. 8 is a cross-sectional view of the strainer of Fig. 1 taken substantially midway between the top and bottom of the strainer; and

Fig. 9 is a diagrammatic view showing the different elevations at which adjoining streams from the nozzle cross one another.

Referring first to the embodiment illustrated in Fig. 1 of the drawing, the body of the nozzle is composed of two parts, one of which is indicated at 11 and is externally threaded at its upper or outer end as at 12, and the other of which is indicated at 13 and is internally threaded at its inner end for threaded engagement with the outer threaded end 12 of the part 11 for securing the two parts 11 and 13 together.

Each part 11 and 13 is cylindrically chambered at 14 and 15 respectively so that each chamber forms substantially a continuation of the other, and the outer end of the part 13 has an outlet or discharge opening 16 surrounded by an inwardly

extending annular flange 17 and leading from the chamber 14, 15 of the nozzle body, while the opposite end of the part 11 has reduced neck portion 18 with an inlet opening 19 therethrough, said neck portion being externally threaded for attachment to the liquid supply system through which liquid is supplied to the nozzle. Obviously other attachment facilities may be provided if desired.

Hereinafter the end of the nozzle body 11, 13 where the outlet opening, 16, is located will be referred to as the outer or discharge end of the nozzle or nozzle body and the end at which the threaded connection 18 is located will be referred to as the inner or inlet end thereof.

A cylindrical strainer of substantially smaller diameter than the chamber 14 is preferably provided in that chamber so that liquid supplied through the inlet opening 19 is required to pass through that strainer to reach the outlet 16 of the nozzle and this strainer may be of any desired type and mounted in the nozzle in any convenient manner.

In the present construction the strainer comprises a tubular body 20 which is closed at the lower end and open at the upper end and provided at the latter end with a circumferential flange 21 which clamps between the nozzle body parts 11 and 13 as shown in Fig. 1 so as to hold the strainer in place. The tubular body 20 is surrounded by a cylindrical screen 22 which fits snugly thereon and the cylindrical wall of the tubular body 20 is provided with a number of comparatively narrow longitudinal slits 23 affording access of liquid from the chamber 14 through the screen 22 to the interior of the tubular body 20 from whence it is supplied through the open upper end of the tubular body to the chamber 15 of the nozzle. The exterior surface of the body 20 is preferably threaded as indicated at 24 to afford circulation channels under the entire screen and this threading also facilitates holding the screen in place.

A plug or cylindrical core 25 of less diameter than the chamber 15 so as to fit loosely and reciprocate freely therein, is located in the chamber 15 and interposed between the flange 17 of the outlet opening 16 and the top of the strainer 20 so that said plug or core is free to move a substantial distance endwise between said flange 17 and strainer, and as the nozzle is positioned upright in service, this plug or core will rest on the strainer 20 with its upper end separated a substantial distance from the flange 17 when no liquid is supplied to the nozzle.

When, however, liquid is supplied, the liquid pressure will force the plug 25 upwardly so that the upper end thereof seats against the flange 17.

This flange 17 is beveled on its inside face at a suitable angle corresponding to the desired angle of elevation of the discharging streams of liquid and the upper end of the plug or core 25 is centrally recessed as at 26 to leave an annular face 27 which is correspondingly beveled to seal against the internal beveled inner face of the flange 17.

This beveled face 27 of the plug 25 is provided with a circular series of approximately radial slots 28 at intervals therearound which, when the plug 25 is sealed against the outlet opening flange 17, are closed at the top by the flange 17 and form separate individual passageways from the annular space in the chamber 15 around the plug 25 for the discharge of liquid from the interior of the nozzle through the nozzle outlet 16, and each of said passageways directs a small individualized stream 29 of liquid across the opening 16 at a sufficient angle of elevation so that each stream clears or passes over the inturned flange at the opposite side of the opening 16 as shown in Fig. 1.

Moreover each slot 26, while approximately radial, is pitched at a slight angle to the radial plane therethrough so that it does not discharge diametrically across the opening 16 but slightly at one side of the axis of the opening 16, all of the slots 28 being correspondingly pitched so that the streams 29 do not intersect or cross one another at the axis of the opening but pass tangentially through an annular zone as indicated in Fig. 2.

Thus, all streams 29 discharge in a similar generally circumferentially pitched manner, each one circumferentially in advance of the one immediately preceding, and at a slightly lower level at the place where they cross so that each stream passes over the stream immediately succeeding so that there is no appreciable conflict or interference of one stream with another, and they continue as substantially individualized streams, as indicated in Fig. 2, and produce an umbrella like spray pattern of wide range substantially as indicated in Fig. 7.

This non-interfering relation of the streams 29 is illustrated diagrammatically in Fig. 9 in which A represents a stream 29 from one orifice 28 of a nozzle in which the streams discharge as shown in Fig. 2, and B the next preceding stream in a counter clockwise direction as viewed in Fig. 2.

Since the streams A and B are discharged tangentially to a central zone of the nozzle opening 16, as shown in Fig. 2, and upwardly at an angle, and since the opening 28 from which the stream A emerges is circumferentially in advance (in a clockwise direction) of the opening 28 from which the stream B emerges the point at which the streams A and B cross one another is at a greater distance from the opening 28 of the stream B than from the opening 28 of the stream A, and accordingly, the stream B has reached a higher elevation at the crossing point than the stream A.

For example, as illustrated in Fig. 9, the stream A travels a tangential distance A^1 from its opening 28 to the point where the streams A and B cross one another and has reached the elevation A^2 at that point, whereas the stream B which issues from the opening 28 immediately preceding (in a counter clockwise direction) travels a longer tangential distance B^1 from its opening 28 to the point at which the streams A and B cross one another and at this point has reached the higher elevation B^2 so that the stream B passes over the stream A without interference therewith. Thus,

each stream 29 is at a higher elevation than all other streams over which it crosses.

Obviously, this non-interfering relation necessitates a circumferential spacing of the openings 28 according to the cross-section of said openings, and fine stream openings 28 may be closer together circumferentially than larger openings 28 which would discharge streams of such large cross-section that they would not pass over and under one another without some interference. Moreover, with a given circumferential spacing of the openings 28, fine streams 29 may be discharged at a lesser angle of elevation and thus produce a flatter spray than with large openings which would require a greater angle of elevation to insure non-interference of the larger streams in crossing one another.

In some cases full circular spread of spray is not required, and with this nozzle the extent of circumferential spread may be controlled by merely omitting the required number of slots 28 from the side of the nozzle opposite that from which the spray is to be omitted.

For example, for a half circular spread of spray the plug or core 25 may be provided with slots 28 only half way around the top as shown in Fig. 5 leaving a circumferential half of the face 27 plain as indicated at 30 so that it seats throughout the length against the flange 17 and permits no discharge of liquid. Thus, liquid will be discharged only through the slots 28 at the one side of the plug 25, and as these discharge across the opening 16, a semi-circular spray spread will be produced at the side of the nozzle opposite that at which the slots 28 of Fig. 5 are located. It will be understood, of course, that sprays of other circumferential extent, such as 90 degrees, 270 degrees may in like manner be provided.

With such sprays of less than full circular spread, it is necessary to prevent rotation of the plug or core 25 in the chamber 15 to maintain the selected direction of discharge and at the same time permit the reciprocation of the plug or core in the chamber, and to this end the plug 25 is slotted longitudinally at one side as at 31, and a set screw 32 is threaded through the wall of the nozzle part 13 so that the inner end 33 thereof projects into the slot 31 to serve as a key for holding the plug or core 25 against rotation.

The slot 31 is, of course, of sufficient width so that the plug 25 is free to reciprocate, and this slot is also preferably of substantial depth and diminishing in depth to the upper end where it leads into an annular groove 34, thereby providing for extra flow of liquid to the upper end of the plug where it is distributed around the plug by the annular groove 34, and thus, supplements the volume of liquid that is supplied through the circumferential space between the plug and the surrounding wall of the nozzle part 13.

In sprays of full circular spread, there is no need to hold the plug 25 against rotation, and the set screw 32 and tapped opening therefor in the wall of the nozzle part 13 may in such cases be omitted.

Moreover, in the sprays of full circular spread, the slot 31 may also be omitted, in which event the plug or core is preferably formed as shown in Fig. 6 with diametrically opposed flat sides 35 leading up to the annular groove 34 around the top of the plug to afford the extra volume of liquid supply for which the slot 31 serves in the structure illustrated in Fig. 1.

It will be understood from the above that in all of the illustrated forms of the invention, the

plug or core 25 is free to reciprocate in the nozzle and that when liquid is not being supplied to the nozzle and the latter is not in operation, the plug or core rests on the top of the strainer 20 in the position shown in Fig. 6, whereas when liquid is supplied and the nozzle is in operation, the plug is lifted by the liquid pressure to the position in which it is shown in Fig. 1, thereby seating the upper end of the plug tightly against the bottom beveled face of the flange 17 and closing the tops of the slots 28 to provide the spray passageways, said reciprocal movement of the plug being advantageous as it provides a self cleaning effect which assures unobstructed passageways for liquid discharge.

While I have shown and described my invention in a preferred form, I am aware that various changes and modifications may be made therein without departing from the principles of my invention, the scope of which is to be determined by the appended claims.

I claim as my invention:

1. A nozzle of the class described comprising a nozzle body provided with an inlet leading into the interior thereof, said nozzle body having an outlet opening with a series of passageways circumferentially spaced along the margin thereof and leading from the interior of the nozzle body in mutually convergent and mutually non-conflicting directions that extend across the opening and over the opposite margin thereof.

2. A nozzle of the class described comprising a nozzle body provided with an inlet leading into the interior thereof, said nozzle body having an outlet opening with a series of passageways circumferentially spaced along the margin thereof and leading from the interior of the nozzle body in directions that extend across the opening and over the opposite margin thereof, all of said passageways having the ends thereof nearest said opening correspondingly in advance circumferentially of the respective ends thereof farthest from said opening.

3. A nozzle of the class described comprising a nozzle body provided with an inlet leading into the interior thereof, said nozzle body having an outlet opening with a series of passageways circumferentially spaced along the margin thereof and leading from the interior of the nozzle body in directions that extend across the opening and over the opposite margin thereof, all of said passageways having the ends thereof nearest said opening correspondingly in advance circumferentially of the respective ends thereof farthest from said opening, and each passageway having a trajectory of discharge that misses the trajectories of discharge of all the other passageways.

4. A nozzle of the class described comprising a nozzle body with a chamber therein and having an inlet to the chamber and an outlet opening from the chamber and surrounded by a flange, and means in said chamber movable to and from the outlet opening and cooperable with said flange to form a series of circumferentially spaced passageways along the margin of said outlet opening which lead from the chamber of the nozzle body

in directions that extend across the outlet opening and over the opposite margin thereof.

5. A nozzle of the class described comprising a nozzle body with a chamber therein and having an inlet to the chamber and surrounded by an inwardly extending flange, and a reciprocable member in said chamber operable by pressure in the chamber to seat against the inner face of said flange and form therewith a series of circumferentially spaced passageways along the margin of said outlet opening which lead from the chamber of the nozzle body in directions that extend across the outlet opening and over the opposite margin thereof.

6. A nozzle of the class described comprising a nozzle body with a chamber therein and having an inlet to the chamber and surrounded by an inwardly extending flange, and a reciprocable non-rotatable member in said chamber operable by pressure in the chamber to seat against the inner face of said flange and form therewith a series of circumferentially spaced passageways along the margin of said outlet opening which lead from the chamber of the nozzle body in directions that extend across the outlet opening and over the opposite margin thereof.

7. A nozzle of the class described comprising a nozzle body with a chamber therein and having an inlet to the chamber and an outlet opening from the chamber and surrounded by an inwardly extending flange, and a reciprocable member in said chamber operable by pressure in the chamber to seat against the inner face of said flange and form therewith a series of circumferentially spaced passageways along the margin of said outlet opening which lead from the chamber of the nozzle body in directions that extend across the outlet opening and over the opposite margin thereof, and means on the nozzle body engaging with said member to hold the latter against rotary movement in the chamber.

8. A nozzle of the class described comprising a nozzle body with an elongated chamber therein and having an inlet to the chamber at one end and an outlet opening at the other end surrounded by an inwardly extending flange, a screen at the inlet end of the chamber and interposed between said inlet and said outlet opening, and a member in said chamber which is reciprocable between the screen and the outlet opening and operable by pressure in the chamber to seat against the inner face of said flange, said member having a slotted seating face which cooperates with said flange to form therewith a series of circumferentially spaced passageways along the margin of said outlet opening which lead from the chamber of the nozzle body in directions that extend across the outlet opening and over the opposite margin thereof.

9. A spraying device of the class described comprising a body with a circular series of inwardly directed spray outlets leading therefrom, each spray outlet being arranged to discharge in a path which missingly crosses the path of discharge of another spray outlet.

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