

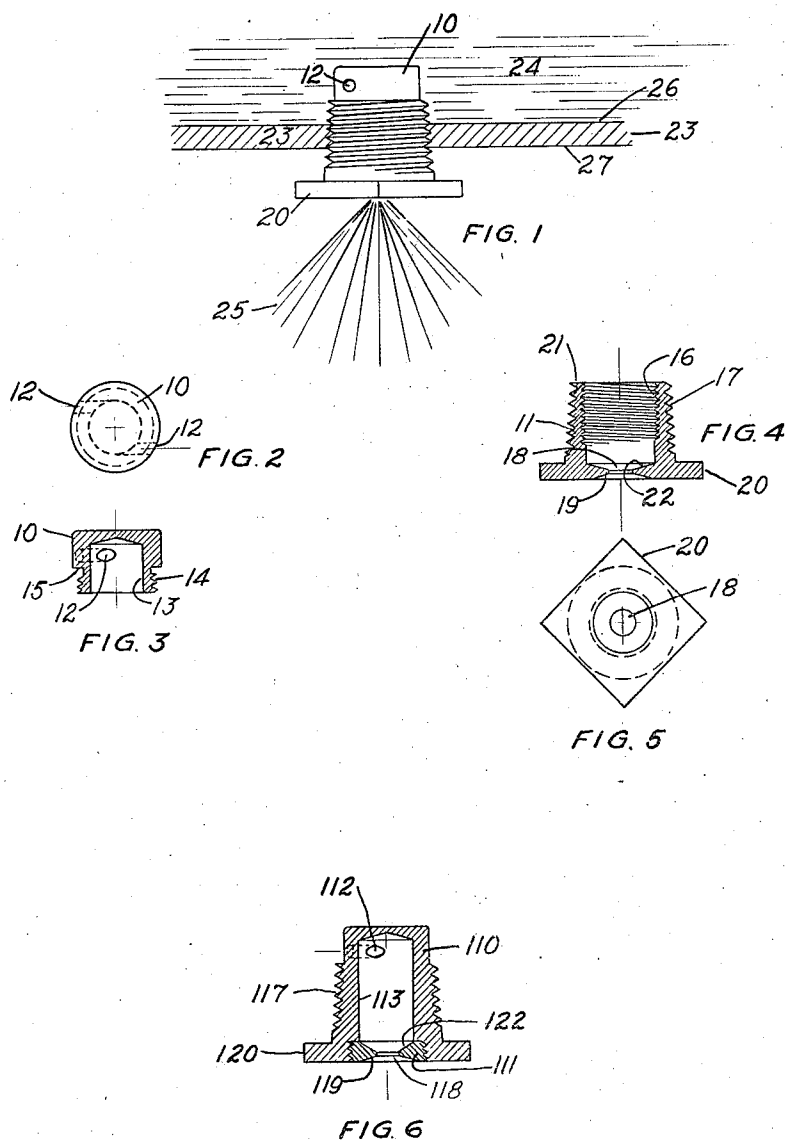
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SPRAYING NOZZLE

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SPRAYING NOZZLE

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1 Claim. (Cl. 299—114)

This invention relates to an improved nozzle for use in the spraying and dispersing of liquids.

The nozzle of this invention is of the spin or whirl chamber type wherein the spin or rotative motion of the fluid in the chamber before entering the discharge orifice is effected by tangential entry of the fluid into the spin chamber.

Objects and advantages of this invention include a more effective utilization of the energy of the fluid due to the pressure at which it is supplied to the nozzle, and the simplification of design, installation, maintenance and use, in comparison with nozzles now available. In conventional nozzles of the spin chamber class, the spin is ordinarily imparted in one or the other of two ways. One way is by the use of spiral vanes within the nozzle in the path of the fluid; these vanes are essentially coaxial with the spin chamber and the discharge port, and serve to impart spin to the fluid. The other way is by the conduction of the fluid through a side entry port in a tangential direction with respect to the axis of the spin chamber of the nozzle, thereby imparting spin or rotative motion to the fluid in the spin chamber. The present invention constitutes an improvement upon nozzles of the latter, or tangential-entry, class.

Nozzles of this latter class are further subdivided into two types, as to their general design with respect to the fluid passages leading to the spin chamber from the supply chamber,—which may be a reservoir, supply pipe, or other means for conducting fluid to the nozzle assembly.

In one of these two types, which is illustrated in United States Patent No. 1,361,238 of R. S. Fleming, the direction of flow of the fluid entering the nozzle assembly is substantially parallel to and usually coincident with the axis of the spin chamber and the body of the spray. In order to secure a tangential entry into the spin chamber portion of the nozzle, therefore, the direction of fluid must be changed by passages within the nozzle, through at least 90° or thereabouts. This results in passages which are particularly susceptible to clogging, and also generally requires complete disassembly of the nozzle for cleaning. For practical purposes, nozzles of this type must be made in at least two pieces, and usually require complete machining of all portions coming in contact with the fluid.

This type of nozzle is more commonly used where only a single nozzle is mounted on the supply pipe and where the coaxial position of the supply pipe, nozzle body, and spray offer

structural and design advantages, as for instance in oil burners and spray dryers in which it is desirable to supply an air stream annularly and symmetrically to the mass of spray.

In the other type, sometimes referred to as the "side entrance" type, the initial flow in the connection to the supply pipe is in the same general direction as in the tangential entry port itself. This type is frequently called "non-clogging" on account of the more direct and larger passages leading to the tangential ports of the spin chamber. As a rule, this passage is of much greater length and cross sectional area than that of the entry port to the spin chamber, to provide physical strength and a sufficient thread length for the usual pipe thread method of attachment. Nozzles of this type are frequently used in multiple in spray chamber or spray pond installations in which a number of nozzles are mounted on a single supply pipe, or manifold, the direct connection being either to the side outlet of T's or to threaded nipples welded to the supply pipe at intervals. In either case it will be noted that the direction of flow of the fluid must be changed substantially.

Nozzles made in accordance with the present invention do not employ the vanes, side fittings, or complex internal passages which are characteristic of the spin chamber nozzles now commonly used. The fluid moves directly from the supply chamber into the spin chamber through tangential openings in the body of the nozzle, and the spin of the fluid is imparted by the combined effects of the motion or energy of the fluid and the location of the openings with respect to the spin chamber. These improved nozzles are therefore simple in design and easily constructed, as will be further pointed out hereinafter. They also result in a saving of space, and may be readily installed and removed. They are also particularly advantageous in that they reduce to a minimum the friction losses in spraying. In conventional spin-chamber nozzles wherein spin is imparted by tangential entry of the fluid into the spin chamber, the fluid has its direction changed in passing from the supply chamber into the spin chamber, since it must, in so passing, move through side fittings or through internal passages within the nozzle body. The present invention, by elimination of side fittings and internal passages, reduces energy loss from such sources to a minimum, inasmuch as the pressure in the supply chamber acts directly to create velocity in a relatively short entrance port to the spin chamber, without any interme-

diate loss of pressure due to friction and change in direction which result from passage through the conventional side fittings or internal direction-changing passages.

5 The invention will now be described more particularly with reference to the accompanying drawing, which illustrates diagrammatically nozzles made in accordance therewith. In the drawing,

10 Figure 1 represents a side view of one form of the complete nozzle, in operating position;

Figure 2 represents an end view of the cap portion of the nozzle of Figure 1;

15 Figure 3 represents a sectional view of the cap portion of the nozzle of Figure 1 in the plane of the axis of the nozzle;

Figure 4 represents a sectional view of the tip portion of the nozzle of Figure 1, in the plane of the axis of the nozzle;

20 Figure 5 represents an end view of the tip portion of the nozzle of Figure 1; and

Figure 6 represents a sectional view of a modified form of the nozzle, in the plane of the axis of the nozzle.

25 Like figures refer to like parts throughout the drawing.

Referring now to the drawing, and more particularly to Figures 1 to 5 inclusive, 10 represents the cap portion of the nozzle and 11 the tip portion. The cap 10 is threaded over a portion of its outer surface, as shown at 14, and this threaded portion of cap 10 screws into the tip 11 which is correspondingly threaded on its interior surface 16. The threaded portion 14 of cap 10 is preferably of lesser diameter than the rest of the cap, thus providing a shoulder 15 adapted to abut firmly against the end surface 21 of tip 11 when the cap and the tip are tightly screwed together. One or more tangential holes or entrance ports 40 12 are provided in the unthreaded portion of cap 10; these ports extend from the exterior of cap 10 to the interior surface 13, and their axes are substantially tangential to the interior surface 13 which surface is of cylindrical shape, and defines the upper portion of the spin chamber. Both the interior surface 16 and the exterior surface 17 of tip 11 are threaded. The threadings of the interior surface 16 are adapted to receive the threaded portion of the cap 10; while the outer surface 17 is threaded in order that the assembled nozzle may be screwed into and through the walls of the supply chamber. As shown in Figure 1, one wall of the supply chamber is indicated by the numeral 23, and the fluid in the supply chamber is represented by the numeral 24. The tip 11 is provided at its bottom end with a restricted circular orifice 18, which is coaxial with the spin chamber. The approaches to the orifice may be tapered as indicated at 19 and 22. The angle of taper is conveniently about 120°, although this is not critical. The edges 20 of the bottom are conveniently hexagonal or square, to facilitate screwing the nozzle into its position in the wall of the supply chamber.

65 For installation, the nozzle is first assembled by screwing the cap 10 tightly into the tip 11. The nozzle is then screwed firmly into an opening through a wall 23 of the supply chamber, which opening is of course threaded to fit the threads on surface 17. The nozzle should be screwed in far enough so that the port or ports 12 will be entirely within the inner surface 26 of the wall of the supply chamber. How much further the nozzle is screwed in (up to the point where the base contacts the outer surface 27 of the wall 23)

is not important, so long as there is no leakage of fluid past the threads, except that the nozzle should not be screwed in so far as to impede flow or circulation of fluid 24. For example, when the fluid 24 is flowing through a pipe of relatively small diameter, the presence of a number of nozzles projecting their maximum distance into the pipe would tend to impede the flow of the fluid.

The nozzle may be readily removed for cleaning, replacement, or repair by merely unscrewing it, preferably after first removing the fluid, or at least the pressure, from the supply chamber.

After the nozzle is placed in position as above described, the fluid 24, under sufficient pressure 15 to cause it to flow outwardly from the supply chamber through any orifice therein, passes into the tangential port or ports 12, thereby establishing a whirling motion within the spin chamber, which chamber is defined essentially by the interior walls 13 and 16. The fluid moves outwardly toward and through orifice 18, and emerges therefrom as a hollow conical sheet which quickly breaks up into droplets of spray.

The number of nozzles used for any installation depends of course upon such matters as volume of spray desired, size of nozzle, capacity of the equipment, etc. If it is desired to provide a means for spraying a considerable quantity of fluid over a given surface or object, for example, 20 it may be convenient to arrange pipes running from a suitable supply and pressure source containing the fluid, and providing each pipe with a sufficient number of nozzles for the purposes and conditions involved. The nozzles may be positioned to spray downwardly, upwardly, or at any suitable angle between.

The nozzle of this invention has been shown and described as being made in two parts,—the cap 10 and the tip 11, as that appears to be the most convenient configuration in which to make it. It would of course be possible to make the nozzle in more parts, or in only one piece, to give functionally the same final form. However, there appears to be no particular advantage, and considerable difficulty or at least extra effort, in such other ways; and inasmuch as the nozzle of this invention is designed for simplicity, one of the simplest forms of it has been described herein. Minor modifications may readily be made,—for example, instead of forming cap 10 with a top portion of enlarged diameter, whereby shoulder 15 abuts edge 21 of tip 11 when the parts are screwed together, the tip 11 may be made with enlarged internal diameter for the threaded portion, whereby the bottom of cap 10 abuts the shoulder of the unthreaded interior portion of tip 11. In this way, a spin chamber of the same diameter throughout its length can be provided.

Another alternative form is shown in Figure 6, wherein the numbering is essentially the same as in Figures 1 to 5 except that each number is preceded by the numeral 1. In this form, the cap portion 110 may be made to include the entire nozzle except for a tip 111 which includes merely the orifice 118 and the bottom end of the spin chamber; which tip would be screwed or otherwise placed into position in the bottom of the cap. Inasmuch as the threaded portion of surface 117 would then be part of the cap, the outer portion 120 of the base should preferably also be part of the cap, so that the two would cooperate when the nozzle is inserted into or removed from the wall of the supply chamber.

While the foregoing disclosure sets forth in de-

tail an improved type of nozzle, it is to be understood that this disclosure is by way of illustration and that various modifications and changes may be made without departing from the spirit and scope of the invention as set forth in the appended claim.

We claim:

In combination, a spray nozzle, and a supply chamber containing a fluid to be sprayed, said spray nozzle consisting of a cap portion and a tip portion, the tip portion being threaded exteriorly and interiorly, the cap portion being threaded exteriorly throughout a part of its length and screwing into the tip portion, the unthreaded part of the cap portion being of greater diameter than the threaded part thereof but of lesser diameter than the exteriorly threaded part of the tip portion, said nozzle being adapted to screw into a threaded opening in the wall of said supply chamber by means of the exterior threads on the tip portion, the positioned nozzle extending into the supply chamber a distance less than the diameter of the cap portion, the joined cap and tip portions defining a spin chamber, said

chamber having inlet ports in the unthreaded part of the cap portion, said ports being tangentially disposed to the axis of said spin chamber and positioned to provide straight-line communication from the supply chamber to the spin chamber and to impart spin to the fluid being sprayed, and an outlet spray-orifice positioned coaxially with said spin chamber and in the tip portion at the end opposite the cap portion, said inlet ports having an aggregate cross-sectional area not appreciably in excess of that of the outlet orifice, said nozzle being capable of forming a spray by virtue of the fluid pressure in the supply chamber; said wall of the supply chamber extending outwardly for a considerable distance away from the line of contact with the nozzle and thus permitting unimpeded flow of the fluid in substantially a straight line, from points relatively remote in the body of said fluid in said supply chamber, through each inlet port into said spin chamber.

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