Sept. 30, 1941 C. R. KEEP 2,257,691

SPRAY NOZZLE

Filed Nov. 17, 1938

Fig. 1.

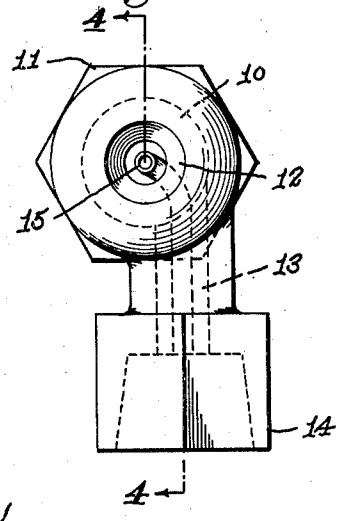


Fig. 2.

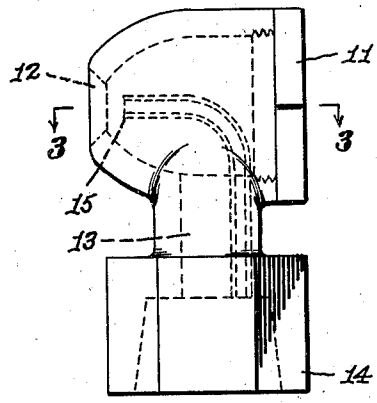


Fig. 3.

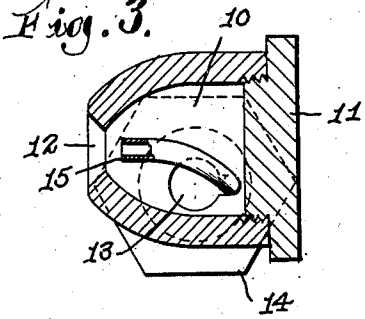


Fig. 4.

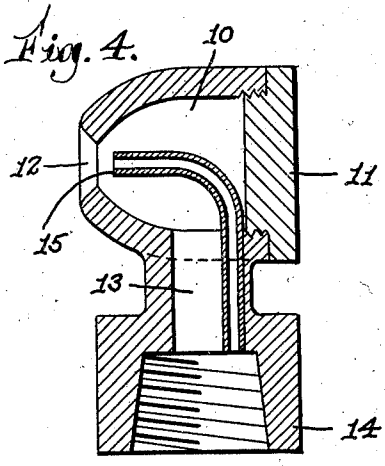
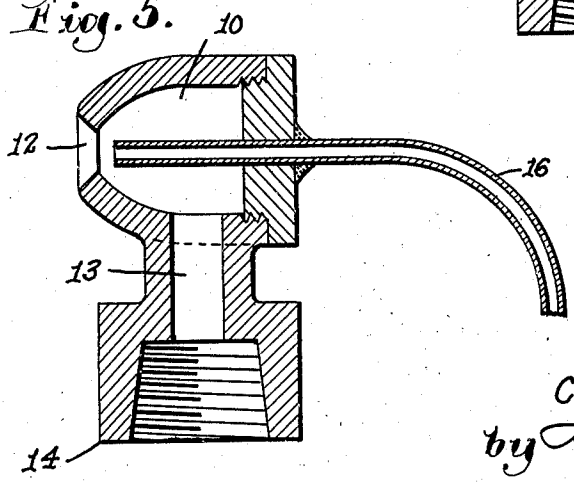


Fig. 5.



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SPRAY NOZZLE

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Application November 17, 1938, Serial No. 241,006

3 Claims. (Cl. 299—115)

This invention relates to spray nozzles and relates more particularly to spray nozzles for producing a large volume of spray over a wide angle and under low pressure.

In producing a water spray for air conditioning, it is desirable to use nozzles providing wide angles of spray. The nozzles now in general use introduce the water tangentially into a tapered chamber having a discharge outlet at its narrowest portion. The water emerges from such a nozzle in the form of a whirling hollow cone of spray. In such a nozzle the wide angle is achieved but a relatively large pressure is required for spraying a relatively small volume of water. Furthermore, little or no spray occurs within the hollow cone leaving open unsprayed areas.

An object of this invention is to spray a relatively large volume of liquid through a wide angle.

Another object of the invention is to spray a relatively large volume of liquid through a wide angle under low liquid pressure.

Another object of the invention is to provide an improved spray nozzle.

Other objects of the invention will be apparent from the following description and the drawing.

The invention will now be described with reference to the drawing, of which:

Fig. 1 is a front elevation of one embodiment of a spray nozzle according to this invention;

Fig. 2 is a side elevation of the nozzle of Fig. 1;

Fig. 3 is a sectional view along the lines 3—3 of Fig. 2;

Fig. 4 is a sectional view along the lines 4—4 of Fig. 1, and

Fig. 5 is a sectional view similar to Fig. 4 but illustrating another form of nozzle.

The spray nozzle has the hollow tapered chamber 10 of circular cross-section which is closed off at its broadest end by the plug 11 and which has at its narrowest end the centrally located tapered outlet opening 12. A cylindrical opening 13 extends from the chamber 10 into the threaded base 14 which is adapted to be screwed onto a liquid supply pipe or header. The opening 13 is arranged to feed liquid tangentially to the interior of the chamber 10 so that the liquid entering the chamber whirls circumferentially around the interior of the chamber until it emerges from the outlet 12. The construction described so far is old in the art and provides a wide angled hollow cone of spray.

This invention provides means for projecting a stream of liquid to co-act with the whirling liquid adjacent its point of emergence from the whirl chamber to provide a greatly increased volume of spray at greatly reduced pressure. The spray is projected in a wide angle forming a cone filled with spray to provide greater air to liquid contact. In the embodiment illustrated by Figs. 1–4 inclusive, the tube 15 is arranged with its outlet end centrally to the rear of the outlet opening 12 and spaced therefrom. The tube extends into the chamber 10 and along its axial line, a substantial distance and then turns through a right angle to extend through the neck of the nozzle in an opening alongside the opening 13. The other and inner end of the tube communicates with the interior of the base 14 to receive a portion of the liquid which enters the nozzle. The tube 15 could extend within the opening 13 but in that case, it would decrease the area of the opening 13 which is not so desirable.

In the embodiment illustrated by Fig. 5, the tube 15 has its outermost portion arranged within the whirl chamber 10 as in Figs. 1–4, but its outer end 16 extends externally from the nozzle for connection to the source supplying liquid to the nozzle or to another source.

The tube 15 does not merely project a separate stream of liquid to fill up all or a portion of the hollow cone of spray which would be provided by the nozzle if the tube 15 were omitted. The jet of water from the tube 15 changes the characteristics of the whirling liquid adjacent and in the outlet opening 12. The diameter of the tube 15 and its spacing from the outlet 12 are important taken together and with respect to the diameter of the outlet 12. It is also desirable that the tube 15 extend along the axial line of the chamber 10 for a substantial distance back of the outlet 12 so that the jet from the tube moves centrally into the outlet 12.

In one successful embodiment in a nozzle drawn substantially to scale in the drawing hereof, the tube 15 had an inner diameter of $\frac{1}{16}$'' and an outer diameter of $\frac{1}{8}$''. The orifice of inner diameter of the opening 12 was 0.182''. The tube 15 was spaced $\frac{1}{8}$'' to the rear of the outlet 12. It is preferred that this distance be not less than the outer diameter of the tube 15. With a similar nozzle without a tube 15, one and one-half gallons per minute of water at twenty pounds per square inch pressure were projected through an angle of 45°. With the nozzle described herein connected to the same water header, the following results were obtained.

Pressure in pounds per square inch	Volume in gal. per min.	Angle of discharge cone
		Degrees
5.0	1.62	83
7.5	1.94	90
10.0	2.26	97

The discharge cone was filled with spray instead

of being hollow and the spray was somewhat coarser which is desirable for the duty for which the nozzle was intended, viz. the washing of evaporator coils, and the wetting of filters in air washers. The tabulated results show that with half the water pressure, half again as much water was sprayed through almost double the angle through the use of this invention.

The outer diameter of the outlet 12 is not so important except that it must provide a diverging outlet to enable the spray to leave the nozzle in a cone. Utilizing this invention, a cone of spray is produced in an angle much greater than the angle indicated in the drawing by the sides of the diverging outlet 12.

While one or more embodiments of the invention have been described for the purpose of illustration, it should be understood that the invention is not limited to the exact apparatus and arrangement of apparatus described, since many departures may suggest themselves to those skilled in the art without departure from the invention.

What is claimed is:

1. An air washer spray nozzle having a whirl chamber with sharply curved converging walls, said walls being cut away to form a substantially cone shaped diverging outlet to the interior of said chamber, the innermost end of said outlet and the outermost end of said chamber meeting in substantially point contact, said chamber having a tangential liquid inlet, and a tube having its delivery end in said chamber in axial alignment with and spaced to the rear of said outlet for spraying liquid into the liquid leaving said outlet from said chamber to provide a wide angle spray of relatively coarse droplets, the inner diameter of said outlet being substantially greater than the outer diameter of said end of said tube and said end of said tube being spaced from said outlet a distance not less than the outer diameter of said end.

2. An air washer spray nozzle comprising a base adapted to be fitted to a liquid supply connection, a sharply curved converging whirl chamber, walls forming a liquid supply passage extending axially from said base to connect tangentially with said chamber, said chamber having an axial cone shaped diverging outlet formed through its walls, the innermost end of said outlet and the outermost end of said chamber meeting in substantially point contact, a tube having a portion with an outer diameter less than the inner diameter of said outlet extending within and axially of said chamber to the rear of said outlet and spaced therefrom a distance less than the outer diameter of said portion, said tube having another portion bent at right angles and extending through said passage and terminating in said base.

3. An air washer spray nozzle comprising a base adapted to be fitted to a liquid supply connection, a sharply curved converging whirl chamber, walls forming a liquid supply passage extending axially from said base to connect tangentially with said chamber, said chamber having an axial cone shaped diverging outlet formed through its walls, the innermost end of said outlet and the outermost end of said chamber meeting in substantially point contact, a tube having a portion with an outer diameter less than the inner diameter of said outlet extending within and axially of said chamber to the rear of said outlet and spaced therefrom a distance less than the outer diameter of said portion, said tube having another portion bent at right angles and extending through a wall of said passage and terminating in said base, said wall being cut away to accommodate said last mentioned portion of said tube.

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