Jan. 3, 1950 F. A. SIMMONS 2,493,209

SPRAY OR ATOMIZER NOZZLE

Filed Jan. 25, 1949

Fig. 1

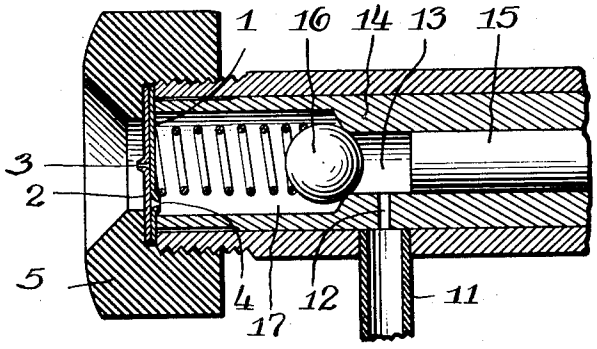


Fig. 2

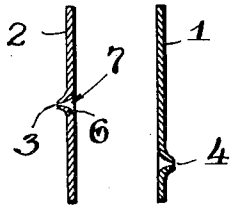
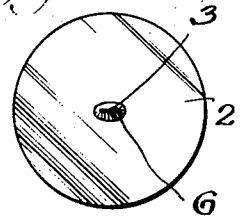


Fig. 3



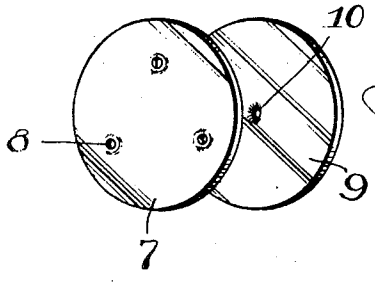


Fig. 4

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Patented Jan. 3, 1950 2,493,209

UNITED STATES PATENT OFFICE

2,493,209

SPRAY OR ATOMIZER NOZZLE

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Application January 25, 1949, Serial No. 72,720

11 Claims. (Cl. 299—153)

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This invention relates to nozzles for atomizing liquids.

The principal purpose of the invention is to provide an extremely simple nozzle capable of dividing a stream of liquid into minute particles. A further object is to provide such a nozzle which is capable of atomizing a wide range of liquids, such as paints, enamels, oils, insecticides, and the like, and which may be manufactured without reference to exacting tolerances and which does not require critical adjustments during use. A further object is to provide such a nozzle which also functions in a limited manner as a check valve to abruptly and completely check the flow of liquids when the operating pressure upon the liquid is relieved.

A host of more or less intricate structures have heretofore been proposed or used for the conversion of an integrated body of liquid into finely divided liquid particles projected through the atmosphere from the nozzle aperture or apertures in a broadening stream. The problem becomes increasingly difficult as the specified size of the particles is reduced. Also, a nozzle which may be capable of efficiently atomizing a liquid having certain physical characteristics may not properly serve to atomize liquids having different characteristics. The nozzle herein described, while very simple and inexpensive, is adapted to handle liquids having a wide range of viscosities, densities, and surface tension characteristics, and which differ in other respects.

In the accompanying drawing,

Fig. 1 is a cross-sectional view of a portion of a sprayer assembly including the nozzle of the invention;

Fig. 2 is a cross-sectional view of one form of the essential elements of the nozzle separated for purposes of illustration;

Fig. 3 is a front view of the nozzle elements; and

Fig. 4 is a perspective view of a modified form of the nozzle elements, separated for purposes of illustration.

A form of nozzle which may be readily produced in quantity and at low cost is illustrated in the drawing. It consists essentially of two apertured discs clamped together at their peripheries, the apertures being in nonalignment so that liquid flowing through the nozzle is required to flow an appreciable distance laterally between the two discs. The characteristics of the discs and apertures for the most satisfactory operation of the atomizer nozzle are described below.

Disc 1 may be referred to as the inner disc since it is disposed inwardly from outer disc 2 in the nozzle and sprayer structure. Both of these discs may be conveniently formed from sheet metal, preferably a metal such as half hard brass which possesses some resilience in that the

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central portions of the discs may be slightly spread apart by fluid pressure exerted between the discs and will spring back together when the pressure has been relieved. It is not necessary that both discs 1 and 2 possess such resilient qualities, but it is desirable for best results that at least one of these members be somewhat springy or resilient.

The two elements of the nozzle are preferably generally flat, since this is the most inexpensive and practical form to employ, but it should be understood that the surfaces forming the interface between the two elements may be other than planar, provided only that the engaging surfaces conform generally to each other.

Aperture 3 from which the fine liquid particles are emitted is preferably a sharp edged orifice which may be round, elongated to form a slot, as illustrated in Fig. 3, or otherwise shaped. Aperture 3 may be located anywhere in disc 2 inside of the marginal portion used for clamping, the central position illustrated being preferred to avoid interference with the atomized stream by the clamping nut 5. An outwardly protruding dent 6 is formed in disc 2 at the eventual location of aperture 3 to provide a small cavity 7 between the discs. Aperture 3 is then punched, pierced, or drilled at the apex of dent 6. In a properly controlled operation, the indentation and aperture may be formed by a tool which first draws the metal and then pierces it.

Aperture 4 may be formed in the same way as aperture 3, if desired, but it is not important whether an orifice with sharp edges is provided. Any small aperture which is not in alignment with aperture 3 in the assembled nozzle is satisfactory for the purposes of the invention. The area of aperture 4 should be roughly equal to that of aperture 3.

If desired, and if the capacity of the sprayer apparatus is sufficient to permit it, a plurality of apertures may be employed in either or both nozzle elements. Nozzle element 7 (Fig. 4), for example, has three discharge apertures 8 equally spaced from each other and inner disc 9 has a single supply aperture 10 at its center.

The nozzle herein described can be used with any spraying equipment or pump capable of supplying fluid to the nozzle at pressure above, say 30 pounds per square inch. The requisite pressure depends somewhat upon the characteristics of the nozzle elements and apertures. In the apparatus illustrated in Fig. 1, the fluid is drawn from a container, not shown, through tube 11 and inlet port 12 into chamber 13 of cylinder 14 by the reciprocating action of piston 15 acting in cooperation with check valve 16. The fluid is forced into nozzle chamber 17 whence it flows through aperture 4 of inner nozzle disc 1. The pressure of this fluid forces discs 1 and 2 apart

to a slight extent to permit the passage of the fluid through the lateral broad and shallow passageway thus provided to cavity 7 and aperture 3. The resilience of one or both of the nozzle elements tends of choke off or throttle the flow of fluid between the discs and the fluid escapes from this pressure condition as it bursts into cavity 7. It is likely that there is considerable whirling and turbulence of the fluid within this cavity which is thought to cause the breaking up of the fluid into fine particles as the material is emitted from discharge aperture 3.

Although, as stated above, discharge aperture 3 may be provided in any convenient shape, it has been found that improved results are obtained when a slot is used, particularly when supply aperture 4 is laterally disposed with respect to the length of the slot in the nozzle assembly.

It will be understood that considerable variation is possible in the form and dimensions of the structure described without departing from the principles of the invention. As a specific example of one form of suitable structure, the following dimensions of the discs and apertures when half hard brass is used are given:

	Inches
Diameter of discs	$\frac{5}{16}$
Thickness of inner disc	0.010
Thickness of outer disc	0.010
Dimensions of slot in outer disc	0.040 x 0.008
Diameter of round aperture in inner disc	0.032

Invention is claimed as follows:

1. An atomizer nozzle comprising two discs of thin springy metal in abutting face-to-face relationship, one of said discs having a long and narrow slot therein, the portion of said disc immediately surrounding said slot being upstruck to form a lip around said slot and a cavity between said discs at said slot the other of said discs having an aperture therein in nonalignment with said slot, the portion of said disc immediately surrounding said aperture being upstruck to form a lip around said aperture and a cavity between said discs at said aperture.

2. An atomsizer nozzle in accordance with claim 1 wherein said aperture is laterally disposed with respect to the length of said slot.

3. An atomizer nozzle comprising outer and inner elements clamped together at their peripheries and having nonregistering apertures therein, at least one of said elements being resilient, each of said elements having a cavity inwardly of and communicating with the aperture therein, said elements being substantially in engagement at areas adjacent said cavities.

4. An atomizer nozzle comprising outer and inner elements clamped together at their peripheries and having nonregistering apertures therein, at least one of said elements being resilient, the aperture in each of said members communicating with a cavity formed inwardly thereof and between said elements, said elements being substantially in engagement at areas adjacent said cavities.

5. An atomizer nozzle in accordance with claim 4 wherein an aperture in the outer element is a long and narrow slot.

6. An atomizer nozzle in accordance with claim 4 wherein an aperture in the outer element is a sharp-edged orifice.

7. An atomizer nozzle comprising outer and inner elements clamped together at their peripheries and having central portions thereof in close proximity to each other, said elements having nonregistering apertures therein, at least one of said elements being resilient, the aperture in the outer element communicating with a cavity formed inwardly thereof and between said elements, and the aperture in the inner element communicating with a cavity formed inwardly thereof and between said elements, whereby the pressure of fluid in said last-named cavity will force the fluid between the elements to the cavity inwardly of the aperture in the outer element.

8. An atomizer nozzle comprising outer and inner elements clamped together at their peripheries and having nonregistering apertures therein, at least one of said elements being resilient, said elements normally being in face-to-face contact with one another, the aperture in the outer element communicating with a cavity formed inwardly thereof and between said elements, and the aperture in the inner element communicating with a cavity formed inwardly thereof and between said elements, whereby the pressure of fluid in said last-named cavity will force the elements out of face-to-face contact with one another and will force fluid from the last-named cavity between the elements to the cavity inwardly of the aperture in the outer element.

9. An atomizer nozzle comprising outer and inner generally flat elements of thin resilient metal clamped together at their peripheries and having nonregistering apertures therein, each of said elements having a cavity inwardly of and communicating with the aperture therein, said elements being substantially in engagement at areas adjacent said cavities.

10. An atomizer nozzle comprising outer and inner generally flat elements of thin resilient metal clamped together at their peripheries and having nonregistering apertures therein, the aperture in each of said members communicating with a cavity formed inwardly thereof and between said elements, said elements being substantially in engagement at areas adjacent said cavities.

11. An atomizer nozzle comprising outer and inner generally flat elements of thin resilient metal clamped together at their peripheries and being otherwise unconfined and having nonregistering apertures therein, the aperture in each of said members communicating with a cavity formed inwardly thereof and between said elements, said elements being substantially in engagement at areas adjacent said cavities.

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