

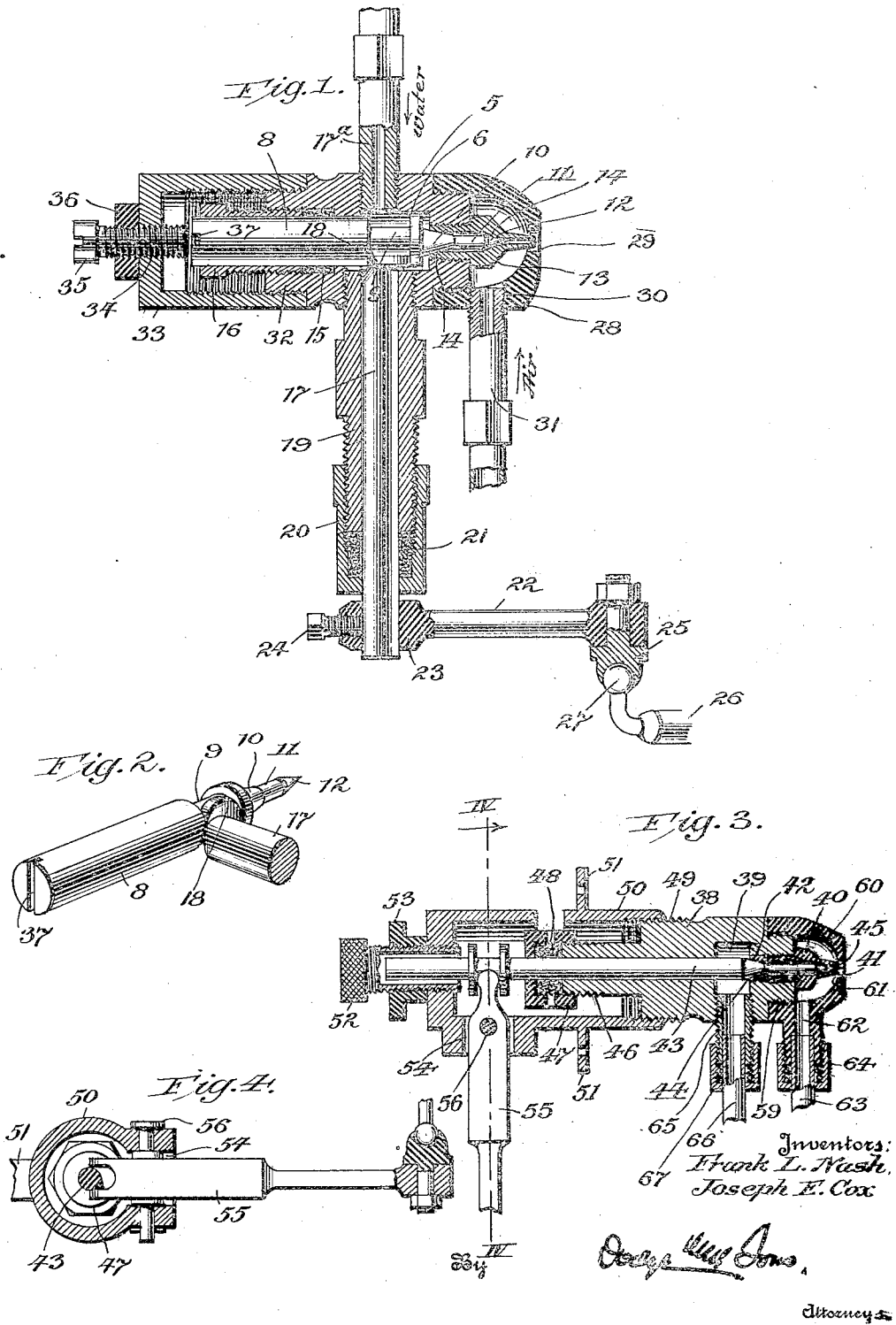
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SPRAY NOZZLE

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SPRAY NOZZLE

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Our invention relates to spray nozzles for mixing fluids and particularly to nozzles adapted for atomizing or spraying a fluid in a finely divided state.

One object of the invention is to provide a simple and efficient nozzle which is capable of close adjustment and exact regulation.

Another object is the provision of a nozzle adapted to atomize one fluid under the action of a second fluid under pressure.

A further object is the provision of a nozzle in which all parts are easily accessible and in which the valve seat is renewable.

Other objects of the invention will appear from the following specification when read in conjunction with the accompanying drawings in which,

Figure 1 is a sectional view through one form of spray nozzle embodying our invention;

Figure 2 is a perspective view in detail of the regulating mechanism shown in Figure 1;

Figure 3 is a sectional view of a modified form of spray nozzle; and

Figure 4 is a detailed sectional view of the regulating mechanism employed with the nozzle shown in Figure 3, the section being taken on line IV—IV.

Referring to Figure 1 the reference character 5 designates the body of the spray nozzle, this body having a longitudinal passageway therethrough and containing a chamber 6. Associated with the passageway in body 5 and movable back and forth in the chamber 6 is a regulating needle 8. As shown, this needle is substantially cylindrical in cross-section and has near its forward end an annular groove 9. In front of the groove 9 the needle is reduced in cross-section to form a conical portion 10, a reduced portion 11 and a pointed end 12.

Threaded into the forward end of body 5 is a nipple 13, this nipple having a conical seat 14 on its inner end adapted for cooperation with the conical portion 10 of needle 8. When the needle 8 occupies its extreme right-hand position as shown in Figure 1, the conical portion 10 of needle 8 engages

the seat 14 and seals the connection between chamber 6 and the interior of nipple 13. The left-hand end of chamber 6 is rendered fluid tight by means of a packing 15 which closely surrounds the stem of needle 8 and is held in intimate relation therewith by means of an apertured threaded plug 16.

Fluid may be supplied to the chamber 6 through a pipe 17a and the flow of this fluid through the nipple 13 may be varied by regulating the position of needle 8. For the purpose of accomplishing this regulation there is associated with the body 5 a rotatable rod 17 carrying at its inner end a cam 18 (see Fig. 2). This cam is eccentrically mounted with respect to rod 17 and when this rod is rotated it will be seen that the needle 8 is moved back and forth in accordance with the amount of such rotation. Threaded into the body 5 and acting as a bearing for the rod 17 is a tubular member 19 carrying at its outer end a threaded cap 20. This cap is perforated to receive the rod 17 and also contains a space for packing 21 which seals the space between member 19 and rod 17 and prevents the escape of fluid from chamber 6. Any suitable means may be provided for rotating the rod 17, but as here shown a lever 22 having an eye 23 is secured to the rod by set screw 24. The other end of lever 22 contains an eye to receive a member 25 which is connected to an actuating rod 26 by means of a ball and socket joint 27.

Threaded onto the reduced forward end of body 5 is a hollow rounded cap 28 having an opening 29 in one side to accommodate the end of nipple 13. This cap is also perforated at 30 to receive a fluid supply pipe 31.

The body 5 has a reduced threaded portion 32 for the reception of a tubular cap 33. This cap is perforated at 34 to receive an adjusting screw 35 which coacts with a lock nut 36. Adjustment of the screw 35 back and forth varies the distance through which the needle 8 can travel so that the extent to which the needle valve opens may be exactly controlled. After long continued use the cooperating surfaces of nipple 13 and conical portion 10 of needle 8 may be fouled by the accumulation of dirt or these surface may become

worn to an uneven contour. In order to make it possible to remove this dirt without dismantling the parts of the nozzle, and to vary the angular relation of these cooperating surfaces for distributing the wear, the left-hand end of needle 8 is slotted at 37 so that by removal of the cap 33 a screw driver may be inserted to rotate the needle 8.

One application for which this spray nozzle is particularly adapted is in the atomizing of water by means of air under pressure. When used in this connection water is supplied to the chamber 6 of the nozzle through the pipe 17a, while air under pressure is supplied to the interior of cap 28 through pipe 31. Under such conditions the water enters chamber 6 and upon opening of the needle valve by actuation of lever 22 some of the liquid escapes through the nipple 13. At the same time air entering the interior of cap 28 from pipe 31 is given a swirling motion and in escaping through the orifice 29 encounters the fine stream of liquid coming out of nipple 13. Through the interaction of these two fluids the water is broken up into a fine spray. The amount of water escaping through nipple 13 may be controlled by adjustment of the throw of needle 8 or by the regulation of the position of the needle through the actuation of lever 22. The condition of the spray may further be varied by changing the pressure by which air is supplied to the interior of cap 28.

This form of device is particularly practical and efficient in that the arrangement of cam 18 for cooperation with groove 9 is such that the position of needle 8 may be regulated very closely and exactly by manipulation of lever 22. It will also be manifest that all parts of the nozzle are accessible for repair or adjustment and that in case the needle valve becomes worn, the nipple 13 may be replaced by removing cap 28.

In Figures 3 and 4 we have shown a slightly modified form of nozzle such as that disclosed in our copending application Serial No. 271,329, filed April 19, 1928, Patent No. 1,734,872, granted November 5, 1929, of which the present case is a continuation in part.

The nozzle shown in Figure 3 comprises a hollow body 38 containing a chamber 39. This body contains a longitudinal passage-way the forward portion of which is threaded to receive a hollow nipple 40 having a reduced forward end 41 and containing a conical valve seat 42 at its rearward end. Longitudinally movable through the opening in body 38 is a needle 43. This needle is reduced in cross-section at its forward end to form a conical valve seat 44 adapted to cooperate with the seat 42 on nipple 40 and is further reduced to a sharp point 45 which in one position extends through the restricted opening in the right-hand end of nipple 40. The rear end of body 38 is of

greatly reduced diameter and is threaded at 46 to receive a sealing cap 47 containing packing 48. The purpose of this packing is to prevent the escape of fluid from chamber 39 rearwardly between the needle 43 and the passage in which it moves.

The body 38 is also threaded at 49 to receive a hollow screw cap 50 having radially extending ears 51 adapted to secure the cap to any desired support. The rear end of cap 50 contains a threaded opening to receive a hollow screw cap 52 which is knurled and is adapted to cooperate with a locking nut 53. It will be seen that the cap 52 may be screwed in and out and may be locked in any desired position by means of the nut 53. The cap 50 also contains a lateral opening 54 for the reception of a needle operating arm 55, this arm being pivotally secured to the cap by a pin 56. The end of arm 55 extending within the cap 50 is bifurcated, as shown in Figure 4, each fork of the bifurcation being rounded to cooperate with two spaced collars secured to the needle 43. When the arm 55 is swung from side to side the needle 43 is moved back and forth through the body 38 so as to vary the opening between the conical seat 44 on the needle and the valve seat 42 on nipple 40. The extent of this longitudinal movement can be varied by adjustment of the hollow plug 52 referred to above.

A portion of the body 38 is cut away at the forward end and is threaded at 59 to receive a hollow rounded cap 60 having a lateral opening 61 therein. The opening 61 is in substantial alinement with the passage through body 38, and when the parts are in position this opening registers with the reduced end of nipple 40. The cap 60 contains a lateral opening 62 communicating with a fluid supply pipe 63 secured thereto by a threaded connection 64. A tube 65 threaded into the body 38 affords communication with a second fluid supply pipe 66 which is connected to it by means of a threaded connection 67.

The structure which has just been described is particularly adapted to mixing two fluids, one of which is supplied to chamber 39 through pipe 66, and the other of which is supplied to the interior of cap 60 through pipe 63. For the sake of this description we shall assume that water is supplied to the chamber 39 through pipe 66, and air under pressure is supplied to cap 60 through pipe 63. So long as the needle 43 occupies its extreme right-hand position no water can escape from the chamber 39, because the outlet from this chamber is effectively sealed by the engagement of conical portion 44 of the needle with valve seat 42 of nipple 40. When, however, the lever 55 is moved so as to slide the needle 43 to the left, water can escape from the chamber 39 and will pass out through the reduced end of nipple 41. If

at this time air is being supplied to the hollow cap 60 this air will be given a swirling motion by the interior rounded surface of cap 60 and will then escape laterally through the opening 61 where it will encounter the water which is escaping from the nipple 40. The interaction of this air under pressure and the water will cause the water to be broken up into a finely atomized spray which will be thrown out away from the nozzle in a highly diffused form. The extent of this interaction may be readily controlled by regulating the position of needle 43 through lever 55, and also by varying the pressure under which the air is supplied through pipe 63. The degree of atomization can also be controlled by adjustment of the hollow plug 52 which can be made to limit the amount by which the needle valve is opened.

It will be apparent that the spray nozzle structure which we have just described is not only very simple in construction, but is highly efficient in operation. This is particularly true because all parts of the nozzle can be reached for repair or replacement particularly the valve seat contained in the removable nipple. Another particular advantage of this construction is the means for adjusting the throw of the regulating needle without necessitating dismantling of the parts or the use of special tools.

Although we have herein shown and described only two forms of spray nozzle embodying our invention, it will be obvious that various changes and modifications may be made in the details thereof, within the scope of the appended claims, without departing from the spirit and scope of our invention.

What is claimed is:

1. A spray nozzle comprising a hollow body having a fluid inlet and a fluid outlet; a removable tubular nipple secured in said body in alinement with said outlet and having an inner tapered valve seat; a needle movable in said body, said needle containing an annular groove in its outer surface, and having a portion adapted to cooperate with said tapered valve seat; eccentric means for moving said needle to regulate the size of said outlet, said means extending into said groove; means for adjusting the throw of said needle, and means whereby said needle may be rotated.

2. A spray nozzle comprising a hollow valve body; a removable valve seat threaded into said body; a needle movable longitudinally of said body and rotatable therein, and having a tapered portion on one end cooperating with said valve seat, and a slot in the other end; a cap secured to said body and enclosing the slotted end of said needle; a cam groove extending entirely around said needle; and needle operating means including an eccentric member operatively associated with said groove, whereby said needle

can be moved irrespective of the angular position of said needle.

3. A spray nozzle comprising a hollow valve body; a movable control needle in said body, said needle having a slotted end, and a cam groove extending entirely around it; a cap enclosing said slotted end; and eccentric means engaging said groove to move said needle, irrespective of the angular position occupied by said needle.

In testimony whereof we have signed our names to this specification.

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