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ATOMIZING APPARATUS

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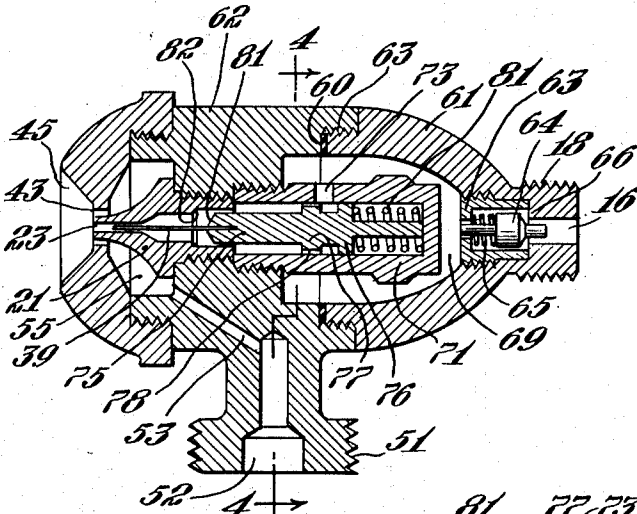


Fig. 3

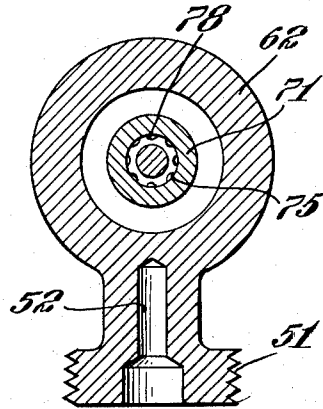


Fig. 4

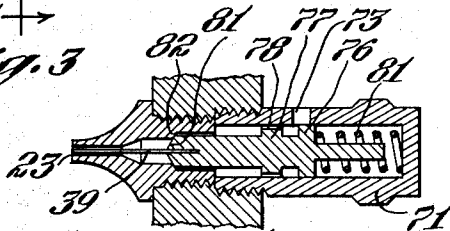


Fig. 5

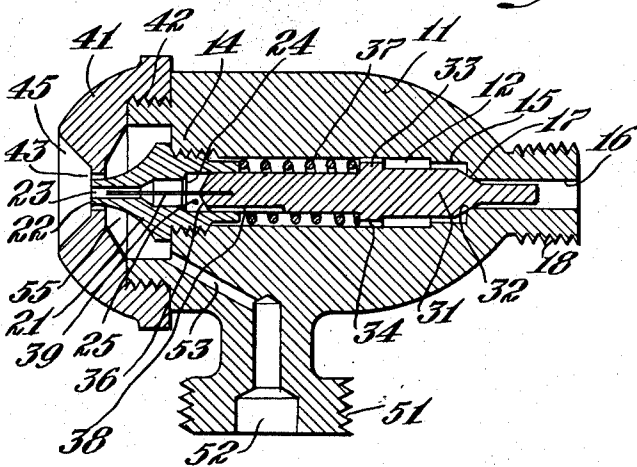


Fig. 2

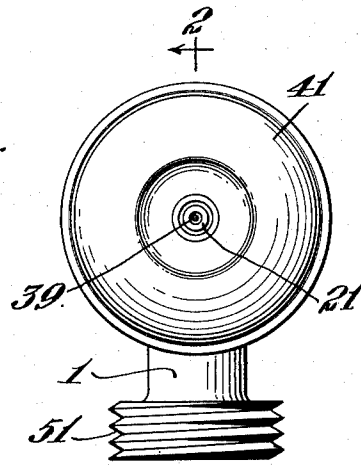


Fig. 1

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ATOMIZING APPARATUS

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3 Claims. (Cl. 299—59)

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The present invention relates to atomizing or spray nozzle apparatus, and more particularly to such apparatus of the type which is especially suitable for providing a humidifying mixture of finely divided water and air.

It is the main object of the present invention to provide nozzle apparatus of the above type which divides a liquid such as water into very fine particles intermixed with another fluid such as air, while regulating its discharge in conformity with the pressure of the liquid supplied thereto, and keeping itself open by continuously automatic action, thereby remaining in operation in spite of accidentally entering dirt and other impurities which in other types of such apparatus often impair proper and continuous operation.

Other objects of the invention are to provide spray nozzle or humidifying apparatus of the above mentioned type which is simple and inexpensive in manufacture and yet very rugged and reliable; to provide such apparatus which can be easily dissembled and reassembled for the purpose of cleaning or for exchanging control elements which permit adjustment of its operation; and to provide spray nozzle humidifying apparatus which is adaptable to different types of operation, always providing certain and reliable automatically regulated performance.

In one of the aspects of the invention, a spray nozzle is provided with a cleaning needle extending into the nozzle opening but being considerably smaller, thus permitting fluid flow therearound, and pressure responsive means which move the needle within its nozzle with slightly changing fluid pressure, thus providing an automatic cleaning operation.

In another aspect, the invention contemplates a combination of valve and adjustable port arrangement with the above mentioned cleaning needle, the valve means tending to keep the nozzle closed when the fluid to be passed through and atomized by the nozzle has a pressure below a certain value, whereas the valve opens and the port is regulated according to pressure variation, at the same time imparting a cleaning motion to the needle, when the pressure rises above a certain value.

In still another aspect, the invention provides a humidifying device which combines two nozzles for two fluids, one of which may be liquid and the other gaseous, these nozzles being so correlated that the two fluids, both applied under pressure, intermingle and form an especially fine spray which is propelled a considerable distance beyond the nozzle.

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A further feature of apparatus according to the invention is the provision of valve means which check the fluid supply while the pressure is below a given value, and of other valve means which regulate the fluid discharge dependent upon the fluid pressure.

In an additional aspect of the invention, a single control body having two valve elements constituting a regulating channel, and a cleaning needle, provides operation within a predetermined pressure range, regulation according to pressure change, and cleaning action.

In yet another aspect of the invention, one of the valve elements is a separate check valve, and a tortuous path which may be used for filtering is introduced while the control body provides mainly continuous flow regulation and nozzle cleaning action.

These and other objects, aspects and features will appear from the following description of two typical practical embodiments illustrating the novel characteristics of the invention. This description refers to a drawing in which

Fig. 1 is a front elevation of one embodiment of my invention;

Fig. 2 is a section on line 2—2 of Fig. 1 showing the valve portion;

Fig. 3 is a section, similar to that shown in Fig. 2, through another embodiment of the invention, this section showing the device during operation;

Fig. 4 is a section on line 4—4 of Fig. 3; and

Fig. 5 is a fragmentary section, similar to Fig. 3, but showing the regulating valve in closed position.

In Figs. 1 and 2, numeral 11 denotes the main body of the spray apparatus according to this embodiment of the invention. This body has a central conduit portion 12 which is threaded at 14 and is at the other end twice stepped down to form shoulders at 15 and 16, a valve seat 17 being formed at the shoulder 15—16, and bore 16 being open and surrounded by a threaded portion 18 for connection to a suitable supply of pressure fluid.

Screwed into threaded portion 14 of the central conduit is the nozzle body 21 having a blunt front end 22, a discharge bore 23, a valve seat portion 24, and a guide bore portion 25.

Slidably inserted in conduit 12 is a control body 31 which has a regulating valve cone portion 32, a guide shoulder 33 with passage grooves 34, and a safety valve cone 36. Fastened to the safety valve end of the control member 31 is a pin 39 which reaches into nozzle opening 23 but is considerably smaller so as to permit

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flow of fluid through the nozzle. A spring 37, inserted between nozzle body 21 and shoulder 33, tends to close valve 17—32. The pin end of control body 31 fits the portion 25 of nozzle body 21 and has a groove or channel 33. The control body is guided within the conduit portion by shoulder 33 and by its front end within bore 25.

A nozzle cap 41 is at 42 screwed to the main body 11 and forms a second, annular, nozzle 43 which surrounds, and is flush with the outside face 22 of nozzle 21. The nozzle cap 41 is conically recessed as shown at 45, in order suitably to direct the spray flowing from the nozzle. Cap 41, body 11 and nozzle 21 form a chamber 55.

The main body 11 is further provided with a threaded flange portion 51, surrounding an inlet passage 52 which leads through a bore 53 into the chamber 55 which is formed by nozzle cap 41, nozzle 21 and main body 11.

The device according to Figs. 1 and 2 operates as follows:

Assuming that it is desired to provide a humidifying water spray with the aid of compressed air, the air supply is connected to inlet 52 and first turned on; the compressed air leaves nozzle outlet 43 with a spiral motion or turbo effect which is very effective in further breaking up the water emerging in a spray from nozzle 23.

The water supply, connected to inlet 16, is then turned on. The water pressure forces valve 17—32 to open and passes through portion 15, through recesses 34 and past spring 37 and groove 39 and further past needle 39 into nozzle 23, from which it emerges as a very fine spray, the needle promoting the breaking up of the jet.

The spring 37 opposes the pressure of the water entering at 16, and by appropriate movement depending upon the pressure variations, regulates the amount of water which enters the nozzle through channel 33. If the water pressure should become too high, valve 24—36 closes, leaving only a very small amount to flow through channel 33. Due to the continuously prevailing changes in water pressure, valve body 31 will continuously move back and forth to a slight extent at least, moving pin 39 within nozzle opening 23 and keeping it free from impurities or obstacles. When the pressure water supply is cut off or the supply pressure falls below a given value, spring 37 again forces valve cone 32 against seat 17 and the device closes automatically.

It will thus be noted that the nozzle according to the invention operates with self cleaning and regulating action within the fairly narrowly defined limits of a range of fluid pressure.

The embodiment according to Figs. 3 to 5 is in its general outline similar to that shown in Figs. 1 and 2, above described. The main body, however, is divided into two portions 61 and 62, which are at 63 joined by means of a thread and a sealing gasket 60.

The pressure water inlet 16, 13 is in this instance provided with a check valve comprising a valve body 63, a check valve 64 and a valve spring 65, the valve body 64 fitting valve seat 65 of housing portion 61.

The front body portion 62 carries a nozzle body 21 which is quite similar to that described above with reference to Fig. 2. Screwed into front body portion 62 is further a control housing 71 which has a uniformly cylindrical bore and is pierced by a fluid admission port 73 connecting to chamber 69 formed by housing 61—62. Within control housing 71 slides a control body 75 which has a guide shoulder 76, and a guide and valve shoulder

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77, which is provided with grooves 78. A spring 80 urges the control body 75 toward the nozzle body 21, with valve face 81 resting against valve seat 82, as shown in Fig. 5, when the apparatus is in inoperative position. The nozzle is then practically closed by valve 81—82 with a small amount of water escaping around the valve seat, and port 73 considerably narrowed by valve shoulder 76. In this condition, check valve 64—65 is likewise closed.

Discharge bore 23 and air outlet or nozzle 43 are similar to those described with reference to Figs. 1 and 2.

The spray device according to Figs. 3 to 5 operates as follows:

Again, the compressed air is first admitted through inlet 52, emerging through annular nozzle 43.

The pressure fluid, such as water, is then admitted through inlet 16, and lifts valve 64. The fluid proceeds through chamber 69 which may be filled with filter material, changes its direction of flow and enters through port 73 into control housing 71. Passage at 23 being practically inhibited, the fluid pressure compresses spring 80 and widens the supply area at 73, also lifting valve face 81 from seat 82. The pressure fluid emerges through nozzle opening 23, and together with the compressed air entering through 52, 53 and 55, forms a fine spray, directed and distributed by conical recess 45. The supply port area at 73 changes proportionate to the varying water pressure, thus ascertaining and securing a fairly steady supply of pressure fluid. With slight variations of the pressure, the control body 75 moves back and forth with pin 39 moving within nozzle opening 23, keeping it clean from fluid flow obstructing impurities. This cleaning action is effective even when a piece of dirt lodges between the pin and the water outlet wall, the pressure building up behind the obstacle forcing the control pin backward, whereby the obstacle is dislodged and blown out by the pressure fluid. After performing this cleaning action, the pin moves back into normal position.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. Spray apparatus comprising a body enclosing a chamber, a liquid inlet port for admitting liquid to the chamber at a predetermined average pressure, a liquid outlet nozzle for emitting liquid from said chamber, a gas outlet adjacent said nozzle for forming a spray mixture with said liquid at said average pressure, a gas inlet leading to the outlet, a control member slidable in the chamber between advanced and retracted positions along the line of liquid flow between said port and nozzle, said control member being responsive to said liquid pressure at the inlet port to move toward advanced position, resilient means yieldingly urging the member toward retracted position, said resilient means being biased to hold said member intermediate said positions against said average pressure, a cleaning member at the forward end of the control member movable with the control member within the nozzle, the lodging of particles in the nozzle adjacent the cleaning member causing obstruction of flow and back pressure against said average pressure thereby to move the control member from said inter-

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mediate position and dislodge the particles, whereby each time an obstruction is lodged in said nozzle said control member and cleaning member are automatically actuated during spray forming operation to clean the nozzle, thereby to restore the proportion of liquid in said mixture.

2. Spray apparatus comprising a body enclosing a chamber, a liquid inlet port for admitting liquid to the chamber at a predetermined average pressure, a liquid outlet nozzle for emitting liquid from said chamber, a gas outlet adjacent said nozzle for forming a spray mixture with said liquid at said average pressure, a gas inlet leading to the outlet, a control member slidable between advanced and retracted positions along the line of flow between said port and nozzle, said control member being responsive to said liquid pressure to move toward advanced position, resilient means yieldingly urging the member toward retracted position, said resilient means being biased to hold said member intermediate said positions against said average pressure, a cleaning member at the forward end of the control member movable with the control member within the nozzle, the lodging of particles in the nozzle adjacent the cleaning member causing obstruction of flow and back pressure against said average pressure thereby to move the control member from said intermediate position and dislodge the particles, whereby each time an obstruction is lodged in said nozzle said control member and cleaning member are automatically operated to clean the nozzle, thereby to restore the proportion of liquid in said mixture, a valve portion at one end of the control member, and a valve seat between said chamber and nozzle forming valve means closed when the control member is in advanced position, whereby excess pressure on said control member closes said valve means to prevent an excess of liquid in said mixture.

3. Spray apparatus comprising a body en-

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closing a chamber, a liquid inlet port for admitting liquid to the chamber at a predetermined average pressure, a liquid outlet nozzle for emitting liquid from said chamber, a gas outlet adjacent said nozzle for forming a spray mixture with said liquid at said average pressure, a gas inlet leading to the outlet, a piston slidable in the chamber between forward and rear positions along the line of flow between said port and nozzle, said piston having a face responsive to said liquid pressure to move the piston toward forward position, resilient means yieldingly urging the member toward rear position, said resilient means being biased to hold said member intermediate said positions against average pressure, a flexible cleaning pin at the forward end of the piston movable with the piston within the nozzle, the lodging of particles in the nozzle adjacent the pin causing obstruction of flow and back pressure against said average pressure thereby to move the piston from said intermediate position and dislodge the particles, whereby each time an obstruction is lodged in said nozzle said piston and pin are automatically operated to clean the nozzle, thereby to restore the proportion of liquid in said mixture.

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