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APPARATUS FOR OBTAINING AN EXCEEDINGLY FINE ATOMIZATION

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FIG. 1

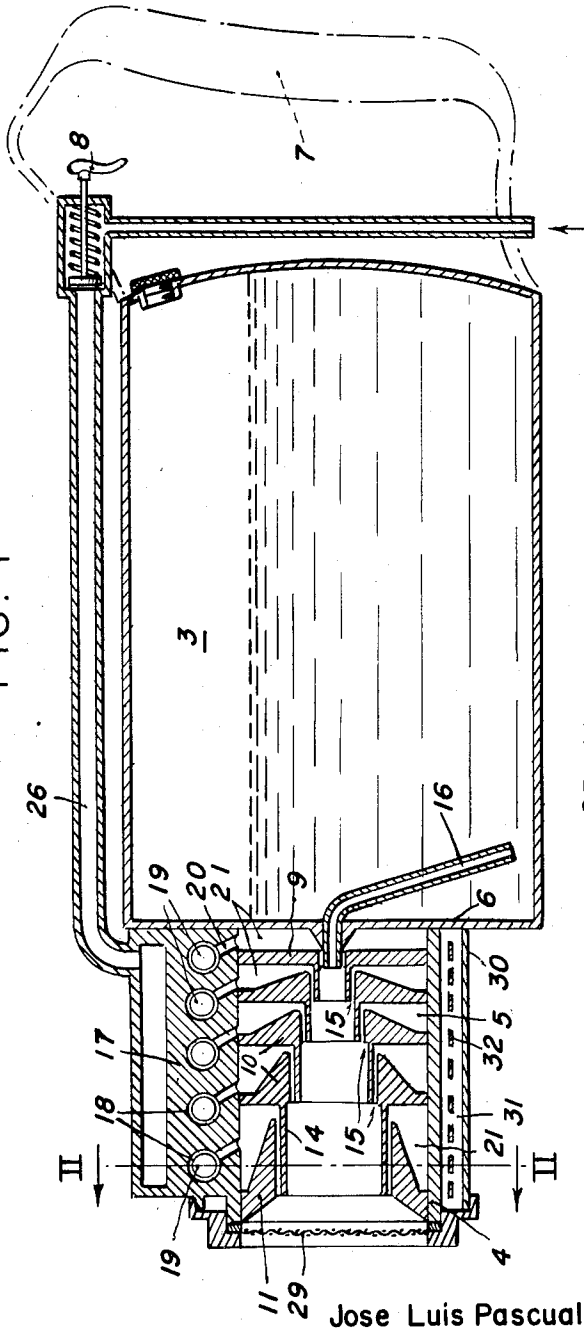
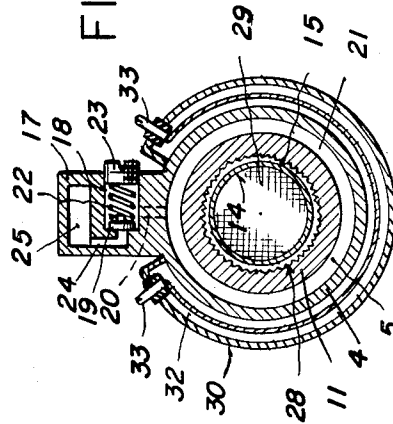


FIG. 2



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APPARATUS FOR OBTAINING AN EXCEEDINGLY FINE ATOMIZATION

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10 Claims. (Cl. 299—86)

This application is a continuation-in-part of my application Serial No. 776,639 filed September 29, 1947, now abandoned.

The present invention relates to a process and apparatus for obtaining an exceedingly fine atomization.

The object of the present invention is to provide a process for producing a microscopic atomization of a liquid or solution in order to enable the same to remain suspended in the air a long enough time for ensuring an adequate effect from the atomized disinfectant or other material. This process is founded on the principle of producing an initial atomization of the liquid or solution by means of a jet of pressure gas which, on passing through an adequate nozzle obtains a high velocity of discharge in the axial direction of flow, a rapid rotary movement being imparted simultaneously to the same in order that both movements in cooperation, give rise to a helical conical displacement of the jet of gas at the inside of which and near the lateral surface thereof is disposed almost the totality of the previously atomized liquid particles. Then the conical jet is submitted to a series of accelerating impacts by further successive jets of gas, which further reduce the size of the liquid particles very effectively at each impact, until attaining such a fineness that a perfect suspension of the particles within the air or solution into which the said liquid or solution is atomized is ensured.

A further object of the present invention is to provide an apparatus specially designed for use with the process set forth, wherein an atomizing nozzle is provided, comprising an initial atomization nozzle having a central suction tube in communication with a receptacle, the outlet opening of the tube being surrounded by a ring nozzle for the discharge of the pressure gas, both discharging into a chamber having a plurality of further outlet nozzles for the gas, with increasing diameters and gradually arranged in the forward running direction of the jet. Each of the nozzles is in communication with a chamber connected by a conduit with a pressure regulating valve, adjustable at will, and all of them are connected at the pressure side to a single duct, to which the pressure gas proceeding from any compressing or storing means in current use is delivered, and in said duct a distributing valve is provided to control the working of the atomizing nozzle.

A still further object of the present invention is to provide an apparatus of the kind set forth comprising heat supplying means to overcome the fall of temperature caused within the nozzle owing to the evaporation of the atomized liquid and the expansion of the atomizing gas, said heat supplying means comprising an outer jacket covering the nozzle, within which an electric heating resistance is located having the terminals thereof connected to a flexible conductor. The resistance is specially calculated for supplying the exact amount of heat for maintaining the nozzle at a reasonable working temperature and preventing the freezing of the liquid or the moisture conveyed by the gas, without modifying the

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specific nature of the liquid which may enter into consideration.

In order that the nature and scope of the present invention may be clearly understood, reference is made to the following detailed description taken in consideration with the accompanying sheet of drawings showing a single embodiment only by way of example.

In the drawings:

Fig. 1 is a sectional view of an atomizing apparatus for hand operation in accordance with the present invention, and

Fig. 2 is a cross section of the atomizing nozzle of Fig. 1 on the line 2—2.

The apparatus described consists of a portable ensemble, comprising a receptacle 3 for the liquid to be atomized, having coupled to one of the ends thereof an atomizing nozzle constituted by an essentially cylindrical body 4 provided with a cylindrical chamber 5 open at the outlet of the nozzle, whilst the bottom thereof is determined by the wall 6 proper of the front of the receptacle 3 which the nozzle is coupled to. This ensemble forms a portable apparatus manageable by one single hand, for which purpose there is provided at the rear portion of the receptacle 3 the corresponding handle 7 for the manipulation with the gas passage control valve lever 8 located at a suitable point so as to be easily accessible to one of the fingers of the same hand which holds the apparatus. Nevertheless, it is not absolutely indispensable to arrange the liquid container or receptacle so as to form a single body with the atomizing nozzle. Said nozzle may be, likewise, relative to the container, independently arranged in order to allow of greater quantities of liquid to be stored, by means of a suitable flexible conduit in which case the manipulation handle 7 will be fixed directly to the nozzle.

In the inside of the cylindrical cavity there is mounted, by any mechanical means allowing the clamping thereof in a suitable position, a plurality of discs 9, 10 and 11 provided in the central part thereof with holes 12 having diameters increasing in the forward direction of the gaseous jet. In the holes are lodged annular collars or cylinders 13 and 14 that are formed as part of the preceding intermediate disc, leaving between the same and the wall of the corresponding hole 12 a small annular space 15 for the passage of the pressure gas. The first collar 13 is connected to a suction tube 16 which, crossing the wall 6 of the receptacle 3 extends downwardly to the bottom thereof, so that it may be possible to draw almost the entire amount of the liquid contained in the receptacle. The last disc 11 is not provided with a collar, but has a free conical outlet in order to allow the free expansion of the gaseous jet.

The body 4 has a lateral extension 17 in which is provided a plurality of housings 18, the number thereof being equal to that of the discs mounted within the cylindrical cavity 5. In the housings are lodged valves 19 specially disposed so as to close the ports 20 that connect the housings 18 with chambers 21 defined between each two discs in the chamber 5. These chambers are in communication with the annular spaces 15 for the discharge of the pressure gas. The closing action of the valves 19 is ensured by the springs 22, arranged between the former and screws 23, specially arranged for the adjustment of the pressure under which the gas is fed to the chamber 21.

The housings 18 are provided with conduits 24 which place them in communication with a collector 25 to which extends a pressure gas supply tube 26 and coupled thereto is a flexible conduit connected with a compressor device not shown. The supply tube 26 is provided with a control valve of any known type, located in a position close to the handle 7 of the apparatus, so that it may be easily operated by one of the fingers of the hand which holds the device.

For giving the jet of gas which circulates through the annular spaces 15 a rapid rotary movement, the holes 12 have helical grooves 28, shown in Fig. 2, and in order to prevent liquid or solid particles, having dimensions larger than the maximum necessary to ensure a permanent suspension thereof from coming out of the nozzle, the outlet of the nozzle is covered by means of a foraminous member 29 which may accomplish this condition without constituting an obstacle for the discharge of the suspension in a normally atomized condition.

The nozzle is laterally covered by means of a jacket 30, forming a space 31 in which a resistance 32 is lodged, provided with terminals 33. (Fig. 2) to yield an amount of heat sufficient to compensate the heat absorbed by the expansion of the pressure gas and the evaporation of the liquid which is being atomized.

The pressure gas jet flowing through the annular space between the collar 13 and the disc 11 acquires a great velocity axially and due to the helical grooves 28 a rapid rotary movement is likewise imparted thereto. The centrifugal force acting upon the liquid particles which the jet carries in suspension tends to progressively increase the diameter of the jet forming a cone, with the mass thereof endowed with the same movements as set forth above. This expansion takes place within the chambers formed by the discs 9, 10 and 11, and within the same chambers there takes place the successive impacts of the further pressure gas jets against the conical jet, so that the suspension particles are sufficiently reduced in size when reaching the discharge mouth of the nozzle. The fineness of the liquid particles increases with the number of successive impacts which the initial atomization jet is subjected to, although practically it has been observed that four or five successive jets are sufficient for obtaining a satisfactory fineness. In the same manner the distinct pressures under which the gas is supplied to the atomization nozzles will affect proportionally the development of the liquid particles atomization cycle and the obtaining of different degrees of fineness and dispersion are made possible by the alteration of the mutual ratios of pressure between the distinct nozzles. An optimum operation is secured by causing the successive pressures to have a progressive increase which provides a rapid acceleration of the jet of gas with the particles in suspension.

The invention may be carried into practice in other embodiments differing in detail from that given by way of an illustrative example. It may, thus, be fabricated in any shape and size, utilizing in the manufacture thereof the materials most suitable to each particular case of embodiment and combined in the most convenient way for securing the desired results.

I claim:

1. An apparatus for atomizing liquids, comprising an atomizing nozzle having a body with an outlet, a cylindrical chamber in said body, a liquid projecting nozzle at the end thereof opposite said outlet, a plurality of discs arranged inside said chamber axially thereof defining with

the wall of said chamber a series of pressure chambers extending axially of said chamber, each of said discs having a hole the diameter of the hole in each said disc being larger than the diameter of the hole in the preceding disc in the direction of the outlet, a cylindrical collar connected to certain of said discs adjacent the hole therein extending into the hole of a succeeding disc and defining with the wall of said hole of said succeeding disc an annular passage connecting said series of pressure chambers with the outlet of said apparatus and means for supplying a gas under pressure to said pressure chambers.

2. An apparatus for atomizing liquids as set forth in claim 1 wherein helical grooves are provided in the inner wall of said holes.

3. An apparatus as set forth in claim 1 wherein said cylindrical collars extend to the forward wall of the succeeding disc.

4. An apparatus as set forth in claim 1 wherein the forward disc at the outlet of said nozzle has a discharge nozzle in the forward face thereof of a diameter increasing from the edge of the cylindrical collar on the immediately preceding disc to the inner diameter of said cylindrical chamber.

5. An apparatus as set forth in claim 1 wherein a jacket is provided surrounding said body forming an annular space between said jacket and said body, and an electrical heating resistance within said annular space.

6. An apparatus for atomizing liquids as set forth in claim 1 wherein there is provided a receptacle for the liquid to be atomized, and a side of said receptacle constitutes the bottom of said cylindrical chamber.

7. An apparatus as set forth in claim 6 wherein a suction tube is connected to said liquid projecting nozzle and extends into said receptacle.

8. An apparatus as set forth in claim 1 wherein there is provided a pressure gas tube connected to a source of pressure gas supply, a handle upon said body, a control valve inserted in said gas tube adjacent said handle and a channel connecting each of said pressure chambers with said pressure gas tube.

9. An apparatus as set forth in claim 8 wherein a variable biased regulating valve is provided in each of said channels for adjusting the gas pressure in each of said pressure chambers.

10. An apparatus as set forth in claim 8 wherein a threaded screw is provided cooperating with said regulating valve in said channels for adjusting the gas pressure.

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