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ULTRASONIC ATOMIZER

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Fig.1

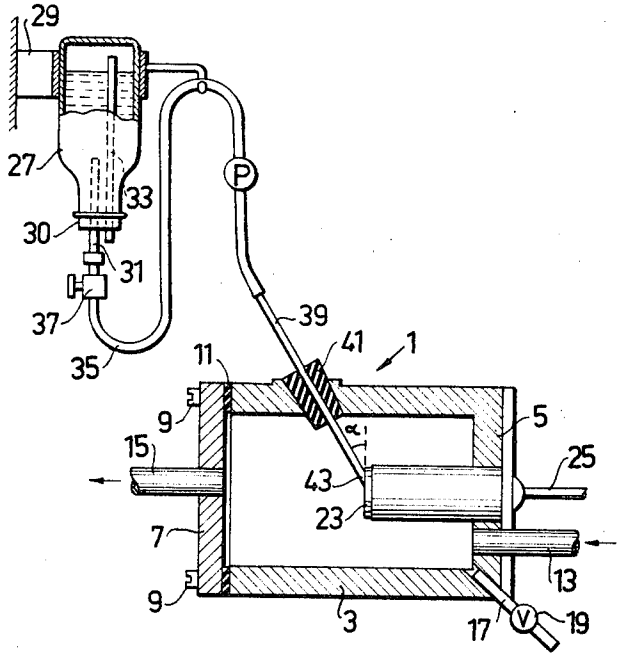
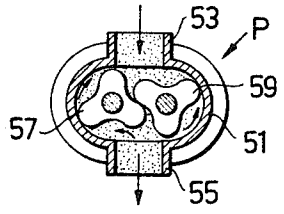


Fig.2



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ULTRASONIC ATOMIZER

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ABSTRACT OF THE DISCLOSURE

An ultrasonic atomizer to form aerosols having a chamber through which a current of gas flows and in which an ultrasonic vibrator is located. The liquid to be atomized is fed to the vibrating face of the vibrator.

The present invention relates to an ultrasonic atomizer for atomizing liquids and forming an aerosol.

The atomization of liquids by means of an ultrasonic vibrator is associated with several problems. Among the most important of these are the damping effect when supplying excess of liquid to the vibrating body, the difficulty of controlling the amount of liquid atomized per unit of time and the problem of insulating the current supply lead in those cases, where the vibrating body is wholly or partly surrounded by liquid. These problems have not been acceptably solved in known ultrasonic atomizers, in view of which the atomizers have not gained a desired broad application.

The present invention aims at solving said problems, whereby an ultrasonic atomizer is obtained which in view of its reliability and simple design has a many-facetted use.

The ultrasonic atomizer according to the invention for atomizing liquids and forming an aerosol comprises an atomizing chamber having a gas inlet and a gas outlet, and a vibrating body arranged in the atomizing chamber and having a vibrating surface, which is adapted to receive liquid for atomization from liquid supply means, the vibrating surface being arranged inclined, preferably essentially vertically, and the liquid supply means being so arranged relative to the vibrating surface, that the liquid in the supply means is in continuous liquid contact with the liquid atomized at the vibrating surface. The liquid supply means may comprise a liquid supply tube opening adjacent to the vibrating surface and the mouth of which is bevelled so as to be essentially parallel with the vibration surface and possible engages same with its outmost tip, the liquid supply tube suitably being elastically suspended.

In a particular embodiment of the invention the liquid supply means comprises a device, for instance a displacement pump, giving a controllable constant flow of liquid to the vibrating surface.

The invention will now be described by an example with reference to the appended drawing, wherein FIG. 1 shows, partly in section, an embodiment of the ultrasonic atomizer according to the invention, and FIG. 2 shows, on an enlarged scale, a detail of the ultrasonic atomizer of FIG. 1.

The ultrasonic atomizer shown in FIG. 1 comprises a container, generally designated **1**, having side walls **3**, one end wall **5** integral therewith and one removable end wall **7** attached to the side walls **3** by means of screws **9**. In order to obtain sealing a gasket **11** is clamped between the removable end wall **7** and the side walls **3** of the container. The container has a gas inlet **13** arranged in the end wall **5** and a gas outlet **15** centrally positioned in the removable end wall **7**. In the lower part of the container **1** a drain tube **17** having a shut-off cock **19** is provided.

An ultrasonic vibrator **21** is arranged in the removable end wall **7** and extends inwardly into the container **1** and ends in a vertical vibrating surface **23**, the vibrator being supplied with high frequency current through a coaxial cable **25**.

The liquid to be atomized is stored in a bottle **27**, which is suspended in a bracket **29** upside down. The bottle can be an ordinary hospital drop flask, used for instance when giving blood transfusions. The bottle **27** is sealed by means of a plug **30** penetrated by a liquid discharge tube **31** and an air inlet tube **33** extending above the free surface of the liquid in the bottle. A flexible hose **35** provided with a hose clamp **37** is connected to the tube **31**. The hose **35** leads to the inlet of a pump P, the outlet of which is connected to a liquid supply tube **39**. This tube **39** is received in an aperture in the upper side of the container **1**, the tube being arranged in a plug **41**, for instance made of rubber. The mouth **43** of the liquid supply tube **39** is bevelled so as to be adapted to the vibrating surface **23**, adjacent to which it opens. The inclination α of the tube **39** relative to the vertical plane coinciding with the vibrating surface **23** should be small as possible and suitably less than 30°.

FIG. 2 shows, on an enlarged scale, a section through the pump P. The pump is a so-called displacement pump and consists of a pump housing **51** having an inlet **53** and an outlet **55**, and pump elements **57**, **59**, having opposite rotational directions.

Briefly, the function of the apparatus is the following: A continuous flow of carrier gas is supplied to the container **1** through the gas inlet **13**, the gas outlet **15** being connected to a device to which an aerosol is to be supplied, for instance a respirator, an oil burner or the like. When the flow of carrier gas has been adjusted to a suitable value the ultrasonic vibrator **21** and the pump P is started after opening the hose clamp **37**. The pump speed is adjusted to provide a suitable liquid flow and a predetermined amount of liquid per unit of time is now supplied to the vibrating surface **23**, where it is successively atomized when leaving the mouth **43** of the tube **39**, and the atomized liquid is then carried by the carrier gas out through the outlet **15**.

By using the arrangement suggested several advantages are gained. By means of the displacement pump an accurate supply of liquid is provided. In view of the vertical arrangement of the vibrating surface there is no risk of damping the vibrations of the vibrating body when supplying excess of liquid, as non-atomized liquid immediately flows off from the vibrating surface, the efficiency of the ultrasonic vibrator thus being unchanged. The liquid flown off from the vibrating surface can be discharged from the container **1** through the tube **17** at regular intervals by opening the cock **19**. Thanks to the fact that the ultrasonic vibrator does not come into contact with the liquid, except, of course, at the vibrating surface, the insulating problem at the point of connection of the current supply cable is essentially facilitated.

The present invention thus provides an ultrasonic atomizer which, in view of its ability to generate an aerosol having a well defined composition, has a multifarious use. It may for instance be used in respirators for the supply of moisture, anaesthetica, etc., in flame spectrometry for the generation of an aerosol containing the element to be analyzed for the supply of fuels in diesel engines, oil burners, jet motors, etc.

The invention is, of course, not limited to the embodiment shown in the drawing. Thus, the pump P may be removed, the supply of liquid being controlled by changing the height of the flask **27** or contracting the hose clamp **37**. The pump P can be of any type but is preferably a displacement pump giving a continuous flow of liquid. The pump can be supplied with liquid from a

iquid container of any design and can be supplied with iquid under pressure or operate with self-suction. Nor s it necessary that the vibrating surface is positioned /ertically. The important thing is that said surface has in inclination which gives an efficient runoff from the /ibrating body so as to prevent damping of the vibrations)f said body. Generally, the angle between the vibrating surface and the vertical should be less than 45°.

What is claimed is:

1. Ultrasonic atomizer for atomizing liquids and forming an aerosol, comprising an atomizing chamber having gas inlet and a gas outlet, and a vibrating body arranged n the atomizing chamber and having a vibrating surface, which is adapted to receive liquid for atomization rom liquid supply means, in which the vibrating surface s arranged inclined, preferably essentially vertically, and he liquid supply means are so arranged relative to the 'ibrating surface, that the liquid in the supply means s in continuous liquid contact with the liquid atomized .t the vibrating surface.

2. Ultrasonic atomizer according to claim 1, in which he liquid supply means comprises a liquid supply tube

opening adjacent to the vibrating surface and the mouth of which is bevelled so as to be essentially parallel with the vibration surface and possibly engages same with its outmost tip, the liquid supply tube suitably being elastically suspended.

3. Ultrasonic atomizer according to claim 1 or 2, in which the liquid supply means comprises a device, for instance a displacement pump, giving a controllable constant flow of liquid to the vibrating surface.

4. Ultrasonic atomizer according to any of the preceding claims, in which a liquid drain means is positioned in the lower part of the atomizing chamber.

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