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[54] FLUID ATOMIZERS

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[51] **Int. Cl.** **B05b 3/14**

[58] **Field of Search** 239/102, 505, 520, 523, 421

[56] **References Cited**

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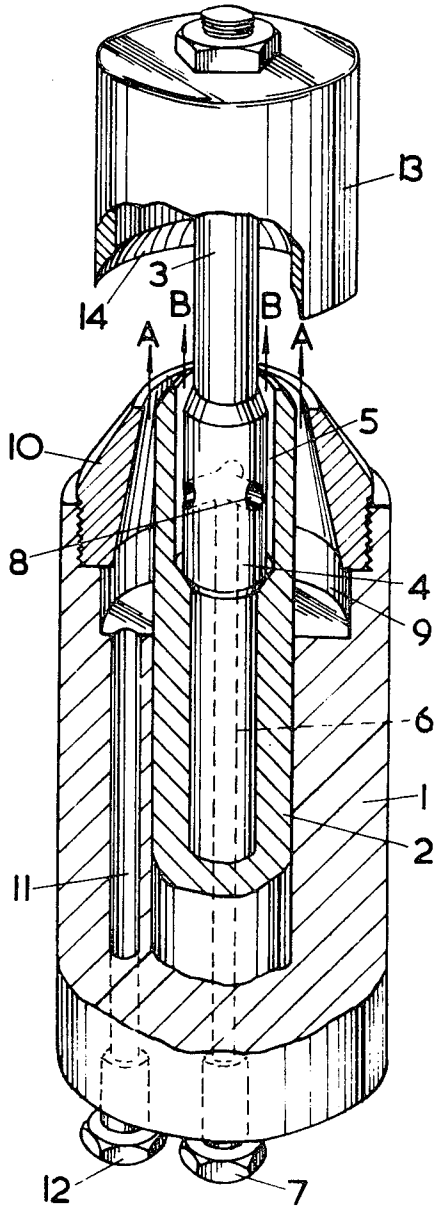
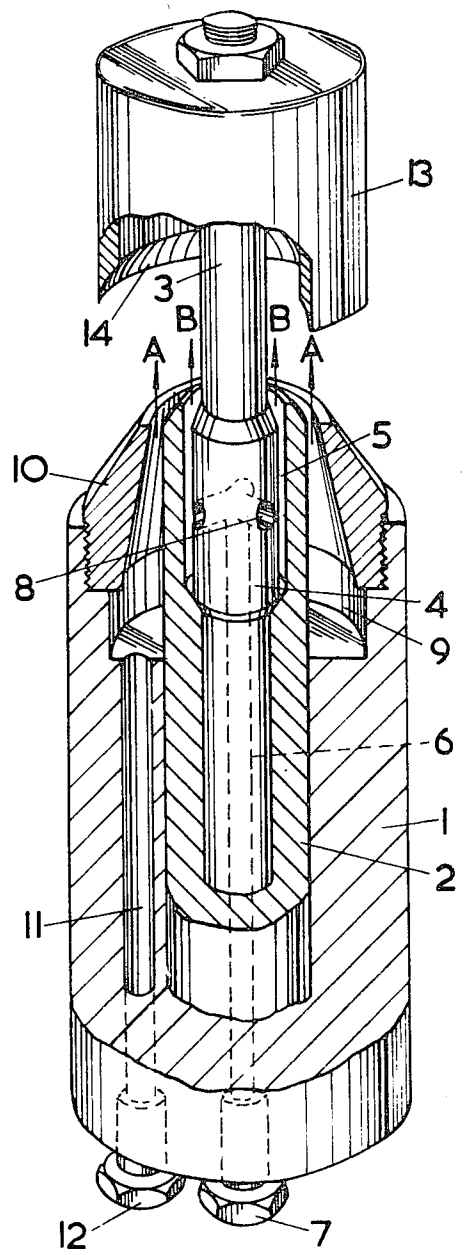
[57] **ABSTRACT**

Air issuing at high velocity from an annular nozzle under choked flow conditions is directed at a resonator constituted by a well formed in a cup spaced from the nozzle and coaxial with it. The airflow is thus induced to vibrate and liquid is injected within the annular curtain and in the same direction to impinge on the vibrating air mass by which it is atomized into fine droplets.

6 Claims, 1 Drawing Figure





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FLUID ATOMIZERS

The invention relates to fluid atomizers in which a fluid is directed into a vibrating gaseous mass.

A vibratory sound field can be generated by the discharge of a high-velocity stream of gas into a tuned cavity. A resonance will be set up by the periodical loading and discharging of the cavity which can occur over an appreciable range of separation distances between the discharge point and the cavity. The resultant high intensity acoustic output possesses considerable energy and liquid directed into the zone of vibration can, according to the operating conditions, be atomized into exceedingly small droplets from about micron size upwards.

Various spray nozzles have utilized this feature with generally successful results. However, there is tendency for liquid from wetted surfaces to be reentrained in the form of large droplets which is unacceptable in many cases.

The present invention seeks to effect some improvement in this respect.

A fluid atomizer according to the invention comprises a body having an annular nozzle connected to discharge a high-velocity gas stream and at least one orifice located inside the nozzle and connected to discharge a stream of liquid in substantially the same axial direction as the gas stream, an open-ended resonator spaced from the nozzle and substantially coaxial therewith, with its mouth directed towards the nozzle, and a stem extending along the nozzle axis between the resonator well and the body.

In a preferred embodiment, the liquid discharge orifice is of annular configuration and is concentric with the nozzle.

According to a feature of the invention, a circumferential knife edge may be formed at the mouth of the resonator by an internal chamfer.

An embodiment of the invention will now be described by way of example with reference to the accompanying diagrammatic drawing which represents a fluid atomizer shown in partial section.

The fluid atomizer shown in the drawing comprises a cylindrical body **1** bored out axially to receive a sleeve **2** which carries a stem **3**. The stem **3** has an intermediate portion **4** of the increased diameter which fits into a counterbore in the upper part (as shown in the drawing) of the sleeve **2** with radial clearance to define an axially extending annular passage **5**. A passage **6** (shown in dotted lines) extends along the axis of the stem **3** from the lower end of the latter, where it communicates with an inlet union **7**, to the midpoint of the enlarged portion **4** where it branches into a series of radially extending ducts terminating in holes **8** which communicate with the annular passage **5**. The upper part of the body **1** is counterbored to form a cavity **9** and is also internally screw threaded to receive a ring member **10** having a tapered bore and being bevelled on its outer surface in the same direction as the taper of the bore. The ring member **10** surrounds the sleeve **2** and,

with the outer surface of the sleeve, defines a convergent nozzle in communication with the cavity **9** and having an annular outlet. A duct **11** extending through the body **1** in an axial direction serves to connect the cavity **9** with a second inlet union **12**.

The upper end of the stem **3** carries a cup **13** comprising a bluff body counterbored to form a well and having an internal chamfer **14** which defines an annular knife edge at the mouth of the cup. The mouth of the cup is directed towards the nozzle aforementioned and spaced from it to give an axial clearance between the nozzle and the knife edge.

In operation, the inlet union **12** is connected to a gas supply, usually compressed air, the gas flowing from the nozzle outlet at near sonic velocity, as indicated by the arrows A. The gas passes from the nozzle into the well of the cup **13** which acts as a resonator in known fashion, the frequency being determined by the depth of the well and its spacing from the nozzle, the upper part of the stem **3** acting as a stabilizer.

Liquid introduced into the inlet nozzle **7** will flow to the annular passage **5** and thence as an annular stream as indicated by the arrows B to impinge on the vibrating gas by which it is atomized and entrained to flow over the knife edge of the cup **13** into the surrounding atmosphere.

Providing the liquid is discharged within the curtain of gas and in the same general direction, it need not be discharged as an annular sheet, but can, according to circumstances, pass from a series of arcuate slots spaced circumferentially, from a ring of holes or even from a single hole.

I claim:

1. A fluid atomizer comprising a body having an annular nozzle arranged to discharge a high-velocity gas stream and at least one orifice located inside the nozzle and arranged to discharge a stream of liquid in substantially the same axial direction as the gas stream, an open-ended resonator spaced from the nozzle and substantially coaxial therewith, with its mouth directed towards the nozzle, and a stem extending along the nozzle axis between the resonator and the body, means for feeding a liquid to said orifice, said liquid-feeding means including a passage in said stem and an annular passage communicating with said orifice, said passage in said stem and said annular passage communicating with each other at a point spaced from said orifice.

2. A fluid atomizer according to claim **1** in which the orifice is of annular configuration and is concentric with the nozzle.

3. A fluid atomizer according to claim **1** in which the orifice is defined in part by the stem.

4. A fluid atomizer according to claim **1** in which the stem serves to connect the resonator and the body.

5. A fluid atomizer according to claim **1** having a circumferential knife edge formed at the mouth of the resonator.

6. A fluid atomizer according to claim **5** in which the knife edge is defined by an internal chamfer.

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