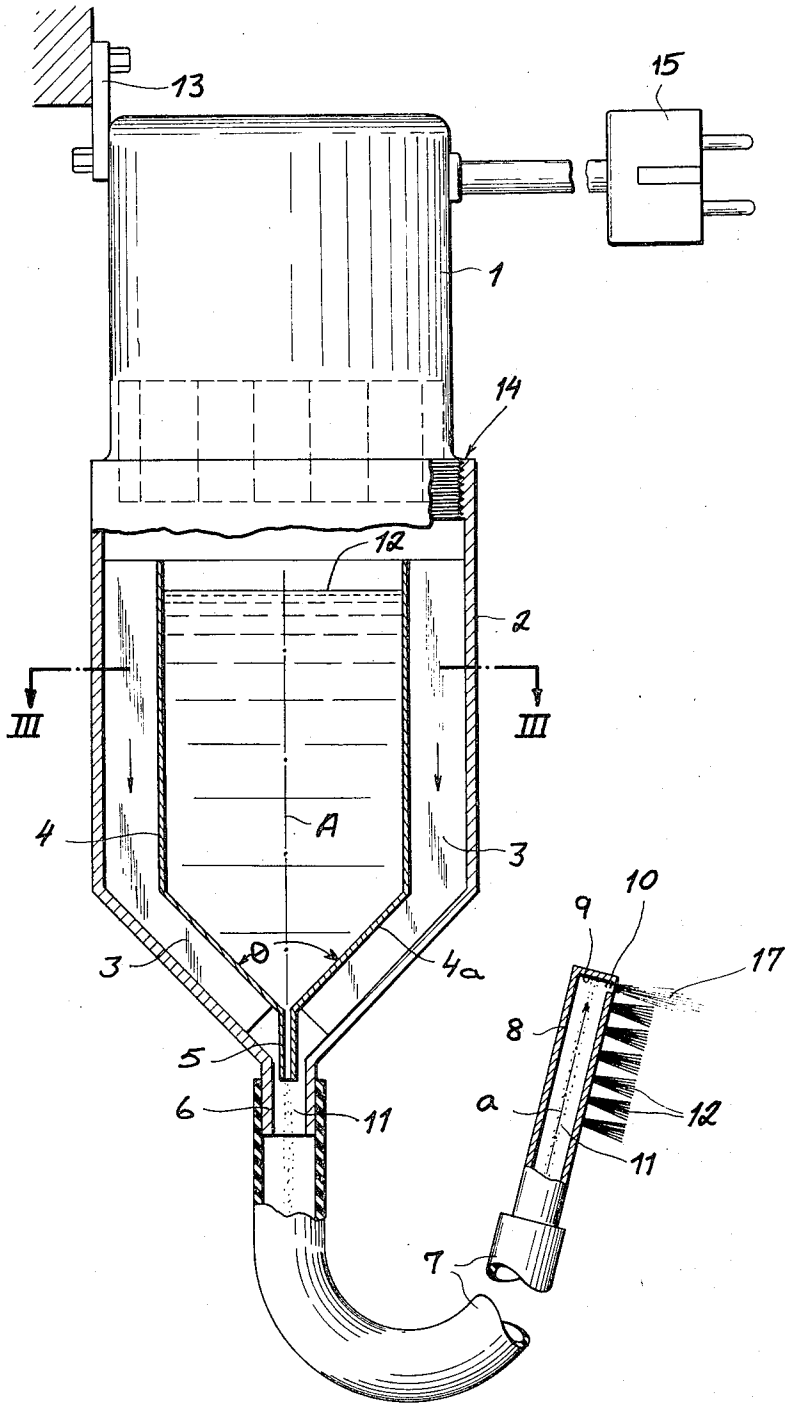

FIG. 1

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United States Patent

[11] 3,628,875

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[33] **Japan**
[31] **P 18 03 541.1**

[54] **SPRAYING DEVICE WITH HAND-HELD SPRAYING HEAD**
7 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **401/137,** 15/321, 401/188
[51] **Int. Cl.** **A46b 11/04**
[50] **Field of Search** 15/321, 302; 401/137–139, 188–190, 137

[56] **References Cited**
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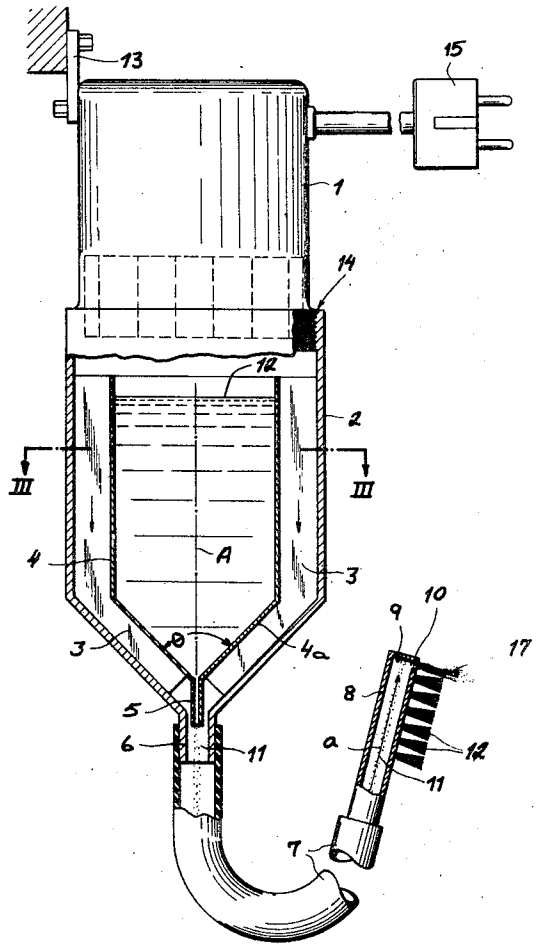
ABSTRACT: An axial blower is mounted on a wall, and a housing having a frustoconical end portion with a tubular extension is removably threaded onto it. This extension carries a flexible tube whose free end is a spraying tip or head in the form of a blind tube with a lateral orifice. Spaced coaxially within the housing by several axially extending vanes is a cylindrical liquid receptacle having a frustoconical end portion with a tubular extension of small fluid-flow cross section extending into the housing extension. The blower exerts pressure on the liquid in the receptacle to drive it through the constriction at the bottom of the receptacle, an airstream flowing around the receptacle entrains these droplets toward an impact (impingement) surface formed at the end of the handpiece to atomize the larger droplets and form a mist which is ejected through the orifice of the endpiece.



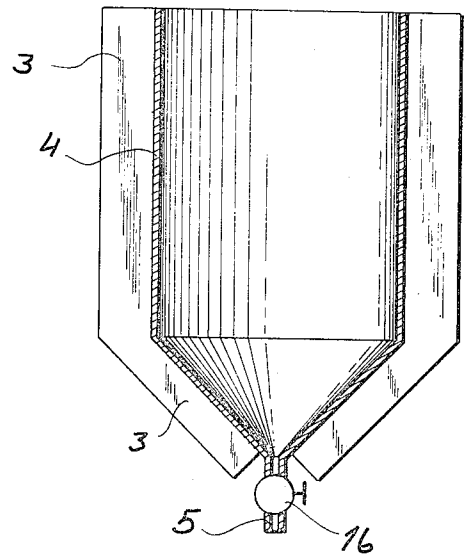


FIG. 2

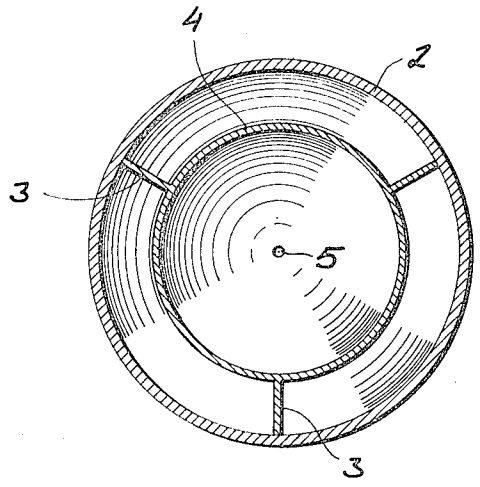


FIG. 3

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SPRAYING DEVICE WITH HAND-HELD SPRAYING HEAD

FIELD OF THE INVENTION

The present invention relates to a spraying apparatus particularly adapted for household use for cosmetic, medical, or dental purposes and, more particularly, to a spray device and method for dispensing a low-viscosity liquid (e.g. water or an aqueous solution) in the form of an atomized jet.

BACKGROUND OF THE INVENTION

Such sprayers for household use generally comprise a small air compressor, a small liquid reservoir, a nozzle arrangement adapted to held in the hand, and two generally coaxial flexible conduits connecting the nozzle to the reservoir and compressor. The airstream of one conduit encounters the liquid emerging from the other at a specially designed nozzle and breaks up the liquid to form droplets which emerge at the nozzle.

This type of apparatus has several disadvantages. Firstly the apparatus is quite noisy, the compressor usually being a small pump or blower which must develop considerable pressure, expensive, difficult to handle and prone to breakdown.

It has not been possible heretofore to form the fine mist spray remote from the end of the conduit and thence drive it through a single tube. Such a system, however, has been found to be disadvantageous since the mist tends to form into relatively large droplets of irregular size so that the output end of the Tube only sputters rather than ejecting a fine mist.

OBJECTS OF THE INVENTION

It is, therefore, the general object of the present invention to provide an improved spray apparatus and method of spraying.

A more specific object is to provide an apparatus of the above-described general type which overcomes the above-mentioned disadvantages, e.g., which is inexpensive and silent while being easy to handle.

SUMMARY OF THE INVENTION

The above objects are attained in accordance with the present invention, by a method and apparatus wherein the liquid is expelled into an air stream in droplets and carried by the air stream to an endpiece on a flexible conduit. The droplets impinge upon an impact surface of this endpiece and are atomized, whence they are swept by the airstream out an orifice which opens laterally to the path of the airstream. In this manner, the droplets are conveyed to the endpiece via a single conduit and are there turned into a very fine mist.

According to another feature of the present invention, a small axial blower is fastened to a wall and a housing can be screwed onto the base of this blower and hang there. A receptacle is received within the housing with a space all around between it and the housing so that the air pressure generated by the blower is exerted both on the liquid in the receptacle to drive it out through an aperture in its extreme lower end, and forms an airstream around this receptacle. Both the housing and the receptacle are of similar shape, i.e., cylindrical with a frustoconical lower end terminating in a tubular extension, and are nested coaxially one within the other with circumferential spacing and the extension of the receptacle extending into that of the housing. Advantageously, the receptacle is removable filling and is provided with flat spacing elements which extend radially outwardly and axially along the receptacle.

The endpiece mounted on the flexible tube fitted over the extension of the housing is advantageously a blind tube having a radially or laterally opening orifice near its end wall. Thus, the droplets are atomized and blown immediately out laterally. For dental use this tube can be fitted with bristles and may constitute a toothbrush.

It will be appreciated that the invention is able to accomplish satisfactory transmission of a liquid-in-gas dispersion with only partial agglomeration of liquid droplets, through a single conduit, by virtue of the combined effect of the pressure drive of the liquid to the point at which the initial dispersion of liquid in gas is formed, and subsequent impingement or impact atomization. Thus, earlier systems inducing the flow of liquid into a high-velocity gas stream by Venturi and like effects are also characterized by an immediate decrease in velocity of the combined flow and, therefore, inability to pass the combined flow through a single conduit; in contrast, the present system provides an augmented pressure behind the body of liquid, thereby ensuring entrainment of droplets at continued high velocity and the high velocity at the impact or impingement surface necessary for the greatest effectiveness thereof.

DESCRIPTION OF THE DRAWING

The above and other objects, features, and advantages will become more fully apparent from the following description, reference being made to the accompanying drawing, in which:

FIG. 1 is an elevational view, partly in section, of the apparatus according to the present invention;

FIG. 2 is an axial sectional view through the receptacle of the present invention; and

FIG. 3 is a cross section according to the line III—III of FIG. 1.

SPECIFIC DESCRIPTION

The spraying apparatus according to the present invention has, as shown in FIG. 1, an axial blower 1 attachable to a wall by means of a bracket 13 and into which a cylindrical housing 2 is threaded by means of a threaded region 14. The housing 2 has a frustoconical end portion and a tubular extension 6 with a flexible conduit 7 extending from the base 6 of the housing 2 to an endpiece 8.

As also shown in FIG. 2, a receptacle 4 is received within the housing 2 and has a central axis A which is also the axis of the housing 2. The receptacle 4 is generally cylindrical with a frustoconical lower end portion 4*a* and an axially tubular extension 5 whose free end forms an aperture and extends into the tube 6. The housing 2 is similarly proportioned. Furthermore, the receptacle 4 is provided with laterally extending vanes 3 that serve as spacing elements between the exterior wall of the receptacle 4 and the interior wall of the housing 2, these vanes being formed unitarily with the receptacle 4. Each of the three vanes 3 extends axially the full length of the receptacle, leaving only the extension 5 free. Such a construction allows the receptacle 4 to be readily removed from the housing 2, when this latter is unscrewed from the blower 1, while insuring its coaxial spacing therein during use. As shown, the coaxial end portion 4*a* of the receptacle 4 defines an angle θ of around 90°, as does the corresponding portion of the housing. FIG. 2 also shows how the extension 5 can be sitted with a small valve 16 to adjust the flow therethrough.

The endpiece 8 is formed as a blind tube having a longitudinal axis *a* and an internal end wall 9. An orifice 10 is formed in the side of this tube 8 adjacent the flat wall 9. This endpiece 8 is simply press fitted in the end of the tube 7, as the tube is fitted over the extension 6 of the housing 2. For use as an irrigated toothbrush, the endpiece 8 is provided with bristles 12.

In order to use this apparatus, the receptacle is filled with whatever liquid is to be sprayed, e.g., mouthwash, alcohol, disinfectant, astringent, and is placed in the housing 2 which is then screwed onto the base of the blower 1. A plug 15 is connected to a source of electricity or a switch is actuated to start the blower 1 going. This blower 1 then exerts gas pressure on the entire surface 12 of the body of liquid in the receptacle 4 and thereby causes it to spurt or drop out of the extension 5 and form droplets 11. An airstream produced by the fan 1 also passes axially down all around the receptacle 4 and is compressed and entrains the droplets 11 to drive them through the tube 7. This airstream completely surrounds the extension 5 at its tip where is defines the aperture through which the droplets 11 pass, so that these droplets are very effectively entrained.

The droplets 11 strike the impact surface 9 at the blind end of the endpiece 8, since due to their inertia they are not simply blown directly out the orifice 10, and are atomized to form a mist just adjacent this orifice 10. This mist is then blown out the orifice 10 by the air stream to form a very fine spray 17 which, on using the endpiece as a toothbrush, irrigates the teeth and gums advantageously.

Of course, it would be equally possible to use such a sprayer for cosmetic purposes, such a spraying certain liquid makeups on the face or body, for use with a massage in spraying rubbing alcohol, or for any of a multitude of other uses to which a small sprayer is adapted. The system is advantageous also on prophylactic and medicinal grounds since it facilitates the oxygenation of the skin and mucous tissues then air is used as the gaseous fluid.

I claim:

1. An apparatus for spraying a liquid comprising:

a receptacle holding a body of liquid and formed below the liquid level with an aperture;

means for applying a gas under superatmospheric pressure to the body in said receptacle to force said liquid through said aperture, and for forming a gas stream adjacent said aperture for entraining droplets of the liquid;

conduit means forming a path for the gas stream and entrained liquid droplets and having an end remote from said aperture and formed with an orifice opening laterally of said path; and

means adjacent said orifice forming an impact surface transverse to said path for intercepting said droplets and atomizing same, said conduit means further guiding the airstream out through said orifice to entrain the mist produced at said impact surface, said receptacle having an extreme lower end formed with said aperture, said conduit means including a housing receiving said receptacle, a flexible conduit having one end connected to said housing adjacent said aperture, and an endpiece connected to the other end of said conduit and formed with said surface, said housing and said receptacle each having a central axis and being of uniform cross section, said receptacle being spacedly received within and coaxial with said housing.

2. The apparatus defined in claim 1 wherein said extreme lower end of said receptacle is frustoconical and formed with an axial tubular extension forming said aperture, said housing also having a frustoconical lower end and an axial tubular extension spaced outwardly from said receptacle, said extension of said receptacle extending into said extension of said housing.

3. The apparatus defined in claim 1 wherein said receptacle is provided with a plurality of radially extending spacer elements engaging the interior of said housing and supporting said receptacle.

4. The apparatus defined in claim 1 wherein said means for applying a gas under pressure is a blower atop said housing and sealingly engaged therewith.

5. The apparatus defined in claim 4 wherein said housing is threadedly engaged in said blower.

6. The apparatus defined in claim 1 wherein said endpiece is adapted to be held in the hand and constitutes a blind tube having a longitudinal axis and a radial opening constituting said orifice, the internal end wall of said tube being flat and perpendicular to said longitudinal axis and forming said surface.

7. The apparatus defined in claim 6 wherein said endpiece is provided with bristles and is adapted to be used as a toothbrush.

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