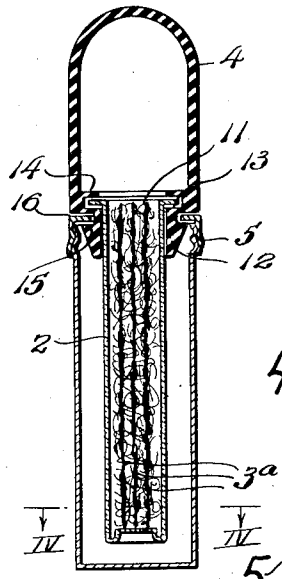
May 26, 1942. W. H. ROSE 2,284,591

NEBULIZER

Filed Nov. 24, 1939

FIG.-3



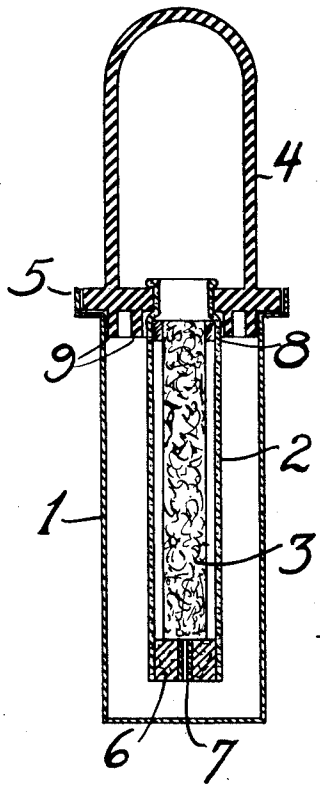


FIG.-1

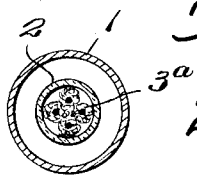


FIG. 4

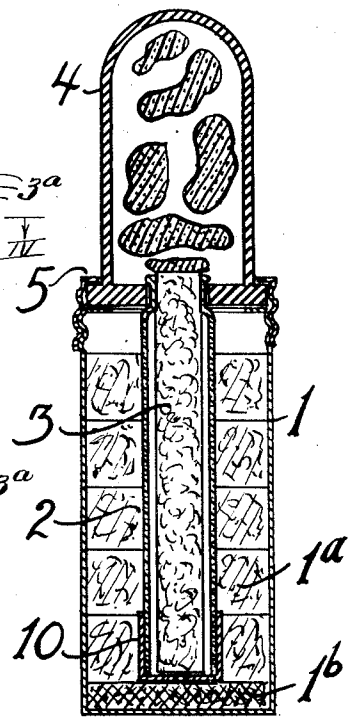


FIG.-2

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UNITED STATES PATENT OFFICE

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NEBULIZER

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Application November 24, 1939, Serial No. 305,949

8 Claims. (Cl. 299—88)

The present invention relates to a method and means for dispensing liquids. More specifically, it relates to an apparatus for producing a mist or spray of atomized or nebulized liquid. In particular, the invention relates to a device for applying medicinal liquids to the membranous tissue of the human nose or throat.

It is an object of the invention to provide a nebulizer device, which while simple and economical to construct, will more efficiently perform the desired service. It is a further object, to provide a nebulizer or atomizer of such character, that oily compositions may be used in the nose and throat without the substantial danger of lung congestion, due to inhalation of large droplets of an unassimilable material, which is now common.

The invention and these and other objects may be fully understood from the following specification, when it is read in conjunction with the accompanying drawing, in which,

Fig. 1 is a vertical section through a nebulizer device, according to the invention;

Fig. 2 is a similar view through a modified form of the device;

Fig. 3 is a similar view through another form of the device; and

Fig. 4 is a cross sectional view, taken along the line IV—IV of Fig. 3.

In the drawing the same numerals have been used to designate parts which in general are common to all forms of the invention. The numeral 1 designates a container which may be of any suitable material such as glass, molded cellulose, or plastic material, or of metal and the like. For disposal in the container 1 or for use in conjunction with any similar liquid reservoir, there is the nebulizer tube 2, which like the container may be of glass or the like. In the tube 2 is disposed a packing material or core 3 which is preferably of felt or another compacted fibrous material, but which may be any pervious absorbent material including chalk, pumice, paper, and the like. It is intended, however, that the material used shall be of such nature and form that there shall be a slight clearance between the core and the inner surface of the tube 2. The outer or upper end of the tube 2 is provided with a pressure bulb member 4 which, as has been shown in the drawing, may be of any convenient form. The inner or lower end of the tube is provided with a closure having a restricted passageway therethrough, against which it is intended that the core 3 shall be firmly seated. When used in conjunction with a container for liquid, it is preferable to provide a cap member 5 which holds the bulb in fluid-tight relation to the mouth of the container.

As shown in Fig. 1, the nebulizer tube 2 is a straight sided tube, having a plug 6 inserted in its lower end. The plug may be of any non-porous rigid or semi-rigid material, such as cork, rubber, wood, or the like, provided with a restricted passageway therethrough. As shown, the passageway is formed by means of a fine bore metal tube 7 extending through the plug. The core 3 in this form of the invention, is supported at the outer end by means of the retainer ring 8, this ring also aiding in maintaining the desired close contact between the lower end of the core 3 and the inner surface of the plug 6. The bulb member 4 is of special conformation, having a pair of spaced annular skirted portions 9 encircling the opening provided to receive the nebulizer tube, the inner skirt portion engaging the tube sidewalls. These portions, when the tube is held in a vertical position, provide an annular receptacle to receive any free fluid which may run down the tube. As shown, the bulb 4 is flanged and is adapted to be held in fluid-tight relation to the mouth of the container by means of the annular cap 5.

In Fig. 2, the container 1 is provided with an annular core 1a of fibrous absorbent material, and a pad 1b of a non-fibrous material such as cellulose sponge disposed at the bottom of the container, providing a container reservoir of the type disclosed in United States application Serial No. 305,948 filed November 24, 1939. In the nebulizer unit, the tube 2 is quite comparable to the tube illustrated in Fig. 1, including the tube core 3. As shown, however, the core is extended to or slightly beyond the other end of the tube, so that it is within the bulb 4 or in immediate communication therewith, and in the bulb 4 are disposed fragments of a spongy, non-fibrous, absorbent material, such as cellulose sponge. It has been found that in this way the capacity of the nebulizer for fluid may be increased without increase in its size, and without substantially decreasing the bulb pressure available for discharging a liquid spray. As illustrated in this figure, the tube 2 is provided with a closure at its inner or lower end, consisting of a perforated cap 10. This cap may be of metal, cemented and tightly fitted to the tube end, but preferably it is cellulose material fitted to the tube end while wet with water and permitted to dry in place. This type of material shrinks in drying and provides a permanently liquid-tight contact with

the tube. If desired, and especially when a metal cap member 10 is used, the end of the tube 2 may be formed with a beaded edge over which the cap is shaped.

Fig. 3 illustrates another form of the device, in which the tube 2 is represented as formed of glass, or moulded plastic or cellulose material, and having a discharge end unitary with the side wall portions, the passageway for the spray discharge of liquid being formed in the end. The upper or outer end of the tube 2 in this modification is flanged as at 11 to provide suitable means of engagement with the form of bulb shown. This bulb is designed for insertion in the mouth of the container 1. It is provided with an annular tapered plug portion 12 above which and within the bulb is formed a shoulder 13 on which the tube flange 11 is supported within the bulb. An annular flange 14 on the inner wall of the bulb is disposed in spaced relation to the shoulder 13, and prevents movement of the tube end into the bulb. Preferably the space between the shoulder 13 and flange 14 should be slightly less than the thickness of the tube flange 11, providing a friction fit. An annular grooved portion 15 on the portion 12 is adapted to receive the inner edge portion 16 of the annular cap member 5.

As packing for the nebulizer tube in this modification, the use of a plurality of elements is contemplated, as compared with the unitary core members 3 shown in Figs. 1 and 2. The absorbent core in this modification is formed by inserting a number of elements 3a formed of a fibrous material intertwined with wire or similar material. Sections of the wire and fiber devices used to swab the stem of a tobacco pipe have been found satisfactory for the purpose. Three or four of such pipe cleaner sections may be inserted in a conventional medicine dropper tube to provide a nebulizer tube of quite satisfactory characteristics. In Fig. 4 is shown a cross sectional view of the nebulizer tube packed with pipe cleaner sections as described.

In operation, any of the nebulizer elements illustrated in Figs. 1 to 4 inclusive, is immersed in the liquid to be used and by manipulation of the bulb, liquid is drawn into the body 1 to be absorbed by the core 11. When application of the liquid is required, compression of the bulb forces a stream of air through the upper end of the core and around the core through the clearance space provided. In escaping from the tube, the pressure air passes through and around the outer end of the core, picking up fine particles of the absorbed liquid in passage. The air and liquid particles issuing from the discharge opening of the tube in the form of a fine spray. An advantage of the device lies in the metering effect of the absorbent core, which prevents any great quantity of liquid from being discharged at one time. By proper selection of the material used as a core, various degrees of saturation may be provided in the spray. The less dense materials, such as loose felt, provide for high liquid content in the spray, while the more dense materials, such as chalk, reduce the liquid content.

The nebulizer devices described are equally suitable for use with containers in which the liquid to be used is held as a body of liquid, or in which the liquid is held absorbed as in the container illustrated in Fig. 2. In the latter instance, the content of the nebulizer core is renewed through the non-fibrous absorbent pad 1b disposed at the bottom of the container. The partially dried nebulizer core will tend to absorb additional liquid from the pad, and the pad in turn will tend to replenish itself by absorption from liquid held in the container core. Although the principal effect is obtained by capillary action, it may be reinforced by slightly compressing the nebulizer bulb when inserting the tube into the container, and not making a completely air-tight closure between the cap and casing.

Although the device described has been found particularly suitable for use as a nasal applicator, it is obviously usable in many other ways, as for instance, for the application of oils or tannic acid to burns, and for the sprayed application of medicinal or other preparations externally, or internally of any body cavity. Furthermore, it is not intended that the invention be considered as limited by any specific embodiment set forth above for the purpose of illustration, but only by the appended claims.

I claim:

1. A liquid nebulizer device, comprising a body member, a closure at one end of said member having a discharge outlet therein, a pressure element at the other end of said member, and a core of an absorbent material disposed within said body substantially throughout the length thereof, the lower end of said core abutting against the closure, said core being disposed substantially in spaced relation to the wall of said body, adapted to permit the flow of pressure air between the core and said wall surfaces and a discharge through the closure outlet, the pressure air passing through and around the outer end of the core picking up fine particles of absorbed liquid in the passage.

2. A nebulizer device according to claim 1, in which the core of an absorbent material comprises a plurality of rod-like, fibrous elements disposed in intermeshed relation within the body member.

3. A liquid nebulizer device according to claim 1, in which said nozzle closure comprises a plug of substantially non-absorbent material inserted in an open end of the nebulizer body, said plug having a longitudinally extending fluid passage therethrough.

4. A liquid nebulizer device according to claim 1, in which said nozzle closure comprises a cap member for one open end of the nebulizer body member, said cap having a spray discharge opening therein.

5. A liquid nebulizer device, comprising a body member, a spray nozzle at one end, a core of porous absorbent material in said body member, the lower end of said core substantially covering the nozzle outlet, and disposed within said member substantially throughout its length in spaced relation to the walls thereof, a pressure element for the other end of said member, a means for renewing a charge of liquid in said core including a container, an annular filler of a liquid absorbent material in said container adapted to receive said body member, and a pad of a non-fibrous, absorbent material at the bottom of said container resiliently engageable by the discharge end of said body member, and means carried by said pressure element to removably engage said container in fluid-tight relation with said element, bringing the discharge end of the body member into engagement with said pad.

6. A liquid nebulizer device comprising a body member, a closure at one end of said member having a discharge outlet therein, a pressure

element at the other end of said member and a core of an absorbent, air-pervious material disposed within said body member through a substantial portion of the length thereof, the lower end of said core abutting against the closure, a substantially unobstructed air passage extending longitudinally a major portion of the length of said core and ending adjacent the lower end thereof, adapted to permit the unobstructed flow of pressure air along said air passage, and its discharge from the closure outlet, the pressure air passing through the outer end of the core, picking up fine particles of absorbed liquid in the passage.

7. A liquid nebulizer device according to claim 6 in which the core comprises a plurality of narrow, elongated fibrous elements disposed in intermeshed relation within the body member, the lower ends of said fibrous elements substantially covering the closure outlet.

8. A liquid nebulizer device comprising a body member, a spray nozzle at one end, a core of pervious absorbent material in said body member, the lower end of the core substantially covering the nozzle outlet and disposed within said member through a substantial portion of the length thereof, an air passage extending longitudinally a substantial portion of the length of said core and ending adjacent the lower end thereof, a pressure element for the other end of said body member, a means for renewing a charge of liquid in said core including a container having an annular filler of a liquid-absorbent material in said container adapted to receive said body member, and a pad of a compressible absorbent material at the bottom of said container resiliently engageable by the discharge end of said body member and means carried by said pressure element to removably engage said container in fluid-tight relation with said element, bringing the discharge end of the body member into engagement with said pad.

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