Aug. 14, 1951 V. C. HALL 2,564,400

ATOMIZER

Filed Oct. 29, 1949

Fig. 1.

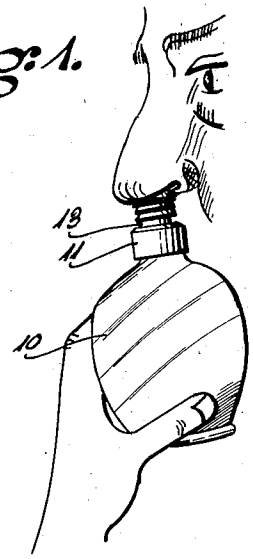


Fig. 2.

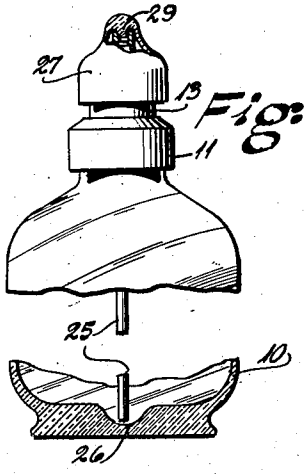
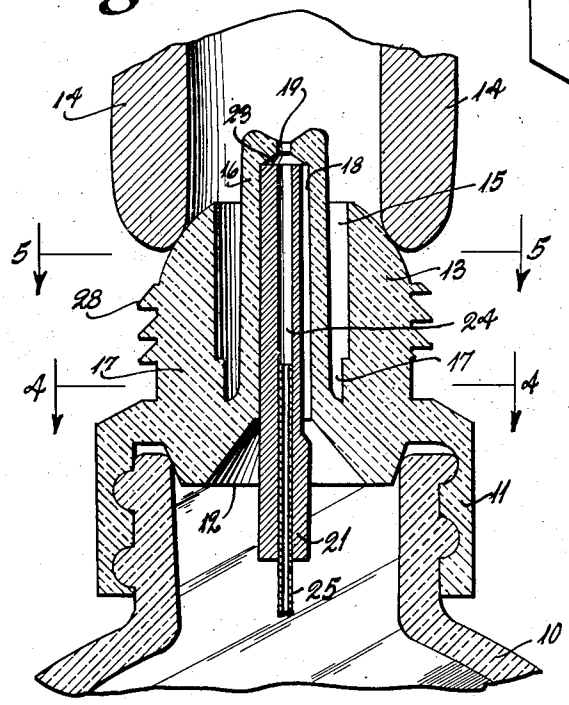


Fig. 3.



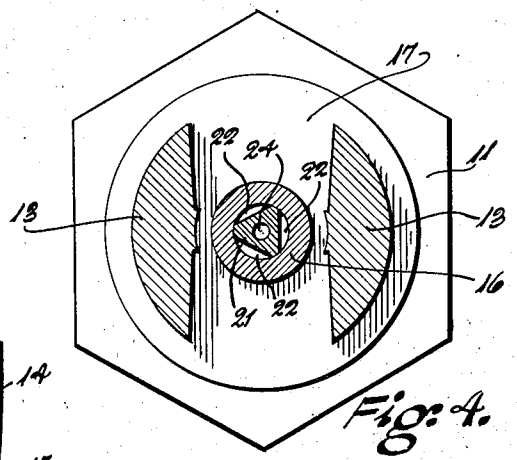


Fig. 4.

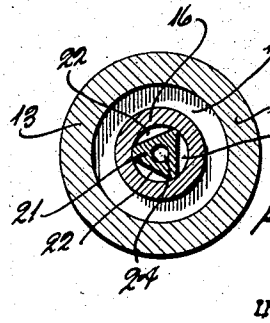


Fig. 5.

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ATOMIZER

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3 Claims. (Cl. 128—173)

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This invention relates to atomizers, and more particularly to an atomizer for spraying medicated liquids through the nasal cavities. The article of the invention also is useful to supply drops of the medicated liquid.

Atomizers for spraying medicated liquids into the nose are old in the art. However, they have had the disadvantage that the spray from the atomizer generally diverges to such an extent that the liquid is deposited upon the interior walls of the nose immediately adjacent to the nozzle of the atomizer. This has been objectionable because such liquid performs no useful function at this site, and moreover will not remain upwardly within the nostril.

A foremost feature of the present invention, therefore, is the construction of an atomizer which overcomes the tendency of the usual atomizer to produce a divergent spray. With the device of the present invention, the spray is confined to a small size, and because of this, the spray is carried upwardly into the nasal passageways to the uppermost portions thereof where the medication is principally desired. This has the further important advantage that the liquid does not run downwardly out of the nasal passageways.

In accordance with the invention, the spray delivered from the nozzle of the atomizer is confined within an enveloping stream of air. This enveloping stream of air serves as a shield between the spray itself and the immediately adjacent surfaces of the interior of the nose so that the spray does not reach these nasal surfaces. It will therefore be seen that this enveloping body of air serves as a protecting sheath which directs the spray upwardly against the higher nasal surfaces where the medication is intended to perform its therapeutic function. It will be appreciated that due to the fact that the enveloping stream of air carries the spray upwardly to the desired surfaces in the nose, a lesser amount of medication is used. That is, the medicated liquid is not deposited upon the lower portions of the nasal passageway where it performs no, or but very slight, useful function, and in most instances merely runs downwardly out of the nose.

A preferred embodiment of the atomizer of the invention is disclosed in the accompanying drawings in which Figure 1 illustrates the general mode of using the device. Figure 2 is an elevational view, the uppermost and lowermost portions being broken away to show the structure. Figure 3 is a vertical, sectional view through the device showing its relationship to the lower portion of a nose. Figure 4 is a sectional view on the line 4—4 of Figure 3, and Figure 5 is a sectional view on the line 5—5 of Figure 3.

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The medicated liquid which is to be sprayed is retained within the container 10. This container is preferably made of a material which is of sufficiently elastic character that its side walls can be compressed in order to eject the contained liquid. A preferred material for the container 10 is polyethylene, inasmuch as this plastic is highly resistant to the liquids which will ordinarily be used and because of its elastic properties. However, it is to be understood that other plastics, and even metals, may be used as the material for making the container 10 so long as at least a portion of its walls is compressible so that an internal pressure may be created to serve to eject the liquid.

A cap 11 is affixed to the open top mouth of the container 10. For convenience, the top of the container 10 is formed with a reduced neck portion, as is best shown in Figure 3. As here shown, the cap 11 is screw threaded upon the exterior of the neck portion of the container 10, but it is to be understood that this is not an essential mode of attachment. Thus, it is possible to merely relay upon an internal or external frictional fit if this should be desired, but the screw thread attachment illustrated has the advantage of minimizing accidental separation of the two parts.

The under side of the interior of the cap is formed with a generally conical protuberance 12. When the cap is screwed into place, the external surface of this protuberance 12 bears upon the container 10, as shown in Figure 3, to establish a liquid-tight seal. However, it is obvious that other fluid-tight arrangements may be used, such as the provision of the ordinary sealing gasket.

Upon the upper side of the cap 11 is a generally dome-shaped projection 13. The topmost surface of this projection 13 is of generally conical or rounded formation so that it will fit upwardly into the nostril openings of varying sizes. This relationship is shown in Figure 3, the walls of the nose being indicated at 14. This dome-shaped projection 13 therefore serves as a nose-fitting body.

Within the dome-shaped projection 13 is an annular passageway 15. It will be noted that this annular passageway 15 leaves standing a centrally located nozzle 16. The nozzle 16 therefore

is an upwardly projecting formation which preferably extends above the top most edge of the rounded surface of the dome-shaped projection 13 which fits against the nose. The advantage of this will be explained later.

The annular passageway 15 which surrounds the upwardly projecting nozzle 16 therefore opens outwardly in an upward direction, and this passageway 15 extends downwardly to the lowermost portion of the dome-shaped projection 13. Lateral passageways 17 are formed through the side wall of the lower portion of the dome-shaped projection 13. These laterally extending passageways 17 provide a communication between the annular passageway 15 and the external atmosphere so that air may enter through the passageways 17 and flow upwardly through the annular passageway 15.

Extending axially through the nozzle 16 is a bore 18. At the topmost end of the nozzle 16, this bore 18 is of reduced size to form the nozzle opening 19. It will be noted from Figure 3 that the top of the nozzle 16 is slightly recessed, and this is preferable so that the nozzle opening 19 will be slightly below the topmost surface of the nozzle 16. The advantage of this arrangement will be made clear hereinafter.

Fitting within the bore 18 is a stem 21. This is preferably a frictional fit so that the stem 21 will be retained in place. The stem 21 is flattened at one or more places on its side, as is best shown in Figure 5, so that passageways 22 are formed upwardly alongside of the stem 21 and within the nozzle projection 16. These flattened surfaces must extend downwardly sufficiently far along the stem 21 so that they open out below the cap 11 so that the passageways 22 communicate with the interior of the container 10.

The stem 21 terminates at its top sufficiently below the nozzle opening 19 to form a mixing chamber 23 at the uppermost portion of the enlarged part of the bore 18. It will therefore be seen that there is an open communication between the interior of the container 10 and the mixing chamber 23.

The stem 21 has an axial opening 24 therethrough. A tube 25 fits tightly upwardly within this opening 24. The tube 25 extends downwardly to the bottom of the container 10 so that its lowermost opening is within the medicated liquid retained therein. When the liquid is forced upwardly through the tube 25, therefore, it flows upwardly through the opening 24, through the stem 21 and into the mixing chamber 23. From the mixing chamber 23 this liquid and the air which has also entered the mixing chamber 23 from the passageways 18, are ejected outwardly through the nozzle opening 19.

It may be here observed that the interior bottom wall of the container 10 slopes downwardly to a sump 26. The provision of this sump 26 is not essential, but it is desirable so that only a minimum amount of liquid will not be completely removed from the container 10.

To enclose the cap 11 when the atomizer is not in use, a closure 27 is provided. This closure 27 is preferably screwed upon the threads 28 upon the exterior of the drum-shaped projection 13, but it is apparent that a frictional fit may suffice. Within the closure 27 is a small projection 29 which bears against the surface around the nozzle opening 19 to form a fluid-tight fit. It is therefore apparent that even when the device is inverted, liquid cannot escape when the closure 27 is in place.

To use the device, the medicated liquid is placed within the container 10 after removal of the cap 11. When the cap is then replaced and the side walls of the container are compressed between the fingers, as is shown in Figure 1, pressure is created within the container 10. This pressure serves to force some liquid up through the tube 25 and into the mixing chamber 23. At the same time air is forced into the mixing chamber 23 through the passageways 18. The intermingling of this air and liquid within the mixing chamber 23 serves to break the liquid up into droplets, and these droplets are ejected through the nozzle opening 19. Inasmuch as there are preferably a plurality of passageways 22, the intermixing of the air and liquid within the chamber 23 is made more complete and a resulting fine spray issues from the nozzle opening 19.

The dome-shaped protuberance 13 is, of course, applied to the nose 14 in substantial airtight relationship. At the same time that the side walls of the container 10 are being compressed to eject a spray from the nozzle opening 19, air should be inhaled into the nose. This inhalation of air draws the external atmospheric air inwardly through the lateral openings 17 and upwardly through the annular passageway 15. Due to the relative length of the annular passageway 15, the air stream is guided upwardly closely around the nozzle 16. It will therefore be seen that this air stream issuing upwardly through the annular passageway 15 serves as an enveloping shield between the spray from the nozzle opening 19 and the immediately adjacent internal surfaces of the nose 14. Due to the slightly lowered position of the nozzle opening 19, this surrounding stream of air is shielded from the opening 19 so that it does not tend to divert the liquid being sprayed.

Inasmuch as the stream of air which flows upwardly out of the annular passageway 15 serves as a sheath about the spray from the nozzle opening 19, the spray is carried in its entirety upwardly to the nasal passageways which are desired to be treated. Inasmuch as the liquid will be deposited at these higher portions of the nasal passageways and none, or practically none, of it will be deposited upon the lower surfaces of the nasal passageway, no liquid will run downwardly out of the nose.

When it is desired to obtain drops of the liquid, it is merely necessary to invert the atomizer. Liquid then runs downwardly into the neck of the bottle through the passageways 22 into the mixing chamber 23 and out of the nozzle opening 19. Because of the relatively small size of these passageways, only droplets will be ejected unless the side walls of the container 10 are compressed at the same time.

The cap 11, the stem 21 and the closure 27 are preferably made of a plastic material such, for example, as polystyrene. However, it is apparent that other plastics such as phenolic resins, and even metal, may be used as the material for making these parts. The tube 25 is preferably made of polyethylene, but is may as well be made of a plastic or metal or may be made of rubber.

It will be apparent that variations may be made in the preferred embodiment of the invention which is illustrated, without departing from the invention. For example, instead of having a continuous annular passageway between the nozzle and the nose-fitting body, it would be possible to have a plurality of circu-

larly arranged passageways in its stead so that their streams merge to form a circular enveloping stream. In like manner it would be possible to create the necessary pressure within the container 10 by a separate compressible bulb which delivers air into the container, instead of having the container of the collapsible type which is specifically illustrated. Mention may also be made of the fact that the nozzle opening is not necessarily higher than the nose-fitting body but that this is preferable because the air stream has an opportunity to assume a more uniform flow within the nose before it reaches the level of the spray.

Inasmuch as the atomizer of the invention serves to confine the spray, when the spray is inhaled through the nasal cavity, nearly all of the medicament will be carried down into the respiratory system. As a consequence of this, as has been pointed out, very little of the medicament remains in the nostril openings.

What is claimed is:

1. An atomizer comprising a container, a cap on the container having a nose-fitting body, a nozzle disposed centrally of said body and separated therefrom by an annular passageway, said passageway being of substantially similar cross sectional area throughout its depth to thereby impart linear movement to the air flowing therethrough, conduit means for supplying liquid and air from within the container to said nozzle upon a rise of pressure within the container and for intermixing the liquid and air so that they issue as a spray from said nozzle, said body having a lateral opening from the atmosphere to said passageway so that external air may be inhaled through said body and an encircling stream of confining air having said linear flow will be formed around the spray.

2. An atomizer comprising a collapsible container, a cap on the container having a nose-fitting body, a nozzle disposed centrally of said body and separated therefrom by an annular passageway, said passageway being of substantially similar cross sectional area throughout its depth to thereby impart linear movement to the air flowing therethrough, conduit means for supplying liquid and air from within the container to said nozzle upon an increase of pressure in the container and for intermixing the liquid and air so that they issue as a spray from said nozzle, said body having a lateral opening from the atmosphere to said passageway so that external air may be inhaled through said body and an encircling stream of confining air having said linear flow will be formed around the spray.

3. An atomizer comprising a nose-fitting body, a nozzle disposed centrally of said body and separated therefrom by an annular passageway, said passageway being of substantially similar cross sectionl area throughout its full extent and to its discharge opening to impart linear movement to the air flowing therethrough and issuing therefrom, said body having an opening from the atmosphere to said passageway so that external air may be inhaled through said body, means for admixing liquid and air for ejection as a spray of liquid through said nozzle, said passageway serving to encircle said spray with a confining stream of inhaled air having said linear flow generally parallel to the direction of flow of the spray from the nozzle.

VICTOR C. HALL.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
447,064	Shurtleff	Feb. 24, 1891
451,079	Shurtleff	Apr. 28, 1891
474,035	Vant Woud	May 3, 1892
1,148,749	Burke	Aug. 3, 1915

FOREIGN PATENTS

Number	Country	Date
3,062	Great Britain	Feb. 6, 1912