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NEBULIZER HAVING MEANS FOR ELIMINATING FAILURES

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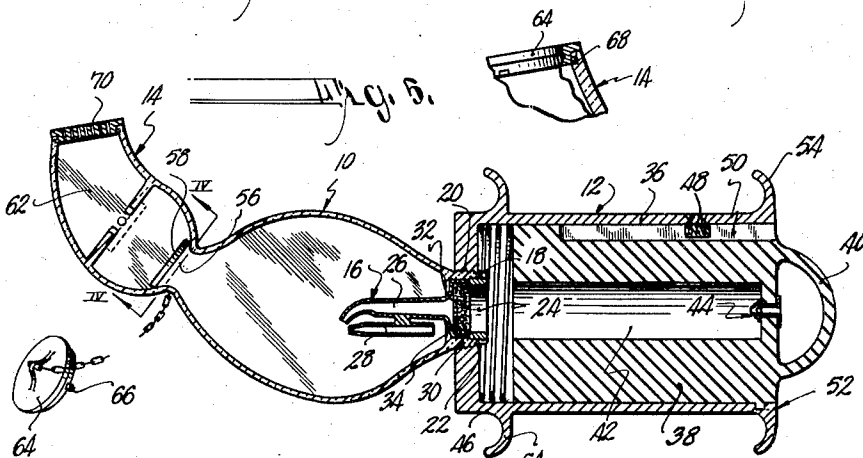
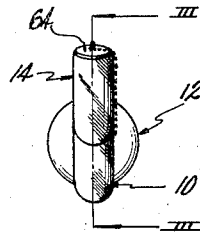
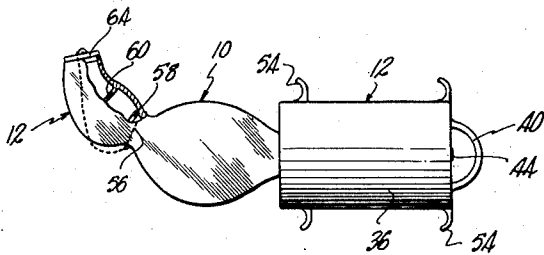


Fig. 3.

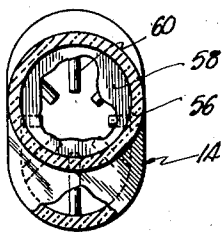


Fig. 4.

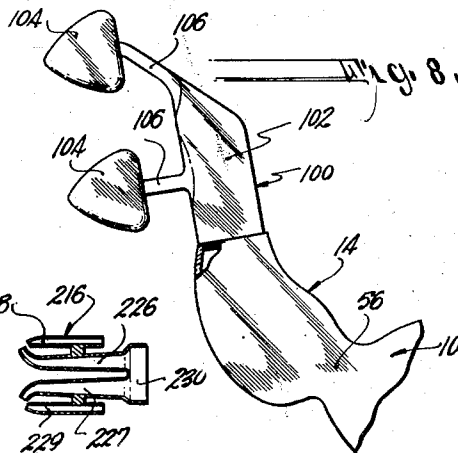


Fig. 5.

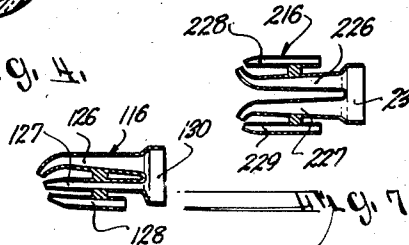


Fig. 6.

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NEBULIZER HAVING MEANS FOR  
ELIMINATING FAILURES

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4 Claims. (Cl. 128—194)

This invention relates to improvements in medical instruments and particularly in a combination nebulizer and insufflator, the primary aim being to provide such features in an instrument of such type as to assure positive and faultless operation over long periods of time.

Treatment of many types of illnesses requires the use of means to assist in the inhalation of vaporized medicants, powders and other substances. In many instances such as in the case of certain asthmatic and bronchial conditions, it is imperative that the instrument used to provide relief, be completely free of all defects, for it is conceivable that in the event of clogging of the instrument or other defective condition, the patient could suffocate or at least become violently ill before repair of the instrument could be made. By way of example only, persons with certain types of asthma or the like must frequently carry a nebulizer or the like with them at all times and, because of the nature of conventional instruments of this type, it is advisable that two such instruments be always available for oftentimes loss of time even for a moment may cause unconsciousness and ultimate suffocation if no attendant is available to give aid and assistance.

In light of the above it is the most important object of the instant invention to meet the dire necessity for a trouble-free device having component parts for eliminating the hazards of faulty operation and to provide an instrument that is neither difficult to operate nor complicated in its maintenance and upkeep.

Another important aim of the present invention is to provide a nebulizer for permitting inhalation or inward application of medicated vapors through use of a pump to supply air pressure and including a filter for removing air-laden particles that otherwise tend to clog the air tubes or pipettes which serve to atomize the liquid medicant prior to discharge from the nozzle forming a part of the instrument.

Another object of the instant invention is to provide in a medical device of the aforementioned character, filter means disposed ahead of the air tube so that the medicant itself will not become contaminated and thereby tend to coagulate or otherwise deteriorate and so that the contamination will not reach the lungs, bronchial tubes and other parts of the body of the user.

Another important aim of my present invention is to combine in a nebulizer of the aforementioned type, means for permitting application of medicated powders and other substances through use of improved nozzle structure forming a part of the body of the instrument.

Still further objects include the way in which the liquid medicant is additionally protected against contamination by valve means in the said nozzle; the way in which a shelf is provided for receiving a capsule of medicated powder within the nozzle; the manner of utilizing such shelf for limiting the extent of movement of the outlet valve of the nozzle; the way in which the liquid container or body, together with the air and liquid tubes or pipettes and the pump itself, are all interconnected for quick and simple

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disassembly to permit cleaning as becomes necessary and to permit further the changing of the said filter; and other important aims and objects including novel details of construction all to be made clear or become apparent as the following specification progresses.

In the drawing:

Figure 1 is a side elevational view of a nebulizer having means for eliminating failures made according to my present invention.

Fig. 2 is an end elevational view thereof.

Fig. 3 is an enlarged, longitudinal, cross-sectional view showing the closure cap removed from the nozzle and a perforated cap secured in place.

Fig. 4 is a transverse, cross-sectional view taken on line IV—IV of Fig. 3, parts being broken away for clearness.

Fig. 5 is an enlarged, fragmentary, detailed, cross-sectional view illustrating the manner of attachment of the caps to the nozzle.

Fig. 6 is a cross-sectional view illustrating a modified form of pipette construction.

Fig. 7 is a cross-sectional view illustrating a still further modification of pipette structure; and

Fig. 8 is a fragmentary, elevational view illustrating a nasal applicator attached to the nozzle of the instrument.

The primary components of the instrument shown in the drawing consist of a container or hollow body 10 for liquid medicant, pump means 12 removably attached to the body 10 at one end thereof, nozzle structure 14 at the opposite end of the body 10, and internal structure 16 for atomizing the liquid contained in the body 10.

While the body 10 is preferably flat and oblong, its shape and configuration is of no particular consequence other than as convenience may require, particularly when it is to be considered that the instrument should be adapted for convenience in carrying in the user's pocket and be thereby readily available for use in all emergencies.

Body 10 is provided with an inlet nipple 18 at one end thereof externally threaded as at 20 for releasably receiving the proximal end of the pump means 12 and internally threaded as at 22 for receiving a ring nut 24 that is utilized to retain the structure 16 within the nipple 18.

The atomizing means 16 shown in Fig. 3 of the drawing, includes an air tube 26 laterally bent at the outlet end thereof for discharge of air across the proximal end of a liquid tube 28 that is attached to the tube 26. The air tube 26 has an enlarged collar 30 at its inlet end receiving a filter 32 and held against an internal shoulder 34 at the innermost end of the nipple 18 by the nut 24. It is noteworthy that nut 24 also holds the filter 32 within the collar 30.

Pump means 12 includes a cylinder 36 which reciprocally receives a piston 38 provided with a finger loop 40 at the outermost end thereof. A bore 42 in the piston 38 is in direct alignment with the nipple 18 and ball valve means 44 at the outermost end of the bore 42 prevents regress of air when the piston 38 is forced inwardly against the action of spring 46. A removable stop 48 carried by the cylinder 36 within a longitudinal slot 50 in the piston 38, limits the extent of outward movement of the latter. Slot 50 is sufficiently wide however, to permit limited rotational movement of the piston 38 to permit locking of the same at the innermost end of its path of travel through use of an L-slot and detent structure formed in the cylinder 36 and the piston 38 respectively and broadly designated by the numeral 52. Lateral ears 54 on the cylinder 36 are adapted to receive the fingers of the user when the piston 38 is manipulated.

A restricted passage 56 between the body or container 10 and the hollow nozzle 14 is normally closed by a disc-gate or valve 58 that is freely movable to an open

position by the force of pressure in the body 10. Its extent of outward movement is limited by a shelf that consists of a plurality of inwardly extending radial pins 69 within the nozzle 14. Pins 69 are also adapted to support a porous capsule (not shown) of medicated powder within chamber 62 of the nozzle 14.

When the instrument is not in use it is to be preferred that the outlet end of the nozzle 14 be closed by a cap 64 in the manner shown by Figs. 1 and 2. Cap 64 has a small detent 66 that is received by an L-slot 68 in nozzle 14 for ready attachment and removal.

In the event the instrument is used as an insufflator, cap 64 is removed and replaced by a perforated cap 70 as seen in Fig. 3.

In the event it becomes necessary or advisable to increase the relative amount of air permitted to enter the body 10 on each stroke of the piston 38, the vaporizing structure 16 shown in Fig. 3, may be readily replaced with a modified form of vaporizing means 116 that includes liquid air tubes 126 and 127, both communicating with collar 130; tubes 126 and 127, together with a liquid tube 128 are all interconnected.

In Fig. 7 of the drawing, there is illustrated still another form of atomizing structure 216 having a pair of air tubes 226 and 227 communicating with collar 230 and each having a liquid tube 228 and 229 respectively.

Figure 8 of the drawing illustrates the adaptation of a nasal applicator 100 to the body 10, and particularly to the nozzle 14 thereof with the means of interconnection being the same as that provided for the caps 64 and 70. Applicator 100 includes an elongated manifold 102 having a pair of perforated nasal pieces 104 connected therewith by conduits 106. Assuming the instrument is to be used for application or inhalation of a vaporized medicant, the body or container 10 is first charged with the liquid to be used for such purpose. Cap 64 is thereupon removed and nozzle 14 placed in the mouth with the pump means 12 disposed beneath the body 10 so that the liquid immerses the tube 26 and 28 except only for their discharge ends.

Piston 38 may thereupon be turned slightly through use of the fingerpiece 40 releasing the lock and the operator may thereupon pump the piston 38 to force air through the filter 32 and the air tube 26. As the piston 38 is moved outwardly, valve 44 opens, admitting air into the bore 42. Upon the inward stroke of piston 38, valve 44 closes and the air is forced into the body 10.

The air discharging from the outlet end of the tube 26 raises the liquid in the tube 28 and the atomized mixture thereupon impinges upon the valve 53, opening the passage 56.

When the instrument is not in use it is to be preferred that the piston 38 be locked in the position shown in Fig. 3 and the cap 64 replaced.

In lieu of placing a liquid within the body 10, a porous capsule of medicated powder may be placed in the chamber 62 and the perforated cap 70 inserted in the nozzle 14, whereupon the pump 12 is again utilized to supply air pressure and to force the powder into the mouth and throat. Manifestly, the nasal applicator 100 may be utilized either for application of vapor or powder materials.

In any event, the particles of dust and dirt in the air are filtered prior to entry into the tube 26 and, therefore, the discharge end of tube 26, as well as the proximal end of the tube 28, will not become clogged and thereby render the instrument useless until cleaned, as is necessary in conventional devices of this type.

When it becomes necessary to change the filter 32, pump means 12 may easily be detached from the body 10, the nut 24 removed and the entire structure 16 likewise removed from the body 10 for cleaning and insertion of a new filter.

Details of construction may vary within the spirit of

the invention and, therefore, it is desired to be limited only by the scope of the appended claims.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. In a nebulizer for inhaling or inwardly applying medicated vapors, a hollow body adapted for containing a quantity of liquid medicant and having a tubular element integral with the body forming an air inlet, said element being provided with an inturned flange having a shoulder facing away from the body; a hollow nozzle 14 integral with the body at the opposite end thereof and provided with an outlet opening, there being a restricted passage between the body and the nozzle; an air tube having structure thereon engaging said shoulder, said tube extending into the body; a liquid tube in the body disposed to receive a blast of air across one end thereof and emanating from the air tube; a manually operated pump for supplying air pressure; means for releasably securing the pump to the element; a removable filter in said element and normally bearing against said structure; releasable means in said element for holding the filter and said structure against the shoulder; and normally closed valve means in the nozzle movable to an open position in response to the pressure of vaporized medicant emanating from the container.

2. In a nebulizer for inhaling or inwardly applying medicated powders, a hollow body adapted for containing a quantity of liquid medicant and having a tubular element integral with the body forming an air inlet, said element being provided with an inturned flange having a shoulder facing away from the body; a hollow nozzle integral with the body at the opposite end thereof and provided with an outlet opening, there being a restricted passage between the body and the nozzle; an air tube having structure thereon engaging said shoulder, said tube extending into the body; a liquid tube in the body disposed to receive a blast of air across one end thereof and emanating from the air tube; a manually operated pump for supplying air pressure; means for releasably securing the pump to the element; a removable filter in said element and normally bearing against said structure; releasable means in said element for holding the filter and said structure against the shoulder; normally closed valve means in the nozzle movable to an open position in response to the pressure of currents of air emanating from the container; and a plurality of inwardly extending radial pins within the nozzle intermediate said opening and the passage providing a support in the nozzle for receiving a capsule containing medicated powder, adapting the head for inward application or inhaling of such powder through use of said pump when the body is empty.

3. In a nebulizer for inhaling or inwardly applying medicated products, a hollow body adapted for containing a quantity of liquid medicant and having a hollow, internally threaded cylindrical element integral with the body forming an air inlet, said element being provided with an inturned annular flange having a shoulder facing away from the body, and an outlet in the opposite end of the body; an air tube having an outturned annular rim on one end thereof engaging said shoulder, said tube extending into the body; a liquid tube secured to the air tube and having one end thereof disposed to receive a blast of air across one end thereof and emanating from the air tube; a manually operated pump for supplying air pressure; means for releasably securing the pump to said element; a removable annular filter in said element and normally bearing against said rim; and a ring nut threaded in said element against the filter for releasably holding the latter and said rim of the air tube in position against the shoulder.

4. In a nebulizer as set forth in claim 3 wherein said pump includes a cylinder having a bore in alignment with said air inlet; a piston reciprocable in the bore for creating air pressure in the air tube; resilient means in the

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cylinder for biasing the piston toward one end of its path of travel; and a check valve in the outermost end of the bore to prevent regress of air thereinto as the piston is moved to the other end of its path of travel.

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