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[73] Assignee **Becton, Dickinson and Company**

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[54] **DEVICE FOR DISPENSING INHALABLE FLUIDS**
8 Claims, 7 Drawing Figs.

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(Inquired); 222/541 (Inquired), 400.7; 239/309,
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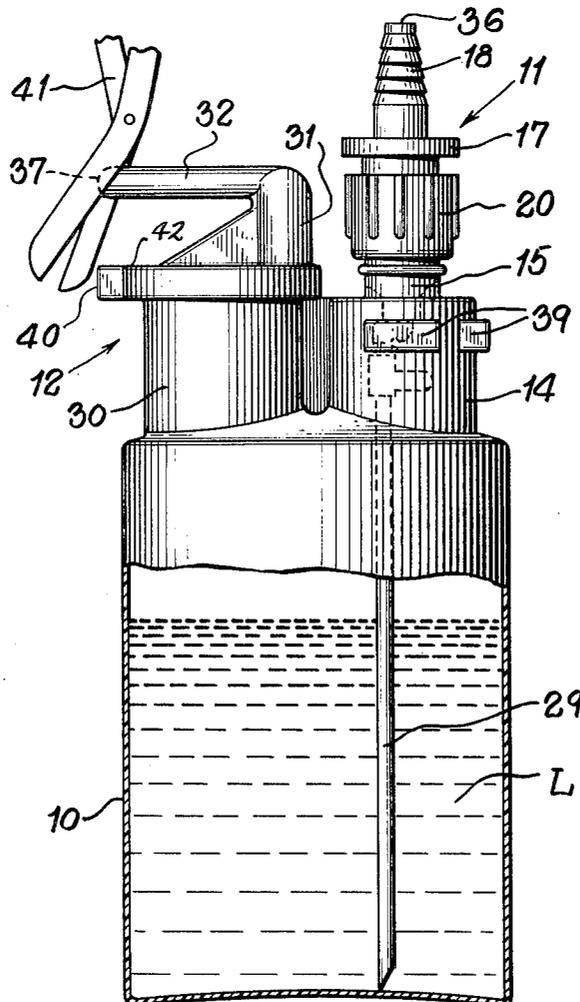
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ABSTRACT: A self-containing device for dispensing inhalable fluids, such as nebulized medicinal preparations or humidified breathable gas, including a container formed of cutable plastic and a sealed inlet formation and sealed outlet formations capable of being removed or cut away to establish the inlet and outlets. The container has an assembly at the inlet for aspirating a liquid with a gas to form a spray and a baffle in conjunction with the container wall and liquid surface for nebulizing the aspirated spray. The outlet construction consists of a large diameter tube and a small diameter tube extending therefrom, with a cutable blister formation between the two tubes. The outermost end of the smaller diameter tube forms the sealed outlet.



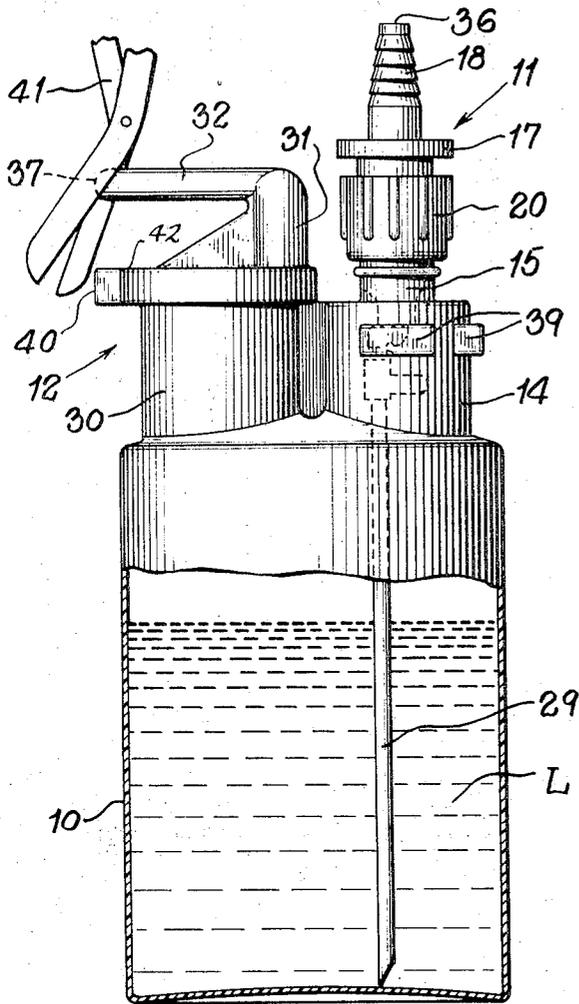


Fig. 1.

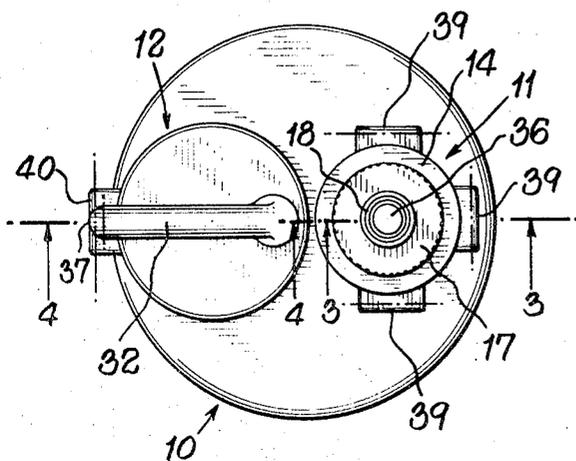
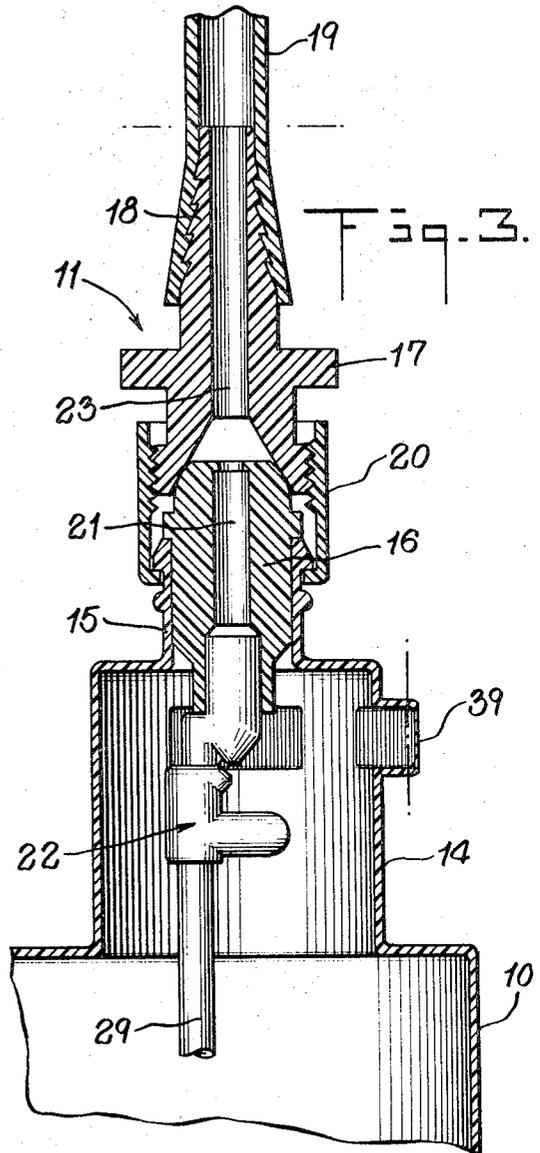
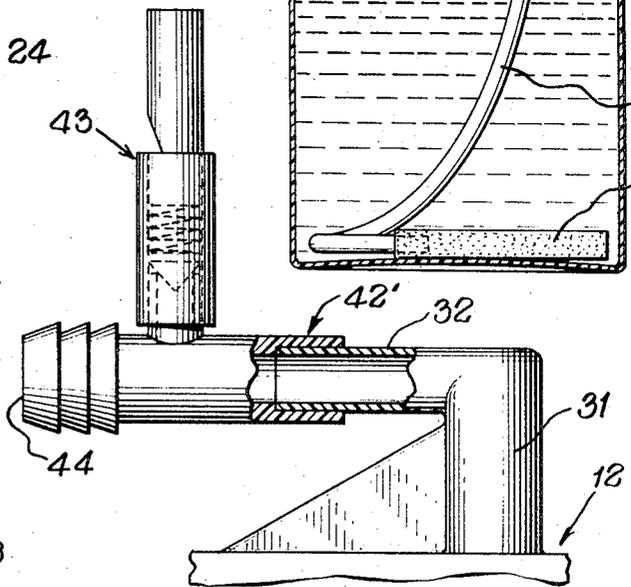
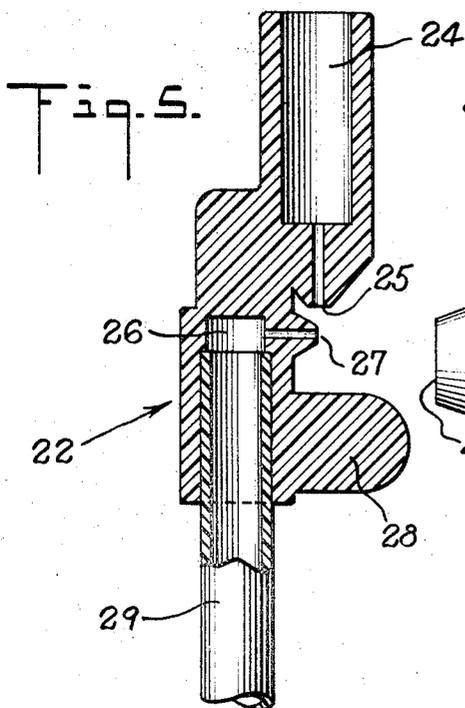
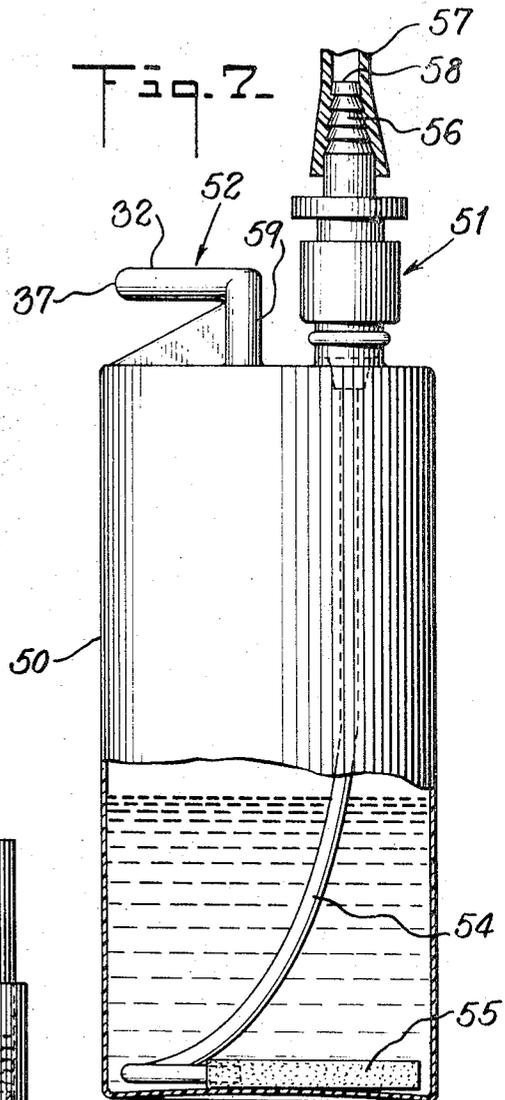
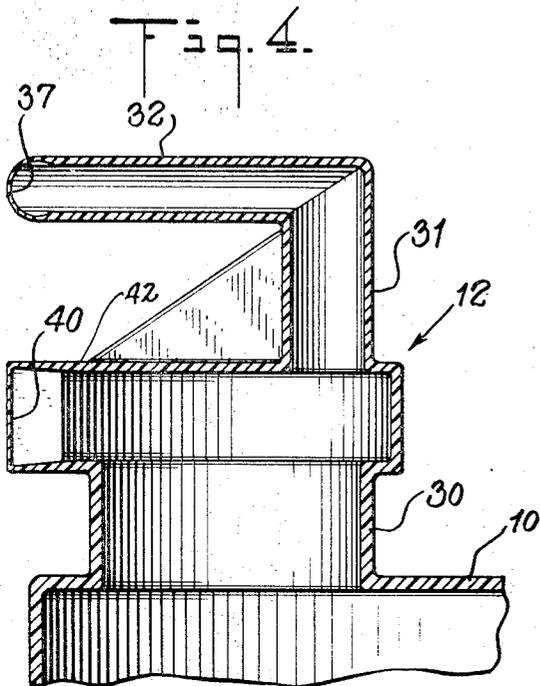


Fig. 2.

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DEVICE FOR DISPENSING INHALABLE FLUIDS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to inhalation therapy and, more particularly, to inhalers of the nebulizing or breathable gas humidifying type.

The present invention is concerned with such devices which are utilized for humidifying inhalable gas and treating pulmonary ailments with a preparation administered by inhalation. This is accomplished by direct inhalation of the preparation by the patient or breathing an atmosphere thereof.

2. Description of Prior Art

Neubilizers of the prior art for medicinal preparations have several disadvantages. Among these is that as a reusable device they are subject to pollution and cannot be effectively decontaminated to prevent pulmonary cross-infection from one patient to another.

SUMMARY OF THE INVENTION

Accordingly, an object of the present invention is to provide a device which overcomes the disadvantages of such prior devices.

Another object is to provide an improved device including a completely sealed container for the medicinal preparation, which device is formed with inlet and outlet openings just prior to being used, whereby contamination of the device is averted.

Another object is to provide such a device which is so economical in construction that it is expendable after use on a single patient, whereby cross-infection is prevented.

Another object is to provide such a device which more effectively prepares the inhalable fluid for administration.

A further object is to provide such a device which can be utilized in many different manners.

Other and further objects will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

In accordance with the present invention, the foregoing objects are generally accomplished by providing a self-containing device which comprises a container for a liquid, and inlet means for a gaseous fluid and outlet means for treated fluid at the upper end of the container, the inlet and outlet means being formed of plastic material and having an end formation for sealing the inlet and outlet means and being constructed and arranged to be removed or cut away to open the inlet and outlet means.

More specifically, the container may be equipped with an aspirator near the inlet means including a nozzle in fluid flow communication with the inlet means for directing the gaseous fluid downwardly and a second nozzle positioned crosswise and adjacent the first nozzle for the eduction of a spray of the liquid, and a baffle member adjacently below the nozzles onto which the spray of liquid is directed and in conjunction with the container wall and liquid surface to nebulize the same.

Alternatively, a porous gas diffusing element in fluid flow communication may be placed in the liquid, which is confined by the container and which causes the gas to be humidified.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is an elevational view, partly in section of a device in accordance with the present invention.

FIG. 2 is a top plan view of the device shown in FIG. 1.

FIG. 3 is a sectional view taken along the line 3-3 on FIG. 2 illustrating the details of the inlet section of the device.

FIG. 4 is a sectional view taken along the line 4-4 on FIG. 2 illustrating the details of the outlet section of the device.

FIG. 5 is an enlarged longitudinal sectional view of a combined aspirator and nebulizer assembly.

FIG. 6 is a view similar to FIG. 4 but illustrating an audible safety release valve applied to an open outlet.

FIG. 7 is an elevational view, partly in section, of another embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1 to 5 of the drawings in detail, there is shown a nebulizer which generally comprises a container 10 having an inlet section 11 and an outlet section 12, both at the top of the container.

The inlet section 11 (FIG. 3) comprises a cylindrical column 14 extending upwardly from the container having a neck portion 15 at the upper end thereof, a body member 16 seated in the neck portion, a combined inlet fitting and cap closure 17 having a nozzle 18 for connection of a tube 19 for supplying air, oxygen or any other inhalable gas, and a coupling 20 for screw-threadedly securing the inlet fitting 17 on the neck portion over the body member 16. The inlet fitting 17 may be discarded in some instances and the coupling 20 used instead.

The body member 16 has a central bore 21 in fluid flow communication with a bore 23 of the inlet fitting 17 at its upper end, and has inserted therein at its lower end an aspirating and nebulizing assembly 22 (FIG. 5).

As best shown in FIG. 5, the assembly 22 has an upper bore section 24 terminating in a downwardly facing nozzle 25 at its lower end, and has a lower bore section 26 terminating in a nozzle 27 at its upper end which nozzle is positioned crosswise and adjacent to the nozzle 25. The assembly further has a baffle 28 directly beneath the nozzles and has a siphon tube 29 inserted into the lower bore section 26 and extending to the bottom of the container (FIG. 1).

When a gas under pressure is introduced into the bore 23 of the inlet fitting 17, a blast of gas is directed across the nozzle 27 by the nozzle 25. This causes eduction of fluid in the container through the nozzle 27 in the form of an aspirated spray. This spray is caused to impinge upon the baffle 28 by the blast of gas discharged from the nozzle 25 which in turn impinges upon the surface of the fluid and the container wall to nebulize the spray to a micron size suitable for inhalation.

The outlet section 12 (FIG. 4) comprises a covered cylindrical column 30 extending upwardly from the container 10, a vertical tubular section 31 on the top of the column 30, and a horizontally extending tubular portion 32 to which may be attached a nasal cannula or catheter (not shown) for insertion into a nostril.

The container 10 and its integral outlet section 12 and the inlet fitting 17 are formed of a plastic material which can be readily cut by scissors. The nozzle 18 of the fitting 17 has a formation 36 at its upper end (FIG. 1) for sealing the same. The horizontal tubular portion 32 likewise has a formation 37 for sealing the same. Additional openings may be provided by rupture of blisterlike end formations 39 and 40 of thinner plastic material on the inlet and outlet section columns 14 and 30 respectively, for purposes to be described hereinafter. After placing sterile liquid L into the sterile container 10 and sealing the inlet fitting 17 onto the neck portion 15, the device is completely sealed, so that the liquid cannot be contaminated.

When the device is to be used, the inlet formation 36 is cut away and the outlet formation 37 is likewise cut away, as by scissors 41, after which one end of a tube, such as a cannula or catheter (not shown) is telescoped over the tube 32 and the other end inserted into a person's nostril. An inhalable gas is delivered by the tube 19 through the bore 23 of the inlet fitting 17 and aspiration and nebulization take place as already described. The nebulized liquid is discharged through the tubular portion 32 which has been opened at the outlet formation 37.

There are shown three blister formations 39 (see FIG. 2) on the inlet section column 14 and these function as venturi or air suction openings when cut. When an inhalable gas, such as ox-

xygen is delivered by tube 19 or coupling 20, the concentration of oxygen with respect to air discharged may be varied, depending upon whether three, two, one or no formations 39, respectively, are cut.

There is shown one blister formation 40 (see FIGS. 1 and 2) on an annular protuberance 42 of the outlet section column 30 and this blister formation 40 is provided as a cuttable surface to enable the scissors 41 to be readily inserted therethrough, so as to cut away the entire upper portion of protuberance 42 including tubular section 31 and tubular portion 32, after which the opened section of protuberance 42 is connected for face mask or hood application. The contents of the container are administered to a single patient and the entire device is discarded when treatment of the patient is completed or when the entire contents of the container have been discharged.

In FIG. 6, the formation 37 of the tubular portion 32 has been cut away and a coupling 42' having a whistle 43 thereon is shown connected to the portion 32. The coupling 42' has an outlet 44 for discharge of the nebulized preparation and the whistle 43, which includes a check valve, serves as an audible alarm to indicate that the outlet 44 of the device has encountered a blockage, so that the attendant is immediately alerted to this condition.

In FIG. 7, there is shown a humidifier for inhalable gas which comprises a container 50 for a liquid having an inlet section 51 and an outlet section 52 on the top thereof, a flexible tube 54 having one end connected to the inlet section 51, and a porous gas diffusing element 55 resting on the bottom of the container and being attached to the other end of the tube 54.

The inlet section 51 includes a nozzle 56 for the connection of a gas supply tube 57 and a formation 58 for sealing the upper end of the nozzle 56.

The outlet section 52 includes a vertical tubular section 59, and a horizontal tubular portion 52 having a formation 37 for sealing the same.

The container 50 and its integral outlet section 52 and the inlet nozzle 56 are constructed of thin plastic material which enables the sealing formations to be readily cut away.

In use, the inlet formation 58 and the outlet formation 37 are cut away and the gas is introduced into the inlet nozzle 56. The gas is directed through the tube 54 to the element 55 which diffuses the gas. The diffused gas, as it rises through the liquid, is humidified and is discharged from the device.

Here again the device is completely sealed before use and is discarded after use, as already described.

From the foregoing description it will be seen that the present invention provides an improved fluid dispensing device which cannot be contaminated prior to use and being inexpensive is discarded after use.

We claim:

1. A device for dispensing fluids, comprising:

a plastic container for the fluid having an inlet section and an outlet section;

means within said container for treating fluid introduced

through the inlet section;

outlet means at said outlet section for discharging the treated fluid, said outlet means including a covered cylindrical column extending from the container and a tubular projection extending a predetermined distance from the cylindrical column, said tubular projection being of considerably smaller diameter than said column to permit connection of the outlet section to a relatively small diameter delivery tube; and

a blisterlike formation on a sidewall of the cylindrical column, said formation being adapted to be easily ruptured to cut away the tubular projection and the cover of the cylindrical column to provide a larger diameter outlet passage and to permit connection of a relatively large delivery tube to the outlet section.

2. The invention in accordance with claim 1, wherein the inlet section includes an extending tubular projection terminating in an annular protuberance forming a seal and adapted to be cut away and the tubular projection extending from the cylindrical column also terminating in an annular protuberance forming a seal and adapted to be cut away, whereby the container is sealed until the protuberances are cut away.

3. The invention in accordance with claim 1, wherein the blisterlike formation is formed on an annular protuberance formed around the cylindrical column, the blister being frangible to allow for cutting away the entire annular protuberance including the cover and the tubular projection.

4. The invention in accordance with claim 1, wherein an audible safety release element is attached to said outlet means to indicate when said device has encountered a blockage during discharge of said treated fluid.

5. The invention in accordance with claim 1, wherein said inlet means includes means for introducing an inhalable gas under pressure into said container, an aspirator is positioned in said inlet section including a first nozzle in fluid flow communication with said inlet means for directing the gas downwardly, a second nozzle positioned crosswise and adjacent said first nozzle for the eduction of a spray of the fluid therefrom, a syphon tube in fluid flow communication with said second nozzle and extending downwardly into the container, and a baffle member adjacently below said nozzles onto which the spray of the fluid is directed to nebulize the same.

6. The invention in accordance with claim 5, additionally comprising a plurality of blister formations formed on said inlet section and positioned adjacent said first nozzle, said blister formations being adapted to be easily ruptured to provide air suction openings for varying the concentration of the inhalable gas.

7. The invention in accordance with claim 6, wherein there are three blister formations formed about the inlet section.

8. The invention in accordance with claim 1, wherein humidifying means including a porous diffusing element is positioned between said inlet and outlet sections.

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