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P. J. CIRANNA

3,605,738

MEDICINAL SPRAY DEVICE

Filed June 20, 1969

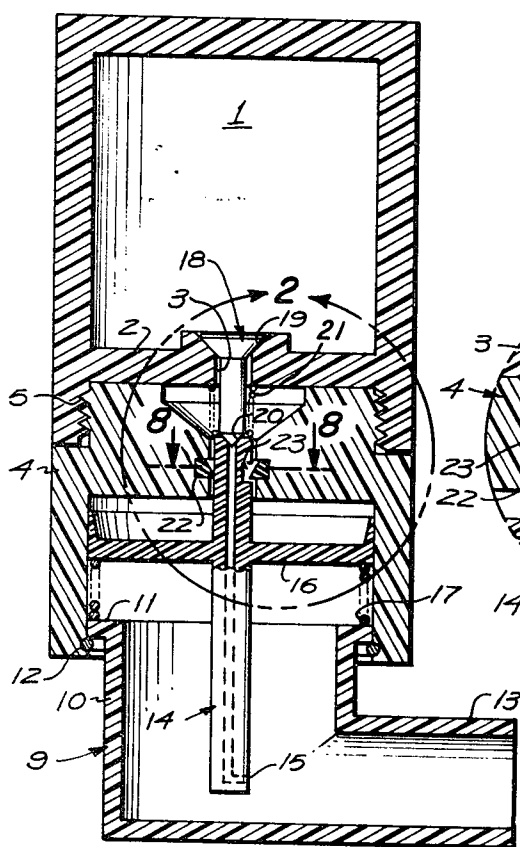


FIG. 1

FIG. 2

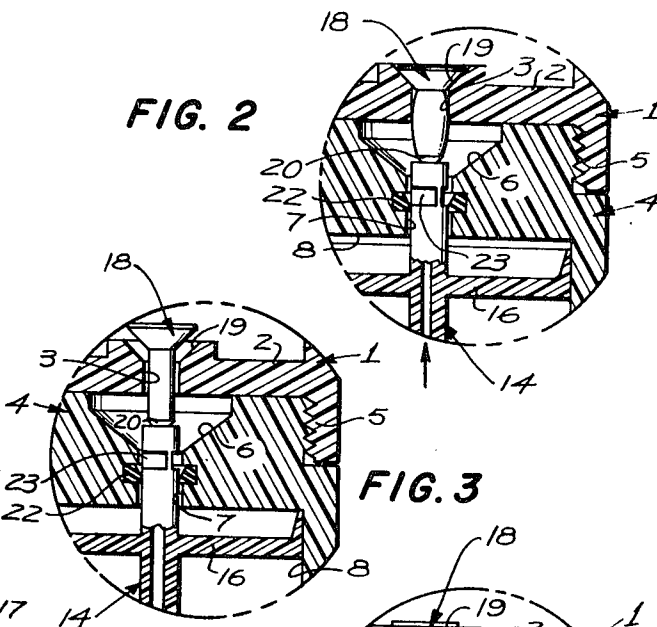


FIG. 3

FIG. 4

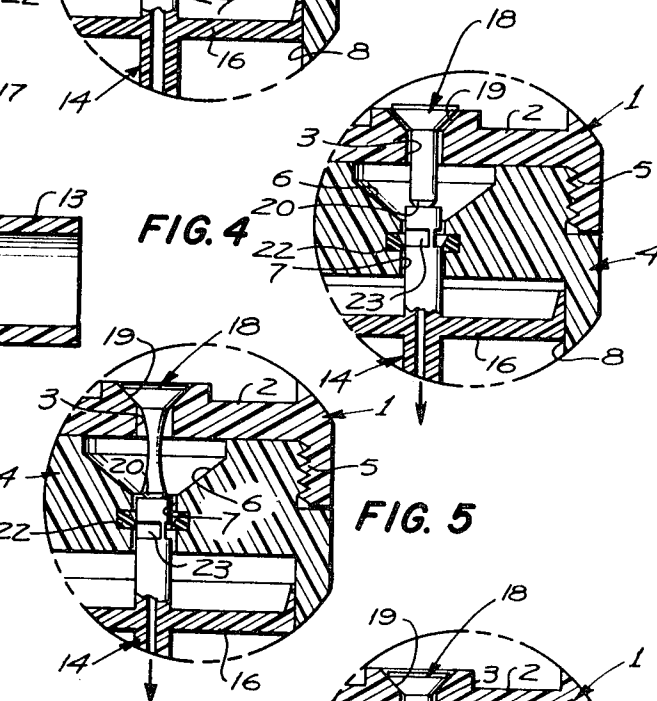


FIG. 5

FIG. 6

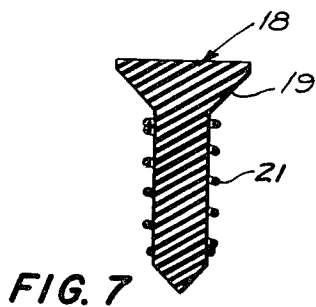
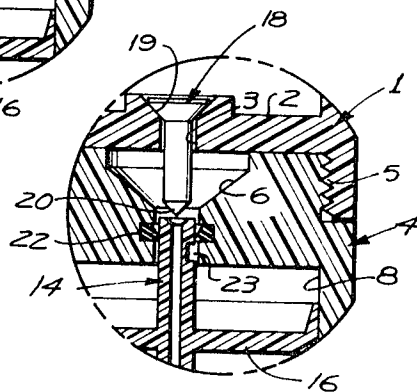


FIG. 7

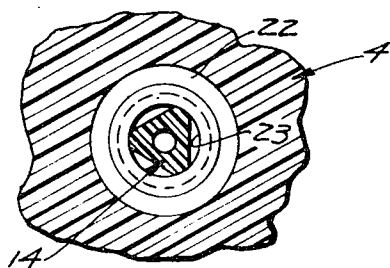


FIG. 8

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MEDICINAL SPRAY DEVICE
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2 Claims

ABSTRACT OF THE DISCLOSURE

A device for producing from a pressure vessel a predetermined spray charge containing an inhalant medicine and a pressurizing aerosol, the vessel communicating with a metering chamber which, in turn, communicates with a nozzle tube located within an ejection tube intended to be placed in suction inducing relation with a patient's mouth or nose. A first valve controls flow into the metering chamber and a second valve attached thereto controls flow through the nozzle tube and the ejection or suction tube. The first valve is manually operated to cause a predetermined quantity of the medicine-aerosol fluid to fill the metering chamber. A piston of large area supports the nozzle tube and is operable, in response to suction applied by the patient to the discharge tube, to close the first valve and open the second valve and thereby cause delivery of the medicine-aerosol charge to the patient's mouth or nose simultaneously with inhalation. By means of a third valve, the metering chamber may also communicate momentarily with a chamber closed by the piston at its side opposite from the side exposed to suction pressure so as to supplement the force exerted by the patient.

BACKGROUND OF THE INVENTION

Spray devices which utilize a pressurized aerosol to deliver a charge of a medicine-aerosol to a patient's mouth or nose are known. One type utilizes a discharge tube containing a nozzle and a pressure vessel arranged to be pressed toward each other to cause a predetermined quantity of the medicine-aerosol fluid to enter a metering chamber; then, upon release, the charge is ejected.

Heretofore such devices have required that the patient inhale precisely at the time the charge is ejected; otherwise, the medicine is wasted. If the patient manipulates the device, precise timing is less difficult than if an attendant or nurse administers the medicine, providing, however, if the patient has deficient coordination or is semi-conscious, the required timing is usually not accomplished.

SUMMARY OF THE INVENTION

The present invention provides a solution to this problem and is summarized in the following objects:

First, to provide a medicinal spray device which is so arranged that after the device is manipulated to transfer a predetermined quantity of medicine-aerosol mixture to a metering chamber, the subsequent act of inhalation, when the device is placed in close proximity to the patient's mouth or nose, automatically releases the charge; thus, simultaneous inhalation and ejection of the charge is assured.

Second, to provide a medicinal spray device of the type indicated in the preceding object, wherein a portion of the medicine-aerosol charge may be employed to pressurize one side of a piston simultaneous with the application of suction pressure on the other side thereof, thereby minimizing the effort required by the patient.

Third, to provide a medicinal spray device wherein a pressure vessel communicates with a metering chamber which, in turn, communicates with a nozzle tube carried by a piston of large diameter; the nozzle tube being

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mounted in a larger ejection tube to which the piston is exposed, and novel valve means operable by movement of the piston to cause the metering chamber to be charged, then on application of suction to the piston, to open communication between the metering chamber and the nozzle tube.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is an enlarged longitudinal sectional view of the medicinal spray device, with the parts shown in their normal condition; that is, essentially as they appear between uses of the device.

FIG. 2 is a fragmentary sectional view, taken within circle 2 of FIG. 1.

FIGS. 3, 4, 5 and 6 are fragmentary sectional views, corresponding to FIG. 2, showing succeeding stages of operation of the medicinal spray device.

FIG. 7 is a further enlarged sectional view of the valve member.

FIG. 8 is a further enlarged fragmentary transverse sectional view, taken through 8—8 of FIG. 1.

SPECIFICATION

The medicinal spray device includes a pressure vessel 1, having a bottom wall 2 containing an outlet port 3. A body member 4 is joined to the pressure vessel 1 by a screwthread connection 5.

The upper end of the body member 4 seals against the bottom wall 2 of the pressure vessel and is provided with a central cavity which forms a metering chamber 6. The lower end of the metering chamber is connected by a passage 7 to a relatively large piston chamber 8.

A suction tube 9 is provided which includes a relatively large vertical portion 10, having an external flange 11, which fits slidably in the piston chamber 8, and is held within the piston chamber 8 by a retainer ring 12. The suction tube 9 also includes a horizontal portion 13, dimensioned to be presented to a patient's mouth or nose.

Centered within the vertical portion 10 of the suction tube is a nozzle tube 14, of small diameter, the lower end of which terminates in a nozzle 15, directed horizontally toward the open end of the horizontal portion 13. The upper end of the nozzle tube extends through the passage 7 and into the metering chamber 6. Formed integrally with the nozzle tube 14 is a piston 16, which fits slidably within the piston chamber 8, and may be provided with a peripheral lip facing toward the closed end of the chamber 8. A spring 17 is interposed between the flanged end of the suction tube 9 and the piston 16 so as to urge the piston upwardly toward the closed end of the piston chamber 8.

A valve member 18 formed of rubber or other elastomer is received in the outlet port 3 of the pressure vessel and extends to the nozzle tube 14. The valve member includes a flanged upper end which engages a correspondingly flanged upper end of the outlet port 3 so as to form therewith a pressure vessel valve means 19. The lower extremity of the valve member is conical and fits a conical recess in the upper end of the nozzle tube 14 to form a nozzle tube valve means 20.

Should increased thrust of the valve member 18 to close the nozzle tube valve means 20 be desired, a spring 21 is fitted around the valve member, as shown in FIGS. 1 and 7 (the spring being omitted from the other figures). The lower end of the spring is suitably secured to the valve member 18 adjacent its lower end and the upper end of the spring bears against the bottom wall 2.

The nozzle tube 14 fits loosely within the passage 7, and the passage 7 is provided with a channel which receives a transfer valve ring 22. The inner periphery of which sealingly engages the nozzle tube 14. A relatively

short axial portion of the nozzle tube is provided with a set of grooves 23; that is, the nozzle tube is essentially triangular in cross section in this region, as shown in FIG. 8.

Operation of the medicinal spray device is as follows:

To initiate use of the device, the device is held in the position shown in FIG. 1; that is, with the pressure vessel above the suction tube. The suction tube is pressed upwardly with respect to the pressure chamber, compressing the spring 17 so as to force the nozzle tube 14 and piston 16 upwardly through the position shown in FIG. 2 to the position shown in FIG. 3. This operation cocks the medicinal spray device by permitting a charge of the medicine-aerosol mixture to enter the metering chamber 6. The mixture remains in a liquid state or nearly so. When the suction tube is released, the suction tube returns to the position shown in FIG. 1. However, the nozzle tube and piston remain in the position shown in FIG. 3. If the open end of the horizontal portion 13 of the suction tube 9 is presented to the patient's mouth or nostril, and the patient inhales, a slight vacuum pressure is established in the suction tube and in the region underlying the piston 16. It will be noted that the area of the piston is quite large so that a relatively small suction pressure will tend to move the piston downwardly from the position shown in FIG. 3 through the positions shown in FIGS. 4 and 5 to the position shown in FIG. 6. This movement takes place relatively rapidly, but in the course of this movement, there is momentary communication between the metering chamber 6 and the upper side of the piston so that a portion of the liquid medicine-aerosol mixture within the metering chamber will expand as a gas in the region above the piston 16, and the force exerted by the expanded gaseous mixture augments the suction force applied by the patient, thus reducing the effort required by the patient. When the piston 16 reaches the position shown in FIG. 6, the nozzle tube valve 20 opens so that the charge of medicine-aerosol is ejected from the nozzle 15 and into the patient's nostril or mouth.

After this operation is completed, the piston 16 moves upwardly from the position shown in FIG. 6 toward the position shown in FIG. 1 a sufficient distance to close the nozzle tube valve 20 without opening the pressure vessel valve 19. It is not intended that the piston 16 provide an airtight seal with the piston chamber 8, so that any residual pressure existing above the piston 16 and in the metering chamber 6 will be gradually relieved until the pressure therein has returned to atmospheric pressure, at which time the spray device is ready for reuse.

While the medicinal spray device is primarily intended for human use, it should be pointed out that in view of the fact that the medicine is discharged automatically when a suction pressure is applied, the device is uniquely suited for administering the medicine to animals.

It should be noted that the medicine need not be in

liquid form, but may be a microfine powder suspended in the aerosol.

While a particular embodiment of this invention has been shown and described, it is not intended to limit the same to the details of the construction set forth, but instead, the invention embraces such changes, modifications and equivalents of the various parts and their relationships as come within the purview of the appended claims.

I claim:

1. A spray device for medicine-aerosol fluids comprising:

- (a) a pressure vessel;
- (b) means defining a metering chamber, a relatively large piston chamber and passages connecting said pressure vessel and chambers;
- (c) a nozzle tube extending from said metering chamber through said piston chamber and including a piston fitting said piston chamber;
- (d) an ejection tube surrounding said nozzle tube and having an end slidably received in said piston chamber;
- (e) a valve member extending from said pressure vessel to said nozzle tube and including a first valve means operable to close said pressure vessel and a second valve means operable to close said nozzle tube;
- (f) said ejection tube being manually operable to open said first valve means while said second valve means remains closed, thereby to permit a charge of medicine-aerosol fluid to enter said metering chamber, said piston being responsive to suction pressure in said ejection tube to open said second valve means and close said first valve means thereby to cause the medicine-aerosol fluid to flow through said nozzle tube and issue from said ejection tube.

2. A spray device, as defined in claim 1, wherein:

- (a) a momentary operable valve means is interposed between said metering chamber and said piston chamber to permit a portion of said medicine-aerosol fluid to enter said piston chamber and exert a force against one side of said piston augmenting the suction force against the other side of said piston.

References Cited

UNITED STATES PATENTS

2,992,645	7/1961	Fowler	128—208
3,456,644	7/1969	Thiel	128—173

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