

[54] **INHALATION COORDINATED
AEROSOL DISPENSING DEVICE**

[75] Inventors: **Robert E. Thompson**, Maplewood;
Ernest LeBreton, Lake Hiawatha,
both of N.J.

[73] Assignee: **Schering Corporation**, Bloomfield,
N.J.

[22] Filed: **June 7, 1971**

[21] Appl. No.: **150,654**

[52] U.S. Cl. **128/173 R**, 128/208, 128/211,
128/225

[51] Int. Cl. **A61m 11/00**, A61m 15/06

[58] Field of Search 128/173, 208, 201,
128/266, 225, 211

[56] **References Cited**

UNITED STATES PATENTS

3,456,646 7/1969 Phillips et al. 128/173 R

Primary Examiner—Richard A. Gaudet

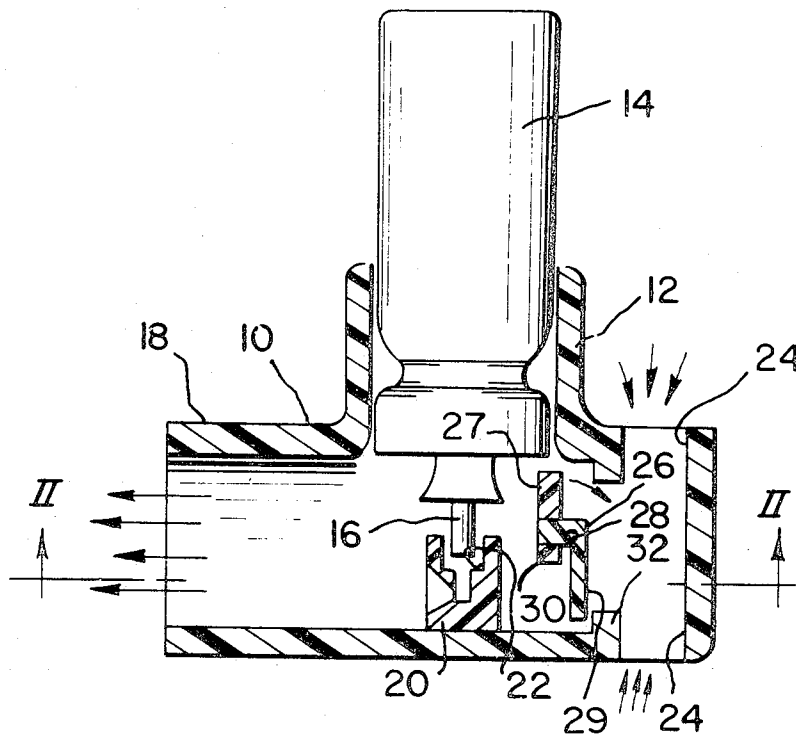
Assistant Examiner—Ronald L. Frinks

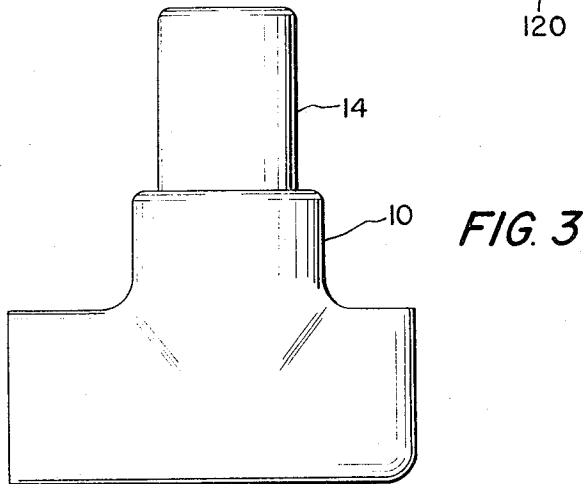
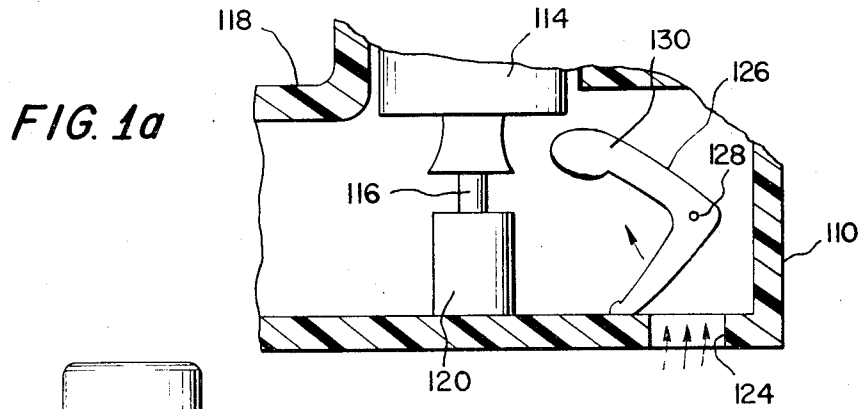
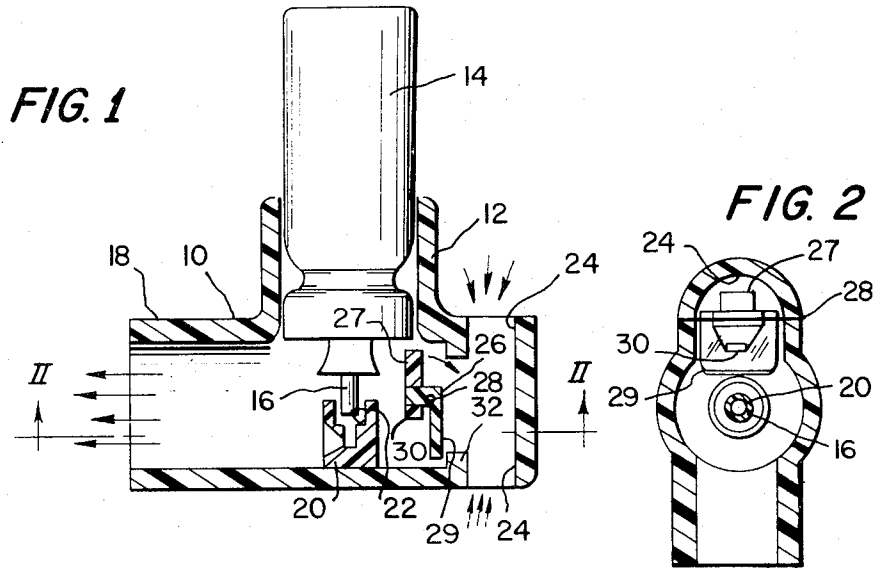
Attorney—Millen, Rapses & White

[57] **ABSTRACT**

An aerosol dispensing device for discharging a metered amount of a medicament-containing aerosol into the mouth of a patient by manual compression thereof, which can be discharged only during inhalation by the patient or by first tilting the device from its normally vertical dispensing position to a horizontal position, thereby releasing a gate which normally blocks actuation of the device.

9 Claims, 4 Drawing Figures





INVENTORS
ROBERT E. THOMPSON
ERNEST Le BRETON

BY *Millen, Raptier & White*

ATTORNEYS

INHALATION COORDINATED AEROSOL DISPENSING DEVICE

BACKGROUND OF THE INVENTION

Aerosol dispensing devices which discharge a metered amount of a medicament as an aerosol upon finger compression thereof are well known. See U.S. Pat. No. 3,001,524. A problem associated with the use of such devices is synchronizing the discharge of the medicament with inhalation by the patient so that the medicament is inspired deeply into the lungs. If a patient is uncertain whether he has inhaled the medicament deeply, he sometimes will actuate the device several times, which can lead to dangerous overdosage. Also, if the propellant is not diluted by inhaled air, damage to or spasms of the upper respiratory tract can occur. Therefore, several devices have been developed which are inhalation-actuated. See U.S. Pat. Nos. 3,157,179; 3,187,748; 3,302,834; 3,456,644; 3,456,645; and 3,456,646. Such devices are air-actuated, i.e., the device is first compressed manually to prepare it for actuation by inhalation by the patient, which triggers a mechanism which releases a metered amount of the aerosol. Some such devices are triggered only by a build-up of a vacuum produced by the patient sucking on the mouthpiece, see U.S. Pat. Nos. 3,157,179 and 3,302,834, which can be difficult for a patient having an asthmatic attack. The prior art devices which do not block the flow of inhaled air are discharged from a cocked position by the force of a stream of inhaled air, which require delicate and relatively complicated construction to ensure that the force which maintains the device in cocked but not discharged condition is overcome by the slight force imparted by a stream of inhaled air. All of the air-actuated devices of the prior art suffer from the deficiency that they cannot reliably be discharged by the breath of a patient whose breath is too weak to release the cocked mechanism.

It is therefore an object of this invention to provide an inhalation-coordinated aerosol dispensing device of simple, reliable and inexpensive construction. Another object is the provision of such a device which requires a very slight flow of inhaled air to permit discharge thereof. A further object is the provision of such a device which can be discharged, if desired, by means other than the force of inhaled air. It is another object of this invention to provide such a device which precludes unintentional multiple dosing by furnishing a system which must be first actuated by inhalation and then by mechanical depression for each inhaled breath of the user.

SUMMARY OF THE INVENTION

An inhalation-coordinated aerosol dispensing device is provided with a pivotally mounted vane, positioned in a chamber which provides communication between an air inlet and a medicament discharging outlet, which blocks the compression-activation of the aerosol valve and the air inlet until shifted to a non-blocking position by a stream of inhaled air or, optionally, also unless the device is tilted from its normal vertical-dispensing position to a downward-pointing horizontal position.

BRIEF DESCRIPTION OF THE DRAWINGS

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

FIG. 1a is an enlarged fragmentary sectional view of another embodiment incorporating features in accordance with the invention;

FIG. 2 is a bottom view, partially in section along line II—II of FIG. 1; and

FIG. 3 is a side elevation view.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIGS. 1, 2 and 3 the device is seen to comprise a housing 10 with a cylindrical portion 12 formed in the upper surface thereof to slidably receive an aerosol dispensing container 14 therein. The container is conventional in the art and generally includes a hollow valve stem or movable element 16 which transmits a metered dosage of aerosol under pressure from within the dispenser 14 when the stem is depressed against spring pressure into the container. As described above, the contents of the dispenser can include any of the known medicaments for treating respiratory problems.

The housing 10 further includes a breathing tube 18 mounted normal to the cylindrical portion 12 and forming an intersection therewith. A nozzle member 20 is mounted on the bottom of the housing 10 in alignment with the breathing tube 18 and is provided with an opening 22 in the upper side thereof communicating with the nozzle and positioned and adapted to receive the stem 16 of the dispenser 14. As can be seen, then, depression of the dispenser 14 to actuate the valve stem 16 by contact with the nozzle member on downward movement of the dispenser in the cylindrical portion 12 causes a dose of aerosol to be discharged through the nozzle member into the breathing tube 18.

Positioned at the opposite end of the housing 10 from the breathing tube 18 are vent openings 24 which open to the ambient for purposes to be described below. A vane 26, pivotally mounted on an axle 28 with an upper member 27 and lower member 29 offset in opposite directions from axle 28, is disposed within the housing 10 between the vent openings and the breathing tube 18 and subjacent to the lower portion of the dispenser 14. The vane is pivotal in the direction indicated by the arrow and is normally positioned in the illustrated configuration under the influence of a counterweight 30 and is blocked from further counterclockwise rotation by a stop 32. As can be seen by reference to the figure, the vane 26 is so configured and positioned to normally block downward movement of the dispenser 14 thereby normally precluding depression of the dispenser 14 and dispensation of a dose of aerosol through the nozzle 20.

In normal operation, the user places his mouth over the breathing tube 18 and inhales, thereby drawing air through the vent openings 24 and deflecting the vane 26 in a clockwise direction. Deflection of the vane 26 moves the portion thereof normally positioned below the dispenser 14 from beneath the lower end thereof, thereby freeing the dispenser for downward movement thereof within the cylindrical portion 12. The dispenser 14 is then depressed and a dose of aerosol is dispensed into the breathing tube 18 and lungs of the user. When pressure is released on the dispenser 14, the spring (not shown) contained within the mechanism for maintaining the valve stem 16 extended, returns the dispenser to the illustrated position and the vane 26 is rotated counterclockwise by the counter weight 30 to resume a blocking position. Additional doses require an identi-

cal, two phase, repetition of the above-described procedure.

In the event that a user is unconscious and respiration is slight, the device may be used by placing the device in the mouth of the user with the cylinder portion 12 in a horizontal position and the axis of breathing tube 18 vertical. In this position, the counter weight 30 swings the vane 26 open, thereby allowing the medicament to be administered at will, as shown in FIG. 2.

The configuration of the vane may be varied as desired and the self-opening feature of the vane may be omitted if so desired. In FIG. 1a a variation of the vane configuration is illustrated. Components of this embodiment corresponding to those of the preceding embodiment are indicated by like numerals of the next higher order. In that embodiment, the vent opening 124 is disposed through the lower wall of the housing 110 and the vane 126 is in an inverted "L" shaped configuration mounted on the axle 128 above the vent opening. Air passes in the direction indicated by the arrows and deflects the vane clockwise when the user inhales as was described above. Rotation of the housing 110 to point the breathing tube 118 downward will not result in opening of the vane 126 automatically.

The disclosed device, in both its disclosed forms, precludes the administration of medicament in its upright position without prior inhalation followed by mechanical actuation. The danger of overdosage by multiple actuation is therefore minimized. Because air can flow around the top portion 27 of vane 26 even before it is moved to its unblocking position, the patient does not experience a feeling of suffocation while the vane 26 is in its blocking position.

What has been set forth above is intended primarily as exemplary to enable those skilled in the art to practice the invention.

From the foregoing description, one skilled in the art can easily ascertain the essential characteristics of this invention, and without departing from the spirit and scope thereof, can make various changes and modifications of the invention to adapt it to various usages and conditions.

What is claimed is:

1. An aerosol metering device for inhalation comprising:

a housing having a breathing tube and a spaced vent opening communicative therewith;

means for dispensing a medicament-containing aerosol into the housing comprising a dispensing element reciprocally received in said housing and actuated upon inward reciprocation thereof to dis-

pense a dose of the contents thereof into said breathing tube;

a pivotally mounted vane disposed in said breathing tube, said vane having an upper member positioned in alignment with said dispensing element so as to normally block depression of said dispensing element and a lower member rigidly connected thereto by means of an intermediate pivot which is offset from said upper member, whereby said vane is inhalation actuated so as to be pivotally moved out of alignment and blocking position of said dispensing element, such that depression of said element during inhalation dispenses a dose of medicament-containing aerosol into said breathing tube.

2. A device according to claim 1 wherein the means for dispensing the aerosol into the breathing tube is a pressurized container having a reciprocally actuated dispensing valve reciprocally mounted in said housing to dispose said valve in engaging relationship with the interior thereof, such that reciprocation of said container results in actuation of said valve.

3. A device in accordance with claim 1 wherein said vane is pivotally mounted so as to be gravity actuated in a blocking position.

4. A device in accordance with claim 3 wherein said vane is configured and weighted to move out of blocking position of said dispensing element when said breathing tube is pointed downwardly.

5. A device in accordance with claim 3 wherein said vane is configured and weighted to remain in blocking position of said dispensing element in both upright and downwardly pointed positions until breath actuated into a non-blocking position.

6. A device in accordance with claim 1 wherein said vane is configured so as to permit air to flow through said breathing tube while said vane is in its blocking position.

7. A device in accordance with claim 6 wherein said vane is pivotally mounted so as to be gravity actuated in a blocking position.

8. A device in accordance with claim 7 wherein said vane is configured and weighted to move out of blocking position of said dispensing element when said breathing tube is pointed downwardly.

9. A device in accordance with claim 7 wherein said vane is configured and weighted to remain in blocking position of said dispensing element in both upright and downwardly pointed positions until breath actuated into a non-blocking position.

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