ABSTRACT OF THE DISCLOSURE

An aerosol dispensing device for discharging a metered amount of a medicament-containing aerosol into the mouth of a patient during inhalation. The device is initially manually compressed to a charging condition and is automatically discharged by a mechanism actuated by the breathing of the patient.

This invention relates to a dispensing device which is particularly suited for dispensing and administering measured amounts of fluids. The principal use for devices of this type at the present time is in dispensing metered amounts of a medicament-containing aerosol for inhalation therapy.

A variety of devices for administering medicament during inhalation have been developed and used. It is an object of the present invention to provide a new and improved device which utilizes the manual compressive force of the patient for maintaining the device in a charging or ready condition and a trigger actuated mechanism for discharging. A further object is to provide such a device wherein the trigger mechanism is breath actuated, permitting the manually applied force to discharge the dose. An additional object is to provide such a dispensing device which is inexpensive, simple and dependable.

A variety of materials, particularly in the medical field, are being packaged and sold in aerosol containers, usually with a built-in metering valve. It is a particular object of the present invention to provide a new and improved dispensing device for use with commercially available aerosol containers. A further object is to provide such a device in which the user can readily remove and replace the container. A particular object is to provide such a device wherein the metering valve action is provided by the manually applied forces of the patient upon the container.

It is an object of the invention to provide a dispensing device for use in combination with an aerosol dispensing container equipped with a metering valve movable between charging and discharging positions and having a discharge tube at one end thereof and charged with a self-propelling liquid composition, the device including a housing for receiving the container for reciprocation of the container within the housing, with the housing including means defining an air passage therethrough and including a support member having an opening receiving the discharge tube and providing a discharge passage for the tube into the air passage. A further object is to provide such a device including a vane or trigger member disposed in the air passage and movable between a first position substantially blocking the passage and a second position not blocking the passage, bias means urging the vane member toward the first position, and latch means carried in the housing engaging the container and vane member, with the vane member when in the first position maintaining the container and valve means in the charging position when a compression force is applied to the container urging the valve means to the discharging position under continued application of the compression force. It is a particular object of the invention to provide such a dispensing device in which the pressure differential is produced by the inhalation of the patient. Another object is to provide such a device in which the compression force is manually applied and maintained by the patient.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the description of the preferred embodiment given hereinafter. The drawings merely show and describe preferred embodiments of the present invention which are given by way of illustration or example.

In the drawings:

FIG. 1 is a side view of the preferred embodiment of the dispensing device of the invention;

FIG. 2 is an enlarged partial sectional view showing the device of FIG. 1 in the charging position;

FIG. 3 is a view similar to that of FIG. 2 showing the device in the discharging position; and

FIGS. 4 and 5 are views corresponding to FIGS. 2 and 3, respectively, showing an alternative embodiment of the device.

Referring to the device of FIGS. 1-3, a container 10 is slidably positioned within a cylindrical portion 11 of a housing 12. An air passage is provided through the housing between a plurality of inlet openings 13 and a mouthpiece 14.

The container 10 may be a conventional aerosol dispensing container such as is described in United States Patent No. 3,001,524. A metering valve 20 may be incorporated in the container 10 and includes a stem 21 movable between a charging position (FIG. 2) and a discharging position (FIG. 3). A tank 22 is fixed in the end of the container 10 with a gasket 23 at the container opening. Another gasket 24 and a plate 25 are positioned at the other end of the tank 22. A spring 26 is positioned about the stem 21 and is compressed between the plate 25 and a shoulder 27 on the stem. The stem has a tubular outer end 28 with a lateral passage 29.

When the valve is in the charging position of FIG. 2, fluid from the container 10 flows in the tank 22 around the reduced inner end of the stem 21. Engagement of the shoulder 27 with the gasket 23 prevents discharge from the container. For discharging, the spring 26 is compressed to the position of FIG. 3, bringing the trigger pin 20 into sealing engagement with the gasket 24 and at the same time, bringing the lateral opening 29 into the interior of the tank 22. The measured charge of material within the shell is discharged through the tubular end 28 of the stem of the valve.

When the container 10 is inserted in the housing 12, the end 28 of the stem valve is positioned in a support member 30 of the housing and a passage 36 provides for flow from the valve into the air passage of the housing. The container is preferably but not necessarily removable and replaceable.

A trigger element in the form of a flapper or vane 38 is pivotally carried in the housing between a base portion 39 and a freely movable and outwardly extending arm member 40. A spring member 41, typically a leaf spring of a resilient material such as beryllium copper, is fastened to the housing by a pin 42, passes over a spacer 43 and through a notch in the member 40, to engage the vane 38, urging it in a clockwise direction as viewed in FIG. 2.

A bar 45 slides in an opening 46 in the housing and is pivotally connected to a second bar 47. The second bar 47 is also pivotally carried on the vane 38.

The member 40 and a similar projecting member 50 coact to define an opening 51 in the air passage through
the housing. This opening is substantially closed by the vane 38 when in the position of FIG. 2. A plurality of passages 53 may be provided in the vane 38, the passages normally being closed by a resilient cover 54 carried on the vane 38.

A cycle of operation of the device starts with the condition of FIG. 2. The valve 29 is in the charging position 22 and is filled with fluid from the container 10. A compression force is applied to the housing and container, as by placing the thumb at the bottom of the housing and one or two fingers at the top of the container, as viewed in FIG. 1. A downward force is exerted on the bar 45 and the bar 47 and the vane 38. The arrangement of these parts is such that the bars 45, 47 function as a latch or toggle and maintain the mechanism in the position of FIG. 2. The patient then places the mouthpiece 14 in his mouth and starts to inhale. This act of inhalation produces a pressure differential across the vane 38, resulting in a force which moves the vane counterclockwise against the urging of the spring 41 thus triggering the latch or breaking the toggle. The vane moves to the position of FIG. 3 under the continued application of the manual force exerted through the container and the bars 45, 47. This permits movement of the container 10 relative to the housing 12 to the valve discharging position of FIG. 5. A metered amount of fluid from the container is injected into the air passage as the patient is inhaling, providing the desired dosage.

After inhalation, the manual compression force is released, permitting the return of the vane to the position of FIG. 2. The device is now ready for administration of another dose. The openings 53 in the vane 38 permit exhalation by the patient with the mouthpiece 14 in the patient's mouth. The cover 54 serves to block the passages 53 during inhalation to obtain maximum pressure differential. When the vane moves to the position of FIG. 3, ready flow of air is permitted over the top of the vane and also around the lower portion, since that portion of the vane below the top of the projecting member 40 need not extend the entire width of the opening 51.

An alternative form of the device is shown in FIGS. 4 and 5. A container 10 is mounted in a housing 11 having the same general configuration as the housing 11. The tubular end 28 of the valve 20 rests in the support member 35, with a passage 36 providing communication to the air passage through the housing. In this embodiment, the housing air passage starts at the top of the housing, passing around the container 10 and through an opening 61 to the mouthpiece 14. A vane member 62 normally closes the passage 61 and is urged to the closed position by a spring 63 fixed to the housing with a pin 64. A bar 65 is pivotally mounted in an opening in the housing, with one end of the bar engaging the container 10 and the other end of the bar pivotally receiving a second bar 66. The other end of the bar 66 is pivotally mounted in the vane member 62.

The operation of the device of FIGS. 4 and 5 is similar to that of the device of FIGS. 1–3. The mechanism is initially in the position of FIG. 4 and the valve is charged. The patient applies the manual compression force, but the bars 65, 66 remain in the latched position. The patient places the mouthpiece 14 in his mouth and starts to inhale, thereby producing a pressure differential across the vane member 62 causing it to pivot counterclockwise to the position of FIG. 5. This triggers the latch mechanism, permitting clockwise rotation of the bar 65 and downward movement of the container 10 to the position of FIG. 5, with a resultant discharge of the measured dose into the air passage. When the manual pressure is released, the mechanism returns to the position of FIG. 4.

Although exemplary embodiments of the invention have been disclosed and discussed, it will be understood that other applications of the invention are possible and that the embodiments disclosed may be subjected to various changes, modifications and substitutions without necessarily departing from the spirit of the invention.

We claim as our invention:

1. In a dispensing device for use in combination with an aerosol dispensing container equipped with a metering valve means movable between charging and discharging positions, and having a discharge tube at one end thereof and charged with a self-propelling liquid composition, the improvement comprising:

   a. housing for receiving said container for reciprocation of said container within said housing, said housing including means defining an air passage therethrough;

   b. said housing including a support member having an opening receiving said discharge tube and providing a discharge passage for said tube into said air passage;

   c. a vane member disposed in said air passage and movable between a first position substantially blocking said passage and a second position not blocking said passage;

   d. bias means urging said vane member toward said first position;

   e. latch means carried in said housing and engaging said container when said vane member, with said vane member when in said first position maintaining said container and valve means in said charging position when a compression force is applied to said container urging said vane means to the discharging position, and with a pressure differential in said air passage across said vane member moving said vane member to said second position, permitting movement of said valve means to the discharging position under continued application of said compression force.

2. A device as defined in claim 1 in which said latch means includes a toggle joint positioned between said container and said vane member.

3. A device as defined in claim 1 in which said latch means comprises first and second bars joined at a pivot point with the other end of said first bar engaging said container in a transmitting relation and with the other end of said second bar pivotally engaging said vane member.

4. A device as defined in claim 1 in which said vane member is pivotally mounted in said housing for movement between said first and second positions, and in which said latch means comprises first and second bars joined at a pivot point, with said first bar slidably positioned in an opening in said housing and with the other end thereof engaging said container, and with the other end of said second bar pivotally engaging said vane member.

5. A device as defined in claim 1 in which said vane member is pivotally mounted in said housing for movement between said first and second positions, and in which said latch means comprises first and second bars joined at a pivot point, with said first bar pivotally mounted in an opening in said housing and with the other end thereof engaging said container, and with the other end of said second bar pivotally engaging said vane member.

6. In a dispensing device, the combination of:

   a. a housing including an aerosol dispensing container charged with a self-propelling liquid composition, said housing including means defining an air passage therethrough;

   b. metering valve means coupled to said container and movable between a charging position for receiving a charge from said container and a discharging position for dispensing said charge;

   c. trigger means disposed in said air passage and movable between a first position substantially blocking said
passage and a second position not blocking said passage;
bias means urging said trigger means toward said first position; and
latch means carried in said housing and engaging said container and said trigger means, with said trigger means when in said first position maintaining said container and valve means in said charging position when a compression force is applied to said container urging said valve means to the discharging position, and
with a pressure differential in said air passage across said trigger means moving said trigger means to said second position, permitting movement of said valve means to the discharging position under continued application of said compression force.

7. A device as defined in claim 6 in which said latch means includes a toggle joint comprising first and second bars joined at a pivot point with the other end of one bar engaging said container in force transmitting relation and with the other end of the other bar carried on said trigger means.

References Cited
UNITED STATES PATENTS
2,992,645 7/1961 Fowler ------------ 128—266 XR
3,001,524 9/1961 Maison et al. ------- 128—208 XR

RICHARD A. GAUDET, Primary Examiner
MARTIN F. MAJESTIC, Assistant Examiner

U.S. Cl. X.R.

128—208, 211