May 17, 1949. M. R. FIELDS 2,470,298

POWDERED MEDICINE DISPENSER

Filed Feb. 7, 1949

Fig. 1.

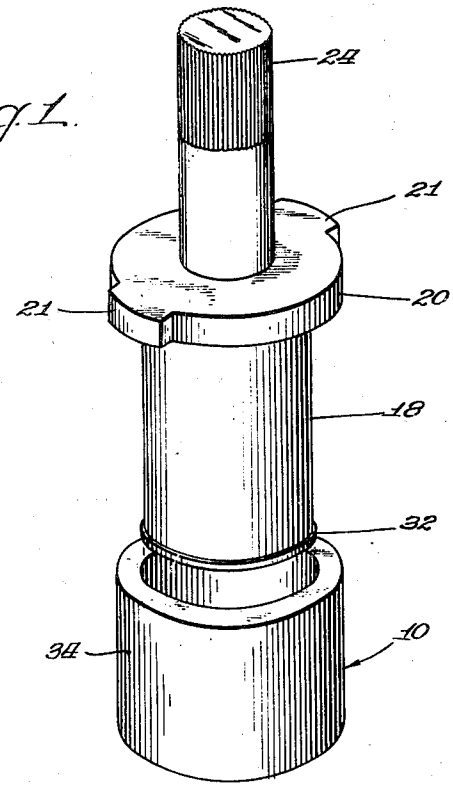


Fig. 4.

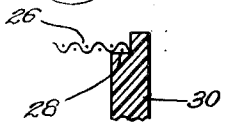


Fig. 5.

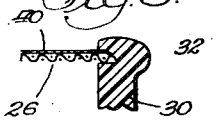


Fig. 6.

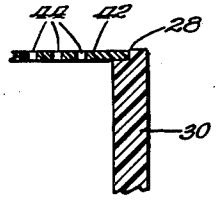
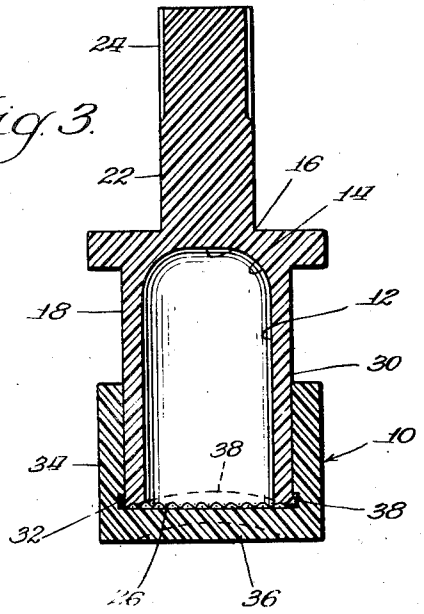


Fig. 3.



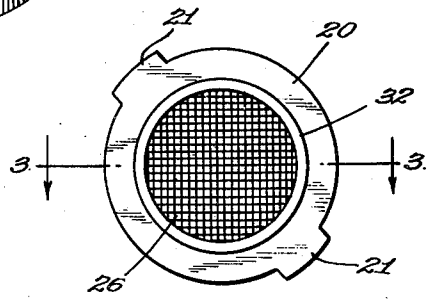


Fig. 2.

INVENTOR.
Mack R. Fields
BY
Donald H. Sweet Atty.

Patented May 17, 1949 2,470,298

UNITED STATES PATENT OFFICE

2,470,298

POWDERED MEDICINE DISPENSER

Mack R. Fields, Libertyville, Ill., assignor to Abbott Laboratories, North Chicago, Ill., a corporation of Illinois

Application February 7, 1949, Serial No. 74,979

9 Claims. (Cl. 128—272)

1

My invention relates to therapeutics and includes among its objects and advantages an improvement in the administration of medicament in powdered form. In the accompanying drawings:

Figure 1 is a perspective view of a dispensing container according to the invention;

Figure 2 is an end view of the screened end of the dispenser;

Figure 3 is a section of the covered dispenser on line 3—3 of Figure 2;

Figure 4 is a detail of the screen edge before sealing;

Figure 5 is a detail similar to Figure 4 indicating an alternative closure; and

Figure 6 is a section similar to Figure 5 indicating a perforated plate closure.

In the embodiment of the invention selected for illustration, I have shown a substantially cylindrical tube 18, having an end wall 16, forming a cup-shaped receptacle. The end wall 16 joins the tube 18 by means of a fillet 14. The open end of the cup-shaped receptacle is covered by a foraminated closure, such as a screen 26 (Figure 3) or a perforated plate 42 (Figure 6), through which powdered material can sift. As packaged in the factory, a resilient cap 10 covers the foraminated end, and tightly seals the openings thereof to prevent exit of material from the dispenser while the cap is in place.

The closed end of the dispenser has a continuous flange 20 projecting beyond the exterior cylindrical surface of the tube 18. Two spaced retaining lugs 21 extend radially in opposite directions from the flange. An axial cylindrical handle portion 22 extends beyond the flange 20 to facilitate the manipulation of the dispenser and has its upper portion knurled at 24. The flange 20 and lugs 21 are available for positioning the dispenser in place in various assembled combinations, such as that of my co-pending application, Serial Number 24,319, filed April 30, 1948.

In one convenient size, the medicament chamber is about one-fourth inch in diameter and one-half inch long.

When used to dispense a powdered medicament, such as antibiotics, vasoconstrictors, antihistiminics, antispavinotics, antiallergens, etc., a dispenser of the size indicated need often be filled only to a minor extent, to provide a therapeutic dose of the medicament. However, the advantageous operating characteristics remain effective under substantially any condition of partial or complete fullness.

The unit is disposable, in the sense that it is

2

intended to be thrown away after the contents have been used. The unit may be filled by placing it in a position inverted from that of Figure 3 and depositing the powdered medicament in the chamber, after which the screen 26 is laid in place and the entire unit brought into contact under light pressure with a superimposed source of heat sufficient to soften the plastic edge and imbed the edge of the screen in the softened plastic. This action may be facilitated both as to placement of the screen and as to quick fusion by providing the plastic body initially with a substantially square rabbet 28 indicated in Figure 4 extending about half way across the upper edge of the wall 30. In any event, the process of fusion is practiced so as to leave a small outward protuberance or bead 32 substantially in the plane of the screen 26.

The rubber cap 10 includes a cylindrical wall 34 of such a diameter that it grips the outer surface 18 with gentle friction, and a bottom 36 which is flat when assembled in Figure 3, but is originally molded bulging inwardly as indicated in dotted lines at 38. At the inside corner, where the walls 34 and 36 join, there is an annular groove 38 only a trifle larger than the lip 32. This provides practical assurance that during shipment, the bottom 36 will be held up in snug contact with the screen 26, so that when the user inverts the complete unit and lifts the rubber cap off, substantially all the powder charge will be inside the chamber below the screen 26.

Such a unit has several advantages for inhalation therapy. It can be arranged with the screen at the bottom as indicated in my above mentioned co-pending application, and periodically tapped or agitated to discharge a minor fraction of its contents repeatedly until medication is completed. This gradual release of successive increments is a great advantage in enabling the patient to inhale effectively, especially when the patient is able to discharge such an increment at the beginning of an inhalation quickly enough to waft the entire increment into the body passages and still have ample lung capacity to continue inhalation and to scavenge the initial inlet passage and secure penetration of the medicament deep into the lungs or other body cavity. Such agitation may be automatic in response to inhalation, as in my co-pending application, or the patient can jolt the container with a finger or hand at the appropriate time. Automatic dislodgement of substantially the same increment can also be achieved by having the inhaled stream

move the container itself to cause it to strike against a fixed obstacle.

The same container with the screen at the bottom can also produce a prolonged step-by-step gradual release of the medicament when the air stream merely wipes past or impinges on the screen **26**. Such delivery lends itself readily either to actuation by the inhaled stream or to the use of a bulb or other source of pressure to develop a stream carrying the powder, which powder-carrying stream can be delivered at suitable time intervals to mix with additional inhaled air, as by a nozzle placed in or near the opening of a nostril.

The screen is also effective to secure gradual delivery by increments when used in a position completely inverted from that of Figure 3. Obviously when the screen **26** is uppermost the effective force of the air stream directed against it needs to be a little greater than with the screen **26** lowermost. But, in the size indicated, the removal of the contents with the screen **26** uppermost is well within the lung capacity of even a feeble patient, employing any one of a variety of devices such as are commonly called snuff takers, including such a device as that of co-pending application Serial Number 54,792, filed October 15, 1948, by Howard H. Young and Douglas A. Loper.

When powder removal is practiced with the screen **26** uppermost the contour of the bottom of the chamber becomes significant. If an axial air current goes down the center of the chamber, and an annular air current rises around it, the air flow would tend to generate a torus, or annular vortex, at the bottom of its flow, which vortex will pick up the top grains of powder and carry them away. As the charge becomes exhausted, the fact that the fillet **14** extends in far enough to slightly constrict the outer portion of such a vortex, can result in substantially complete scavenging of the bottom so that the entire charge is delivered. It is also true that the same configuration will produce almost equally complete scavenging with a concentrated jet coming down one side of the chamber.

The mesh of the screen **36** should be such that it will support the powder mass in the chamber substantially without loss of material except when jarred or agitated. An important criterion of success in inhalation therapy is to secure the optimum grain size and crystal or nodule form necessary to enable the body passages of the patient to carry most of the medicament through to the desired place of deposit. With powdered sodium penicillin, for instance, the grain size that gives the best therapeutic results calls for a screen of about 60 mesh to secure such support from the screen. It will be obvious that other medicaments may secure the best therapeutic results when inhaled in grains of different size or shape characteristics and that, in connection with each different medicament, the proper procedure is to ascertain by clinical test what grain characteristics give the best result and then to adjust the mesh of the screen to give the proper support to such grains.

In Figure 5 I have indicated the screen **26** covered by a thin aluminum foil **40**, which is laid in place before sealing so that the heat sealing welds the screen and cover into the plastic material. With such a seal during shipment the user can easily rupture the foil **40** with a pencil point or a finger nail and tear it away before using the capsule.

In Figure 6 the foraminated closure **42** is a

perforated plate with apertures **44** of predetermined dimensions. The plate **42** may be fused in or made a pressed fit in the rabbet **38**. In such a construction a wider range of adaptability is afforded, because each hole **44** may be of the dimensions required to prevent discharge except by jolting, and thereafter the number of holes may be changed to vary the quantity delivered at each jolt.

This application is a continuation in part of my copending application Serial Number 24,319, filed April 30, 1948, which is in turn a continuation in part of my copending application Serial Number 772,104, filed September 4, 1947.

Others may readily adapt the invention for use under various conditions of service by employing one or more of the novel features disclosed or equivalents thereof. In practice, the size and number of the perforations in the foraminated closure, and the particle size of the powder to be dispensed, may be varied to secure any desired piecemeal rate of release. The dispenser may be filled with a single predetermined amount, or dose, or it may contain several doses, or an indeterminate amount with discharge dependent on the manner of use. As at present advised with respect to the apparent scope of my invention I desire to claim the following subject matter:

1. A dispensing container for dispensing finely divided solids into a stream of air to render them airborne, comprising, in combination: a cylindrical container body having an open end; a foraminated closure at said open end adapted to support finely divided solids and to permit them to sift through when jolted; spaced lugs projecting radially from said body remote from said closure for suspending said body; and handle means coaxial with said body and projecting axially beyond said lugs.

2. A dispensing container for dispensing finely divided solids into a stream of air to render them airborne comprising, in combination: a cylindrical container body having an open end; a foraminated closure at said open end adapted to support finely divided solids and to permit them to sift through when jolted; means projecting radially from said body remote from said closure for suspending said body; handle means coaxial with said body and projecting therefrom in a direction away from said closure; said suspending means including an encircling flange, and spaced lugs extending radially from the outer edge of said flange.

3. A dispensing container for dispensing finely divided solids into a stream of air to render them airborne comprising, in combination: a cylindrical container body having an open end; a foraminated closure at said open end adapted to support finely divided solids and to permit them to sift through when jolted; means projecting radially from said body remote from said closure for suspending said body; a cylindrical handle means of smaller diameter than and coaxial with said body and projecting therefrom in a direction away from said closure; said suspending means including an encircling flange, and spaced lugs extending radially from the outer edge of said flange.

4. A dispensing container for dispensing finely divided solids into a stream of air to render them airborne comprising, in combination: a container body having an open end; a foraminated closure at said open end adapted to support finely divided solids and to permit them to sift through when

jolted; and a resilient cup sealing said foraminated closure; said cup having a closed end portion convex with respect to said closure in undistorted condition, whereby forcing said end portion against said closure distorts said end portion and causes said end portion to press against said closure to close all the foraminations thereof; said cup having side wall means integral with said end portion and adapted to encircle and grip said body adjacent said closure; said body having an externally projecting rim adjacent the peripheral edge of said closure; said cup having a groove positioned to receive said rim.

5. A dispensing container for dispensing finely divided solids into a stream of air to render them airborne comprising, in combination: a container body having an open end; a foraminated closure at said open end adapted to support finely divided solids and to permit them to sift through when jolted; and a resilient cup sealing said foraminated closure; said cup having a closed end portion convex with respect to said closure in undistorted condition, whereby forcing said end portion against said closure distorts said end portion and causes said end portion to press against said closure to close all the foraminations thereof; said cup having side wall means integral with said end portion and adapted to encircle and grip said body adjacent said closure.

6. A dispensing container for dispensing finely divided solids into a stream of air to render them airborne comprising, in combination: a container body having an open end; a foraminated closure at said open end adapted to support finely divided solids and to permit them to sift through when jolted; and a resilient cup sealing said foraminated closure; said cup having a closed end portion convex with respect to said closure in undistorted condition, whereby forcing said end portion against said closure distorts said end portion and causes said end portion to press against said closure to close all the foraminations thereof.

7. A dispensing container for dispensing finely divided solids into a stream of air to render them airborne, comprising, in combination: a cylindrical container body having an open end; a foraminated closure at said open end adapted to support finely divided solids and to permit them to sift through when jolted; said container being completely sealed except for said foraminated closure; means projecting from said body remote from said closure and shaped for fastening said body in place by a rotary movement; and cylindrical handle means of smaller diameter than said body and projecting from said body at the end opposite said closure.

8. A cartridge for dispensing powdered medicament in an airborne stream comprising, in combination: a chamber having an opening; a foraminated closure in said opening; and a charge of medicament in said chamber; said charge being in the from of small discrete particles; the flow characteristics of said charge being such that the charge can be retained on said closure when undisturbed, but particles sift through readily under agitation in quantities approximately proportional to the extent of such agitation; said closure being sufficiently open to permit an air jet to pass through and beyond it into the space inside said chamber, whereby airborne particles can be liberated through said closure by blowing a jet into said chamber through only part of the area of said closure; said chamber having a depth about twice its diameter; said chamber end opposite said foraminated closure having a central substantially flat portion, and a fillet joining the periphery of said flat portion to the longitudinal wall of said chamber.

9. A dispensing container for dispensing finely divided solids into a stream of air to render them airborne, comprising, in combination: a cylindrical container body having an open end; a foraminated closure at said open end adapted to support finely divided solids and to permit them to sift through when jolted; spaced lugs projecting radially from said body remote from said closure for suspending said body; said body including a portion projecting axially beyond said lugs and available as a handle.

MACK R. FIELDS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
388,202	Ives	Aug. 21, 1888
998,052	Treiber	July 18, 1911
1,054,864	Parker	Mar. 4, 1913
2,214,032	Stewart	Sept. 10, 1940

FOREIGN PATENTS

Number	Country	Date
595,416	Germany	Apr. 10, 1934