

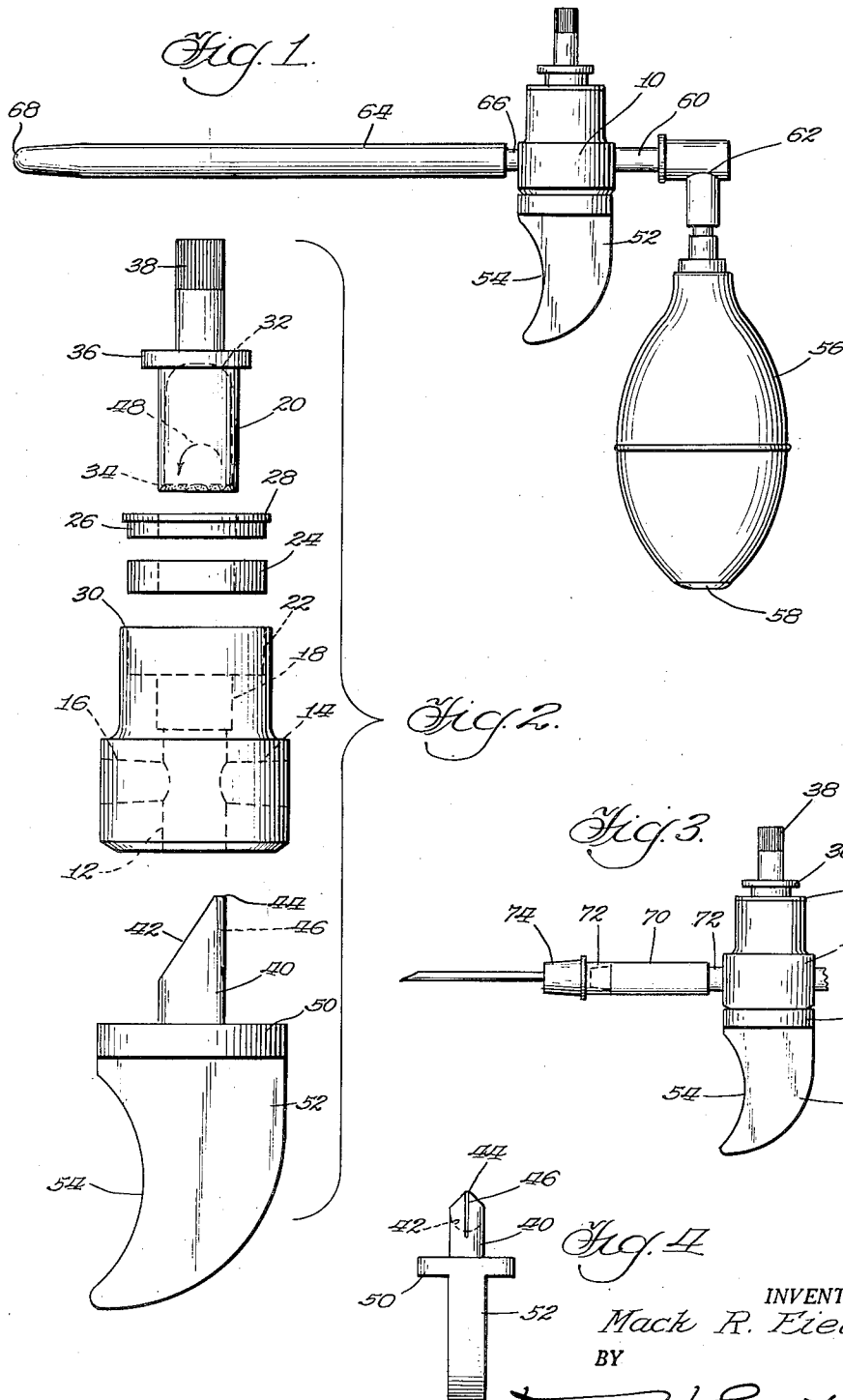
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M. R. FIELDS

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INSUFFLATOR

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INVENTOR.

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BY

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2,507,702

INSUFFLATOR

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9 Claims. (Cl. 128—266)

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My invention relates to the administration of medicament, and includes among its objects and advantages compact, convenient, and efficient equipment for medication by the inhalation of powders.

It has recently been discovered that various antibiotics and other medicaments, notably penicillin, can be administered to the human organism by inhalation rather than parenterally. In the case of penicillin inhaled deep into the lungs, there is the remarkable advantage that it is possible for the organism to receive such material in powdered form on the lining of the lung and absorb it through the moist surfaces on which it is deposited in such a way that it appears in the blood stream with substantially the same effectiveness as if administered subcutaneously. It is even possible, by a proper selection of grain size and chemical composition, to achieve desirable and controllable delay in the rate of absorption of such material into the system.

In the accompanying drawings:

Figure 1 is a side elevation of a complete administration unit arranged for nasal or oral administration;

Figure 2 is an exploded view of the insufflator proper;

Figure 3 is a side elevation of the insufflator equipped with a different type outlet; and

Figure 4 is a detail of the deflector.

In the embodiment of the invention selected for illustration, the body 10 is provided with a central vertical bore 12. At a lower level this bore communicates with a horizontal inlet 14 and an outlet 16. Further up, the bore 12 is enlarged as at 18 to the diameter necessary to fit the outside of a capsule 20. The section 18 extends up only a fraction of the vertical dimension of the capsule 20 and above the section 18 the bore is further enlarged as indicated at 22 to define an annular chamber adapted to receive a rubber sealing ring 24 and a plastic retaining ring having a peripheral flange 28 for axial abutment with the extreme upper edge 30 of the body 10.

The capsule 20 may be according to my co-pending application Serial Number 74,979, filed February 7, 1949, now Patent Number 2,470,298 or any other suitable configuration. In the embodiment disclosed it includes a barrel of the right size to fit in the bore 18, washer 24 and retainer 26, with a closed top at 32 and a foraminated bottom at 34. The capsule includes the flange 36 and knurled handle 38. The particular shape of the flange and handle has no sig-

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nificance when the capsule is used in connection with such a body as is disclosed herein. When assembled, the capsule is reliably held by substantial friction arising from the fact that the washer 24 is a snug fit in the body and a snug fit on the capsule.

Means are provided for directing air or other gaseous mediums entering through the inlet 14, up to the capsule 20 in such a way that the stream of gas will entrain and carry out of the capsule a substantial admixture of the powdered contents, which powder will be carried out of the outlet 16 by the dynamic force of the stream. I have illustrated a deflector in the nature of a cylindrical stud 40 formed to be a light friction fit in the bore 12. The stud has its upper end bevelled nearly all the way across, as indicated at 42, at an angle of about 35 degrees to the axis, leaving a small plateau 44 at its extreme upper end and at one side of the bore 12. The parts are so proportioned that when the stud 40 is thrust home, this plateau 44 is substantially in contact with the screen 34 of the capsule 20. Leading up to and debouching through the center of the plateau 44 is a small groove 46, which groove extends down far enough so that a substantial lower portion of the groove extends across the inlet 14 to receive the entering air. It will be apparent that gas forced in through the inlet 14 will have its velocity greatly increased by the reduction in cross section of the stream when it enters the groove 46 and that the air moving through the groove 46 will issue through the plateau 44 and screen 34 and enter the capsule 20. Because the major portion of the area of the screen 34 overlies the bevelled end 42 and is unobstructed, such air will turn over and go back down through the screen as indicated by the arrow 48 in Figure 2. In so doing it will push out through the screen substantial quantities of the powdered contents and the powder thus ejected will enter the outlet 16 and thus leave the body 10.

To secure correct positioning of the parts combined for easy cleaning, I form the stud 44 as an upward projection from the center of a flange 50. When the flange 50 is pushed into contact with the body 10 the plateau 44 will be correctly positioned with respect to the screen 34. The flange 50 carries a trigger-shaped horn 52 extending below and having a concave face 54 adapted to fit one finger of the hand of the user.

It will be obvious that air under suitable pressure may be supplied to the inlet 14 in various conventional ways, including connection to a

pressure main or mechanical source of air supply in a properly equipped operating room or hospital ward. I have illustrated also a conventional rubber bulb 56 provided with a conventional check valve at 58 and having a tapered metal discharge nozzle 60 extending horizontally from the tip 62. In Figure 1 the delivery member 64 is a tube of transparent plastic having a tapered end portion 66 adapted to fit on the outlet 16 and a rounded delivery end at 68. This member is long enough so that the user can hold the entire device comfortably with the delivery end 68 merely juxtaposed to one of the user's nostrils or extending into the open mouth of the user to or past the uvula. The same equipment can be manipulated with equal convenience by a physician or attendant standing in front of the person receiving the medicament.

In Figure 3 the same body 10 is provided with a short plastic nipple 70 having a tapered end 72 fitting in the outlet 16 and a duplicate tapered end adapted to fit a conventional cannula 74 or a bronchoscope or other clinic apparatus.

I prefer to make the inlet opening 14 materially larger than the outlet 16 so that the user will always assemble the parts in the same sense, with the groove 46 facing toward the bulb 56.

Others may readily adapt the invention for use under various conditions of service by employing one or more of the novel features involved, or equivalents thereof. The trigger 54 is especially comfortable when the top 62 is replaced with a valve controlled by thumb pressure, and the bulb 56 is a tube leading to a pressure main. As at present advised with respect to the apparent scope of my invention, I desire to claim the following subject matter.

1. Equipment for administration of air-borne powders to body cavities comprising, in combination: a body having a vertical bore open at both ends; a powder holder having a perforate end; means for positioning said holder as a plug in the upper end of said bore, with its perforate end down; said means including an annular friction washer; an annular chamber in said body at the upper end of said bore; and an annular cover for said washer; said washer being a snug fit in said chamber and on said holder; a bottom plug insertable in the bottom of said bore; said body having diametrically opposite lateral inlet and outlet passages communicating with said bore below the perforate end of said holder; said bottom plug including an upwardly extending deflector for directing gas entering said inlet up into said holder; said deflector being shaped to leave clearance adjacent said outlet to direct into said outlet the powder-laden gas coming down from said holder; hand-power means for delivering gas under pressure into said outlet; and nozzle means connected to said outlet for conveying the powder-laden gas into a body cavity.

2. Equipment for the administration of air-borne powders to body cavities comprising, in combination: a body having a vertical bore open at both ends; a powder holder having a perforate end; means for positioning said holder as a plug in the upper end of said bore, with its perforate end down; said means including an annular friction washer; a bottom plug insertable in the bottom of said bore; said body having lateral inlet and outlet passages communicating with said bore below the perforate end of said holder; said bottom plug including an upwardly extending deflector for directing gas entering said inlet up into said holder; said deflector being shaped

to leave clearance adjacent said outlet to direct into said outlet the powder-laden gas coming down from said holder; power means for delivering gas under pressure into said outlet; and nozzle means connected to said outlet for conveying the powder-laden gas into a body cavity.

3. Equipment for the administration of air-borne powders to body cavities comprising, in combination: a body having a vertical bore open at both ends; a powder holder having a perforate end; means for positioning said holder as a plug in the upper end of said bore, with its perforate end down; a bottom plug insertable in the bottom of said bore; said body having inlet and outlet passages communicating with said bore below the perforate end of said holder; said bottom plug including an upwardly extending deflector for directing gas entering said inlet up into said holder; said deflector being shaped to leave clearance adjacent said outlet to direct into said outlet the powder-laden gas coming down from said holder; means for delivering gas under pressure into said outlet; and nozzle means connected to said outlet for conveying the powder-laden gas into a body cavity.

4. Equipment for the administration of air-borne powders to body cavities comprising, in combination: a body having a vertical bore open at both ends; a powder holder having a perforate end; means for positioning said holder as a plug in the upper end of said bore, with its perforate end down; a bottom plug insertable in the bottom of said bore; said body having inlet and outlet passages communicating with said bore below the perforate end of said holder; said bottom plug including an upwardly extending deflector for directing gas entering said inlet up into said holder; said deflector being shaped to leave clearance adjacent said outlet to direct into said outlet the powder-laden gas coming down from said holder; and means for causing a stream of gas to flow through said equipment and into a body cavity.

5. Equipment according to claim 4 in which the gas flowing through is delivered to said inlet under pressure.

6. Equipment for the administration of air-borne powders to body cavities comprising, in combination: a body having a vertical bore open at both ends; a powder holder having a perforated end; means for positioning said holder as a plug in the upper end of said bore, with its perforate end down; a bottom plug insertable in the bottom of said bore; said body having inlet and outlet passages communicating with said bore below the perforate end of said holder; said bottom plug including an upwardly extending deflector for directing gas entering said inlet up into said holder; said deflector being shaped to direct a jet of small area against less than half said perforated holder end; and to guide into said outlet gas leaving through the remainder of said holder end.

7. Equipment for the administration of air-borne powders to body cavities comprising, in combination: a body having a vertical bore open at the top; a powder holder having a perforate end; means for positioning said holder as a plug in the open upper end of said bore, with its perforate end down; said body having inlet and outlet passages communicating with said bore below the perforate end of said holder; and a deflector for directing gas entering said inlet up into said holder; said deflector being shaped to leave clearance adjacent said outlet to direct into said outlet

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the powder-laden gas coming down from said holder.

8. Equipment for the administration of airborne powders into body cavities comprising, in combination: a body having a bore open at one end; a powder holder having a perforated end; means positioning said holder as a plug in said open end of said bore with its perforated end in said bore; said body having inlet and outlet passages communicating with said bore; and a deflector adjacent said inlet opening for directing gas entering said inlet into said holder; said deflector being shaped to leave clearance adjacent said outlet to direct into said outlet the powder-laden gas coming from said holder.

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9. Equipment for the administration of airborne powders into body cavities comprising, in combination: a body having a bore open at one end; said opening adapted to be closed by a powder holder having a perforated end; said body having inlet and outlet passages communicating with said bore remote from the resting position of said powder holder; and a deflector adjacent said inlet opening for directing gas entering said inlet toward said open end; said deflector being shaped to leave clearance adjacent said outlet to permit escape of gas.

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No references cited.