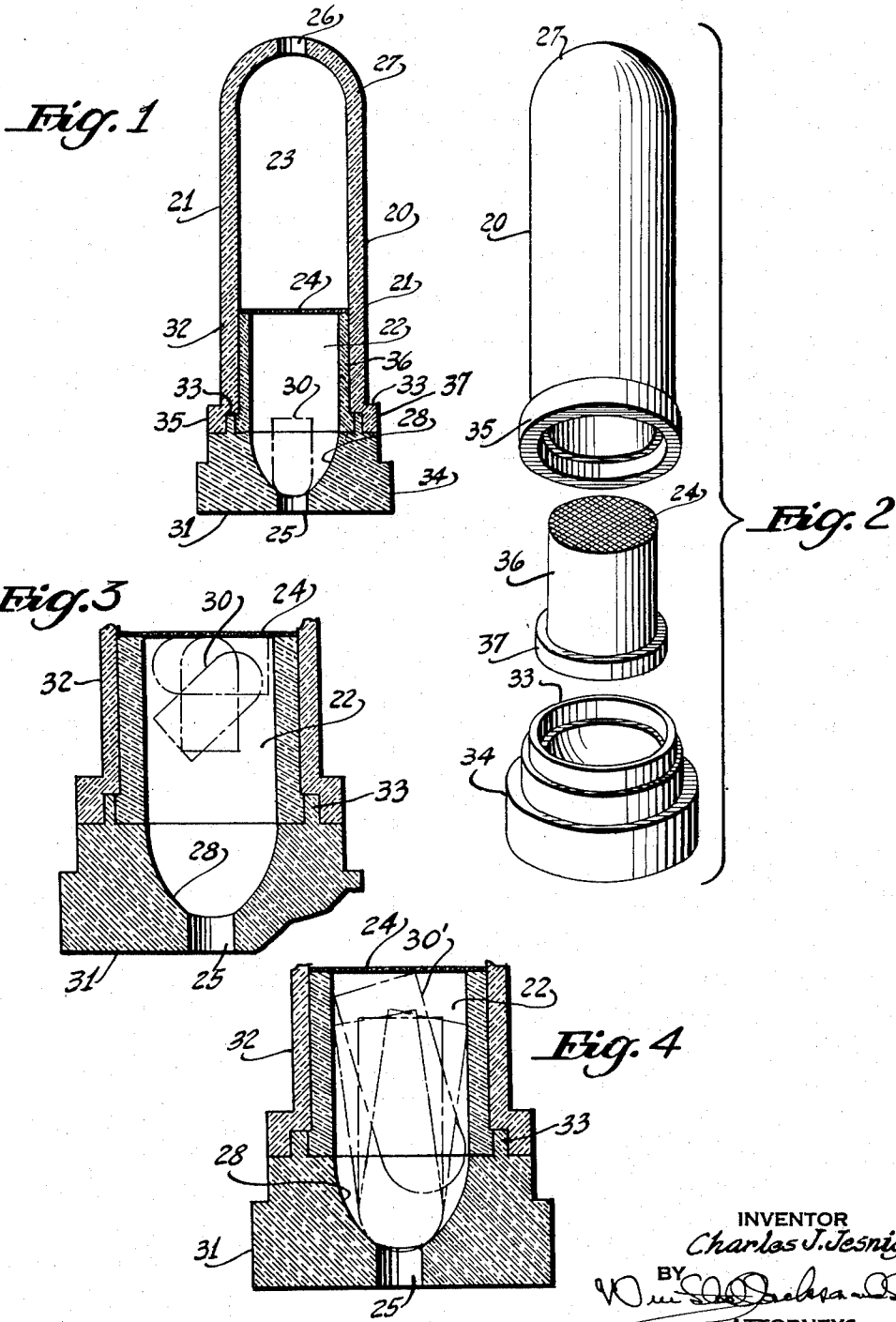


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C. J. JESNIG
MEDICINAL INHALER
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MEDICINAL INHALER

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The present invention relates to inhalers for medicinal powders such as penicillin and streptomycin.

A purpose of the invention is to permit dispensing of medicinal powder in an inhaler from a standard capsule which can be filled by a standard filling machine.

A further purpose is to assure rather complete removal of medicinal powder from a container by an inhaler, minimizing waste.

A further purpose is to secure a whirling action desirably accompanied by tumbling, shaking, tapping, spinning, bouncing, or flipping of the capsule to obtain rather complete distribution of medicinal powder in the air stream and minimize waste.

A further purpose is to reduce the weight and simplify the construction of inhalers for medicinal powders.

A further purpose is to obtain a uniform distribution of the powder in the inhaled air and avoid the inhaling of lumps.

A further purpose is to provide for employing capsules of different sizes in the same inhaler.

A further purpose is to assure that the capsule will return to the base of the inhaler and in some cases permit the capsule to act as a valve in the inhaler.

Further purposes appear in the specification and in the claims.

In the drawings I have chosen to illustrate one only of the numerous embodiments in which my invention may appear, selecting the form shown from the standpoints of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

Figure 1 is an axial section of an embodiment of the invention.

Figure 2 is a detached perspective of the components of the inhaler of Figure 1.

Figures 3 and 4 are fragmentary enlarged axial sections of the injection chamber, showing the operation of different containers.

Describing in illustration but not in limitation and referring to the drawings:

Medicinal powders such as dry penicillin, dry streptomycin and mixtures of the same in varying proportions have proved to be effective when injected in a stream of air for treatment of mucous membranes of the body, such as the throat, nose and sinus. The invention is applicable to these and other medicinal powders.

Efforts have been made in the past to render such powders air-borne by vibration of a heavy member such as a ball in the vicinity of a spe-

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cial container in which the powder is placed. The filling of such special containers has proved to be expensive and requires special filling machinery.

In accordance with the present invention, the medicinal powder such as penicillin, streptomycin or mixtures of the same, or any other suitable medicinal powder, is preferably placed in a standard gelatine cup-like medicinal capsule half of the telescoping type, which can be filled by a standard filling machine. Any other light container of comparable size may be used, such as an aluminum capsule half or cup.

Most of the medicinal powders of the types which will be employed are hygroscopic, and therefore the closed capsules or other containers will preferably be kept in a bottle or other airtight container prior to use. The capsule is then a single use container to introduce the powder into the inhaler and perform additional functions as later explained.

The inhaler of the present invention is designed to support the capsule or other container and also desirably to whirl, spin, tumble, shake, tap, flip and bounce the container in such manner as to cause the medicinal powder to become airborne, and to travel with the stream of air being inhaled into the region of the throat, nose or sinus.

The inhaler of the invention, for application at the nose or mouth, is shown at 20. The outlet of the inhaler may be placed in position in line with one nostril, and with the mouth closed the user inhales, drawing the stream of air through the inhaler and thus causing the powder to be picked up and brought into contact with the interior of the nose and sinus. The other nostril may be closed by the finger.

The inhaler comprises a hollow body 21 having at its lower portion an injection chamber 22, at its upper portion a mixing chamber 23 and between the two chambers a screen 24 suitably of wire or plastic mesh. Air is drawn into the injection chamber through an inlet 25. The air inlet is located at any suitable point, conveniently the bottom. The mixture of air and medicinal powder is taken into the nose or mouth through an outlet opening 26 suitably at the opposite end or top of the inhaler. For convenient socketting in the nostril or in the mouth, the upper end of the inhaler is of hemispherical form at 27.

The interior of the injection chamber includes a capsule recess 28 at the bottom. A capsule half or other container 30 rests at the bottom of the recess when the inhaler is inactive. In

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order to restore the capsule to the center of the recess whenever it drops from a position above the floor, the recess is preferably generally spherically curved.

In order to insert the capsule into the injection chamber and remove it therefrom, the inhaler is made in two portions, a base 31 and a top 32. The base consists of a socket portion, containing the container recess 28, a rim 33 at the upper end to interlock with the top 32, and an outer flange 34 to aid in grasping the base. The bottom of the base is flat, to permit resting on a table or the like, and the top, except for the rim, is preferably flat.

The top 32 is preferably tubular, and has an enlarged rim 35 which engages around the rim 33 on the base, and makes a frictional interlock. Any other type of interlock between the parts may be used.

The screen 24 is conveniently supported by a thimble or sleeve 36 which carries the screen 24 cemented or otherwise fastened on its upper end, makes a press fit inside the top 32, and is flanged outwardly at 37 at the lower end to frictionally engage the inside of the rim 33 on the base. The use of the thimble to insert the screen is optional, as I have obtained good results by fastening the screen directly to the inside of the top 32.

The inhaler body may suitably be made of plastic such as polystyrene, or acrylic plastic, or of glass. Where plastic is used extrusion molding will be desirable.

In operation, the top 32 is removed from the base, the thimble remaining in the top. A container of medicinal powder is then opened and inserted in the recess 28 of the base, with the open end preferably upwardly directed. If, as will often be the case, the container is a medicinal capsule, the top of the capsule will be removed or opened when the capsule is inserted in the base recess. Thus in effect the capsule bottom half will often constitute the container. The container as used will preferably be shorter than the diameter of the injection chamber (internal diameter of the thimble), so that the container can flip-flop or turn end-over-end, as later explained, to secure more complete emptying of medicinal powder into the air stream.

In some cases, however, less desirably a capsule half or other container 30 may be used, as shown in Figure 4, which is longer than the injection chamber minimum diameter, and which can plunge and vibrate, as well as whirl, but cannot flip-flop. Of course, in any case, the injection chamber height is greater than the length of the container.

After the container is inserted in the base, the top is secured on to the base. The inhaler is now ready for immediate use. The outlet 26 is then placed in the nostril or mouth, depending upon the desired point of application, and the user inhales vigorously. The inhaler should be removed from contact with the nostril or mouth while the user exhales, as otherwise powder may be wasted. As soon as the user begins vigorously inhaling, the air stream entering through the inlet 25 causes the container to rise in the chamber until often it will momentarily strike against the screen 24. In the preferred form the diameter of the injection chamber is great enough to permit the container to turn completely over since the greatest dimension of the container is less than the chamber diameter. The effect of the inlet air jet is to cause the capsule to spin about its axis, while, at the same time it is likely to whirl about an axis trans-

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verse to its axis, to move or bounce up and down in the chamber, and in most cases to tumble, turn end-over-end or flip-flop, and to vibrate. This combination of motions which can be observed by watching through the transparent wall of the injection chamber, causes the powder to be shaken out through the open end of the capsule and likewise causes the air to flow through the opening end and project powder from the capsule. At the same time suction is applied to the interior of the injection chamber, which removes powder from the capsule. The expenditure of the powder is very rapid indeed under these conditions, a few vigorous sniffs often being sufficient to cause the great bulk of the powder to become air-borne and to leave the inhaler.

Figure 3 shows the capsule half or container 30 in process of flip-flopping or somersaulting, so that it will momentarily have its open end directed and downwardly and at other times will assume all other angular relations to the air stream. The air jet of the stream will thus enter the capsule cup and tend to remove the contents more completely. When the container drops after the user ceases to inhale, the closed end, being heavier, will tend to assume the bottom position and close the inlet.

After a given use, the empty capsule half or other container should be removed by taking apart the inhaler, and the inhaler should preferably be cleaned by washing and then dried before subsequent use.

The screen functions during the injection to prevent large lumps from passing through the outlet, assuring that the powder, which has been compressed in the capsule, is well broken up and completely air-borne before it can leave the inhaler.

In the design shown, the formation adjoining the inlet opening 25 is preferably not of cone shape, to avoid the tendency to create a whistle or other objectionable noise during use.

Thus it will be evident that by the present invention the capsule or other container serves as a shipping container, as a holder for the medicinal powder when it is removed from its bottle or other initial container to the inhaler, and finally as a vibrating or tumbling carrier by which the powder is to be dispersed in the air. At the same time it should be emphasized that after each sniff the spherical formation of the base at 28 causes the capsule or other container to drop back into the recess, at which point the container desirably serves to close off the main inlet 25. Thus between one sniff and the next the container acts as a shut-off valve for the bottom and prevents or restricts the entry of moisture. Likewise in case the user should inadvertently exhale through the inhaler, the container dropping to the bottom in the recess and, closing the inlet 25, acts as a check valve to minimize the loss of medicinal powder which occurs during such unintentional reversal of the inhaler flow.

The automatic centering of the container into the container recess when the container drops from the top of the injection chamber is therefore a matter of importance.

The mixing chamber 23 serves to mix the air-borne streams of medicinal powder with any other air so that the uniformity of the distribution of the powder in the air leaving by the outlet is improved.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident

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to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. An inhaler for medicinal powder, comprising a body having an injection outlet at the top, an air inlet, an injection chamber in the lower part of the body communicating with the inlet and outlet having a lower recess for receiving and positioning a light cup-like container, a screen across the interior of the body, a light cup-like container, having an opening to dispense a portion of its contents as it moves and containing medicinal powder in position to be moved by an air stream in the cavity, and walls forming a mixing chamber above the screen adjoining the outlet.

2. An inhaler for medicinal powder, comprising a body having an injection chamber and an air inlet and outlet in communication therewith, and a light container in the chamber having an opening to dispense a portion of its contents as it moves, movable in an air stream and having a maximum container dimension sufficiently less than the width and less than the height of the container so that the container is free to turn over and over, whereby the container is free to

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tumble and discharge its content into the air stream.

3. An inhaler for medicinal powder comprising a body having a cavity therein and also having openings from the cavity to the exterior of the body at displaced points whereby a suction applied at one of the openings will cause air to flow into the other opening and sweep through said cavity, and a container for the medicinal powders located within said cavity and having an opening for dispensing such powders, the cavity being larger in all dimensions than the container, whereby the container can be continuously agitated and turn about in all directions and dislodge its contents into the air current sweeping through the cavity.

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