June 9, 1953 F. E. BROWN 2,641,254

APPLICATOR

Filed Oct. 18, 1948 2 Sheets-Sheet 1

Fig. 1.

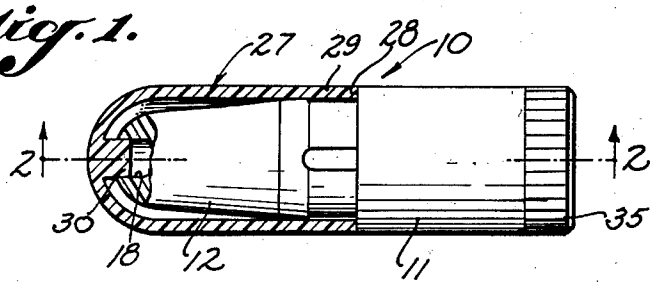


Fig. 2.

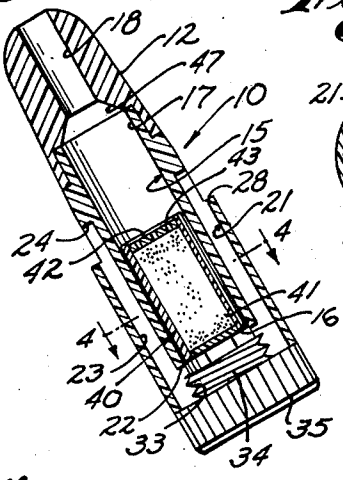


Fig. 4.

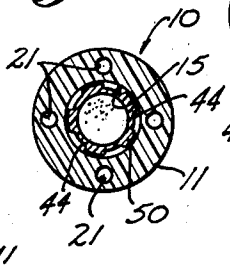


Fig. 3.

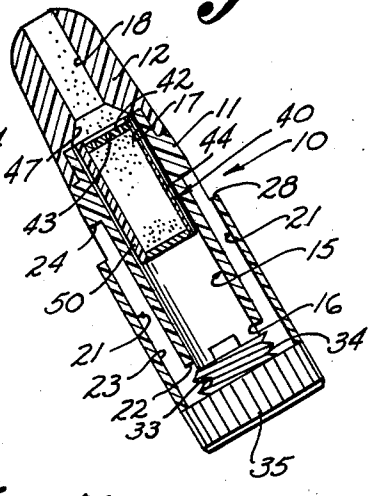


Fig. 5.

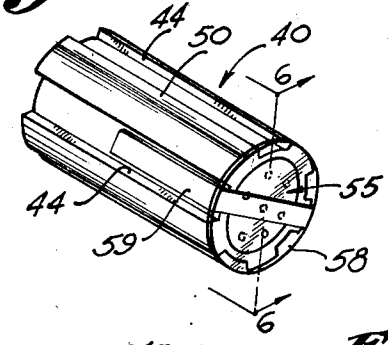


Fig. 7.

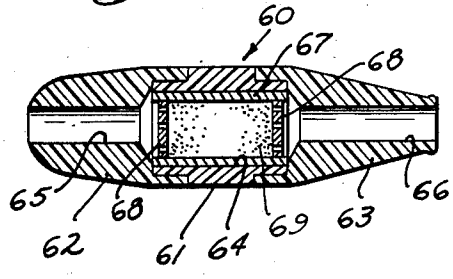
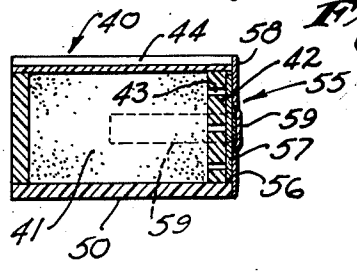


Fig. 6.



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Fig. 12.

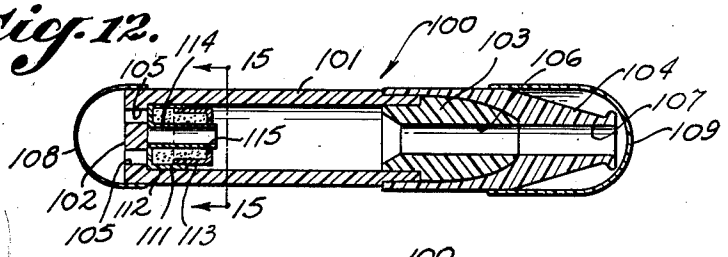


Fig. 13.

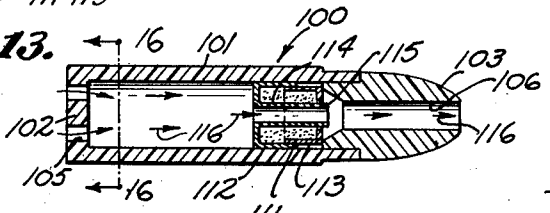


Fig. 14.

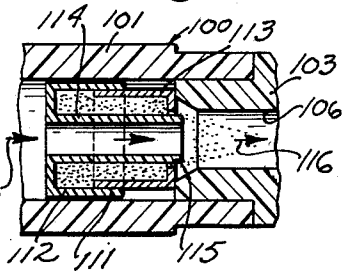


Fig. 15.

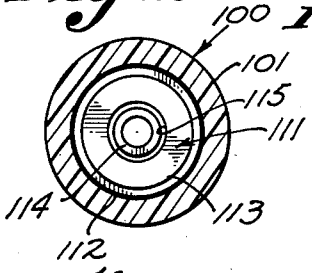


Fig. 16.

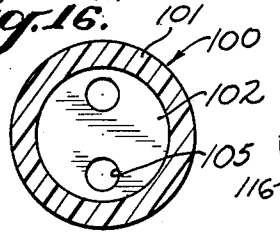


Fig. 8.

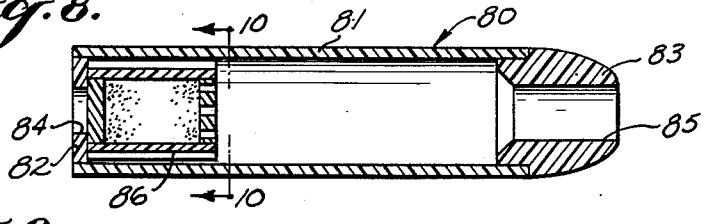


Fig. 9.

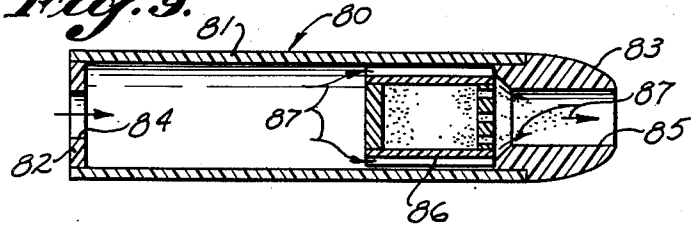


Fig. 10.

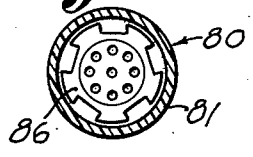
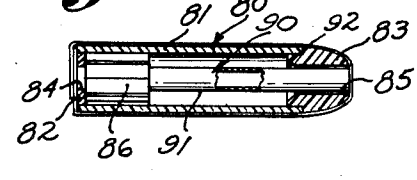


Fig. 11.



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UNITED STATES PATENT OFFICE

2,641,254

APPLICATOR

Frank E. Brown, Burbank, Calif., assignor to Frederick M. Turnbull, Los Angeles, Calif.

Application October 18, 1948, Serial No. 55,135

8 Claims. (Cl. 128—206)

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My invention relates to devices, hereinafter termed applicators, for introducing liquid or powdered medicaments of varius types into the oral and respiratory regions of the body, a general object of the invention being to provide applicators for distributing said medicaments with maximum efficiency.

Reference is hereby made to my co-pending applications Serial No. 41,857, filed July 31, 1948, and Serial No. 84,243, filed March 29, 1949, now Patent No. 2,590,832.

A considerable number of medicaments have been developed for application to the oral and respiratory regions of the body, such medicaments being employed in the treatment of infection in such regions, in the treatment of allergies, in the treatment of bronchical asthma, as correctives for halitosis, etc. Medicaments for the purposes mentioned are available in the form of powders and liquids, examples of such powdered medicaments being the well known penicillin and sulfa compounds, vasoconstrictors, antihistamines for hay fever and other allergies, antispasmodics for bronchial asthma, etc. Appropriate liquid medicaments may take the form of antiseptics, correctives for halitosis, etc.

It is an object of the invention to provide an applicator having a movable capsule therein which contains the powdered medicament to be applied to the oral or respiratory regions of a patient, the capsule being movable under the influence of an air stream produced by inhalation and being adapted to strike a stop within the device with sufficient force to dislodge a quantity of the medicament therefrom into the air stream, whereby the air stream carries the medicament to the area to which the medicament is to be applied. A related object is to provide an applicator wherein the movable capsule is returned to its initial position by the action of gravity.

An important object of the invention is to provide an applicator of the foregoing character having air inlet and outlet passages which are so located that both may be sealed by means of a single closure, thereby eliminating any necessity for separate closures for the inlet and outlet passages.

Another object is to provide an applicator wherein the capsule carrying the medicament is readily removable so that it may be recharged with fresh medicament, or may be replaced with a new capsule containing fresh medicament.

It is another object of the invention to provide a capsule for use with powdered medicaments which includes a wall having one or more

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discharge openings through which the medicament is discharged when the capsule strikes the stop within the device in the manner hereinbefore indicated.

Another object is to provide a capsule of the character set forth in the preceding paragraph wherein the discharge opening or discharge openings are located in only one wall of the capsule so as to substantially prevent circulation of air through the capsule, whereby to prevent exhalation of the breath into the capsule in the event that the user exhales through the applicator inadvertently. This construction prevents contamination of the powdered medicament in the capsule and also prevents admission of moisture carried by the breath into the capsule, which is an important feature since many powdered medicaments are quite anhydrous and deliquescent and thus take up moisture readily.

A further object is to provide means for sealing the discharge openings in the capsule to prevent loss of medicament therefrom until such time as the capsule is to be inserted into the applicator for use, and to prevent any loss of effectiveness of and contamination of the medicament. An important object is to provide a capsule having manually graspable means for removing the sealing means readily to facilitate preparation of the capsule for insertion into the applicator. Still another object in this connection is to provide an arrangement wherein the sealing means and the aforementioned manually graspable means are adhesively connected to the capsule.

Another object of the invention is to provide readily removable means for retaining the capsule in a fixed position within the applicator prior to use so as to prevent inadvertent discharge of powdered medicament from the capsule during packaging, shipment, and the like.

An important object of the invention is to provide an applicator which will produce a whistling sound when the user inhales air therethrough at a rate sufficient to insure adequate penetration of the powdered medicament into the oral and/or respiratory regions, and which will not produce a whistling sound when the rate of inhalation is insufficient to insure such penetration.

Another object of the invention is to provide a capsule which is adapted to retain a liquid medicament so that vapors bearing such medicament may be drawn into the oral and respiratory regions of the body by inhalation through an applicator containing the capsule. Such liquid medicaments, examples of which have been

given, may be used in the treatment of the oral and respiratory areas, or may be used as correctives for halitosis.

Preferably, in order to increase the quantity of liquid medicament which the capsule is capable of retaining to a maximum, the capsule includes a material which is both an absorbent and an adsorbent, which is an important object of the invention; a typical example of such an absorbent and adsorbent material is diatomaceous earth. Diatomaceous earth is particularly desirable since it has a large surface area per unit volume and is thus capable of retaining a large quantity of the liquid medicament.

The foregoing objects and advantages of the invention together with various other objects and advantages thereof which will become apparent, may be attained through the employment of the exemplary embodiments which are illustrated in the accompanying drawings and which are described in detail hereinafter. Referring to the drawings:

Fig. 1 is a side elevational view of a nasal and oral applicator which embodies the invention, a closure for the applicator being shown in longitudinal section;

Fig. 2 is a longitudinal sectional view showing the applicator with the closure removed and showing the applicator in one of its operating positions;

Fig. 3 is a view similar to Fig. 2 but showing the applicator in another of its operating positions;

Fig. 4 is a transverse sectional view taken along the broken line 4—4 of Fig. 2;

Fig. 5 is a perspective view showing a medicament-containing capsule of the invention and showing a sealing means therefor;

Fig. 6 is a sectional view taken along the broken line 6—6 of Fig. 5;

Fig. 7 is a longitudinal sectional view of an applicator for use with liquid medicaments;

Fig. 8 is a longitudinal sectional view of another embodiment of the invention in one of its operating positions;

Fig. 9 is a view similar to Fig. 8 but showing another operating position of the embodiment shown in Fig. 8;

Fig. 10 is a transverse sectional view taken along the broken line 10—10 of Fig. 8;

Fig. 11 is a longitudinal sectional view on a reduced scale showing the embodiment of Figs. 8 to 10 as packaged for shipment;

Fig. 12 is a longitudinal sectional view of still another embodiment of the invention;

Fig. 13 is a view similar to Fig. 12 but showing the components of the embodiment illustrated in Fig. 12 in different operating positions;

Fig. 14 is an enlarged, fragmentary longitudinal sectional view showing a portion of the embodiment of Fig. 12; and,

Figs. 15 and 16 are enlarged, transverse sectional views taken along the broken lines 15—15 and 16—16, respectively, of Figs. 12 and 13, respectively.

Referring particularly to Figs. 1 to 4 of the drawings, I show an applicator 10 comprising an elongated body 11 having frictionally connected thereto an element 12 which may serve as either a nose piece or a mouth piece, depending upon whether medicament is to be applied to the nasal or oral regions. The body 11 is provided with an axially extending chamber 15 therein having an inlet end 16 and an outlet end 17, the chamber communicating at its outlet end 17 with an axial outlet passage 18 in the element 12.

Communicating with the inlet end 16 of the chamber 15 is a plurality of inlet passages 21 which are formed in the body 11, each inlet passage comprising an inwardly extending portion 22 which communicates with the inlet end 16 of the chamber, an intermediate portion 23 which extends longitudinally of the body 11 substantially in parallelism with the axis thereof, and an outwardly extending portion 24 which communicates with the exterior of the body at a point intermediate its ends. The inlet passages 21 are uniformly spaced around the periphery of the body, as best shown in Fig. 4 of the drawings.

As shown in Fig. 1 of the drawings, the applicator 10 includes a closure 27 which is adapted to fit over the outlet end of the applicator, i. e., which is adapted to fit over the element 12 and a portion of the body 11. The closure 27 preferably takes the form of a cap which seats against an annular shoulder 28 formed on the body 11. The closure 27 includes a peripheral skirt 29 which seals the air inlet passages 21 when the closure is seated against the shoulder 28, and, since the closure fits over the element 12, it also closes the outlet passage 18. Thus, the closure 27 performs the dual function of closing both the inlet passages 21 and the outlet passage 18, which is an important feature of the invention. If desired, the closure 27 may be provided with an inwardly extending, axially directed plug 30 which is insertable into the axial outlet passage 18 to seal same.

The body 11 of the applicator is provided with an opening 33 which is axially aligned with the chamber 15 and which communicates with the inlet end 16 thereof, this opening being closed by a removable plug 34 which may be frictionally connected to the body 11, or which may be threadedly connected thereto as shown. Preferably, the plug 34 is provided with a knurled head 35 for convenience in inserting and removing the plug.

Slidable within the chamber 15 is a capsule 40 which corresponds in size and shape to the size and shape of the chamber, the capsule being insertable into the inlet end 16 of the chamber through the opening 33 upon removal of the plug 34. The capsule 40 contains a powdered medicament 41 and is provided with a foraminous wall 42 which extends transversely of the axis of the body 11, the medicament being dischargable from the capsule through foramina or perforations 43 in the wall 42. The applicator 10 includes air passage means past the capsule 40 to provide communication between the inlet and outlet ends 16 and 17 of the chamber 15, the air passage means comprising a plurality of longitudinal grooves 44 in the capsule in the particular construction illustrated.

The inner end of the member 12 is provided with a shoulder 47 which serves as a stop with which the capsule 40 collides upon movement of the capsule axially of the chamber 15 from the inlet end 16 thereof toward the outlet end 17 thereof, a quantity of the medicament 41 being discharged from the capsule through the foramina 43 when the capsule strikes the shoulder or stop 47.

Considering the operation of the applicator 10, the patient inserts the element 12 into his mouth, or into one nostril, depending upon whether the oral or nasal regions are to be treated. In-

halation through the device, with the parts in the positions shown in Fig. 2 of the drawings, causes the capsule 40 to be propelled through the chamber 15 toward the outlet end 17 thereof under the influence of the air streams flowing through the device until the capsule strikes the stop 47 as shown in Fig. 3, whereupon a quantity of the medicament 41 is discharged through the foramina 43 into the air stream as a result of the impact. The purpose of the grooves 44 in the capsule is to provide an air passage past the capsule so that a stream of air may flow through the applicator 10 as the patient inhales, such air stream carrying the discharged medicament into the region to be treated. As soon as the patient ceases to inhale, the capsule 40 drops back into the position shown in Fig. 2 of the drawings under the influence of gravity.

It will be noted that the shoulder forming the stop 47 for the capsule is tapered toward the outlet passage 18 in the element 12, the purpose of such taper being to permit the air passing through the longitudinal grooves 44 to flow freely into the outlet passage 18.

In the particular construction illustrated, the capsule 40 comprises a sleeve 50 having closure elements pressed into the respective ends thereof, one of these closure elements forming the foraminous wall 42. As shown, the foramina 43 are small openings through the wall 42, although a piece of wire screen or other foraminous material may be substituted for the wall 42 if desired.

It will be noted that since the capsule 40 is provided with foramina 43 at only one end thereof, substantially no air will flow through the capsule 40 by way of the foramina 43 in the event that the user of the applicator 10 exhales therein inadvertently. In other words, since there are no air passages through the capsule, exhalation into the applicator will not produce a flow of exhaled air through the capsule. This is an important feature since it prevents contamination of the powdered medicament and also prevents the powdered medicament from taking up moisture from the air exhaled into the applicator.

Referring particularly to Figs. 5 and 6 of the drawings, I show the capsule 40 provided with a sealing means, indicated generally by the numeral 55, for closing the foramina 43 in the foraminous wall 42 until such time as it is desired to insert the capsule into the chamber 15 in the applicator prior to use, the purpose of the sealing means being to prevent loss of the medicament 41 from the capsule and to prevent loss of effectiveness of and contamination of the medicament. As best shown in Fig. 6, the foraminous wall 42 is pressed into the sleeve 50 a short distance beyond the corresponding end of the sleeve to provide a recess 56 with which the foramina 43 communicate. Disposed in the recess 56 is a sealing element 57 of paper or other suitable material which closes the foramina 43. The sealing element 57 is retained in the recess 56 by means of an adhesive element 58 which adheres to the sleeve 50 in the area bounding the recess 56, and which preferably adheres to the sleeve 50 in the area bounding the recess 56, and which preferably adheres to the sealing element 57 so that the latter will be removed from the recess upon removal of the adhesive element 58. In order to facilitate removal of the sealing element 57 and the adhesive element 58, I prefer to employ a strip 59 of adhesive material which adheres to the sleeve 50 of the capsule, the strip 59 preferably passing between the adhesive element 58 and the sealing element 57. In order to remove the sealing means 55 from the capsule 40 prior to inserting the capsule into the chamber 15 in the applicator, it is merely necessary to grasp one end of the strip 59 and pull the sealing means from the capsule, which is an important feature of the invention.

In Fig. 7 of the drawings, I show an applicator 60 which is particularly adapted for use with liquid medicaments, this applicator comprising a body 61 having a nose piece 62 frictionally connected to one end thereof and having a mouth piece 63 frictionally connected to the opposite end thereof. The body 61 is provided with an axially extending chamber 64 which communicates with passages 65 and 66 in the nose piece 62 and the mouth piece 63, respectively, the chamber 64 being of a size to receive a capsule 67 therein. The capsule is provided with foraminous walls 68 through which air may flow into and out of the capsule. It will be noted that if the nose piece 62 is inserted into a nostril of the patient, the air flows through the passage 66 in the mouth piece 63, through the capsule 67, and thence through the passage 65 in the nose piece 62, so that the passage 63 serves as an inlet passage and the passage 62 serves as an outlet passage. Conversely, if the mouth piece 63 is inserted into the mouth of the patient, the air flows through the applicator 60 in the opposite direction so that the passage 65 in the nose piece 62 serves as an inlet passage and the passage 66 in the mouth piece 63 serves as an outlet passage.

The capsule 67 contains an absorbent and adsorbent material 69, such as diatomaceous earth, for example, which is capable of retaining a relatively large quantity of a liquid medicament, such as one of the liquid medicaments given previously, for use in treatment of the oral or nasal regions, or for use as a corrective for halitosis. A material such as diatomaceous earth is to be preferred since it is capable of retaining a large quantity of liquid per unit volume and is sufficiently porous to permit relatively free flow of air through the capsule.

When using the applicator 60, the patient either inserts the nose piece 62 into one nostril, or inserts the mouth piece 63 into his mouth, depending upon whether the nasal or oral regions are to be treated with the medicament carried by the capsule. Subsequent inhalation through the applicator results in the inhalation of a charge of the medicament, ordinarily in the form of vapors.

When the supply of liquid medicament retained by the material 69 within the capsule 67 is exhausted, it may be replenished readily by immersing the capsule in the liquid until it is saturated therewith. It will be noted that the capsule 67 may be removed from the chamber 64 for recharging by removing either the nose piece 62 or the mouth piece 63 from the body 61 of the applicator.

Referring now to Figs. 8 to 11 of the drawings, I show an applicator 80 comprising a tubular barrel 81 having a disc 82 pressed into one end thereof and having a nose piece or mouth piece 83 pressed into the other end thereof, the disc 82 having a central inlet opening 84 and the nose piece or mouth piece having an outlet passage 85. Slidable in the tubular barrel 81 is a capsule 86 which is identical to the capsule 40 and which is adapted to contain a powdered medicament.

Considering the operation of the applicator 80, the user inhales through the device with the element 83 inserted either into the mouth or a nos-

tril to produce a flow of air as indicated by the arrows 87 in Fig. 9. This flow of air propels the capsule 86 through the tubular barrel 81 until it strikes the element 83 to dislodge powdered medicament into the air stream through the discharge openings in the capsule in the manner previously discussed.

In order to insure that the user of the applicator 80 will inhale through the device with sufficient force to produce optimum penetration by the powdered medicament, I prefer to so proportion the inlet opening 84, the outlet passage 85 and the grooves in the capsule 86 that the air flowing through the device will produce a whistling sound when the user inhales at the proper rate. Thus, if no whistling sound is produced, the user is advised of the fact that he is inhaling through the applicator 80 at an insufficient rate to insure proper penetration by the powdered medicament, which is an important feature of the invention. As an example, I have found that if the inlet opening 84 and the outlet passage 85 are approximately $\frac{3}{16}$ inch in diameter and if the grooves in the capsule 86 are approximately $\frac{3}{32}$ inch wide by $\frac{3}{32}$ inch deep, no whistling sound will be produced by the flow of air through the applicator unless the rate of inhalation is sufficiently high to produce the desired penetration by the powdered medicament.

If desired, the foregoing whistling feature may be embodied in the forms discussed previously and in the form shown in Figs. 12 to 16 of the drawings.

A feature of the embodiment of my invention shown in Figs. 8 to 11 of the drawings is that it may be manufactured cheaply so that the applicator 80 may be used only once, i. e., may be used until the supply of powdered medicament in the capsule 86 is exhausted, and then discarded. Consequently, the disc 82 and the nose piece or mouth piece 83 may be permanently secured to the tubular barrel 81 if desired.

Referring to Fig. 11 of the drawings, in order to prevent movement of the capsule 86 in the tubular barrel 81 prior to use of the applicator 80, I provide means, indicated generally by the numeral 90, for preventing movement of the capsule 86 until such time as the applicator is to be used. The means 90 is shown as comprising a rod 91, which may be tubular, if desired, and which is inserted through the outlet passage 85 into engagement with the capsule 86, the rod 91 being of sufficient length to maintain the capsule in engagement with the disc 82. The rod 91 is held in place by an adhesive strip 92 which extends lengthwise around the applicator 80 and engages the outer end of the rod 91. It will be apparent that with the adhesive strip 92 in place, the rod holds the capsule in engagement with the disc 82 to prevent movement of the capsule in the barrel 81, whereby to prevent dislodging of any of the powdered medicament from the capsule prior to use of the applicator 80. In order to prepare the applicator for use, it is merely necessary to remove the adhesive strip 92 and the rod 91, which is a feature of the invention.

Referring now to Figs. 12 to 16 of the drawings, I show an applicator 100 comprising a tubular barrel 101 having a closed end 102 and having an open end in which a nose piece 103 is pressed. Telescoped over the nose piece 103 is a mouth piece 104 which may be removed, as shown in Fig. 13, to permit insertion of the nose piece 103 into a nostril of the user. Otherwise, if the mouth piece 104 is to be used, it may be left in place, as shown in Fig. 12.

The closed end 102 is provided with radially offset inlet openings 105 and the nose piece 103 is provided with an outlet passage 106, an outlet passage 107 registering with the outlet passage 106 being provided in the mouth piece 104. When the applicator 100 is not in use, the inlet openings 105 and the outlet passages 106 and 107 may be sealed by means of closures 108 and 109, the closure 108 being adapted to telescope over the closed end 102 of the barrel 101, and the closure 109 being adapted to telescope over the mouth piece 104, or the barrel 101.

Slidable within the tubular barrel 101 is a capsule 111 having two relatively movable elements 112 and 113, the element 113 being cup-like and telescoping into a cup-like portion of the element 112. The element 112 includes a tubular stem 114 which provides an air passage past the capsule 111 and which extends through an opening 115 in the element 113. The diameter of the opening 115 is slightly greater than the external diameter of the tubular stem 114 to provide an annular discharge opening for the capsule 111.

Considering the operation of the applicator 100, if the nose piece 103 is to be used, the user removes the mouth piece 104, the mouth piece otherwise being left in place. With the mouth piece 104 inserted in the mouth, or with the nose piece 103 inserted in a nostril, the user inhales through the applicator 100 to produce a flow of air therethrough as indicated by the arrows 116. Such flow of air propels the capsule 111 through the tubular barrel 101 until it strikes the nose piece 103 to dislodge powdered medicament from the capsule through the annular opening surrounding the tubular stem 114. Also, since the elements 112 and 113 are slidably fitted together, the impact of the capsule 111 against the stop provided by the nose piece 103 tends to cause telescoping movement of the element 113 into the element 112 to forcibly expel powdered medicament from the capsule through the annular opening surrounding the tubular stem 114.

As is the case with the capsules 40 and 86 employed in the applicators 10 and 80, the capsule 111 is provided with a discharge opening at one end thereof only to substantially prevent flow of air through the capsule, whereby to prevent contamination and/or moistening of the powdered medicament in the capsule in the event that the user inadvertently exhales into applicator 100.

Although I have disclosed various exemplary embodiments herein for purposes of illustration, it will be understood that I do not intend to be limited specifically thereto since various changes, modifications and substitutions may be incorporated in the embodiments disclosed without necessarily departing from the spirit of the invention as set forth in the appended claims.

I claim as my invention:

1. In an applicator of the character described, the combination of: an elongated body provided with an axially extending chamber having inlet and outlet ends, said body being provided with an outlet end having an air outlet passage which communicates with said outlet end of said chamber, and being provided with an air inlet passage which communicates with the exterior of said body at a first point intermediate said outlet end of said body and the opposite end thereof and which communicates with said inlet end of said chamber at a second point intermediate said first point and said opposite end of said body; a medic-

ament carrying and dispensing capsule disposed in said chamber and movable from said inlet end of said chamber toward said outlet end thereof under the influence of an air stream flowing through said chamber from said inlet end of said chamber toward said outlet end thereof; means providing an air passage past said capsule to provide communication between said inlet and outlet ends of said chamber; and stop means adjacent said outlet end of said chamber for impingement by said capsule to dislodge medicament from said capsule into the air stream.

2. An applicator as set forth in claim 1 including a closure which is adapted to fit over said outlet end of said body and which is provided with means for closing said inlet passage.

3. An applicator as set forth in claim 2 wherein said closure is provided with means for closing said outlet passage.

4. An applicator as set forth in claim 1 wherein said inlet passage extends between said first and second points on said body in a direction substantially parallel to the axis of said body.

5. An applicator as set forth in claim 1 wherein said opposite end of said body is provided with an opening which communicates with the inlet end of said chamber and which is of a size to permit insertion of said capsule therethrough into said chamber, said applicator including a removable closure for said opening.

6. An applicator as set forth in claim 1 wherein said capsule is provided with a first end wall adjacent said outlet end of said chamber and a second end wall adjacent said inlet end of said chamber, said first end wall having foramina to permit discharge of medicament from said capsule into the air stream when said capsule strikes said stop means.

7. An applicator as set forth in claim 1 wherein said capsule is provided with grooves therein, said grooves forming said means for providing an air passage past said capsule.

8. In an applicator of the character described, the combination of: an elongated chamber having an inlet at one end and an outlet at the opposite end; a medicament carrying and dispensing capsule disposed in said chamber and movable from said one end thereof toward said opposite end thereof under the influence of an air stream flowing through said chamber from said one end thereof toward said opposite end thereof, said capsule having a first end adjacent said one end of said chamber and having a second end adjacent said opposite end of said chamber, said first end of said capsule being imperforate and said second end of capsule having a discharge opening therein; means providing an air passage past said capsule; and stop means adjacent said opposite end of said chamber for impingement by said capsule to dislodge medicament through said discharge opening into the air stream.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
D. 104,135	Fuerst	Apr. 20, 1937
1,818,028	Allen	Aug. 11, 1931
2,123,353	Catt	July 12, 1938
2,310,681	Derham	Feb. 9, 1943
2,340,142	Rauner	Jan. 25, 1944
2,469,034	Garris	May 3, 1949
2,470,296	Fields	May 17, 1949
2,470,297	Fields	May 17, 1949

FOREIGN PATENTS

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