Description

This invention relates to an inhalation device. A propellant-free inhalation device with a supply of pulverized medical substance in a supply chamber, a manually actuatable metered dosing means in form of a rotatable dosing means having one or more peripheral recesses (dosing chambers) to receive in one position from the supply chamber the dose of the medical substance to be inhaled and to discharge the dose in another position, with a mouthpiece, formed at the side of the housing of the inhalation device for active inhalation and with an air channel for distributing the discharged dose in the breathing air flow and with at least one air intake embodied within the housing is described in DE 35 35 561.

In the known inhalation device the mouthpiece is arranged in such a way that its axis extends parallel to the axis of the dosing means. Its air channel is guided underneath the dosing means to the opposite side of the housing where the air intakes are situated, by forming a cavity on the level of the dosing chamber. If due to a rotation of the dosing means the loaded recess (dosing chamber) is facing the air channel of the mouthpiece, the dose of powder that has been before discharged from the supply chamber falls, due to the gravity forces and - if desired - supported by a vibrating mechanism from the dosing chamber into the cavity of the air channel and is therefrom inhaled into the lungs of the patient by means of active inhalation. The air channel has a throttle area which is destined to promote the mixing of air with the medical substance by means of turbulence.

The known inhalation device has two critical drawbacks. On one hand the accuracy in dosing the powder to be inhaled and in emptying the dosing chambers is not satisfactory, on the other hand a reliable dispersion of the powder in the breathing air is not warranted. For proper handling of the known device both hands are necessary. Emptying of the dosing chamber and getting all the powder out of the mouthpiece is not guaranteed.

It is the object of the present invention to construct an inhalation device, starting from the above mentioned propellant-free inhalation device, in which the inhaled dose is reproducible at a high level of accuracy and in which a complete dispersion of the medical substance into the breathing air is achievable.

This object is achieved according to the invention by the following features: The main axis of the mouthpiece and the axis of the dosing means form an angle in the range of 70 to 110°, preferably 90°. The air channel is led on the level of the dosing means directly to the periphery of the dosing means, offset from the outlet of the supply chamber. The air intake is formed within the attachment area of the mouthpiece and is extended to the periphery of the dosing means in the orifice area of the air channel.

In the propellant-free inhalation device of the invention the air intakes are therefore arranged in such a way, respectively the paths of the air ducts are chosen such, that immediately at the beginning of the inhalation process air is led directly into the filled dosing chamber of the dosing means and that the same is intensively flushed by the inflowing air. The sucked-in air therefore blows the dosing chamber clean. Because of the relatively short air path between dosing chamber and the orifice of the mouthpiece the blown-out dose is received by the patient nearly completely. The actually inhaled dose therefore is reproducible at a high level or accuracy in the propellant-free inhalation device of the invention; also a complete dispersion of the medical substance in the air stream is achieved.

In a feature of the embodiment the dosing means is received in a fixed hollow cylindrical body which has recesses corresponding to the width of the dosing chambers and being spaced apart on the circumference of the dosing means according to the angular distance of the dosing chambers, said recesses being located on one side in the area of the supply chamber and on the other side in the area where the air channel of the mouthpiece and the air intake discharge into the cylindrical body.

Such an embodiment creates a clear separation, free of retroactions, between the receipt of the dose to be inhaled from the supply chamber on the one hand and the discharge of the dose to be inhaled into the air channel of the mouthpiece on the other hand.

Preferably, between the recess associated with the mouthpiece and a wall portion of the air channel of the mouthpiece, there is provided an opening for the passage of the intaken air directly at the periphery of the dosing means. An especially intensive air jet for cleaning off the dosing chamber positioned in front of the gap results when the gap is moulded like a nozzle.

Therapeutical preparations for inhalation often consist of a micronized drug and a less finely divided auxiliary substance which together form agglomerates (DE-A-1792207). Agglomerates are, however, also formed if the preparation only consists of uniformly micronized particles. Only the individual particles of the drug shall reach the deeper areas of the patient's lung. Therefore already in the mouthpiece of the device a separation of auxiliary substance and drug particles and desagglomeration (dispersion) should take place. For this purpose as high shear forces as possible should act on the agglomerates thus helping to disperse the particles adhering to each other. So according to another feature of the embodiment the cross-sectional shape of the air channel in the mouthpiece is adapted to create high shear forces.

This can be achieved, for example, if the air channel in the mouthpiece has a substantially constant cross-sectional area.

Other features and advantages of the invention will become apparent from the description of the examples shown in the drawings.

Fig. 1 is a longitudinal section through one embodiment of the inhalation device according to the present invention;

Fig. 2 is an explosive view of the structure of the inhalation device according to Fig. 1 in connection with other variants of parts of the device;

Fig. 3 is a cross section of a modified dosing means of the inhalation device;

Fig. 4 is a cross section of another modified dosing means.

Fig. 1 shows a propellant-free inhalation device with a supply chamber 1 into which a certain supply of a pulverized medical substance to be inhaled is filled. As a rule, the amount is measured that it is sufficient for up to 300 single doses.

The supply chamber has a square cross-section (Fig. 2) and a lid 1a is tapered towards the bottom. A long extending cover 2 is put onto the supply chamber 1.

At the end of the conical portion 1c of the supply chamber there is a manually actuatable dosing means 3 having five peripheral recesses 4, called dosing chambers. In the position of the dosing means shown in Fig. 1, the upper dosing chamber 4a is just being filled with the dose of medical substance to be inhaled from the supply chamber 1, while the earlier filled dosing chamber 4b is ready to be discharged.

At one side of the inhalation device a mouthpiece 5 is formed, through which the medical substance can be inhaled actively and which has an air channel 6 for distribution of the dose discharged from the dosing chamber 4b into the flow of breathing air. In the example illustrated, the main axis 21 of the mouthpiece 5 forms an angle of approxemately 90° with the axis of the dosing means 3. The embodiment of the invention, however, in no way is restricted to this form. Angles of approx. 70° to 110° can likewise be formed. The longitudinal axis of the mentioned air channel in the example is therefore perpendicular to the longitudinal axis of the dosing means. In the vicinity of the dosing means the air channel is led at the level of the dosing means directly to its periphery. According to the position shown in Fig. 1 the air channel is thus directly opposite the dosing means, here the dosing chamber 4b.

The dosing means is received in a fixed hollow cylindrical body 7 which has recesses corresponding to the width of the dosing chamber 4, set off on the circumference by the angular distance of the dosing chambers 4a and 4b, the recesses being located on the one side in the area of the conical section lc of the supply chamber and on the other side in the area where the air channel 6 of the mouthpiece 5 discharges.

In the area where the mouthpiece is attached, air intakes 8 are provided. The intaken air is led to an opening 7b between the recess of the hollow cylindrical body that is facing the mouthpiece and a partition wall 5a of the mouthpiece. From the opening the air arrives directly like a jet in the dosing chamber 4b and blows the powder contained therein out into the air channel 6 of the mouthpiece 5, without leaving any residue. It is preferred to mould the mentioned air supply opening 7b like a nozzle to create a strongly aligned stream of air.

In Fig. 2 the structure of the inhalation device according to fig. 1 is made clear in an explosive view.

The cover 2, together with the flap 2a, the function of which will be explained further below, is adapted to cover the supply chamber 1 and its lid 1a. Said lid closes the upper edge of the supply chamber.

An integral connection is provided between the supply chamber 1 and the hollow cylindrical body 7, which is adapted to mount the dosing means 3 with the dosing chambers 4. Moulded together with the supply chamber is also the rear wall 9 of the device, likewise the attachment 7a to receive the mouthpiece 5 including the wall 5b with the air intakes 8 and the air channel 6 as well as the bottom side 5c of the device (fig. 1).

In addition to the dosing chambers 4, the dosing means 3 also has teeth 3a which are engaged with the flap 2a such that rotation can only be accomplished stepwise corresponding to the peripheral distance between the dosing chambers 4 and the recesses in the body 7 (fig. 1). The detent drive of the dosing means automatically aligns the dosing chambers with the outlet of the supply chamber on the one side and the air channel of the mouthpiece on the other side. Thus a good charging and discharging of the dosing chamber is ensured. Furthermore, the supply chamber 1 has a detent nose 1b which engages into recesses or notches 3b in the dosing means such that analogue to a ratchet rotation is only possible in one direction. It is thus possible to actuate the device just as the usual metered dose inhalers containing propellants.

To reduce friction between the dosing means 3 and the cyclindrical body 7 different shapes and sizes of the slot 7c can be formed.

The mouthpiece can be closed with a cover 10 which comprises detent noses 11 to engage into the air intakes 8 and subsequently close the same and take care of a safe sealing of the device. Furthermore, an unintended operation is prevented.

In another embodiment the cover 10 is connected to the mouthpiece or to the device so that it can be pulled

off the mouthpiece, but cannot be completely removed from the device.

In another form of embodiment according to Fig. 1 the lid 1a of the supply chamber 1 for the medical substance may comprise a chamber, which, for example, is filled with silicagel or another drying agent to protect the medical substance against humidity.

Furthermore a vibrating mechanism can be provided, by means of which the medical substance is shaked when the device is operated, so that the respective dosing chamber receives a uniform charge. This vibrating mechanism, for example, can be formed by a ratchet in a manner known per se. The supply chamber 1 or the cover 2 can also have notches, which cause vibrations when these parts are moved relatively to each other.

Also for the design of the drive of the dosing means the man skilled in the art avails of several possibilities. In the simplest case this design can be embodied corresponding to the dosing devices in aerosol systems. Preferrably the drive is adapted to be rotated manually by means of a knob.

Also with respect to the detent drive and the "ratchet" other embodiments are imaginable.

The inhalation device desirably includes an arrangement, which prevents multiple doses to be discharged from the device.

The opening at the conical portion 1c of the supply chamber 1 is shaped for low friction forces of the dosing means in its bearing and easy rotation of the barrel without jamming.

For visual monitoring of the supply level in the supply chamber the supply chamber preferably is manufactured of usual transparent material. In the cover 2 a longitudinal slot or window may be provided, if desired with markings on it. These markings reveal the supply level, respectively the number of doses left.

The propellant-free inhalation device according to the invention can also be provided with a dose counting system, where the counting steps can be derived from the rotation of the dosing means, for example via a gear system provided with numbers or by colour stripes.

In the figs. 3 and 4 cross-sectional views of modified dosing means 3 are shown. In fig. 3 the dosing chambers 4 of the dosing means 3 are flattened in the bottom area and embodied less deep compared to those of the previously described embodiment.

The dosing chambers 4 of the dosing means 3 in fig. 4 show a triangular cross-section which are moulded in relation to the direction of rotation indicated by arrow A.

Moreover the axis 21 of the mouthpiece 5 not necessarily has to stand perpendicularly on the axis of the supply chamber 1 as illustrated in fig. 1. Good results also have been obtained when the angle between the axes 20 and 21 generally lies in the range of 90 to 130°.

Claims

1. Propellant-free inhalation device with a supply of pulverized medical substance in a supply chamber (1), a manually actuatable metered dosing means (3) in form of a rotatable metering drum having one or more peripheral recesses (dosing chambers (4)) to receive in one position from the supply chamber the dose of the medical substance to be inhaled and to discharge the dose in another position, with a mouthpiece (5), formed at the side of the housing of the inhalation device for active inhalation and with an air channel (6) for distributing the discharged dose in the breathing air flow and with at least one air intake (8) embodied within the housing, characterized by the following features
   - the main axis (21) of the mouthpiece (5) and the rotation axis of the dosing means (3) form an angle in the range of 70 to 110°, preferably 90°;
   - the air channel (6) is led at the level of the dosing means (3) directly to the periphery of the dosing means, offset from the outlet of the supply chamber;
   - the air intake (8) is formed within the attachment area of the mouthpiece (5) and is extended to the periphery of the dosing means (3) in the orifice area of the air channel (7).

2. Inhalation device according to claim 1, characterized in that the dosing means (3) is received in a fixed hollow cylindrical body (7) which has recesses corresponding to the width of the dosing chambers (4) set off on the circumference according to the angular distance of the dosing chambers on the dosing means, said recesses being loceated on the one side in the area of the supply chamber (1) and on the other side in the area where the air channel (6) of the mouthpiece (5) and the air intake (8) discharge into the cylindrical body (7).

3. Inhalation device according to claim 2, characterized in that between the recess associated with the mouthpiece (5) and a wall portion (5a) of the mouthpiece an opening (7b) is formed for the passage of the intaken air directly to the periphery of the dosing means.

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The propellant-free inhalation device according to the invention can also be provided with a dose counting system, where the counting steps can be derived from the rotation of the dosing means, for example via a gear system provided with numbers or by colour stripes.

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Claims

1. Propellant-free inhalation device with a supply of pulverized medical substance in a supply chamber (1), a manually actuatable metered dosing means (3) in form of a rotatable metering drum having one or more peripheral recesses (dosing chambers (4)) to receive in one position from the supply chamber the dose of the medical substance to be inhaled and to discharge the dose in another position, with a mouthpiece (5), formed at the side of the housing of the inhalation device for active inhalation and with an air channel (6) for distributing the discharged dose in the breathing air flow and with at least one air intake (8) embodied within the housing, characterized by the following features
   - the main axis (21) of the mouthpiece (5) and the rotation axis of the dosing means (3) form an angle in the range of 70 to 110°, preferably 90°;
   - the air channel (6) is led at the level of the dosing means (3) directly to the periphery of the dosing means, offset from the outlet of the supply chamber;
   - the air intake (8) is formed within the attachment area of the mouthpiece (5) and is extended to the periphery of the dosing means (3) in the orifice area of the air channel (7).

2. Inhalation device according to claim 1, characterized in that the dosing means (3) is received in a fixed hollow cylindrical body (7) which has recesses corresponding to the width of the dosing chambers (4) set off on the circumference according to the angular distance of the dosing chambers on the dosing means, said recesses being loceated on the one side in the area of the supply chamber (1) and on the other side in the area where the air channel (6) of the mouthpiece (5) and the air intake (8) discharge into the cylindrical body (7).

3. Inhalation device according to claim 2, characterized in that between the recess associated with the mouthpiece (5) and a wall portion (5a) of the mouthpiece an opening (7b) is formed for the passage of the intaken air directly to the periphery of the dosing means.

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4. Inhalation device according to claim 3, characterized in that the opening (7b) is moulded in form of a nozzle.

5. Inhalation device according to one of the claims 1 to 4, characterized in that the cross-sectional shape or area of the air channel (6) in the mouthpiece (5) is substantially constant.

6. Inhalation device according to one of the claims 1 to 5, characterized in that a cover (10) for the mouthpiece (5) is provided, having detent elements (11) to fit into the air intakes (8).

7. Inhalation device according to one of the claims 1 to 6, characterized in that the supply chamber (1) is closed with a lid (1a) having on its inner side a chamber to take up a drying agent.

8. Inhalation device according to one of the claims 1 to 7, characterized in that over the supply chamber (1) a cover (2) may be fitted.

9. Inhalation device according to one of the claims 1 to 8, characterized in that a manually actuatable vibrating mechanism is provided for vibrating the supply of pulverized medical substance.

10. Inhalation device according to claim 8 or 9, characterized in that notches are provided on the cover (2) of the supply chamber (1) and that by a motion relative to the wall of the supply chamber vibrations are created.

11. Inhalation device according to one of the claims 1 to 10, characterized in that the manually actuatable rotative drive for the dosing means (3) includes a stepping mechanism (3a, 2a) for stepwise rotation of the dosing means with a step length corresponding to the peripheral distance of the dosing chambers.

12. Inhalation device according to one of the claims 1 to 11, characterized in that an arrangement for visual monitoring of the supply level is provided.

13. Inhalation device according to claim 8 and 12, characterized in that the supply chamber (1) is manufactured from translucent material and the cover (2) for the supply chamber has a longitudinal slot.

14. Inhalation device according to one of the claims 1 to 13, characterized in that a counting system is provided, for the number of doses removed.

15. Inhalation device according to one of the claims 1 to 14, characterized in that the main axis (21) of the mouthpiece (5) and the main axis (20) of the supply chamber (1) form an angle in the range between 90° to 130°.

Patentansprüche

1. Treibgasfreies Inhalationsgerät mit einem Vorrat an pulverförmiger medizinischer Substanz in einer Vorratskammer (1), einer von Hand betätigbaren Dosiereinrichtung (3) in Form einer drehbaren Dosiertrommel mit einer oder mehreren peripheren Vertiefungen (Dosierkammern (4)) zur Aufnahme der zu inhalierenden Dosis der medizinischen Substanz aus der Vorratskammer in einer Stellung, und zur Abgabe derselben in einer anderen Stellung mit einem seitlich am Gehäuse des Inhalationsgerätes angeformten Mundstückes (5) zum aktiven Einatmen und mit einem Luftkanal (6) zur Verteilung der abgegebenen Dosis in dem Atemluftstrom und mit wenigsten einem Lufteinlaß (8) in dem Gehäuse, gekennzeichnet durch die folgenden Merkmale
   - die Hauptachse (21) des Mundstückes (5) und die Drehachse der Dosiereinrichtung (3) bilden einen Winkel im Bereich von 70°-110,° vorzugsweise von 90°;
   - der Luftkanal (6) ist auf Höhe der Dosiereinrichtung (3) unmittelbar bis zu ihrer Peripherie geführt, versetzt zu dem Auslaß der Vorratskammer ;
   - der Lufteinlaß (8) ist innerhalb des Ansatzbereiches des Mundstückes (5) ausgebildet und erstreckt sich zu der Peripherie der Dosiereinrichtung (3) im Mündungsbereich des Luftkanals (7).

2. Inhalationsgerät nach Anspruch 1, dadurch gekennzeichnet, daß die Dosiereinrichtung (3) in einem feststehenden hohlzylindrischen Körper (7) aufgenommen ist, der Ausnehmungen entsprechend der Breite der Dosierkammern (4), peripher versetzt um den Winkelabstand der Dosierkammern, auf der Dosier-

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einrichtung aufweist, wobei die Ausnehmungen einerseits im Bereich der Vorratskammer (1) und andererseits in dem Bereich angeordnet sind, wo der Luftkanal (6) des Mundstückes (5) und der Lufteinlaß (8) in den zylindrischen Körper (7) einmünden.

3. Inhalationsgerät nach Anspruch 2, dadurch gekennzeichnet, daß zwischen der dem Mundstück (5) zugeordneten Ausnehmung und einem Wandteil (5a) des Mundstückes eine Öffnung (7b) ausgebildet ist, zum Durchtritt der angesaugten Luft direkt zu der Peripherie der Dosiereinrichtung.

4. Inhalationsgerät nach Anspruch 3, dadurch gekennzeichnet, daß die Öffnung (7b) in Form einer Düse ausgebildet ist.

5. Inhalationsgerät nach einem der Ansprüche 1-4, dadurch gekennzeichnet, daß die Querschnittsform oder der Bereich des Luftkanals (6) in dem Mundstück (5) im wesentlichen konstant ist.

6. Inhalationsgerät nach einem der Ansprüche 1-5, dadurch gekennzeichnet, daß ein Deckel (10) für das Mundstück (5) vorgesehen ist, das Rastelemente (11) zur Aufnahme in die Lufteinlässe (8) aufweist.

7. Inhalationsgerät nach einem der Ansprüche 1-6, dadurch gekennzeichnet, daß die Vorratskammer (1) mit einem Deckel (1a) verschlossen ist, der auf seiner Innenseite eine Kammer zur Aufnahme eines Trocknungsmittels aufweist.

8. Inhalationsgerät nach einem der Ansprüche 1-7, dadurch gekennzeichnet, daß über die Vorratskammer (1) eine Abdeckung (2) geschoben werden kann.

9. Inhalationsgerät nach einem der Ansprüche 1-8, dadurch gekennzeichnet, daß ein von Hand betätigbarer Rüttelmechanismus vorgesehen ist zum Aufrütteln des Vorrats an pulverförmiger medizinischer Substanz.

10. Inhalationsgerät nach Anspruch 8 oder 9, dadurch gekennzeichnet, daß Kerben an dem Deckel (2) der Vorratskammer (1) vorgesehen sind und daß durch eine Bewegung relativ zu der Wand der Vorratskammer Vibrationen gebildet werden.

11. Inhalationsgerät nach einem der Ansprüche 1-10 dadurch gekennzeichnet, daß der von Hand betätigbare Drehantrieb für die Dosiereinrichtung (3) ein Schrittschaltwerk (3a, 2a) für die schrittweise Drehung der Dosiereinrichtung mit einer Schrittlänge entsprechend dem peripheren Abstand der Dosierkammern aufweist.

12. Inhalationsgerät nach einem der Ansprüche 1-11, dadurch gekennzeichnet, daß eine Anordnung für die visuelle Überwachung des Vorratspegels vorgesehen ist.

13. Inhalationsgerät nach Anspruch 8 und 12, dadurch gekennzeichnet, daß die Vorratskammer (1) aus durchsichtigem Material hergestellt ist und daß der Deckel (2) der Vorratskammer einen Längsschlitz aufweist.

14. Inhalationsgerät nach einem der Ansprüche 1-13, dadurch gekennzeichnet, daß ein Zählsystem vorgesehen ist für die Anzahl der entnommenen Dosen.

15. Inhalationsgerät nach einem der Ansprüche 1-14, dadurch gekennzeichnet, daß die Hauptachse (21) des Mundstückes (5) und die Hauptachse (20) der Vorratskammer (1) einen Winkel im Bereich zwischen 90° - 130° bilden.

Revendications

1. Inhalateur sans gaz propulseur avec une réserve de substance médicale pulvérulente dans une chambre d'alimentation (1), un dispositif de dosage actionnable manuellement (3) sous la forme d'un tambour rotatif de dosage comportant une ou plusieurs cavités périphériques [chambres de dosage (4)] pour recevoir dans une position la dose de substance médicale à inhaler provenant de la chambre d'alimentation et évacuer cette dose dans une autre position, avec un embout (5) formé sur le côté du corps de l'inhalateur pour une inhalation active et un canal d'air (6) pour distribuer la dose débitée dans le flux d'air aspiré et

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avec au moins une admission d'air (8) ménagée dans le logement, caractérisé par les particularités suivantes :

- l'axe principal (21) de l'embout (5) et l'axe de rotation du dispositif de dosage (3) forment un angle de l'ordre de 70 à 110°, de préférence de 90°;
- le canal d'air (6) est guidé, au niveau du dispositif de dosage (3) directement vers la périphérie du dispositif de dosage et est décalé de la sortie de la chambre d'alimentation;
- l'admission d'air (8) est formée à l'intérieur de la zone de fixation de l'embout (5) et s'étend vers la périphérie du dispositif de dosage (3), dans la région de l'orifice du canal d'air (7).

2. Inhalateur suivant la revendication 1, caractérisé en ce que le dispositif de dosage (3) est logé dans un corps cylindrique creux fixe (7) qui possède des cavités correspondant à la largeur des chambres de dosage (4) décalées sur la circonférence conformément à la distance angulaire des chambres de dosage sur le dispositif de dosage, lesdites cavités étant situées, d'un côté, dans la région de la chambre d'alimentation (1) et, de l'autre côté, dans la région où le canal d'air (6) de l'embout (5) et l'admission d'air (8) débouchent dans le corps cylindrique (7).

3. Inhalateur suivant la revendication 2, caractérisé en ce qu'entre la cavité associée à l'embout (5) et une partie de paroi (5a) de l'embout est pratiquée une ouverture (7b) pour le passage de l'air admis, directement vers la périphérie du dispositif de dosage.

4. Inhalateur suivant la revendication 3, caractérisé en ce que l'ouverture (7b) est moulée sous la forme d'une tuyère.

5. Inhalateur suivant l'une quelconque des revendications 1 à 4, caractérisé en ce que la forme ou l'aire en coupe transversale du canal d'air (6) dans l'embout (5) est essentiellement constante.

6. Inhalateur suivant l'une quelconque des revendications 1 à 5, caractérisé en ce qu'une coiffe (10) est prévue pour l'embout (5) et comportant des éléments de positionnement (11) destinés à s'introduire dans les admissions d'air (8).

7. Inhalateur suivant l'une quelconques des revendications 1 à 6, caractérisé en ce que la chambre d'alimentation (1) est fermée par un couvercle (1a) comportant sur sa face interne une chambre pour y loger un agent déshydratant.

8. Inhalateur suivant l'une quelconque des revendications 1 à 7, caractérisé en ce qu'une coiffe (2) peut être ajustée sur la chambre d'alimentation (1).

9. Inhalateur suivant l'une quelconque des revendications 1 à 8, caractérisé en ce qu'un mécanisme vibrateur actionnable manuellement est prévu pour faire vibrer la réserve de substance médicale pulvérulente.

10. Inhalateur suivant la revendication 8 ou 9, caractérisé en ce que des encoches sont prévues sur la coiffe (2) de la chambre d'alimentation (1) et que des vibrations sont créées par un mouvement par rapport à la paroi de la chambre d'alimentation.

11. Inhalateur suivant l'une quelconque des revendications 1 à 10, caractérisé en ce que l'entraînement rotatif actionnable manuellement pour le dispositif de dosage (3) comprend un mécanisme pas à pas (3a, 2a) pour la rotation progressive du dispositif de dosage d'une longueur de pas correspondant à la distance périphérique des chambres de dosage.

12. Inhalateur suivant l'une quelconque des revendications 1 à 11, caractérisé en ce qu'un agencement est prévu pour le contrôle visuel du niveau d'alimentation.

13. Inhalateur suivant les revendications 8 et 12, caractérisé en ce que la chambre d'alimentation (1) est fabriquée en matériau translucide et en ce que la coiffe (2) pour la chambre d'alimentation comporte une fente longitudinale.

14. Inhalateur suivant l'une quelconque des revendications 1 à 13, caractérisé en ce qu'un système de comptage est prévu pour le nombre de doses débitées.

15. Inhalateur suivant l'une quelconque des revendications 1 à 14, caractérisé en ce que l'axe principal (21)

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de l'embout (5) et l'axe principal (20) de la chambre d'alimentation (1) forment un angle de l'ordre de 90° à 130°.