mixture, the dry powder will be more effectively deagglomerated for releasing the drug particles from the powder formulation. In effect, the dosing accuracy increases.

It is therefore an object of the present invention to provide an inhalation device in which at least a part of the metering cycle is inhalation-triggered and in which the the bandwidth for the required triggering forces is as small as possible.

Moreover, it is an object of the present invention to provide an inhaler of the above-referred kind which is further enhanced with regard to usability and in view of eventual mal operation. This and other objects are achieved by an inhalation device according to claims 1 and 10. Advantageous embodiments of the invention may be derived from the dependent claims.

**Summary**

In one aspect of the present disclosure, there is provided an inhalation device for powdered drugs to be received by a patient by an inhalation-caused air stream, comprising at least one powder reservoir, metering means for repeatedly metering a powder dose from the reservoir, a transportation mechanism for moving said metering means from a filling position for receiving a powder dose into an emptying position for releasing said powder dose into a powder channel, at least one activating device for manual operation by the patient, said activating device being operatively connected to said transportation mechanism such that upon operation a single powder dose is being metered, said activating device comprising a dosage key (5) acting on said transportation mechanism when pressed by the patient, said transportation mechanism comprising a dosage lever (6) acting on said metering means, wherein said dosage lever (6) is locked in the inhalation position of said metering means after said dosage key (5) has been actuated by the user, wherein said dosage lever (6) in the inhalation position engages a trigger member and is releasable by actuation of the trigger member, wherein the trigger member comprises at least one cam surface and wherein the dosage lever (6) engages said cam surface tangentially in said locked inhalation position.

In another aspect of the present disclosure, there is provided an inhalation device for powdered drugs to be received by a patient by an inhalation-caused air stream, comprising at least one powder reservoir, metering means for repeatedly metering a powder dose from the reservoir, a transportation mechanism for moving said metering means from a filling position for receiving a powder dose into an emptying position for releasing said powder dose into a powder channel, at least one activating device for manual operation by the patient, being operatively connected to said transportation mechanism such that upon operation a single powder dose is being metered, said activating device comprising a dosage key (5) acting on said transportation mechanism when pressed by the patient, the inhalation device further comprising at least one powder disintegration means, wherein said metering means and said transportation mechanism are arranged within a dosing compartment and said disintegration means is arranged in a powder discharge compartment, and wherein said dosing compartment is sealed against said powder discharge compartment.

## Description

According to ~~one aspect of~~ the present invention, there is provided an inhalation device for powdered drugs to be received by a patient by an inhalation-induced airflow, comprising at least one powder reservoir, metering means for repeatedly metering a powder dose from the reservoir, a transportation mechanism for moving said metering means from a filling position for receiving a powder dose into an emptying position for releasing said powder into a powder channel, at least one activating device for manual operation by the patient, being operatively connected to said transportation mechanism such that upon operation a single powder dose is being metered, said activating device comprising a dosage key acting on said transportation mechanism, wherein said transportation mechanism comprises a dosage lever acting on said metering means, said dosage lever locked in the inhalation position of said metering means after said dosage key has been properly actuated and wherein said dosage lever in the inhalation position engages a trigger member and being releasable by actuation of the trigger member, wherein the trigger member comprises at least one cam surface and wherein the dosage lever engages said cam surface tangentially in said locked inhalation position.

With the inhalation device according to the invention, the metering cycle will only be completed and the transportation and/or metering means will only be reset

after inhalation of a metered quantity of powder by the patient. Inhalation will cause the trigger member to release said dosage lever which will reset the metering means into its filling/receiving position. Since the dosage lever only engages said cam surface of the trigger member tangentially, the contact force between the dosage lever and the trigger member is almost independent from the tolerance of the components.

In other words, the trigger member comprises a cam surface which forms a curve which is engaged or contacted by the dosage lever peripherally from outside such that the fastening hook makes line contact with the cam surface. The position of the contact point/contact line between cam surface and the dosage lever is almost the same, i.e. remains stable, irrespective of the angular end position (locked position) of the trigger member relative to the dosage lever.

According to one advantageous ~~aspect~~ embodiment of the invention, the trigger member comprises an inhalation-operated valve in an air duct communicating with said powder channel. The inhalation-operated valve is operatively connected to said dosage lever so that the dosage lever is releasable by action of the valve initiated by the suction generated by the patient during inhalation. The inhalation-operated valve may be for instance in the form of a spring-loaded flap which due to the resilience of the spring is normally held in closed position.

The dosage lever may comprise a fastening hook engaging behind and/or under said cam surface in the inhalation position.

In one advantageous embodiment of the inhalation device according to the invention, the fastening hook comprises a planar contact surface making line contact with the cam surface in the inhalation position. Due to the fact that the fastening hook only tangentially engages the cam surface, excursion of the contact surface due to the tolerances of the parts of the inhaler is only possible in axial direction, which, however, has no impact on the required triggering forces.

Triggering of the dosage lever is achieved by a pivot motion of the cam surface so that only a slight pivoting movement of the triggering member almost

instantaneously releases the dosage lever. Due to this design, the bandwidth of required air flow variation for the suction to be applied by the patient can be kept remarkably below 30 l/min.

In one advantageous embodiment, the inhalation-operated valve may include a flap which fulfils a pivot movement upon inhalation, said cam surface being provided on the flap or on a pivot shaft of the flap. The flap is for example a major component of the aforementioned valve. The pivot axis may extend in the centre of gravity of the flap or nearby the centre of gravity of the flap. In the event the cam surface is also arranged nearby the pivot axis or nearby the centre of gravity of the flap, easy triggering may be achieved.

Also Aaccording to ~~yet another aspect of~~ the present invention, there is provided an inhalation device for powder drugs to be received by a patient by an inhalation-caused air stream/inhalation-caused air flow, comprising at least one powder reservoir, metering means for repeatedly metering a powder dose from the reservoir, a transportation mechanism for moving said metering means from a filling position for receiving a powder dose into an emptying position for releasing said powder dose into a powder channel, at least one activating device for manual operation by the patient, said activating device being operatively connected to said transportation mechanism such that upon operation a single powder dose is being metered, said activating device comprising a dosage key acting on said transportation mechanism when pressed by the patient, and at least one powder disintegration means, wherein said metering means and said transportation means are arranged within a dosing compartment and said disintegration means is arranged in a powder discharge compartment, and wherein said dosing compartment is sealed against said powder discharge compartment.

A powder disintegration means in the sense of the instant application is a means for breaking up a powder agglomerate or releasing drug particles from a carrier material. Said powder disintegration means may include means for guiding powder and air as well as a cyclone/air classifier.