a generally tubular substantially hollow first portion having a first distal end and a first proximal end and a first portion axis extending from the first distal end to the first proximal end;

a base portion formed at the first proximal end;

an actuator seat formed in the base portion;

an actuator nozzle formed in the actuator seat and operable for dispensing a spray of metered fluid; and

a generally tubular substantially hollow second portion having a second proximal end and a second distal end defining a mouthpiece, the second proximal end being located adjacent the first proximal end and the second distal end defining an end of the mouthpiece, the generally tubular substantially hollow second portion having a second portion axis extending from a centre of the actuator nozzle to a centre of the end of the mouthpiece, the end of the mouthpiece having an open face defining a mouthpiece face plane which is angled relative to a plane perpendicular to the second portion axis, the substantially hollow second portion defining a floor portion being in juxtaposition with the base portion and a roof portion.

Preferably the mouthpiece face plane is angled such that the mouthpiece roof portion extends distally, in the second portion axial direction, further than its floor portion.

By having an angled mouthpiece face plane orientated thus, a patient is encouraged to angle a MDI device of which the actuator housing forms a part into a position where both the upper and lower lips can be sealed against the mouthpiece during inhalation of a dispensed medicament and at an angle at which the emerging spray tends to be directed more upwardly over the tongue into the oral cavity.

The mouthpiece face plane may be at an angle between 10 degrees and 50 degrees relative to the plane perpendicular to the second portion axis, preferably 30 degrees. In a preferred embodiment, the spray direction is angled upwardly substantially 30 degrees in the distal direction relative to the plane perpendicular to the first portion axis.

Alternatively, the actuator nozzle defines a spray axis which is angled upwardly in the distal direction relative to the second portion axis.

With the combination of the angled mouthpiece face plane and the angled spray direction, the delivery of a medicament from an MDI device incorporating such an actuator housing is more likely to be directed above and over the tongue of the patient.

In addition to having an angled end face at the second distal end of the mouthpiece, the generally tubular substantially hollow second portion of the actuator housing may further comprise a first region and a second region formed on the external surface, the first region being closer to the distal end than the second region and being configured to define a guidance region, the second region being located adjacent the proximal end and being configured to define a sealing region.

In addition to the embodiments in which the mouthpiece face plane is angled with respect to the first portion axis, the actuator nozzle may be upwardly angled with respect to the base portion to produce an upwardly angled spray with respect thereto.

There is also disclosed a metered dose inhaler device comprising a canister having a metering valve, and an actuator housing as described above, the metering valve being operable for engaging with the actuator seat formed in the base portion of the actuator housing.

Typically, such dispensing devices are used valve down and the valve is gravity-fed, so the valve does not have a dip tube. In dispensing devices that are used valve up, a dip tube is required. A dip tube can present a problem when dispensing formulations because of loss of prime in propellant-based formulations and/or due to inhomogeneity of the drug suspension which could take several actuations to advance up the tube.

Naturally, such a metered dose inhaler device has the advantages conferred by the actuator in that the plume of medicament dispensed from the canister via the metering valve is more likely to be effectively angled upwards with respect to the horizontal, and/or is less likely to be obstructed by the upper front teeth, and therefore substantially reduces the loss of medicament received by the patient due to buccal and tongue deposition as well as deposition on the teeth and lips.

There is also disclosed a method of manufacturing a metered dose inhaler device comprising an actuator configured to deliver an aerosol spray from a nozzle orifice having an axis and to predispose a user of the metered dose inhaler device to direct the nozzle orifice axis towards the roof of the user's mouth. In each of the foregoing embodiments users have a predisposition to direct the nozzle thus.

There is also disclosed a method of treatment of a pulmonary condition in a human patient, the method comprising providing a metered dose inhaler device comprising an actuator with a mouthpiece, the actuator configured to deliver an aerosol spray from a nozzle orifice having an axis and to predispose a patient to direct the nozzle orifice axis towards the roof of the patient's mouth, the patient inserting the mouthpiece into their mouth and actuating the metered dose inhaler device while inhaling.

There is also disclosed a method of treatment of a pulmonary condition in a human patient, the method comprising providing a metered dose inhaler device comprising an actuator with a mouthpiece, the actuator configured to deliver an aerosol spray from a nozzle orifice having an axis and to predispose a patient to direct the nozzle orifice axis towards the roof of the patient's mouth, the

patient inserting the mouthpiece into their mouth, aligning the nozzle orifice towards the roof of their mouth, and actuating the metered dose inhaler device while inhaling.

There is also disclosed a method of treatment of a pulmonary condition in a human patient, the method comprising providing a metered dose inhaler device comprising an actuator with a mouthpiece, the actuator configured to deliver an aerosol spray from a nozzle orifice, placing at least a portion of the actuator mouthpiece in the mouth of the patient, directing the nozzle orifice axis towards the roof of the mouth, actuating the metered dose inhaler device while inhaling, so as to reduce ballistic tongue deposition of the resulting aerosol plume as compared to the amount of ballistic tongue deposition that would result if the nozzle orifice axis was directed into the oral cavity at an essentially horizontal angle. In a preferred aspect of this method, the patient places their teeth around the outside of the mouthpiece prior to actuating and inhaling.

The present disclosure also provides for a kit comprising a metered dose inhaler device comprising an actuator with a mouthpiece and a set of instructions to a patient to use the device according to any of the methods described above.

Brief description of the drawings

For a better understanding of the present invention, reference will now be made, by way of example, to the accompanying drawings in which:

Figure 1a illustrates a sectioned side view of a first type of conventional actuator;

Figure 1b illustrates a front view of the actuator of Figure 1a;

Figure 2a illustrates a sectioned side view of a second type of conventional actuator;

Figure 2b illustrates a front view of the actuator of Figure 2a;

Figure 3a illustrates a sectioned side view of a first embodiment of an actuator in accordance with the present invention;

Figure 3b illustrates a front view of the actuator of Figure 3a;

Figure 4 illustrates a sectioned side view of the actuator of Figures 3a and 3b, including a canister;

Figure 5a illustrates a sectioned view of a second embodiment of an actuator in accordance with the present invention;

Figure 5b illustrates a front view of the actuator of Figure 5a;

Figure 6 illustrates a sectioned side view of a third embodiment of an actuator in accordance with the present invention;

Figure 7a is similar to Figure 6 but illustrates a sectioned side view of another embodiment of an actuator in accordance with the present invention;