housing and end cap and a movement of the collar relatively to a dispensing container of the device is undesirably required during an initial setting up of the device. It may also be possible for fluff or debris to become lodged but difficult to sense near the air inlets of the device near the collar, potentially allowing inhalation thereof, and the air inlet area is limited by narrow gaps between the collar and housing.

WO 2008/040062 discloses an inhaler with a cover cap arranged to seal the inhaler so that nothing may enter the inhaler through a housing top in order to exclude mud and dust and for use in wet conditions. The cover cap is flexible to allow operation of the device's canister without allowing mud or dust on the cap to be sucked in and inhaled. However, this requires a complicated arrangement of moving parts elsewhere on the housing in order to provide an air inlet.

It is known to provide a breath-actuated inhaler in which the act of inhalation by a user causes a dose to be provided, but this type of device is fairly complicated and expensive.

The present invention aims to alleviate at least to a certain extent the problems of the prior art.

According to an embodiment~~a first aspect of the invention~~ there is provided a housing cap apparatus for an inhaler, the housing cap having a valve for selectively restricting air flow through an air flow passageway of an inhaler. This is advantageous in that the valve can be used to restrict or prevent the user or patient from inhaling at a sub-optimal time relative to drug delivery and may, in particular prevent the user from inhaling substantially too early.

Preferably, at least a portion thereof comprising a deformable portion formed of deformable material and including at least one valve, the deformable portion being deformable between a first configuration in which the valve is restricted and a second

The cap may be arranged to be connectable to an inhaler housing by provision of mutually engaging threads which permit a threaded twisting removal or connection thereof.

Another embodiment~~A second aspect of the invention~~ provides an inhaler for inhalation into the airway of a user, the inhaler having a housing at least partially defining a flow passageway extending through the inhaler from an air inlet to an outlet, the inhaler including apparatus in accordance with the first aspect of the invention. Preferably, a metered dose canister is located in the housing.

Another embodiment~~A third aspect of the present invention~~ provides an inhaler for inhalation into the airway of a user, the inhaler having a housing at least partially defining a flow passageway extending through the inhaler from an air inlet to an outlet, wherein a valve is provided for selectively restricting the flow passageway. This is also advantageous in that the valve can be used to restrict or prevent the user or patient from inhaling at a sub-optimal time relative to drug delivery and may, in particular prevent the user from inhaling substantially too early.

The inhaler may further comprise a housing cap apparatus in accordance with the first aspect of the invention.

Preferably, the inhaler having a housing at least partially defining a flow passageway extending through the inhaler from an air inlet to an outlet, the inhaler having a deformable portion formed of deformable material and including at least one valve, the deformable portion being deformable between a first configuration in which the valve is restricted and a second configuration in which the valve is open for allowing air flow through the air flow passageway. This is advantageous in that the valve can be used to restrict or prevent the user or patient from inhaling at a sub-optimal time relative to drug delivery and may, in particular prevent the user from inhaling substantially too early.

The deformable portion may comprise at least part of a housing cap, the housing cap being in accordance with the first aspect of the invention.

Another embodiment~~A further aspect of the invention~~ provides an inhaler for inhalation into the airway of a user, the inhaler having a housing at least partially defining a flow passageway extending through the inhaler from an air inlet to an outlet, wherein a valve is provided for selectively restricting the flow passageway. This is also advantageous in that the valve can be used to restrict or prevent the user or patient from inhaling at a sub-optimal time relative to drug delivery and may, in particular prevent the user from inhaling substantially too early.

The outlet may comprise an aperture in a mouthpiece of the housing.

The housing may have a canister-receiving portion arranged to receive a metered dose canister.

The inhaler may include a metered dose canister arranged to be located in the canister-receiving portion, the canister having a main body which is movable in the canister-receiving portion for firing a metered dose of drug into the flow passageway.

The canister may have a stem extending from the main body and a metering valve, the main body being pressurised and movable relative to the valve stem for firing the metered dose via the metering valve. Accordingly, a metered dose canister may advantageously be fired at a time when the valve is at a correct moment during or just after the valve for the flow passageway is opened or after the valve begins to open such that good timing and coordination may be achieved.

The valve may be fully closable for fully preventing air flow along the flow passageway. Accordingly a user may be totally unable to inhale through the device

The sealing ring may be flexible and may additionally be arranged to deform from a closed configuration to an open configuration in which it permits airflow along the flow passageway.

The inhaler may include a housing cap arranged to fit on the housing, at least part of the housing cap being movable relative to the housing for opening and closing the valve. The housing may have at least one aperture formed in an outer wall thereof and the housing cap may have at least one inlet aperture formed through a wall thereof, the housing cap being movable relative to the housing to place the apertures in and out of register with one another for opening and closing valve, respectively.

The housing cap may have a skirt arranged to mate around the housing.

The housing cap may be removably attachable to the housing.

Housing caps in accordance with or used in any of the above aspects may advantageously be fitted to an inhaler housing thereby providing a valve for restricting or blocking airflow through the inhaler, such that opening of the valve from a restricted or fully blocking configuration may be coordinated with drug delivery for optimum inhalation. Housing caps with these features may be fitted to a wide range of existing inhaler housing bodies, thereby substantially improving the performance of the same without requiring substantial redesign costs.

Housing caps in accordance with or used in any of the embodiments or aspects of the invention may have a head portion formed of deformable material, the head portion incorporating the valve, which is in the form of at least one sealing aperture which is deformable between a closed configuration and an open configuration. The housing cap may be so deformable by pressing downwardly on the head portion. The closed configuration may be a relaxed or rest configuration of the head portion and the open configuration may be a deformed configuration thereof, such that the head portion may

advantageously be biased towards and return to the closed configuration from the open configuration automatically. The head portion may be formed of resiliently deformable material for self closing the aperture to the closed configuration and/or self-returning the head portion to the rest configuration.

According to a first aspect, there is provided a housing cap apparatus for an inhaler, the housing cap apparatus having one or more valves for selectively restricting air flow through an air flow passageway of the inhaler wherein at least a portion of the housing cap apparatus comprises a deformable portion formed of deformable material and including the one or more valves, the deformable portion being deformable between a first configuration in which the valve is restricted and a second configuration in which the valve is open for allowing air flow through an air flow passageway of the inhaler.

According to a second aspect, there is provided an inhaler for inhalation into the airway of a user, the inhaler having a housing at least partially defining a flow passageway extending through the inhaler from an air inlet to an outlet, the inhaler including an apparatus as disclosed herein and, optionally, a metered dose canister located in the housing.

According to a third aspect, there is provided an inhaler for inhalation into the airway of a user, the inhaler having: a housing at least partially defining a flow passageway extending through the inhaler from an air inlet to an outlet, wherein a valve is provided for selectively restricting the flow passageway, wherein the valve includes a sealing ring arranged to selectively form a seal between a metered dose canister and an inner wall of the housing, and wherein the sealing ring is flexible and is arranged to deform from a closed configuration to an open configuration in which it permits air flow along the flow passageway.

The present invention may be carried out in various ways and a number of preferred embodiments of inhalers and housing caps in accordance with the present invention

will now be described by way of example with reference to the accompanying drawings, in which:

Figures 1A and 1B are sections through a first embodiment of an inhaler in accordance with the present invention;

Figures 2A and 2B are sections through a second embodiment of an inhaler in accordance with a preferred embodiment of the present invention;

Figures 3A, 3B and 3C are sections through a third embodiment of an inhaler in accordance with the present invention and including a housing cap;

Figures 4A and 4B, 4C and 4D are views of a fourth embodiment of an inhaler in accordance with the present invention;

Figures 5A to 5F are views of a fifth preferred embodiment of an inhaler in accordance with the present invention and including a housing cap;

Figures 6A to 6G show a modification of the embodiment of Figures 5A to 5F;

Figures 7A to 7F show a further modification of the embodiment of Figures 5A to 5F;

Figures 8A to 8H show various views of a modified version of the embodiment of Figures 7A to 7F;

Figure 9 shows the embodiment of Figures 8A to 8H in use;

Figures 10A to 10C are views of the housing cap of the inhaler of Figures 8A to 8H;

Figures 11A shows a perspective view of a further preferred embodiment of an inhaler and housing cap in accordance with the invention;

Figures 11B, 11C and 11D show front elevational, left elevational and sectional (looking from right) views, respectively, of the apparatus shown in Figures 11A; and