**[02]** It would be desirable, therefore, to provide apparatus and methods for reducing the loss of medicament from the delivery pathway.

**[03]** Dispensers such as syringes are often prefilled with a desired medicament volume. A practitioner then fully depresses a plunger in the syringe to deliver the medicament into the patient. Prefilling the syringe reduces the likelihood of overfilling or underfilling by a practitioner. Fully depressing the plunger of the syringe reduces the likelihood of underdosing the patient, assuming that the prefilled volume is correct.

**[04]** Volumetric precision of prefilling a large volume may be greater than the volumetric precision of prefilling a small volume. When it is desirable to prefill the dispenser for the delivery of a small volume, the lack of volumetric precision may be unacceptable. It would be desirable, therefore, to provide apparatus and methods for using a dispenser to deliver a small volume of the medicament to the patient.

SUMMMARY OF INVENTION

[04a] A first aspect of the present invention provides a fitting for a fluid dispenser, the fitting having a longitudinal axis and comprising:

a detent that is configured to limit longitudinal insertion of the dispenser into the fitting by applying a longitudinal contact force against a terminal surface of the dispenser, the detent defining a first tangent plane and an opening configured to be placed in fluid communication with the dispenser;

a seal that is configured to be deformed by the surface, into a sealing contact against the surface, the contact defining a second tangent plane substantially coplanar with the first plane when the surface abuts the detent; and

a body that is configured to:

receive the surface; and

support the detent and the seal.

[04b] There is disclosed an apparatus for dispensing fluid, the apparatus comprising:

a coupler to sealingly engage a dispenser that is pre-filled with an initial volume of fluid; and

a body defining a passageway that is configured to be placed in fluid communication with the dispenser, the passageway:

having a volume that is not less than 10% the initial volume; and

being in fluid communication with a hypodermic needle.

[04c] A second aspect of the present invention provides a fluid dispenser, the dispenser having a longitudinal axis and a distal end, the distal end comprising:

a detent transverse to the longitudinal axis, the detent defining an aperture in fluid communication with a bore of the dispenser, and configured to limit longitudinal insertion of the dispenser into a fitting by applying a longitudinal contact force against a surface of the fitting, the surface defining a first tangent plane, the fitting

including an interior wall and defining an opening configured to be placed in fluid communication with the aperture; and

a seal that is configured to be deformed by the surface, into a sealing contact against the surface, the contact defining a second tangent plane substantially coplanar with the first plane when the detent abuts the surface; and

a terminal portion that includes a lateral wall and is configured to:

support the detent and the seal; and

be received by the fitting

wherein:

when the seal is in sealing contact against the surface, and the detent abuts the surface, the lateral wall, the interior wall and the seal define a first dead space, the first dead space having a first volume and isolated from fluid communication with the bore; and

the detent, when in contact with the surface, defines a second dead space, the second dead space having a second volume that is no more than 1% the first volume.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[05]** FIG. 1 is a perspective view of apparatus in accordance with the principles of the invention;

**[06]** FIG. 2 is an exploded perspective view of the apparatus shown in FIG. 1, including a partial cross-sectional view of internal features of the apparatus;

**[07]** FIG. 3 is a partial cross-sectional view of the apparatus shown in FIG. 1, the view taken along lines 3-3 (shown in FIG. 1);

WHAT IS CLAIMED IS:

1. A fitting for a fluid dispenser, the fitting having a longitudinal axis and comprising:

a detent that is configured to limit longitudinal insertion of the dispenser into the fitting by applying a longitudinal contact force against a terminal surface of the dispenser, the detent defining:

a first tangent plane; and

an opening configured to be placed in fluid communication with the dispenser;

a seal that is configured to be deformed by the surface, into a sealing contact against the surface, the contact defining a second tangent plane substantially coplanar with the first plane when the surface abuts the detent; and

a body that is configured to:

receive the surface; and

support the detent and the seal.

2. The fitting of claim 1 wherein:

the body includes an interior wall; and

the dispenser includes a lateral wall;

such that, when the surface is in sealing contact against the seal, and abuts the detent, the interior wall, the lateral wall and the seal define a region that is isolated from fluid communication with the dispenser.

3. The fitting of claim 2 wherein:

the region is a first dead space having a first volume;

the detent, when in contact with the surface, defines a second dead space having a second volume;

the second volume is no more than 1% the first volume; and

the second dead space includes one or more volumes in a region that is:

transversely coextensive with contact between the surface and the detent; and

longitudinally extensive between the surface and the detent.

4. The fitting of claim 3 wherein the second dead space is within the seal.

5. The fitting of claim 2 wherein the sealing contact is sufficient to prevent leakage of fluid from the dispenser to the region when the dispenser is actuated to dispense the fluid.

6. The fitting of claim 1 wherein:

the dispenser is pre-filled with an initial volume of fluid; and

the body defines a void that is in fluid communication with the opening, the void having a void volume that is not less than 10% the initial volume.

7. The fitting of claim 6 wherein the void volume is selected from not less than 25%, 50%, 75% or 90% of the initial volume.

8. A fluid dispenser, the dispenser having a longitudinal axis and a distal end, the distal end comprising:

a detent transverse to the longitudinal axis, the detent:

defining an aperture in fluid communication with a bore of the dispenser; and

configured to limit longitudinal insertion of the dispenser into a fitting by applying a longitudinal contact force against a surface of the

fitting, the surface defining a first tangent plane, the fitting including an interior wall and defining an opening configured to be placed in fluid communication with the aperture; and

a seal that is configured to be deformed by the surface, into a sealing contact against the surface, the contact defining a second tangent plane substantially coplanar with the first plane when the detent abuts the surface; and

a terminal portion that includes a lateral wall and is configured to:

support the detent and the seal; and

be received by the fitting

wherein:

when the seal is in sealing contact against the surface, and the detent abuts the surface, the lateral wall, the interior wall and the seal define a first dead space, the first dead space having a first volume and isolated from fluid communication with the bore; and

the detent, when in contact with the surface, defines a second dead space, the second dead space having a second volume that is no more than 1% the first volume.

9. The dispenser of claim 8 wherein the second dead space includes one or more volumes in a region that is:

transversely coextensive with contact between the surface and the detent; and

longitudinally extensive between the surface and the detent.

10. The dispenser of claim 8 wherein the second dead space is within the seal.

11. The dispenser of claim 8 wherein the sealing contact is sufficient to prevent leakage of fluid from the dispenser to the first dead space when the dispenser is actuated to dispense the fluid.

12. The dispenser of claim 8 wherein the detent and the seal extend longitudinally in a distal direction from the terminal portion, the detent including a bottom, the seal, in a relaxed state, extending distally beyond the bottom.

13. The dispenser of claim 12 wherein the seal does not extend transversely under the bottom.

14. The dispenser of claim 12 wherein the terminal portion defines a recess configured to secure the seal such that a distal end of the seal is not drawn laterally under the bottom.