

What is claimed is:

1. A syringe comprising:
 - a substantially cylindrically shaped barrel having an open proximal end, a proximal end and an inner sidewall, from a distal end extends a needleless connector and a lumen
 - 5 therethrough, the lumen being in fluid communication with a cavity of the barrel, the cavity being defined by the open proximal end, the distal end and the inner sidewall;
 - a plunger disposed within the barrel having plunger rod, a distal end, the distal end including a connection feature extending distally from the distal end;
 - a first stopper disposed proximal to a second stopper, the first stopper comprising a
 - 10 proximal end, a distal end and an outer surface the proximal end including an aperture configured to receive the connection feature of the plunger rod;
 - a second stopper disposed proximal to the distal end of the barrel, the second stopper comprising a proximal end, a distal end and an outer surface;
 - a first variable volume, the first variable volume being disposed between the first
 - 15 stopper and the second stopper;
 - a second variable volume, the second variable volume being between the second stopper and the distal end of the barrel; and
 - a flow path structure disposed at the distal end of the barrel, the flow path structure extending from the distal end of the barrel along the inner sidewall of the barrel.
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2. The syringe of claim 1, wherein the flow path structure is a protrusion extending from the inner sidewall of the barrel, the protrusion having a semicircular cross-sectional shape.
3. The syringe of claim 1, wherein the flow path structure is a protrusion extending from
- 25 the inner sidewall of the barrel, the protrusion having a convex cross sectional shape.
4. The syringe of claim 1, wherein the flow path structure is a protrusion extending from the inner sidewall of the barrel, the protrusion having a concave cross sectional shape.
5. The syringe of claim 1, wherein the flow path structure is a unitary body molded into
- 30 the inner sidewall of the barrel.

6. The syringe of claim 1, wherein the flow path structure is a non-unitary body assembled into the inner sidewall of the barrel.
- 5 7. The syringe of claim 1, wherein the first stopper further comprises a plurality of radial ribs disposed on the outer surface of the first stopper.
8. The syringe of claim 1, wherein the second stopper further comprises a plurality of radial ribs disposed on the outer surface of the second stopper.
- 10 9. The syringe of claim 1, wherein the proximal end of the second stopper has an inwardly conical shape configured to receive a distal end of the first stopper.
10. The syringe of claim 1, wherein the distal end of the second stopper has an outwardly
15 conical shape configured to conform and to be received by the distal end of the barrel.
11. The syringe of claim 1, wherein the connection feature comprises a plurality of threads for engaging a plurality of female threads integral to the aperture of the first stopper.
- 20 12. The syringe of claim 1, wherein the needleless connector is integral with the distal end of the barrel.
13. The syringe of claim 1, wherein the second stopper has a length, the flow path structure extends at least the length of the second stopper, thereby creating a flow path between the
25 second stopper and the inner sidewall of the barrel when the second stopper abuts the distal end of the barrel.
14. The syringe of claim 13, wherein when the second stopper fully abuts the distal end of the barrel, the flow path structure creates a flow path from the second variable volume to the
30 lumen of the barrel.

15. The syringe of claim 1, wherein advancement of the second stopper against the distal end of the barrel causes deformation of the second stopper due to the flow path structure interfering with the second stopper.
- 5 16. The syringe of claim 15, wherein advancement of the second stopper against the distal end of the barrel causes a flow path between the second stopper and the barrel.
17. The syringe of claim 1, wherein the distal end of the barrel has a frustoconical shape.
- 10 18. The syringe of claim 17, wherein the flow path structure follows the frustoconical shape of the distal end of the barrel.
19. The syringe of claim 18, wherein the flow path structure extends to the lumen of the barrel.
- 15 20. The syringe of claim 1, wherein the flow path structure has a sloped proximal end, thereby allowing less restrictive advancement of the second stopper against the flow path structure.
- 20 21. The syringe of claim 1, wherein the flow path structure has a first thickness profile TP1 along the inner sidewall of the barrel and a second thickness profile TP2 along the distal end of the barrel.
22. The syringe of claim 21, wherein the first thickness profile TP1 is greater than the
- 25 second thickness profile TP2.
23. The syringe of claim 1, the syringe being in an initial state, an intermediate state and a final state.
- 30 24. The syringe of claim 23, wherein the initial state is defined by the plunger being in a fully retracted position in the cavity, and the first stopper and second stopper are separated

within the cavity by the first variable volume, and the second stopper and distal end of the barrel are separated within the cavity by the second variable volume.

25. The syringe of claim 23, wherein the intermediate state is defined by the plunger being
5 in a partially advanced position in the cavity, and the second stopper has been fully advanced against the distal end of the barrel, the advancement of the second stopper causing expulsion of contents of the second variable volume through the lumen, thereby essentially eliminating the second variable volume.
- 10 26. The syringe of claim 23, wherein the final state is defined by the plunger being in a fully advanced in the cavity, and the distal end of the first stopper abuts the proximal end of the second stopper, thereby eliminating the first variable volume.