Claims

1. A syringe assembly comprising:

a barrel including a cylindrical sidewall having an interior surface with a first cross-sectional width defining a chamber for retaining fluid, an open proximal end and a distal end including a distal wall having an opening therethrough in fluid communication with said chamber, said sidewall including a rib adjacent said proximal end defining a second cross-sectional width that is less than the first cross-sectional width;

an elongate plunger rod including a proximal end, a distal end, and a main body extending between the proximal and distal end, the plunger rod being distally and proximally movable within said chamber, the proximal end including a thumb press, the distal end including a stopper-engaging portion, the plunger rod further including a flexible protrusion between the thumb press and the main body, the protrusion having a cross-sectional width greater than the cross-sectional width of the barrel at the rib and the plunger rod further including a first support member disposed perpendicularly to the plunger rod that includes an annular projection having a distally facing surface, a proximally facing surface and an outer edge; a strut element disposed on the distally facing surface between the flexible protrusion and the annular projection and at least one frangible portion comprising disposed proximally adjacent to the support member and comprising two or more point connections are disposed adjacent to the edge of the support member, the strut element includes a first beam and a second beam which extend in a distal direction from the distally facing surface along a first axis wherein the first beam and the second beam intersect one another at a midpoint between the first beam and the second beam to form an intersection; the first beam and the second beam have a rounded edge which has a height that increases from the outer edge of the annular projection to the intersection;

a stopper having a proximal end and a distal end, the stopper attached to the stopper-engaging portion of the plunger rod such that when the distal end of the stopper is in contact with the distal wall of the barrel, the flexible protrusion is permitted to advance distally past the rib in the barrel and lock the plunger rod in the barrel to prevent reuse of the syringe assembly.

2. The syringe assembly of claim 1, wherein the main body of the plunger rod comprises two intersecting transverse members to form a cross-shaped body having four quadrants between the intersecting two transverse members.

3. The syringe assembly of claim 2, wherein the transverse members and the quadrants extend from the distal end to the proximal end of the plunger rod and are intersected by the flexible protrusion, support and frangible portion.

4. The syringe assembly of claim 3, wherein the cross-sectional width of the transverse members decreases from the support to the thumb press.

5. The syringe assembly of claim 1, wherein the strut element is attached to the flexible protrusion at the intersection.

6. The syringe assembly of claim 1, wherein the first beam and the second beam are aligned with the transverse members of the main body of the plunger rod.

7. The syringe assembly of claim 1, wherein a distal end of the rib includes a distal portion facing the distal end of the barrel having a decrease in the cross-sectional width in the interior surface of the barrel to form a barrier to removal of the plunger rod.

8. The syringe assembly of claim 1, further comprising a ramp disposed proximally adjacent to the rib having an increasing cross-sectional width from the rib to the open proximal end of the barrel.

9. The syringe assembly of claim 8, wherein the ramp facilitates advancement of the annular protrusion distally past the rib.

10. The syringe assembly of claim 1, wherein the proximal end of the barrel further comprising a flange.

11. The syringe assembly of claim 1, wherein the barrel further comprising a needle cannula attached to the opening of the barrel.

12. The syringe assembly of claim 1, wherein the connection between the plunger rod and the stopper is frangible.

13. The syringe assembly of claim 1, wherein the flexible protrusion comprises at least two leaves extending radially outwardly from the plunger rod.

14. The syringe assembly of claim 13, wherein the at least two leaves have an arcuate shape that inhibits the flexible protrusion from flexing inwardly after the plunger rod has been locked in the barrel.

15. The syringe assembly of claim 13, wherein the at least two leaves have a tapered outer edge that facilitates movement of the flexible protrusion distally past the rib.

16. The syringe assembly of claim 1, wherein the plunger rod further comprises a second support member disposed at the proximal end of the main body.

17. The syringe assembly of claim 1, wherein the two or more point connections are disposed in an off-set pattern.

18. The syringe assembly of claim 17, wherein the protrusion further includes four leaves disposed such that any two of the four leaves are equidistant from each other and a third point connection and a fourth point connection is misaligned with a third and a fourth leaves, wherein the third point connection and the fourth point connection are disposed adjacent to opposite ends of the outer edge of the support member.

19. The syringe assembly of claim 18, further comprising off-set elements that project radially outward and taper from the transverse members into openings between the transverse members.

20. The syringe assembly of claim 1, wherein the protrusion facilitates distal movement of the plunger rod by flexing in the proximal direction as a force in the distal direction is applied to the plunger rod.

21. The syringe assembly of claim 1, further comprising a gap between the distal end of the stopper and the distal wall of the barrel when the syringe assembly is in an initial position.

22. The syringe assembly of claim 1, wherein the application of a continuous distally directed force to the plunger rod causes the stopper and plunger rod to move together in the distal direction within the barrel until the stopper reaches the distal end of the barrel, thereby allowing the protrusion to advance distally past the rib in the barrel and lock the plunger rod in the barrel to prevent reuse of the syringe assembly.

23. The syringe assembly of claim 1, wherein application of a proximally directed force to the plunger, after the protrusion has advanced distally past the rib, causes the frangible portion of the plunger rod to break.

24. The syringe assembly of claim 1, wherein the two or more point connections are adapted to withstand application of a force on the plunger rod in the distal direction and break upon application of a force in the proximal direction after the flexible protrusion has advanced distally past the rib.

25. The syringe assembly of claim 1, wherein the cross-sectional width of the two or more point connections decreases from the distal end to the proximal end.

26. The syringe assembly of claim 1, wherein the body portion comprises a distal portion having a first cross-sectional width, a proximal portion having a second cross-sectional width that is less than the first cross-sectional width, and a transition portion disposed between the distal portion and the proximal portion, the transition portion having a

transitional cross-sectional width that decreases from the distal portion to the proximal portion.

27. The syringe assembly of claim 1, further comprising a visual indicator on the stopper-engaging portion being fully visible when the stopper-engaging portion is proximally moved relative to the stopper.