CLAIMS

THE INVENTION CLAIMED IS:

1. A fluid path connector for a medical fluid delivery system, the fluid path connector comprising:

a first connector element comprising a body, a first lumen, a first flexible leg, and a second flexible leg; and

a second connector element comprising a body defining an undercut having a sloped surface, a second lumen, a channel defined in the body, and at least one sealing element positioned within the channel,

wherein the first flexible leg comprises a first flange and the second flexible leg comprises a second flange, wherein the first flange and the second flange are each angled inwardly towards a longitudinal axis of the first connector element,

wherein, upon engagement of the first connector element with the second connector element, the first flange and the second flange engage with the sloped surface of the undercut of the body of the second connector element to prevent disengagement of the first connector element and the second connector element, and

wherein the at least one sealing element is configured to define a fluid tight seal between the second lumen of the second connector element and the first lumen of the first connector element to form a fluid path when the first connector element and the second connector element are engaged with one another.

2. The fluid path connector of claim 1, wherein the first connector element and the second connector element are each in fluid communication with a fluid element selected from the group consisting of a syringe, a spike member, a fluid tube set, and a bulk fluid container.

3. The fluid path connector of claim 1 or 2, wherein the first flange and the second flange are each angled at 45-75 degrees relative to the longitudinal axis of the first connector element.

4. The fluid path connector of any of claims 1-3, wherein the first connector element further comprises a first actuating arm associated with the first flexible leg and a second actuating arm associated with the second flexible leg, and

wherein, upon applying an inwardly-directed pressure to the first actuating arm and the second actuating arm, the first flexible leg and the second flexible leg move in an outward direction relative to the body of the second connector element to disengage the first flange and the second flange from the undercut to allow the first connector element and the second connector element to be disengaged.

5. The fluid path connector of claim 4, wherein at least one of the first flexible leg and the second flexible leg include at least one reinforcing rib.

6. The fluid path connector of any of claims 1-5, wherein, when the first connector element and the second connector element are connected to one another, the first connector element and the second connector element are configured to withstand a fluid pressure in the fluid path of at least 800 psi.

7. The fluid path connector of any of claims 1-6,

wherein the first connector element further comprises a support base that extends from the body between the first flexible leg and the second flexible leg, and

wherein the support base is configured to reduce deflection of the body due to a fluid pressure exerted by a fluid moving through the fluid path.

8. The fluid path connector of claim 7, wherein the support base comprises at least one reinforcing rib to reduce deflection of the body due to the fluid pressure exerted by the fluid moving through the fluid path.

9. The fluid path connector of any of claims 1-8, wherein the at least one sealing element is one of the following: an elastomeric O-ring, an overmolded sealing surface, and a quad ring.

10. The fluid path connector of any of claims 1-9, wherein the channel is dimensioned such that the at least one sealing element moves along a longitudinal axis of the second connector element in opposite directions within the channel when the first connector element and the second connector element are engaged and disengaged from one another.

11. The fluid path connector of any of claims 1-10, wherein the at least one sealing element moves between a first position in which the at least one sealing member seals a fluid channel defined in the second connector element to prevent the fluid from flowing through the second connector element and a second position in which the at least one

sealing member is moved out of the fluid channel to permit the fluid to flow through the second connector element.

12. The fluid path connector of any of claims 1-11, wherein at least one of the first connector element and the second connector element further comprises a skirt that surrounds the body of the second connector element.

13. The fluid path connector of claim 12, wherein the skirt extends beyond a distal end of the body of at least one of the first connector element and the second connector element.

14. The fluid path connector of claim 12 or claim 13, wherein at least one aperture is defined in the skirt for the second connector element.

15. The fluid path connector of any of claims 1-14, wherein at least one of the first connector element and the second connector element further comprises a fluid path adaptor configured for connecting the at least one of the first connector element and the second connector element to a fluid delivery element.

16. The fluid path connector of any of claims 1-15, wherein the first connector element comprises a slidable sleeve configured to lock the first flexible leg and second flexible leg when the first connector element is engaged with the second connector element.

17. A medical fluid delivery system, comprising:

a syringe comprising a proximal end, a distal end, and a sidewall extending from the proximal end to the distal end;

a fluid delivery member; and

a fluid path connector, comprising:

a first connector element comprising a body, a first lumen, a first flexible leg, and a second flexible leg; and

a second connector element comprising a body defining an undercut having a sloped surface, a second lumen, a channel defined in the body, and at least one sealing element positioned within the channel,

wherein the first connector element is fluidly connected to one of the fluid delivery member and the distal end of the syringe,

wherein the second connector element is fluidly connected the other of the fluid delivery member and the distal end of the syringe,

wherein the first flexible leg comprises a first flange and the second flexible leg comprises a second flange, wherein the first flange and the second flange are each angled inwardly towards a longitudinal axis of a longitudinal axis of the first connector element,

wherein, upon engagement of the first connector element with the second connector element, the first flange and the second flange engage with the sloped surface of the undercut of the body of the second connector element to prevent disengagement of the first connector element and the second connector element, and

wherein the at least one sealing element is configured to define a fluid tight seal between the second lumen of the second connector element and the first lumen of the first connector element to form a fluid path when the first connector element and the second connector element are engaged with one another.

18. The medical fluid delivery system of claim 17, wherein the first connector element and the second connector element are each in fluid communication with a fluid element selected from the group consisting of a syringe, a spike member, a fluid tube set, and a bulk fluid container.

19. The medical fluid delivery system of claim 17 or 18, wherein the first flange and the second flange are each angled at 45-75 degrees relative to the longitudinal axis of the first connector element.

20. The medical fluid delivery system of any of claims 17-19, the first connector element further comprising a first actuating arm associated with the first flexible leg and a second actuating arm associated with the second flexible leg, and

wherein, upon applying an inwardly-directed pressure to the first actuating arm and the second actuating arm, the first flexible leg and the second flexible leg move in an outward direction relative to the body of the second connector element to disengage the first flange and the second flange from the undercut to allow the first connector element and the second connector element to be disengaged.

21. The medical fluid delivery system of claim 20, wherein at least one of the first flexible leg and the second flexible leg include at least one reinforcing rib.

22. The medical fluid delivery system of any of claims 17-21, wherein, when the first connector element and the second connector element are connected to one another, the first

connector element and the second connector element are configured to withstand up a fluid pressure in the fluid path of at least 800 psi.

23. The medical fluid delivery system of any of claims 17-22, wherein the first connector element further comprises a support base that extends from the body between the first flexible leg and the second flexible leg, and

wherein the support base is configured to reduce deflection of the body due to a fluid pressure exerted by a fluid moving through the fluid path.

24. The medical fluid delivery system of claim 23, wherein the support base comprises at least one reinforcing rib to reduce deflection of the body due to the fluid pressure exerted by the fluid moving through the fluid path.

25. The medical fluid delivery system of any of claims 17-24, wherein the channel is dimensioned such that the at least one sealing element moves along a longitudinal axis of the second connector element in opposite directions within the channel when the first connector element and the second connector element are engaged and disengaged from one another.

26. The medical fluid delivery system of any of claims 17-25, wherein at least one of the first connector element and the second connector element further comprises a skirt that surrounds the body of the first connector element and the body of the second connector element.

27. The medical fluid delivery system of claim 26, wherein the skirt extends beyond a distal end of the body of at least one of the first connector element and the second connector element.

28. The medical fluid delivery system of claim 26 or 27, wherein at least one aperture is defined in the skirt for the second connector element.

29. The medical fluid delivery system of any of claims 17-28, wherein at least one of the first connector element and the second connector element further comprises a fluid path adaptor configured for connecting the at least one of the first connector element and the second connector element to the fluid delivery element.

30. The medical fluid delivery system of any of claims 17-29, wherein the first connector element comprises a slidable sleeve configured to lock the first flexible leg and second flexible leg when the first connector element is engaged with the second connector element.

31. A fluid path connector for a medical fluid delivery system, the fluid path connector comprising:

a first connector element comprising a body defining a first undercut having a first sloped surface, a first flexible leg, and a second flexible leg; and

a second connector element comprising a body defining a second undercut, a third flexible leg, and a fourth flexible leg,

wherein the first flexible leg comprises a first flange, the second flexible leg defines a second flange, the third flexible leg comprises a third flange, and the fourth flexible leg defines a fourth flange, wherein the first flange and the second flange are each angled inwardly towards a longitudinal axis of the first connector element, wherein the third flange and the fourth flange are each angled inwardly toward a longitudinal axis of the second connector element, and

wherein, upon engagement of the first connector element with the second connector element, the first flange and the second flange link into the second sloped surface of the second undercut of the body of the second connector element and the third flange and the fourth flange link into the first sloped surface of the first undercut of the body of the first connector element to ensure the first connector element and the second connector element are prevented from disengaging with one another.

32. The fluid path connector of claim 31, wherein the first flange and the second flange are each angled at 45-75 degrees relative to a longitudinal axis of the first connector element, and

wherein the third flange and the fourth flange are each angled at 45-75 degrees relative to a longitudinal axis of the second connector element.

33. The fluid path connector of any of claims 31-32, wherein the first connector element further comprises a first actuating arm and a second actuating arm,

wherein the second connector element further comprises a third actuating arm and a fourth actuating arm,

wherein, upon applying an inwardly-directed pressure to the first actuating arm and the second actuating arm, the first flexible leg and the second flexible leg move in an

outward direction relative to the body of the second connector element to allow the first connector element and the second connector element to be disengaged, and

wherein, upon applying an inwardly-directed pressure to the third actuating arm and the fourth actuating arm, the third flexible leg and the fourth flexible leg move in an outward direction relative to the body of the second connector element to allow the first connector element and the second connector element to be disengaged.

34. The fluid path connector of claim 33, wherein at least one of the first actuating arm, the second actuating arm, the third actuating arm, and the fourth actuating arm include at least one reinforcing rib.

35. The fluid path connector of any of claims 31-34, wherein, when the first connector element and the second connector element are connected to one another, the first connector element and the second connector element are configured to withstand up a fluid pressure of at least 800 psi.

36. The fluid path connector according to any one of claims 1-17, wherein the first flange of the first flexible leg and the second flange of the second flexible leg each flex radially outward as they pass the undercut of the second connector during an engagement process and return to an unflexed position to contact and engage the undercut of the second connector element to engage and the first connector element with the second connector element, and

wherein the first lumen and the second lumen are in fluid communication in the engaged position.

37. The fluid path connector of claim 36, wherein the first connector and the second connector are non-reversibly engaged when the first flange and the second flange of the first connector element engage the undercut of the second connector element.

38. A fluid path connector for a medical fluid delivery system, the fluid path connector comprising:

a first connector element comprising a body having a support base, a first lumen, a first flexible leg having a first actuating arm, and a second flexible leg having a second actuating arm, wherein at least one of the first flexible leg and the second flexible leg includes at least one reinforcing member; and

a second connector element comprising a body defining an undercut having a sloped surface, a second lumen, a channel defined in the body, and at least one sealing element positioned within the channel,

wherein the first flexible leg comprises a first flange and the second flexible leg comprises a second flange and the first flange and the second flange are each angled inwardly toward a longitudinal axis of the first connector element,

wherein, upon engagement of the first connector element with the second connector element, the first flange and the second flange engage with the sloped surface of the undercut of the body of the second connector element to prevent disengagement of the first connector element and the second connector element,

wherein, upon applying an inwardly-directed pressure to the first actuating arm and the second actuating arm, the first flexible leg and the second flexible leg move in an outward direction relative to the body of the second connector element to disengage the first flange and the second flange from the undercut to allow the first connector element and the second connector element to be disengaged, and

wherein the sealing element is configured to define a fluid tight seal between the second lumen of the second connector element and the first lumen of the first connector element to form a fluid path when the first connector element and the second connector element are engaged with one another.

39. The fluid path connector of claim 38, wherein, when the first connector element and the second connector element are connected to one another, the connection between the first connector element and the second connector element is configured to withstand a fluid pressure in the fluid path of at least 800 psi.

40. A fluid path connector for a medical fluid delivery system, the fluid path connector comprising:

a cover element configured to provide fluid communication between a tubing set and distal tip of a syringe, the cover element comprising:

a body defining a channel to receive the distal tip of the syringe and one or more fluid paths for filling and delivering a medical fluid;

at least one locking arm configured to engage with an engagement feature on the distal tip of the syringe to non-releasably lock the cover element to the syringe,

wherein the engagement feature comprises an undercut in the distal tip of the syringe,

wherein the at least one locking arm is configured to flexibly outwardly engage an outer surface of the distal tip of the syringe as the cover element is slid

proximally onto the distal tip of the syringe, and wherein a locking protrusion on an inner surface of the at least one locking arm non-releasably engages the undercut and the locking arm flexibly inwardly engage the distal tip of the syringe.

41. The fluid path connector of claim 40, wherein the at least one locking arm is connected to the body at a distal end of the locking arm and an outer surface of the locking arm aligns with an outer surface of the cover element.

42. The fluid path connector of claim 41, wherein alignment of the outer surface of the at least one locking arm with the outer surface of the cover element prevents a user from disengagement of the locking protrusion of the at least one locking arm from the undercut.