

CLAIMS

1. A syringe comprising:
a barrel having a proximal end, a distal end, and a sidewall extending substantially circumferentially between the proximal end and the distal end along a longitudinal axis; and
at least one syringe retaining member having at least one lug protruding radially outwardly relative to an outer surface of the sidewall, the at least one lug tapering axially along the outer surface of the sidewall in a direction from the distal end toward the proximal end,
wherein the at least one lug is configured for engagement with a locking mechanism on a fluid injector to releasably lock the syringe with the fluid injector, and
wherein a taper of the at least one lug rotationally guides the syringe into self-orienting alignment with the locking mechanism and axially ejects the syringe upon rotation of the syringe.
2. The syringe of claim 1, wherein the at least one lug comprises a first surface tapered axially along the outer surface of the sidewall in the direction from the distal end toward the proximal end.
3. The syringe of claim 2, wherein the at least one lug further comprises a second surface tapered axially along the outer surface of the sidewall in a direction opposite the first surface.
4. The syringe of claim 3, wherein the at least one lug further comprises a base surface arranged substantially perpendicularly relative to the longitudinal axis.

5. The syringe of claim 4, wherein the at least one lug further comprises at least one surface connecting the first surface and the second surface to the base surface.

6. The syringe of claim 4, wherein at least one of the first surface, the second surface, and the base surface has a shape selected from the group consisting of linear, curved, continuous, discontinuous, and planar.

7. The syringe of claim 1, wherein a plurality of lugs is spaced around at least a portion of the outer surface of the sidewall with equal or unequal angular intervals around the outer surface of the sidewall.

8. The syringe of claim 7, wherein the plurality of lugs is aligned longitudinally at or near the proximal end relative to the longitudinal axis.

9. The syringe of claim 7, wherein at least one of the plurality of lugs is offset toward the proximal end or the distal end of the barrel.

10. The syringe of claim 1, wherein the at least one lug comprises at least one first lug and at least one second lug, and wherein the at least one second lug is same as or different from the at least one first lug.

11. The syringe of claim 10, wherein at least one of the at least one first lug and the at least one second lug comprises an inclined release member protruding from the outer surface of the sidewall to a top surface of the at least one of the at least one first lug and the at least one second lug.

12. The syringe of claim 1, wherein at least one of the at least one lug comprises one or more locking tabs having at least one stop surface for preventing a rotation of the syringe within the locking mechanism.

13. The syringe of claim 1, wherein the at least one of the at least one lug comprises at least one radially inwardly recessed hollow portion.

14. The syringe of claim 1, further comprising at least one flange protruding radially outwardly from the outer surface of the sidewall relative to the longitudinal axis and extending circumferentially around at least a portion of the outer surface of the sidewall.

15. The syringe of claim 14, further comprising a longitudinal stop surface on the at least one flange for limiting a length of a longitudinal insertion of the syringe into the locking mechanism.

16. The syringe of claim 1, wherein the at least one lug has a shape having a triangle-shaped, arrowhead-shaped, rectangular, or rounded outline.

17. A syringe comprising:

a barrel having a proximal end, a distal end, and a sidewall extending substantially circumferentially between the proximal end and the distal end along a longitudinal axis; and

at least one lug protruding radially outwardly relative to an outer surface of the sidewall, the at least one lug having at least one surface tapering axially along the outer surface of the sidewall in a direction from the distal end toward the proximal end,

wherein the at least one lug is configured for engagement with a locking mechanism on a fluid injector to releasably lock the syringe with the fluid injector, and

wherein the at least one surface rotationally guides the syringe into self-orienting alignment with the locking mechanism and wherein the at least one surface axially ejects the syringe upon rotation of the syringe.

18. A syringe comprising:

a barrel having a proximal end, a distal end, and a sidewall extending substantially circumferentially between the proximal end and the distal end along a longitudinal axis; and

a plurality of lugs protruding radially outwardly relative to an outer surface of the sidewall and spaced around at least a portion of the outer surface of the sidewall, at least one of the plurality of lugs comprising:

a first surface tapered axially along the outer surface of the sidewall in a direction from the distal end toward the proximal end;

a second surface tapered axially along the outer surface of the sidewall in a direction opposite the first surface;

a base surface arranged substantially perpendicularly relative to the longitudinal axis; and

at least one surface connecting the first surface and the second surface to the base surface,

wherein at least one of the plurality of lugs is configured for engagement with a locking mechanism on a fluid injector to releasably lock the syringe with the fluid injector, and

wherein at least one of the first surface and the second surface rotationally guides the syringe into self-orienting alignment with the locking mechanism, and

wherein at least one of the first surface and the second surface axially ejects the syringe upon rotation of the syringe.

19. A fluid injection apparatus, comprising:
at least one syringe comprising a cylindrical barrel with a distal end, a proximal end, a sidewall, and a longitudinal axis extending between the distal end and the proximal end, the barrel having at least one lug protruding radially outwardly from an outer surface of the sidewall, the at least one lug having a surface tapered axially in a direction toward the proximal end;
an injector comprising an injector housing defining at least one syringe port for receiving the at least one syringe;
and
a locking mechanism associated with the at least one syringe port for securing the at least one syringe within the at least one syringe port, the locking mechanism configured for engaging the at least one lug of the at least one syringe to releasably lock the at least one syringe within the at least one syringe port,
wherein the tapered surface of the at least one lug rotationally guides the at least one syringe into self-orienting alignment with the locking mechanism and axially ejects the at least one syringe upon rotation of the at least one syringe.

20. The fluid injection apparatus of claim 19, wherein the locking mechanism comprises:

- a housing having a proximal end, a distal end, and a central opening extending therebetween;
- a first retaining ring at the distal end of the housing; and
- a second retaining ring within the central opening of the housing between the proximal end of the housing and the first retaining ring,

wherein the second retaining ring is selectively rotatable relative to the first retaining ring to operatively engage the at least one lug of the at least one syringe.

21. The fluid injection apparatus of claim 20, wherein the first retaining ring has at least one first recess configured to receive the at least one lug of the at least one syringe when the proximal end of the at least one syringe is inserted into the at least one syringe port.

22. The fluid injection apparatus of claim 21, wherein the at least one first recess has at least one guide surface for guiding the at least one lug of the at least one syringe into the at least one first recess, and wherein at least one lateral surface of the at least one first recess defines a guide path for guiding a movement of the at least one lug within the at least one first recess.

23. The fluid injection apparatus of claim 22, wherein the at least one guide surface is radially angled or curved relative to the longitudinal axis in a direction from the distal end toward the proximal end of the first retaining ring.

24. The fluid injection apparatus of claim 20, wherein a plurality of lugs is spaced around at least a portion of the outer surface of the sidewall of the at least one syringe, and

wherein a plurality of first recesses is spaced apart around at least a portion of an inner surface of the first retaining ring.

25. The fluid injection apparatus of claim 20, wherein the second retaining ring has one or more locking elements on at least a portion of an inner sidewall of the second retaining ring.

26. The fluid injection apparatus of claim 25, wherein the one or more locking elements are separated by one or more second recesses.

27. The fluid injection apparatus of claim 26, wherein at least one of the one or more second recesses is configured to receive the at least one lug of the at least one syringe when the proximal end of the at least one syringe is inserted through the first retaining ring.

28. The fluid injection apparatus of claim 20, wherein the first retaining ring comprises one or more first recesses and the second retaining ring comprises one or more second recesses configured for receiving the at least one lug upon rotation of the second retaining ring into selective alignment with the one or more first recesses.

29. The fluid injection apparatus of claim 20, further comprising a third retaining ring between the first retaining ring and the second retaining ring.

30. The fluid injection apparatus of claim 20, wherein at least one elastically resilient member is coupled with the second retaining ring.