CLAIMS

The invention claimed is:

1. A syringe device comprising :

a syringe barrel;

a piston having a first end insertable within the syringe barrel, a second end opposing the first end, and an overall length defined between the first an second ends;

a vial port disposed within the piston configured to receive a vial in lengthwise orientation along a portion of the overall length of the piston; and

a fluid passageway extending through the piston from the vial port through the first end.

2. The syringe device of claim 1 further comprising a piercing structure disposed in fluid communication with the fluid passageway.

3. The syringe device of claim 1 further comprising a valve associated with the fluid passageway.

4. The syringe device of claim 1 wherein the vial port is configured to receive a vial through an opening along a side of the piston.

5. The syringe device of claim 1 wherein the vial port is configured to receive a vial through an opening in the second end of the piston.

6. The syringe device of claim 1 wherein the piston comprises a hinge, and wherein the vial port is configured to receive a vial by inserting the while the hinge is in an open position and to retain the vial while the hinge is in a closed position.

7. The syringe device of claim 1 further comprising a piston seal disposed at the first end of the piston, the piston seal being over-molded onto a stem portion of the piston.

8. A syringe piston comprising:

a stem portion having one or more projections; and

a seal portion over-molded onto the stem portion and covering the one or more projections.

9. The syringe piston of claim 8 further comprising:

a fluid passageway through at least a portion of a length of the piston stem; and an opening through the over-molded seal portion.

10. The syringe piston of claim 8 wherein the stem comprises a first portion and a second portion, and wherein the seal is over-molded onto the first potion prior to joining the first and second portions.

11. The syringe piston of claim 10 wherein the fist and second stem portions have differing diameters relative to each other.

12. A syringe device comprising :
a syringe barrel;
a syringe piston having a first end insertable within the syringe barrel, and a second end opposing the first end;
a vial housing associated with and extending from the second end of the piston; and
a piercing structure associated with the second end of the piston and extending into the vial housing.

13. The syringe device of claim 12 wherein the vial housing comprises a first part attached to the second end of the piston and a second part joinable to the first part.

14. The syringe device of claim 13 wherein the first part is attached permanently to the second end of the piston.

15. The syringe device of claim 13 wherein the first part is reversibly attached to the second end of the piston.

16. The syringe device of claim 13 wherein the second part of the housing comprises an appendage configured to insert into a slot in a syringe pump.

17. A syringe device comprising:
a syringe barrel;
a piston sleeve;
a sleeve insert having a first end insertable within the sleeve, an opposing second end, and a length defined by the distance between the first and second ends;
a fluid channel extending along an exterior side of the sleeve insert from the first end at least a portion of the length of the sleeve insert; and
a rotary valve controlling fluid communication between the fluid channel and the syringe barrel.

18. The syringe device of claim 17 wherein the rotary valve is configured to establish fluid communication between the syringe barrel and the fluid channel by rotation of the sleeve insert relative to the piston sleeve.

19. The syringe device of claim 17 further comprising a vial housing associated with the second end of the sleeve insert.

20. The syringe device of claim 17 further comprising a piston seal over-molded onto the piston sleeve.

21. A syringe device comprising :
a syringe barrel;
a piston sleeve;
a sleeve insert having a first end insertable within the sleeve, an opposing second end, and a length defined by the distance between the first and second ends;
a compartment disposed within the sleeve insert; and
a valve controlling fluid communication between the compartment and the syringe barrel.

22. The syringe device of claim 21 wherein the valve is configured to establish fluid communication between the syringe barrel and the compartment by rotation of the sleeve insert relative to the piston sleeve.

23. The syringe device of claim 21 wherein the sleeve comprises an over-molded seal.

24. The syringe device of claim 21 wherein the sleeve insert comprises a tip portion and a body portion, and further comprising a seal over-molded onto the tip potion and onto the piston sleeve.

25. The syringe device of claim 24 wherein the body portion irreversibly attaches to the tip portion of the sleeve insert.

26. A medication agent preparation system comprising: a syringe comprising:
a syringe barrel having an internal chamber; and
a piston having a first end, a second end, and a fluid passageway passing longitudinally through the piston, at least a portion of the piston comprising the first end being inserted within the chamber; and
a valve associated with the fluid passageway, the valve comprising a valve body and a cap over-molded onto the valve body.

27. The system of claim 26 wherein the valve body comprises at least one projection, and wherein the at least one projection is cover by the over-molded cap.

28. The system of claim 26 wherein the cap comprises an elastomeric material and the valve body comprises a hard-plastic material.

29. The system of claim 26 further comprising:
a piercing structure associated with the second end of the piston, and comprising a fluid channel and a tip;
a vial disposed proximate the piercing structure;
a first component of a medication agent disposed within the internal chamber; and a second component of the medication agent disposed within the vial.

30. The system of claim 29 wherein the valve selectively isolates the first component from the second component.

31. A method of preparing a medication agent for administration to an individual, comprising:
providing a syringe comprising a syringe barrel and a piston disposed at an initial position relative to the syringe barrel, the piston comprising a piston sleeve and a sleeve insert; providing a first component within the syringe barrel;
providing a second component within a vial; providing a valve associated with a fluid passageway between the vial and the syringe barrel, the valve being initially provided in a closed position, blocking fluid passage through the passageway; repositioning the valve; sliding the piston to join the first component with the second component; mixing the first and second component to form a medication agent; and
drawing the medication agent into the syringe barrel.

32. The method of claim 31 wherein the valve is a rotary valve actuated by rotation of the piston sleeve relative to the sleeve insert.

33. The method of claim 31 wherein the fluid passageway comprises a channel disposed along a sidewall surface of the sleeve insert.

34. The method of claim 33 wherein the piston further comprises a seal over-molded onto the piston sleeve, the seal having an opening alignable with the channel by rotation of the sleeve insert relative to the piston sleeve.

35. The method of claim 31 further comprising:
providing a piercing structure associated with the piston insert; and
prior to repositioning the valve, utilizing the piercing structure to pierce a septum comprised by the vial.

36. A method of preparing a composition comprising;
providing a syringe barrel having a barrel chamber containing a first component;
providing a piston having a compartment containing a second component, the piston comprising: a piston sleeve;
a sleeve insert comprising a tip and a body; and
a seal over-molded onto the tip and an end of the piston sleeve, the seal having at least one opening passing therethrough;
rotating the piston sleeve relative to the insert to establish fluid communication between the compartment and the barrel chamber;
sliding the piston to join the first and second components;
mixing the first and second components to form a composition; and
drawing the composition into the syringe chamber.

37. The method of claim 36 wherein the first component comprises a liquid.

38. The method of claim 36 wherein the second component comprises a lyophilized substance.

39. The method of claim 36 wherein sleeve insert further comprises an appendage configured for insertion into a slot in a syringe pump.

40. The method of claim 36 wherein the tip is permanently attached to the body of the sleeve insert.

41. The method of claim 36 wherein the seal comprises an elastomeric material.

The invention claimed is:

1. A syringe device comprising:
a syringe barrel;
a piston having a first end insertable within the syringe barrel, and a second end opposing the first end;
a vial housing comprising a first part and a second part, the first part disposed within the piston and configured to receive a capped end of a vial in lengthwise orientation along a portion of the overall length of the piston, the second part configured to engage both a base of the vial and the first part, the second part further defining an appendage comprising a stem supporting a disk, the appendage configured to engage a syringe pump;
a fluid passageway extending through the piston from the first part through the first end;
a valve having a valve body having a longitudinal axis, the valve body extending through an opening in a side of the piston, the longitudinal axis orthogonally traversing the fluid passageway; and
a piercing structure associated with the second end of the piston and extending into the vial housing.

2. The syringe device of claim 1 wherein the second part is joinable to the first part.

3. The syringe device of claim 1 wherein the first part is attached permanently to the second end of the piston.

4. The syringe device of claim 1 wherein the first part is reversibly attached to the second end of the piston.