CLAIMS

1. An auto-injector, comprising:

a container capable of comprising a medicament;

a shuttle coupled to the container and on a horizontal path with a first state and a second state;

an energy source configured to release energy to translate the container and to translate the shuttle, preferably the energy source is pressurized fluid from a can;

an impediment preventing horizontal movement of the shuttle before activation of the auto-injector; and

a needle having

a first end configured to extend out of the auto-injector, and

a second end configured to extend into the container, wherein the second end of the needle and the container are not in fluid communication with one another before activation of the auto-injector;

and the energy is released from the energy source after:

a. the auto-injector is activated; and

b. the shuttle moves along its path, whereby

i. the container and the second end of the needle are put into fluid communication with one another, and

ii. the first end of the needle extends out of the auto-injector.

2. The auto-injector of claim 1, wherein activation of the auto-injector allows for movement of an actuator from its first location to its second location, whereby

the actuator contacts a portion of the energy source, preferably a can, to release energy, preferably as a pressurized fluid.

3. The auto-injector of claim 2, wherein the actuator is interlocked with the impediment before the auto-injector is activated.

4. The auto-injector of claim 3, wherein movement of the actuator from its first location to its second location is horizontal and, the release of energy from the

energy source causes the shuttle to move horizontally from its first state to its second state.

5. The auto-injector of claim 4, further including:

a driver that can traverse the auto-injector vertically, is coupled to the needle, and has a first position, a second position, and a third position; and

a gear movable by the shuttle,

wherein horizontal movement of the shuttle from its first state toward its second state causes the gear to rotate and the driver to move vertically from its first position to its second position, and the vertical movements and horizontal movements are substantially perpendicular to one another.

6. The auto-injector of claim 5, further including a housing enclosing the container, the shuttle, the energy source, and at least a portion of the needle, wherein the first end of the needle is positioned:

within the housing when the driver is in the first position;

outside of the housing when the driver is in the second position; and

within the housing when the driver is in the third position.

7. The auto-injector of claim 5, wherein the actuator at its first location comprises

a resilient member that is movable from a first energy-storing state to a first energy-released state and is capable of translating the actuator from its first location to its second location, respectively.

8. The auto-injector of claim 7, wherein upon release of the energy, preferably a pressurized fluid from the energy source, the resilient member is moved from its first energy-released state toward a second energy-storing state by the shuttle and by the actuator, causing vertical translation of the first end of the needle to outside of the housing.

9. The auto-injector of claim 8, wherein after a threshold amount of energy is released, the resilient member is moved from the second energy-storing

state toward a second energy-released state, causing vertical translation of the first end of the needle into the housing.

10. The auto-injector of claim 9, wherein after the threshold amount of energy is released, movement of the resilient member from the second energy-storing state toward the second energy-released state, urges the shuttle to move in the horizontal direction from its second state toward its first state, causing rotation of the gear in a second rotational direction that is opposite of the first rotational direction, thereby causing the driver to move vertically from the second position, to the third position.

11. The auto-injector of claim 8, wherein the first energy-storing state and the second energy-storing state are the same location within the housing.

12. The auto-injector of claim 8, wherein the first energy-storing state and the second energy-storing state are different locations within the housing.

13. The auto-injector of claim 9, wherein the first energy-released state and the second energy-released state are the same location within the housing.

14. The auto-injector of claim 9, wherein the first energy-released state and the second energy-released state are different locations within the housing.

15. The auto-injector of claim 7, wherein the resilient member is a spring.

16. The auto-injector of claim 15, wherein the spring is the only spring contained within the auto-injector.

17. The auto-injector of claim 15, wherein the energy-storing state is a compressed position of the spring, and the energy-release state is an expanded position of the spring.

18. The auto-injector of claim 2, further including a resilient member, movable from an energy-storing state to an energy-released state, wherein the resilient member moves the activator from the first location to the second location by moving from the energy-storing state to the energy-released state.

19. The auto-injector of claim 18, wherein the resilient member is moved from the energy-released state toward another energy-storing state by the shuttle and by the activator upon release of energy, preferably pressurized fluid from the fluid source.

20. The auto-injector of claim 19, wherein after a threshold amount of pressurized fluid is released from the fluid source, the resilient member is moved from the second energy-storing state toward its second energy-released state, causing translation of the first end of the needle into an interior of the auto-injector.

21. The auto-injector of claim 1, wherein energy released from the energy source acts against the container and moves the container into fluid communication with the needle.

22. The auto-injector of claim 1, wherein before the auto-injector is activated, a first stop prevents the shuttle from moving and prevents the container from moving into fluid communication with the needle.

23. The auto-injector of claim 22, wherein the first stop abuts a surface of the shuttle before the auto-injector is activated.

24. The auto-injector of claim 1, wherein the auto-injector is activated by a button configured to be depressed by a user.

25. An auto-injector, comprising:

a container capable of comprising a medicament;

an energy source that is configured to translate the container and a shuttle within the auto-injector, wherein the energy source is preferably a pressurized fluid;

a needle having a first end configured to extend out of the auto-injector, and a second end configured to extend into the container, wherein, before activation of the auto-injector, the second end of the needle and the container are not in fluid communication with one another; and

a resilient member movable between an energy-storing state and an energy-released state, wherein 1) a first movement of the resilient member from the energy-storing state to the energy-released state can cause a release of pressurized fluid from the energy source, that results in 2) a second movement of the resilient member from its energy-released state toward a second energy-storing state, followed by 3) a third movement of the resilient member toward a second energy-released state that causes the first end of the needle to retract into the auto-injector from outside of the auto-injector.

26. The auto-injector of claim 25, wherein the resilient member is a spring.

27. The auto-injector of claim 26, wherein the spring is the only spring contained within the auto-injector.

28. The auto-injector of claim 5, wherein the gear moveable by the shuttle includes:

a first gear portion and a second gear portion that rotate about a same axis, wherein the first gear portion and the second gear portion have different diameters.

29. The auto-injector of claim 28, wherein the first gear portion has a larger diameter than the second gear portion.

30. The auto-injector for claim 28, wherein the second gear portion has a larger diameter than the first gear portion.

31. The auto-injector of claim 28, wherein the driver further comprises a driver rack gear configured to engage with the first gear portion.

32. The auto-injector of claim 31, wherein the shuttle further comprises a shuttle rack gear configured to engage with the second gear portion.

33. The auto-injector of claim 22, wherein before the auto-injector is activated, a second stop prevents the button from being depressed by a user.

34. The auto-injector of claim 33, further including a tab coupled to an outer surface of the auto-injector before the auto-injector is activated, wherein the tab includes the second stop.

35. The auto-injector of claim 34, wherein the tab must be removed from the auto-injector to enable the button to be depressed by the user.

36. The auto-injector of claim 1, further including a first indicator, wherein the first indicator is visible from outside of the housing before the auto-injector is activated.

37. The auto-injector of claim 36, wherein the first indicator is positioned on the shuttle.

38. The auto-injector of claim 37, further including a second indicator, wherein the second indicator is visible from outside of the housing only after the auto-injector is activated.

39. The auto-injector of claim 38, wherein the second indicator is positioned on the shuttle, and is visible from outside of the housing only after the release of energy from the energy source moves the shuttle from the first state to the second state.

40. The auto-injector of claim 38, further including a third indicator, wherein the third indicator is visible from outside the housing only after an injection performed by the auto-injector is complete.

41. The auto-injector of claim 40, further including an indicator slide that is 1) uncoupled from the shuttle before activation of the auto-injector, and 2) becomes coupled to the shuttle when the shuttle moves from the first state to the second state, and wherein the third indicator is positioned on the indicator slide.

42. The auto-injector of claim 41, wherein movement of the shuttle from the second state back toward the first state also moves the indicator slide in a same direction so that the third indicator is visible from outside of the auto-injector.

43. The auto-injector of claim 8, wherein movement of the shuttle from its first state to its second state:

causes the shuttle to contact and push the actuator in the same direction;

transition the resilient member from its first energy-released state toward its second energy-storing state; and

causes movement of the driver and extension of the first end of the needle outside of the housing.

44. The auto-injector of claim 10, wherein movement of the resilient member from the second energy-storing state toward the second energy-released state urges the actuator into direct contact with the shuttle during horizontal movement of the shuttle from its second state toward its first state to cause rotation of the gear and retraction of the first end of the needle into the auto-injector.

45. The auto-injector of claim 22, wherein the auto-injector is activated by a button configured to be depressed by a user, and the button includes the first stop.

46. The auto-injector of claim 6, wherein:

the housing includes a third stop;

the auto-injector further includes an indicator slide configured to facilitate visibility of an indicator from outside of the auto-injector; and

the third stop maintains a position of the indicator slide so that horizontal movement of the shuttle locks the shuttle to the indicator slide.

47. The auto-injector of claim 1, further including a valve assembly coupled to the container, the valve assembly including a diaphragm having a unitary central body with an outer rim extending outwardly from the central body and about a periphery of the central body.

48. The auto-injector of claim 47, wherein the diaphragm includes a raised portion located at a radially center position of the central body, the raised portion having a thickness protruding outward from the central body at a distance that is greater than an extension of the outer rim relative to the central body.

49. An auto-injector, comprising:

a housing;

a container disposed in the housing and storing a medicament;

a fluid source disposed in the housing and storing a pressurized medium; and

a fluid conduit disposed in the housing and selectively coupled to the container to receive the medicament,

wherein the fluid conduit is configured to extend out of the housing and deliver the medicament from the container in response to the fluid source releasing the pressurized medium to expel the medicament.

50. An auto-injector, comprising:

a housing;

a container disposed in the housing and storing a medicament;

a fluid source disposed in the housing and storing a pressurized medium;

a fluid conduit disposed in the housing and selectively coupled to the container to receive the medicament, wherein the fluid conduit is configured to extend out of the housing and deliver the medicament from the container in response to the fluid source releasing the pressurized medium to expel the medicament; and

a drive system including a plurality of pressure lines and configured to generate a drive force to deliver the medicament from the container.

51. An auto-injector, comprising:

a housing;

a container disposed in the housing and storing a medicament;

a fluid source disposed in the housing and storing a pressurized medium; and

a fluid conduit disposed in the housing and selectively coupled to the container to receive the medicament, wherein the fluid conduit is configured to extend out of the housing and deliver the medicament from the container in response to the fluid source releasing the pressurized medium to expel the medicament; and

a valve assembly disposed in the housing and including a high pressure body portion, a low pressure body portion, and a diaphragm positioned between the high pressure body portion and the low pressure body portion, wherein the fluid source is coupled to the valve assembly via one or more pressure lines.

52. An auto-injector, comprising:

a housing;

a container disposed in the housing and storing a medicament;

a fluid source disposed in the housing and storing a pressurized medium;

a fluid conduit disposed in the housing and selectively coupled to the container to receive the medicament, wherein the fluid conduit is configured to extend out of the housing and deliver the medicament from the container in response to the fluid source releasing the pressurized medium to expel the medicament;

a valve assembly disposed in the housing and coupled to the fluid source via one or more pressure lines; and

a regulator disposed within the valve assembly and including a flange, a rod extending outwardly from the flange, a conduit extending through the rod and the flange, and a resilient member disposed about the rod and abutting against the flange.

53. An auto-injector, comprising:

a housing;

a container disposed in the housing and storing a medicament;

a fluid source disposed in the housing and storing a pressurized medium;

a fluid conduit disposed in the housing and selectively coupled to the container to receive the medicament, wherein the fluid conduit is configured to

extend out of the housing and deliver the medicament from the container in response to the fluid source releasing the pressurized medium to expel the medicament; and

a shuttle actuator movably coupled to the container such that the shuttle actuator is configured to move the container within the housing.

54. An auto-injector, comprising:

a housing;

a container disposed in the housing and storing a medicament;

a fluid source disposed in the housing and storing a pressurized medium;

a fluid conduit disposed in the housing and selectively coupled to the container to receive the medicament, wherein the fluid conduit is configured to extend out of the housing and deliver the medicament from the container in response to the fluid source releasing the pressurized medium to expel the medicament; and

a can actuator configured to contact the fluid source when moving from a first position towards a second position, thereby transitioning the fluid source from a closed configuration towards an open configuration.

55. An auto-injector, comprising:

a housing;

a container disposed in the housing and storing a medicament;

a fluid source disposed in the housing and storing a pressurized medium;

a fluid conduit disposed in the housing and selectively coupled to the container to receive the medicament, wherein the fluid conduit is configured to extend out of the housing and deliver the medicament from the container in response to the fluid source releasing the pressurized medium to expel the medicament; and

a carrier configured to receive at least a portion of the fluid conduit, such that a position of the fluid conduit is maintained within the housing by the carrier.

56. An auto-injector, comprising:

a housing;

a container disposed in the housing and storing a medicament;

a fluid source disposed in the housing and storing a pressurized medium;

a fluid conduit disposed in the housing and selectively coupled to the container to receive the medicament, wherein the fluid conduit is configured to extend out of the housing and deliver the medicament from the container in response to the fluid source releasing the pressurized medium to expel the medicament; and

a driver including a first rack that is configured to mesh with a gear, the driver configured to extend the fluid conduit out of the housing in response to the gear rotating in a first direction.

57. An auto-injector, comprising:

a housing;

a container disposed in the housing and storing a medicament;

a fluid source disposed in the housing and storing a pressurized medium; and

a fluid conduit disposed in the housing and selectively coupled to the container to receive the medicament,

wherein the fluid conduit is configured to extend out of the housing and deliver the medicament from the container in response to the fluid source releasing the pressurized medium to expel the medicament, and

wherein the housing includes at least one opening along a bottom cover of the housing, and the fluid conduit is configured to extend out of the housing via the at least one opening along the bottom cover.

58. An auto-injector, comprising:

a housing;

a container disposed in the housing and storing a medicament;

a fluid source disposed in the housing and storing a pressurized medium; and

a fluid conduit disposed in the housing and coupled to the container to receive the medicament,

wherein the fluid conduit is configured to extend out of the housing, and

wherein the medicament is delivered from the container in response to the fluid source releasing the pressurized medium to expel the medicament.

59. An auto-injector, comprising:

a housing;

a container configured to store a medicament;

a fluid source configured to store a pressurized fluid; and

a valve assembly fluidly coupled to the fluid source and the container, the valve assembly configured to regulate the pressurized fluid directed from the fluid source towards the container to expel the medicament from the housing, the valve assembly including a first cavity, a second cavity, and a diaphragm positioned between the first cavity and the second cavity,

wherein, in response to the fluid source releasing the pressurized fluid, a pressure differential is generated within the valve assembly such that the diaphragm is urged away from the first cavity and towards the second cavity to direct the pressurized fluid towards the container through the first cavity, and

wherein, in response to the fluid source ceasing release of the pressurize fluid, the pressure differential within the valve assembly equalizes such that the diaphragm is urged away from the second cavity and towards the first cavity to vent the pressurized fluid into the housing through the second cavity.

60. An auto-injector, comprising:

a housing;

a container disposed within the housing and storing a medicament;

a fluid source disposed within the housing and storing a pressurized fluid; and

a valve assembly disposed within the housing and in fluid communication with each of the fluid source and the container, the valve assembly including a first body, a second body coupled to the first body, and a diaphragm coupled between the first body and the second body;

wherein the valve assembly is configured to form a pressure differential between the first body and the second body, the diaphragm is configured to move away from the first body and towards the second body in response to the fluid source releasing the pressurized fluid into the valve assembly, and the first body is configured to direct the pressurized fluid towards the container for delivering the medicament out of the housing, and

wherein the valve assembly is configured to equalize the pressure differential between the first body and the second body, the diaphragm is configured to move away from the second body and towards the first body in response to the fluid source

ceasing release of the pressurize fluid into the valve assembly, and the second body is configured to direct the pressurized fluid into the housing for venting.

61. An auto-injector, comprising:

a housing;

a container storing a medicament;

a fluid source storing a pressurized fluid; and

a valve assembly fluidly coupled to the fluid source and the container, the valve assembly including a diaphragm that is moveable between a high pressure cavity and a low pressure cavity,

wherein the fluid source is configured to generate a pressure differential within the valve assembly to move the diaphragm away from the high pressure cavity and into the low pressure cavity in response to releasing the pressurized fluid into the valve assembly, wherein a portion of the pressurized fluid is directed by the high pressure cavity towards the container for delivering the medicament out of the housing, and

wherein the fluid source is configured to equalize the pressure differential within the valve assembly to move the diaphragm away from the low pressure cavity and towards the high pressure cavity in response to terminating further release of the pressurize fluid into the valve assembly, wherein the pressurized fluid released into the valve assembly is directed by the low pressure cavity into the housing for venting.