

What is claimed is:

1. A drug delivery device comprising:
 - a housing having an opening;
 - a drug storage container including a delivery member having an insertion end configured to extend at least partially through the opening in the housing;
 - a plunger;
 - a drive mechanism activatable to drive the plunger in a distal direction to expel a drug from the drug storage container through the delivery member;
 - a guard moveably disposed adjacent to the opening and operably coupled to the drive mechanism, wherein moving the guard in a proximal direction relative to the housing causes the guard to directly or indirectly activate the drive mechanism; and
 - a lock disposed at least partially within the guard and rotatable between a first rotational position wherein the lock permits movement of the guard in the proximal direction and a second rotational position wherein the lock limits movement of the guard in the proximal direction.
2. The drug delivery device of claim 1, comprising a container holder fixed relative to the housing, the drug storage container being disposed at least partially within the container holder.
3. The drug delivery device of claim 2, wherein one of the lock and the container holder includes a cam and the other one of the lock and the housing includes a cam follower.
4. The drug delivery device of claim 3, including a biasing member configured to bias the cam follower against the cam to urge the lock to rotate from the first rotational position toward the second rotational position.
5. The drug delivery device of claim 4, wherein the biasing member exerts a proximally directed biasing force on the lock.
6. The drug delivery device of claim 1, wherein one of the lock and the housing includes a cam and the other one of the lock and the housing includes a cam follower.
7. The drug delivery device of claim 6, comprising a biasing member configured to bias the cam follower against the cam to urge the lock to rotate from the first rotational position toward the second rotational position.
8. The drug delivery device of claim 7, wherein the biasing member exerts a proximally directed biasing force on the lock.
9. The drug delivery device of any one of claims 1 to 8, the lock including a distally facing abutment surface selectively engageable with a proximally facing abutment surface of the guard.
10. The drug delivery device of any one of claims 1 to 9, the guard having an extended position wherein the guard extends at least partially through the opening in the housing and a retracted position wherein the guard is disposed away from the extended position toward the housing.

11. The drug delivery device of claim 10, comprising a first projection extending outwardly from the lock and a second projection extending inwardly from the guard, wherein the first and second projections engage one another to retain the lock in the first rotational position.

12. The drug delivery device of claim 11, wherein the second projection slides out of engagement with the first projection to allow the lock to rotate away from the first rotational position toward the second rotational position when the guard moves from the extended position to the retracted position.

13. The drug delivery device of claim 12, comprising:
a third projection distal to the second projection and extending inwardly from the guard; and
a fourth projection distal to the first projection and extending outwardly from the lock,
wherein the third and fourth projections engage one another to retain the lock in an intermediate rotational position between the first and second rotational positions when the guard moves from the extended position to the retracted position.

14. The drug delivery device of claim 13, wherein the third projection slides out of engagement with the fourth projection to allow the lock to rotate from the intermediate rotational position to the second rotational position when the guard moves from the retracted position to the extended position.

15. An arrangement for a drug delivery device, the arrangement comprising:
a guard configured to selectively cover an insertion end of a delivery member of the drug delivery device, the guard having an extended position wherein the guard extends at least partially through an opening in a housing of the drug delivery device and a retracted position wherein the guard is disposed away from the extended position;
a lock rotatable between a first rotational position wherein the lock permits movement of the guard from the extended position to the retracted position and a second rotational position wherein the lock limits movement of the guard from the extended position to the retracted position.

16. The arrangement of claim 15, the lock including a cam follower configured to engage a cam included in the drug delivery device.

17. The arrangement of claim 16, comprising a biasing member configured to bias the cam follower against the cam to urge the lock to rotate from the first rotational position toward the second rotational position.

18. The arrangement of claim 17, the biasing member being configured to bias the guard toward the extended position.

19. The arrangement of any one of claims 15 to 18, the guard having a distal end and a proximal end, the lock being disposed at least partially within the proximal end of the guard.

20. The arrangement of claim 19, the lock including a distally facing abutment surface and the guard including a proximally facing abutment surface, wherein the distally facing abutment surface of the lock is rotationally aligned with and arranged in opposition to the proximally facing abutment surface of the guard when the lock is in the second rotational position.

21. The arrangement of any one of claims 15 to 20, comprising a first projection extending outwardly from the lock and a second projection extending inwardly from the guard, wherein the first and second projections engage one another to retain the lock in the first rotational position.

22. The arrangement of claim 21, wherein the second projection slides out of engagement with the first projection to allow the lock to rotate away from the first rotational position toward the second rotational position when the guard moves from the extended position to the retracted position.

23. The arrangement of claim 22, comprising:
a third projection distal to the second projection and extending inwardly from the guard; and
a fourth projection distal to the first projection and extending outwardly from the lock,
wherein the third and fourth projections engage one another to retain the lock in an intermediate rotational position between the first and second rotational positions when the guard moves from the extended position to the retracted position.

24. The arrangement of claim 23, wherein the third projection slides out of engagement with the fourth projection to allow the lock to rotate from the intermediate rotational position to the second rotational position when the guard moves from the retracted position to the extended position.

25. The arrangement of any one of claims 15 to 24, the lock including a ring disposed at least partially within the guard.

26. The arrangement of any one of claims 15 to 25, the guard having first opening and the lock having a second opening, the first and second openings being aligned with each other when the lock is in the first rotational position.

27. The arrangement of claim 26, wherein the lock is disposed at least partially within the guard.

28. The arrangement of any one of claims 26 or 27, wherein the guard includes a wall extending between a proximal end of the guard and a distal end of the guard, the first opening being formed in the wall.

29. The arrangement of any one of claims 26 to 28, wherein the first and second openings are not aligned with each other when the lock is in the second rotational position.

30. A drug delivery device comprising:
a housing having an opening;
a drug storage container including a delivery member having an insertion end configured to extend at least partially through the opening in the housing;
a plunger;
a drive mechanism activatable to drive the plunger to expel a drug from the drug storage container through the delivery member; and
an indicator operably coupled to the drive mechanism to generate a continuous or repeating audible signal during drug delivery, and to cease generating the continuous or repeating audible signal when drug delivery is complete.

31. The drug delivery device of claim 30, the indicator being rotatable relative to the housing.

32. The drug delivery device of claim 31, wherein activating the drive mechanism causes the drive mechanism to rotate the indicator relative to the housing.

33. The drug delivery device of claim 32, wherein the drive mechanism ceases rotating the indicator when drug delivery is complete.

34. The drug delivery device of any one of claims 32 or 33, the drive mechanism including a rotational biasing member initially held in an energized state and a mechanical linkage operably coupling the rotational biasing member and the plunger, wherein the mechanical linkage is configured to rotate as the rotational biasing member de-energizes.

35. The drug delivery device of claim 34, the mechanical linkage including a plunger guide having a proximal end and a distal end, the plunger being at least partially disposed within the distal end of the plunger guide, the proximal end of the plunger guide being coupled to the indicator such that the indicator rotates jointly with the plunger guide.

36. The drug delivery device of any one of claims 30 to 35, comprising:
a first plurality of projections coupled to the indicator; and
a second plurality of projections concentrically arranged with the first plurality of projections,
wherein the first plurality of projections slidably engages the second plurality of projections to generate the continuous or repeating audible signal during drug delivery.

37. The drug delivery device of claim 36, the second plurality of projections being disposed around the first plurality of projections.

38. The drug delivery device of claim 37, wherein, during drug delivery, the first plurality of projections rotates relative to the second plurality of projections such that each projection of the first plurality of projections slidably engages one or more projections of the second plurality of projections.

39. The drug delivery device of any one of claims 36 to 38, each projection of the first plurality of projections extends in a radially outward direction, and each projection of the second plurality of projections extends in a radially inward direction.

40. The drug delivery device of any one of claims 36 to 39, each projection of the first plurality of projections includes a flexible arm moveable between a first radial position and a second radial position when the flexible arm engages a respective projection of the second plurality of projections.

41. A drug delivery device comprising:
a housing having an opening and a housing anti-rotation feature;
a drug storage container including a delivery member having an insertion end configured to extend at least partially through the opening in the housing;
a plunger;
a drive mechanism activatable to drive the plunger to expel a drug from the drug storage container through the delivery member; and

an end cap removably coupled with the housing adjacent to the opening when in a storage position, the end cap having an end cap anti-rotation feature that, when the end cap is in the storage position, is adjacent to and substantially in-line with the housing anti-rotation feature.

42. The drug delivery device of claim 41, wherein one of the end cap anti-rotation feature and the housing anti-rotation feature comprises a protrusion, and the other one of the end cap anti-rotation feature and the housing anti-rotation feature comprises a second opening configured to receive the protrusion when the end cap is in the storage position.

43. The drug delivery device of claim 42, wherein the protrusion is substantially parallel to a longitudinal axis of the drug delivery device.

44. The drug delivery device of any one of claims 42 or 43, wherein the drive mechanism is configured to drive the plunger in a distal direction to expel the drug from the drug storage container through the delivery member, and wherein the protrusion extends from the housing in the distal direction.

45. The drug delivery device of claim 44, wherein the second opening is formed in a tubular wall of the end cap.

46. The drug delivery device of any one of claims 42 to 45, wherein the end cap has a distal end with a non-circular cross-section and a proximal end with a circular cross-section.

47. The drug delivery device of claim 43, wherein the non-circular cross-section of the distal end of the end cap is square-shaped.

48. A method of assembling a drug delivery device comprising:
providing a guard configured to selectively cover an insertion end of a delivery member of the drug delivery device;
positioning a lock at least partially within the guard, the lock being rotatable between a first rotational position wherein the lock permits movement of the guard relative to the delivery member and a second rotational position wherein the lock limits movement of the guard relative to the delivery member; and
determining whether a first opening in the guard is rotationally aligned with a second opening in the lock.

49. The method of claim 48, wherein determining whether the first opening in the guard is rotationally aligned with the second opening in the lock comprises emitting light through one of the first opening and the second opening and checking if the light passes through the other one of the first opening and the second opening.

50. The method of any one of claims 48 or 49, wherein the guard includes a wall extending between a proximal end of the guard and a distal end of the guard, the first opening being formed in the wall.

51. The method of any one of claims 48 to 50, wherein the lock includes a cam follower configured to engage a cam included in the drug delivery device.

52. The method of any one of claims 48 to 51, wherein the lock includes a distally facing abutment surface and the guard including a proximally facing abutment surface, wherein the distally facing abutment surface of the lock is rotationally

aligned with and arranged in opposition to the proximally facing abutment surface of the guard when the lock is in the second rotational position.

53. The method of any one of claims 48 to 52, wherein a first projection extends outwardly from the lock and a second projection extends inwardly from the guard, wherein the first and second projections engage one another to retain the lock in the first rotational position.

54. The method of any one of claims 48 to 53, wherein the second projection slides out of engagement with the first projection to allow the lock to rotate away from the first rotational position toward the second rotational position when the guard moves from an extended position to a retracted position during use of the drug delivery device.

55. The method of any one of claims 48 to 54, wherein the guard and the lock each have an annular shape and are coaxial with each other.

56. A drug delivery device comprising:
a housing having an opening;
a drug storage container including a body portion defining a longitudinal axis and a delivery member having an insertion end configured to extend at least partially through the opening during a delivery state;
a plunger moveable in a distal direction to expel a drug from the drug storage container through the delivery member;
a rotational biasing member initially held in an energized state and configured to rotate about the longitudinal axis when released; and
a mechanical linkage operably coupled to the plunger and the rotational biasing member, the mechanical linkage being configured to convert rotation caused by the release of rotational biasing member into movement of the plunger in the distal direction.

57. The drug delivery device of claim 56, wherein the mechanical linkage is configured to convert rotation caused by the release of the rotational biasing member into movement of the plunger in the distal direction without causing the plunger to rotate.

58. The drug delivery device of any one of claims 56 or 57, wherein the mechanical linkage includes a nut having a threaded inner surface engaging a threaded outer surface of the plunger.

59. The drug delivery device of claim 58, wherein a distal end of the rotational biasing member is fixedly secured to the nut.

60. The drug delivery device of any one of claims 58 or 59, wherein the rotational biasing member surrounds at least a portion of the nut.

61. The drug delivery device of any one of claims 57 to 60, comprising a lock having an initial position wherein the lock prevents the nut from rotating and a second position wherein the lock does not prevent the nut from rotating.

62. The drug delivery device of claim 61, wherein the lock is configured to move in a proximal direction while moving from the initial position to the second position.

63. The drug delivery device of any one of claims 61 or 62, comprising a guard member moveably positioned adjacent to the opening, wherein the guard member has an extended position wherein the guard member extends at least partially through the opening in the housing and a retracted position wherein the guard member is positioned away from the extended position toward the housing.

64. The drug delivery device of claim 63, wherein moving the guard member from the extended position to the retracted position causes the lock to move from the initial position to the second position.

65. The drug delivery device of any one of claims 56 to 64, comprising a plunger guide coupled to the housing and including a distal end having an opening, wherein a proximal end of the plunger is disposed within the plunger guide in a storage state.

66. The drug delivery device of claim 65, wherein the rotational biasing member is at least partially disposed within the plunger guide.

67. The drug delivery device of any one of claims 56 to 66, wherein the drug storage container is fixedly secured to the housing such that the drug storage container does not move relative to the housing during operation of the drug delivery device.

68. A drug delivery device comprising:
a housing having an opening;
a drug storage container including a delivery member having an insertion end configured to extend at least partially through the opening in the housing;
a plunger;
a drive mechanism activatable to drive the plunger in a distal direction to expel a drug from the drug storage container through the delivery member;
a guard moveably disposed adjacent to the opening and operably coupled to the drive mechanism; and
a lock selectively engageable with the guard to limit movement of the guard in a proximal direction.

69. The drug delivery device of claim 68, comprising an indicator operably coupled to the drive mechanism to generate a continuous or repeating audible signal during drug delivery.

70. The drug delivery device of claim 69, wherein the indicator ceases generating the continuous or repeating audible signal when drug delivery is complete.

71. The drug delivery device of any one of claims 69 or 70, the indicator being rotatable relative to the housing.

72. The drug delivery device of claim 69, wherein activating the drive mechanism causes the drive mechanism to rotate the indicator relative to the housing.

73. The drug delivery device of claim 72, wherein the drive mechanism ceases rotating the indicator when drug delivery is complete.

74. The drug delivery device of any one of claims 72 or 73, wherein the drive mechanism includes a rotational biasing member initially held in an energized state and a mechanical linkage operably coupling the rotational biasing member and the plunger, wherein the mechanical linkage is configured to rotate as the rotational biasing member de-energizes.

75. The drug delivery device of claim 74, wherein the mechanical linkage includes a plunger guide having a proximal end and a distal end, the plunger being at least partially disposed within the distal end of the plunger guide, the proximal end of the plunger guide being coupled to the indicator such that the indicator rotates jointly with the plunger guide.

76. The drug delivery device of any one of claims 74 or 75, wherein the mechanical linkage converts rotational motion into at least linear motion of the plunger.

77. The drug delivery device of claim 76, wherein the plunger includes a threaded exterior surface, and wherein the mechanical linkage includes a nut having a threaded inner surface engaging the threaded exterior surface of the plunger.

78. The drug delivery device of any one of claims 69 to 77, comprising:
a first plurality of projections coupled to the indicator; and
a second plurality of projections concentrically arranged with the first plurality of projections,
wherein the first plurality of projections slidably engages the second plurality of projections to generate the continuous or repeating audible signal during drug delivery.

79. The drug delivery device of claim 78, the second plurality of projections being disposed around the first plurality of projections.

80. The drug delivery device of claim 79, wherein, during drug delivery, the first plurality of projections rotates relative to the second plurality of projections such that each projection of the first plurality of projections slidably engages one or more projections of the second plurality of projections.

81. The drug delivery device of any one of claims 78 to 80, wherein each projection of the first plurality of projections extends in a radially outward direction, and each projection of the second plurality of projections extends in a radially inward direction.

82. The drug delivery device of any one of claims 78 to 81, wherein each projection of the first plurality of projections includes a flexible arm moveable between a first radial position and a second radial position when the flexible arm engages a respective projection of the second plurality of projections.

83. The drug delivery device of any one of claims 68 to 82, the lock being disposed at least partially within the guard and rotatable between a first rotational position wherein the lock permits movement of the guard in the proximal direction and a second rotational position wherein the lock limits movement of the guard in the proximal direction.

84. The drug delivery device of claim 83, comprising a container holder fixed relative to the housing, the drug storage container being disposed at least partially within the container holder.

85. The drug delivery device of claim 84, wherein one of the lock and the container holder includes a cam and the other one of the lock and the housing includes a cam follower.

86. The drug delivery device of claim 85, comprising a biasing member configured to bias the cam follower against the cam to urge the lock to rotate from the first rotational position toward the second rotational position.

87. The drug delivery device of claim 86, wherein the biasing member exerts a proximally directed biasing force on the lock.

88. The drug delivery device of claim 83, wherein one of the lock and the housing includes a cam and the other one of the lock and the housing includes a cam follower.

89. The drug delivery device of claim 88, comprising a biasing member configured to bias the cam follower against the cam to urge the lock to rotate from the first rotational position toward the second rotational position.

90. The drug delivery device of claim 89, wherein the biasing member exerts a proximally directed biasing force on the lock.

91. The drug delivery device of any one of claims 83 to 90, the lock including a distally facing abutment surface selectively engageable with a proximally facing abutment surface of the guard.

92. The drug delivery device of any one of claims 83 to 91, the guard having an extended position wherein the guard extends at least partially through the opening in the housing and a retracted position wherein the guard is disposed away from the extended position toward the housing.

93. The drug delivery device of claim 92, comprising:
a first projection extending outwardly from the lock; and
a second projection extending inwardly from the guard,
wherein the first and second projections engage one another to retain the lock in the first rotational position.

94. The drug delivery device of claim 93, wherein the second projection slides out of engagement with the first projection to allow the lock to rotate away from the first rotational position toward the second rotational position when the guard moves from the extended position to the retracted position.

95. The drug delivery device of claim 94, comprising:
a third projection distal to the second projection and extending inwardly from the guard; and
a fourth projection distal to the first projection and extending outwardly from the lock,
wherein the third and fourth projections engage one another to retain the lock in an intermediate rotational position between the first and second rotational positions when the guard moves from the extended position to the retracted position.

96. The drug delivery device of claim 95, wherein the third projection slides out of engagement with the fourth projection to allow the lock to rotate from the intermediate rotational position to the second rotational position when the guard moves from the retracted position to the extended position.