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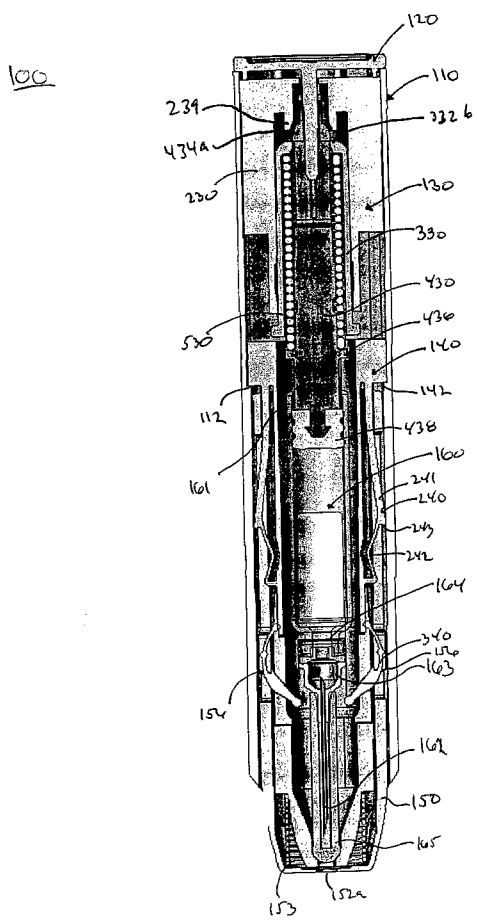
(54) Title: AUTOMATIC INJECTOR



(57) Abstract: An auto-injector for dispensing a predetermined dose of medicament is disclosed. The auto-injector includes a needle cover that is configured to move from a retracted position to an extended locked position. The auto-injector includes a first locking assembly to hold the needle cover in a locked retracted position and a second locking assembly to hold the needle cover in a locked extended position.

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AMENDED CLAIMS

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What is claimed is:

1. An auto-injector comprising:

a housing;

a cartridge container disposed within the housing;

a cartridge received within the cartridge container, the cartridge having at least one opening therein and containing a medicament, the medicament rearwardly confined by a plunger, wherein the cartridge includes a needle assembly to dispense the medicament there through;

an actuation assembly providing a stored energy source capable of being released to drive the plunger within the cartridge to dispense the medicament through the needle assembly;

a needle cover received within the housing, the needle cover having an opening formed therein to permit the passage of the needle assembly there through during a medicament dispensing operation, the needle cover having a first locked position whereby the needle cover is in a locked retracted position prior to activation of the auto-injector, the needle cover having a second locked position whereby the needle cover is in a locked extended position after operation of the auto-injector;

a first locking assembly that holds the needle cover in the first locked position; and

a second locking assembly that holds the needle cover in the second locked position.

2. The auto-injector according to claim 1, wherein the first locking assembly is connected to one of the cartridge container and the housing.

3. The auto-injector according to claim 2, wherein the first locking assembly includes at least one locking tooth that releasably engages the needle cover.

4. The auto-injector according to claim 3, wherein each locking tooth includes a locking surface constructed and arranged to contact a surface on the needle cover.

5. The auto-injector according to claim 4, wherein the locking surface contacts the surface on the needle cover to prevent movement of the needle cover such that it is maintained in the first locked position prior to activation of the auto-injector.

6. The auto-injector according to claim 5, wherein the first locking assembly further includes a tab constructed and arranged to contact the cartridge.

7. The auto-injector according to claim 6, wherein the tab causes the first locking assembly to pivot in response to movement of the cartridge during a medicament dispensing sequence such that the locking surface pivots out of contact with the surface on the needle cover.

8. The auto-injector according to claim 6, wherein the tab is constructed and arranged to minimally impede the movement of the cartridge within the cartridge container during a medicament dispensing sequence.

9. The auto-injector according to claim 7, wherein the locking surface is formed by a notch formed in the first locking assembly.

10. The auto-injector according to claim 5, wherein each locking tooth further includes a spring assembly constructed and arranged to bias the locking surface into contact with the surface.

11. The auto-injector according to claim 3, wherein each locking tooth is pivotally connected to the cartridge container.

12. The auto-injector according to claim 11, wherein each locking tooth includes a bearing axle received within a slot formed in the cartridge container.

13. The auto-injector according to claim 12, wherein each locking tooth includes a tab located on one side of the bearing axle and a locking surface located on an opposite side of the bearing axle, wherein the tab is constructed and arranged to contact the cartridge such that the locking tooth pivots about the bearing axle in response to movement of the cartridge within the cartridge container.

14. The auto-injector according to claim 13, wherein the locking surface is constructed and arranged to contact a surface of the needle cover to prevent movement of the needle cover.

15. The auto-injector according to claim 14, wherein each locking tooth further includes a spring assembly constructed and arranged to bias the locking surface into contact with the surface.

16. The auto-injector according to claim 15, wherein the spring assembly includes a flexible extension extending from the locking tooth, wherein the flexible extension is constructed and arranged to contact the cartridge container.

17. The auto-injector according to claim 11, wherein each locking tooth pivots in response to movement of the cartridge within the cartridge container, wherein each locking tooth includes a locking surface constructed and arranged to contact a surface on the needle cover, wherein the locking surface pivots out of contact with the surface when the locking tooth pivots in response to the movement of the cartridge.

18. The auto-injector according to claim 11, wherein each locking tooth includes a bearing surface formed thereon, wherein the bearing surface is constructed and arranged to contact the cartridge within the cartridge container during the medicament dispensing sequence.

19. The auto-injector according to claim 18, wherein the cartridge contacts the bearing surface during the medicament dispensing operation causing the locking tooth to pivot, wherein each locking tooth includes a locking surface constructed and arranged to contact a surface on the needle cover, wherein the locking surface pivots out of contact with the surface when the locking tooth pivots in response to the movement of the cartridge.

20. The auto-injector according to claim 19, wherein each locking tooth includes a spring assembly constructed and arranged to bias the locking surface into contact with the surface.

21. The auto-injector according to claim 20, wherein the pivoting of the locking tooth in response to the cartridge contacting the bearing surface is sufficient to overcome the bias of the spring assembly to permit the locking surface to pivot out of contact with the surface.

22. The auto-injector according to claim 18, wherein each locking tooth does not impede the movement of the cartridge within the cartridge container during the medicament dispensing sequence when the bearing surface contacts the cartridge.

23. The auto-injector according to claim 22, wherein the bearing surface is constructed and arranged to slide over the cartridge as the cartridge moves during the medicament dispensing operation.

24. The auto-injector according to claim 18, wherein each locking tooth is constructed and arranged on the cartridge container such that needles of varying lengths and cartridges of varying lengths and diameters can be accommodated within the cartridge container.

25. The auto-injector according to claim 1, further comprising:

a needle cover spring assembly for moving the needle cover from the locked retracted position to the locked extended position, wherein:

the actuation assembly requires an activation force to release the stored energy source,

the needle cover spring assembly provides a biasing force, and

the activation force is greater than the biasing force.

26. The auto-injector according to claim 1, wherein the second locking assembly includes at least one locking arm connected to one of the housing, the cover member and the cartridge container.

27. The auto-injector according to claim 26, wherein at least a portion of the locking arm is received within an aperture when the needle cover is in the first locked position.

28. The auto-injector according to claim 27, wherein each locking arm has an exterior sliding surface formed on a strut, the sliding surface constructed and arranged to contact an edge

of the aperture to temporarily compress the locking arm when the needle cover moves from the first retracted locked position to the second extended locked position.

29. The auto-injector according to claim 28, wherein each locking arm has a locking surface that is constructed and arranged to engage an outer edge of the needle cover when the needle cover is in an extended position to hold the needle cover in the second locked position.

30. The auto-injector according to claim 29, wherein:

each locking arm has a thick strut portion and a thin strut portion,

the thick strut portion is outwardly curved and the thin strut portion is inwardly curved, and

the strut portions are constructed and arranged such that the locking arm cannot be compressed when the needle cover is in the second locked position such that the locking surface remains engaged with the outer edge of the needle cover.

31. The auto-injector according to claim 26, wherein each locking arm is connected to the cartridge container.

32. The auto-injector according to claim 31, wherein each locking arm is spaced from the cartridge container such that the locking arm can be temporarily compressed against the cartridge container as the needle cover moves from the first locked position to the second locked position.

33. The auto-injector according to claim 32, wherein each locking arm has a locking surface to engage the needle cover when the needle cover is in the locked extended position.

34. The auto-injector according to claim 26, wherein each locking arm has a thick strut portion and a thin strut portion, wherein the thick strut portion is outwardly curved and the thin strut portion is inwardly curved.

35. The auto-injector according to claim 34, wherein the strut portions are constructed and arranged such that the locking arm can be temporarily compressed as the needle cover moves from the first locked position to the second locked position.

36. The auto-injector according to claim 1, wherein:

the cartridge container includes at least one ledge extending outwardly therefrom, and

the at least one ledge is constructed and arranged to engage an edge of an opening in the needle cover to limit the travel of the needle cover with respect to the cartridge container when the needle cover is in the extended position.

37. The auto-injector according to claim 1, wherein each of the needle cover and the cartridge container has an opening formed therein, the openings aligned prior to activation of the auto-injector such that a user can view the contents of the cartridge through the openings.

38. The auto-injector according to claim 36, wherein the cartridge container includes at least one ledge constructed and arranged to engage an edge in the opening in the needle cover to limit the travel of the needle cover with respect to the cartridge container.

39. The auto-injector according to claim 38, wherein the ledge engages one edge in the opening in the needle cover when the needle cover is in the first locked position and engages another edge when the needle cover is in the second locked position.

40. The auto-injector according to claim 38, wherein the openings are not aligned after operation of the auto-injector such that the user cannot view the contents of the cartridge through the openings.

41. The auto-injector according to claim 1, wherein the housing has an oval cross section in a lateral direction.

42. The auto-injector according to claim 1, wherein the actuation assembly is mounted within the housing adjacent an open end.

43. The auto-injector according to claim 42, wherein the actuation assembly has a housing having at least one projection extending therefrom, the at least one projection located within a complimentary opening formed in the housing.

44. The auto-injector according to claim 43, wherein the actuation assembly housing is located within the housing adjacent to and spaced from one end of the housing such that a recess is formed adjacent the one end.

45. The auto-injector according to claim 44 further comprising a release pin removably connected to the actuation assembly, the release pin located in the recess.

46. The auto-injector according to claim 45, wherein the release pin has a pin removably recessed within an opening in the actuation assembly, wherein the auto-injector is not operable when the release pin is connected to the actuation assembly.

47. The auto-injector according to claim 46, wherein the release pin includes at least one tab extending therefrom, the at least one tab is compression fit into a complimentary recess formed in the actuation assembly housing.

48. The auto-injector according to claim 42, further comprising a release pin removably attached to the actuation assembly, wherein the auto-injector is not operable when the release pin is connected to the actuation assembly.

49. The auto-injector according to claim 48, wherein a pin on the release pin is received within an opening in the actuation assembly to prevent actuation of the auto-injector.

50. The auto-injector according to claim 49, wherein the opening is spaced from the open end of the housing.

51. The auto-injector according to claim 49, wherein the release pin includes at least one tab extending therefrom, the at least one tab is compression fit into a complimentary recess formed in the actuation assembly.

52. The auto-injector according to claim 1, wherein the actuation assembly comprises:

an outer body;

an inner body operatively coupled to the outer body;

a collet operatively coupled to the inner body; and

an energy source.

53. The auto-injector according to claim 52, wherein the collet is molded as a single piece.

54. The auto-injector according to claim 53, wherein:

the collet has an opening formed on one end,

the auto-injector further comprises a release pin removably attached to the actuation assembly, and

the release pin is removably received in the opening in the collet to prevent operation of the actuation assembly.

55. The auto-injector according claim 54, wherein the collet is received within an opening in the inner body prior to medicament dispensing and is displaced from the opening at the initiation of the medicament dispensing sequence.

56. The auto-injector according to claim 55, wherein the collet has an elongated opening formed therein, and the release pin is received within the elongated opening.

57. The auto-injector according to claim 56, wherein the collet has at least one tapered portion, and the outer body has at least one surface constructed and arranged to contact the at least one tapered portion.

58. The auto-injector according to claim 57, wherein the at least one surface is constructed and arranged to contact the at least one tapered portion to compress the collet in an area around the elongated opening such that the collet is released from the inner body in response to application of an activation force.

59. The auto-injector according to claim 53, wherein the collet includes a flange, and the energy source is constructed and arranged to be positioned between the flange and an end of the inner body.

60. The auto-injector according to claim 59, wherein the flange is constructed and arranged to contact the cartridge to limit the travel of the plunger within the cartridge.

61. The auto-injector according to claim 59, wherein the flange is constructed and arranged to travel within the cartridge such that a full volume of medicament can be dispensed through the needle.

62. The auto-injector according to claim 52, wherein the collet is operatively coupled to the plunger.

63. The auto-injector according to claim 52, wherein the collet has an elongated opening formed therein, and one end of the opening has an arch construction.

64. The auto-injector according to claim 52, wherein the inner power pack is constructed and arranged to receive different sized collets.

65. The auto-injector according to claim 52, wherein the cartridge container is constructed and arranged such that the energy released from the stored energy source of the actuation assembly during the medicament dispensing operation is opposed by a front end of the cartridge container and is not transmitted to the needle cover.

66. The auto-injector according to claim 65, wherein the cartridge container, the cartridge, the housing, and the activation assembly outer body receive residual force from the energy source after activation of the medicament dispensing operation to prevent kick back of the auto-injector during the injection operation.

67. The auto-injector according to claim 52, wherein the cartridge container is constructed and arranged such that the energy released from the stored energy source to drive the needle and cartridge during the medicament dispensing operation is opposed by a front end of the cartridge container and is not transmitted to the needle cover.

68. The auto-injector according to claim 67, wherein the cartridge container, the cartridge, the housing, and the activation assembly outer body receive residual force from the

energy source after activation of the medicament dispensing operation to prevent kick back of the auto-injector during the injection operation.

69. The auto-injector according to claim 1, wherein the cartridge container has at least one tab contacting the cartridge to orient and align the cartridge within the cartridge container.

70. An auto-injector comprising:

a housing;

a cartridge container disposed within the housing;

a cartridge received within the cartridge container, the cartridge having at least one opening therein and containing a medicament, the medicament rearwardly confined by a plunger, wherein the cartridge includes a needle assembly to dispense the medicament there through;

an actuation assembly providing a stored energy source capable of being released to drive the plunger within the cartridge to dispense the medicament through the needle assembly;

a needle cover at least partially received within the housing, the needle cover having an opening formed therein sized to permit the passage of the needle assembly there through during a medicament dispensing operation, the needle cover having a first locked retracted position and a second locked extended position; and

a locking mechanism for selectively holding the needle cover in the first locked position and in the second locked position,

wherein the locking mechanism is constructed and arranged to be protected against external contact by at least one of the needle cover and the housing.

71. The auto-injector according to claim 70, wherein the locking mechanism is concealed by at least one of the needle cover and the housing.

72. The auto-injector according to claim 71, wherein the locking mechanism comprises:

a first locking assembly that holds the needle cover in the first locked position; and

a second locking assembly that holds the needle cover in the second locked position.

73. The auto-injector according to claim 72, wherein the first locking assembly is connected to one of the cartridge container and the housing.

74. The auto-injector according to claim 73, wherein the first locking assembly includes at least one locking tooth that releasably engages the needle cover.

75. The auto-injector according to claim 74, wherein each locking tooth includes a locking surface constructed and arranged to contact a surface on the needle cover.

76. The auto-injector according to claim 75, wherein the locking surface contacts the surface on the needle cover to prevent movement of the needle cover such that it is maintained in the first locked position prior to activation of the auto-injector.

77. The auto-injector according to claim 76, wherein the first locking assembly further includes a tab constructed and arranged to contact the cartridge in response to movement of the cartridge.

78. The auto-injector according to claim 77, wherein the tab causes the first locking assembly to pivot in response to movement of the cartridge during the medicament dispensing operation such that the locking surface pivots out of contact with the surface on the needle cover.

79. The auto-injector according to claim 77, wherein the tab is constructed and arranged to minimally or negligibly impede the movement of the cartridge within the cartridge container during a medicament dispensing operation.

80. The auto-injector according to claim 78, wherein the locking surface is formed by a notch formed in the first locking assembly.

81. The auto-injector according to claim 75, wherein each locking tooth further includes a spring assembly constructed and arranged to bias the locking surface into alignment and contact with the surface at predetermined times.

82. The auto-injector according to claim 74, wherein each locking tooth is pivotally connected to the cartridge container.

83. The auto-injector according to claim 82, wherein each locking tooth includes a tab located on one side of the bearing axle and a locking surface located on an opposite side of the bearing axle, wherein the tab is constructed and arranged to contact the cartridge such that the locking tooth pivots about the bearing axle in response to movement of the cartridge within the cartridge container.

84. The auto-injector according to claim 83, wherein the locking surface is constructed and arranged to contact a surface of the needle cover to prevent movement of the needle cover.

85. The auto-injector according to claim 84, wherein each locking tooth further includes a spring assembly constructed and arranged to bias the locking surface into alignment and contact with the surface at predetermined times.

86. The auto-injector according to claim 85, wherein the spring assembly includes a flexible extension extending from the locking tooth, wherein the flexible extension is constructed and arranged to contact the cartridge container.

87. The auto-injector according to claim 82, wherein:

each locking tooth pivots in response to movement of the cartridge within the cartridge container,

each locking tooth includes a locking surface constructed and arranged to contact a surface on the needle cover, and

the locking surface pivots out of contact with the surface when the locking tooth pivots in response to the movement of the cartridge.

88. The auto-injector according to claim 82, wherein each locking tooth includes a bearing surface formed thereon, the bearing surface constructed and arranged to contact the cartridge within the cartridge container during the medicament dispensing sequence.

89. The auto-injector according to claim 88, wherein:

the cartridge contacts the bearing surface as the cartridge moves during a medicament dispensing sequence causing the locking tooth to pivot,

each locking tooth includes a locking surface constructed and arranged to contact a surface on the needle cover, and

the locking surface pivots out of contact with the surface when the locking tooth pivots in response to the movement of the cartridge.

90. The auto-injector according to claim 89, wherein each locking tooth includes a spring assembly constructed and arranged to bias the locking surface into alignment and contact with the surface at predetermined times.

91. The auto-injector according to claim 90, wherein the pivoting of the locking tooth in response to the cartridge contacting the bearing surface disengages the locking tooth from the cover member.

92. The auto-injector according to claim 88, wherein each locking tooth minimally or negligibly impedes the movement of the cartridge within the cartridge container during the medicament dispensing sequence when the bearing surface contacts the cartridge.

93. The auto-injector according to claim 92, wherein the bearing surface is constructed and arranged to slide over the cartridge as the cartridge moves during the medicament dispensing sequence.

94. The auto-injector according to claim 88, wherein each locking tooth is constructed and arranged on the cartridge container such that needles of varying lengths and cartridges of varying lengths and diameters can be accommodated within the cartridge container.

95. The auto-injector according to claim 70, further comprising:

a needle cover spring assembly for moving the needle cover from the locked retracted position to the locked extended position, wherein:

the actuation assembly requires an activation force to release the stored energy source.

the needle cover spring assembly provides a biasing force, and
the activation force is greater than the biasing force.

96. The auto-injector according to claim 72, wherein the second locking assembly includes at least one locking arm connected to one of the housing, the cover member and the cartridge container.

97. The auto-injector according to claim 96, wherein at least a portion of the locking arm is received within an aperture when the needle cover is in the first locked position.

98. The auto-injector according to claim 97, wherein each locking arm has an exterior sliding surface formed on a strut, and the sliding surface is constructed and arranged to contact an edge of the aperture to temporarily compress the locking arm when the needle cover moves from the first retracted locked position to the second extended locked position.

99. The auto-injector according to claim 98, wherein each locking arm has a locking surface that is constructed and arranged to engage an outer edge of the needle cover when the needle cover is in an extended position to hold the needle cover in the second locked position.

100. The auto-injector according to claim 99, wherein:
each locking arm has a thick strut portion and a thin strut portion,
the thick strut portion is outwardly curved,
the thin strut portion is inwardly curved, and
the strut portions are constructed and arranged such that the locking arm cannot be collapsed when the needle cover is in the second locked position such that the locking surface remains engaged with the outer edge of the needle cover.

101. The auto-injector according to claim 100, wherein the thin strut portion is constructed and arranged to prevent the collapse of the locking arm.

102. The auto-injector according to claim 96, wherein each locking arm is connected to the cartridge container.

103. The auto-injector according to claim 102, wherein each locking arm is spaced from the cartridge container such that the locking arm can be temporarily compressed against the cartridge container as the needle cover moves from the first locked position to the second locked position.

104. The auto-injector according to claim 103, wherein each locking arm has a locking surface to engage the needle cover when the needle cover is in the locked extended position.

105. The auto-injector according to claim 97, wherein each locking arm has a thick strut portion and a thin strut portion, the thick strut portion is outwardly curved, and the thin strut portion is inwardly curved.

106. The auto-injector according to claim 105, wherein the strut portions are constructed and arranged such that the locking arm can be temporarily compressed as the needle cover moves from the first locked position to the second locked position.

107. The auto-injector according to claim 70, wherein the cartridge container includes at least one ledge extending outwardly therefrom, the at least one ledge is constructed and arranged to engage an edge of an opening in the needle cover to limit the travel of the needle cover with respect to the cartridge container when the needle cover is in the extended position.

108. The auto-injector according to claim 70, wherein each of the needle cover and the cartridge container has an opening formed therein, the openings aligned prior to activation of the auto-injector such that a user can view the contents of the cartridge through the openings.

109. The auto-injector according to claim 108, wherein the cartridge container includes at least one ledge constructed and arranged to engage an edge in the opening in the needle cover to limit the travel of the needle cover with respect to the cartridge container.

110. The auto-injector according to claim 109, wherein the ledge engages one edge in the opening in the needle cover when the needle cover is in the first locked position and engages another edge when the needle cover is in the second locked position.

111. The auto-injector according to claim 109, wherein the openings are not aligned after operation of the auto-injector such that the user cannot view the contents of the cartridge through the openings.

112. The auto-injector according to claim 70, wherein the housing has an oval cross section in a lateral direction.

113. The auto-injector according to claim 70, wherein the actuation assembly is mounted within the housing adjacent an open end.

114. The auto-injector according to claim 113, wherein the actuation assembly has a actuation assembly housing having at least one projection extending therefrom, the at least one projection located within a complimentary opening formed in the housing.

115. The auto-injector according to claim 114, wherein the actuation assembly housing is located within the housing adjacent to and spaced from one end of the housing such that the actuation assembly housing and the housing form a recess.

116. The auto-injector according to claim 115, further comprising a release pin removably connected to the actuation assembly, the release pin located in the recess.

117. The auto-injector according to claim 116, wherein the release pin has a pin removably recessed within an opening in the actuation assembly, the auto-injector not operable when the release pin is connected to the actuation assembly.

118. The auto-injector according to claim 117, wherein the release pin includes at least one tab extending therefrom, the at least one tab is compression fit into a complimentary recess formed in the actuation assembly housing.

119. The auto-injector according to claim 113, further comprising a release pin removably attached to the actuation assembly, wherein the auto-injector is not operable when the release pin is connected to the actuation assembly.

120. The auto-injector according to claim 119, wherein a pin on the release pin is received within an opening in the actuation assembly to prevent actuation of the auto-injector.

121. The auto-injector according to claim 120, wherein the opening is spaced from the open end of the housing.

122. The auto-injector according to claim 49, wherein the release pin includes at least one tab extending therefrom, the at least one tab is compression fit into a complimentary recess formed in the actuation assembly.

123. The auto-injector according to claim 70, wherein the actuation assembly comprises:

an outer body;
an inner body operatively coupled to the outer body;
a collet operatively coupled to the inner body; and
an energy source.

124. The auto-injector according to claim 123, wherein the collet is molded as a single piece.

125. The auto-injector according to claim 124, wherein the collet has an opening formed on one end, the auto-injector further comprising a release pin removably attached to the actuation assembly, the release pin removably received in the opening in the collet to prevent operation of the actuation assembly.

126. The auto-injector according claim 125, wherein the collet is received within an opening in the inner body prior to a medicament dispensing sequence, and the collet is displaced from the opening at the initiation of the medicament dispensing sequence.

127. The auto-injector according to claims 126, wherein the collet has an elongated opening formed therein, and the release pin is received within the elongated opening.

128. The auto-injector according to claim 127, wherein the collet has at least one tapered portion, and the outer body has at least one surface constructed and arranged to contact the at least one tapered portion.

129. The auto-injector according to claim 128, wherein the at least one surface is constructed and arranged to contact the at least one tapered portion to compress the collet in an area around the elongated opening such that the collet is released from the inner body in response to application of an activation force.

130. The auto-injector according to claim 124, wherein the collet includes a flange, and the energy source is constructed and arranged to be positioned between the flange and an end of the inner body.

131. The auto-injector according to claim 130, wherein the flange is constructed and arranged to contact the cartridge to limit the travel of the plunger within the cartridge.

132. The auto-injector according to claim 130, wherein the flange is constructed and arranged to travel within the cartridge such that a full volume of medicament can be dispensed through the needle.

133. The auto-injector according to claim 123, wherein the collet is operatively coupled to the plunger.

134. The auto-injector according to claim 123, wherein the collet has an elongated opening formed therein, and one end of the opening has an arch construction.

135. The auto-injector according to claim 123, wherein the inner power pack is constructed and arranged to receive different sized collets.

136. The auto-injector according to claim 123, wherein the auto-injector is constructed and arranged such that the energy released from the stored energy source of the actuation assembly during the medicament dispensing sequence is opposed by a front end of the cartridge container and is not transmitted to the needle cover.

137. The auto-injector according to claim 136, wherein the cartridge container, the cartridge, the housing, and the activation assembly outer body receive residual force from the energy source after activation of the medicament dispensing operation to prevent kick back of the auto-injector during the injection operation.

138. The auto-injector according to claim 123, wherein the auto-injector is constructed and arranged such that the energy released from the stored energy source to drive the needle and cartridge during a medicament dispensing sequence is opposed by a front end of the cartridge container and is not transmitted to the needle cover.

139. The auto-injector according to claim 138, wherein the cartridge container within the auto-injector, the cartridge, the housing, and the activation assembly outer body receive residual force from the energy source after activation of the medicament dispensing operation to prevent kick back of the auto-injector during the injection operation.

140. The auto-injector according to claim 138, wherein the housing, cartridge container and actuation assembly are constructed and arranged such that the energy released from the stored energy source to drive the needle and cartridge during a medicament dispensing sequence is not transmitted to the needle cover.

141. The auto-injector according to claim 70, wherein the cartridge container has at least one tab contacting the cartridge to orient and align the cartridge within the cartridge container.