

What is claimed is:

1. An apparatus, comprising:
 - a housing defining a passage and an exit port in fluid communication with the passage;
 - an actuator hub rotatably disposed within a hub volume defined by the housing;
 - and
 - a pushrod coupled to the actuator hub and having a proximal end portion and a distal end portion, the distal end portion of the pushrod movable from a first position within the passage to a second position to move a drug dosage form through at least a portion of the passage to convey the drug dosage form through the exit port, a portion of the pushrod including the proximal end portion being wound about the actuator hub when the distal end portion of the pushrod is in the first position, the proximal end portion of the pushrod having a prefabricated bend of less than 180 degrees that dampens a deformation force produced during rotation of the actuator hub to move the distal end portion of the pushrod from the first position to the second position, a surface of at least one of the pushrod or the housing defining the passage having a contact reducing surface profile configured to substantially prevent negative acceleration of the distal end portion of the pushrod within the passage from the first position to the second position.
2. The apparatus of claim 1, wherein the surface of the pushrod is in sliding contact with the surface of the housing when the distal end portion of the pushrod is moved from the first position to the second position.
3. The apparatus of claim 1, wherein the surface of the pushrod is in sliding contact with the surface of the housing when the distal end portion of the pushrod is moved from the first position to the second position, the contact reducing surface profile having a cross-sectional profile of a waveform.
4. The apparatus of claim 1, wherein the passage includes a delivery passage, the surface of the housing defining the delivery passage is contoured such that a first portion of the surface contacts the drug dosage form when the distal end portion of the pushrod is moved from its first position to its second position and such that the drug dosage form does

not contact a second portion of the surface of housing defining the delivery passage when the distal end portion of the pushrod is moved from its first position to its second position.

5. The apparatus of claim 1, wherein the surface of the pushrod is in sliding contact with the surface of the housing defining the passage when the distal end portion of the pushrod is moved from the first position to the second position, the contact reducing surface profile includes a plurality of grooves defined by the at least one of the surface of the pushrod or the surface of the housing.

6. The apparatus of claim 5, wherein each groove from the plurality of grooves is parallel to another groove from the plurality of grooves.

7. The apparatus of claim 5, wherein a groove from the plurality of grooves has an elongate axis that is transverse to a direction defined by the movement of the pushrod from its first position to its second position.

8. The apparatus of claim 5, wherein at least one groove from the plurality of grooves defines a “V”-shape, a chevron shape, and/or herringbone shape, with the vertices of the grooves aligned with a direction of motion of the pushrod.

9. The apparatus of claim 1, wherein the surface of the pushrod is in sliding contact with the surface of the housing when the distal end portion of the pushrod is moved from the first position to the second position within the passage, the contact reducing surface profile includes a plurality of protrusions.

10. The apparatus of claim 1, wherein:
the passage has a curved shape; and
the pushrod is flexible to assume the curved shape of the passage when the distal end portion of the pushrod is moved from the first position to the second position.

11. The apparatus of claim 1, wherein the pushrod defines an opening configured to be detected by a sensor when the pushrod is moved within the passage.

12. The apparatus of claim 1, wherein a first portion of the pushrod is transparent to a sensor, a second portion of the pushrod different from the first portion is opaque to the sensor.

13. The apparatus of claim 1, wherein the surface of the housing includes the contact reducing surface profile and a portion of the surface of the pushrod configured to contact the contact reducing surface profile surface of the housing is planar.

14. The apparatus of claim 1, wherein the surface of the pushrod is in sliding contact with the surface of the housing defining the passage when the distal end portion of the pushrod is moved from its first position to its second position within the passage, the contact reducing surface profile defining a geometric pattern that repeats along at least one of a length or a width of the contoured surface.

15. The apparatus of claim 1, wherein the surface of the pushrod is in sliding contact with the surface of the housing defining the passage when the distal end portion of the pushrod is moved from its first position to its second position within the passage, the contact reducing surface profile defines a random geometric pattern.

16. An apparatus, comprising:

a housing defining a delivery passage having at least one curvilinear portion and an exit port in fluid communication with the delivery passage;

an actuator hub disposed within a hub volume defined by the housing, the actuator hub rotatable in a first direction and a second direction opposite the first direction; and

a pushrod coupled to the actuator hub, at least a portion of the pushrod being movably disposed in the delivery passage, a distal end portion of the pushrod movable in the first direction, in response to rotation of the actuator hub in the first direction, from a first position to a second position to move a drug dosage form through the delivery passage to convey the drug dosage form through the exit port, the pushrod movable in the second direction in response to rotation of the actuator hub in the second direction, a proximal end portion of the pushrod having a prefabricated bend of less than 180 degrees that dampens a deformation force produced during rotation of the actuator hub to move the distal end portion of the pushrod from the first position to the second position, the prefabricated bend of the proximal end portion being disposed within the hub volume, a surface of the housing being

contoured such that the friction between a surface of the pushrod and the surface of the housing is reduced and negative acceleration of the distal end portion of the pushrod is prevented as the pushrod is moved from the first position to the second position.

17. An apparatus, comprising:

a housing defining a delivery passage and an exit port in fluid communication with the delivery passage, the housing defining a hub volume within which a hub is rotatably disposed; and

a pushrod, a distal end portion of the pushrod being movably disposed in the delivery passage to convey a drug dosage form through the exit port when the distal end portion of the pushrod is moved from a first position to a second position, a proximal end portion of the pushrod coupled to the hub such that rotation of the hub and the proximal end portion of the pushrod causes the distal end portion of the pushrod to move between the first position and the second position,

a surface of the housing defining the hub volume having a contact reducing surface profile,

a portion of the pushrod movably disposed within the hub volume contacts the contact reducing surface profile of the surface of the housing defining the hub volume when the pushrod is moved from the first position to the second position, the proximal end portion of the pushrod being disposed within the hub volume and having a prefabricated bend of less than 180 degrees, the prefabricated bend reduces contact of the portion of the pushrod with the contact reducing surface profile of the surface of the housing defining the hub volume.

18. An apparatus, comprising:

an actuator hub; and

a pushrod, a distal end portion of the pushrod configured to be movably disposed within a delivery passage of a drug delivery device to convey a drug dosage form through the delivery passage when the distal end portion of the pushrod is moved from a first position to a second position, a portion of the pushrod coupled to and wrapped around the actuator hub when the pushrod is in its first position, the portion of the pushrod being unwrapped from around the actuator hub in response to rotation of the actuator hub to move the distal end portion of the pushrod from the first position to the second position,

the proximal end portion of the pushrod having a prefabricated angle of less than 180 degrees, the angle of the pushrod being disposed between the portion of the pushrod

wrapped around the actuator hub when the pushrod is in its first position and an end of the pushrod inserted into the actuator hub.

19. The apparatus of claim 18, wherein:
the delivery passage has a curved shape; and
at least a portion of the pushrod is flexible to assume the curved shape of the delivery passage when the distal end portion of the pushrod is moved from the first position to the second position.
20. The apparatus of claim 18, wherein the angle is defined by an intersection of a first portion of a longitudinal axis of the proximal end portion of the pushrod when in an undeformed configuration, and a second portion of the longitudinal axis of the proximal end portion of the pushrod when in the undeformed configuration.
21. The apparatus of claim 20, wherein the angle is between 90 degrees and 180 degrees.
22. The apparatus of claim 21, wherein the angle is between 120 degrees and 150 degrees.
23. The apparatus of claim 20, wherein the angle is molded, stamped, or formed by heat-treatment.