DRUG DELIVERY DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims the priority of U.S. Provisional Application No. 62/908,504, filed September 30, 2019, entitled “Drug Delivery Device,” which is incorporate by reference herein.

FIELD OF DISCLOSURE

[0002] The present disclosure relates to drug delivery devices, and, more particularly, devices for automatically injecting a drug into a patient.

BACKGROUND

[0003] A general aversion to exposed needles, as well as health and safety issues, have led to the development of drug delivery devices which conceal a needle or other insertion member prior to use and which automate various aspects of an injection process. Such devices offer a variety of benefits as compared with traditional forms of drug delivery including, for example, delivery via a conventional syringe.

[0004] A drug delivery device may incorporate various mechanisms to implement various automated features. Such features include automatically covering a needle in a pre-delivery and/or post-delivery state, providing an interface for a user to activate a drive mechanism, indicating to the user that drug delivery is complete, among other features. Typically a drug delivery device will incorporate a separate or independently operable mechanism to realize each of its automated features. As a consequence, with each added feature, the mechanical complexity of the device tends to increase. This, in turn, can increase the size of the device, which can make it cumbersome for the user to handle, as well as increase manufacturing costs and timeframes. As the demand grows for drug delivery devices with greater ease of use and safety, finding a way to incorporate more automated features without adding undue complexity to the drug delivery device presents various design and manufacturing challenges.

[0005] The present disclosure sets forth drug delivery devices embodying advantageous alternatives to existing drug delivery devices, and that may address one or more of the challenges or needs mentioned herein.

SUMMARY

[0006] One aspect of the present disclosure provides a drug delivery device including a housing, a drug delivery container fixed relative to the housing, a biasing member, and a plunger operably coupled to the plunger biasing member, and a plunger guide fixed relative to the housing. The drug storage container may include an interior surface and a stopper slidable along the interior surface. The plunger may be configured to: (i) selectively rotate from an initial rotational position to a second rotational position under a biasing force exerted by the biasing member, and (ii) translate linearly in a distal direction to drive the stopper through the drug storage container after rotating from the initial rotational position to the second rotational position. The plunger is disposed at least partially within the plunger guide.

[0007] There is disclosed a drug delivery device including a housing having an opening, a drug storage container, a guard moveably positioned adjacent to the opening, a plunger, a plunger biasing member, and a releaser member. The drug storage container may include a delivery member having an insertion end configured to extend at least partially through the opening. The plunger may be moveable in a distal direction to expel a drug from the drug storage container through the delivery member. The releaser member may be operably coupled to the guard and the plunger. Furthermore, the releaser member may be configured to rotate from an initial rotational position to a second rotational position under a biasing force exerted by the plunger biasing member.

[0008] There is disclosed a drug delivery device including a housing, a drug storage container, a plunger, a plunger biasing member initially retained in an energized state, and an indicator. The drug storage container may include a delivery member having an insertion end configured to extend at least partially through the opening. Releasing the plunger biasing member may drive the plunger in a distal direction to expel a drug from the drug storage container

through the delivery member. The indicator may have an initial position wherein the indicator retains the plunger biasing member in the energized state, and a second position wherein the indicator generates an audible signal indicating an end of drug delivery.

What is claimed is:

1. A drug delivery device comprising:

a housing;

a drug storage container fixed relative to the housing and including an interior surface and a stopper slidable along the interior surface;

a biasing member;

a plunger operably coupled to the biasing member and configured to:

selectively rotate from an initial rotational position to a second rotational position under a biasing force exerted by the biasing member, and

translate linearly in a distal direction to drive the stopper through the drug storage container after rotating from the initial rotational position to the second rotational position; and

a plunger guide fixed relative to the housing, the plunger being disposed at least partially within the plunger guide.

2. The drug delivery device of claim 1, wherein the biasing member is disposed at least partially within the plunger.

3. The drug delivery device of claim 2, wherein the biasing member comprises a compression spring.

4. The drug delivery device of any one of claims 2 or 3, wherein the plunger is configured to translate linearly in the distal direction while rotating from the initial rotational position to the second rotational position.

5. The drug delivery device of any one of claims 1 to 4, wherein the plunger is rotationally fixed relative to the housing after rotating from the initial rotational position to the second rotational position.

6. The drug delivery device of any one of claims 1 to 5, wherein one of the plunger and the plunger guide comprises a cam and the other one of the plunger and the plunger guide comprises a cam follower.

7. The drug delivery device of claim 6, wherein the biasing force of the biasing member urges the cam follower against the cam to urge the plunger to rotate from the initial rotational position toward the second rotational position.

8. The drug delivery device of claim 7, wherein the plunger includes the cam follower and the plunger guide includes the cam, and wherein the cam follower is formed by at least one projection extending outwardly from the plunger.

9. The drug delivery device of claim 8, wherein the plunger guide comprises an annular wall, wherein the cam is formed by a proximally facing surface of the annular wall.

10. The drug delivery device of any one of claims 1 to 9, comprising:

a releaser member operably coupled to the plunger and configured to selectively rotate relative to the housing, wherein each of the plunger and the plunger guide is disposed at least partially within the releaser member; and

a guard moveably positioned adjacent to an opening in the housing and operably coupled to the releaser member.

11. The drug delivery device of claim 10, wherein the guard has an extended position wherein the guard extends at least partially through the opening in the housing and a retracted position wherein the guard is positioned away from the extended position toward the housing.

12. The drug delivery device of claim 11, wherein the releaser member is prevented from rotating in at least one rotational direction when the guard is in the extended position, and wherein the releaser member is allowed to rotate in the at least one rotational direction when the guard is in the retracted position.

13. The drug delivery device of any one of claims 11 or 12, wherein moving the guard from the extended position to the retracted position allows the releaser member and the plunger to rotate jointly from the initial rotation position toward the second rotation position under the biasing force exerted by the biasing member.

14. The drug delivery device of claim 9, wherein an opening is formed in the annular wall distal to the proximally facing surface, and wherein the opening slidably receives the projection after the plunger rotates from the initial rotational position to the second rotational position.

15. The drug delivery device of any one of claims 1 to 14, wherein the housing comprises an opening, and wherein the drug storage container comprises a delivery member having an insertion end configured to extend at least partially through the opening.

16. The drug delivery device of claim 15, wherein the guard is moveably positioned adjacent to the opening of the housing.

17. The drug delivery device of claim 16, wherein the guard has an extended position wherein the guard extends at least partially through the opening in the housing and a retracted position wherein the guard is positioned away from the extended position toward the housing.

18. The drug delivery device of claim 17, comprising a guard biasing member configured to bias the guard toward the extended position.

19. The drug delivery device of claim 18, comprising an indicator operably coupled to the guard biasing member and configured to generate an audible signal indicating an end of drug delivery.

20. The drug delivery device of claim 19, comprising a second cam and a second cam follower, wherein the indicator comprises a second cam follower.

21. The drug delivery device of claim 20, wherein a biasing force of the guard biasing member urges the second cam follower against the second cam to urge the indicator to rotate relative to the housing.

22. The drug delivery device of claim 21, wherein the indicator is configured to rotate jointly with the plunger from the initial rotational position to the second rotational position, and rotate independently of the plunger from the second rotational position to a third rotational position.

23. The drug delivery device of claim 22, wherein the indicator, upon reaching the third rotational position, comes into contact with the housing or a structure fixed relative to the housing to generate the audible signal.

24. The drug delivery device of claim 9, wherein the plunger guide comprises an opening formed in the annular wall, and wherein the proximally facing surface defines a portion of the periphery of the opening.

25. The drug delivery device of claim 9, wherein the proximally facing surface is sloped, and wherein the biasing force of the biasing member is configured to urge the cam follower to slide along the proximally facing surface to urge the plunger to rotate from the initial rotational position toward the second rotational position.