DRUG DELIVERY DEVICE

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] The present application claims the priority of U.S. Provisional Application No. 62/908,504, filed September 30, 2019, entitled, "Drug Delivery Device," and U.S. Provisional Application No. 62/961,048, filed January 14, 2020, entitled, "Drug Delivery Device," each of which is incorporated by reference.

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 may include automatically covering a needle in a pre-delivery and/or post-delivery state, automatically inserting a needle and/or a cannula into a user, automatically activating a drive mechanism, automatically 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] According to an aspect of the present invention, there is provided a drug delivery device including a housing defining a longitudinal axis and having an opening and a drug storage container including a delivery member having an insertion end configured to extend at least partially through the opening during a delivery state. The device may further include a guard moveably positioned adjacent to the opening and a plunger having a generally cylindrical body portion extending along the longitudinal axis and at least one flange extending radially outwardly from the body portion, wherein the plunger is moveable toward the distal end of the drug storage container to expel a drug from the drug storage container through the delivery member. The device may also include a plunger biasing member configured to urge the plunger toward the distal end of the drug storage container and a releaser member defining a guide configured to receive the at least one flange and permit axial movement of the plunger relative to the releaser member while resisting or preventing rotational movement between the plunger and the releaser member, and an indicator configured to generate an audible signal indicating an end of drug delivery.

[0007] The releaser member may include an initial position wherein the releaser member prevents the plunger from moving into the delivery state, and a second position wherein the releaser member does not prevent the plunger from moving into the delivery state.

[0008] The releaser member may further includes a third position wherein the indicator generates the audible signal indicating the end of drug delivery. The releaser member may be configured to translate linearly in a proximal direction while moving from the second position to the third position and may be configured to rotate while moving from the second position to the third position.

What is claimed is:

1. A drug delivery device comprising:

a housing defining a longitudinal axis and having an opening;

a drug storage container including a delivery member having an insertion end configured to extend at least partially through the opening during a delivery state;

a guard moveably positioned adjacent to the opening;

a plunger having a generally cylindrical body portion extending along the longitudinal axis and at least one flange extending radially outwardly from the body portion, wherein the plunger is moveable toward a distal end of the drug storage container to expel a drug from the drug storage container through the delivery member;

a plunger biasing member configured to urge the plunger toward the distal end of the drug storage container; and

a releaser member defining: a guide configured to receive the at least one flange and permit axial movement of the plunger relative to the releaser member while resisting or preventing rotational movement between the plunger and the releaser member, and an indicator configured to generate an audible signal indicating an end of drug delivery.

2. The drug delivery device of claim 1, wherein the releaser member includes an initial position wherein the releaser member prevents the plunger from moving into the delivery state, and a second position wherein the releaser member does not prevent the plunger from moving into the delivery state.

3. The drug delivery device of claim 2, wherein the releaser member further includes a third position wherein the indicator generates the audible signal indicating the end of drug delivery.

4. The drug delivery device of claim 3, wherein the releaser member is configured to translate linearly in a proximal direction while moving from the second position to the third position.

5. The drug delivery device of claim 4, wherein the releaser member is configured to rotate while moving from the second position to the third position.

6. The drug delivery device of claim 5, wherein the releaser member, upon reaching the third position, comes into contact with the housing or a structure fixed relative to the housing to generate the audible signal.

7. The drug delivery device of any one of claims 1 through 6, wherein the guide extends in a proximal direction, along the longitudinal axis, from the indicator.

8. The drug delivery device of claim 7, wherein the plunger includes at least two flanges and the releaser member includes at least two guides configured to receive the at least two flanges.

9. The drug delivery device of claim 8, wherein the releaser member is prevented from moving from the initial position toward the second position when the guard is in an extended position, and wherein the releaser member is allowed to rotate from the initial position toward the second position when the guard is in a retracted position.

10. The drug delivery device of claim 9, comprising a guard biasing member operably coupled to the guard and the releaser member.

11. The drug delivery device of claim 10, wherein the guard biasing member urges the releaser member to rotate from the initial position toward the second position at least when the guard is in the retracted position.

12. The drug delivery device of claim 11, comprising a plunger guide at least partially disposed within the releaser member, wherein a camming surface on one or both of the releaser member and the plunger guide translates an axial force from the guard biasing member into a transverse force causing the releaser member to rotate at least when the guard is in the retracted position.

13. The drug delivery device of any of claims 2 through 12, wherein the plunger is at least partially disposed within the releaser member when the releaser member is in the initial position.

14. The drug delivery device of any one of claims 1 through 13, wherein the plunger includes a body portion having an inner wall defining an axial chamber.

15. The drug delivery device of claim 14, wherein the plunger biasing member is at least partially disposed within the axial chamber of the plunger.

16. The drug delivery device of claim 1, further comprising a plunger guide, wherein the releaser member is configured to move in a proximal direction into contact with the plunger guide to generate the audible signal indicating the end of drug delivery.

17. The drug delivery device of claim 1, wherein the drug storage container is filled or pre-filled with the drug, and wherein the drug comprises one of: a drug containing a human IgG1 kappa antibody, a drug containing a small interfering RNA (siRNA) that lowers lipoprotein(a), efavaleukin alfa, evolocumab, and a drug containing a gastric inhibitory polypeptide receptor (GIPR) antagonist and a GLP-1R agonist.