IMPACT ACTIVATED BRAKE FEATURE FOR DRUG DELIVERY DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] Priority is claimed to US Provisional Patent Application No. 63/252,949, filed October 6, 2021, the entire contents of which are hereby incorporated by reference herein.

FIELD OF DISCLOSURE

[0002] The present disclosure generally relates to drug delivery devices, and, more particularly, to impact activated brake features for drug delivery devices.

BACKGROUND

[0003] Drug delivery devices, such as injectors, are used to deliver liquid drugs to a patient. Upon activation, a drug delivery device will expel a drug stored within an internal reservoir through a needle, cannula, or other delivery member into the patient. Some drug delivery devices, such as pen-type autoinjectors, may be positioned adjacent to a patient's skin to deliver a drug via an injection needle or some other means over a period of time. The drug delivery device may be positioned near the tissue of the patient's abdomen, thigh, arm, or some other portion of the patient's body.

[0004] Some devices may have drawbacks. Specifically, users may be frightened by an exposed injection needle or feel they are inherently incapable of performing an injection. Because of aversions to exposed needles, as well as health and safety issues that may be involved, various types of injectors and other devices have been developed for concealing needles from the user and automating the injection task to assist the user in performing the injection, ensure reliable delivery of the medication and ensure patient safety.

[0005] Typically, three tasks may be performed when injecting a drug into a patient with a hypodermic syringe: 1) insertion of the needle into the patient; 2) injection of the drug from the syringe into the patient; and 3) withdrawal of the needle after the injection has been completed. Generally, shield-activated devices use manual needle insertion techniques whereby a user simultaneously inserts a needle and initiates dosing through the action of retracting a shield relative to the rest of the device. In these devices, the needle may automatically insert upon manually activating the device. Button-activated devices typically employ automated needle insertion mechanisms whereby the needle is inserted mechanically and the dosing mechanism release is automatically delayed until the correct device state is achieved. Any or all of these devices may use manual and/or automated withdrawal mechanisms to retract the needle, and typically rely on springs or other power sources to generate forces required to perform the tasks. Occasionally, a user may inadvertently mishandle or drop the device prior to use. In these circumstances, if the device is dropped in certain orientations, inertial forces may cause the internal components to move relative to each other, which may result in inadvertent premature device activation. Such a premature activation may result in some or all of the desired drug from actually being delivered to the user, which may be wasteful and potentially harmful to the user and/or others.

[0006] 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

[0007] In accordance with a first aspect, a drug delivery device includes a housing having proximal and distal ends and a longitudinal axis extending therebetween, an injection assembly at least partially disposed within the housing at or near the proximal end, a shield slidably coupled with the housing, a drive assembly at least partially disposed within the housing and operably coupled with the injection assembly and the shield, and a cap. The injection assembly includes a needle or a cannula. The shield is positionable in an extended position in which at least a proximal end thereof extends a distance beyond the proximal end of the housing. The drive assembly is engageable to deliver a medicament via the injection assembly. The cap is removably coupled with at least one of the shield or

the housing and is adapted to limit movement of the shield when coupled with the shield and/or the housing such that the drive assembly is restricted from delivering the medicament via the injection assembly.

[0008] In some examples, the shield may further be positionable in a retracted position in which the proximal end of the housing protrudes a distance beyond the proximal end of the shield. In such examples, moving the shield to the retracted position engages the drive assembly to deliver the medicament via the injection assembly.

[0009] In some approaches, the cap may include a locking tab, and the shield may include a detent. At least a portion of the locking tab of the cap may be positionable within the detent. In such approaches, positioning the portion of the locking tab within the detent may prevent the shield from moving to the retracted position. Further, in these and other examples, the housing may include a ramp that urges the locking tab into the detent. In some examples, upon removing the cap from the shield and the housing, a gap is formed between the housing and the shield to permit relative movement therebetween.

[0010] In any of these examples, the shield may further include a snap to secure the cap therewith.

[0011] In accordance with a second aspect, a drug delivery device includes a housing having proximal and distal ends and a longitudinal axis extending therebetween, an injection assembly at least partially disposed within the housing at or near the proximal end, a shield slidably coupled with the housing, a drive assembly at least partially disposed within the house and operably coupled with the injection assembly and the shield, and a cap. The injection assembly includes a needle or a cannula. The shield is positionable in an extended position in which at least a proximal end thereof extends a distance beyond the proximal end of the housing. The drive assembly is engageable to deliver a medicament via the injection assembly. The cap is removably coupled with at least one of the shield or the housing. The housing, the shield, and the cap cooperate to form a braking mechanism to prevent the drive assembly from activating to deliver the medicament via the injection assembly.

[0012] In accordance with a third aspect, a drug delivery device having a braking mechanism includes a housing having proximal and distal ends, a longitudinal axis extending therebetween, and a ramp member positioned at or near the proximal end, a shield slidably coupled with the housing, and a cap removably coupled with at least one of the shield of the housing. The shield is movable between an extended position wherein at least a proximal end thereof extends a distance beyond the proximal end of the housing and a retracted position wherein the proximal end of the housing protrudes a distance beyond the proximal end of the shield. The shield further includes a detent disposed along a length thereof. The cap includes at least one locking tab. When the cap is coupled with at least one of the shield or the housing, upon the shield moving towards the retracted position, the ramp member of the housing urges the at least one locking tab into engagement with the detent of the shield to restrict the shield from moving to the retracted position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The above needs are at least partially met through provision of the impact activated brake feature for drug delivery devices described in the following detailed description, particularly when studied in conjunction with the drawings, wherein:

[0014] Fig. 1 illustrates a perspective view of an example drug delivery device in accordance with various embodiments;

[0015] Fig. 2 illustrates a cross-sectional view of the example drug delivery device of Fig. 1 in accordance with various embodiments;

[0016] Fig. 3A illustrates a cross-sectional view of an example rear sub-assembly of the example drug delivery device of Figs. 1 & 2 in accordance with various embodiments;

[0017] Fig. 3B illustrates a cross-sectional view of an example drug storage container of the example drug delivery device of Figs. 1-3A in accordance with various embodiments;