

subconjunctival, intracorneal or epicorneal spaces. Wherever the desired location of implantation, typical methods of implantation all require relatively invasive surgical procedures, pose a risk of excessive trauma to the eye, and require excessive handling of the implant. For example, in a typical method for placement in the vitreous, an incision is made through the sclera, and the implant is inserted into and deposited at the desired location in the vitreous, using forceps or other like manual grasping device. Once deposited, the forceps (or grasping device) are removed, and the incision is sutured closed. Alternatively, an incision can be made through the sclera, a trocar can be advanced through the incision and then the implant can be delivered through the trocar. Similar methods can be employed to deliver implants to other locations, e.g., implantation in the anterior chamber of the eye through an incision in the cornea.

[0006] There are numerous drawbacks of such techniques for implant delivery. Extensive handling of the implant is necessitated in these techniques, creating a risk that the implant will be damaged in the process. Many implants are polymer-based and are relatively fragile. If portions of the implants are damaged and broken-off, the effective therapeutic dose delivered by the implant once placed will be significantly altered. In addition, it becomes inherently difficult using these methods to achieve reproducible placement from patient to patient. Additionally, all of these techniques require an incision or puncture in the eye large enough to require suturing. Thus, such techniques are typically performed in a surgical setting.

[0007] Many considerations affect the design and efficacy of an implant delivery device. First, it is important to ensure that the implant is consistently delivered to the subject with each application. Second, because implant therapy often requires numerous applications, the cost of providing the implant should also be considered.

[0008] Based on the foregoing, a need for a more facile, convenient, less invasive, and less traumatic means for delivering implants into the eye and other anatomy remains. In addition, a need for a more controlled means of delivering implants also remains. The innovations described herein solve these unmet needs and provide additional advantages.

SUMMARY OF THE DISCLOSURE

[0009] According to a first aspect of the present invention, there is provided an implant delivery device comprising an elongated body, a cannula, a plunger, a dispense button and a prime button. The elongated body has a proximal end and a distal end. The cannula is carried by the body and has a distal portion extending from the distal end of the body. The cannula is sized and configured to slidably receive a rod-shaped implant therein. The plunger is slidably received within the cannula and movable from a retracted position, in which a rod-shaped implant is retained inside the cannula, to a distally advanced position, in which the

through the status window when the movable part is in the unlocked position, and a D showing through the status window when the movable part is in the dispensed position.

[0013] In some embodiments, the device further comprises a spring configured to return the prime button to the locked position if the prime button is not fully moved to the unlocked position. In these embodiments, and the device is configured to provide tactile confirmation when the prime button is moved to the unlocked position, thereby confirming an unlocked state. The device may be configured to emit a soft click when the prime button reaches the unlocked position.

[0014] In some embodiments, the device further comprises a spring configured to return the dispense button to the extended position if the dispense button is not fully moved to the depressed position. In these embodiments, the device is configured to provide tactile confirmation when the dispense button is moved to the depressed position, thereby confirming an implant has been dispensed. The device may be configured to emit a soft click when the dispense button reaches the depressed position.

[0015] In some embodiments, the cannula is provided with a retaining feature configured to releasably retain a rod-shaped implant within the cannula until the implant is pushed out by the plunger. The retaining feature may comprise a bend in the cannula having an angle of at least 5 degrees. In some embodiments, the retaining feature comprises one or more items in a group consisting of a bend, a nail head, a dimple, an oval, a flex section, an adhesive, an S-curve, an etched sleeve and a wire. The device may further comprise a preloaded rod-shaped implant. In some embodiments, the device further comprises a window through the elongated body allowing a user to view the preloaded implant before it is dispensed by the device.

[0016] In some embodiments, the device further comprises a push bar coupled to the plunger and configured to move longitudinally within the elongated body. In these embodiments, the push bar is configured to be moved distally by the prime button between a locked position and an unlocked position. The push bar is configured to be moved further distally by the dispense button between the unlocked position and a dispensed position to drive the plunger distally within the cannula and dispense an implant from the distal portion of the cannula. The push bar may be provided with cam features to unlock a cap positioned on the distal end of the body when the push bar reaches the unlocked position. In some embodiments, the device is configured to dispense the rod-shaped implant intravitreally.

[0017] According to a second aspect of the present invention, there is provided a device for delivering a rod-shaped implant comprising an elongated body, a cannula, a plunger, a dispense button, a cap, a prime button, and a status window. The elongated body has a proximal end and a distal end. The cannula is carried by the body and has a distal portion extending from the distal end of the body.

The cannula is sized and configured to slidably receive a rod-shaped implant therein. The plunger is slidably received within the cannula and is movable from a retracted position, in which a rod-shaped implant is retained inside the cannula, to a distally advanced position, in which the implant is ejected from the cannula by the plunger. The dispense button is located on a top side surface of the elongated body and is generally movable radially inward from an extended position, in which the plunger remains in the retracted position, to a depressed position, in which the plunger is moved toward the distally advanced position. The cap is movable from an attached position, in which the cap is covering the distal end of the body and the distal portion of the cannula and prevents the dispense button from moving into the depressed position, to a detached position, in which the cap is separated from the body and allows the dispense button to move into the depressed position. The prime button is located on the proximal end of the elongated body and is movable towards the distal end of the body from a locked position, in which the cap is prevented from moving into the detached position, to an unlocked position, in which the cap is allowed to move into the detached position. The status window is configured to indicate when the prime button has moved from the locked position to the unlocked position, and when the dispense button has moved into the dispense position. The delivery device is configured to be operated by a user moving the prime button from the locked position to the unlocked position, subsequently moving the cap from the attached position to the detached position, and subsequently moving the dispense button from the extended position to the depressed position, thereby causing the plunger to move from the retracted position to the distally extended position to eject the implant from the distal portion of the cannula.

[0018] There is disclosed a method of delivering a rod-shaped implant includes the step of providing an implant delivery device. In this method, the implant delivery device includes an elongated body, a cannula, a plunger, a dispense button, a cap and a prime button. The elongated body has a proximal end and a distal end. The cannula is carried by the body and has a distal portion extending from the distal end of the body. The cannula carries a rod-shaped implant therein and the plunger is slidably received within the cannula. The dispense button is located on the elongated body. The cap is removably attached to the distal end of the body and covers the distal portion of the cannula when the cap is attached to the body. The prime button is located on the proximal end of the elongated body. The method further includes the step of moving the prime button from a locked position to an unlocked position, thereby unlocking the cap. After unlocking the cap by moving the prime button, the cap is removed from the body, thereby unlocking the dispense button. The method also includes the step of inserting a distal tip of the cannula into a patient. After unlocking the dispense button by removing the cap, the dispense button is moved from an extended position to a depressed position, thereby causing

CLAIMS

What is claimed is:

1. An implant delivery device comprising:
5 an elongated body having a proximal end and a distal end;
a cannula carried by the body and having a distal portion extending from the distal end of the body, the cannula being sized and configured to slidably receive a rod-shaped implant therein;
a plunger slidably received within the cannula and movable from a retracted position, in
10 which a rod-shaped implant is retained inside the cannula, to a distally advanced position, in which the implant is ejected from the cannula by the plunger;
a dispense button movable from an extended position, in which the plunger remains in the retracted position, to a depressed position, in which the plunger is moved toward the distally advanced position; and
15 a prime button movable from a locked position, in which the dispense button is prevented from moving into the depressed position, to an unlocked position, in which the dispense button may be allowed to move toward the depressed position,
wherein the delivery device is configured to be operated by a user moving the prime
button from the locked position to the unlocked position, and subsequently moving
20 the dispense button from the extended position to the depressed position, thereby causing the plunger to move from the retracted position to the distally extended position to eject the implant from the distal portion of the cannula.
2. The device of claim 1, wherein the prime button is located on the proximal end of the
25 elongated body and moves towards the distal end of the body when moving from the locked position to the unlocked position.
3. The device of claim 2, wherein the device is configured so that the prime button can be
operated by a user's thumb.
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4. The device of claim 3, wherein the dispense button is located on a top side surface of the elongated body and generally moves radially inward when moving from the extended position to the depressed position.

5. The device of claim 4, wherein the device is configured so that the dispense button can be operated by a user's forefinger or thumb.
6. The device of claim 1, wherein the device further comprises a cap movable from an attached position, in which the cap is covering the distal end of the body and the distal portion of the cannula, to a detached position, in which the cap is separated from the body.
7. The device of claim 6, wherein the device further comprises an interlock mechanism that prevents the cap from moving from the attached position to the detached position when the prime button is in the locked position.
8. The device of claim 6, wherein the device further comprises an interlock mechanism that prevents the dispense button from moving to the depressed position when the cap is in the attached position.
9. The device of claim 1, wherein the device further comprises a status window through a portion of the body, the status window allowing a user to see a position of a movable part within the body which represents a priming status and an implant status, the movable part being movable between a locked position, an unlocked position and a dispensed position.
10. The device of claim 9, wherein the position of the movable part is depicted by a change of color.
11. The device of claim 10, wherein the change of color comprises a red feature showing through the status window when the movable part is in the locked position, a yellow feature showing through the status window when the movable part is in the unlocked position, and a green feature showing through the status window when the movable part is in the dispensed position.
12. The device of claim 9, wherein the position of the movable part is depicted by a change of letter or symbol.
13. The device of claim 12, wherein the change of letter or symbol comprises an L showing through the status window when the movable part is in the locked position, a U showing through

the status window when the movable part is in the unlocked position, and a D showing through the status window when the movable part is in the dispensed position.

14. The device of claim 1, wherein the device further comprises a spring configured to return
5 the prime button to the locked position if the prime button is not fully moved to the unlocked position, and wherein the device is configured to provide tactile confirmation when the prime button is moved to the unlocked position, thereby confirming an unlocked state.

15. The device of claim 14, wherein the device is configured to emit a soft click when the
10 prime button reaches the unlocked position.

16. The device of claim 1, wherein the device further comprises a spring configured to return
the dispense button to the extended position if the dispense button is not fully moved to the
depressed position, and wherein the device is configured to provide tactile confirmation when
15 the dispense button is moved to the depressed position, thereby confirming an implant has been dispensed.

17. The device of claim 16, wherein the device is configured to emit a soft click when the
dispense button reaches the depressed position.

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18. The device of claim 1, wherein the cannula is provided with a retaining feature
configured to releasably retain a rod-shaped implant within the cannula until the implant is
pushed out by the plunger.

25 19. The device of claim 18, wherein the retaining feature comprises a bend in the cannula having an angle of at least 5 degrees.

20. The device of claim 18, wherein the retaining feature comprises one or more items in a
group consisting of a bend, a nail head, a dimple, an oval, a flex section, an adhesive, an S-curve,
30 an etched sleeve and a wire.

21. The device of claim 1, wherein the device further comprises a preloaded rod-shaped
implant.

22. The device of claim 21, wherein the device further comprises a window through the elongated body allowing a user to view the preloaded implant before it is dispensed by the device.
- 5 23. The device of claim 1, wherein the device further comprises a push bar coupled to the plunger and configured to move longitudinally within the elongated body, the push bar configured to be moved distally by the prime button between a locked position and an unlocked position, the push bar configured to be moved further distally by the dispense button between the unlocked position and a dispensed position to drive the plunger distally within the cannula and
10 dispense an implant from the distal portion of the cannula.
24. The device of claim 23, wherein the push bar is provided with cam features to unlock a cap positioned on the distal end of the body when the push bar reaches the unlocked position.
- 15 25. A device for delivering a rod-shaped implant, the device comprising:
an elongated body having a proximal end and a distal end;
a cannula carried by the body and having a distal portion extending from the distal end of
the body, the cannula being sized and configured to slidably receive a rod-shaped
implant therein;
20 a plunger slidably received within the cannula and movable from a retracted position, in
which a rod-shaped implant is retained inside the cannula, to a distally advanced
position, in which the implant is ejected from the cannula by the plunger;
a dispense button located on a top side surface of the elongated body and generally
movable radially inward from an extended position, in which the plunger remains in
25 the retracted position, to a depressed position, in which the plunger is moved toward
the distally advanced position;
a cap movable from an attached position, in which the cap is covering the distal end of
the body and the distal portion of the cannula and prevents the dispense button from
moving into the depressed position, to a detached position, in which the cap is
30 separated from the body and allows the dispense button to move into the depressed
position;
a prime button located on the proximal end of the elongated body and movable towards
the distal end of the body from a locked position, in which the cap is prevented from
moving into the detached position, to an unlocked position, in which the cap is
35 allowed to move into the detached position; and

a status window configured to indicate when the prime button has moved from the locked position to the unlocked position, and when the dispense button has moved into the dispense position,

wherein the delivery device is configured to be operated by a user moving the prime button from the locked position to the unlocked position, subsequently moving the cap from the attached position to the detached position, and subsequently moving the dispense button from the extended position to the depressed position, thereby causing the plunger to move from the retracted position to the distally extended position to eject the implant from the distal portion of the cannula.

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