

[0032] Recently, efforts have been made to perform such lens replacement surgeries using smaller corneal incisions. For example, as shown schematically in the illustration of FIG. 3, typically, the distal end of an intraocular lens inserter 14 is inserted completely through the incision 10, during a procedure of inserting an intraocular lens 18.

However, with reference to FIG. 4, recently surgeons have been adopting a “wound-assist” technique, wherein only a small portion of the tip 20 of the intraocular lens inserter 14 is inserted into the incision 10, wherein the incision 10 is smaller than the incisions previously made, such as during the procedure illustrated in FIG. 3. As such, the intraocular lens 18, in its folded state, is pushed through and slides along interior surfaces of the incision 10. This allows the incision 10 to be smaller and the wound itself (incision 10) becomes a lumen for inserting the lens 18 into the eye.

[0033] During such a procedure, the surgeon can use the distal end 20 of the tip of the intraocular inserter 14 to help hold the incision 10 open. For example, the surgeon might apply a lateral force in the direction of arrow 22 in order to hold the incision 10 open such that the lens 18 can be pushed therethrough.

SUMMARY OF THE INVENTION

[0033a] According to a first aspect of the present invention, there is provided an intraocular lens inserter comprising:

an intraocular lens support portion configured to support an intraocular lens for insertion into an eye of an animal;

an actuator portion configured to receive mechanical energy from an energy storage device and to convert the received mechanical energy into translational movement of a lens supported in the intraocular lens support portion.

[0033b] According to a second aspect of the present invention, there is provided an intraocular lens inserter comprising:

an intraocular lens support portion;

an actuator portion communicating with an energy storage device and comprising a substantially incompressible fluid, the actuator portion configured to apply mechanical forces from the energy storage device to the incompressible fluid for discharging an intraocular lens supported by the intraocular lens support portion.

[0033c] According to a third aspect of the present invention, there is provided a method for discharging an intraocular lens from an intraocular lens cartridge, the method comprising:

releasing stored energy from a compressible energy storage medium;

conducting the released energy from the compressible energy storage medium with a substantially incompressible fluid to a plunger;

moving the plunger with the substantially incompressible fluid to push an intraocular lens out of an intraocular lens cartridge.

[0034] ~~An aspect of at least one~~Embodiments of the inventions disclosed herein includes the realization that an intraocular lens inserter design can allow a surgeon to actuate and thus discharge a lens from an inserter device with one hand can provide a surgeon and can also reduce the manual force that must be applied by the surgeon. For example, in some known conventional devices, such as plunger devices, a surgeon must use significant manual force against the proximal end of the plunger to push the lens through the end of the inserter device. This makes it more difficult for the surgeon to hold the device in the desired orientation and location during insertion. This problem is more significant in the surgical procedures more recently adopted such as that described above with reference to Figure 4. Thus, an intraocular lens insertion device that provides assisted discharge force can help a surgeon perform the surgical procedure as desired.

[0035] ~~Another aspect of at least one~~Embodiments of the inventions disclosed herein includes the realization that significant costs for such devices can be reduced by the use of an inserted device having an incorporated mechanism for storing energy for providing a discharge force, which is not connected by a tether, for example, to a separate console. For example, some

known types of surgical devices include electrical motors or pneumatic systems that are operated by standalone consoles that provide either electrical power to an electric motor or compressed air to a compressed air motor inside a handpiece of a surgical device. Such systems require the surgeons to purchase or rent the console devices for use with such specialized surgical tools.

[0036] Thus, by providing an intraocular lens inserter with energy storage for providing a discharge force, the intraocular lens inserter is more portable and avoids the requirement for a surgeon to purchase or rent a separate standalone console.

[0037] ~~Another aspect of at least one~~Embodiments of the inventions disclosed herein includes the realization that compressible energy storage devices, such as springs, or compressed air, can provide convenient and portable means for storage of energy which can be output as forces. However, such energy storage devices are more difficult to control for providing, for example, constant velocity output. Thus, ~~an aspect of at least one~~embodiments of the inventions disclosed herein includes the realization that providing an actuating circuit operating with a substantially incompressible fluid, such as a liquid, accommodates the use of mechanisms that can provide more fine control over the velocity of downstream components, even where energy is supplied by a compressible storage device, such as springs or compressed air.

[0038] ~~Another aspect of at least one~~Embodiments of the inventions disclosed herein includes the realization that a hand-held intraocular lens inserter can be made with an incorporated energy storage device and a movement control actuator, with sufficient simplicity that the resulting device can be designed as a single use device and thus disposable, thereby avoiding the costs of resterilization and the potential for cross-contamination. Thus, for example, an intraocular lens inserter device can include a compressible energy storage device and an actuator configured to operate with a substantially incompressible fluid for controlling the release of the energy stored by the energy storage device and the movement of downstream components, such as a lens insertion rod.

[0039] This summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS