INTRAOCULAR LENS WITH COILED HAPTICS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to an intraocular lens for use as an artificial lens implant in the human eye.

2. Description of the Prior Art

The following U.S. patents disclose intraocular lens which employ different types of open loop or closed loop haptics or position fixation members: U.S. Pat. Nos. 4,010,496, 4,085,467, 4,159,546, 4,174,543, 4,242,760, 4,244,060, 4,251,887, 4,253,200, 4,280,232, 4,285,072, 4,298,994, 4,298,995, 4,304,012, 4,316,292, 4,328,595, 4,338,687, 4,340,979, 4,361,913, 4,370,760, 4,377,873, 4,418,431. The purpose of the haptics or position fixation members is to hold or support the optic or lens body in the eye in a stable position with respect to the pupil and visual axis. As pointed out in U.S. Pat. No. 4,418,431, a certain degree of flexibility of the haptics is desirable. In addition, a desirable feature of any intraocular lens is that it exhibits geometrically stable haptic flexion which consists of three basic properties: (1) no side to side movement of the haptic when it flexes; (2) no change in the location or amount of touch of the haptic with the tissue of the eye; (3) the haptic must be able to flex without movement of the optic forward, backward, or side ways when in the anterior or posterior chambers of the eye (uniplanar loop flexion). Very few of the known intraocular lenses have all of these properties. Previously, it had been thought that flexion of closed loop haptics owuld invariably result in anterior optic movement (movement of the optic forward) when placed in the anterior chamber of the eye. This is particularly true for lenses which are made in an angulated or vaulted design in order to support the lens away from the iris. Such anterior optic movement is undesirable since it may result in engagement of the optic with the cornea on its posterior surface which can result in damage to the cornea.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a new and useful intraocular lens having unique types of open loop and closed loop haptics or position fixation members which have a desirable amount of flexibility and geometrically stable haptic flexion.

The haptics or position fixation members have coiled or curled flexible portions which tend to unwind (open) or wind (close) when the haptics flex upon compression of the haptics toward the optic. This has particular advantage when employed in closed loop type haptics in that it provides considerable flexibility and prevents or minimizes anterior optic movement thereby providing uniplanar flexion allowing the lens to be safely used in the anterior chamber of the eye. It also allows for the necessary flexibility required for either anterior or posterior chamber inplantation of intraocular lenses having either closed loop or open loop haptics. By employing coiled flexible portions in open loop haptics, additional locations of flexibility are provided.

The intraocular lens of the invention comprises a lens body or optic having a haptic or position fixation member which comprises a stem portion connected to the optic or lens body, a coiled portion, and a peripheral portion adapted to engage the tissue of the eye. In the embodiment disclosed, the closed loop haptics, have two coiled portions and the open loop haptics, have one coiled portion.

More specifically, the closed loop haptics, have two stems with a coiled portion connected between each stem and its peripheral portion. The open loop haptics, have a single stem with a coiled portion coupled between the stem in its peripheral portion which has a free end. In the open loop haptics, an elbow is located between the coiled portion and the peripheral portion thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a top plan view of an intraocular lens of the invention which has two closed loop haptics each having two coiled portions.

FIGS. **2–5** are side views of intraocular lenses of the invention having two closed loop haptics. In FIGS. **2** and **3**, the lenses are of a convex-planar shape. In FIGS. **4** and **5**, the lenses are of a biconvex shape. In FIGS. **3** and **5**, the haptics are angulated or vaulted.

FIG. **6** illustrates the manner in which one of the coils of one of the haptics of the lens of FIG. **1** unwinds when pressure is applied to the peripheral portion of the haptic toward the lens body.

FIG. **7** is a view similar to that of FIG. **6** but with the loop of the coil being more oval shaped.

FIG. **8** is an intraocular lens having two closed loop haptics each of which has two coils. The peripheral portions of the haptics are more round than those of FIG. **1**.

FIG. **9** illustrates movement of the peripheral portions and unwinding of the coils of the haptics when pressure is applied to the peripheral portions of the haptics toward the lens body.

FIG. **10** is an intraocular lens having two closed loop haptics each of which has two coils. The peripheral portions of the haptics are more pointed than those of FIGS. **1** and **8**.

FIG. **11** is an intraocular lens having two closed loop haptics each of which has two coils. The peripheral portions of each of the haptics are shaped to provide two rounded position fixation portions whereby four point fixation is provided for the lens overall.

FIG. **12** is an intraocular lens having two closed loop haptics one of which is of the type shown in FIG. **10** and the other of which is of the type shown in FIG. **11**.

FIG. **13** is an intraocular lens having two open loop haptics each of which has one coil. The peripheral portions of the haptics provide broad arcs of tissue contact.

FIG. **14** is an intraocular lens having two open loop haptics similar to that of FIG. **14** but having curved stems.

FIG. **15** is an intraocular lens having two open loop haptics each of which has one coil. The peripheral portions of each of the haptics are shaped to provide two rounded fixation portions whereby four point fixation is provided for the lens overall.

FIG. **16** is an intraocular lens having two open loop haptics each of which has one coil. The peripheral portions of each of the haptics are shaped to provide three rounded fixation portions whereby six point fixation is provided totally for the lens overall.

FIG. **17** is an intraocular lens having two closed loop haptics similar to that of FIG. **1** but with diverging stems.

FIG. **18** is an intraocular lens having two closed loop haptics each of which has two coils located on the outside of the stems.