INTRAOCULAR LENS WITH MINIATURE OPTIC

This invention relates to intraocular lenses for the human eye, and, more particularly, to intraocular lenses of the type which can be positioned in the anterior chamber, the posterior chamber, or partially in the anterior chamber and partially in the posterior chamber of the eye. The invention also relates to methods of inserting and positioning such lenses in an eye.

One type of intraocular lens is described and claimed in my U.S. Pat. No. 4,174,543 issued Nov. 20, 1979. Such a lens is inserted into the eye through a corneoscleral incision that may be also used to remove a natural lens. To minimize the possibility of injury to the eye, it is important that the incision be made as small as possible. To this end, another type of lens is described and claimed in my co-pending application Ser. No. 422,374, now U.S. Pat. No. 4,451,935 entitled Intraocular Lens and Method of Positioning the Same in an Eye. In my co-pending application a lens is described and claimed which has a two-piece optic, allowing the surgeon to make an incision in the eye smaller than the diameter of the lens body, or optic. In the case of the two-piece optic, depending on where the optic is split and depending on the means used for connecting the two pieces together there may result in some instances an undesirable glare effect at the juncture of the two pieces. This same undesirable glare effect has in the past precluded the use of intraocular lenses with optics substantially smaller than 5 mm in diameter, due to the peripheral marginal regions of the miniature optic being in the path of light rays directed toward the retina.

It is an object of the present invention, therefore, to provide a new and improved intraocular lens which avoids one or more of the limitations of prior such lenses.

It is another object of the invention to provide a new and improved intraocular lens which has a lens body which is smaller than the lens body of conventional lenses yet which does not result in undesirable glare.

It is another object of the invention to provide a new and improved method of positioning an intraocular lens in an eye, which avoids one or more of the limitations of prior such methods.

It is another object of the invention to provide a new and improved method of positioning an intraocular lens in an eye utilizing a smaller incision in the eye than the incision required for insertion of a conventional intraocular lens into the eye.

In accordance with the invention, an intraocular lens comprises a lens body and a position-fixation means extending from the lens body for fixating the position of the lens body within the eye. The position fixation means includes masking means for preventing glare from a marginal peripheral portion of the lens body. The lens body and the position-fixation means are separable from one another outside the eye, are individually insertible through an opening in the eye, and are connectable within the eye to form the lens. The lens has a miniature lens body i.e. a lens body which has at least one small dimension which permits it to be inserted into the eye through an incision which is substantially smaller than the incision now generally required for insertion of conventional lens bodies.

Also in accordance with the invention, a method of positioning in an eye an intraocular lens having a plurality of portions which are separable outside the eye and connectable inside the eye, the lens portions including the lens body and the position-fixation member, said position-fixation member having a central stem portion, a pair of opposite seating portions extending generally transversely from opposite ends of said stem portion and a pair of arms also extending generally transversely from spaced regions of said stem portion intermediate said seating portions, each of said arms being flexible so as to be deflectable from a first position in which said arm substantially overlies a peripheral marginal region of said lens body to a second position in which the free end of said arm is closer to the adjacent one of said seating portions than in said first position thereof. The method includes inserting one of said seating portions of the position-fixation member through an incision in the eye while holding the corresponding arm in its second position thereof, inserting the stem portion of the position-fixation member through the incision, and finally inserting the other of said seating portions through the incision while holding the other arm in its second position thereof closer to said other seating portion than in said first position thereof. The method also includes inserting a miniature lens body through the opening in the eye, and connecting the lens body to the position-fixation means within the eye to form the lens.

For a better understanding of the present invention, together with other and further objects thereof, reference is made to the following description, taken in connection with the accompanying drawings, and its scope will be pointed out in the appended claims.

Referring now to the drawings:

FIG. **1** is a simplified schematic sectional view of an eyeball implanted with an intraocular lens embodying a preferred form of the present invention;

FIG. **2** is a plan view of the intraocular lens represented in FIG. **1**;

FIG. **3** is a plan view of the position-fixation member of the lens of FIGS. **1** and **2** shown with one of its arms in position for insertion into the eye;

FIG. **4** is a plan view of the position-fixation member of the lens of FIGS. **1** and **2** showing the other of its arms in position for insertion into the eye;

FIG. **5** is a transverse sectional view along line **5—5** of FIG. **2**;

FIG. **6** is a transverse sectional view similar to the view in FIG. **5**, of another embodiment of a lens constructed in accordance with the invention;

FIG. **7** is a partial transverse sectional view along line **7—7** of FIG. **2**; and

FIG. **8** is a plan view of a lens body according to the present invention.

Referring now particularly to FIGS. **1** and **2** of the drawings, reference **10** generally designates an eyeball shown in simplified schematic cross-section in FIG. **1**. Portions of the eyeball structure which are not believed to be essential to an understanding of the invention have been omitted for the sake of clarity.

The eyeball **10** includes a cornea **12**, an iris **14** having a central opening or pupil **16**, a membrane **18**, vitreous humor **20** and a retina **22**. The natural lens, which normally occupies part of the region between the membrane **18** and the iris **14**, has been omitted since the invention deals with artificial substitutes for a natural lens. An aqueous zone, between the cornea **12** and the membrane **18**, is subdivided by the iris **14** into an anterior chamber **24** and a posterior chamber **26**. A scleral spur **28** in the anterior chamber **24** is spaced from the iris **14** thereby defining a groove **30**.