cates that while such factors (i.e. factors such as convergence of the light, the thickness of the lenses and the need for additional power) place restrictions on the freedom to select the gain independently of the overall power, they do not abolish this freedom. On the contrary, one is left with considerable room to select the gain and the power independently.

For the sake of illustration one may consider the case where the anterior lens is a biconcave positive lens and the posterior lens is a negative lens of which at least the anterior surface is concave. Let us further assume that the posterior surface of the anterior lens and the anterior surface of the posterior lens have the same curvature. That is to say, the curvatures are such that the anterior lens and posterior lens make a perfect fit when the two lenses are pushed up against each other. In this case, simulated ray tracing indicates that the overall power of the lens system will be determined mainly by the curvature of the anterior surface of the anterior lens and by the curvature of the posterior surface of the posterior lens. The gain of the overall system on the other hand will be largely determined by the curvature of the posterior surface of the anterior lens, which is equal to the anterior surface of the posterior lens. Generally, the more curved this surface is (i.e. the shorter the radius of curvature) the higher is the gain of the lens system.

In an intraocular lens based on the present lens system it is envisioned that changes in tension in the ciliary muscle will be able to change the distance between the anterior lens and the posterior lens. This will make it possible for the ciliary muscle to change the power of the intraocular lens and will make it possible for a patient to accommodate. It is assumed that the intraocular lens will be placed in a lens capsule after this capsule has been emptied (FIG. **2**). Changes in tension of the ciliary muscle will be transmitted to the lens capsule via the zonules. The changes in tension in the lens capsule will then in turn change the tension exerted onto the haptics. Tension changes in the lens capsule and movements of the haptics will occur substantially in a plane perpendicular to the optical axis. In order for these changes to change the power of the present lens system they will have to be translated into positional changes parallel to the optical axis. FIGS. **3**–**14** show various ways this can be accomplished.

In the preferred embodiment the positive lens will be the anterior lens and the negative lens will be the posterior lens. However, the reverse order also may be used. The formula for the combined power of two thin lenses does not differentiate these two conditions (except for a change in sign).

Because the lens power of at least one of the two lenses may be rather large, it may be desirable to select the shapes and the optical materials for the two lenses so as to minimize the effects of aberrations.

It may also be desirable to be able to compress the intraocular lens at the time of insertion so as to allow the intraocular lens to be inserted into an eye through a small incision. An alternative strategy would be to insert the component parts of the intraocular lens separately and to assemble them once they have been brought inside the eye.

One embodiment involves attaching skirt **40** to one of the two lenses and cylindrical ring **46** to the other lens. This arrangement serves to ensure that the two lenses remain aligned as they move toward and away from each other. In this embodiment, in order to facilitate movement, it would most likely be desirable to have openings through skirt **40** and cylindrical ring **46** so as to allow aqueous to flow freely between the surrounding space and the space inside skirt **40** and cylindrical ring **46**. For the sake of clarity and because they do not directly relate to the basic operation of the lens system these openings have not been shown in the drawings.

Whereas the main application for the present lens system is for use in an accommodating intraocular lens,the lens system also would be well suited as the basis for an adjustable fixed focus intraocular lens. When implanting an intraocular lens it is often difficult to select the power of the intraocular lens so as to obtain the correct lens power for generating sharp retinal images. It would therefore represent a major advantage to be able to adjust the power of the intraocular lens after it has been implanted in the eye. The lens system of the present invention has a decided advantage in this respect in that it makes it possible to make substantial adjustments in lens power for small changes in position. In order to achieve this goal it would be necessary to provide means, involving steps such as, for example., the shining of a laser into the eye, whereby the separation between the anterior lens **2** and posterior lens **4** may be adjusted from outside the eye without the need for invasive procedures.

CONCLUSION, RAMIFICATION AND SCOPE

Accordingly, the reader will see that the intraocular lens system of this invention can be used to restore accommodation in a human eye. Furthermore this intraocular lens system has the advantages that

- it can be fashioned so as to have high gain, thus allowing large changes in optical power to be generated with small changes in the position of the optical elements.
- it makes it possible for the gain to be selected relatively independently of the overall power of the lens system.
- it allows for a number of embodiments whereby the changes in ciliary muscle tension can be transmitted to the lens system where they can be translated into changes in optical power.
- it is consistent with conventional placement of intraocular lenses inside the lens capsule after the capsule has been emptied in the course of extracapsular cataract extraction.
- it is well suited as the basis for an adjustable fixed focus intraocular lens the power of which may be adjusted after the intraocular lens has been placed in the eye.

Although the description above contains many specifics, these should not be construed as limiting the scope of the invention but as merely providing illustrations of some of the presently preferred embodiments of this invention. The scope of the invention should be determined by the appended claims and their legal equivalents, rather than by the examples given.

I claim:

1. A lens system for implantation in an eye, said lens system comprising:

(a) one positive lens,

(b) one negative lens,

(c) adjustment means whereby change s in the ciliary muscle can alter the distance between said positive lens and said negative lens,

whereby the overall optical power of said lens system may be adjusted.

2. An intraocular lens system as described in claim **1** in which said positive lens and said negative lens substantially retain their individual shapes during the displacement brought about by activation of said adjustment means.

3. An intraocular lens system as described in claim **1** in which said positive lens and said negative lens each individually substantially retain their individual optical powers