from the power of the central circular region. Alternatively, the ring segments may include rings of the same power as central circular region, along with ring segments of two additional powers. Thus, for example, in a trifocal lens having lens powers designated A, B, and C, the concentric rings might be arrayed as B-C-B, B-C-B-C, B-C-A-B, or B-C-A-B-C around a central circular portion of power A. An example of B-C-A-B-C is shown in FIG. **6** as respective concentric rings **24**, **25**, **28**, **30** and **31**.

The intraocular lens according to the invention advantageously may have a plano-convex shape (FIG. **7**) or a bi-convex shape (FIG. **8**). In addition, lenses according to the invention may have a convex-concave shape (FIG. **10**) or a convex-plano-convex shape (FIG. **9**) or a biconcave shape.

Pseudophakic eyes generally exhibit less pupillary excursion than average, due to the general tendency for this type of surgery to be performed on elderly patients who exhibit varying degrees of senile miosis. In addition, some degree of miotic behavior may be the result of the surgery itself. Nevertheless, some degree of pupillary excursion due to differing lighting conditions and the normal accommodation for close focusing occurs in many patients. The lenses according to the invention provide superior vision of both near and far objects throughout the range of pupillary excursion. This is achieved by selecting the relative sizes of the regions such that as the pupillary aperture changes the portion of a bifocal lens exposed always has about one-half of the pupillary area powered for near vision and the other half powered for far vision. In a multifocal lens having three or more powers, the relative areas are similarly balanced to achieve optimum light transmission for segments of each power under all conditions.

In practice, this can be achieved with a lens having an overall diameter of about 6 to 7 mm in which the central region is from 1 mm to 3 mm and the concentric ring regions have a radial thickness of about 0.125 mm or more. Given the normal diameter for the lens, the maximum radial thickness of any one ring region is about 2 mm. The rings can differ in radial thickness, for example by becoming successively narrower so that the area of the rings is constant, or the radial thickness of the rings can be kept constant. The eye size and extent of pupillary excursion in an individual patient should be considered in establishing the actual dimensions of a lens.

The lenses according to the invention provide multifocal vision by relying upon the nervous system's inherent ability to selectively perceive one of two or more sets of optical inputs, e.g., near and far objects. In order for adequate differentiation and rapid neurotransfer between the two sets of inputs to be achieved, a difference in effective power of at least 2.5 diopters is generally necessary although this will vary somewhat from patient to patient. Some patients may achieve effective neurotransfer with differences as low as 1 diopter, while others may require differences as large as 3 diopters. In additional corneal inlay usage will require a lesser difference because of the increased distance from the retina.

The actual powering of the far and near vision regions is selected based on the needs of the individual patient, but the average patient will require a power of +10 to +30 diopters in the far vision regions of the lens, and a power of +10 to +40 diopters in the near vision region of the lens.

The lenses according to the invention can be fabricated by lathe cutting, compression or injection molding, photoetching, milling or electro-forming. The near optic may be placed on either surface of the lens with the power corrected accordingly. Similarly, the concentric ring regions may be formed by varying the curvature of concentric ring portions on either the inner or outer surface, or both. The lenses may also be fabricated using materials having different refractive indices for the near and far vision regions.

I claim:

1. A multifocal lens adapted for intraocular implantation in a human eye comprising a one piece transparent lens body having a substantially circular central region having a first optical power; and a plurality of concentric ring regions coaxially surrounding said central region having second and third optical powers both different from said first optical power, the innermost of said ring regions having a second optical power, and each subsequent ring region having an optical power different from the optical power of the ring region immediately inward therefrom, with the proviso that said plurality of concentric ring regions include either at least one ring region having said first optical power, or at least two ring regions which have the same power.

2. A lens according to claim **1**, wherein the central region is powered for near vision.

3. A lens according to claim **1**, wherein the central region and ring regions are sized such that over an average range of a patient's pupillary excursion about one-half of the exposed portion of the lens is powered for near vision.

4. A lens according to claim **1** wherein the central region is from about 1 to 3 mm in diameter.

5. A lens according to claim **4**, wherein the concentric ring regions have a radial thickness of from about 0.125 mm to about 2 mm.

6. A lens according to claim **5**, wherein the concentric ring regions all have equal area.

7. A lens according to claim **5**, wherein the concentric ring regions all have equal radial thickness.

8. A lens according to claim **1**, further comprising haptics for fixing the lens within the anterior or posterior chamber of the eye.

9. A lens according to claim **1**, wherein the difference in effective power first, second and third optical powers is from about 1 to 3 diopters.

10. A multifocal lens adapted for intraocular implantation in a human eye comprising a one piece transparent lens body having a substantially circular central region having a first optical power; and a plurality of concentric ring regions coaxially surrounding said central region, the first innermost of said ring regions having a second optical power different from said first optical power, and a second subsequent ring region having a third optical power different from the optical power of the innermost ring region and different from the optical power of the central region.

11. A lens according to claim **10**, including a third subsequent ring region having said first optical power.

12. A lens according to claim **10** including a third subsequent ring region having said second optical power.

13. A lens according to claim **12** including a fourth ring region having said third optical power.

14. A lens according to claim **10** having subsequent third, fourth and fifth ring regions respectively with said first, second and third optical powers.