FIG. 2 shows the negative aspheric lens with the aspheric curve on the concave surface in section.

FIG. 3 shows the lens in place on the cornea with the aspheric curve transferred to the convex surface, in section.

THE LENS IS MADE AS FOLLOWS

The aspheric lens blank **1** FIG. **1** with an aspheric concave curvature having a longer radius **2** FIG. **1** near the center and a progressively shorter radius **3** FIG. **1** toward the edge is made by casting. Lens materials such as hydroxyethylmethacrylate (H.E.M.A.), silicone, fluorocarbon copolymers and vinyl pyrrolidone are made by casting.

The casting mold is made from a molding resin such as nylon or polyethylene by injection molding. The aspheric optical surface has a convex radius equal to the required concave blank radius.

The molds optical surface is filled with the selected liquid lens monomer covering the optical surface and allowed to polymerize to form a solid xerogel monolithic mass. Adhesion between the mold and the polymerized lens material must be great enough to insure that separations of the mold and the lens material does not occur during polymerization. The monomer shinks in volume when polymerization occurs and adhesion to the mold is necessary to prevent lens separation from the mold. The monomer shrinkage will be from the top and seen as a lessening of the volume present in the mold. The lens blank is forcibly removed from the mold.

It is possible to cut and polish the aspheric curve having a longer radius **2** FIG. **1** near the center and a shorter radius **3** FIG. **1** near the edge. This is a most difficult operation and requires a high degree of skill and time. Replication is most difficult and impractical in volume production. Molding or casting are much preferred methods.

DEFINING THE ASPHERIC CURVE

The degree or amount of departure from a sphere of the same overall curvature is greatest at a distance seventy-one percent from the center and the amount of departure depends upon the diameter of the lens, the radius of curvature and the refractive index of the lens material. The following formula may be employed to arrive at the maximum depth of the correction required for a plano-convex lens: $x=0.0123D/R^3$

x is the departure from a true sphere,

D is the diameter of the lens,

R is the focal - aperture.

The correction at any given distance from the center of the lens may be found by the following formula: $xy=A/4F3(N/N-1)(h^2y^2-y^4)$

y is the distance from the center of the lens,

A is the aberration coefficient,

h is the radius of the lens,

F is the focal length,

N is the refractive index.

As a simplified method to determine the aspheric corrected contact lens parameters, a computer was programmed to compile the x and y incremental readings to keep the focal point the same for all off-axis rays. At the same time the spherical radius at each increment was calculated.

In conjunction with the above computer calculations, reciprocal or image calculations were generated to make it possible to fabricate the lens by aspherically correcting the lens concave surface.

THE LENS FUNCTIONS AS FOLLOWS

A concave negative aspheric curve of the required aspheric curve **2** FIG. **1** is provided by molding or casting. The concave aspheric curve will have a longer central radius **2** FIG. **1** progressively changing to a shorter peripheral radius **3** FIG. **1**. A spherical convex curve **4** FIG. **2** is cut and polished on the lens blank in the hard xerogel state to form a xerogel contact lens. The lens is hydrated to form a soft hydrogel lens having a spherical convex surface and a predetermined aspheric concave surface. The lens is placed on a cornea **6** FIG. **3** allowing the concave negative refractive power aspheric surface to conform and assume the shape of the cornea **6** FIG. **3**. The convex lens surface will now have the required positive refractive power aspheric curve **7** FIG. **3**. The soft lens concave central zone **2** FIG. **3** and peripheral zone **3** FIG. **3** will now have the curvature of cornea **6** FIG. **3**. The negative aspheric curve present on the concave soft lens surface is now transferred to the convex surface in positive form. This method is ideally suited to soft lens production as only four molded concave curvatures are required to fit all eye radii. This is due to the lens ability to conform and fit the cornea on which it is placed.

Various modifications can be made without departing from the spirit of this invention or the scope of the appended claims. The constants set forth in the disclosure are given as examples and are in no way final or binding. In view of the above, it will be seen that the several objects of the invention are achieved and other advantages are obtained. As many changes could be made in the above constructions and methods without departing from the scope of the invention, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A method of making a contact lens having reduced spherical aberration when in place on the eye made by the steps of providing an aspheric convex optical mold having a longer radius of curvature at the center and a progressively shorter radius of curvature toward the edge of the mold, casting a selected liquid lens monomer over the aspheric convex mold, allowing the liquid lens monomer to polymerize to form a solid xerogel monolithic lens blank, the aspheric lens blank having a concave aspheric surface is removed from the mold, a spherical convex optical surface is cut and polished on the concave aspheric blank to form a xerogel contact lens, the xerogel contact lens is hydrated to form a hydrogel soft contact lens having a spherical convex surface and an aspheric concave surface, the concave lens surface having a shorter radius of curvature toward the lens edge, the soft hydrogel contact lens is placed on the cornea of the eye and the concave lens surface assumes the curvature of the cornea and the convex lens surface becomes an aspheric surface having a longer radius of curvature toward the lens edge and spherical aberration is reduced.

2. A method of making a contact lens having reduced spherical aberration and a progressively longer convex radius of curvature toward the lens edge when in place on the cornea of the eye made by the steps of providing an aspheric convex optical mold having a longer radius of curvature at the center and a predetermined progressively shorter radius of curvature toward the edge of