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BI-FOCAL CORNEAL CONTACT LENS

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3 Claims. (Cl. 351—161)

This invention relates to improvements in bi-focal contact lenses and has its principal value in connection with contact lenses which float upon the cornea. This application is a continuation of my copending application Serial No. 802,883, filed March 30, 1959, now abandoned.

In the case of eyes having astigmatism due to a non-spherical cornea, the space between the contact lens and the cornea is occupied by lachrymal fluid, which, in the case of most eyes, automatically corrects for the non-spherical curvature of the cornea. This is the case because in a contact lens the inside face of the lens has a spherical curvature. In a few cases, the astigmatism may be due to a defect of the lens of the eyeball, or perhaps, if corneal, it may be so large or unusual as to require a special correction of the outer surface of the lens, for which this invention may be employed.

However, the principal value of the invention herein is for bi-focal lenses where there should be maintained a definite orientation between the eyeball and the contact lens carried thereby.

It is not usually considered necessary to be too concerned about perfect correction when the head of a person is laid on the pillow, but it is desirable to have as good vision as possible when the person is reading, and also, when he is looking at distant objects. In such case, the head is held vertical.

Hence, in obtaining the desired advantages of a bi-focal lens, I have found it possible to rely upon the force of gravity to maintain proper orientation between the lens and the cornea. I have also ascertained that a relatively small gravitational force or effect is all that is needed to maintain the corneal contact lens in its properly oriented position, without having to rely upon any other external force applied to the lens.

By any of the methods or construction hereinafter described, I have found it possible to construct a lens which will assume and subsequently maintain a position permanently oriented to a vertical plane passing through the axis of the eye, so that in actual practice, it is not possible to detect or measure any variation greater than the normal margin of error in prescribing and fitting any bi-focal lens.

It will be understood that in making the usual lens the interior face of the contact lens is made spherical or concentric with the cornea, and that the outside face of the lens is also composed of curves which are concentric with the axis of the inner face, so that the lens, if rotated on an axis coinciding with the axis of the lens, will assume any position relative to the vertical. The same conditions prevail when such a lens floats upon the cornea.

A spherically faced lens would never position itself in any one position oriented to the vertical plane above described. If it had a bi-focal reading correction on its exterior surface, that part of the lens might be found at the side or top, or in any intermediate position, rather than in its proper position at the bottom of the lens. The invention herein serves to position and maintain the lens in such oriented position that the bottom close-view portion of the lens, used for reading, is always in the same position at the bottom of the lens. This effect is obtained by constructing the lens in such manner that its center

of gravity is a significant distance immediately below the axis of the lens when the lens is properly oriented with its bi-focal portion in the proper location at the bottom of the lens.

In the drawings accompanying this application, there are illustrated contact lenses of the bi-focal type constructed in various ways in accordance with the invention, and by various methods.

In said drawings:

FIGURE 1 represents a vertical section taken through the focal axis of the eye;

FIGURE 2 is an elevation of the lens looking in the direction of the arrow **2** shown in FIGURE 1;

FIGURE 3 is a view similar to FIGURE 1, but showing a two-piece type of construction;

FIGURE 4 is a front view of the lens shown in FIGURE 3, looking in the direction of the arrow **4**;

FIGURE 5 is a vertical section taken on the focal axis of a partly finished lens;

FIGURE 6 is a similar section taken through the lens of FIGURE 5 after the bi-focal prescription has been formed on the outside face by grinding;

FIGURE 7 illustrates the method of grinding the lens as shown in FIGURE 5 to the shape shown in FIGURE 6;

FIGURE 8 is a vertical sectional view of a lens, similar to that shown in FIGURE 1, but having additional weighting; and

FIGURE 9 is a front elevation of the lens shown in FIGURE 8, looking in the direction of the arrow **9**.

Referring to the drawings, the lens shown in FIGURES 1 and 2, as shown, is made with an enlarged, thickened portion shown as being located between the points **10** and **11** having a sharper curvature and consequently shorter focal length than the spherical surface **12** on the interior face of the lens. This is the reading area of the lens and should always be located or oriented with its center below the axis **13** of the lens which intersects the center of the spherical area **12**, which area **12** of the lens is parallel with the cornea curvature **14**. The upper surface **15** for distance vision is made with a flatter curvature than the curvature **16** of the lower or reading portion of the lens.

As indicated in FIGURE 1, the cornea is of spherical shape, having a radius **17** extending from the center **18** of the cornea. The distance portion **15** has a curvature with a radius **19** extending from the center **20**, the said curvature **15** hence being slightly flatter than the spherical surface **17**, and thus serving as the distance portion of the lens.

The curvature **16** is a curve formed by a radius **21** extending from the center **22** and is shorter than the radius **17**, so that the curvature **16** serves for close-up viewing or reading.

The reading portion **16** of the lens, as shown, averages substantially thicker than the upper or distance portion of the lens, and therefore, the center of gravity of the lens is, in this way, brought down to a level represented by the point **23** (see FIGURE 2), which is a substantial distance below the axis of the lens represented by the point **24** in FIGURE 2. Bringing the center of gravity **23** of the lens as a whole below the axis **24** in this way causes the lens always to maintain the position shown in FIGURE 2, with the center of gravity **23** substantially below the axis **24**. If, for any reason, the lens becomes disoriented, the repeated blinking of the eye will, in a relatively short time, cause it to re-orient itself in the position shown in FIGURE 2, with the reading portion **16** located below the distance portion **15** of the lens.

The lenses herein disclosed may be made from a suitable plastic, transparent material which is non-toxic and has the desired refracting characteristics, such as methyl-