BIFOCAL CORNEAL CONTACT LENS AND METHOD OF MAKING SAME

This application is a continuation-in-part of application Ser. No. 844,801, filed July 25, 1969 now abandoned, which is a continuation-in-part of application Ser. No. 781,865, filed Dec. 6, 1968, now abandoned, which is a continuation of application Ser. No. 714,943, filed Mar. 21, 1968, and now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to a multifocal length lens and particularly to a bifocal corneal contact lens which does not produce optical jump or fuzziness of vision as the patient shifts his gaze from near to far objects and vice versa and which has a much thinner and lighter construction than prior art bifocal contact lenses.

Bifocal corneal contact lenses are relatively new, having been in use since only about 1957, and have met with only limited success due to he problems inherent in their construction.

Bifocal contact lenses are designed primarily to correct the effective focal lengths of the eye so that images will be focused on the retina rather than the it or in front of it as in the case of persons suffering from hyperopia or myopia or the like. Also, such lenses have utility in those persons suffering from presbyopia or those persons who due to some disease or injury of the eye desire a cosmetic effect.

Such prior art lenses place the portion of the lens for viewing distant objects in the central portion of the lens and use the peripheral area of the lens for viewing near objects. This procedure or method is generally employed due to the difficulty in maintaining the lens oriented properly with respect to the eye, and with the near viewing segment located peripherally the patient can glance downwardly and be able to look through the near segment for viewing near objects regardless of the rotational position of the lens on the eye. Many prior art lenses attempt to overcome this problem by locating the near segment in the lower edge of the lens and either truncating the lens or providing it with prism ballast or both to maintain the lens oriented relative to the eye. All of these methods, however, produce other problems of a serious nature which are an incident of the particular construction used.

For example, when the far segment is located centrally of the lens, the lens must be made very thick in order to permit the proper curvature of the peripheral near viewing portion for producing the desired plus power of the lens. In other words, the steep curvature necessary to produce a high plus power is placed in the large diameter near viewing portion resulting in a correspondingly thicker lens. Also, with the far segment located in the center, the patient has to maintain his head erect and glance downwardly with his eyes in order to see near objects through the peripheral near portion, thus requiring a conscious effort on the part of the patient each time he shifts his gaze from a far to near object and vice versa. When a lens having a centrally located far segment is used under conditions of dim lighting, such as at night, the pupil dilates thus bringing into play more of the peripheral near portion resulting in reduced visual acuity for viewing distant objects and when the patient looks down at a book, for example, the pupil constricts resulting in reduced visual acuity for viewing near objects.

In lenses which have the near viewing segment located at the lower edge of the lens, truncation of the lens or prism ballast, or both, must be employed to maintain the lens properly oriented relative to the eye. In either case, the lenses thus produced are very thick and heavy.

In lenses embodying either the centered far segment or off-center far segment with prism ballast, the resulting thick lens is undesirable from the standpoint of discomfort to the user of such lens and, more importantly, with respect to metabolism of the eye. When a thick lens is used, undesirable pressures are created on the eye as the eyelid moves over the lens, the temperature of the eye increases beyond normal limits due to the heat insulating qualities of the lens, and the normal flow of tears or lacrimal fluid is interrupted. All of these characteristics can produce serious disorders in the eye.

Even apart from the harmful physiological effects thus produced, such lenses do not provide good vision. For example, when the distance viewing segment is located in the center of the lens, rays passing through the central part of the lens are focused remote from the lens and rays passing through the peripheral part of the lens are focused near the lens. This action produces a pronounced spherical aberration with consequent fuzziness in the field of vision. This condition is worsened by the use of greater add in the peripheral near viewing portion required because of the central location of the distance viewing segment. Also, as the patient shifts his gaze from near to far objects and vice versa a pronounced jump or shift in the field of vision occurs, attended by blurring or fuzziness in the field of vision.

Attempts have been made in the prior art to locate the near viewing portion or bifocal segment of the lens in the central part of the lens. Applicant does not known of any prior art bifocal contact lens which has the near viewing portion or bifocal segment centered in the lens and which is successfully fitted to a patient. The lack of success of such lenses in the prior art is due to the fact that in accordance with the knowledge and teachings followed in the prior art in making and fitting such lenses, the focal lengths of the carrying lens and the bifocal segment are made significantly different, with the carrying lens and bifocal segment actually constructed and functioning as two completely separate and independent optical systems. Moreover, the depth of focus of the bifocal segment is relatively small and as the near point focal power of the lens is increased by giving the segment more add to correct for near vision, the depth of focus is made even smaller and the focal points of the bifocal segment and carrying lens are even further separated.

The prior art teaches that the power of the bifocal segment must be increased by giving it sufficient add to compensate for the tear layer of the eye. For example, if a patient is farsighted and an add of +1.00 is required to correct for distance vision, the carrying lens is given an add of +1.00. Then the amount of add required to correct for near vision is determined and let it be assumed that an add of +2.00 is indicated. The prior art teaches that the bifocal segment be given an add equal to this amount plus an add of +1.00 to +1.50 to correct for the tear layer, or in other words, a total add of +3.00 to +3.50. If the larger figure is assumed as the