MULTIFOCAL CORNEAL CONTACT LENSES

BACKGROUND OF THE INVENTION

This invention relates to corneal contact lenses and more particularly to multifocal corneal contact lenses.

Multifocal contact lenses are designed to correct a condition of advancing age known as "presbyopia." In a presbyopic eye, ability to focus at near distances, such as the normal reading distance, and in some cases at great distances is diminished. The loss of focusing capability is due to hardening of the eye's natural crystalline lens material.

Generally, multifocal contact lenses (usually either bifocal, trifocal or aspheric) are concentric or segmented in configuration. In a conventional bifocal contact lens of the concentric type, a first, centrally located, circular correction zone constitutes either distant or near vision correction, while a second annular correction zone surrounding the first zone provides the corresponding near or distance vision correction, respectively. In a conventional bifocal contact lens of the segmented type, the lens is divided into two somewhat D-shaped zones. Usually the upper area is for distant vision correction, whereas the lower area is for near vision correction. Such conventional segmented contact lenses require some sort of shifting of the lens relative to the eye to achieve acceptable visual acuity for both distant and near vision.

A trifocal contact lens has a third correction zone whose focal length is between the focal lengths of the distant vision and the near vision zones. The third correction zone may be termed a middle, or intermediate, distance correction zone.

Because of the multiplicity of foci, conventional multifocal contact lenses often produce a perceived image which is blurred. Such a situation worsens as illumination decreases, such as during night driving. With reduced illumination, the pupil enlarges in diameter, and consequently more light simultaneously enters the eye through both the distant vision correction zone and the near vision correction zone. This overlapping imagery increases the blur within the eye and reduces acuity and contrast of vision. The user's brain is usually not capable of ignoring the blurry portion of the image in favor of the focused portion.

OBJECTS OF THE INVENTION

An object of the present invention is to provide improved contact lenses for the correction of presbyopia.

Another object of the present invention is to provide improved pairs of multifocal corneal contact lenses.

Another, more particular, object of the present invention is to provide multifocal corneal contact lenses which minimize or avoid the above-mentioned disadvantage.

SUMMARY OF THE INVENTION

Pursuant to a general embodiment of the present invention, a pair of multifocal corneal contact lenses comprises a first contact lens for one eye of a patient and a second, differently configured lens for the other eye of the patient. The first lens has a first distant vision correction zone and a first near vision correction zone. The second contact lens has a first correction zone and a second correction zone, the first correction zone corresponding substantially in size, shape and location to the distant vision correction zone of the first contact lens, and the second correction zone corresponding substantially in size, shape and location to the near vision correction zone of the first contact lens. The first correction zone of the second contact lens constitutes a second near vision correction zone, the second correction zone constituting a second distant vision correction zone. Thus, in the second contact lens, the distant vision correction zone and the near vision correction zone are reversed with respect to the first contact lens. In addition, at least one of the two contact lenses has an intermediate distance correction zone separating the distant vision correction zone from the near vision correction zone of that lens.

Pursuant to another feature of the present invention, a plurality of intermediate distance correction zones may be disposed between the distant vision correction zone and the near vision correction zone of either or both of the contact lenses. Preferably, one of the intermediate distance correction zones of the first contact lens has a focal length in the same focal range as the focal length of one of the intermediate distance correction zones of the other contact lens. The other intermediate distance correction zone or zones of each lens may then have focal lengths ranges closer to the focal length of one or the other of the distant vision correction zone and the near vision correction zone of the respective lens.

The distant vision correction zones and near vision correction zones of the two lenses may have any of a number of different geometric configurations. For example, the correction zones may be concentrically arranged or may take D shapes (segmented lenses). More particularly, the first distant vision correction zone (first lens) may occupy a circular area and the first near vision correction zone (first lens) may occupy an annular area surrounding the first distant vision correction zone. Likewise, the second near vision correction zone (second lens) may occupy a circular area, while the second distant vision correction zone occupies an annular area around the second near vision correction zone.

In a particular embodiment of the invention, each concentrically configured lens is provided with a plurality of annular intermediate distance correction zones between the circular inner zone and the annular outer zone. One of the intermediate distance correction zones in any particular lens may take the form of an intermediate-distant vision correction zone, while another intermediate distance vision correction zone may take the form of an intermediate-near vision correction zone. Alternatively or in addition, a true intermediate distance correction zone may be provided.

Pursuant to yet another feature of the present invention, the centrally located, circular correction zone of a concentrically configured lens, whether a distant vision correction zone or a near vision correction zone, has an area equal to approximately two-thirds of a minimum area (high illumination) subtended by the respective pupil of the patient. In addition, in a lens having at least two correction zones, it is advantageous if that portion of the outer, annular correction zone coextensive with the pupil in a maximally opened state thereof occupies an area equal to at least two-thirds of the area of the pupil in its maximally opened state (low illumination).

In accordance with another general embodiment of the present invention, a pair of multifocal corneal contact lenses includes a first contact lens for one eye of a patient, the lens having a distant vision correction