BIFOCAL CONTACT LENS OF THE BIVISUAL TYPE

BACKGROUND OF THE INVENTION

The invention relates to a bifocal contact lens of the bivisual type and, more particularly, without any image jump.

Bifocal contact lenses of alternating and bivisual types are available for presbyopic persons. The lenses of the alternating type include variously-configured, segmentally-ground (bifocal) lenses having an essentially-horizontal zone of separation or transitional line (or, more precisely, an area as used hereinafter) between two upper and lower areas of different vertex powers for the distance zone and the reading zone. Using this type of contact lenses, it is difficult to determine the correct segment height when fitting the lens. Furthermore, there is a considerable image jump at the transitional area in some lenses of this type.

In the known bifocal contact lenses of the bivisual type, which sometimes are also known as the simultaneous type, the distance-focusing part is in the center of the lens, and the reading-focusing part is located peripherally around the distance-focusing part. For bifocal operation, the distance part and the reading part must simultaneously cover portions of the pupil area, preferably one-half of the pupil area each, so that simultaneous imaging from the distance and reading parts takes place. This type of contact lens makes it possible to prescribe thin minilenses with relatively steep base curves, so that corneal temperature is kept low and corneal gas exchange is impaired as little as possible. Also, in cases of large pupil diameters of the lens wearers, the lens can be made large so that head attitudes are unnecessary either for reading or viewing at distances. However, double images, particularly of bright objects, and thereby reduction of image contrast are disturbing. Rotational movement of these concentric bivisual lenses is clearly not disadvantageous, so that additional means of stabilizing the position of the lenses on corneas are not necessary, but problems do occur with vertical movement of the lenses on account of differences in the intrinsic brightness (tunnel effect) of the images from the concentric, differently-focusing parts.

A review of various bifocal lens systems and the limits of their application is contained in a paper presented at the 14th Convention of the VDC in Nuernberg in 1969 by Guenter Giefer, entitled, "*Die verschiedenen Bifokallinsensysteme - Moeglichkeiten und Grenzen ihrer Anpassung*" ["bifocal lens systems - possibilities and limits of their application"] (printed in *NOJ,* June 1969) and in the textbook *Kontaklinsen* [*Contact Lenses*] by Heinz Baron, 1981, *Verlag Optische Fachveroeffentlichung GmbH,* Heidelberg.

THE INVENTION

It is an objective or aim of the invention to create a bifocal contact lens of the bivisual type in which vertical movement of the lens will not affect the bivisual acuity.

The objective or aim is achieved in accordance with the invention in that, with the lens on the eye, the transitional or separation zone, line, or area between two differently-focusing parts of the lens runs from the upper to the lower part of the lens, depending on the type. This divides the lens into a nasal (closer to the wearer's nose) part and a temporal (away from the wearer's nose) part for reading-focusing and distance-focusing parts. To maintain the orientation of the transition area, the lens is provided with a stabilization arrangement which is known, in itself.

Advantageously, the transitional zone or area runs through the center of the optical part of the lens and is in the vertical meridial section of the total, physical lens body.

The advantages achieved hereby are to be seen in the fact that differences in brightness of objects have no effect on their perception through the lens. The principle of the invention operates independently of pupil size variations (unlike concentric bifocal arrangements where the pupil could get too small for effective vision through the peripheral part of the lens). Furthermore, tunnel effects are prevented. The eclipsing of a zone, such as can occur when using concentric contact lenses of the bivisual type, or contact lenses based on the alternating principle (segment types), is also avoided.

In a preferred embodiment of the invention, the optical part of the contact lens is divided into two areas by a transition zone running substantially vertically, the distance part and the reading part each covering half of the pupil area simultaneously. Even vertical movement of the lens therefore will have no effect on the bivisual view, due to the vertical orientation of the transition area or zone of separation between the distance part and the reading part of the lens. Even pupil dilation occurring at low light levels or at night, does not result in blurring of the visualized image, because equivalent portions of the pupil area are always covered by the distance part and the reading part.

For stabilizing the orientation of the lens on the eye, known stabilization arrangements are suitable. For example, crescent-shaped stabilization edges (slab-off) which are thinner at the lower and upper part of the lens can be used for lens stabilization through blinking in accordance with U.S. Pat. No. 4,095,878, issued June 20, 1978 in the name of Peter Fanti with priority from German patent No. 24 15 108. It is also possible to generate the lower part of the contact lens heavier so that the center of gravity below the horizontal axis of the lens stabilizes the orientation by gravity (prism ballast), as is known, for example, in a bifocal contact lens with the reading part and the distance, part disposed concentrically from German patent No. 1,136,846. Instead of the prism ballast, an embedded metal ballast can be used for gravitational positional stabilization. It is also possible to use for stabilization of the lens position a known, so-called truncation allowing the contact lens to rest and stabilize on the lower eyelid. The prism ballast and the truncation can also be combined and the supporting edge can also be used. Also suitable for stabilization is an oval-shaped lens design. Also, the back surface or the front surface of the lens can be made peripherally toric for position stabilization.

A variety of manufacturing methods are suitable for achieving the vertically-divided areas of different refractive powers for the reading and distance parts of the lens. As is known, for example from the above-mentioned paper presented by Guenter Giefer, two materials of different indices of refraction can be used, possibly with a front or rear melding of these two materials to avoid an abrupt image jump therefrom. Alternatively, different front surface or back surface curvatures can be used on opposite sides of the transition area to assure the different, vertically-separated refractive