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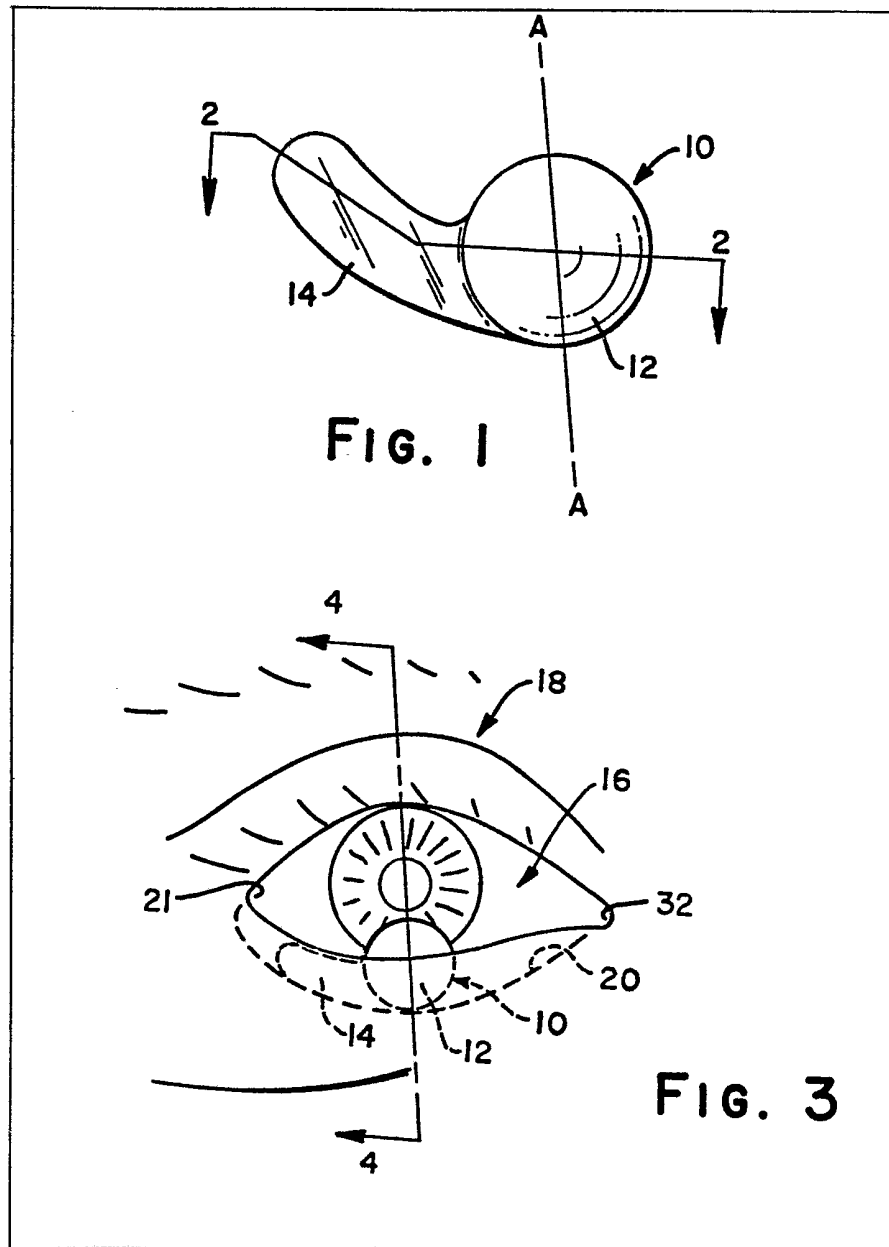
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(54) **Contact lens having lateral carrier**

(57) A contact lens 10 for presbyopes having a main concavo-convex refracting portion 12 and integral laterally extending carrier 14. The lens is designed for positioning against the

globe 16 of the eye with its carrier 14 seated in the inferior fornix 20. The carrier 14 stabilizes the lens in such a position that only with downward gaze does light enter the pupil through the lens for near vision assistance.

This contact lens may be used in combination with spectacle or contact lenses (Figure 6 not shown).



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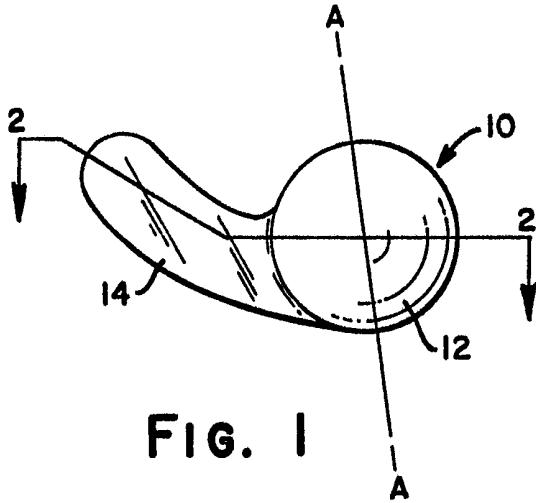


FIG. 1

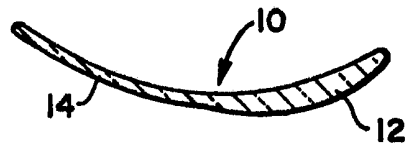


FIG. 2

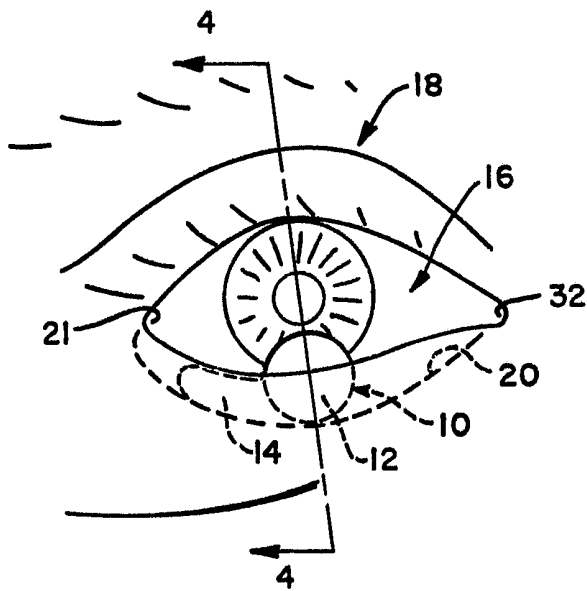


FIG. 3

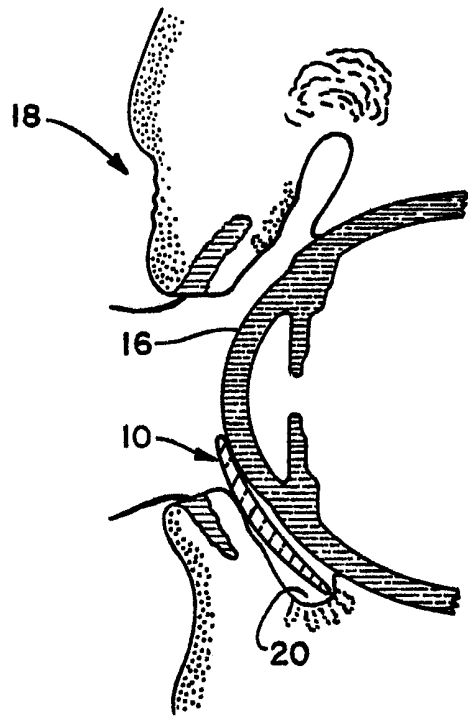


FIG. 4

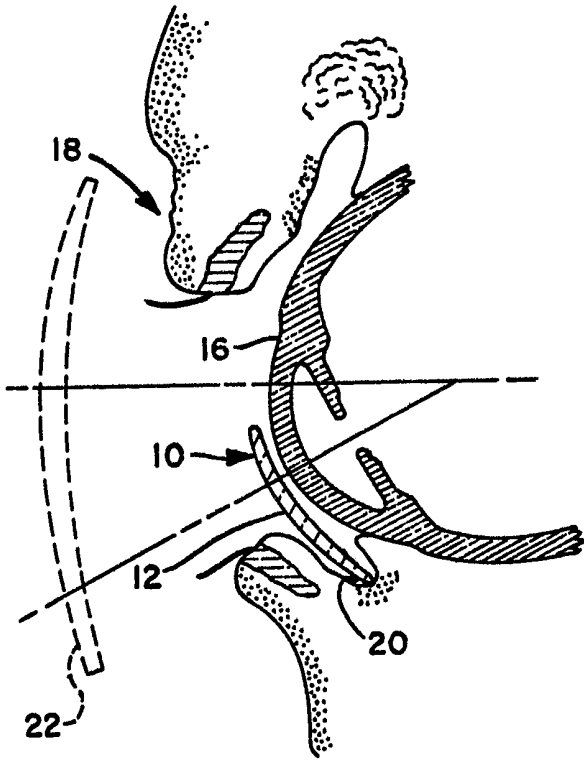


FIG. 5

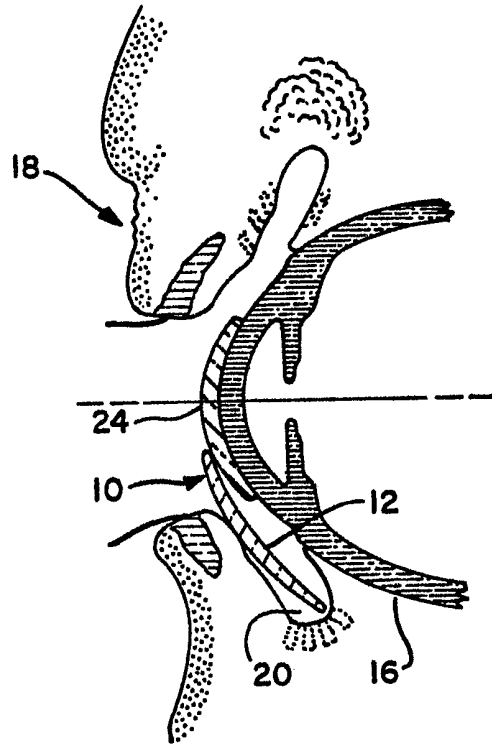


FIG. 6

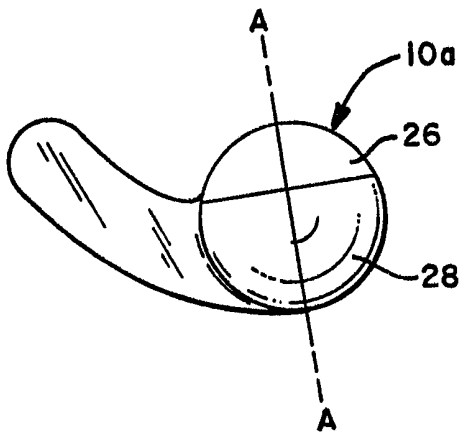


FIG. 7

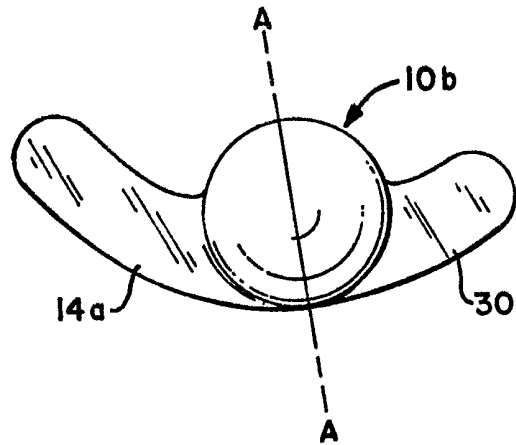


FIG. 8

SPECIFICATION

Contact lens

BACKGROUND OF THE INVENTION

Field of the Invention:

5 This invention relates to contact lenses and has particular reference to improvements in lenses used in the correction of presbyopia.

Discussion of the Prior Art:

10 Multifocal contact lenses are presently of two basic designs, namely the truncated base type and annular reading power type. The former rests on the lower lid so that the lens is pushed up with lowering of the gaze bringing a reading power segment over the optical axis of the eye.

15 While a number of embodiments of this type of lens can be found in the art (e.g. as in U.S. Patent No. 3,102,157 and discussed in U.S. Patent No. 4,268,133) it is well-known to the artisan that difficulties result from movement of the lens over the cornea with blinking or rotation of the truncation away from its operative position.

20 In connection with the annular reading power lens design, adaptation is difficult since both distance viewing and reading powers produce simultaneous retinal images requiring separation by the brain. An example of this type of lens can be found in U.S. Patent No 3,270,099.

25 Other schemes for multifocal viewing with contact lenses include lowered center of gravity devices as in U.S. Patent No. 3,279,878, including the use of weights embedded in the lens structure for orientation of viewing segments as in U.S. Patent No. 3,431,327, surface relief as in U.S. Patent No. 4,268,133, and/or edge chamfering as in U.S. Patent No. 4,095,878. These, in addition to producing structural complication and costliness, afford less than optimum wearing comfort and little assurance of proper reading segment alignment with each attempt to use.

30 In view of the foregoing, it is an object of this invention to provide a contact lens which overcomes the drawbacks of prior art devices and enables a presbyope to view detail at nearpoint with optimum comfort and reliability of continued use.

35 Another object is to accomplish the above with an optical effect analogous to that produced by multifocal spectacles lenses.

40 Still another object is to provide a contact lens which is designed for the correction of visual deficiencies of both presbyopic emmetropes and presbyopic ametropes.

45 Other objects and advantages of the invention will become apparent from the following description.

SUMMARY OF THE INVENTION

50 Objects and advantages of the invention are accomplished with provision of a contact lens having a main concavo-convex refracting portion and one or more laterally extending plano carriers. The lens is designed for positioning against the globe of the eye with the carrier(s) disposed in the

inferior fornix as stabilizing means. Only with downward gaze (rotation of the eye) does light enter the pupil through the lens for presbyopic near vision assistance.

65 The lens is servicable to presbyopic emmetropes who need only this one lens for reading assistance and to presbyopic ametropes wearing separate distance viewing spectacle or contact lenses. The latter would slide behind the lens of the invention with lowering of the gaze while the former would function as for emmetropes but behind single vision spectacles lenses, avoiding the often objected to appearance of multifocal segments in spectacle lenses.

70 Details of the invention will become apparent from the following description when taken in conjunction with the accompanying drawings in which;

80 Fig. 1 is a front elevational illustration of a preferred embodiment of the invention;

Fig. 2 is a cross-sectional view of the contact lens of Fig. 1 taken along line 2—2;

85 Fig. 3 illustrates the contemplated wearing position of the lens of Figs. 1 and 2 in a right eye, dotted line illustration depicting the inferior fornix into which the lens is intended to be seated;

90 Fig. 4 is a cross-section through the eye and lens of Fig. 3 taken approximately along line 4—4;

Fig. 5 is a cross-sectional view similar to Fig. 4 but illustrating a downward rotation of the eye, i.e. lowering of the gaze, for use of the lens in near viewing situations;

95 Fig. 6 illustrates use of the lens of the invention in conjunction with the wearing of a separate distance viewing contact lens; and

Figs. 7 and 8 illustrate modifications of the invention.

100 DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring more particularly to the drawings, lens 10 comprises body portion 12 and laterally extending carrier 14. Portion 12 of the concavo-convex configuration is designed to fit against the globe 16 of an eye 18 (Figs. 3—5) with carrier 14 in the inferior fornix 20 and extending toward the lateral canthus 21. Carrier 14, functioning as stabilizing means, prevents rotational and/or upward displacement of body portion 12 during use of the lens 10 whereby the eye is clear for distance viewing over the lens 10 as in Fig. 4 and rotatable downwardly behind the lens 10 for near viewing through lens 10 as depicted in Fig. 5. The near vision refractive power or "add" required for a particular presbyope is provided in the usual fashion of lens anterior and posterior surface design with consideration of the refractive index and thickness of material from which the lens is constructed. Those interested in this aspect of contact lens design may refer to U.S. Patent Nos. 3,915,609; 4,054,624; 4,123,407 and/or 4,284,399 for exemplification.

115 It is also pointed out that, with avoidance of lens rotation in the eye according to the invention, visual astigmatic correction can be provided in

body portion 12 with an assurance of proper cylinder axis orientation at all times during use of the lens 10. The provision of cylinder correction can be accomplished in the well-known manner of rendering either the anterior or posterior side of the lens toric, i.e. of compound curvature. Those desiring further details of means and method of correcting for astigmatism may refer to the above referenced U.S. Patent Nos. 4,268,133 and 4,095,878.

As further illustrated in Fig. 5, lens 10 may be used in conjunction with the wearing of spectacle lenses such as lens 22 shown with broken line illustration. Thus, a presbyopic ametrope may be provided with spectacle lens distance viewing correction and lens 10 near vision (reading) correction whereby the sometimes objectional aesthetics of multifocal spectacle lenses is avoided. Similarly, distance vision correction may be accomplished with the wearing of conventional distance viewing contact lenses 24 as depicted in Fig. 6 which, in turn, will slide behind lens 10 with lowering of the gaze for reading or other near vision applications.

As further illustrated in Fig. 7, it is herein contemplated that lenses of the invention may comprise an intermediate viewing power area 26 in addition to a near viewing portion 28. Thus, in a manner analogous to the use of spectacle trifocals, the wearer of lens 10a may partially lower his/her gaze for viewing intermediate objects through area 26 while further lowering the gaze for accomplishing the already discussed near or reading power correction with portion 28.

It should be understood that lens 10 may, alternatively, be provided with a progressively varying power, e.g. along an umbilic, e.g. axis A—A, of Fig. 1, in a manner analogous to that used in such spectacles lenses as those of either U.S. Patent No. 4,056,311 or U.S. Patent No. 3,687,528, for example. The manufacture of contact lenses of continuously varying dioptric power is discussed in U.S. Patent No. 3,471,976.

It should also be understood that axes A—A of lenses depicted herein may be downwardly inclined toward the nasal area of a wearer or extended vertically, whichever is desired. Furthermore, lenses produced according to this invention may include a second stabilizing carrier

30 as shown on lens 10b in Fig. 8. It is preferred, however, that this second carrier 30 be shorter than carrier 14a, at least to the extent of not reaching the relatively sensitive medial canthus 32 (Fig. 3) when used.

All lenses illustrated in Figs 1—8 of the drawings are intended for use in the right eye of a patient. For left eye use, carriers 14, 14a and 30 are merely oppositely directed as is the inclination of axis A—A in each case, if the inclination is used.

It will become readily apparent to those skilled in the art that there are various other modifications and adaptations of the precise forms of the invention here shown. Accordingly, the foregoing illustrations are not to be interpreted as restrictive of the invention beyond that necessitated by the following claims.

CLAIMS

1. A contact lens comprising a main concavo-convex body and an integral laterally extending carrier, said lens being intended for positioning in the inferior fornix with said carrier functioning as stabilizing means.

2. A lens according to claim 1 wherein said carrier is plano.

3. A lens according to claim 1 including a pair of laterally extending carriers, one directed oppositely of the other away from said main body.

4. A lens according to claim 3 wherein carriers of said pair are of different lengths.

5. A lens according to claim 1 wherein said main body is of a given spherical refractive power.

6. A lens according to claim 1 wherein said main body is of a given sphero-cylinder refractive power.

7. A lens according to claim 1 wherein said main body is multifocal.

8. A lens according to claim 7 wherein said multifocal main body comprises a plurality of adjoining differently refracting viewing areas.

9. A lens according to claim 7 wherein said multifocal main body is of progressively varying refractive power along a predetermined umbilically extending axis.

10. A lens according to claim 9 wherein said axis is oriented for downward nasal inclination with wearing of the lens.