FIGS. 4 and 5C except that there will be a total of 8 distant and near vision zones rather than 12 as shown in FIG. 4, and the lens will be positive.

Another method of manufacture suitable for producing lenses of the kind illustrated in FIGS. 4, 5A, 5B and 5C involves the following steps. A high negative power lens is cut on a block fitted in the chuck of the lens lathe. A number of sectors in the form of truncated cones are arranged on a base and embedded in a cylinder of plastics material, preferably of lower refractive index. One face of the cylinder is then cut to the same profile as that of the exposed surface of the negative lens and in such a way that the tool cuts into the sectors. The resulting cut surface is then stuck with a thermosetting adhesive to the negative power lens, which is still attached to the block. A front surface is then cut on the combined workpiece to form a lens in the form shown in FIG. 5C.

When manufacturing hard lenses, typical materials are polymethyl methacrylate and copolymers thereof, polyesters and polymers and copolymers of styrene. Polyesters and polymers containing styrene have a higher refractive index than polymethacrylates or polyacrylates.

Referring to FIG. 4, the diameter 'd' of the area covered by the sectors 41 is typically about 6 mm., while the overall diameter will be about 9 to 10 mm. for a hard lens or about 13 to 14 mm for a soft lens. With a typical closeness of fitting, the lens will tend to move over a distance of about 2 mm. Since pupil diameter in average bright intensity is about 4 mm., the pupil area will remain covered at all times by the area defined by the sectors. Because substantially equal amounts of light reach the pupil through the sectors 41 and the zones 42 over substantially the whole of this area fitting of the lens becomes independent of the pupil size and fluctuations in pupil size with different light conditions.

While casting and machining are the preferred methods of producing lenses in accordance with the invention, it may be possible to utilize injection or compression moulding techniques.

It will be appreciated that configurations other than those shown in the accompanying drawings are possible. For example, the major viewing areas may be formed as a series of small contiguous polygonal zones, e.g. hexagons (as seen in plan). Preferably these zones are arranged so that there is substantially uniform distribution of polygonal near vision zones and distant vision zones over the major viewing area.

Preferably the lenses shown in FIGS. 4, 5A, 5B, 5C, 6A, 6B and 6C have about 4 to 20 sectors, generally 6 to 10. Some of the sectors may be for middle distance viewing.

Lenses manufactured in accordance with the invention may be hard or soft and produced by polymerisation of the known monomer mixtures. In the case of soft lenses, the lenses are machined in hard conditions and, after shaping and polishing, swollen in the usual isotonic swelling solutions. When manufacturing by moulding, a degassed polymerisation mixture is poured into a suitably shaped mould half, the mould is closed with the other mould half and the mixture maintained at a controlled temperature or temperature cycle usually between 40° C. and 100° C., until polymerisation is substantially complete. The castings are removed from the moulds, polished (if necessary) and swollen in an appropriate aqueous solution e.g. isotonic saline. A variety of polymerisation recipes are possible, for example, as described in British Pat. Nos. 1,385,677 and 1,475,605 (De Carle), 829,565 (Wichterle) and 1,436,705 (N.R.D.C.), the disclosure of which is specifically imported herein.

Polymers having different refractive indices are readily prepared by suitable selection of the composition monomer mixtures. In order to ensure compatibility it is advisable, where applicable, to select a similar polymerisable composition for the main body of the lens as for the inclusions, such as sectors 41, and to achieve a difference in refractive index by alteration in the relative proportions of the monomers or by incorporating a modifying monomer. In the case of soft (hydrophilic) lenses it is important to select polymer compositions which have a similar swell factor, otherwise the lens may be subjected to internal strains causing internal breakdown in the bonds between the different polymers.

It is a surprising feature of the lenses of the present invention that although the wearer will actually be able to look through two or more zones of different focal length at the same time, after a short acclimatisation period, the wearer learns to discriminate between the images and to ignore the images which are out of focus. After a while, the wearer is no longer conscious that he is seeing several images but is only aware of the one which is in focus, for the particular object or view he is looking at. This situation is achieved so long as the relative zones of distant and near vision (or distant, middle and near vision) portions of the lens are essentially in balance. Thus for a bifocal lens I aim to have approximately half the total viewed area each for distant and near vision. It is however possible to depart somewhat from the 50/50 situation and, for example, provide zones in the relative proportion of 60/40 or 40/60. Also it may be preferable not to distribute the areas entirely uniformly and perhaps provide a greater area of reading vision towards the periphery of the lens.

I claim:

1. A bifocal contact lens wherein at least the major viewing area is divided into a plurality of non-concentric near and distant vision zones, each near vision zone being adjacent to a distant vision zone; there being between at least about 2 zones of each kind in said major viewing area, and wherein the relative areas of the zones are such that in use substantially equal amounts of light enter the eye through the near vision zones and through the distant vision zones respectively.

2. A lens according to claim 1 in which the ratio of the total area of the distant vision zones to the total area of the near vision zones is from about 60:40 to 40:60.

3. A lens according to claim 1 wherein there are between about 2 and about 8 zones of each kind in said major viewing area.

4. A lens according to claim 3 in which there is a central circular area consisting of a distant vision zone located at the optical center of the lens.

5. A lens according to claim 3 in which the distant vision zones comprise a plurality of generally circular areas distributed over a surface of the lens.

6. A lens according to claim 3 in which the near vision zones comprise a plurality of generally circular areas distributed over a surface of the lens.

7. A lens according to claim 3 in which the distant and near vision zones are produced by machining the front or back surface of the lens.

8. A lens according to claim 1 which has been formed by casting a polymerisable liquid monomer mixture.

9. A lens according to claim 1 which is a soft lens.