bifocal contact lenses of the prior art. The first relates to sharp outer corners such as corner **22**. Such sharp corners have been observed to cause damage to the cornea of users. This damage appears in the form of a disruption of the outer cellular layers of the cornea known as corneal staining.

The second problem of prior art diffractive bifocal contact lenses relates to a tendency of foreign matter to build up in the area near inner corner **24**. The foreign matter may include airborne dirt or dust particles as well as protein or lipid deposits and other materials normally present in the tear fluid. These deposits tend to build up particularly in the region immediately adjacent the sharp inner corner **24**, because the foreign matter tends to adhere well to that corner. Furthermore, due to the sharpness of the corner, it is difficult to force cleaning materials into the corner in order to clean such deposits from the lens.

Contrary to the general belief of the prior art, however, investigation has shown that diffractive multifocal contact lenses can function reasonably efficiently when the step corners are intentionally made less sharp. FIG. **2** shows a cross section of a portion of a contact lens **30** according to the invention. Contact lens **30** has a smoothly-curving anterior surface **32** and a structured posterior surface **34**. Posterior surface **34** includes a plurality of concentric annular zones such as zone **36** and zone **38** separated by steps such as step **40**. Step **40** has an outer corner **42** and an inner corner **44**, each of which has been given a radius of curvature greater than the minimum that could be achieved. In one embodiment the radius of curvature of corners **42** and **44** is one-half that of the height of optical step **40**. The use of corners having such increased radii of curvature helps alleviate, or even eliminate, the previously described problems in the prior art. Since outer corner **42** is less sharp than outer corner **22** of FIG. **1**, the likelihood of corneal abrasion is reduced. Similarly since inner corner **44** has an increased radius of curvature as compared with inner corner **24** of FIG. **1**, the adherence of foreign matter to the corner is reduced. Furthermore, because inner corner **44** is less sharp, cleaning instruments will be more easily able to remove foreign matter that does accumulate.

In order to achieve the advantage of the invention a radius of curvature of at least one-half the step height should be used. As the radius of curvature increases beyond one-half of the step height the efficiency of the lens will be slightly reduced because light passing through the step will not normally be directed to either of the two foci. Because the step height is so small compared with the radii of the zones, however, the radius of curvature can be increased to as much as equal to the step height or even 1.5 or 2.0 times the step height without a noticeable loss of optical efficiency.

The exact radius of curvature that should be chosen for a particular lens will depend upon a number of factors. For example the design wavelength and the index of refraction of the lens material will affect the step height, and thus the required radius of curvature. The hardness of the lens will affect its tendency to cause corneal abrasion. Therefore, typically, a harder lens material would indicate that a larger radius of curvature on the outer step is required. Similarly a larger radius of curvature on the inner step will be required for lenses made of a material that has a greater tendency to adhere to proteins or other foreign material. Thus the optimum radii will necessarily be dependent upon a variety of factors. In general the radii of curvature should be at least one-half of the step height, but should be no greater than that which is required to obtain the present advantages.

We claim:

1. A multi-focal ophthalmic lens having diffractive power, said lens having a plurality of concentric diffractive zones, said zones being separated by steps, said steps having predetermined heights, each step having an outer corner and each outer corner having a radius of curvature equal to at least one half said height of its associated step.

2. The multi-focal ophthalmic lens of claim **1** wherein said lens is a contact lens.

3. The multi-focal ophthalmic lens of claim **1** wherein each outer corner has a radius of curvature equal to at least the height of its associated step.

4. The multi-focal ophthalmic lens of claim **3** wherein said lens is a contact lens.

5. The multi-focal ophthalmic lens of claim **3** wherein each outer corner has a radius of curvature equal to at least twice the height of its associated step.

6. The multi-focal ophthalmic lens of claim **5** wherein said lens is a contact lens.

7. The multi-focal ophthalmic lens of claim **1** wherein each step has an inner corner and each inner corner has a radius of curvature equal to at least one half of the height of its associated step.

8. The multi-focal ophthalmic lens of claim **7** wherein said lens is a contact lens.

9. The multi-focal contact lens of claim **8** wherein each inner corner has a radius of curvature equal to at least the height of its associated.

10. The multi-focal contact lens of claim **9** wherein each outer corner has a radius of curvature equal to at least the height of its associated step.

11. The multi-focal contact lens of claim **9** wherein each inner corner has a radius of curvature equal to at least twice the height of its associated.

12. The multi-focal contact lens of claim **11** wherein each outer corner has a radius of curvature equal to at least twice the height of its associated step.

* * * * *