

outer ring 12 is transmitted via the bridging elements 15 to the inner ring 13 and has the effect of slightly displacing the latter in a posterior direction relative to the outer ring. As a result, the inner ring is pressed against the posterior capsule 14a a small distance (on the order of about 2 mm) radially inwardly of the equatorial zone and thereby constitutes a secondary mechanical barrier to the migration, over the posterior capsule and toward the optic region 14b thereof, of epithelial cells that were not blocked by the primary barrier, i.e., the outer ring. As can be seen from FIG. 9, when a posterior capsular opacification-inhibiting device 11 is used, the subsequently implanted IOL (shown only in phantom outline in FIG. 9) will be positioned so as to be seated in the capsular bag 14 anteriorly of the device 11 but posteriorly of the anterior capsular flap 14c.

Merely by way of example, if the capsular bag diameter of a patient is about 9.4 mm, the outer diameter D of the outer ring 12 should be in the range of about 9.9 mm to about 10.9 mm, with the outer diameter d of the inner ring 13 then being in the range of about 7.9 mm to about 8.9 mm.

The principles of the present invention can also be embodied in dual ring posterior capsular opacification-inhibiting structures differing somewhat from that shown in FIGS. 1-3. For example, the device 16 shown in FIGS. 4-6 is basically similar to the device 11 in that it has an outer ring member 17 and an inner ring member 18 interconnected with each other by diametral rod-like bridging elements 19, with the inner ring 18 and the bridging elements 19 being identical to the corresponding members 13 and 15, respectively, of the device 11. The difference between the two devices in essence resides in the fact that the outer ring member 17 of the device 16 has the form of a toroidally shaped ring resembling an anteriorly and posteriorly incomplete capsular bag-like structure, with both the anterior and posterior capsule portions of that structure having respective relatively large holes or openings 17a and 17b therein to define an annular anterior capsular flap-like portion 17c and an annular posterior capsular flap-like portion 17d. As in the first embodiment, of course, the planes of the two rings 17 and 18 are parallel to one another.

As a general proposition, the bridging elements 19 at their ends remote from the ring 18 are connected to the inner peripheral boundary edge of the annular posterior capsular flap-like portion 17d of the toroidal ring 17. Preferably, however, as shown in FIGS. 4-6, those ends of the bridging elements are connected to the toroidal ring 17 through the intermediary of an auxiliary ring 18a the plane of which is parallel to the planes of both rings 17 and 18, with the said remote ends of the bridging elements being fused or otherwise bonded to the auxiliary ring 18a and with the latter being in turn fused or otherwise bonded to the inner peripheral boundary edge of the posterior capsular flap-like portion 17d. The provision of the auxiliary ring 18a serves primarily to stiffen the connection between the inner ring 18 and the outer ring 17.

The toroidal outer or larger ring 17 is shaped as shown so that when it is properly implanted in the residual capsular bag 20 (see FIG. 10) of a patient's eye, its posterior capsular flap-like portion 17d, by virtue of its greater width or thickness relative to that of the outer ring 12 of the embodiment of the device shown in FIGS. 1-3, is at least in part in surface contact not only with the equatorial region of the capsular bag but also with the radially outwardmost region of the posterior capsule 20a (as distinguished from the line contact between the ring 12 and the equatorial region of the capsular bag). Thus, in addition to functioning (like the outer ring 12 of the first embodiment) as a means to prevent the

capsular bag from collapsing or shrinking as well as a receptacle or carrier for an IOL (shown only in phantom outline in FIG. 10) to be subsequently implanted into the bag, the toroidal ring 17 at the same time performs its main function as a means constituting a primary barrier to epithelial cell migration from the equatorial region of the residual capsular bag onto the posterior capsule 20a. The ring 17, of course, also serves as a means for ensuring that the inner or smaller ring 18 will be pressed against and maintained in engagement with the posterior capsule so as to constitute a secondary barrier to migration, into the optic region 20b of the posterior capsule, of epithelial cells that were not blocked by the larger ring.

The posterior capsular opacification-inhibiting device 21 according to a third embodiment of the present invention also includes, like the device 16, a generally toroidally shaped outer ring 22 having the same structural features and functions as the ring 17. In this embodiment, however, the posterior capsule-engaging inner ring 23 of the device, the plane of which is parallel to that of the ring 22, is constituted by either the smaller base edge of an annular, relatively shallow, generally frusto-conical, inwardly directed and posteriorly slanted flange or dish-like structure 24 or by a small ring member of rod-shaped material like the rings 13 and 18 of the other embodiments secured to or incorporated in the smaller base edge of the flange. In either event, the larger base edge 25 of the flange is connected with the inner peripheral boundary edge 22a of the posterior capsular flap-like portion 22b of the toroidal ring 22 which, if desired, may also incorporate an auxiliary stiffening ring like the ring 18a of the embodiment of the device 16 shown in FIGS. 4-6. The flange 24 in the device 21 thus serves as a bridging means performing the functions of the bridging elements 15 and 19 in the devices 11 and 16. Within the contemplation of the present invention, of course, the entire device 21 can be made as a unitary or one-piece structure, or the ring member 22 and the flange 24 can be separately formed and then fused or otherwise bonded to one another.

It will be understood that the foregoing description of preferred embodiments of the present invention is for purposes of illustration only, and that the various structural and utilitarian features herein disclosed are susceptible to a number of modifications and changes none of which entails any departure from the spirit and scope of the present invention as defined in the hereto appended claims.

I claim:

1. A posterior capsular opacification-inhibiting device for implantation into an eye between the posterior capsule and the anterior capsular flap of the residual capsular bag that remains in the eye following an extracapsular cataract extraction, comprising:

a pair of resiliently flexible, concentric, closed, rings having respective planes and having different outer diameters, the larger of said rings being connected to the smaller of said rings by bridging means extending therebetween, the plane of said larger ring being parallel to but offset anteriorly from the plane of said smaller ring, and the outer diameter of said larger ring at its outer periphery being slightly larger than the inner diameter of said residual capsular bag in the equatorial region thereof;

whereby, upon proper implantation of the device into an eye, (i) said larger ring presses along its entire circumference against the interior surface of said residual capsular bag in the equatorial region thereof without overstressing the latter and without engendering an unfurling of said anterior capsular flap, said larger ring