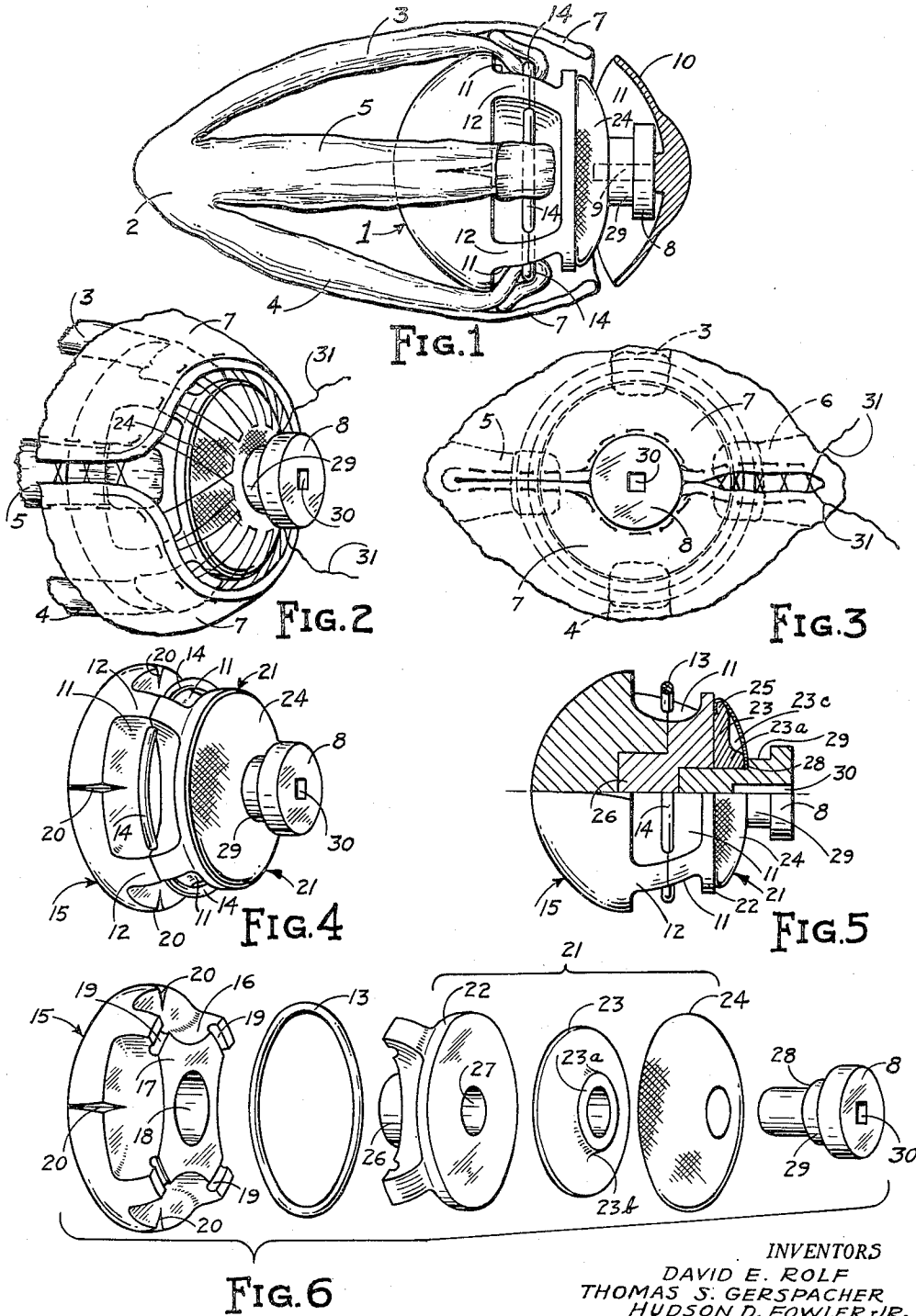


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ARTIFICIAL EYE IMPLANT

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ARTIFICIAL EYE IMPLANT

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This invention relates to a prosthesis for use following ocular enucleation, particularly a prosthetic base of the nature of an eye implant.

In the past, eye implants have been known which have consisted in the main of a ball member and a muscle ring, the latter being mounted in a peripheral groove in the ball parallel to but removed from a plane passing through the middle of the ball. Prior implants with which we are familiar have not been entirely satisfactory because of the difficulty involved in effecting firm suturing, lack of which may permit the ring to come loose at one or more points with attendant prolapse of the implant. The present invention has for its principal object to provide an improved implant which will facilitate the making of firm sutures. Other objects of the invention will be apparent as the description of the invention proceeds.

A preferred embodiment of the invention is illustrated in the accompanying drawings, in which Figure 1 is a simplified representation of the nature of an elevation showing the implant of the invention in place in the muscle cone, Tenon's capsule being shown unattached. Figures 2 and 3 represent, respectively, a perspective and a front elevation illustrating the method of attachment of Tenon's capsule. Figure 4 is a perspective of the assembled implant, omitting any representation of the tissues in which it is located. Figure 5 is a corresponding side view, the upper half of the figure being in section and the lower half in elevation. Figure 6 is an exploded perspective showing the parts of which the implant is made. The scale in each of Figures 1 to 6, inclusive, is approximately twice normal size.

As appears from Figures 1, 4 and 5, the implant takes the form of a generally globular body having in its periphery a series of spaced openings in which may be received and held, as by suturing, certain of the extrinsic ocular muscles. Following enucleation, the isolated rectus muscles are pulled into the several openings, folded over onto themselves with their cut ends outward, and suitably affixed, conveniently by multiple suturing, to a device or devices provided for the purpose. Tenon's capsule is fastened to a different part of the implant, but at a somewhat later stage.

In Figure 1, such generally globular body, designated 1, is shown in place in muscle cone 2 made up of superior rectus muscle 3, inferior rectus muscle 4, lateral rectus muscle 5, and, on the opposite side, medial rectus muscle 6. 55

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Investing the implant much as it would the eyeball is Tenon's capsule 7, to be attached to the implant by the method hereinafter described. Projecting from the implant is a mounting stud 8 in which is received a pin 9 supporting a representation of the externally visible portions of the human eye taking the form of a shell 10.

As indicated in Figures 1, 4 and 5, there are four peripheral openings 11 in globular body 1, one for each of the four rectus muscles. These openings are defined laterally and separated by webs 12 which, insofar as possible, are integral with the parts of the implant with which they are associated. Embedded in webs 12 is a ring 13 (hereinafter called the muscle ring) presenting four exposed portions 14, each of which takes the form of a rail-like member of arcuate shape, located in and spaced from the interior wall of an opening 11. It is to these exposed portions 14 of muscle ring 13 that the four rectus muscles are attached as indicated in Figure 1.

From the foregoing, it is apparent that the implant of the present invention may be regarded as consisting of a fenestrated spheroid having therein a rail-like member lending itself to easy attachment of the ocular muscles.

As indicated in Figures 4, 5 and 6, the implant includes a posterior or inner generally hemispherical member 15 that is characterized, as a result of the presence of openings 11, by a cross-shaped central portion 16. The terminal plane 17 of posterior hemispherical member 15 has therein a central opening 18 and a series of arcuate grooves 19, the latter for receiving the concealed or embedded portions of muscle ring 13. Spaced at 90-degree intervals around the periphery of posterior hemispherical member 15 are four slots 20, each paralleling the longitudinal axis of the implant and located opposite the middle of one of the four openings 11. The purpose of slots 20 is to facilitate manipulation by the surgeon of the needle or needles employed to draw the rectus muscles into openings 11, over exposed portions 14 of muscle ring 13, and thence to the rear for suturing.

Ring 13 is clamped in place in arcuate grooves 19 of posterior hemispherical member 15 and corresponding grooves in anterior hemispherical member 21 and thus is positioned approximately centrally of globular member 1.

Anterior or outer generally hemispherical member 21 conforms to and registers with posterior hemispherical member 15 where their terminal planes adjoin. As indicated in Figure 6, it consists of three separate parts of which one

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is a spheroidal frustum 22 having a positioning stud 26 adapted to extend into opening 18 in posterior hemispherical member 15, such stud projecting from the terminal plane of anterior hemispherical member 21. The other two parts which, together with frustum 22, go to make up anterior hemispherical member 21 comprise a convex annular screen 24 and, immediately adjoining frustum 22, an annular screen support 23, the latter having a collar 23a surrounded by a grooved or cut-away portion 23b which forms a recess 23c beneath the convex portion of screen 24 (see Figure 5). Because the ends of the mesh might cause irritation of the tissues, peripheral edge 25 of screen 24 is turned inward and held in place between support 23 and frustum 22 as shown in Figure 5.

Apart from mounting stud 8, the implant itself may therefore be considered as consisting of a generally ball-like member having a flat face on which is mounted a convex cap taking the form of a screen support member and a screen overlying said support and internally reinforced thereby.

Mounting stud 8, which carries the visible part of the prosthesis; i. e. shell 10, is stepped as indicated in Figure 5 so as to provide an intermediate neck portion 29 which terminates at its posterior end in step 28. Stud 8 normally projects through mesh or screen 24, through support 23, and into frustum 22, in all of which are central openings adapted to receive the shank of the stud. When the latter is in place, step 28 rests against the portion of screen 24 immediately surrounding the central opening therein. Thus the ends of the mesh which make up the screen are clamped in place in such manner as to preclude irritation of the conjunctiva associated with Tenon's capsule, which, in the final stages of implantation, is drawn into close-fitting relation with neck 29. Stud 8 terminates within frustum 22 at a point only slightly removed from the plane of muscle ring 13.

In assembling the implant, the parts shown in Figure 6 are cemented together to give a unitary or substantially integral structure; viz., globular body 1.

In the course of the enucleation which precedes implantation, Tenon's capsule, which normally comprises a continuous sheath investing the entire eyeball except for the cornea, will have been severed from the anterior portion of the eyeball and slit laterally; after healing, it presents the appearance suggested in Figures 1 and 2. To effect the contemplated substitution, the opposed portions of Tenon's capsule are drawn back and globular body 1 is inserted in muscle cone 2, being made fast as already described to rectus muscles 3, 4, 5 and 6. Thereupon sutures 31 are applied by the surgeon, working from the posterior end to the anterior end of one of the lateral slits in Tenon's capsule and continuing repeatedly across screen 24 both above and below mounting stud 8, the needle or needles passing through the edge of Tenon's capsule, through screen 24, into cavity 23c underlying the screen, back through screen 24 at a point spaced laterally from the point of entry, and thence again to the edge of Tenon's capsule. On attaining the anterior end of the lateral slit on the opposite side of the implant, suturing continues until the posterior end of the slit is reached, when sutures 31 are drawn tight and knotted. On completion of this step, the opposed edges of Tenon's capsule immediately overlying screen 24 should fit snugly around the neck portion 29 of stud 8, as indicated in Figure 3.

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The visible parts of the prosthesis; i. e., shell 10, are then inserted, as by pin 9, in non-circular opening 30 in mounting stud 8 (Figure 1). Pin 9 is retained in opening 30 as by friction or other suitable detachable holding means.

Advantages of the invention which derive from novel characteristics of the above-described implant and method of implantation include the fact that the location of and opportunity for ready access to muscle ring 13 make for firm suturing of the rectus muscles, with little or no likelihood of later prolapse of the implant; the fact that the manner of forming and positioning screen 24 permits closing Tenon's capsule around the neck 29 of mounting stud 8 without likelihood of irritation of the tissues by either the inner or outer peripheral edge of the screen; and the fact that the implant, although made up of several parts, may be cemented together to form a structure that, once assembled, will be and remain unitary, undergoing no tendency to come apart as a result of the action of body fluids. Other advantages will be apparent to those skilled in the art to which the invention relates.

In general, the materials of which the implant is made are highly inert plastics, metals, etc., that are known to be tolerated by the human body. Tantalum is an example of a metal known to be tolerated by the body and for this and other reasons is used in making up screen 24. Either tantalum or gold may be used for pin 9. The various other parts, including muscle ring 13, may be individually molded of suitable plastic in the shapes respectively illustrated in Figure 6. These parts and their precise shapes may, however, be simplified, elaborated or otherwise modified without departing from the spirit of the invention.

It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty reside in the invention.

I claim:

1. A prosthetic base of the nature of an eye implant comprising a first generally-hemispherical member; a second generally-hemispherical member; a ring-like member clamped between the two hemispherical members in such manner as to divide it into four exposed portions separated by four concealed portions; and a positioning system comprising a plurality of axially aligned studs, at least one of said studs projecting from one of said hemispherical members.

2. A base as in claim 1 in which one of the hemispherical members receives a stud projecting thereinto and supports a stud projecting therefrom.

3. A base as in claim 1 in which the stud projecting into one of the hemispherical members also extends in the opposite direction to a point removed from the base itself.

4. A prosthetic base of the nature of an eye implant comprising a ball having a flat side; a ball-embedded ring, the plane of the ring paralleling the flat side of the ball; a cap for the ball comprising a screen support and a screen overlying said support and having its outer edge disposed between the support and the flat side of the ball; and, projecting through the cap into the ball, a stud to which are affixed the visible parts of the prosthesis.

5. A base as in claim 4 in which the screen is clamped between the support and the stud.

6. A base as in claim 4 in which the support has an annular recess immediately underlying the screen.

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7. A base as in claim 4 in which the stud projects into the ball.

8. A base as in claim 4 in which the stud has a non-circular opening therein for receiving a non-circular pin on the inside of an artificial eye.

9. A prosthesis for use following ocular enucleation comprising a ball; a ball-embedded ring having four exposed portions to which to attach the four rectus muscles, the four exposed portions being separated by four concealed portions; an internally supported screen to which to attach Tenon's capsule, the support for the screen having an annular recess immediately underlying the screen; and, mounted from the ball, a shell-like representation of a human eye.

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