

Making Silicone Eyes

By Maddie Singer

THE SHAPE OF THE EYE

When Ocular prosthetists make custom prostheses, the prosthetics they make are never round. They are created from an impression of the eye socket, and the cornea of the eye has an apex approximately 3 mm high to create an optical lens that makes the eye look alive, not doll-like. For FX purposes, you might not even have the room for a complete ball in the prosthetic or head you are manufacturing, so having flexibility with the shape can be liberating. For this tutorial, I'll make a standard ocular prosthetic shape.



FIG. 10.05 Master shape of eye with iris button

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To create the master shape, use a sulfur-free, firm, oil clay. The firmer, the better; you need to sculpt a fairly smooth surface. We'll be using Platinum Silicones to fabricate the eye. The posterior side (back side) of the eye we will be making will be relatively concave. The surfaces don't have to be perfect, you'll be able to sand the surfaces of the mold to improve the surface quality later.

Iris Buttons: Iris buttons are clear domes available in different diameters. They have a stem at the apex that allows the button to be registered in the same location after the mold is manufactured. You can purchase them through Factor II. Although they will not be part of the final silicone eye, they are essential for reproducing a realistic cornea with optical quality. The average human iris is 12mm, but every eye is different. It's best to take a measurement of the iris to ensure a good likeness. You should purchase at least one of each size; 10, 10.5, 11, 11.5, 12, 12.5, and 13 mm. Once you determine the iris diameter, you'll grind the stem with a Dremel tool to about 2 mm. Take the iris button and add it to your clay master. It should be located closer to the nasal corner of the master, and not directly in the center. The clay should meet the button gradually so that there is not an abrupt change of shape. It should look like it's part of the form. Spray with matte Crystal Clear acrylic spray. Let dry. Now you have your master.

MAKING THE MOLD

Making the mold is simple. I recommend a less porous stone like Die-Keen (you can get these through a number of dental supply companies, or directly from the manufacturer). You can also use Ultracal 30. Use a piece of rubber matting material from the hardware store and cut a piece that is 1" wide and 10" long. Make a circle and hot glue to a table surface.

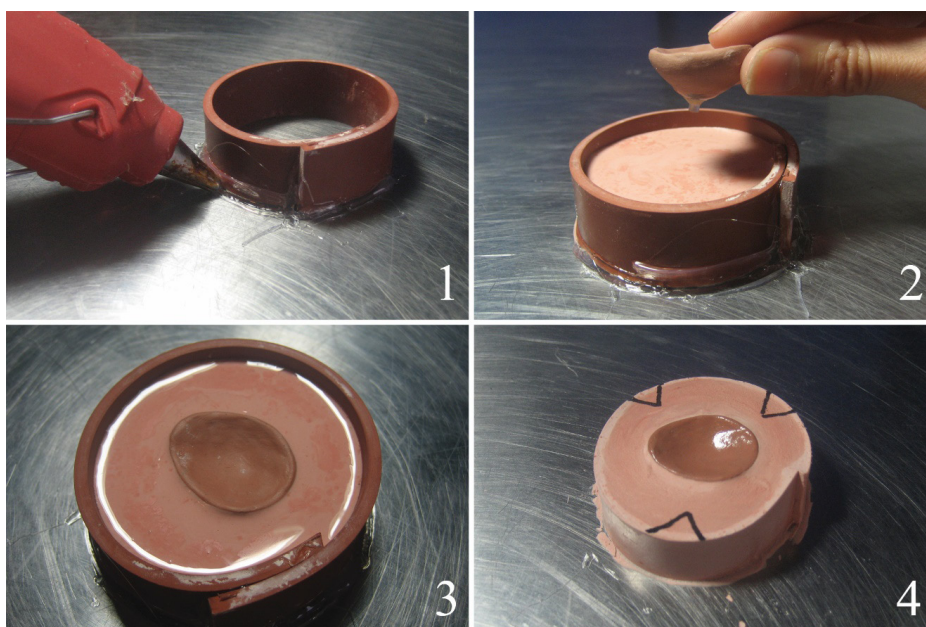


FIG. 10.06 1. Glue form to flat surface. 2. Fill mold with dental stone. 3. Put master eye shape into mold. 4. Cut keys into mold

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Release the stem of the button with a little petroleum jelly. You can add a little clay around the base of the stem to give a little wiggle room for getting it out later. Mix the stone and pour to the top of the rubber matting. Wait until the stone begins to thicken and submerge your master shape to the leading edge as demonstrated.

Let it set until hard. Remove the matting, and carve three negative keys with carving tools or a Dremel.

Release the stone with petroleum jelly, and wrap with 3" wide and 10" long rubber matting and hot glue down around the stone.

Mix stone and brush onto all surfaces, and pour to the top of the rubber matting. When cured, carefully pry open your mold and clean out the clay with alcohol or Ensolve. Carefully pry off the iris button. You can fill any air bubbles with additional stone.

CREATING THE SCLERAL CORE

The sclera is the white portion of the eye. When Ocularists make acrylic eyes, they usually place the iris button back into the mold, and fill the mold with white acrylic. The acrylic is polymerized in a pressure cooker, and removed from the mold. The Ocularist will then grind the surface of the acrylic master by eye with a hand tool to accommodate the clear acrylic, to help facilitate the clear cornea region and the shiny optical surface of the eye. The grinding of the acrylic provides additional space so that when the eye is polished or adjusted, the paint will not be affected. I've invented a different technique that requires no grinding of the silicone and provides a more exacting negative space. Instead of grinding, we'll core the anterior surface of the mold with clay using a Pasta maker set to represent the thickness of the clear region of the eye, and set the iris button back in the mold to create a flat painting surface for the iris.

CORING THE MOLD

Before coring, I recommend sanding both the anterior and posterior surfaces with a fine grit sand paper to improve the surfaces.

Set the Pasta Maker to a thickness of about a 1/6" to 1/8" and place a piece of Kleen Klay (a soft sulfur free clay) in the shape of a worm into the rollers. The clay should come out as a flat even piece.



FIG. 10.08 Sanding prior to coring
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FIG. 10.07 1. Mold ready for additional stone. 2. Filled mold. 3. Completed mold
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FIG. 10.09 Kleen Clay in pasta maker
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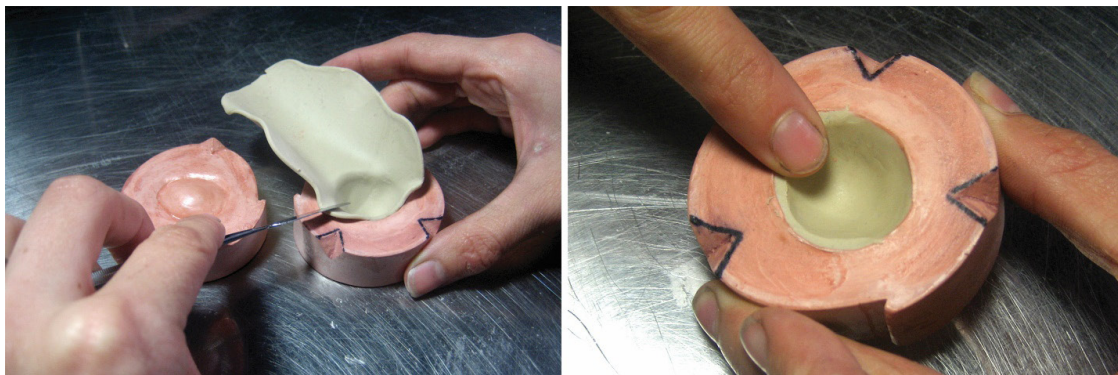


FIG. 10.10 Clay being pressed into mold (L). Graduating edge of clay (R)

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FIG. 10.11 Making room for iris button

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FIG. 10.12 Painting back of button

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Press the clay into the negative space of the anterior mold covering the surface. Trim the excess clay.

Once the clay is trimmed, take your finger and graduate the edge of the clay to a knife-like edge around the circumference of the negative space. Take a tool and find the hole under the clay create from the stem of the button. Cut a circle slightly smaller than the button diameter. This area will receive the iris button.

PREPARING THE BUTTON

Now we'll create the circular canvas for our iris painting. For this we'll use tinted silicone painted onto the flat side of that iris button. This silicone will transfer to the surface of the sclera. Using "P125" from Silicones Inc., weight out 3 grams and catalyze. A platinum dispersion call "588" by Silicones Inc. "588" is a platinum catalyst dispersed in alcohol that we will put in a small spray bottle. This spray bottle will enable us to spray the surface of our silicone and substantially accelerate the cure. I use Factor II intrinsic silicone pigments to tint my silicone for all the painting. I prefer to use a medium grey background when I paint eyes, since the edge of the eye, or "limbus" is usually grey, and by having a grey background, you can paint just shy of the edge to create an even limbus. Tint the silicone by mixing a little white and black pigment. You want it fairly opaque. Next brush the silicone onto the surface of the button and let the silicone level itself.

Spray the surface from about 6 inches away, and let the alcohol flash off for a few seconds and place in a craft oven or toaster oven at 250 degrees for about 10 minutes. To keep the button upright and prevent

the silicone from sliding over the edge, press the button into a small mound of Kleen Klay on a metal palette or flat oven tray. I really like those two-part silicone putties to make custom stands and rigs for things I do. You might try making a reusable silicone stand for this purpose. Remove from the oven and test the surface with a tool to assure the surface is completely set. If it's still not set, spray again and place in the oven for a few more minutes. A really thick surface will take longer to cure.

PLACING THE BUTTON

Take your painted button with stem down, and press back into it original position in the mold. Be careful not to delaminate the silicone from the surface of the button. Add clay around the button if necessary.

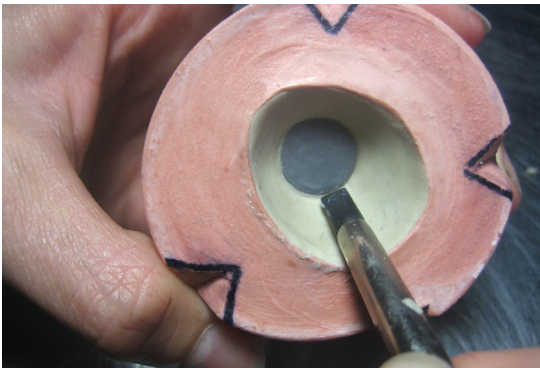


FIG. 10.13 Smoothing clay around button
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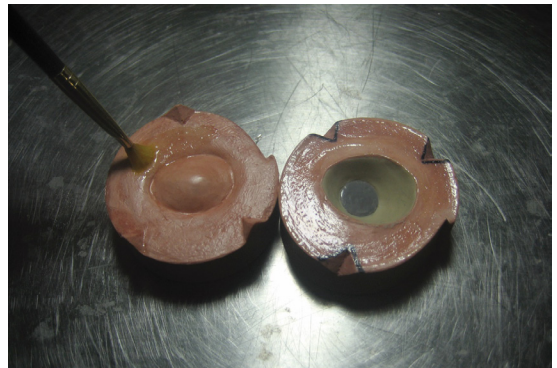


FIG. 10.14 Releasing mold
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You don't want the clay to hang over the silicone surface, so clean any clay off with a tool. And smooth the edge with a silicone tool. Don't get too much clay on the button or it will not stick well to the sclera. Use a little alcohol to clean the surface if necessary. I don't recommend using a solvent to smooth the clay; it tends to be messy. Now you have cored the negative. Release the outer stone surfaces as well as the posterior mold surface with a liquid dish soap. Make sure the surface is not visibly wet.

CASTING THE SCLERAL CORE

Weigh out 5 grams of "P-45" and catalyze (10:1 mix ratio). Tint with white silicone pigment and evacuate (de-gas) in a vacuum chamber. A vacuum chamber is essential for doing quality silicone work especially when casting optically clear pieces. You can buy the components from Factor II. Once evacuated, carefully decant into the negative, and pore some onto the posterior surface as well. Carefully close your mold and clamp with a small C-Clamp.

I use a little two-part putty to create a custom, self-standing, clamp for making eyes. Place in Oven for 40 minutes at 200 degrees.



FIG. 10.15 Filling mold halves

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FIG. 10.16 Clamp tightly

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TRIMMING AND PREPPING THE SCLERAL CORE

Durometer is the term used to measure firmness of a material. When a silicone is firm, or of a high durometer, you can actually grind the surface or the edge to shape it with a red acrylic wheel available through Dedeco and a Dremel. You can also use this same wheel to erase seams on different silicones as well, assuming the durometer is high. It will not work well for low durometer or soft silicones.

Pry the mold apart and marvel at your expertise. Clean the surface of the silicone with alcohol and a paper towel. Trim the flashing with cuticle scissors and carefully grind the seam. Don't be over zealous, just remove the seam.

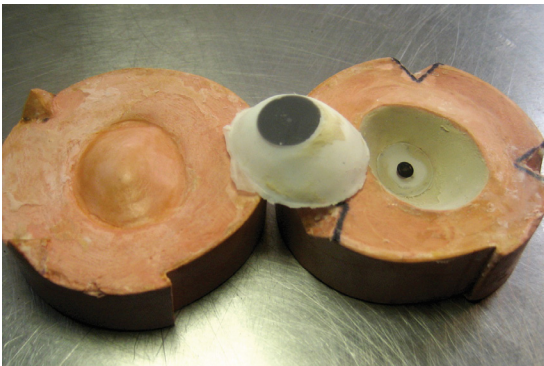


FIG. 10.17 De-molded eye

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FIG. 10.18 Grinding seam

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PREPPING YOUR MOLD BEFORE PAINTING:

You will need to fill the hole created by the stem of the iris button.

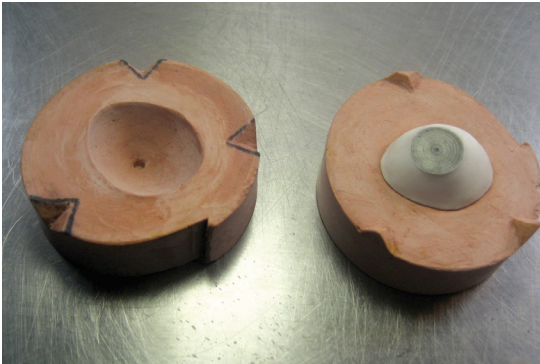


FIG. 10.19 Iris button hole in negative
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FIG. 10.20 Filling button hole
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Mix a small amount of stone and fill the hole making sure there is not a void under the surface. Let set completely, and sand smooth. Spray the surfaces with two even coats of Crystal Clear. The crystal clear will perfect the surface.

PAINTING THE EYE

To paint in silicone, we will make our own silicone paint that we can cure quickly between layers. To create our silicone paint medium, we will use P-125 by Silicones Inc. Mix 5 grams of P-125 and catalyze (10:1 mix ratio). Evacuate the silicone using a vacuum. Silicone pigments available through Factor II will serve as the pigment to tint the silicone.



FIG. 10.21 Mixing thickened silicone
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To clean your brush, I use a solvent from called “Ensolve” from “Enviro Tech.” It is great for cleaning brushes and dispersing silicone. It is a great replacement for zylene or toluene. You should also purchase some thixotropic agent for platinum silicone available at Factor II, Silicones Inc. or Smooth-On. “Thixo” is used to instantly thicken a silicone so that it will not slump or displace. It is essential for creating the striations without fear of the paint moving out of place. Place your prepared silicone core piece back onto the posterior portion of the mold. Take some paint base and mix with appropriate color that will match the color of the striations you are trying to create. For a blue or green eye, I use white striations, and for a brown eye I use black. Add a drop of thixotropic agent and mix. Brush away from the center toward the edge of the iris just shy of the edge so as to create a grey edge.

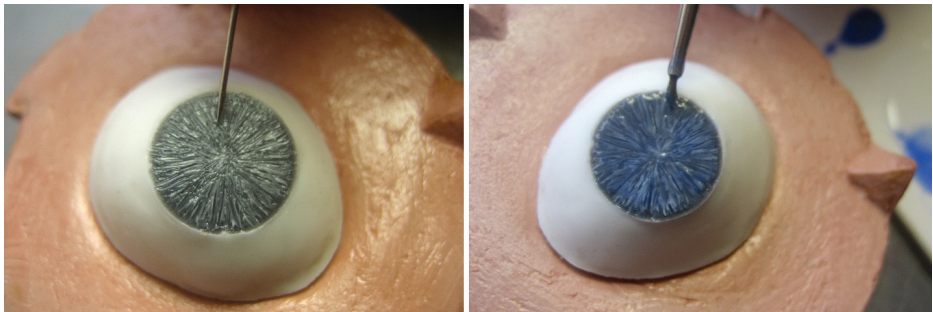


FIG. 10.22 Adding striations to iris (L); Adding color to iris (R)

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Brush technique is essential for creating an even and radial look. You can take a pin to further add the depth and detail of the striations. Once you are satisfied, spray with the 588 and let flash off for 10 seconds and place in oven set at 250 degrees for a few minutes. Check with probe tool to determine the material is set enough as to not disturb. Don't over cure. Once our anatomy is done, we can add washes of color without the addition of “thixo to paint the eye. Set each paint layer with 588, and cure in the oven for a few minutes.

To create the pupil, I make a pupil sheet I can use over and over again. To do this, tint P125 with black pigment and brush a thin even layer onto the back of a metal make-up palette or another metal surface. It's important to make the sheet as thin as possible. You do not want a thick pupil. Be sure to release the metal surface with a little dish soap before applying the silicone. Spray with 588, and place in an oven until cured. Once cured, carefully peel off the silicone and place onto a soft surface like a magazine, and punch out an iris using leather punches.

Leather punches are readily available. Iris sizes vary. The average is 2.5 to 4 mm. Add a little paint base to the center of your iris and place the iris onto the wet silicone. Spray with 588 and cure. Before adding veins, I seal the scleral core to the surface of the posterior mold so it will not change position when the clear part is processed.

Take the paint base, and brush a thin untinted layer over the entire silicone core excluding the iris, and go a little past the edge to seal to the mold. Spray 588 and cure. To make veins, use red cotton thread, and with a tweezers, pull fibers from the thread and place on a paper towel. The threads will stick to the towel so they do not blow away. Brush a thin layer of clear paint base over the surface of the sclera and carefully set the veins. You can manipulate their position with your brush.

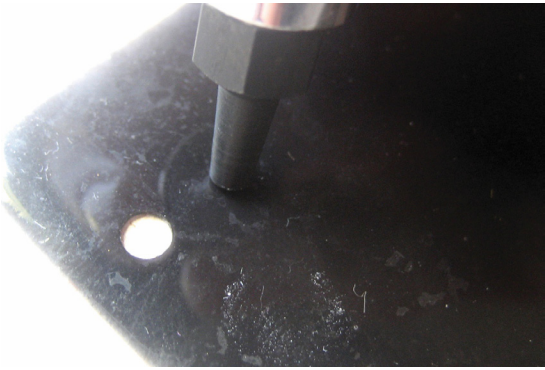


FIG. 10.23 Punching pupils

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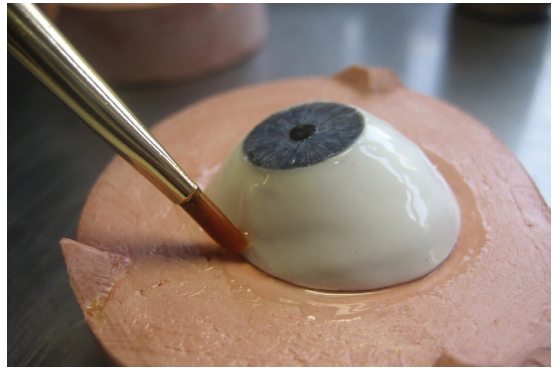


FIG. 10.24 Sealing core to posterior mold

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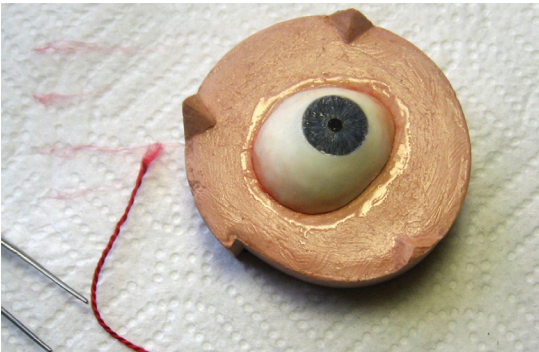


FIG. 10.25 Adding veins to sclera

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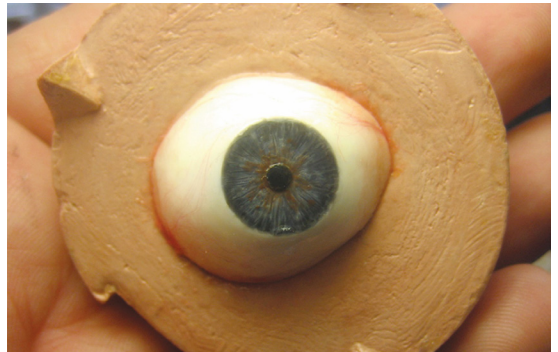


FIG. 10.26 Final paint job; ready for clear layer

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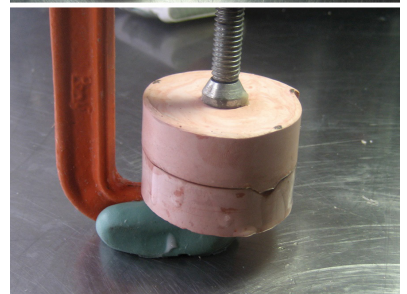
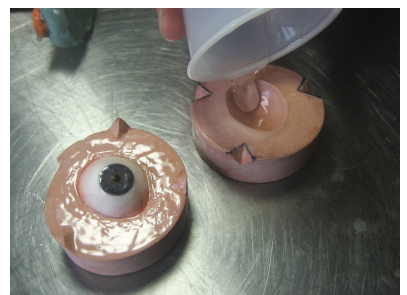
Spray with 588 and cure. Finally, to create the pinkish corners of the eye, I mix tan and red pigment in paint base, and tint the corners. As always spray with 588 and cure. You are now ready to process the clear.

PROCESSING THE OPTICAL SILICONE

To cast the clear portion of the eye, we will use an optically clear silicone from Silicones Inc. called XP 565. Release the anterior surface of the mold with dish soap and let dry. Mix 5 grams of 575 and catalyze (10:1 mix ratio). De-gas and pour slowly into the anterior portion of the mold. Slowly submerge the posterior side of the mold with painted silicone core and clamp slowly as to not create bubbles. Let cure without the addition of heat to avoid bubbles. Cure time is approximately 6 hours.

FIG. 10.27 Pouring optical silicone into mold (top); Mold clamped shut. Now we wait. (bottom)

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TRIMMING AND POLISHING THE SILICONE EYE

Carefully remove the eye from the mold. Trim the flashing and grind the edge with a acrylic grinding wheel. Be careful not to be too aggressive—you don't want to delaminate the clear silicone from the surface of the sclera.

A silicone primer available from Factor II can be brushed onto the silicone core prior to casting the clear to prevent any delamination. Make sure it is a primer designed for platinum silicones. Once you are satisfied with edge, you are now ready to add the polish coat. I make a little rig for polishing I call the “polish stand.” You can simply push pins through a polyethylene dram cup if you don't want to make such a rig. Push three to four push pins through the cup to impale the posterior side of the silicone eye, suspending it. This will allow you to paint your polish over the edge of the eye.

Mix and catalyze 2 grams of 575 and evacuate. Brush a thin layer of 575 over the surface and around the edge. Don't use too much to avoid dripping. Baby the polish and place in oven at 225 degrees for 10–15 minutes. Remove the eye and revel in your achievement!

You can clean the eye with alcohol when it gets dusty or dirty. Do not use any other solvent.



FIG. 10.28 Trimming de-molded eye (top); Grinding edge (bottom)

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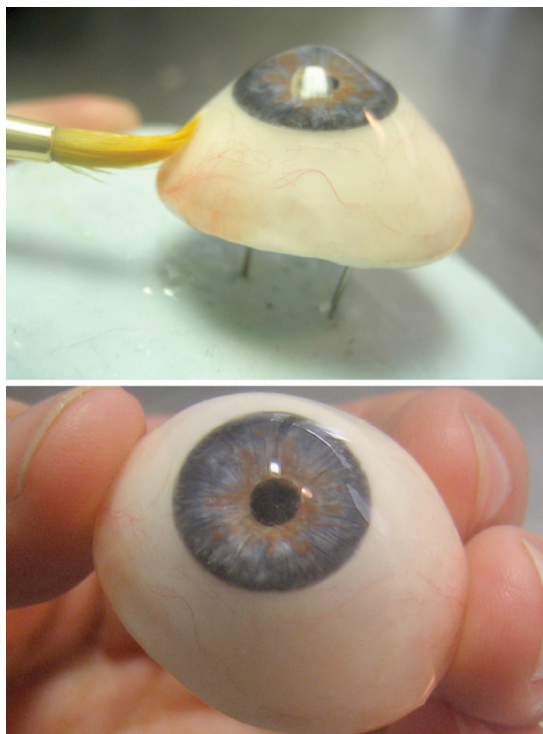


FIG. 10.29 Thin surface layer of 575 (top); finished eye (bottom)

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