STEP by STEP

Powder Separation Moldmaking

Preparing and making tight registration molds. Part 1.

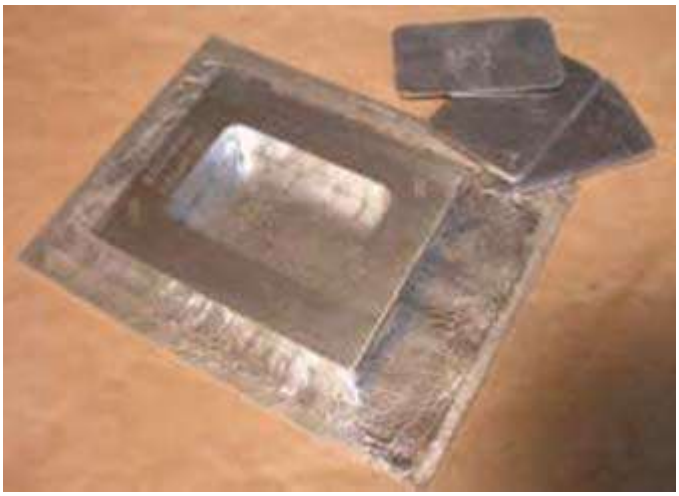
BY DONNA E. SHIMAZU

• Metal models ready for molding
• Mold frame (5/8" high x 1 7/8" wide x 2 7/8" long interior dimensions).
• Vulcanizer
• Two mold frame plates, large enough to sandwich the frame with more than 1/2" extending all around.
• Mold pressure plates (.064" thick and .032" sheet cut slightly smaller than 1 7/8" x 2 7/8" with rounded off corners) NOTE: Cut up 4" x 10" sheets of K&S aluminum available at hobby and hardware stores.
• Old rolling pin or 12" dowel, diameter 1" or more.
• Steel ruler
• X-Acto® knife.
• Pointed tweezers (AA or similar).
• Sprue base formers (commercial or handmade).
• Sharp scissors.
• Soft bristle brush for spreading powder
• Fine brush (00) for powdering release vents.
• Dull, round-tipped, nonserrated butter knife.
• Scalpel with #11 blades.
• Heavy Duty aluminum foil (Reynolds is thicker and better).
• Baby powder or jeweler's talc.
• Wax paper.
• Indelible felt-tipped marker (Sharpie®)
• Ziploc® freezer bag (quart size)
• Small covered container(s)
• Denatured alcohol and paper towels.
• Silicone rubber (Castaldo® Super Strength Strips.™)

Powder separation moldmaking techniques can be used by moldmakers of all experience levels. For some, powder separation means entry-level with no scalpels (except for cutting air releases), consequently less danger of injury. For others, it means convenience, speed, and tight registration. I will be covering just two types of powder separation molds in this article. The first mold will be made with pre-vulcanized keys (instead of commercial metal "locks") and powder separation. The second mold will combine pre-vulcanized keys with powder separation and hand cutting. Modelmaking will not be covered in this article.

1 The preparation.

Prepare your frame by dulling the edges of the opening with a sanding stick, because some of them come with very sharp milled edges that can seriously hurt you. You don't want bevels, just smooth, non-cutting edges. You do, however, want to cut a bevel on one exterior corner of each side of the frame. This gives you a spot in which to slip a dull butter knife to pry the plates from the frame. Mark the frame with a diamond ball bur or a Dremel® electric engraver. Write "silicone" and "top/front" on one of the faces. This is important because the molds should be dedicated to only silicone rubber or only organic rubber, and it's helpful to know which side the front of your model faces.



Silicone rubber and organic rubber are seriously incompatible. If there is even a trace of organic rubber, any silicone rubber making contact will not vulcanize, resulting in a slimy,

sure to follow the manufacturer's specifications. Making the keys is like rolling out pastry dough. Start off with a piece, maybe 5" long. Peel off the safety paper and place the rubber on a

sticky mess. This holds true for the reverse situation: Any trace of silicone rubber will result in uncured, slimy organic rubber. Therefore, you should mark all model bags and note cards with either “silicone used” or “organic used” and the date when the model was last used. If you make a mold at a later date, use the same rubber again, or thoroughly clean the model using solvents, light polishing, heating, and pickling, or all of the above before attempting to mold in a different type rubber.

2

For the pressure plates, almost any perfectly flat, stiff sheet metal can be used. Hobby shops and many hardware stores sell K&S 4" x 10" aluminum sheets in .032" (0.813mm/20-gauge) and .064" (1.626mm/14-gauge) thicknesses. You want the two different thicknesses to accommodate different needs. You can cut 6 pressure plates from each sheet with a table shear. Clip the corners and use a belt sander to smooth the sides and edges, and to round the corners to fit within the mold frame. Make the pressure plates just slightly smaller than the frame opening so the plates can drop easily into the frame cavity without binding or hitching up on any edge. NOTE: Different frame manufacturers cut different corner radii even though the frame is supposedly a standard 1 7/8" x 2 7/8". Try to buy frames from the same supplier so you don’t have to worry about pressure plates not fitting properly.

3

I like to use vulcanized keys rather than commercial metal locks. My keys provide tighter registration in open, as well as restricted areas, and they’re cheaper, too. I make keys maybe once a year. My silicone rubber of choice is Castaldo® Super Strength Gold™. It comes in convenient strips that are 2 7/8" wide, the lengthwise dimension of a standard frame. It is flexible, has a lovely easy-release surface, and is fairly durable for a silicone rubber. It costs a little more than some other brands, but I’ve grown accustomed to it. NOTE: All temperatures and vulcanizing times in this article will be specific to Castaldo® Super High Strength™ siliconerubber. If you use another Castaldo® silicone rubber or another brand, be

piece of wax paper sprinkled with baby powder or jeweler’s talc. Flip the rubber to dust both sides and begin rolling the rubber thin with a rolling pin. (NOTE: I bought the rolling pin at a discount store, and I do not use it on food.) A large dowel will work, but a rolling pin is much easier to use. Stroke in different directions to get an even thinness, and rub on more powder if the rubber sticks. I visually aim for 1.2mm for my thick keys, 1mm for my standard keys, and 0.5mm for my tiny keys.

After you’ve rolled out an even thickness, place pressure plates on the sheet to serve as templates, and cut around them with a dull butter knife. Powder the cut edges of the rubber

pieces by running them against loose powder on the wax paper so they won’t stick to the mold frame. When you have enough done, place a clean mold frame on a piece of heavy duty aluminum foil that is resting on the frame plate.

Place sheets of rubber, alternated with pressure plates, into the frame until it is firmly filled up just beyond the top surface. Cover with another piece of foil and the second frame plate. This mold frame sandwich is placed into a 330°F

preheated vulcanizer under firm pressure.  Do not overtighten because you can jam your vulcanizer when the rubber expands under heat. It is very important to have enough pressure on the stack of rubber and plates because if there is too little pressure, the vulcanized sheets will be spongy, covered with tiny holes, and unusable. The pressure plate must also be perfectly aligned in the mold cavity. If not, the result will be a pinched, damaged pressure plate. NOTE: All things being equal, I prefer to start stacks with rubber and end with metal. You can peel off the outer layer of rubber and have a shorter stack to push out of the frame. Ending with metal provides an even, rigid pressure to the stack.

cutting through, as if you were cutting solder. You might want to split this length of strips into two pieces, since it's a bit difficult to cut across such a wide expanse of strips. Cut across the strips with the scissors.

Use your index finger to keep strips in alignment and take care to cut squared edges. As you cut, the keys will fall into the waiting

4

Vulcanize the 5/8" thick frame for about 30 minutes in a preheated vulcanizer, set to 330°F. When done, speed up cooling by putting the whole frame into water. When the frame and its contents are completely cold, remove the foil and release any rubber flashings from the frame. If you have ended in rubber, peel the sheet off. Push out the stack. Sometimes it takes a bit of work and strong thumbs, but you're happy that you took the time to powder the cut edges. (NOTE: Resist the temptation to whack with a mallet. You'll warp your pressure plates.)

5

After you have removed the stack from the frame, peel the sheets of vulcanized rubber apart from the plates. Go to a clean area, and set up a clean container to hold your keys. Take one of the vulcanized slices and a sharp pair of scissors, and trim three of the four powdered, distorted edges of the sheet. Leave the fourth side to be an anchor. Cut strips almost to the uncut edge, *not*

The containers must have tight lids to keep the keys dust-free. After all, the cut, powder-free surfaces are what bond to unvulcanized rubber! I usually don't cut too many keys at one time, since a dropped container

means a contaminated mess. Instead, I store the uncut sheets in a Ziploc® bag until I need to cut more keys.

container. You can vary the size of the keys by the width of the strips, by what increments you

cut across the strips, and by the thickness of the sheets. When you've cut to the anchor edge, discard it. When I make keys, I generally use one of my frames with a larger opening or a double frame so I can mass produce the keys. I avoid frames thicker than 5/8" to 3/4" because tall stacks are more difficult to remove. Within a stack, I can make sheets of different thicknesses. I separate my keys into containersby size.

9

Trim the corners of the slices to account for the curved corners of the frame. Use a Sharpie® to mark both exposed faces of the rubber slices. Marking with a Sharpie® and vulcanizing helps

make the marking permanent. If you mark after the rubber is vulcanized, the marks tend to rub off. NOTE: I usually record the mold number, the date, and other pertinent notations. I mark

6

For the sprue base formers, you can use commercial sprue base cones, but most of them are too large. All that is needed is a snug target for the wax injector's nozzle, so I like the 3/8" mini cones that Progress Tools sells if I am using a commercial former. Otherwise, I make my own out of dapped 3/8" discs of 24-gauge nickel silver or brass. I dap the discs into the hemispheres, true the cut edge absolutely flat, and drill centered holes. I make several of these with different sized holes to accommodate different sized models. I favor these simple, handmade base formers because they are cheap, easy to make, last forever, and most importantly, don't take up a lot of useable mold space. NOTE: Remember to keep the silicone sprue base formers separated from the organic rubber ones.

7

Making the powder separation mold.
I selected a gang mold of 12 open eyescrews. This model is relatively flat, and would be difficult to cut without bending the model, or miscutting some of the open eyescrew rings. It also has no major undercuts, making it a perfect candidate for powder separation. First, preheat the vulcanizer to 330°F. Prepare a mold frame by cleaning all the surfaces with denatured alcohol to remove dirt, oil, rubber, and any marking pen residue that might transfer onto the mold. Put the clean frame on foil which is on a mold plate, and set this aside. Cut two slices of rubber that are 1 7/8" x 2 7/8" using a steel ruler and a sharp X-Acto® knife. The point is to get accurate cuts through the safety paper and rubber without squashing the edges of the slices. If the rubber is very thick, I might cut 1/16" narrower, or 1 13/16" x 2 7/8". This allows the thick rubber to spread sideways, and not overfill the frame.

the mold number on the side if it's a production mold for ease of identification in drawers. I recommend getting into the habit of marking on the outside surface of the rubber to indicate which way the front of the model is facing. In my case, I write in a landscape format on the back slice of the mold, and in a portrait format on the front slice. When I position my model, it has become an ingrained habit that the front of the model faces the side with the portrait notations. I also make sure it is properly oriented relative to the "Front/Top" marking on the frame.

In the next issue, we will finish making this mold, and also make a powder separation hand cut mold. •

Donna E. Shimazu is the first woman to be certified as a master bench jeweler by Jewelers of America. She is employed as a designer, goldsmith, modelmaker, and research and development specialist at Maui Divers of Hawaii in Honolulu. She has her own jewelry designing and modelmaking business, Donna E. Shimazu Designs. She has also contributed as a technical reader for the following books by Aldofo Mattiello: "The Techniques of Jewelry Illustration and Color Rendering," "Jewelry Wax Modeling" and "How to Create Settings in Metal, Wire and Wax."