STEP by STEP

Powder Separation Moldmaking

Preparing and making tight registration molds. Part 2.

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In the last issue, we began preparing the mold made with the pre-vulcanized keys and powder separation. We will finish that mold in this issue, and make another that combines the pre-vulcanized keys with hand cut molds.

- 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

1

After double-checking the adhesion of the safety paper, put the marked slices into a Ziploc bag that contains 1⁄2 teaspoon of baby powder or talc. Zip it closed, and then shake and coat the exposed surfaces with powder á la Shake ‘N Bake. Retrieve the slices and shake off the excess powder as only a very thin coating 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.™)

needed. With clean hands, peel off the safety paper on the "back half" slice and gently place it into the mold frame, clean side up, without damaging the sides.

2

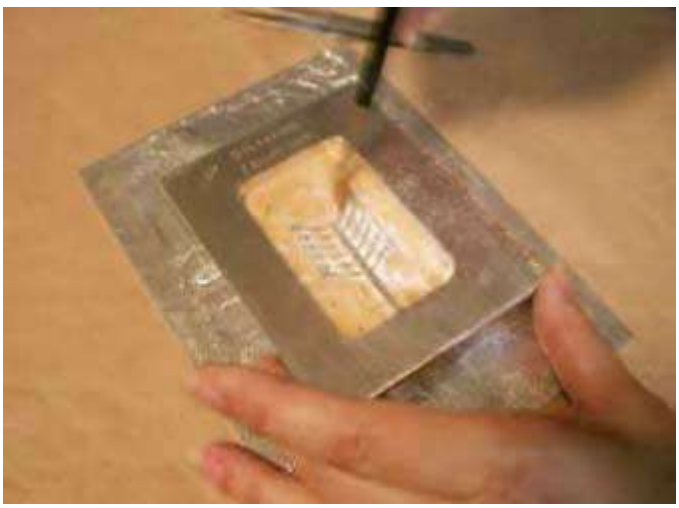
With the bottom rubber slice in place, press a sprue base former against the bottom wall and halfway down into the rubber. Insert the end of the model into the base former, lower it down, and gently press it halfway into the rubber. Using sharp-tipped tweezers, begin placing keys at the corners, around the base former

and along the sides about 1⁄8" from the edge and base former. If the keys are too close to the side, they may shift during vulcanization and

the keys stand straight up and down, to use appropriately sized keys, and to not have the keys resting against the model. Sometimes, it helps to use a clean tool like a watchmaker's screwdriver to make a hole in which to shove a tiny, thin key. The trick is to avoid making the hole too big, because you don't want gaps between the keys and the rubber. Gaps compromise bonding.

4

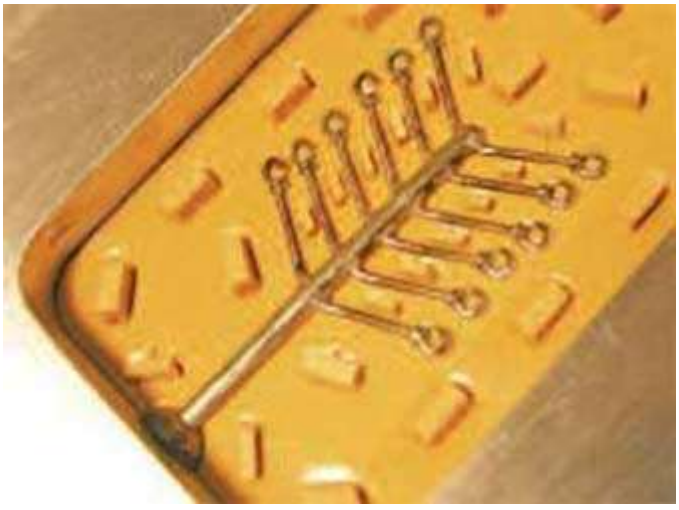
Once the keys are in place and the depths and positioning are reviewed, the whole surface is powdered. Use a soft bristle brush to spread the powder over every surface, especially the sides of the keys and where the rubber meets the model and the frame. Use compressed air



break through the outer edges of the mold. The keys, standing on their bondable, powder-free cut edges, are pressed halfway into the rubber. Try to use keys that will cause even and symmetrical displacement. Don't use skinny keys on one side and fat ones on the opposite side, because the displacement will be uneven, and the model might shift out of place.

3

After establishing the perimeter and the high stress area around the sprue base with medium keys, add fill-in keys in staggered positions. Think staggering as in bricklaying, because it minimizes leakage alleys and improves registration. Add the smaller keys between the eyescrews to further lock in tight registration. It is important to have



to gently remove all the extra powder because just a very thin coating is needed. Blowing with

your breath could result in accidental moisture deposits. Next, peel the safety paper off the top slice, flex it inward, and lower it into the frame. Gently press the rubber downward until it is

firmly in place with no air pockets between the slices. The motion is downward, not side to side or sliding, because you do not want to disturb key/model placement, or cause distortion.

5

Gently rub your hand across the frame and over the surface of the rubber. If there is a slight rise above the frame, you don't need a pressure plate. If the rubber is just short of level to the frame, place one of the thinner pressure plates over the rubber, and press down. If there is a definite drop off between the rubber and the frame surface, add a thick plate or possibly more than one plate. You want the plate surface to be just slightly above the frame surface. If you put too little pressure, you'll get a spongy mold with incomplete fill/fit. If you put too much pressure, you'll cause too much displacement, causing rubber to ooze out, and the keys and the model to shift. Identifying correct pressure comes with experience.

6

After the pressure plate(s) are in place, add the foil and the frame plate to the assembly, and place into a preheated vulcanizer for 30 minutes (15 minutes per slice for this particular rubber). As in the case with the key making enterprise, make sure that the pressure plate is correctly aligned when setting the final pressure. REMEMBER: Firm pressure, but not too tight!

rounded tip of the butter knife along the powder line, and press and wriggle the knife. If you can't start an opening, try another spot. Once a seam is opened, use a back and forth twisting motion to spread the mold apart. Once the mold is parted enough to grab, firmly pull the two

halves apart. This takes a bit of force, so don't be timid. Notice that the model is not bent or twisted as the two halves come apart.

7

After the 30 minutes are up, remove the frame and either air cool or speed cool in water. When the mold is thoroughly cold, peel off the foil, and remove it from the frame. Remove the pressure plate without cutting or gouging the mold face,using the dull butter knife as if you were shucking an oyster. Pull out the sprue base former and trim the rubber flashings off with thesharp scissors, taking care to keep 90° angles to ensure even, edge to edge pressure when injecting wax. Look for the white powder seam line along the sides of the mold. Select a spot away from the sprue opening. Push the

NOTE: If too much pressure is applied, poor key placement is executed, or air pockets aren't repaired properly, keys will shift and/or fall over and the parting line will be distorted. It might even be difficult to locate the parting line if the rubber squirts up and out of the frame.

8

Remove any little flashings of rubber where the model meets the sprue base and at the opening of the sprue base. Test inject the mold, using a mold clamp or two metal plates, and cut air release vents as needed. These are at areas that do not fill, no matter how much you adjust the pressure and/or duration of the injection. At the hard to fill spots, cut slits from the mold cavity outward with a very sharp scalpel.

NOTE: How many, how deep, and the direction of the cuts affect how the mold flexes open. An excessive slit could cause the mold half to crack open too much when flexed, and break the wax model. The general rule of thumb is to cut the minimum to achieve wax fill. This minimizes flashing, flexing problems, and preserves the durability and strength of the mold. Don't despair if you make venting

NOTE: Generally, the first wax shot after powdered release vents are cut is discarded because it has powder adhered to it. Test inject and modify as needed until the mold works properly, and is ready to use.

9

Powder separation/hand cut mold.

This type of mold involves powder separation and hand cutting. I use it when I want to more specifically control the parting line's location, which comes into play with more dimensional models. I like using the powder separation because it gives good outer edge integrity to the mold. It also saves me the monotony of hand cutting the perimeter, allowing me to concentrate on the more critical cutting. I've chosen a model of a sea turtle for this project.

Do everything the same as for the previous project up through the Shake 'N Bake-style coating of the exterior surfaces of the slices of rubber. Take a slice, safety paper facing up, and place the model on top. Trace around the model with a marker, encompassing some space around it, while still leaving approximately 3/8" outside of the tracing.

mistakes. It takes experience and practice.

Flex the mold to open up the slits. Take a fine brush and dust a little powder into the slits, not on the rest of the mold. Use compressed air to remove the extra powder. These slits, with a little powder, will let displaced air escape and allow wax to flow more easily into the mold cavity.

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Powder the exposed area, remove the excess powder, and lift off the safety paper. Insert the model and press it into place.

Remove the model, take an X-Acto knife and cut through the safety paper on the line just drawn. Remove the safety paper outside of the model area and place the rubber slice into a prepared frame assembly. Press in a sprue base former, and place keys in the perimeter and base area.

halfway point along the neck and around the head. It is important to cut without nicking the model, or the blade will have to be replaced. Cuts that are not butter smooth and that have tiny ragged edges are indicators that the blade is damaged and needs replacing. Use alternating wavy and straight cuts radiating around the model to help register the hand-cut area.

12

After the mold is cut apart and little flashings are removed at the sprue base area, do a wax shoot to check if air release vents are needed.

NOTE: I dug out some rubber to make a slight depression for the turtle's shell. The removed rubber was used to fill in the body cavity of the turtle.) Lower the second slice of rubber, clean face down, and press it into place. Follow the same protocol to determine whether or not to use pressure plates(s). Place the foiled and plated frame sandwich into the preheated vulcanizer.

10

After vulcanizing at 330°F for the 30 minutes, cool the mold completely. Peel off the foil, remove from the frame, and pull out the sprue base former. Remove any pressure plates, and trim off the excess rubber flashings. Use the dull butter knife to separate the perimeter of the mold up to the area around the model where unpowdered rubber surfaces bonded together. Using a pony clamp attached to an anchored

chain to hold one end of the mold, cut the mold apart with a scalpel. Pull the rubber as you're cutting, so it releases away from the model. Don't pull too hard or the rubber might tear.

In this case, I cut tiny slits at the tips of the flippers and tail and powdered them.

After a test shoot, the appendages were filling properly and the mold was ready to use. I hope you have found this article useful. Happy moldmaking! •

Take extreme care to be under control at all times. If you slip, the scalpel can run through the rubber and through your thumb in the blink of an eye.

11

Start by following the sprue end and where it attaches to the model. The objective is to cut a parting line that allows for the easiest wax removal and the easiest clean up of any parting line. For this turtle model, the cutting is along the edge of the flippers, tail, and shell, and the

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