

Basic Mold Making
Techniques and Ideas
for Making
Flexible Urethane Molds
with
POR-A-MOLD®

PRODUCT BULLETIN #89.03



POR-A-MOLD®

PHYSICAL PROPERTIES

TYPICAL PROPERTIES OF SYSTEM

	S111	S333	S555	SG450
Viscosity @ 25° cps Curative/Prepol	2000/4000	2350/6800	3600/8100	16,000/4000
Specific Gravity @ 25° C Curative/Prepol	1.298/1.20	1.112/1.317	1.330/1.061	1.20/1.05
Mix Ratio by Weight Curative/Prepol	114/100	112/100	125/100	114/100
Mix Ratio by Volume	100/100	100/100	100/100	100/100

PROPERTIES OF CURED POR-A-MOLD®

Durometer Hardness, Shore A	20	35	50	45
Ultimate Tensile, PSI	187	287	415	950
Modulus, PSI				
100%	38	102	254	174
200%	84	207	425	321
300%	130	280	---	522
Elongation, %	433	292	183	450
Tear, Die, C, PLI	39	52	88	130
Tear, Split, PLI	7.7	9.0	12.5	15
Rebound, Bashore, %	33	49	52	55
Water Absorption, 7 days @ 25°C, %	0.6	0.7	1.4	---

TEST PROCEDURES (Q.C.)

Hardness: Mix equal volumes of the curative and the prepolymer. Cure at 71° C for 3 hours and at 15°C overnight. Check gel time, hardness and surface tack.

Viscosity: Measure Brookfield Viscosity @ 25°C

Specific Gravity: Measure specific gravity @ 25°C using specific gravity bottle.

INTRODUCTION

The great advantage of POR-A-MOLD® is its ability to record the most intricate details of the master or positive model and the ease it can be removed from the master model with undercuts.

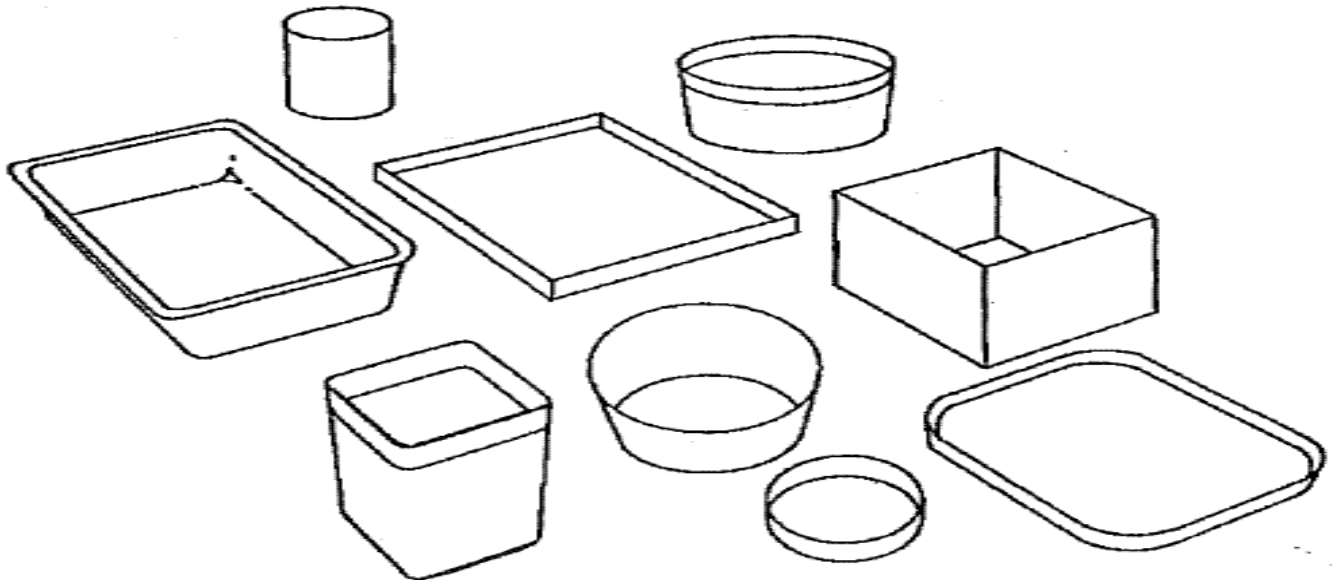
POR-A-MOLD® can be used to make patterns that are exact copies of the master and are used in the ceramic shell and brass lost wax investment casting techniques.

It also can be used to make copies of all kinds of master models that can be recast in the other materials such as wax, resins, epoxies, liquid wood, urethanes gypsum, plaster or cement products.

POR-A-MOLD® allows the production of large editions with little wear or deterioration of the mold from repeated use.

There are several mold making techniques. The ones we are discussing here are the simple basic molds. More complex molds are discussed in our **Product Bulletin #90-03**, which is available free on request from PUMA Polymers.

The first mold we will discuss is the one-piece flat back mold contained in a mold box or plastic container.



These plastic containers can be purchased in any grocery, discount or hardware store.

ONE PIECE MOLD

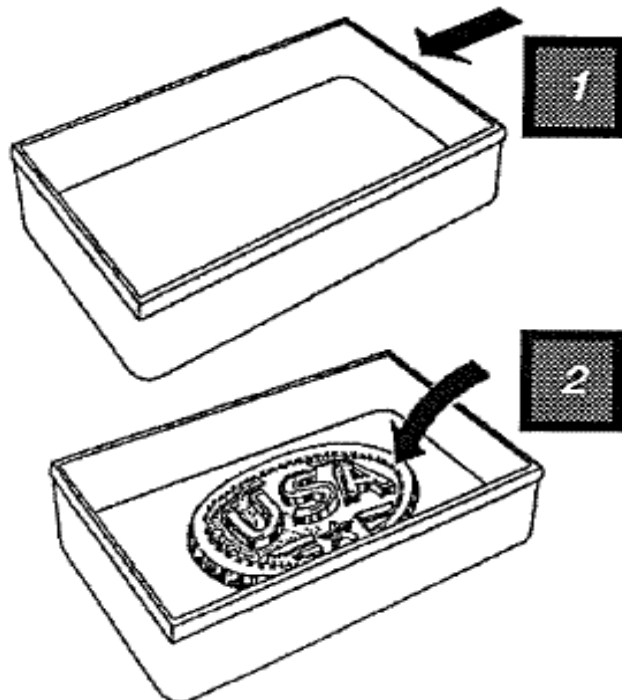
This method requires the POR-A-MOLD[®] to be poured over the master model after it has been placed into the plastic container. The plastic container acts as a mother mold. If the master contains deep undercuts or fine detail that need to be reproduced, we suggest painting on the first coats to capture the details and provide a bubble free surface to be in contact with the master.

After the brush coat(s) have cured from 46 to 60 minutes, or until the material has started to gel and is tacky to the touch, the remaining POR-A-MOLD[®] may be demolded by inverting the container separating the master from the finished mold. (See illustration.)

The success of any of these mold making Techniques depend on several things!!!

1. Proper measurement and mixing of the POR-A-MOLD[®].
2. Proper preparation of the master model.
 - a. If the master is made of porous materials, i.e., clay Plastilene or plaster, it is necessary to seal the master with clear lacquer, varnish or fast drying enamel. Any moisture remaining on the surface of the master will inhibit the curing process of POR-A-MOLD[®], causing it to foam thus resulting in uncured tacky areas.
 - b. If the master is made of metal, glass or other dense materials, sealing is not necessary. Apply PUMA Polymers' release agent, Synlube 531, directly to the master model without loss of fine detail.

1. Plastic container of proper size

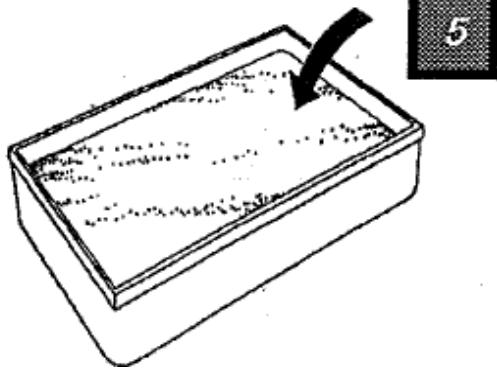
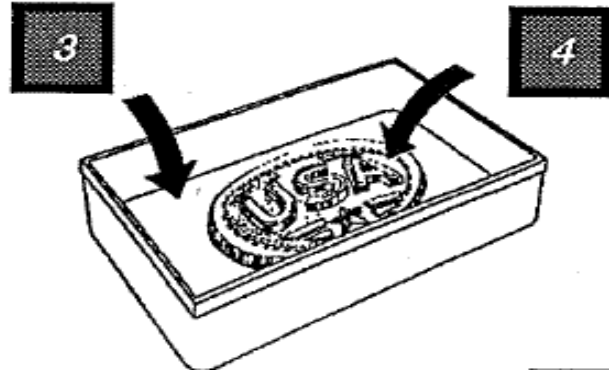


2. Belt buckle face up in bottom of container.

Many objects can be molded in this manner, i.e., carved or sand blasted plaques, belt buckles, three sided objects, etc.

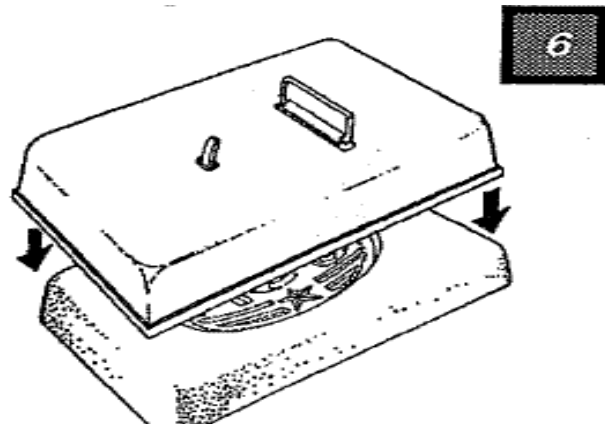
3. Cut hole in bottom of container so belt loop protrudes through bottom. Glue to container on bottom to secure.

4. Apply PUMA Polymers' release agent to inside of container and buckle.



5. Pour POR-A-MOLD® into container, cover buckle with ¼" of material.

6. After proper curing time, invert plastic container and dump cured mold out.



7. Finished mold

- After casting material is pored into mold place belt loop attachment when material has started to gel.
- Cast buckle with casting material, i.e., resins, dense urethanes, etc. Color casting materials with powdered bronze or silver.
- Apply release agent to mold before pouring casting material.

A TWO PIECE MOLD MAY BE MADE AS FOLLOWS

This method requires securing the master model near the bottom of the plastic container so that the mold material will flow under the master. (See illustration)

After applying PUMA Polymers' release agent, Synlube 531, to the inside of the plastic container and the surface of the master model, blend and pour enough POR-A-MOLD[®] material to cover one-half of the master model. Let this set in room temperature (72°F) until the material has cured enough to allow handling (approximately 2 hours.)

After the proper time has elapsed, with a razor blade or exacto knife, cut three wedge-shaped pieces from around the outside edge of the cured POR-A-MOLD[®]. (See illustration) These will be the "keys" that will allow the top half of the mold to fit to the bottom half when you are ready to cast a reproduction.

At this time cut a soda straw or dowel to fit from the surface of the master model to the inside face of the container. This will serve as the pouring hole or tunnel to pour the casting material into the mold. This pouring tunnel may be enlarged to meet the viscosity requirements of casting material.

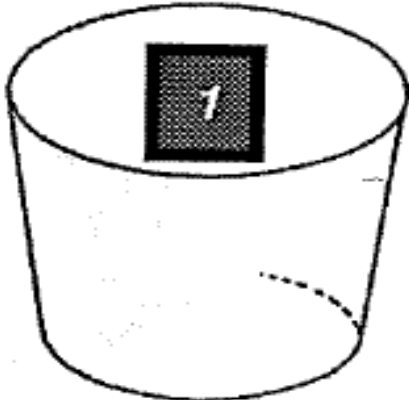
At this time, secure the dowel or straw to the mold surface in the proper position and treat the top surface with PUMA Polymers' release agent, Synlube 531.

Blend and pour enough POR-A-MOLD[®] material to cover the master model with ½" of the POR-A-MOLD[®] material.

After the proper cure time at room temperature (72°F for approximately 12 hours), remove the top half of the mold, extract the master model and you have a mold ready for reproduction casting.

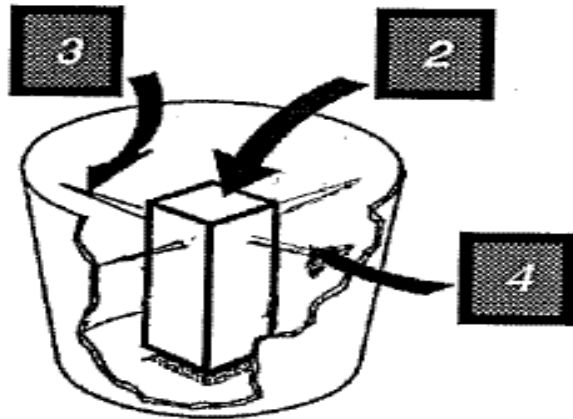
As a tip in casting reproductions, drill or cut a hole in the plastic container which matches up with the end of the straw or dowel and pour your casting material into the mold while it is still in the container. The container will then act as a mother mold.

As you can see, the possibilities are unlimited as to the objects you can reproduce using the two-piece mold.

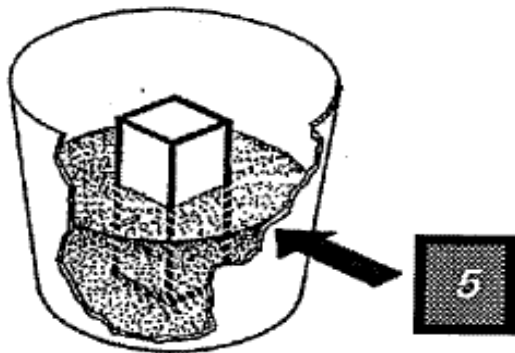


1. Plastic container

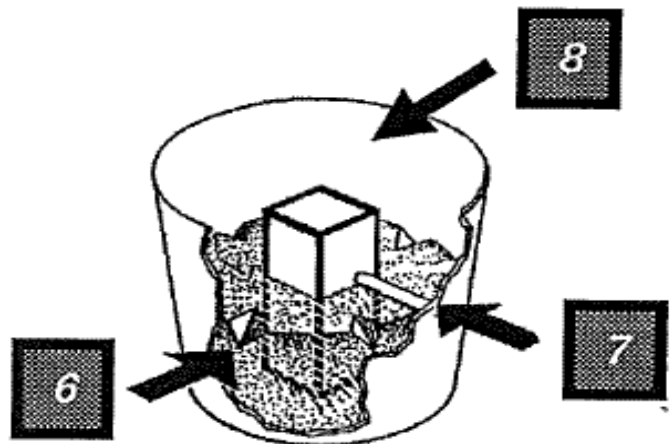
2. Master model
3. Spray inside of container and master with release agent
4. Tooth picks to secure master in position up from bottom of plastic container.



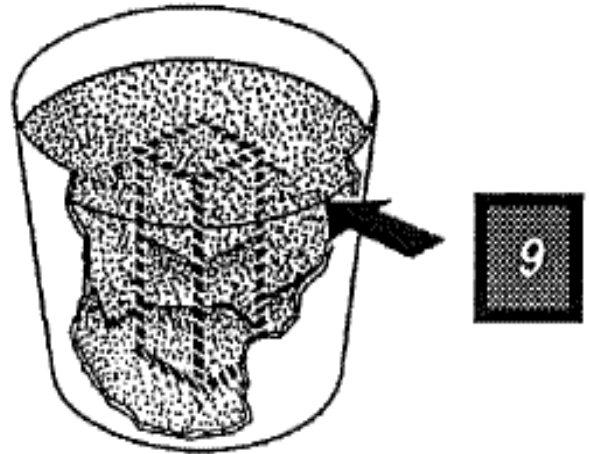
5. Pour POR-A-MOLD[®] half way up master mold.



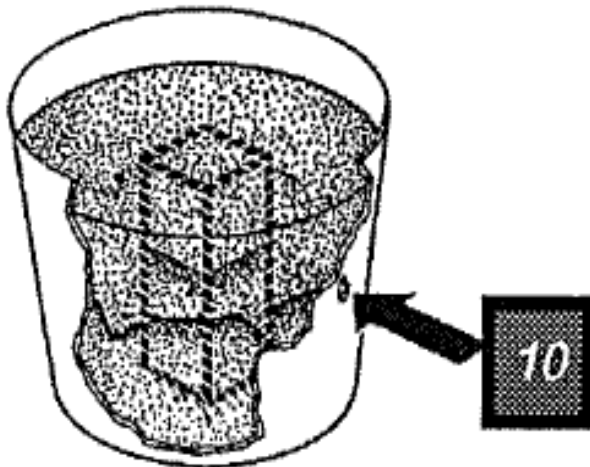
6. After proper curing time, cut keys into poured material while it is in container.
7. Cut and secure straw or dowel for tunnel (to pour casting material).
8. Apply release agent to top of mold and master before pouring balance or POR-A-MOLD[®].



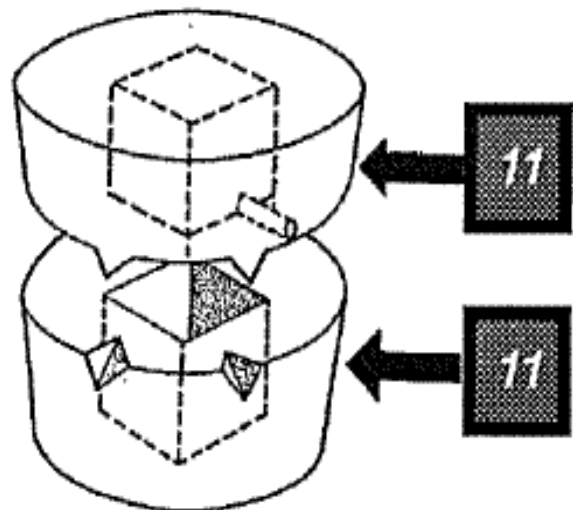
9. Blend and pour POR-A-MOLD[®] to cover master with ½" of material.



10. Drill hole in container to match dowel.



11. 2-piece mold.



THIXOTROPIC

THIXOTROPIC material has the consistency of peanut butter and is used as a troweling type material to build a mold by the paint and trowel method.

One reason for using this type of material is that the master model is too large to use the pouring type material for reasons of economy or the master is too complex for a pouring type mold.

One example of this would be to make a mold of animal horns or antlers. The pour type method would be almost impossible and would use a large quantity of material.

This example of a THIXOTROPIC mold will work on any upright master model or a master model that is complex in shape.

If the master model has undercuts or fine details that need to be reproduced, we suggest that the first coat(s) be painted on. We can do this by using the pouring type POR-A-MOLD® for the brush coat(s) or thinning the THIXOTROPIC material with toluene. Mix a small portion of the material in a container and add 15% to 25% toluene until you have a brushing consistency. Brush this material on the master being sure to brush out any air trapped between the master and the painted coat.

After the brush coat(s) have set 45 to 60 minutes or the material has started to gel and is still tacky to the touch, you can then trowel on the THIXOTROPIC material to the desired thickness.

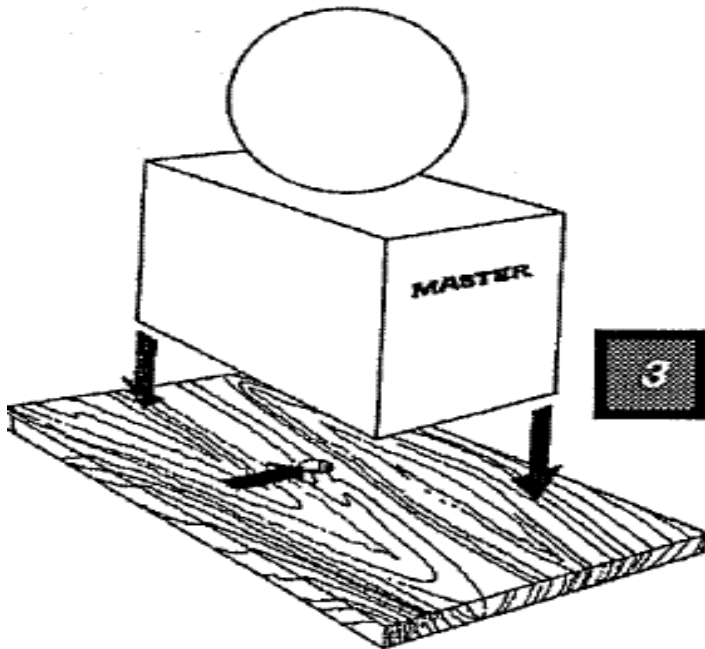
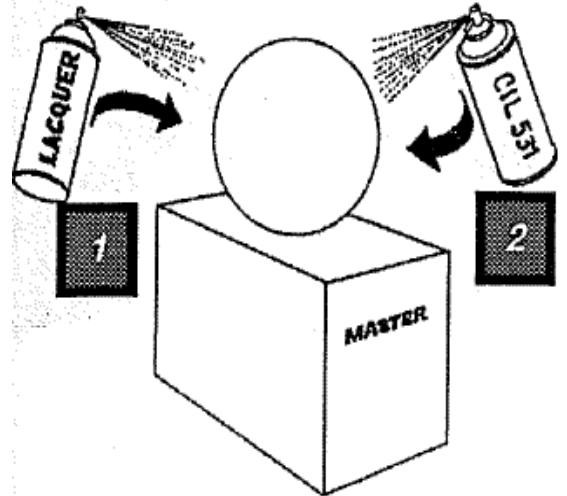
After you have reached the desired thickness, use a plasticizer (smoothing oil) to smooth out the exterior surface of the mold.

The plasticizer will seal the surface from absorbing any moisture and act as a parting agent should you wish to make a backup or mother mold.

CAUTION!

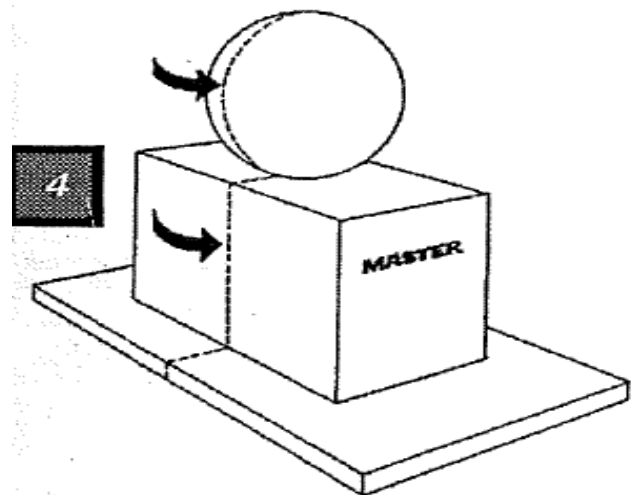
After applying the plasticizer, no additional coats of POR-A-MOLD® can be applied as they will not bond or adhere to the preceding coats.

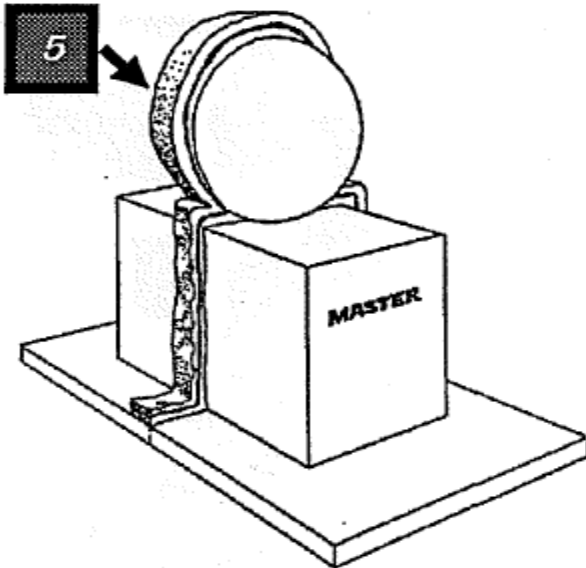
1. Seal master or positive with clear lacquer, varnish or quick drying enamel. Master MUST be dry.
2. Apply PUMA Polymers' release agent, Synlube 531, to master MORE LATER



3. Attach a mounting board to bottom of master. This can be plywood, shipboard, or pressboard. Drill a $\frac{1}{2}$ " diameter hole in bottom of mounting board before attaching master. This will be your pouring hole for casting reproductions.

4. Determine the position of the parting line that will divide the mold into two sections.

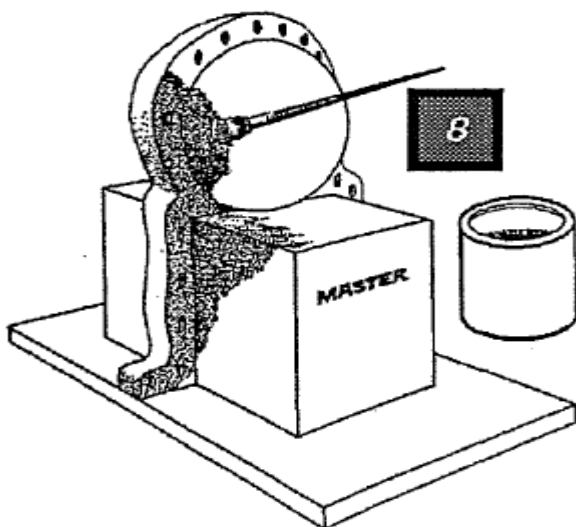
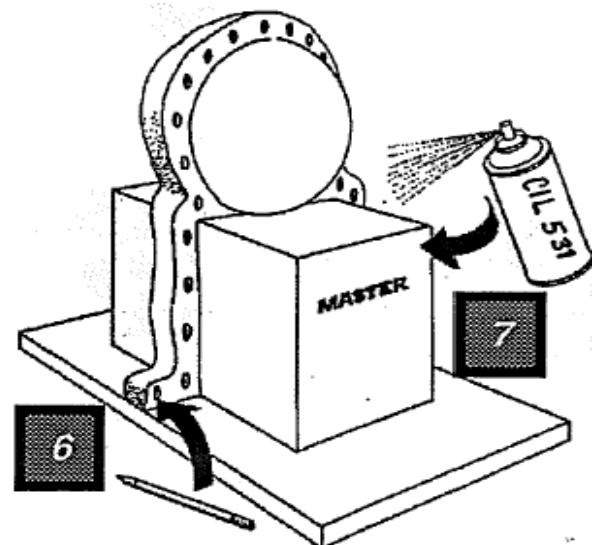




5. Roll out some strips of molding clay, (Playdough, or silly putty will work) about 1" wide and ½" thick. Apply along parting line, adding several layers until 2" in height.

6. Remove the eraser from a pencil and with the metal eraser end, cut out the modeling clay at intervals along the clay border.
7. Apply Synlube 531 release agent to the clay wall and the master model.

The master model and clay border are now ready for POR-A-MOLD®.



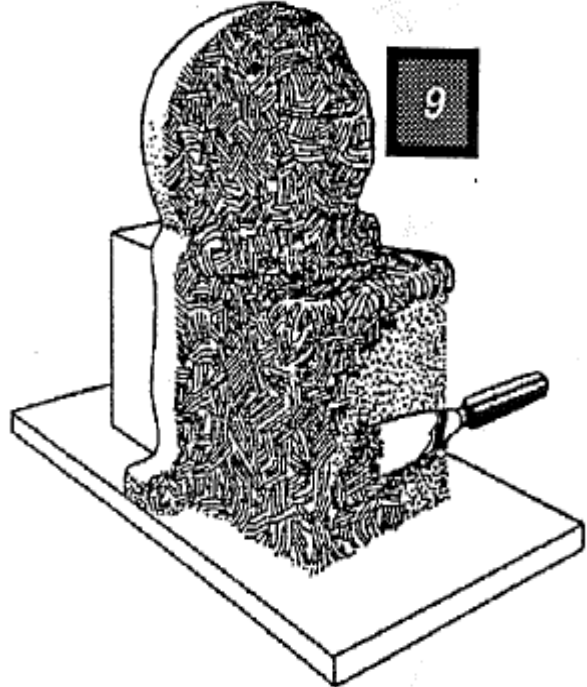
Mix a small amount of THIXOTROPIC to paint the surface of the master. You may thin the THIXOTROPIC material with toluene or xylene (available at most industrial supply stores) until you have a brushing consistency.

8. Paint this blended THIXOTROPIC material over the surface of the master and the clay border. Be sure to paint the inside of all the holes you cut with the metal eraser holder.

Allow this paint coat to set up. Wait until it has started to gel and is still tacky to the touch (approximately 45 to 60 minutes).

9. Mix an adequate amount of THIXOTROPIC material to trowel on the master. With a small trowel or putty knife carefully build up the mold to a thickness of $\frac{1}{4}$ " or greater. Be sure not to leave any thin areas.

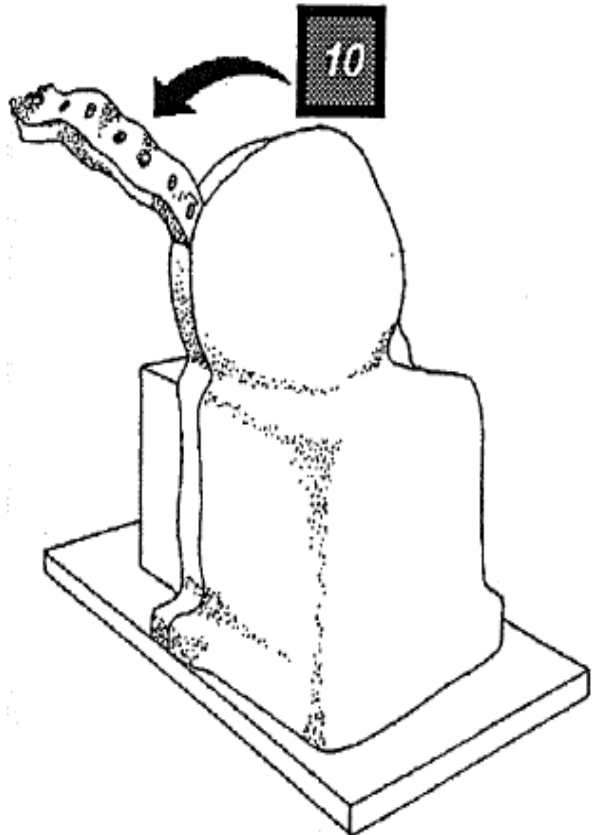
After you have troweled on the desired thickness and the THIXOTROPIC material has started to set or gel, apply a coat of plasticizer. With the plasticizer and your putty knife you can smooth out the exterior rough surfaces of the mold.

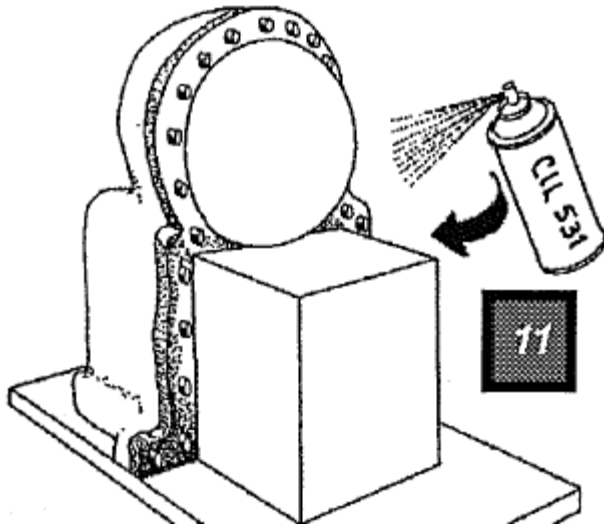


The plasticizer will seal the surface of the mold to avoid picking up moisture and will act as a mold release between the mold and the mother mold.

Let this half of the mold cure overnight. Mix some molding plaster to build a mother mold over the cured POR-A-MOLD®. (You can also make the mother mold with fiberglass.) Build the mother mold up to a thickness of 1-1/2" or 2".

10. After the mother mold has set, peel away the clay border from the first half of the molded rubber. Make certain that no clay remains and the mother mold is dry.

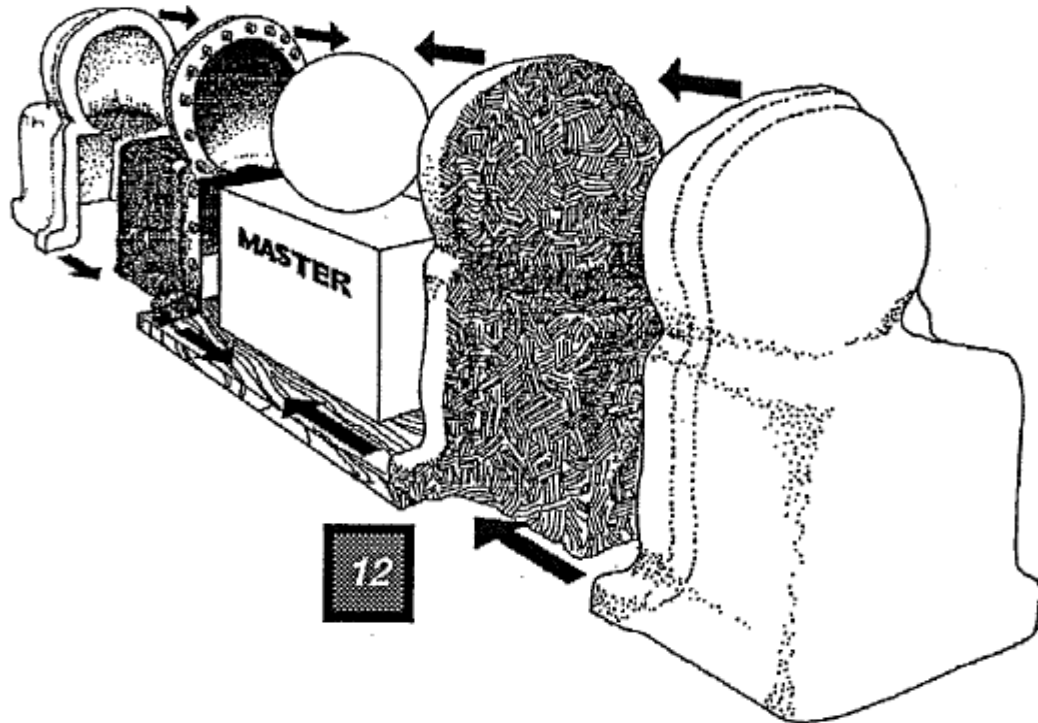




11. Apply PUMA Polymers' release agent to the exposed master model and the border where the clay was removed.

Now repeat steps 8, 9, and 10 to complete the other half of the mold.

Clean and set mother molds aside.



Now peel back, one at a time, each of the two flexible molds. Clean and replace inside each mother mold.

12. Remove the master model from the mounting board. Apply PUMA Polymers' release agent to the inside surfaces of the flexible mold. Reassemble the flexible molds inside of the mother molds and attach to the mounting board with "C" clamps. Invert the mounting board so that the assembled mold is upside down and the pouring hole is now on top.

This THIXOTROPIC mold making examples was for a very basic master model. You can reproduce much more complex models by following the same basic steps.

13. As you pour your casting material through the pouring hole, tilt the mounting board to allow any air trapped inside to escape as the casting material replaces it.

After your casting material has cured, disassemble the mold and remove the reproduction.

Clean and store the flexible mold inside the mother mold in a cool, dry atmosphere.

