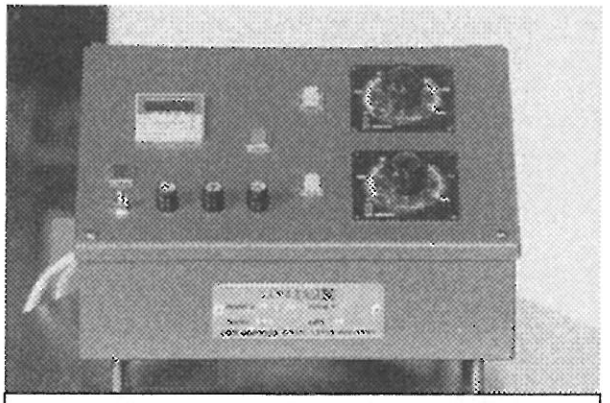
SECTION 7
VULCANIZING PROCEDURE FOR CONQUEST SILICONE MOLDS

Preheating the Vulcanizer

1. Turn on the Vulcanizer by turning on the automatic timer past one hour.

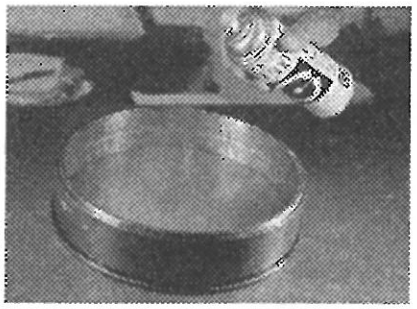
2. Set each temperature controller (top & bottom platen) at 300-325°F.

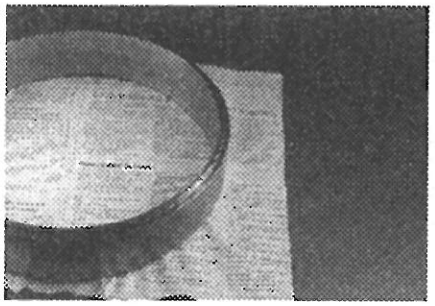
3. When the controller start going on and off independently, the Vulcanizer has reached temperature.

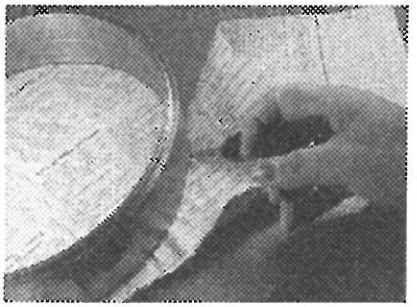


AUTOMATIC TIMER

Preparing The Vulcanizer Frame







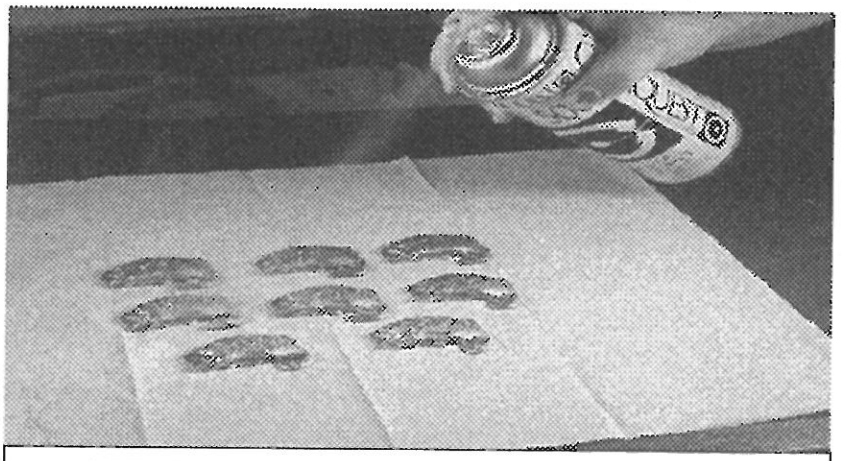
1. Using **CI-500 Mold Release Parting Spray,** spray the inside of the ring and the machined surfaces of the top and bottom plates. Be sure the surfaces are covered completely.

2. Place a sheet of newspaper over the bottom plate, making sure it overlaps the shoulder.

3. Place the ring over the bottom plate making sure to completely push it down evenly. If needed, the Vulcanizer can be used to push the ring over the bottom plate until it touches the shoulder. Cut off excess newspaper.

Do Not Heat Vulcanizer Frame.

Completely Spray Each Model with CI-500 Mold Release



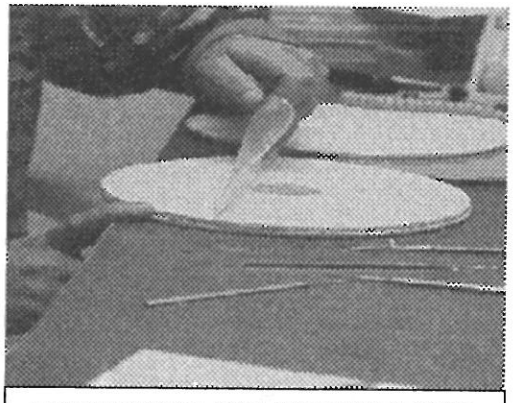
SPRAYING MODELS WITH MOLD RELEASE SPRAY CI-500

Preparing Molds for Vulcanizing
A Typical 1" mold is prepared by using:

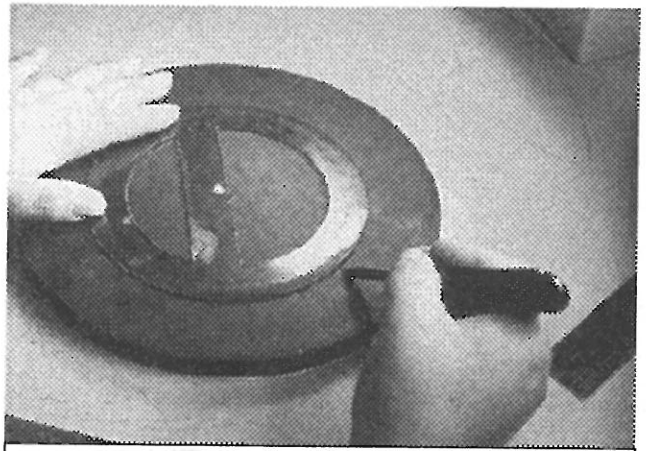
Silicone: Two 1/4" bottom and two 1/4" top discs. The 1/4" discs are placed together after removing their poly or paper protecting coverings.
Do not spray CI-500 Mold Release Parting Spray or put any talc between 1/4" sections if you want them to bond together.

Organic: One 1/2" bottom and one 1/2" top disc.

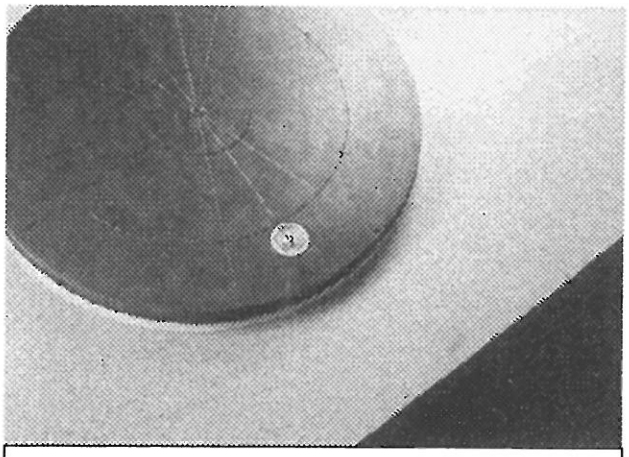
Place the bottom half into the vulcanizing frame. Completely spray the top surface of the mold with the CI-500 Mold Release Spray.



REMOVING POLY COVERING



MEASURING / POSITIONING THE MOLDELS



LAYING OUT THE MODELS

Laying Out the Models

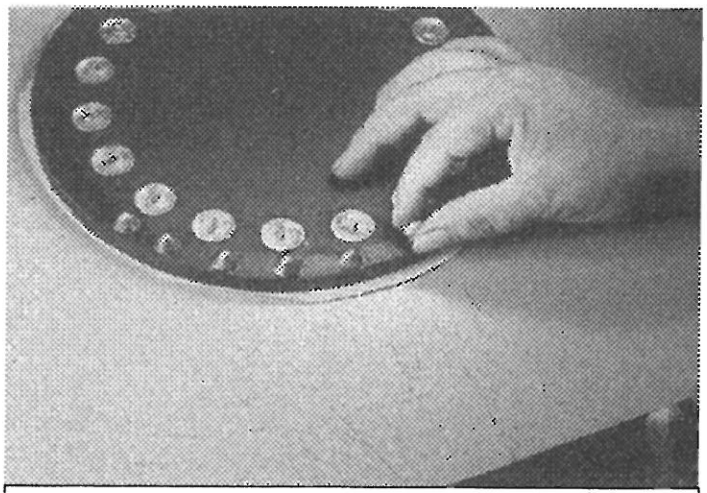
Lay out the models evenly around the mold, no closer than 1/4" to 3/8" from each other. The models should be placed as far from each other as possible, but no closer than 1/2" to 5/8" from the outside edge of the mold. No part of the model should be placed closer than 2 3/4"-3" from the center of the mold.

The models need to be laid out to take best advantage of the centrifugal forces exerted on the metal during casting. As the caster is turning clockwise, the metal or plastic will flow in a counter-clockwise direction.

Zinc does not flow back towards the center very well. Its flow will depend upon the part configuration, speed of the machine and temperature of the metal.

The models should be first examined and laid out with the best gating locations in mind. Avoid laying out the models with extremely heavy sections closer to the outside of the mold. Place heavy sections slightly off to the right or left. This helps avoid excess mold distortions and a tendency for metal flashing. Also, keep in mind that heavy sections are not necessarily the most ideal locations for gating.

Place the Locking or Anti-Shift Settings



PLACING THE MOLD CAP SETTINGS

The Mold Cap Settings are inserted into the bottom half of the mold, by completely pushing the pointed portion into the rubber with your thumb. There is no limit on the amount of mold cap settings that should be inserted into the mold, around and between each model. They should not be placed on locations where gates will be cut after vulcanizing.

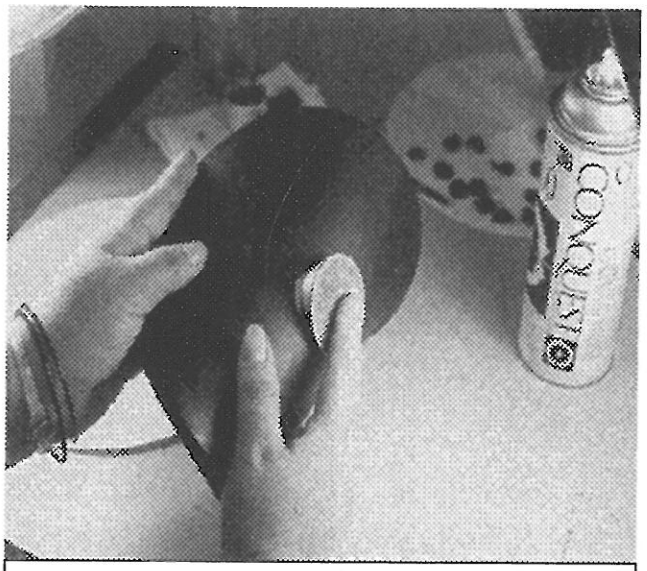
Place the Sprue Former into the Center of the Mold

Place the Top Half of the Compound into the Frame

1. Prepare the top half of the mold the same as the bottom half. Do no spay CI-500 Mold Release Parting Spray, or put any talc between 1/4" sections if you want to bond together.

2. Completely spray the top surface of the mold with the CI-500 Mold Release Spray.

3. Place the sprayed side of the mold half over the models, taking precautions not to disturb them and make sure the Sprue Former is still centered.



PLACING THE SPRUE FORMER

4. Evenly push the silicone mold down by hand.

5. Place a sheet of newspaper over the top of the rubber as described in "Preparing The Vulcanizer Frame" on page 16.

Closing the Vulcanizing Frame

1. Place a sheet of newspaper over the rubber, making sure that it fits inside the ring.

2. Push down the top plate by hand, using body weight.

3. Cut off the overlapping newspaper.

Vulcanizing the Prepared Mold

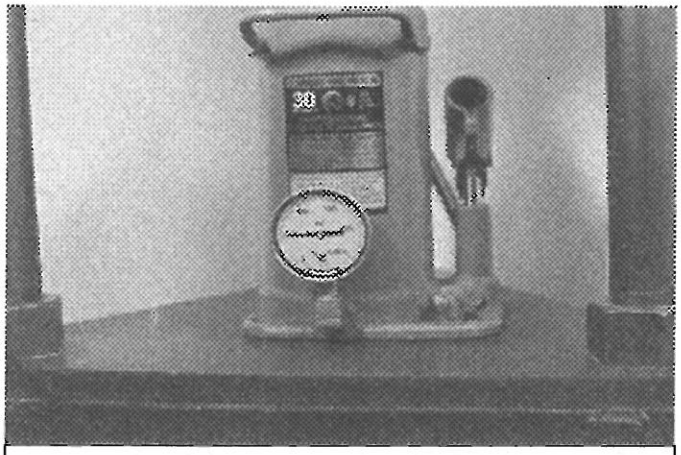
1. Center the vulcanizing frame on the bottom platen. Alignment rings have been machined into bottom platen to assist in proper center.

2. Close the release valve of the hydraulic jack by turning it completely to the right.

3. Apply 2000 PSI to the mold.

4. Release the pressure completely, turning the valve of the hydraulic jack to the left just enough to bring the pressure down to zero and then close (don't let the jack go all the way down).

5. Apply proper pressure according to your mold size again and release the pressure completely.



VULCANIZING PRESSURE GAUGE

6. **Apply vulcanizing pressure to the mold as required:**

9" MOLD	**2,000 – 3,000 PSI**
12" MOLD	**3,000 – 4,000 PSI**
15" MOLD	**4,000 – 5,000 PSI**
18" MOLD	**5,000 – 6,000 PSI**
24" MOLD	**6,000 – 8,000 PSI**

Start the vulcanizing cycle at the pressure on the low side of the range above and allow it to rise to the high side. After the pressure rises, lower it to the middle of the range by slowly releasing the pressure on the jack. NOTE: If required, repeat this step until the vulcanizing cycle is completed.

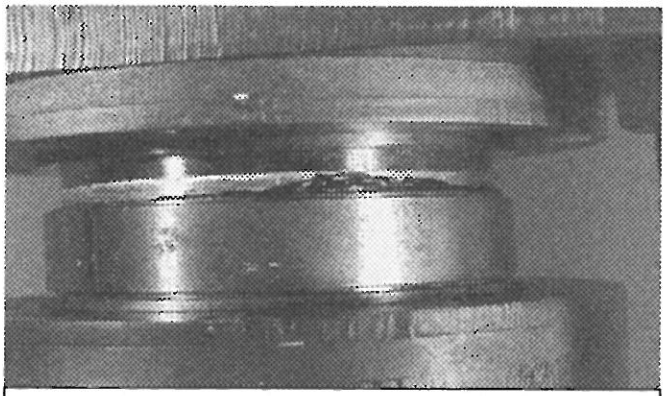
The vulcanizer's timer is set as follows for the different thickness:

1"	**1 1/2 hours**
1 ½"	**2 hours**
2"	**2 1/2 hours**
2 ½"	**3 hours**
3"	**3 1/2 hours**

Conquest Silicone & Organic Rubber, when heated, flows extremely well. If the vulcanizing frame becomes worn or goes out of tolerance and the rubber starts to extrude out between the ring and the top or bottom plate, do the following:

1. Release the jack pressure completely, but keep the top plate of the vulcanizing frame against the top platen. Keep the pressure off for a period of ten minutes.

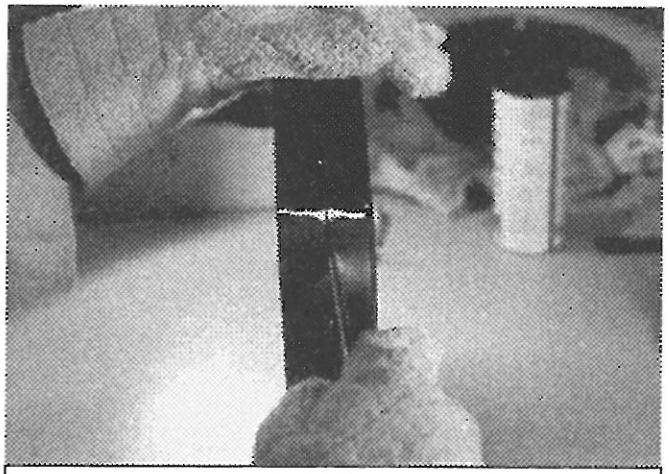
2. After ten minutes, apply the required vulcanizing pressure as described above and continue the vulcanizing cycle.



WORN OR "OUT OF TOLERANCE" VULCANIZING FRAME

Repeat steps 1 and 2 if the extruding continues. It should definitely stop after the second try. If the extruding doesn't stop, it's time to order a new vulcanizing frame.

Opening the Fame and Removing the Vulcanized Mold



SEPARATING THE MOLD

Important – After the timer shuts off, allow the mold to cool down for 5 to 10 minutes, then release the jack pressure completely and remove the vulcanizing frame. Remember to wear heat-resistant gloves.

1. Pry off the top and bottom plates using a large screw.

2. Allow the mold to cool down slightly and it can easily be pushed or pulled through the ring.

Opening the Vulcanized Mold

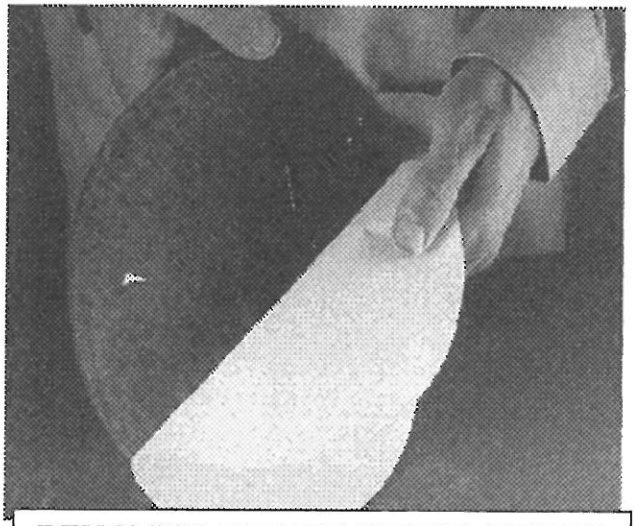
A mold that has been sprayed properly with CI-500 Mold Release Parting Spray will separate easily.

If it does not separate immediately, use a small screwdriver and pry around the parting line until it opens and can be separated by pulling it apart by hand.

The models will drop out or they can be gently removed by hand.

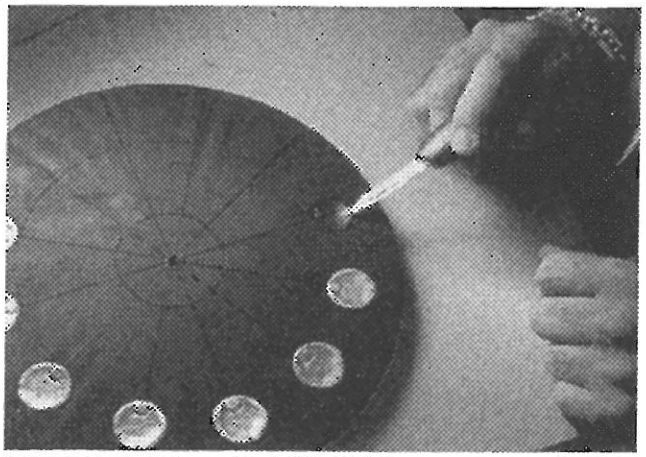
SECTION SEVEN A
VULCANIZING INSTRUCTIONS FOR CONQUEST ORGANIC RUBBER MOLDS

Follow the same procedures as described for vulcanizing Silicone Rubber except for the following:



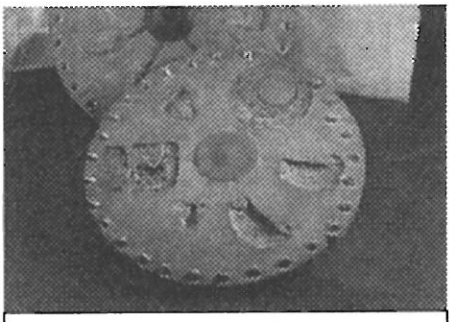
REMOVING THE POLYETHYLENE OR PAPER COVER

- Set the Vulcanizer at 310°F.
- Models can be made from any material capable of withstanding a minimum of 310°F.
- Remove the polyethylene or paper cover of the black organic rubber discs.
- If build-up or special parting line surface is required, cut out the desired amount of rubber layers to the parting line location. Thinner can be squirted in the cut and under each layer for easy removal.
- Use the same vulcanizing pressures for Silicone (page 19, 1-6) except allow the organic rubber to warm up on the Vulcanizer for 5 to 10 minutes under 1000 PSI, then apply the higher vulcanizing pressures.
- The vulcanizing time required for organic rubber is shorter than silicone. One hour per inch at 310°F is all that is required.



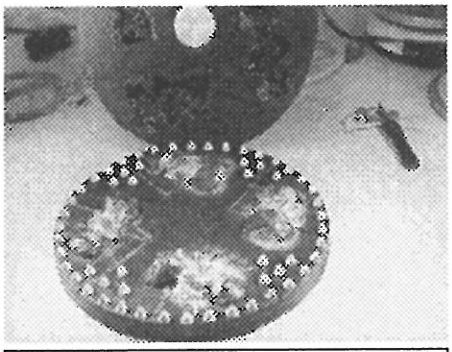
CUTTING OUT THE DESIRED AMOUNT OF RUBBER LAYERS TO THE PARTING LINE LOCATION

SECTION EIGHT
PREPARING VARIOUS TYPES OF RUBBER MOLDS FOR VULCANIZING



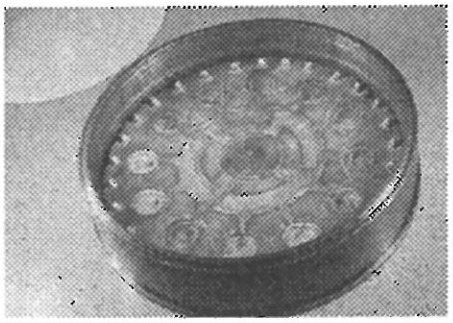
THE MASTER MOLD

A. The Master Mold is usually made form the original master models. The models used in this type of mold can have any combination of uniform or complex parting line shapes. In addition, they also might require pull-out sections or inserts. The procedure in making these types of molds will be described further in this section under D, E, F and G.



PRODUCTION MOLDS

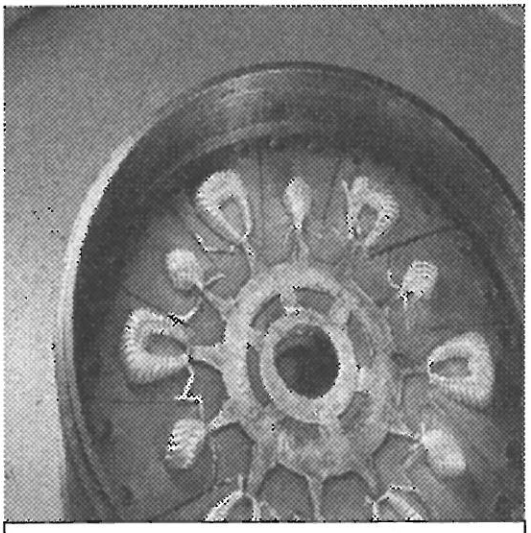
B. Production Molds are made using any type component, i.e., uniform or complex shaped, or pull-out or insert types, but only one type style component should be incorporated in each individual production mold. The most important consideration in preparing production molds is making sure to set up the models in an evenly balanced fashion (Section 7, pg. 17)



MOLD HALF IN PREPARED FRAME

C. Copy Molds (Jig Molds) are duplicates of Production molds and one half, either the top or bottom is made at any one time. The entire mold-gating system, venting, and mold layout is reproduced.

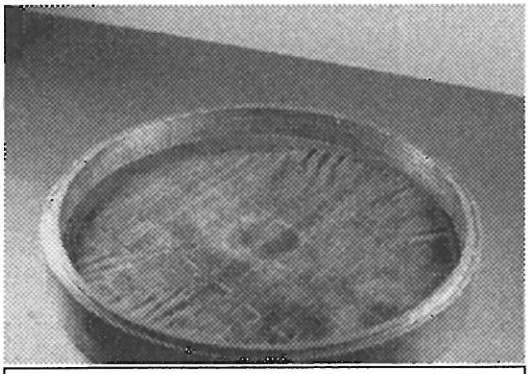
How to Make Copy Molds



CAST GATING SYSTEM

1. The production Mold must be proven out, i.e., gating, venting, etc. The mold should be producing close to 95% good casting. (Gating & Venting will be described in Section 9).

2. The masters used to produce the production mold are placed back into each mold cavity. The models must be placed back into the exact same cavities they formed. It is recommended that you first warm up the mold half. The silicone mold at room temperature is approximately 1 1/2% smaller. Warming the mold will make it somewhat easier to lay the masters in their proper cavities. This can be accomplished by placing the mold half into the prepared vulcanizing frame and placing the frame on the vulcanizer's heated bottom platen.



PRODUCING THE CORRECT MOLD THICKNESS

3. The cast gating system is placed back into the warmed mold.

4. Completely spray the top side of the mold with CI-500 Mold Release Parting Spray.

5. If you are preparing the top half of the copy mold, lay in the mold cap settings.

6. Spray one surface of an unvulcanized rubber disc with CI-500 Mold Release Parting Spray.

7. Place the sprayed side of the rubber disc on top of the prepared mold half. By hand, press it down against the entire surface.

8. Place the required amount of unvulcanized rubber discs on top to produce the correct mold half thickness.

9. Place a sheet of newspaper over the top of unvulcanized mold (Section 7, Page 16).

10. Close the vulcanizing frame (Section 7, page 18).

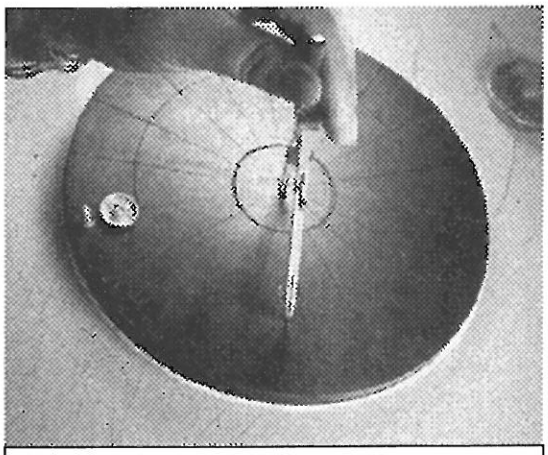
11. Vulcanize the prepared mold (Section 7, pg. 19-20). If you are vulcanizing a 1/2" thick mold-half, the time required is 3/4 of an hour. A 1/4" thick mold-half takes 1/2 an hour.

12. After vulcanizing, prepare the other mold-half by transferring the Masters and Gating Systems to the new mold and repeating steps 2 through 11. In-gate areas and venting might require some clean up work, but the molds produced will be exact copies of the production mold.

D. Preparing Flat Top Molds

1. Measure the thickness of the model and prepare the proper amount of unvulcanized rubber discs to make the bottom mold half. Give yourself at least 1/8" of rubber between the mold bottom and the lowest section of the model.

2. Prepare the vulcanizing frame and models (Section 7, pg. 16-18).



LAYING OUT THE MASTERS

3. Lay the unvulcanized rubber into the vulcanizing frame and spray the top rubber surface with CI-500 Mold Release Parting Spray.

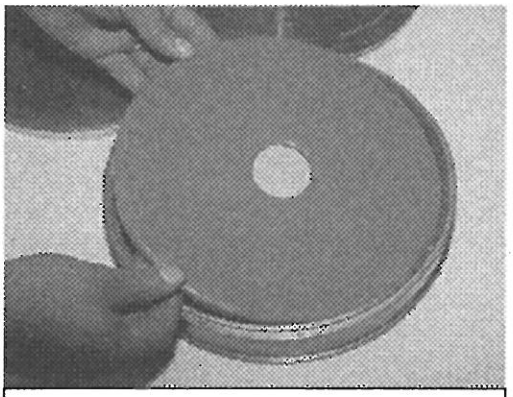
4. Layout the masters in an evenly balanced fashion and place in the mold cap settings (Section 7, pg. 17-18).

5. Spray the proper size 1/2" thick aluminum or steel spacer with the CI-500 Mold Release Parting Spray and place it on top of the models.

6. Close the frame (Section 7, pg. 18).

7. Vulcanize the prepared mold (Section 7, pg. 19-20). If you are vulcanizing a 1/2" thick mold-half, the time required is 3/4 of an hour. A 1/4" thick mold-half takes 1/2 an hour.

Note: If you only have 1 1/2" thick vulcanizing frame with a 1/2" spacer and are preparing a 1/2" thick mold-half, another 1/2" spacer will be required to displace the 1/2" difference.



PLACING RUBBER INTO THE FRAME

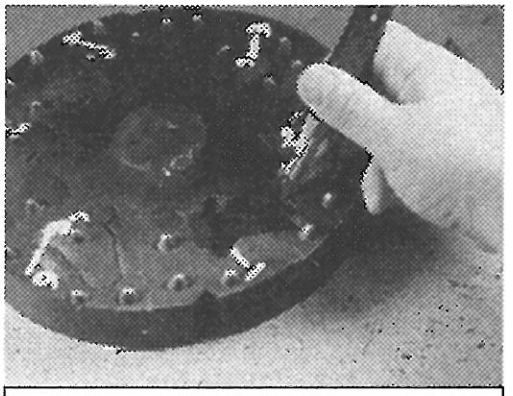
8. After vulcanizing, remove the top cover of the vulcanizing frame and the spacers. Leave the vulcanized mold-half with the models in the vulcanizing frame.

9. Remove the mold cap settings that have filled with rubber and replace these with new ones.

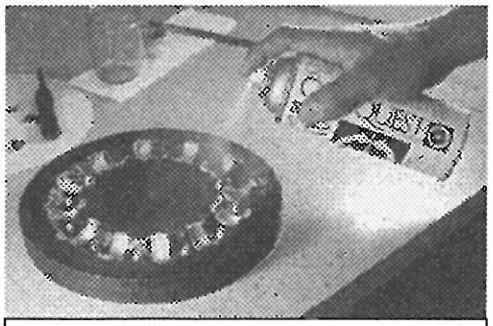
10. Clean off the rubber flash that has flowed over the top of the models; make sure this is done properly or the rubber flash will transfer to the top half of the mold and create imperfections.

11. Prepare a 1/2" thick unvulcanized rubber mold top and completely spray the surfaces.

12. Completely spray the top surface of the unvulcanized mold.



CLEANING THE RUBBER FLASHING



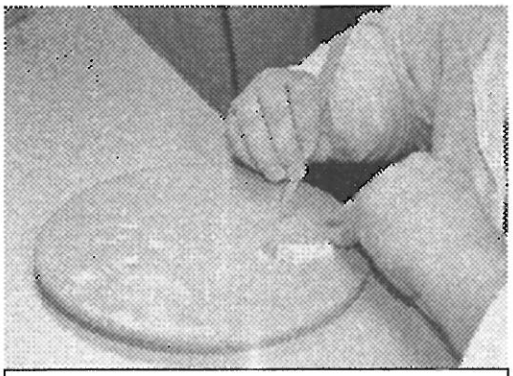
SPRAY THE CUT-OUT RUBBER MOLD

13. Place the sprayed surface of the unvulcanized silicone on top of the vulcanized half.

14. Completely spray the cut-out rubber center sections from the rubber mold tops and place them in the Sprue cut-out area. After vulcanizing, these can easily be removed and will provide the open center down Sprue section of the mold.

15. Place a sheet of newspaper over the surface of the mold as described in Section 7.

16. Close the Vulcanizing frame and vulcanize for 45 minutes.

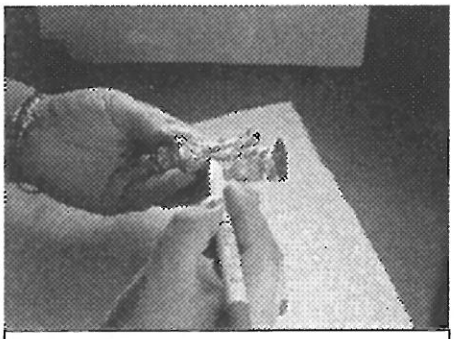


LAYING OUT THE MODELS IN AN EVENLY BALANCED FASHION

E. Build Up Mold are probable the most difficult to prepare. We will attempt to describe the best techniques to follow, but experience and some mistakes will be your best teacher.

1. Again, it is important to lay out the models or masters in an evenly balanced fashion (Section 7, pg. 17-18).

2. We have found its best to set up the mold with the model's deepest section or the area where the old mold build-up is required on the bottom half.



DRAWING THE PARTING LINE LOCATION

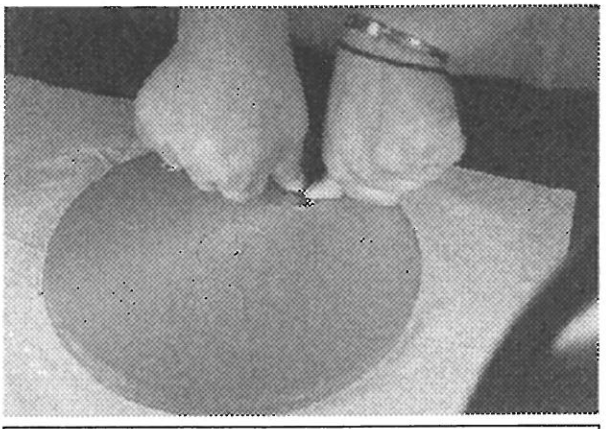
3. Measure the overall height of the models. This will determine the total thickness of the mold required and where the parting line should fall out.

4. Take a felt tip pen and draw the parting line location on the models. Eliminate as many undercuts as possible.

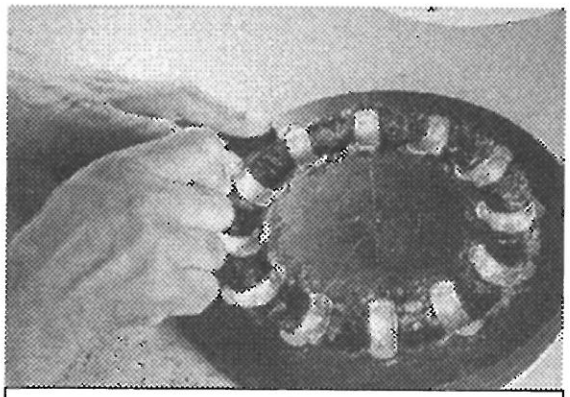
The rubber because of it's excellent elongation and tear strength properties, is quite forgiving and even if, due to mistakes or miscalculations, the parting line falls out in an undercut area, it will allow you to draw out castings. Heavy undercut areas should be avoided wherever possible to provide longer mold casting life and eliminate further production problems in removing castings.

5. Prepare the vulcanizing frame and models as described in Section 7, pg. 16-18.

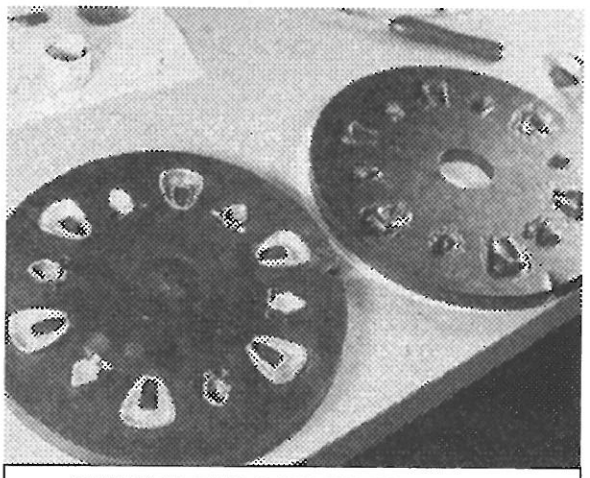
6. Lay in the required amount of unvulcanized rubber into the vulcanizing frame. Do Not spray the top surface with Parting Spray. <u>Only after the complete mold is properly prepared can it be sprayed.</u>



PRESSING THE MODELS INTO THE RUBBER



CUTTING OUT RUBBER FOR DEEPER SECTION MODELS



RUBBER BUILD-UP MODELS WITH HEAVY UNDERCUT SECTIONS

7. Because the silicone rubber is soft and pliable in the unvulcanized state, you can press the models into the rubber. In most cases, you will probably be able to press the models down to the desired parting line location. Organic Rubber should be warmed-up first until it becomes soft and more pliable. More pressure will be required to press the models down as compared to the silicone. Remember that both unvulcanized silicone and the organic rubber have memories, therefore one must over-compensate and push the model slightly deeper into the rubber compound. On models with uneven and deeper sections, you will have to either cut away or scoop out the rubber first. Only remove that amount of rubber that will allow you to reach the parting line locations. The rubber removed should be kept clean and put on the side. It will be used later on, in preparing the remainder of the mold. Always smooth out the cut-away cavity areas with a clean smooth instrument.

8. On models which have heavy undercut sections that stick up higher than the mold surface after the model has been pushed into the rubber, you must build up rubber in that area. Place clean, unvulcanized rubber under or adjacent to these higher sections, until you reach the parting line location.

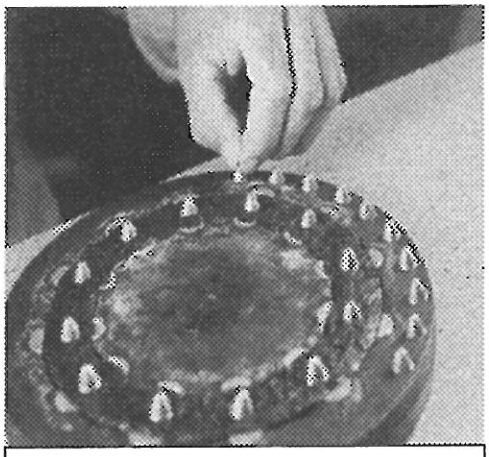
Note: You must use clean rubber for build up, it is recommended that you first clean off the mold surface with acetone or any other quick drying commercial solvent to provide for a good rubber bond. If the mold surface or the built up rubber has dirt on it, talcing up the area will act as a separator, and not become a permanent part of the mold after vulcanizing. Smooth off the build-up area with at clean smooth instrument.

9. After you have cut away and built-up the rubber where required, remove the models carefully and then completely spray all the cavities, built-up areas and the entire mold surface with CI-500 Mold Release Paring Spray.

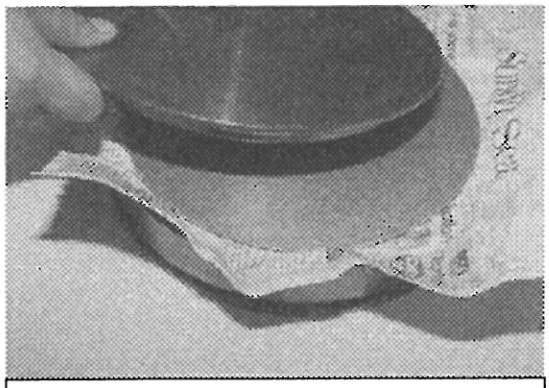
10. Spray the models again with the CI-500 Mold Release Paring Spray and carefully place them back into the prepared cavities.

11. Place in the mold cap settings as described in Section 7, pg. 18.

12. In those locations that have been cut away for the deep model sections, stuff in the clean unvulcanized rubber that was previously removed from these areas. It is important that you use the same amount of rubber that was removed and no more. After stuffing, cut off any excess rubber that might be sticking above the mold surface. Dip a cloth-covered finger in acetone and completely clean the top surface of the stuffed rubber with the solvent. This assures that the rubber will properly bond to the top mold half.



PLACING THE MOLD CAP SETTINGS



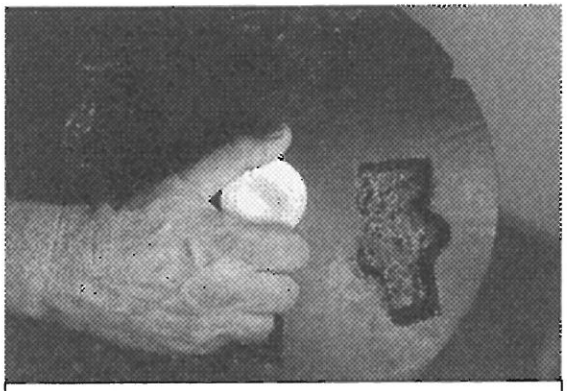
CLOSING THE FRAME

13. Place the proper size rubber disc over the prepared models and mold. DO NOT spray any surface of this disc with Parting Spray. Enough Parting Spray is on the bottom half of the mold to provide separation. If Parting is sprayed by mistake, the stuffed sections of the mold will not bond to the top of the mold. For organic rubber, clean factory talc or remove one layer to allow bonding.

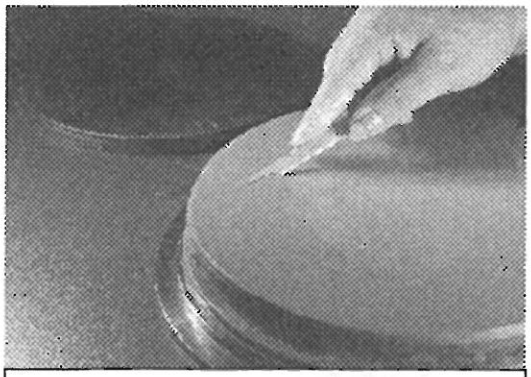
14. Place in the proper size Sprue Former.

15. By hand, press down the silicone disc against the entire surface of the mold. Those sections that are much heavier or higher on models and built up areas will bulge. These areas must be cut out from the rubber disc. This is done quite easily. Closely follow the contour and thickness of the bulge with a knife and remove the cut away rubber strips from the disc.

16. Repeat step 15 until the last rubber disc is laying practically level on the top of the mold.



PLACING THE SPRUE FORMER



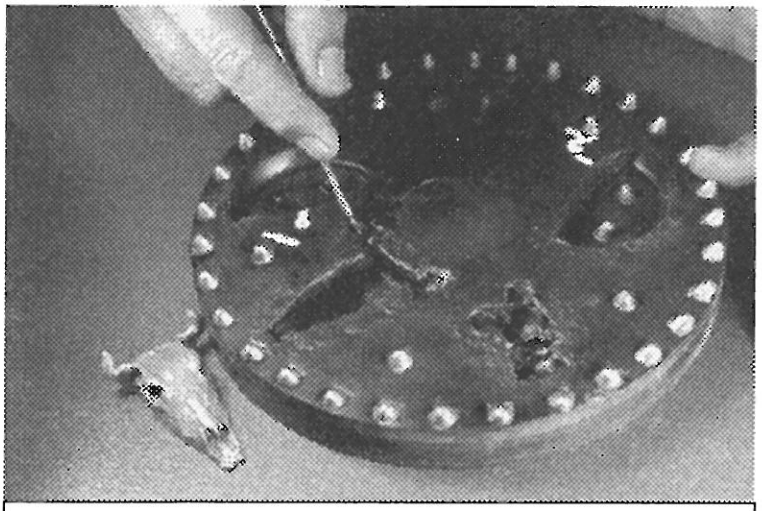
CUTTING HEAVIER SECTIONS

17. Place a sheet of newspaper over the top surface as described in Section 7.

18. Close the vulcanizing frame (Section 8, pg. 18).

19. Vulcanize the mold (Section 8, pg. 19).

20. If it's imperative that the paring line is produced exactly right (which is common on some irregular shaped components), or if you have encapsulated any porting of the model, not all is lost.

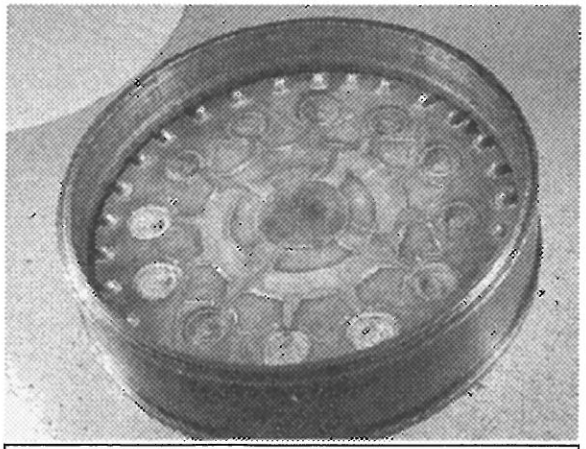


SLITTING THE RUBBER WITH A BP-25 KNIFE

a. If a small section of the model is encapsulated by the rubber, you will still be able to remove the model and the castings. Initially you must carefully slit the rubber directly above the encapsulated area with a BP-25 knife blade and then flex the mold half. The model can be removed and the castings will be closed over itself, but you must take care not to tear it further when removing the castings.

b. On a production basis, if the encapsulated section does not lend itself to be removed as described above, or an exact parting line is critical, follow the next step.

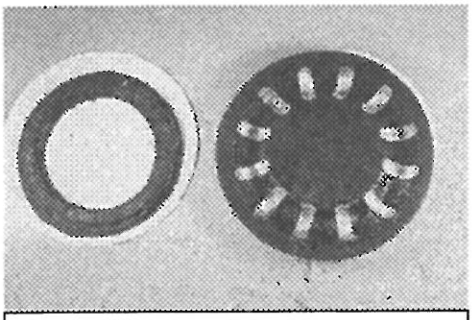
c. Silicone rubber, after vulcanizing, is easy to cut, while organic rubber will be easier to cut only after being warmed up. Using the BP-25 knife blade, evenly cut or shave away the rubber to the entire cavity. It will be helpful to place back the model every once in a while for guidance.



MOLDS SHRINK 2 ½"% AT ROOM TEMPERATURE

d. After the cavities have all been cleaned up, place the models back into their proper cavities. It might be necessary to warm up the mold first, since it has shrunk from being exposed to room temperature.

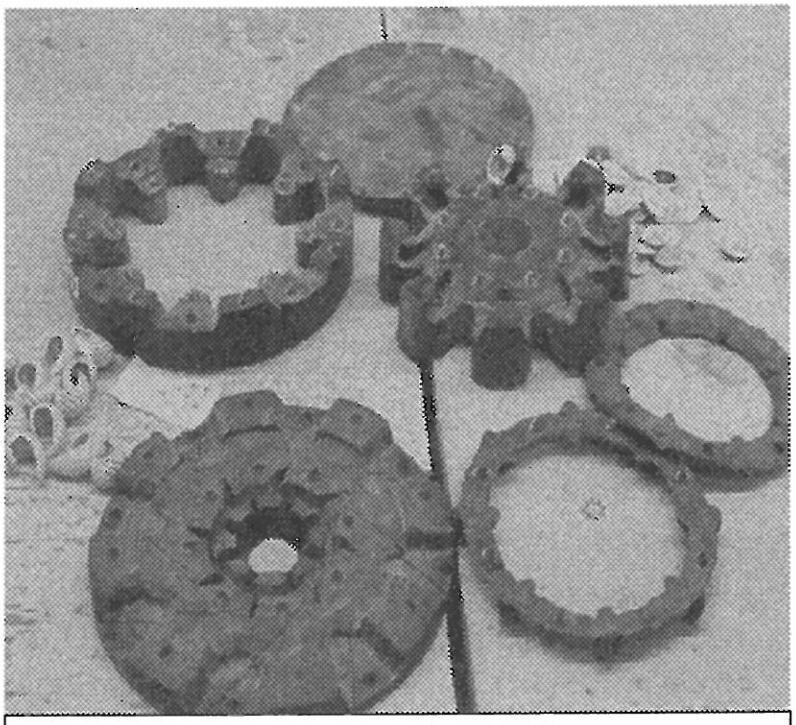
e. Follow the instructions as described for producing a Copy Mold (page 22-23).



INSERT MOLDS

F. Insert Molds can be made in any of the aforementioned mold configurations. Inserts can be incorporated into all the various types of molds. The only consideration required is that the masters of sub-masters must already contain the insert shape or configuration to be produced in the mold cavities.

G. Multi-Section Molds (3-part or more) can be extremely useful and not very difficult to manufacture. Any type of mold can be made as a multi-section type. Most incorporate a third vulcanized pull-out rubber section, usually made up of the entire outside diameter of the mold, which can be pulled out after the mold is opened. A combination three and four section mold can also be made to handle components having heavy undercuts or side cores on two sides of the model. Follow all the model making and vulcanizing procedures described in this section.



MULTI-SECTION MOLDS

1. The special molded-in section is first removed from the unvulcanized rubber mold. This is done by evenly cutting the required size and thickness from the rubber mold layers.

2. Locating or indexing the molded section is usually arranged by special thick "V" or square shape cuts in the main mold, which is transferred to the molded or pull-out section, after vulcanizing.

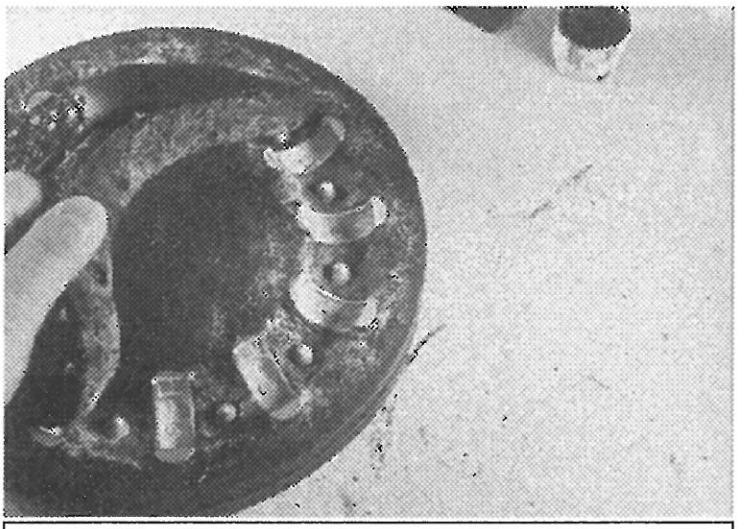
3. The entire cut-out section is completely sprayed with CI-500 Mold Release Parting Spray on all sides and top and bottom.

4. After the models have been properly place in the mold , the entire top and cut-away surfaces of the mold are completely sprayed with the CI-500 Mold Release Paring Spray.

5. The pull-out rubber section is carefully put back in the mold.

6. The mold is prepared for vulcanizing and the pull-out section is vulcanized with the mold.

7. After vulcanizing, the mold will have a completely removable, which contains the side cores for the heavy undercut configurations of the component.



MULTI-SECTION MOLD AFTER VULCANIZING

H. **Matchplate Molds** probably the easiest to make. In the majority of the cases, parts made from matchplates have somewhat symmetrical parting line, are smaller in size, and have less complexity.

1. Before having a matchplate designed and built (Conquest can assist you in finding a qualified source), it is first suggested that you make a regular mold using loose models to work out the mold's gating and proper layout system. Once you have accomplished the best layout and gating system, provide the mold and models to the matchplate maker.

2. When the matchplate is prepared, it will usually have half of the detail of the model on the top side and the other half of the detail on the bottom.

3. Simply take the required amount of CI-500 Mold Release sprayed rubber and place it on the top and underneath the matchplate.

4. Follow the vulcanizing procedure as described in Section 7.

A WORD ABOUT MODELS

Remember that a copy will never be better than you model; therefore, use one with good detail. If possible, use a model 3% or 4% larger than the final size desired.

Try to gold or rhodium-plate your models. This will give you a better finish on your castings and preserve your models for future molds. Models must be clean and free of oil, grease or lacquer coatings, as these would inhibit the curing process.

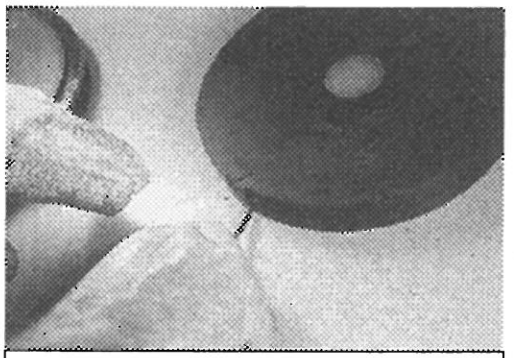
Do not use silver or copper because they will stick to organic rubber. The models can be made of any material that will withstand 325°F (Organic rubber) OR 375°F (Silicone) and several thousand pounds of hydrostatic pressure without distorting, melting, breaking, or deteriorating.

Note: Instructions in this manual are to help orient you to the process of Spin-Casting. Keep in mind that every model is different; therefore, use your discretion in the application of these instructions.

SECTION NINE
GATING & VENTING

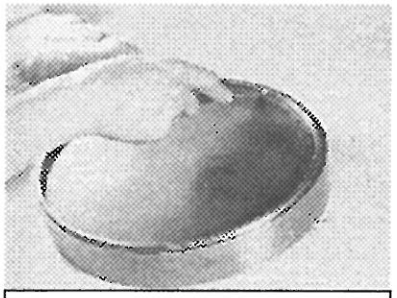
There is no exact science when it comes to gating and venting. It is more of a learned art. The mold-maker will often develop his own techniques after he has a better understanding of metal flow.

The basic guidelines are as follows:



CUTTING BOTH HALVES OF THE MOLD

1. Lay the two halves of the mold together and place them flat on the work table. Using the BP-25 knife blade, make a large "V" cut in the mold, going straight through both halves. Before you make this cut, examine the location so as not to cut into any cavity of the mold cap settings.

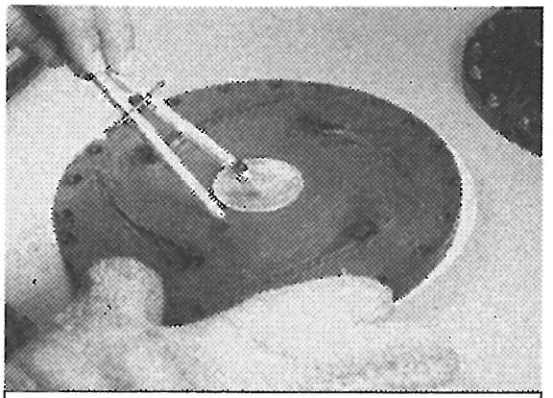


CUTTING OFF EXCESS RUBBER FLASH

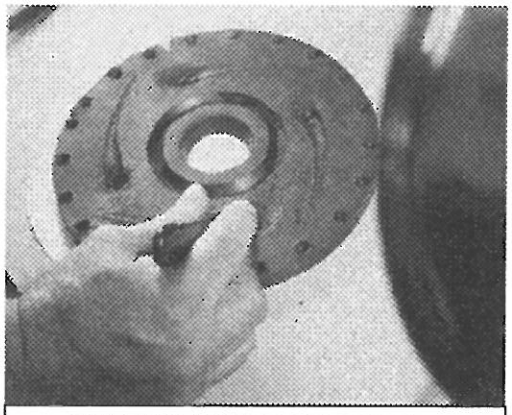
2. Cut off any excess newspaper or rubber flash on the outside diameter of the mold's top and bottom surface.

3. Use a compass and scribe in a circle in the bottom mold-half. The circle should come within 1/2" of the models and be drawn form the center of the mold.

4. When cutting silicone, use the X-Acto knife #5 and the large round router blade. Organic rubber is cut while warm with a BP #25 knife blade. Cut out a ring by following the scribed line. The cut ring should be approximately 1/4" wide by 1/4" deep. This will be part of the main gate running system.



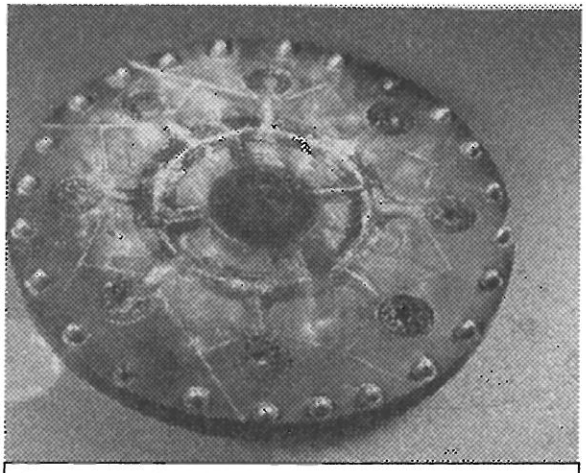
SCRIBING A CIRCLE IN THE BOTTOM RUBBER MOLD



CUTTING EQUALLY SPACED RUNNERS

5. Depending upon how many cavities have to be filled, (the larger the number of parts, the more required), cut from 4 to 6 equally spaced runners (like spokes of a wheel) connecting the center down sprue area with the cut ring. The runners should also be approximately 1/4" wide and 1/4" deep. It's best to first draw these runners with a ball point pen and then make your cuts starting from the ring and into the down sprue area. If you have to fill many little cavities, runners might be required.

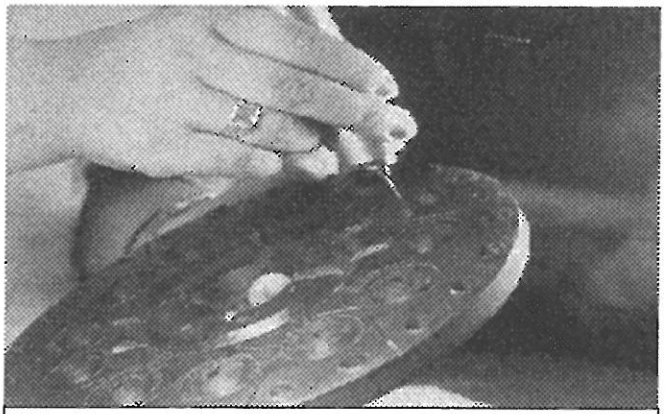
6. Repeat steps 4 and 5 on the top half of the mold. It is easy to transfer the location of the gating system. Simply powder the bottom half, place it over the top, turn the mold over and hit it with your hand. This technique transfers the powder from the top half of the mold and you will now have an outline of the system. Since the powder can easily be brushed off, it is helpful to follow the outline with a ball point pen before cutting.



TRANSFERRING THE GATING LOCATION WITH POWDER

Helpful Hints:

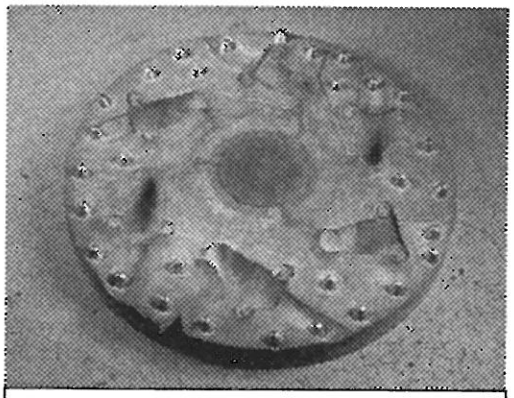
- All the cavities have been laid out with the direction of rotation in mind, i.e., if they have been slightly turned to the left, the mold should be rotated in a clockwise direction and vice-versa. The in-gates are the gates, which go into the cavity directly from the main gating system and should also be cut in the same direction of the cavities.



USING A BALL-POINT PEN TO MARK THE LOCATION

- Use as few in-gates as possible to fill the cavity.

- The cavities in most cases should have been laid out in the long direction. Parts laid out in the wider direction require more gates and are more difficult to fill and vent and require more clean up.



CAVITIES ARE LAID OUT IN THE LONG DIRECTION

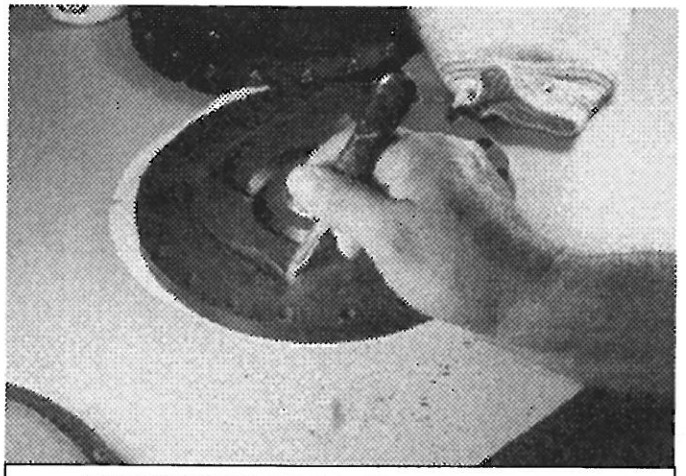
- On round type cavities, place the in-gate slightly off to the right of center on clockwise spins. On counter-clockwise spins, the in-gate is slightly off to the left. Use several vents at the center of the component.

- On the rectangular or square type component cavities, at least one in-gate should be located as close to its lowest corner.

- Most in-gates should be from 1/8" to 1/4" wide, 1/3" to 1/16" deep as it enters the cavity, and minimum 1/8" deep in all other areas.

- You must vent both sides of each in-gate location with a 45 degree air vent running away from each side of the in-gate.

- When you're unsure of how to gate, it's best to gate and vent just one cavity at a time. Cast the mold until you find the most ideal in-gate set-up. Once it works satisfactorily, gate and vent the rest of the components in the same way.



YOU MUST VENT BOTH SIDES OF EACH IN-GATE

Cutting the In-Gates

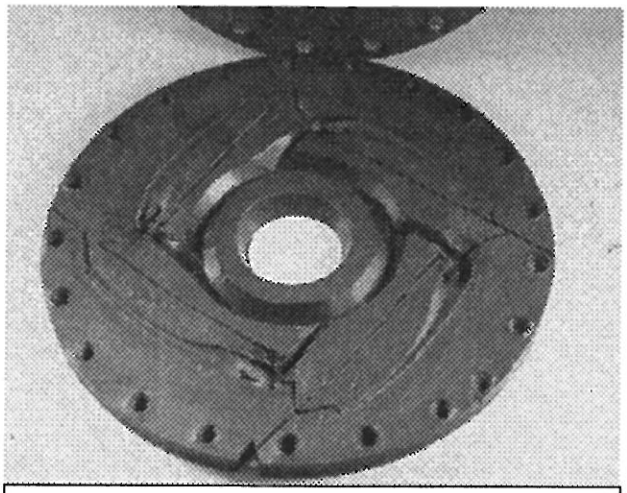
1. Follow your draw in-gates with a vertical cut using the BP #25 knife blade. Your first cuts are from the cavity and toward the gating system about 1/4" long from 1/8" to 1/4" wide, start with a shallow cut in the cavity and end approximately 1/8" deep.

2. From the inside of the cavity below the parting line, cut the horizontal width of the in-gate about 1/4" long from 1/8" to 1/4" wide, start with a shallow cut in the cavity and end off approximately 1/32" deep. Push the blade in approximately 3/16".

3. Approximately 3/16" from the cavity, make a vertical 1/8" to 1/4" deep slit between the cuts made in Step-1 above.

4. You should now be able to remove this wedge shape portion of the in-gate with your finger of tweezers, pulling it up from the cavity.

- When cutting silicone, use the X-Acto #5 knife with the small "V" shape router. With organic rubber, use the BP #25 knife blade to make a cut into the in-gate portion of the gating system. Start your cut at the deepest part of the in-gate. DO NOT GO TO THE CAVITY. End off at approximately the same depth of the ring. This makes the complete connection between the cavity and the gating system.

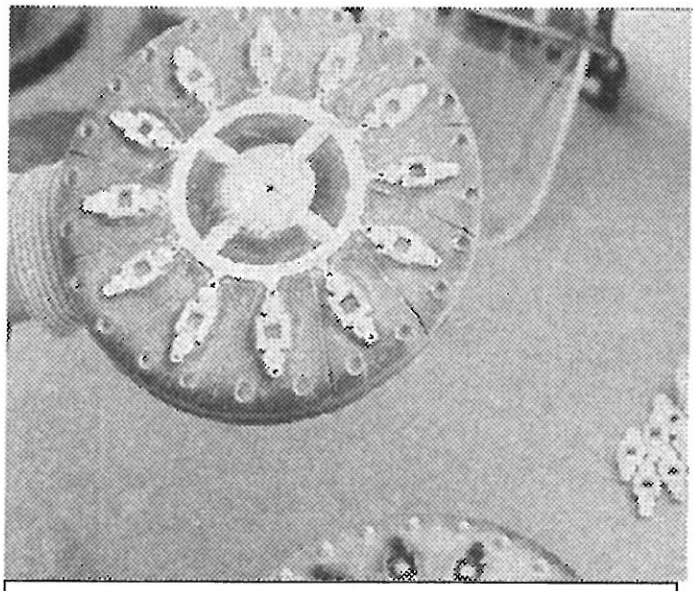


MOLD WITH IN-GATES REMOVED

Note: Centrifugal force pushes the metal or plastic into the cavity under pressure. Only a shallow in-gate cut is required in the cavity for this reason. At the same time, this shallow in-gate connection provides for very simple casting break off with little or no finishing required.

- In an attempt to avoid metal turbulence and provide for better metal flow in areas where the runners go into the main gating system and from the main gating system into the in-gates, slice off all the angle corners made by the cuts with a BP #25 knife blade. Metal does not like to make right angle turns.

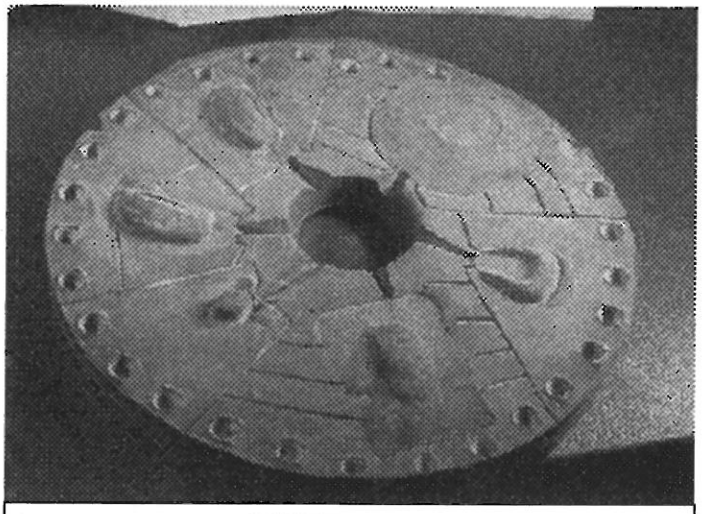
- Depending on the cavity size and configuration, it might be helpful to also cut in the complete gating system on the top half of the mold, especially on larger castings and when casting zinc. As described on page 32, step 6., transfer the system to the top of the mold.
- If you make mistakes or decide no to use an in-gate location, unvulcanized silicone can be stuffed into the gate to stop metal flow. Make sure the gate is first cleaned of talc before stuffing the rubber, and only stuff in approximately the same amount of rubber that was cut out. If this is done properly, the stuffed rubber will become part of the mold.



COMPLETE IN-GATING SYSTEM

Venting

One must remember that as the metal or plastic flows into the mold gating and cavity system, it has to first push out all the air form the gates and cavities. Since rubber is impermeable, venting is extremely important and must be done properly to obtain casting that are void and porosity free and have sharp details plus good dimensional control. Also, there is NO LIMIT on the amount of vents that can be cut into one cavity, and proper venting is definitely a prerequisite for obtaining good castings.



VENTED MOLD

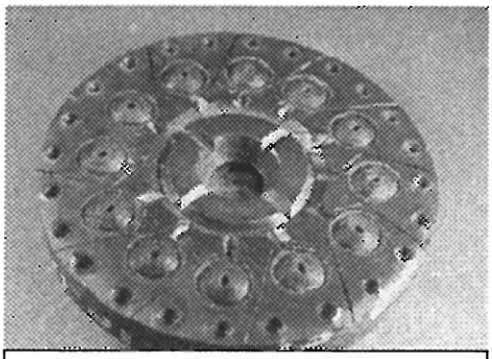
Cavities will require a variety of different types of vents.

Gate Vents
Center Vents
Cavity Vents (drilled)
Reservoir Vents
Exit Vents
Combination Vents

All vents except the Drilled Cavity Vent, will be cut with a BP #25 knife blade. All vents except the Reservoir Vents are in the form of extremely fine "V" cut grooves approximately 1/32" wide. All vents must have a complete path to the outside perimeter of the mold in order to completely bleed out the air from the cavity.

Gate, Center, Reservoir, and Combination vents are all cut from the cavity opposite the direction of metal flow. In all cases, these vents are short cuts made back towards the center of the mold, then into the main connecting vent, exiting to the outside perimeter.

Note: You will be able to identify cavity sections that require venting by **Voided Areas, Shiny Condition** on castings, and **Porosity**. If the vents are cut or drilled properly, they can be broken off and will easily tumble out, with little or no marks showing.



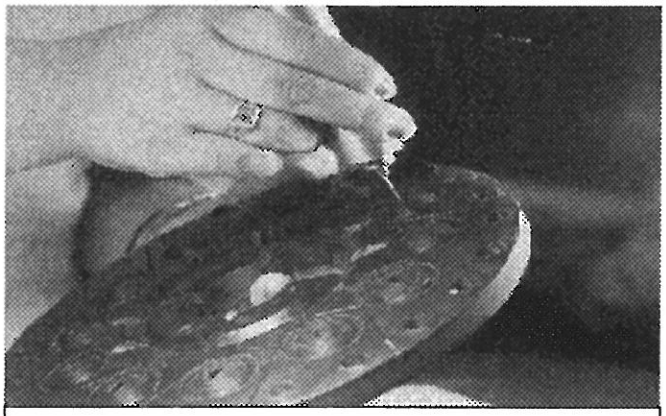
GATE VENTS

Gate Vents

All in-gate locations must have 45 degree vent on either side of the gate leading to the main vents. This helps fill the cavity and eliminate, to a large extent, porosity and metal shrinkage in the gate formed locations.

Center Vents

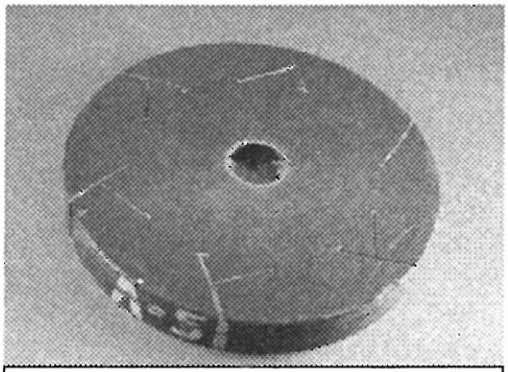
If you draw an imaginary line from the center of the mold cavity, that location will often have trapped air, especially in round cavity configurations. This is usually the section of the cavity, which is also closest to the center of the mold. Several vents, which lead, back towards the center and then into the main connection vent will often clear up this connection.



CAVITY VENTS

Cavity Vents are very small drilled holes, usually made with a 1/32" twist drill and a very high speed flexible shaft drill. These vents are usually required in deep sections of the cavities where air gets trapped and is sometimes adjacent to In-gates.

- It is best to drill these holes straight up and down when the mold is cold or at room temperature. This assures that the vent holes stay open.
- A **Bleed Vent Line** must be cut from the drilled hole on top or bottom of the mold to the outside perimeter.
- Use shop air pressure and clean out any rubber pieces in the cavity and the holes.
- From time to time check to see that the holes stay open and push out any metal cores that might break off in the holes.

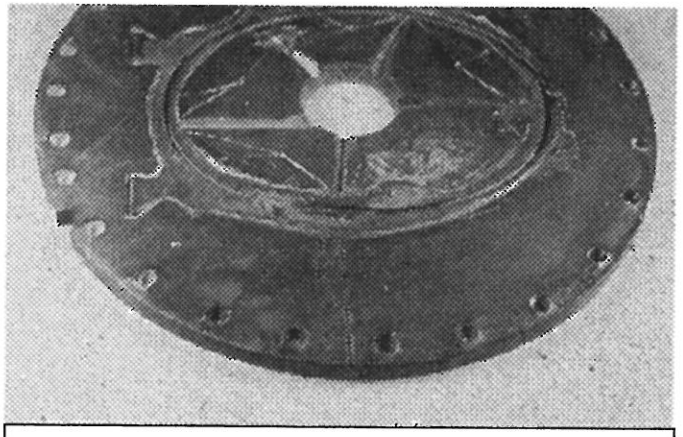


BLEED VENT LINE

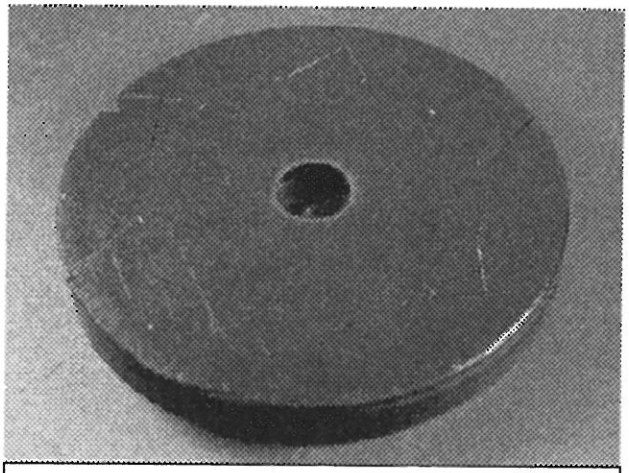
- You will find that Cavity Vents in deep sections are usually required directly opposite the gates in the direction of metal flow.

Reservoir Vents are sometimes required in locations where standard vents are not effective enough to eliminate trapped air. Reservoir Vents are cut just like In-gates (page 32), but they should be as wide as the voided area. A regular vent should be cut connection the Reservoir Vent with the Main Vent providing a complete exit path for trapped air.

Exit Vents are used in every cavity. They are regular cut vents, which are usually made, directly opposite the in-gate area at the point in the cavity closest to the outside of the mold. It is a "Z" shaped vent starting toward the outside of the mold 1/4" long then 1/4" back toward the center of a 45 degree angle and then straight back to the outside of the mold.



EXIT VENTS



COMBINATION VENTS

Combination Vents are made when due to the cavity set-up or gating arrangement, it is impossible to connect a vent with the Main Vent which goes to the outside of the mold. In this case 1/16" or 3/32" drill holes are handled like the Cavity Vents (see page 34) and are used to connect any of the outer type of vents – Gate, Center, Reservoir, and Center.