

SPIN-CASTING MANUAL

Introduction to Spin-Casting

While the art of spin Casting is not new, Conquest Industries' Spin-Casting technology has soared this art to new height. We offer state-of-the-art equipment that is easy to use and maintain, new rubber and silicone compounds, alloys that are specific to the industry, all the supplies, the best service in the industry.

This comprehensive manual will help you though every phase of the Spin-Casting process. Though not a substitute for hands-on training, this manual will answer many questions and can serve as a memory refresher during actual production.

Conquest Industries welcomes you to the Spin-Casting Industry.

Thank you for making us your choice.



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SPIN CASTING

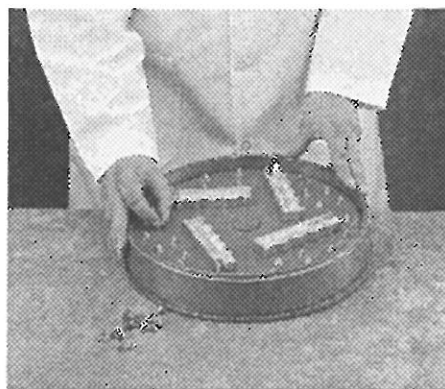
STEP BY STEP

STEP ONE

The mold for the production run is created by spacing the prototype in high heat resistant rubber silicone. A rubber silicone mold is placed into the frame and then the prototype part is strategically placed into the mold for even distributions and efficiency.

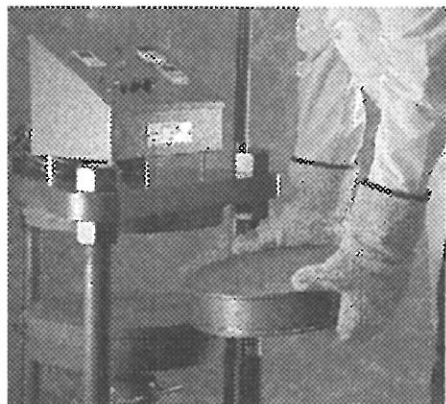
STEP TWO

Alignment accuracy is ensured by the placement of special pins around the rim of the compound before securing each half of the mold in the frame. The purpose of these pins is to maintain alignment of the mold. Mold release is sprayed onto the rubber silicone for easy separation of the mold after pressure has been applied from the Vulcanizer. (see step #3)



STEP THREE

The framed mold is placed between precision ground heat plates, which evenly distributes heat while manual jacks are set to produce the necessary pressure. After approximately one hour the Vulcanizing process is complete. The mold is then removed from the Vulcanizer using heat resistant gloves and allowed to cool.



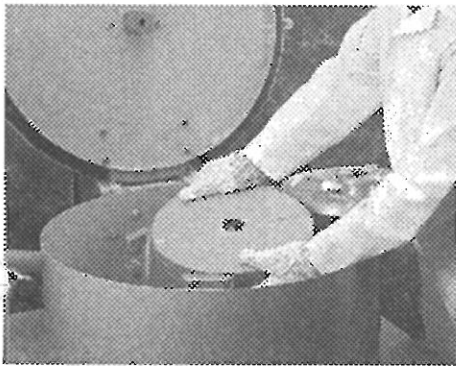
STEP FOUR

Gates are then carefully grooved into the mold to assure that maximum flow of molted material will reach every cavity within the prototype impression. This step is necessary for proper distribution of metal throughout the prototype, eliminating pockets of air.



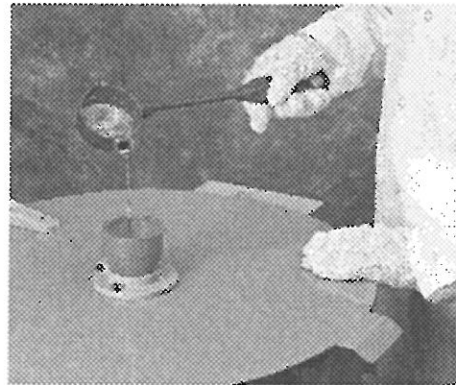
STEP FIVE

The mold is then secured in the Spin caster, which can accommodate any mold thickness up to four inches without the need for spacers. The Spin caster can also accommodate mold and frame diameters of 9", 12", 15", and 18".



STEP SIX

The molted material is poured into the Spin caster funnel. The centrifugal force sends the molted alloy into even the most intricate mold patterns. This ensures great detail within the prototype mold and will eliminate unnecessary finishing for most parts.



STEP SEVEN

In only seconds, the production parts are set and readied for easy removal. The special pins allow for the efficient assembly and realignment of the mold for future use. **THIS PROCESS TAKES TWO HOURS – FROM START TO FINISH!**

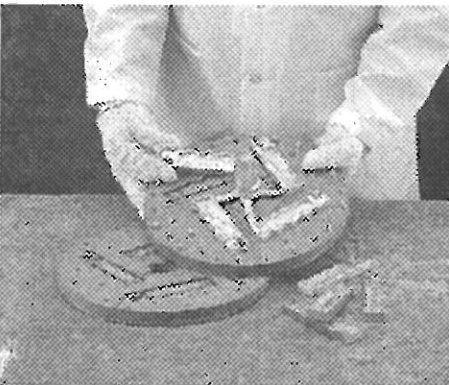


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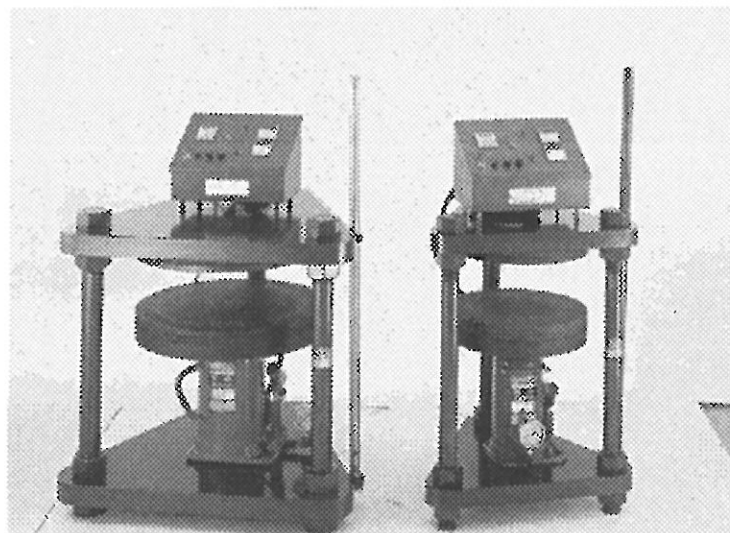
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| 2 | Rubber Mold Compounds |
| 3 | Conquest Vulcanizing Equipment |
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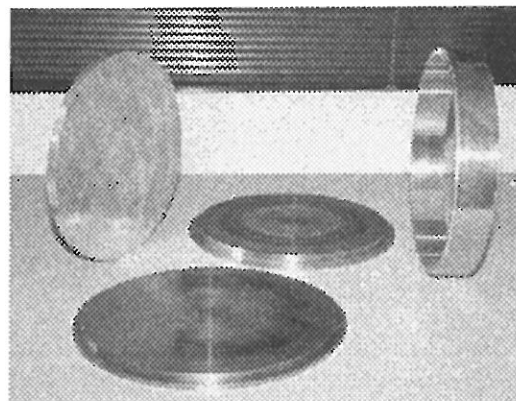
SECTION ONE

BASIC EQUIPMENT & ACCESSORIES REQUIRED FOR A SPIN-CASTING OPERATION

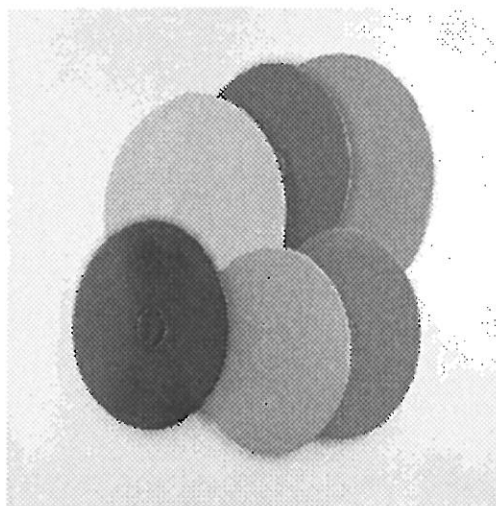
MOLD MAKING



CONQUEST VULCANIZER



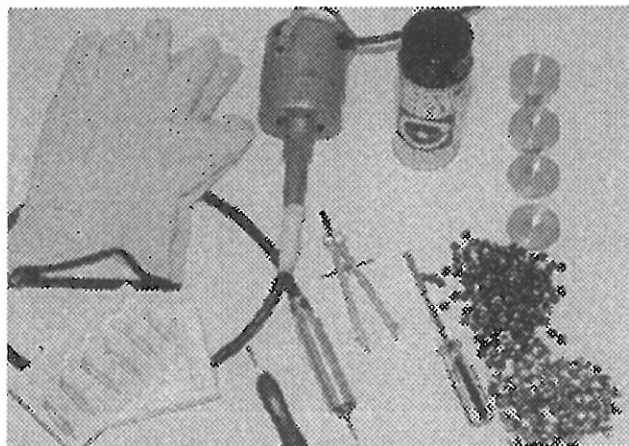
**PRECISION MACHINED
VULCANIZING FRAME**



**SILICONE & ORGANIC
RUBBER MOLD COMPOUNDS**

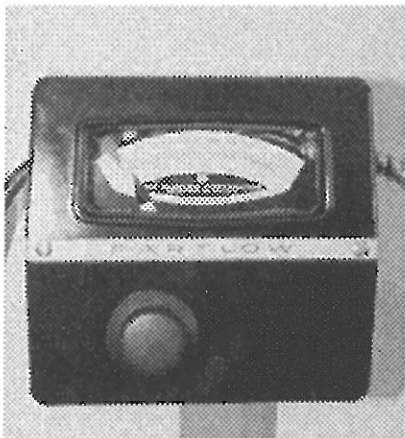
ACCESSORIES

- A. Steel Mold Cap Setting
- B. Heat Resistant Gloves
- C. Knives and Blades
- D. Sprue Formers
- E. Large Screwdriver
(Not supplied)
- F. High Speed Flexible
Shaft Drill
and Fine-Twist Drills
- G. CI-500 Mold Release
- H. Compass
- I. Brass Settings

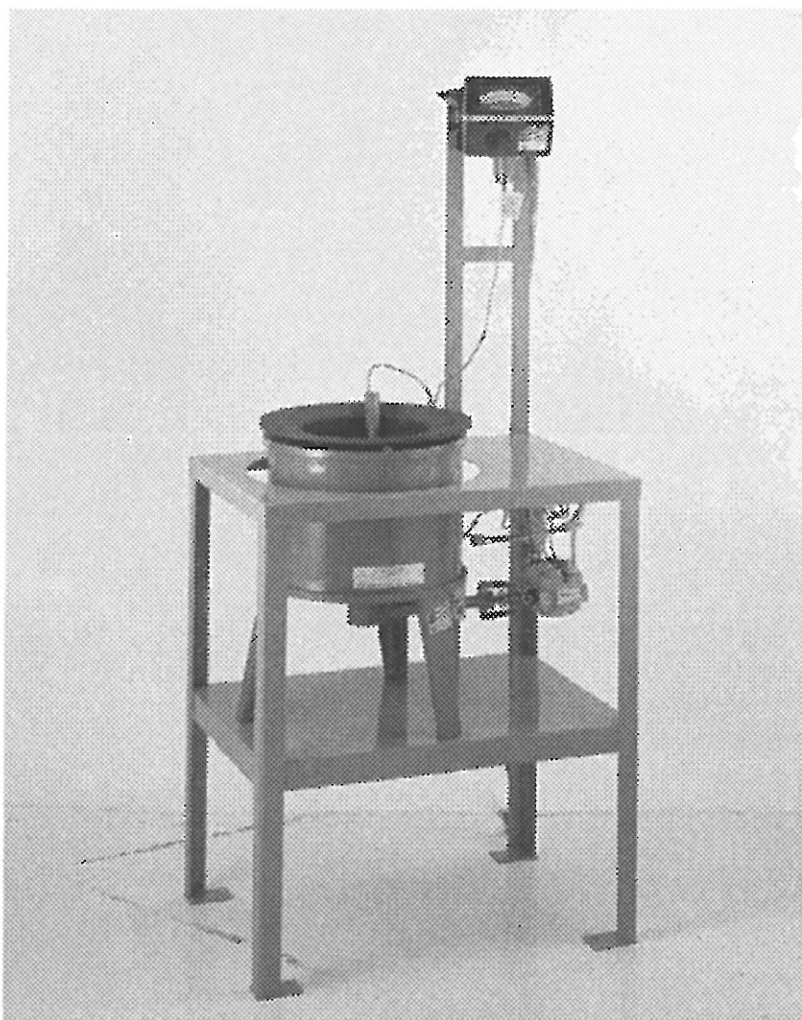


ACCESORIES

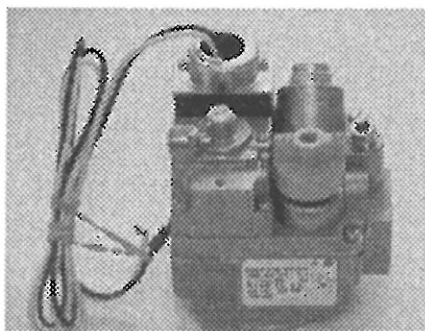
METAL MELTING



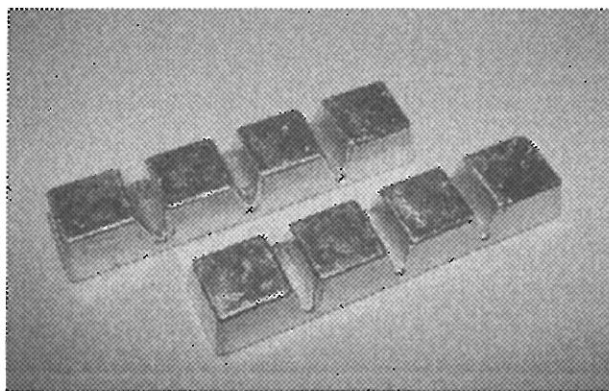
**TEMPERATURE
CONTROLLER**



GAS OR ELECTRIC MELTING FURNACE

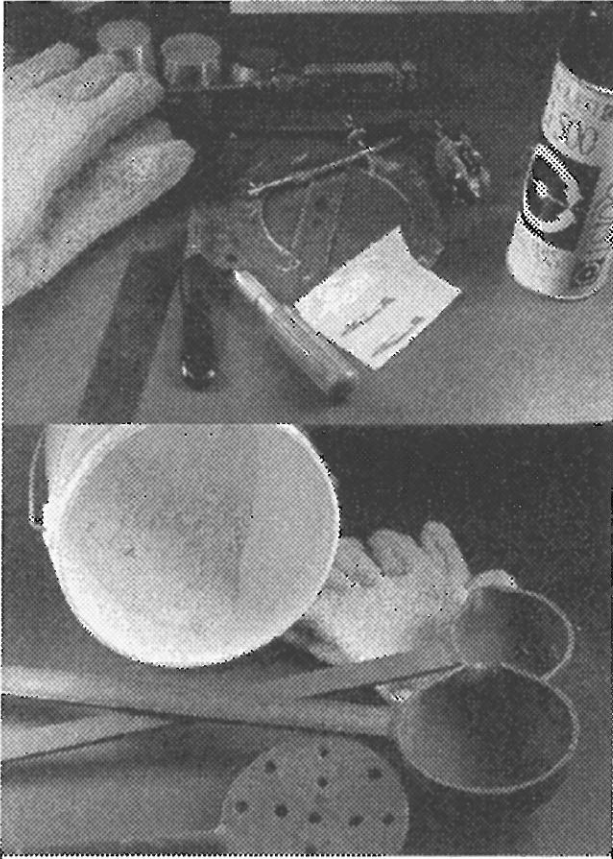


SAFETY GAS VALVE



HIGH PURITY CASTING ALLOYS

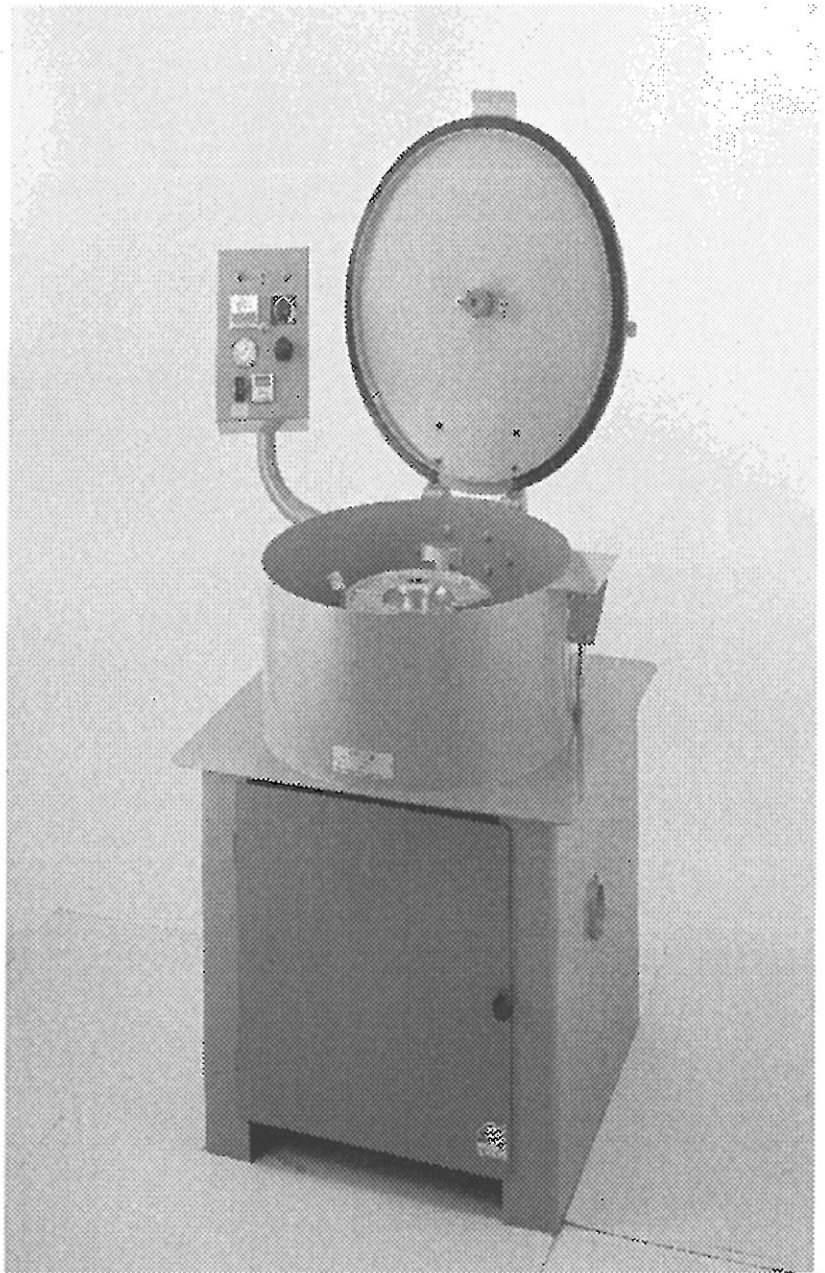
CASTING



ACCESSORIES

ACCESSORIES

- a) Fine casting/dusting powder.
- b) Leather or fabric gloves.
- c) Various sizes ladle.

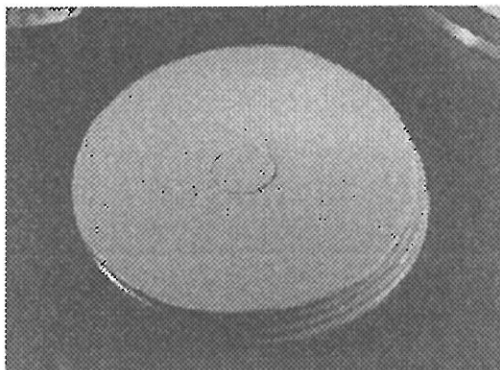


CASTING MACHINE

- All of the above equipment and accessories can be purchased from Conquest Industries or their local distributor. Most are stocked items. Conquest can assist you in obtaining or finding a local source for any of the commercial casting metals or plastics.

SECTION TWO

CONQUEST RUBBER MOLD COMPOUNDS



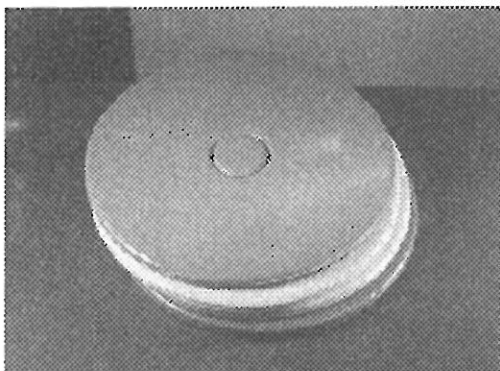
CHT1

Silicone Rubber Mold Compounds

Silicone molds are available in unvulcanized 1/4" or 1/2" thick discs in 9", 12", 15", 18" and 24" diameters. The 1" mold set is made up of four 1/4" thick discs or two 1/2" thick discs.

Two compounds are available from Conquest Industries:

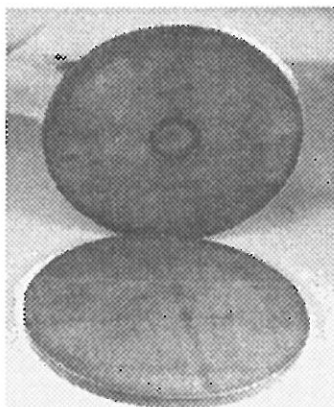
CHT1 is the highest quality, longest lasting, and highest temperature-resistant and lowest shrinkage compound available for zinc casting. It has been designed for long production runs and thick section castings.



CLT1

CLT1 is a less expensive, good quality, good temperature-resistant compound. It will provide less than 1/2 the production life of the CHT1 compound in zinc casting, but has provided fantastic chemical attack resistance for polyester and polyurethane plastic casting. It is also used for short or prototype runs in zinc and is excellent for lead or tin casting.

Organic Rubber Mold Compounds

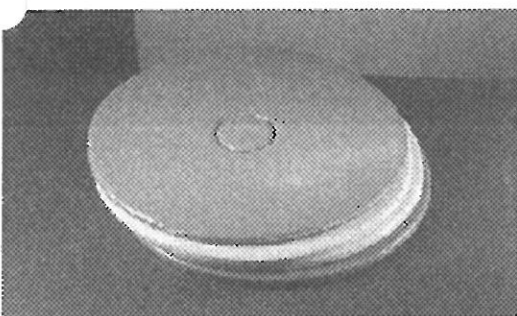


PR3

Organic rubber is available in unvulcanized 1/2" and 17/32" discs in 9", 12", 15", 18" and 24" diameters. The 1" mold set is made up of two 1/2" or 17/32" discs.

Three mold compounds are available from Conquest Industries:

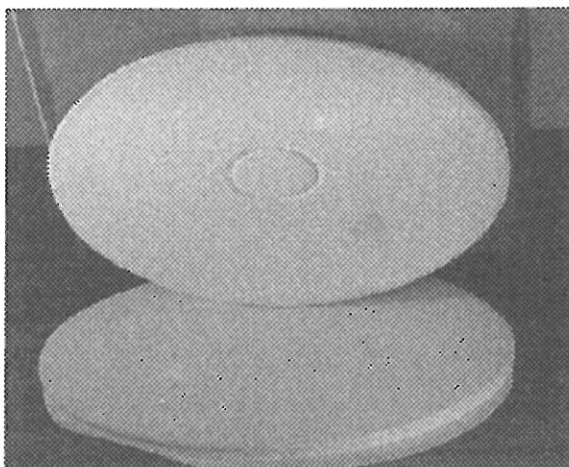
PR3 is one of the most successfully proven products in the past decade. Temperature stable, excellent de-layering with no need of liquid chemicals. Superior life and good compatibility with tin alloys for bulky figures. Detailing fidelity is superb for high quality jewelry reproductions.



PR2

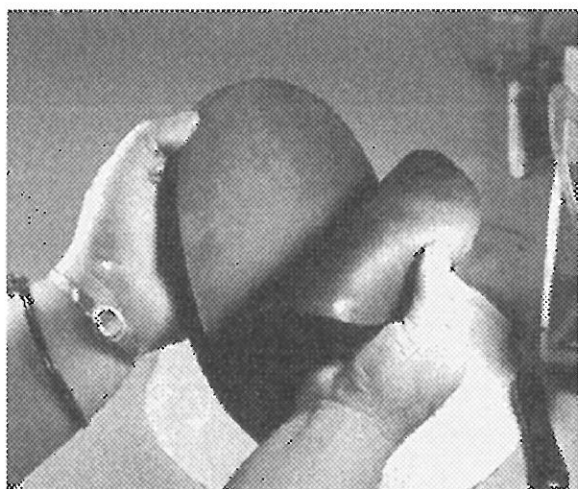
PR2 is a 60-65 duro compound with excellent flow and build-up characteristics and very little shrinkage. This black rubber compound offers excellent undercut and tear resistance, extremely good de-layering and handling properties.

WR3 is a hard 70-5 duro white rubber compound that is excellent for thin, flat and round parts that have limited undercuts. With the least amount of shrinkage of almost all organic rubber compounds, it is ideal for reproducing masters and for production requirements.



WR3

Unlike Conquest silicone mold discs which are one solid piece, the 1/4" or 1/2" organic rubber discs are made up of many thin layers. Usually eight to nine 1/16" layers are used to form a standard 1/2" disc. When doing build-up work or when cutting out a cavity. These can be easily lifted out. Thinner in a spray can is used to separate the layers.



ORGANIC RUBBER DISCS

Never use organic rubber when casting zinc or plastic.

The plastic sticks to the rubber and the high pouring temperatures of zinc will break it down extremely fast. Organic rubbers are sulfur cured. Zinc reacts very badly with sulfur. Upon solidification, zinc sulfide will form in the grain boundaries of the metal resulting in a brittle casting.

SECTION THREE

CONQUEST VULCANIZING EQUIPMENT

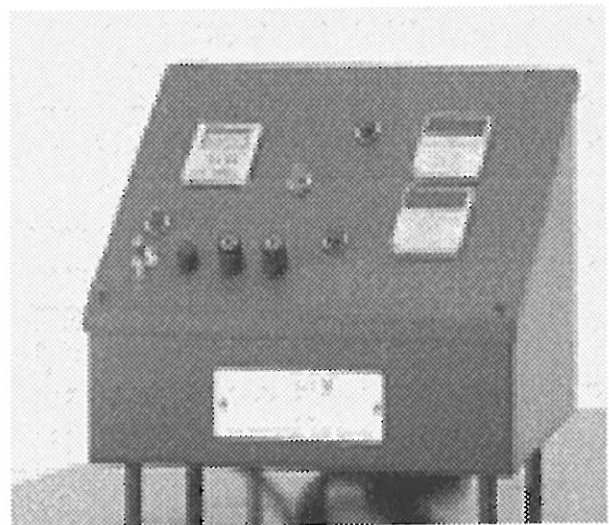


**MOLD MAKING
VULCANIZER UNIT**

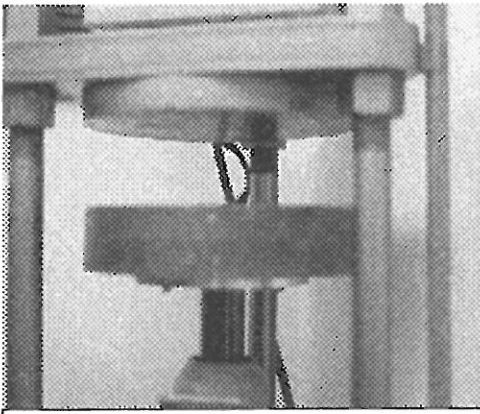
In the vulcanized state, silicone compounds have a hard putty consistency. Organic rubber in the unvulcanized state is considerably harder and has higher green strength than silicone compounds. If warmed first, it will soften up to a large extent. The vulcanizing press applies heat and pressure to the rubber compound. This squeezes the rubber into intimate contact with every tiny detail and surface finish of the model. As the rubber reaches its cross-linking or polymerizing temperature, it changes into a fully vulcanized, heat resistant, high tear-strength, and stable rubber mold.

The precision built Vulcanizer is basically a press with heated platens. Several very important features have been built into Vulcanizers for ease of operation and consistent top quality results in rubber mold handling.

Two independently working temperature controllers have been installed for both the top and bottom platens. It is extremely important in rubber mold-making that the temperature be held within $\pm 10^{\circ}\text{F}$. between each platen. This assures that each half of the mold is vulcanized exactly at the same temperature. This assures uniform mold-making results, eliminating casting and dimensional problem later on.



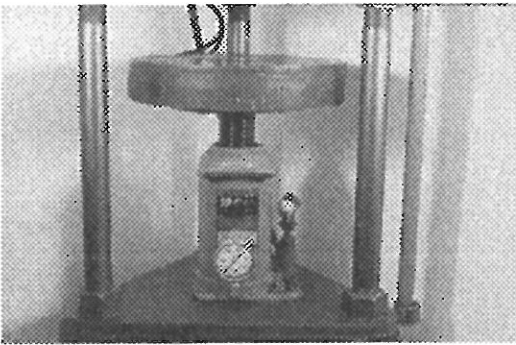
**VULCANIZER UNIT
CONTROLS**



PLATEN SYSTEM

The **Conquest Platen System** incorporates single flat "pancake shape" disc heaters in each platen. These heaters are extremely accurate, quick heating and, more significantly, provide absolutely uniform surface temperatures throughout the cross section of each platen. This eliminates the hot and cold spot problems most found on Vulcanizers using calrod or strip type heaters. Uniform surface platen temperatures are important!

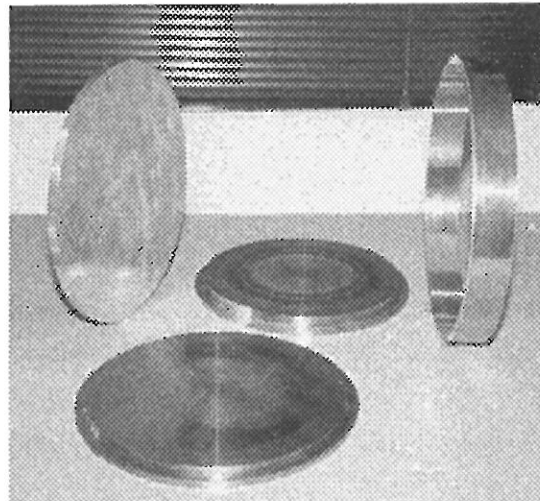
The three-post design and adjustment nuts on Conquest Vulcanizers allows for simple platen parallel alignment. It takes only a few minutes. Parallelism between platens is of significant importance during rubber mold vulcanizing to provide for more uniform mold and cavity results. It helps eliminate metal or plastic flashing, which most often occurs in molds, which are out of parallel.



CONQUEST VULCANIZER

Conquest Vulcanizers are equipped with hydraulic jacks and pressure gauges to provide an accurate measure of the pressure applied to the rubber during vulcanizing. For uniformity of results, the users can now read and maintain constant pressure for the various size rubber molds that they manufacture.

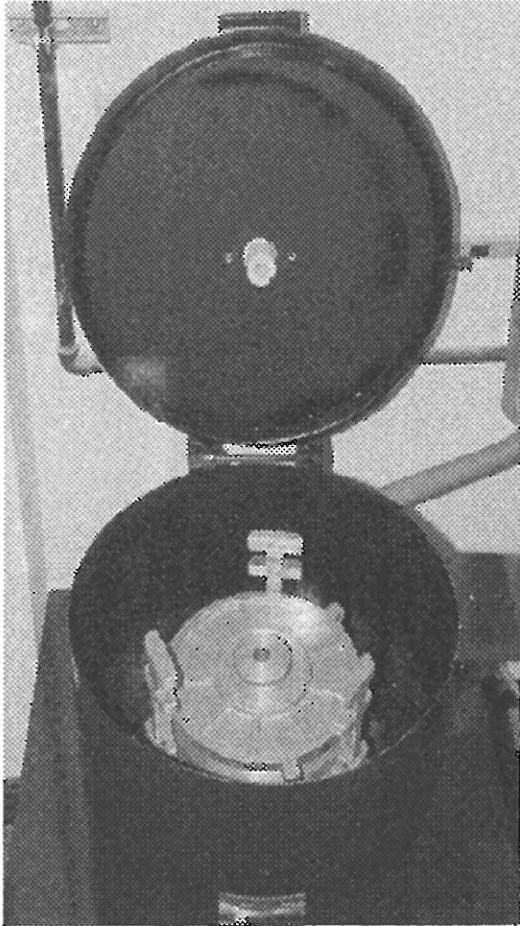
Conquest Vulcanizing Frames (steel or aluminum) are precision machined to highest tolerances, which eliminates any rubber shifting or moving during vulcanizing. While heating up, the rubber expands (approx. 3-5%) and some old frames or poorly made new frames can be out of the tolerance, allowing the rubber to extrude out between the ring and the top or bottom plate. The extruded rubber will cause the entire parting line of the mold to shift toward the extruded area, completely shifting and distorting the mold cavities and their locations. The resulting mold is not only difficult to cast and hold uniform pressure without flashing, but several cavities might be completely uncastable.



VULCANIZING FRAMES

SECTION FOUR

CONQUEST SPIN-CASTING EQUIPMENT

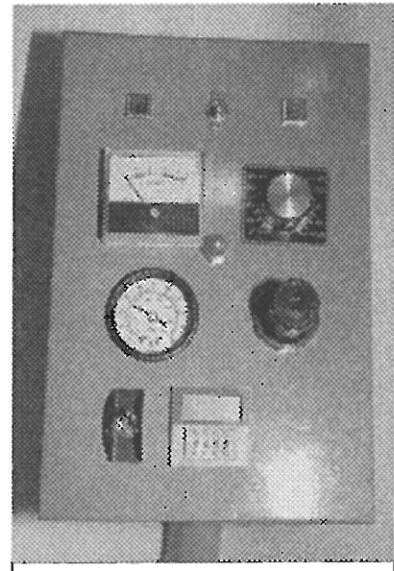


**HIGH-SPEED
ROTATING HEADS**

During the casting cycle, centrifugal pressure is used to introduce metal or plastic into the cavities or the rubber mold. The Conquest Spin-Caster units have adjustable high speed rotating tables. The rubber mold is positioned and automatically held together during the casting cycle. Special care must be taken not to distort the mold cavities by excess squeezing of the rubber. This is easily accomplished by our adjustable air pressure clamping system.

Several variables come into play during the centrifugal casting cycle. They are:

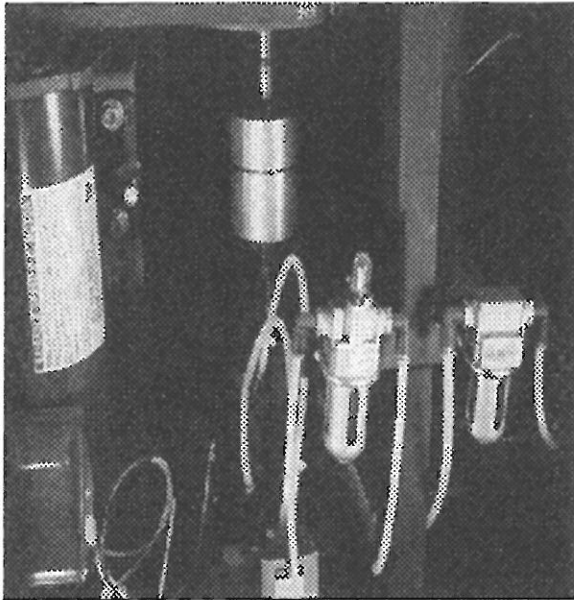
- Speed or RPM required
- Pressure
- Casting Cycle Time



**ADJUSTABLE
AIR-PRESSURE
CLAMPING SYSTEM**

These variables are controlled on the Conquest Spin-Caster. Adjustments for speed, pressure, and casting cycle time are incorporated into each unit. Temperature is adjusted by a separate temperature controller or pyrometer in the metal melting furnace.

It is important to understand that if all variables are maintained as low as possible. i.e., lowest speed possible and lowest temperature possible, (with of course, good casting being produced) the overall rubber mold life and efficiency of the operation will significantly improved.



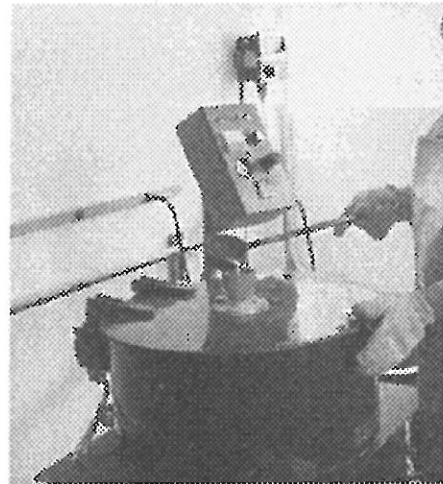
CONQUEST AIR CYLINDER

The **Conquest Automatic Spin-Caters** have several very important features which help provide for consistent results, close tolerances and ease of operation.

Our clamping and air pressure systems allows much lower pressures to hold the rubber mold together to prevent flashing. We manufacture our own air-cylinder, which is an integral part of each unit. They are automatically lubricated and trouble-free. Most important this pressure system provides uniform pressure throughout the entire cross-section of the rubber mold, resulting in much closer tolerance capabilities than found on other centrifugal machines, especially jewelry type.

Reversing capabilities are built into each unit, providing clockwise and counter clockwise rotations. This assists the mold maker in setting up and designing the gating system and component layout to take advantage of the direction of spin for best results.

Conquest units have speed capabilities (up to 1000 RPM) to provide greater centrifugal casting pressures when required to cast thin or difficult to fill components. Since zinc is somewhat more sluggish than lower temperature tin or lead-base metals, and less dense (lower weight), higher speeds are often needed to cast zinc components.



GOOD RULES TO FOLLOW

Be sure you are working with a good master model

- Take the time to make the best Master Model possible. Highlight the details and be certain it has a very good finish. Keep in mind that time and effort spent on the Master Model will show during production. Use a high quality Master Model and you will have a high quality casting. This will save you money and time by reducing the after-casting work.

A good mold is vital to your success.

- Use only good compounds when making your molds. Remember to store compounds in a fresh environment such as a dark corner or room.
- Position your models on an even weight and size around the mold to ensure balanced spinning.
- When you position the models, always think ahead and plan for your gating and venting systems.
- Any entrapped dross in the metal will float; therefore, it is advisable to position your models facing the bottom half of the mold.
- In-gates in the molds must be "clean cut" to avoid turbulence in the metal flow.
- For large production runs, join various molds of the same model to help in production flow and time/money savings.

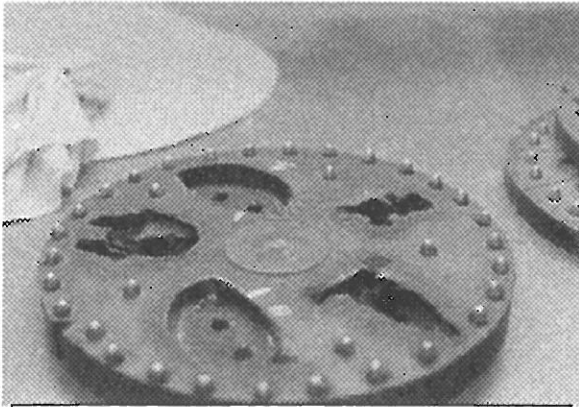
Never use scrap or recycled metal.

- Use only high purity metal. This will be cost-effective in the long run and will prevent hidden defects and poor quality castings.
- Entrained oxides (dross) will make the metal flow slower. It is important to remember that with long runners the cleanest metal will reach the cavity first.

Work, at all times, in a clean and safe area.

SECTION FIVE

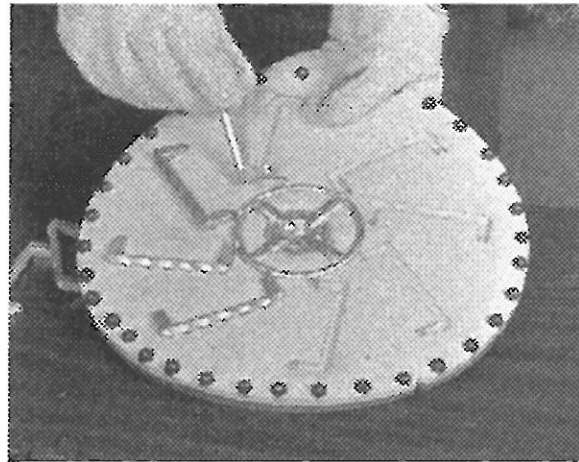
VARIOUS TYPES OF RUBBER MOLDS FOR DIFFERENT PRODUCTION REQUIREMENTS



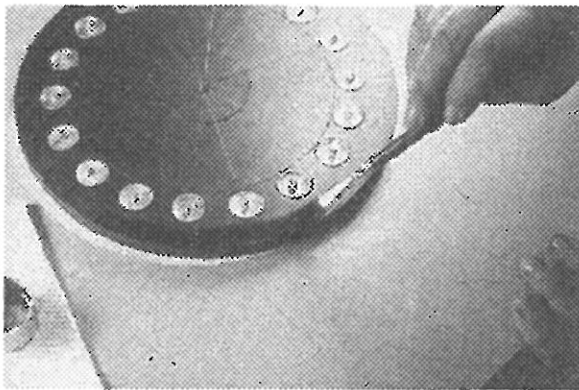
MASTER MOLD (SINGLE)

The **Master Mold** is most often used to cast submasters from original master or machined models. Duplicating prototypes or very small production runs are made in master molds. Several masters or models or models of similar size and weight can be placed in a single master mold in a balanced fashion, i.e., approximately equal weight and size parts opposite each other in the mold or equally positioned around the mold.

Flat Top Molds are ideal to use when the parting line location on a top or bottom surface is required and thickness shrinkage has to be controlled. The model is sunk completely in the bottom half of the mold and the parting line is produced on the model's top surface. This type of mold can only be used with models having either a flat top or bottom surface, with absolutely no undercuts on the sides. Thin, flat components are most often produced on flat top molds.



FLAT TOP MOLDS

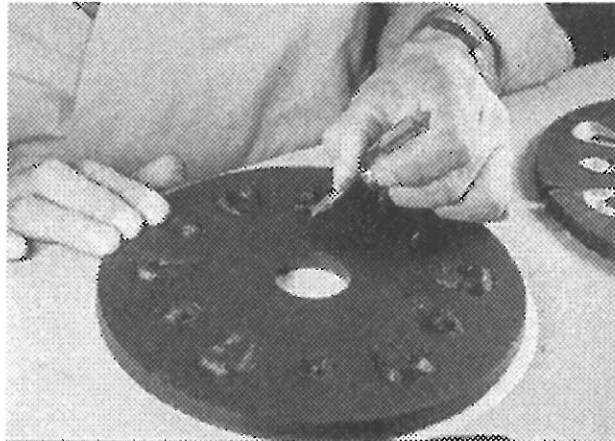


PRODUCTION MOLDS

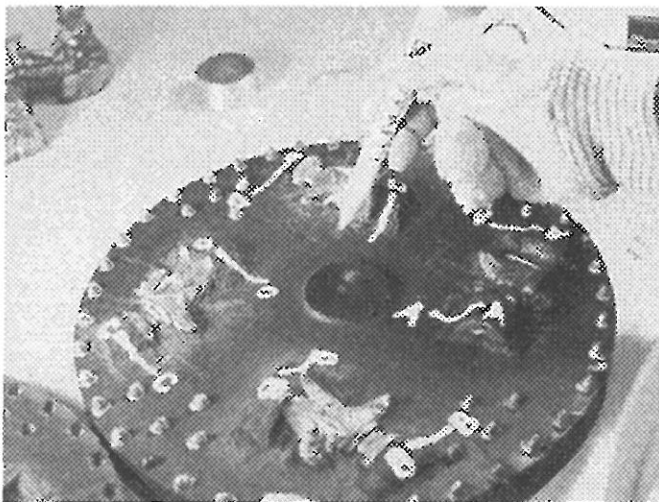
Production Molds are multi-cavity molds made using the same type of models equally spaced around the mold. These are used in casting production quantity.

Copy Molds (Jig Molds) are used when duplications of production molds are required. It is a fast and simple method of reproducing a fully checked-out mold layout and gating system on the same type of component.

Build-Up Molds are used for non-uniform or complex components. This is perhaps the most difficult type of mold to make because of the unequal paring line required on complex shapes. In the unvulcanized state, Silicone Rubber can simply be cut and molded, making Build-Up Molds easier to manufacture. The moldmaker has to have an appreciation for parting lines and undercuts. This skill is developed through experience.



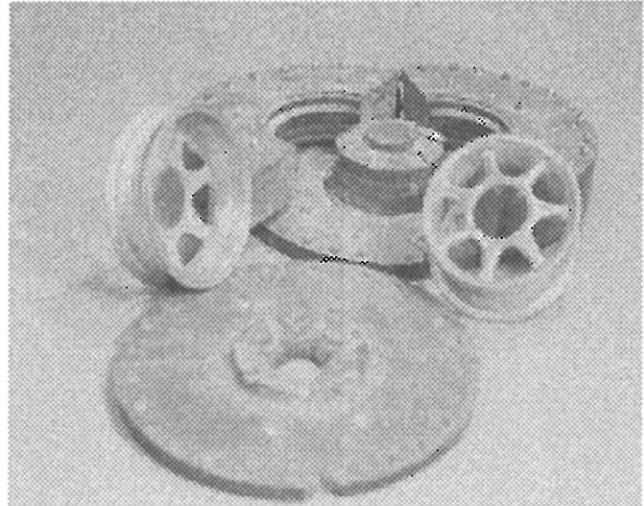
BUILD-UP MOLDS



INSERT MOLDS

Insert Molds are used with special inserts for product configurations or functions. Often more wear resistant materials like Teflon and brass inserts are used. Metal or plastic is cast around the insert to make it an integral part of the component.

Multi-Section Molds (3-part or more) are used on components having special side cores or several undercuts which cannot be handled in a standard two-part or up-and-down type mold. This type of mold usually encompasses a molded-in third or fourth rubber section, which pulls out from the mold. It contains either the side cores or the undercut configuration of the components.



MULTI-SECTION MOLDS

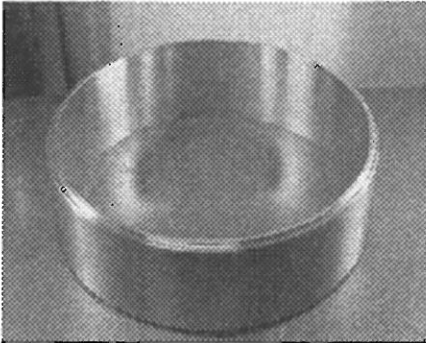
Matchplate Molds are used when numerous molds of one particular type of component are required. This differs from loose type models since the masters, locators and gating system are fixed of mold will provide casting with excellent dimensional reproducibility.

Note: The Procedure for vulcanizing rubber molds is explained in Section 7. The techniques used in preparing the various types of rubber molds will be explained in more detail in Section 8.

Techniques require for making the above molds will vary considerably from one mold type to another. The rubber mold vulcanizing procedure, however, will be nearly the same.

SECTION SIX

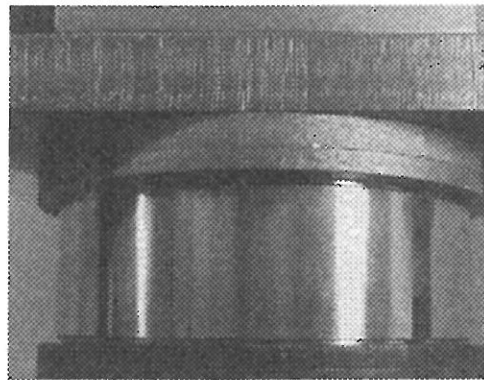
INSTALLING THE CONQUEST VULCANIZER



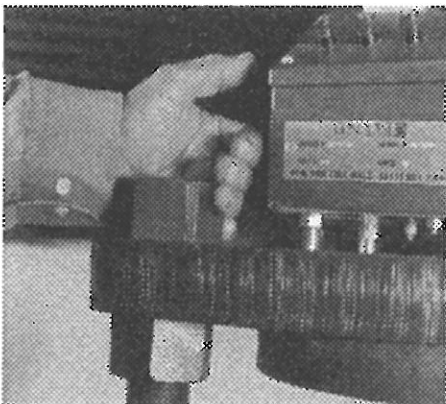
LARGE DIAMETER RING

All Conquest Vulcanizers are inspected and calibrated before being shipped. During shipping the heavy post nuts may loosen causing the platens to out of parallel. Tightening the Vulcanizer and aligning those platens is quite simple. The entire procedure will take less than twenty minutes.

1. Tighten all bottom post nuts using a large pipe wrench.
2. Loosen all top post nuts one or two turns. A large diameter ring forms a Vulcanizer frame can be used as a large parallel surface.



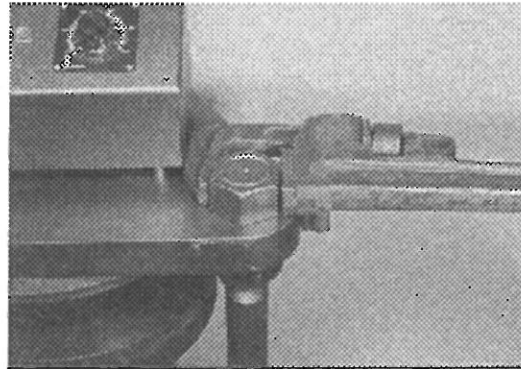
**THE RING MUST TOUCH
THE TOP PLATEN**



**ADJUST POST NUTS BY
HAND**

3. Center the ring on the vulcanizer's bottom platen. Aligning rings have been machined into the bottom platen to assist in proper centering.
4. Make sure the release valve on the vulcanizer's hydraulic jack has been closed (turned completely to the right). One end of the jack handle has been equipped with a fitting for this purpose. Pump the jack handle up until the ring almost touches the top platen.

5. At this point, continue pumping slowly until the ring is completely touching the top platen. You should not see any light between the ring and the top platen.
6. The adjustment nuts are located under the top plate on each post. Turn the adjustment nuts by hand until they touch the plate.



**TIGHTEN TOP AND
ADJUSTMENT NUTS**

7. Hand tighten all the post nuts.
8. Further tighten top and adjustment nuts on each post as much as possible by hand.
9. Turn the release valve on the hydraulic jack counter clockwise until the platen moves down.
10. Using the pipe wrench, tighten all the top nuts and then all the adjustment nuts as much as possible. The Vulcanizer is now in parallel.

Caution!

Consult a professional electrician before installing this equipment.
120V System: Plug into your normal outlet, provided that the line can support a minimum of 25 amps.

240V System: Have your professional electrician install single phase plugs that will meet your local requirements.