Laboratory Complete Denture Tooth Manual

Learn to Fabricate Dentures Using Justi Teeth
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On the opposite page is a reproduction of an editorial which appeared in the last Justi Denture Manual, printed in 1964. Since then many procedures have changed and new materials have become available, but the complexity of making dentures has remained as challenging as ever.

With this new edition, it is our goal to give the technician a better understanding of some of the techniques available to construct a more functional, comfortable, and beautiful denture using Justi teeth.

April 1, 2015

Emilio Pozzi
President, American Tooth Industries

Mission Statement

AMERICAN TOOTH INDUSTRIES

Quality Policy

Our family of brands: Justi, Pozzi, Major, Leone and Regal carries an old motto of our company “Simple inventions last forever.” Using the tools of their forebears, the human eye and hand, our craftsmen carry on the American Tooth Industries’ tradition of excellence. We are delivering quality products at a fair market value and we shall continue to do so.
H.D. Justi began to manufacture artificial teeth in 1864, using the finest materials available to him at that time. This consciousness of high quality standards has persisted to the fourth generation and is clearly portrayed in the most modern of prosthetic products - Justi Imperial Plastic Teeth.

Since we pioneered the first manufactured plastic teeth in 1940, many major improvements in the structure of the plastic and in methods of production have been made. Any student of prosthetic techniques who is interested may obtain from our Research Department the technical data supporting our belief that Imperial plastic teeth are the best of all brands of plastic teeth now available.

This manual represents more than twenty-five years' experience by our professional staff in handling plastic teeth, along with suggestions from educators, prosthodontists and general practitioners throughout the country. It is intended as a guide for dentists, students and dental technicians to aid them in producing the most durable and aesthetically correct dentures possible - through the use of Justi Imperial Plastic Teeth.

As we enter our second century we are confident that the joint Research efforts of Justi with Williams - leaders in the field of precious metals for dentistry - will assure you of continued leadership in the field of prosthetic materials as the years go by.

April 1, 1964

E. Ernest Rose, D.D.S.
President
A NOTE TO OUR READERS: Unlike many technical manuals, the type in this book has not been justified left and right for ease of reading. It has been our goal to make this book as understandable and easy to read as possible.

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Table of Contents

Chapter I
MAXILLARY & MANDIBULAR IMPRESSIONS .............8

Chapter II
SELF-CURING IMPRESSION TRAYS ..................9

Chapter III
STABILIZED BASEPLATES & OCCLUSAL RIMS .......11

Chapter IV
ARTICULATION ........................................17

Chapter V
TYPE SELECTION OF UPPER ANTERIOR TEETH ....22

Chapter VI
IMPERIAL SHADE GUIDE .............................26

Chapter VII
JUSTI TOOTH LINES & SHADE GUIDE SYSTEMS ....28

Chapter VIII
HARDNESS AND WEAR RESISTANCE OF
ARTIFICIAL TEETH ....................................31

Chapter IX
POSTERIOR TEETH ARRANGEMENTS ..............33

Chapter X
LABORATORY PROCEDURES .......................61

Chapter XI
JUSTI EDUCATIONAL MATERIALS ..................77
CHAPTER I

MAXILLARY AND MANDIBULAR IMPRESSIONS

Although the dentist will be making the impressions, the technician should be well versed in the technique used for the impressions and aware of the anatomical landmarks in the resulting stone casts. The dentist will select a tray that will be large enough to record all of the pertinent anatomical information, yet not so large as to distort the soft tissues and cause the patient discomfort.

Once the proper trays have been selected for the preliminary impressions an impression material is needed. The material of choice for the impressions is an alginate material that is rapid setting. The trays are modified with a soft beading wax placed along the peripheral borders. The impression material is mixed according to the manufacturers instructions and loaded into a tray. The tray is inserted into the patient’s mouth and held in place for the required setting time. Since these are preliminary impressions the resulting casts should show the anatomical landmarks as they appear in the mouth. The frenums, hamular notches, foveas, tuberosities, retromolar pads, mylohyoid ridges and oblique ridges should all be seen on the casts having the appropriate physical form and be apparent in sharp detail.

The impressions should be poured immediately in the dental office to hold distortion to a minimum. When the plaster has set, the impression trays are removed from the casts. The dentist should mark on these casts, the anatomical landmarks that will be significant to the technician for the fabrication of final custom impression trays. This procedure will provide a preliminary outline for the fabrication of custom trays.

The final impressions are made using self curing impression trays fabricated by the dental technician (Chapt. II). Care in constructing the tray borders is important. The appropriate tray extension must provide for proper coverage of the same anatomical landmarks as with the preliminary impressions. The tray and impression material, when properly positioned in the patient’s mouth, will extend to the anatomical peripheral borders and cover the landmarks. The impression material is displaced uniformly about the peripheral borders, and the excess material is allowed to flow past the vibrating line. After the impression material has set to the proper firmness, the impression is quickly removed from the patient’s mouth.

The impression is inspected for accuracy. Once the dentist is satisfied with the results, the impression is processed for infection control and sent to the lab for the boxing and pouring procedures.
CHAPTER II

SELF-CURING INDIVIDUAL IMPRESSION TRAYS

Custom Trays: Much time can be saved and excellent results obtained by using the following techniques.

A cast is made from a carefully taken preliminary impression. The cast is pencil outlined to the periphery of the final denture. Baseplate wax is adapted to the cast; one sheet of wax, if using a silicone type impression material, two sheets of wax when using an impression material like *Alginmax* for a full load impression. “The choice of impression material is made by the dentist determined from the condition of the patient’s tissues,” tissue function, and the ability of the patient to handle the impression material (“Impression.” Prosthodontic Treatment. 1975:137).

Prepare the self-curing tray acrylic for the custom trays. The *Justi Tray Material* is a coarse type powder that has a high degree of elasticity with a moderate curing time to allow for ample working time. Mix according to the manufacturer’s directions. When the acrylic reaches a doughy consistency, it can be manipulated without sticking to the hands. Place the material between a sheet of polyethylene or cellophane and press with a glass slab to about an eighth of an inch thickness. Then finger press into shape on top of the wax spacer on the cast. Some of the excess tray material is used to shape a handle and placed on the tray at the anterior midline. After the material has passed the heat cycle the tray will be hard and ready to trim along the outline. The *Justi Tray Material* has no significant shrinkage after the cure. The surface roughness will aid in the retention of the impression material.

Note:

The spacer must not extend beyond the borders of the tray.

The peripheral edge of the trays meet the top of the outline.

The handles are formed to allow the dentist to grip without the tray slipping from the fingers and should not interfere with the position of the lips.

The trays have the appropriate amount of retention holes for the dentist’s impression material.

The trays are cleaned, disinfected, and placed into a heat-sealed bag.

*Alginmax* is an irreversible hydrocolloid alginate. If you are using this
material for the final impression with a custom tray, evenly spaced retention holes need to be drilled into the tray. *Alginmax* has dimensional stability for more than 120 hours, yet the setting is complete in just 2 minutes.

**Fig. 1. Completed maxillary and mandibular custom trays.**

*Bead, box, pour, and the master casts:* At the lathe, remove the handle from the impression trays with a carborundum disc. Box the impressions with a plaster and pumice mix or an alginate material. Use a vacuum to remove the air in the modeling stone as it is being mixed.

Pour the final impression by vibrating modeling stone into the impression trays. After the stone has set, about 45 minutes, remove the casts from the impression trays. Wet the cast with SDS (saturated calcium sulfate dihydrate solution), and use the cast trimmer to flatten and trim the casts. The thickness of the base should be about 1/2 inch thick. Trim the sides of the casts to produce land areas with dimensions of 3 mm, except for the posterior of the mandibular cast which should be trimmed at 6 mm. Use SDS to rinse the casts of the ground stone. Cut index grooves into the base of the casts for articulation. The casts are ready to be surveyed for undercuts and prepared for the construction of stabilized baseplates with occlusion rims.
CHAPTER III

STABILIZED BASEPLATES
and
OCCLUSION RIMS

In order to transfer the relationship between the maxilla and the mandible of the edentulous patient to the articulator, it is necessary to have a substitute for the natural dentition. This substitute will be the cast models of the jaws and wax rims, called occlusal rims, that have been adapted to stabilized baseplates.

A stabilized baseplate is a temporary devise that will act as a denture base upon which the occlusion rim will be fabricated. The baseplate will not become part of the actual denture. It is important that the material used for the baseplates will adapt well to the casts and have an accurate and stable fit. However, care must be exercised not to scar or scrape the master casts with repeated placement and removal of the acrylic bases. Scaring the casts compromises the models, may cause irritation to the patient’s ridges and could destroy the retention of the denture. To prevent this from happening, all the undercut areas of the models are blocked out with an appropriate blockout wax and duplicate models are made to preserve the master casts (Fig. 2).

Fig. 2. Edentulous cast of the maxillary with undercuts blocked out.
**Auto-polymerizing resin** is the most widely used material for the construction of stabilized baseplates. This material provides an accurate and well-adapted baseplate that will maintain its accuracy through the clinical and laboratory procedures.

Note:

Deep undercuts on the master casts must be blocked out. Flow melted wax into the undercut depression. Be sure that the casts are dry or the wax won’t adhere. Duplicate the cast to create a working model.

Paint the working cast with a tin foil substitute and allow the separator to dry. Paint a second coat of separator. When completely dry the casts will have a glossy appearance.

Place the casts in a container with saturated calcium sulfate dihydrate solution (SDS) and soak the casts for 2-3 minutes.

Make the baseplates by means of the “sprinkle on” technique using **Justi Repair Material**. This is a self-curing, methyl-methacrylate material. It is cross-linked and internally pigmented to give a dense and even texture. The baseplates have a thickness of 1.5 mm to 2.0 mm (Fig.3).

Control of the acrylic is important to prevent the resin from getting all over the casts and lab table. To help control the acrylic flow, use an eye-dropper to wet the polymer with the autopolymerizing monomer.

![Fig. 3. Auto-polymerizing resin adapted to an edentulous cast.](image)
Occlusion Rims: Considerable chair time can be saved if the rims are formed to definite dimensions which represent an average measurement of the intermaxillary space taken from many hundreds of case study patients. On normal patients, the occlusal rims produced by the following procedures will require little alteration in the mouth; However, this must not be interpreted as a method of obtaining vertical dimension. There is no such thing as a “standard” vertical dimension. The following measurements recommended for the construction of the occlusal rims must not be interpreted as such by the reader. These measurements simply offer a reasonable starting point. Every case is unique, and the dentist will make adjustments in the patient's mouth to determine the proper height and contour of the occlusal rim for his denture.

Justi Preformed Occlusion Bite Rim Wax is U-shaped and has a recessed ridge that allows for easy placement onto the baseplate. Soften the preformed rim wax in a bowl of fairly warm water. The rim wax will become soft and pliable. Adapt the softened rim wax to the acrylic baseplate and position it directly over the crest of the ridge. Referring to the orientation lines, reduce the facial and occlusal surfaces of the rim wax to the proper dimensions. Seal the rim to the baseplate, and contour the facial form.

The Maxillary Occlusion Rim

The occlusion rim height is established at 22 mm from the deepest point of the labial sulcus, beside the labial notch (not on the frenum). The occlusal surface is adjusted to parallel the crest of the ridge as it runs posteriorly. The contour of the maxillary occlusion rim will be used by the dentist to determine lip support, facial midline, high lipline, cuspid placement and incisal edge to the occlusal plane. The wax of the occlusal rim is built out to simulate the labial contour of the teeth and the denture when it has been completed. Even though the final adjustments of the wax rim must be done in the patient’s mouth, the upper cast will give clues to how the technician should contour the wax. As a rule, the greater the loss of the alveolar structure the thicker will be the occlusal rim.

Note:

Anterior height, 22 mm. The labial surface of the wax rim is perpendicular from the sulcus to the occlusal surface (Fig.4) (AFM 162-6,1982,156).

Anterior width of incisal, 3 mm (AFM 162-6,1982,156).

Posterior height, 10 mm (AFM 162-6,1982,156).

Posterior width of occlusal, 10 mm (AFM 162-6,1982,156).
The Mandibular Occlusion Rim

Mark a line 2/3rds up the height of the retromolar pad on each side of the mandibular cast and extend the line to the edge of the model. This will be an orientation line visible when the baseplate is in place. The line represents the posterior height of the lower occlusal rim. The anterior height of the occlusal rim is 18 mm up from the labial sulcus.

It is important that the rim approximate the position of the teeth of the final denture, and therefore should be centered over the alveolar ridge. Mark both sides of the crest of the ridge with a line that runs from the posterior to anterior borders. Extend the lines onto the land areas. This will allow the technician to see the position of the lines when the occlusal rim is placed on the cast. On the occlusal surface of the wax rim, inscribe a line on the wax that will connect the orientation marks drawn on the land areas.
Fig. 5. Measurements shown of the mandibular occlusion rim.

Note:

Anterior height: 18 mm from the deepest point of the labial flange to the occlusal plane (Fig.5) (AFM 162-6,1982,156).

Anterior width of incisal: 3 mm (AFM 162-6,1982,156).

Posterior height: 18 mm (AFM 162-6,1982,156).

Posterior width of occlusal: 10 mm (AFM 162-6,1982,156).

The completed baseplates and occlusion rims are often referred to as bite blocks. They may also be used to “plump” the outer lips and cheeks. This is done by adding a roll of wax horizontally along the facial surface of the rims. The purpose is to fill in tissue that has been lost, either about the lips and/or the cheeks. The dentist will be able to sculpture the wax to provide the patient with an attractive face contour, and remove many of the lines and wrinkles about the mouth. The technician will reproduce the “plumping” in the finished denture.

Lightly flame the surfaces of the occlusion rims, and polish the wax surfaces with cotton and cold water. The rims should appear neat and glossy with no rough or irritating borders that would cause discomfort to the patient. The patient’s feelings about their new dentures begins at this point. They are now ready to be used by the dentist to record the centric relation, vertical dimension, and occlusal plane.
Centric relation: The maxillomandibular relationship in which the condyles articulate with the thinnest avascular portion of their respective disks with the complex in the anterior-superior position against the shapes of the articular eminencies. This position is independent of tooth contact. (GPT-7)

Vertical dimension: A vertical measurement of the face between any two conveniently located points, one above and one below the mouth, usually along the midline.

Occlusal plane: The plane established by the incisal edges of the incisors, and the occlusal surfaces of the bicuspid and molar teeth of the maxilla and mandible.

![Fig. 6. Maxillary and mandibular rims together.](image)

When finished with your procedure follow the appropriate disinfection procedures, and seal the appliances in a heat seal bag for delivery to the clinic.
CHAPTER IV

MOUNTING OF CAST ON AN ARTICULATOR

Laboratory mounting: Once the technician has received the bite blocks with the casts from the clinic, the rims should be attached together. The assembled appliance references the relationship between the two jaws, and the technician must preserve this information. The bite blocks are mounted in the articulator giving the technician a model of the patient’s mouth. If the dentist hasn’t selected the teeth for the denture yet, the selection is made now. The mounted casts will help determine the intermaxillary space. This will aid the technician to select the length of the posterior teeth. For the denture to function properly, the chewing plane distance must be maintained. Sometimes appearance is sacrificed a little to provide function efficiency.

After mounting the master casts in their proper relation on the articulator (Fig. 7), the casts are surveyed for the arrangement of the teeth. To preserve the mounting records, the upper occlusion rim is set aside and an acrylic or shellac baseplate is adapted to the cast. Soften the Justi Preformed Occlusion Bite Rim Wax, and place on the crest of the ridge area of the base plate. The wax will receive the teeth, and hold them.

![Fig. 7. Bite blocks are ready for setting artificial teeth.](image)

Arrangement of the teeth: There are three basic rules concerning the positioning of artificial teeth with relationship to the edentulous ridge. These rules will be dictated by rigid requirements of mechanics and aesthetics. Deviating from these rules will create unfavorable stresses, or undesirable aesthetic results.
THE THREE BASIC RULES:

1. Upper anterior teeth must, in most cases, be set to fulfill the aesthetic requirements of lip contour. Incisors are given a labial inclination of 25° to 30° from vertical (AFP 162-6. Dec 91: 51) (Fig. 8). If the anterior teeth in the upper denture are set parallel with the vertical plane, the vermillion border of the lip will not be held up and supported by the denture. The result will be an edentulous look.

2. The upper and lower posterior teeth must be set over the center of the ridge, or slightly lingual of center (Fig. 9). This positioning will help avoid the creation of leverage factors that cause tilting of the denture (Fig. 10). The central sulcus of the upper posterior teeth should fall on a imaginary line drawn down through the center of the ridge. The buccal cusps of the lower posteriors should fall on the same imaginary line. (This is one technique for positioning the posterior teeth of a full denture. Other systems will be addressed later in this manual.)

3. The incisal edges of the lower anterior teeth should be centered over the crest and set vertical to the plane of the lower border of the mandible. Studies of orthodontic patients indicate that in normal dentition, the lower incisors are invariably centered on the alveolar bone. The incisors are not normally inclined more than ±5° from a vertical, raised from the plane of the lower border of the mandible (Fig. 11). The setting of the lower anteriors, labial to the crest of the ridge or at the extreme angle toward the labial, will again create unfavorable stresses. This will cause tipping of the lower denture during masticatory effort.

The upper cuspids are set straight labio-lingually to give prominence to their necks (Fig. 12). This prominence forms the corner of the mouth and accentuates the cuspid eminence. This helps create the proper labial contour. They are the only anterior teeth to be set without a labial contour.

![Fig. 8. Correct and incorrect angulation of the maxillary anterior teeth.](image)
Fig. 9. Proper relationship of the posterior to the center of the ridge.

Fig. 10. Undesirable stresses developed by setting the posterior teeth buccal to center of the ridge.

Fig. 11. Relationship of the incisal edges of the lower anterior teeth to the crest of the ridge.
Fig. 12. Cuspid eminence to give proper contour.

Fig. 13. Arrangement of the upper anterior teeth. Labial prominence is determined by the labial contour of the upper bite block. Note the varying axial angulation of the centrals, laterals, and cuspids.

Fig. 14. Preparation of the lower bite block. The lines indicate the center of the lower ridge. The upper central sulci will be positioned to touch this line. By this procedure, the buccal cusps of the lower will be automatically centered over the crest of the ridge.
Fig. 15. Positioning of the lingual cusps of the upper posterior teeth.
CHAPTER V

TYPE SELECTION OF UPPER ANTERIOR TEETH

Frame Harmony Chart: The selection of tooth type is made by reference to the Frame Harmony Chart (Fig. 16). The form or shape of the anterior teeth follow the proportions of the bony skeleton. Persons with a tall, narrow skeletal structure will have long, slender arms, legs, fingers, feet, skull and teeth. Thus, a patient with a tall, slender frame would require a long, narrow tooth such as an Imperial type 5. A short, broad patient would require a tooth similar to an Imperial type 4.

Mold selection: Upper anterior teeth are best chosen by use of photographs or pre-extraction records, if they are available. In their absence, the operator must resort to experience to effectively select the teeth that will be harmonious to the whole patient. Justi Imperial teeth may be selected to follow this natural scheme by referring to the chart below.

Frame Harmony

Type selection of maxillary anteriors

<table>
<thead>
<tr>
<th>Patient's Height</th>
<th>WIDTH Patient's Frame</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NARROW</td>
<td>MEDIUM</td>
</tr>
<tr>
<td>TALL 6' or more</td>
<td>TYPE 5</td>
<td>TYPE 12</td>
</tr>
<tr>
<td>MED. 5'6&quot; — 6'</td>
<td>TYPE 3</td>
<td>TYPE 2</td>
</tr>
<tr>
<td>SHORT 5'6&quot; or less</td>
<td>TYPE 7</td>
<td>TYPE 8 or 10</td>
</tr>
</tbody>
</table>

Fig. 16. Frame Harmony Chart.
Upper Anterior Tooth Form or Type Selection.

Tooth Size: Imperial maxillary anterior teeth are designated in size by the following letters.

1. G - giant
2. L - large
3. M - medium
4. N - normal
5. S - small
6. T - tiny

Note:

1. The shape of the maxillary anterior teeth, when inverted, should be the approximate shape of the outline of the face.
2. The contour of the maxillary anterior teeth, when viewed from the profile, should have the same facial curvature.

Imperial mandibular anteriors are designated in size by the following letters, U, V, W, X, Y, and Z. They become progressively smaller in that order.

For cases with excessive alveolar bone loss, VL is a V width but longer, YL is a Y width but longer, VS is a V width but shorter, and YS is a Y width but shorter.

Imperial Articulation Table:

<table>
<thead>
<tr>
<th>With maxillary anteriors</th>
<th>Use mandibular anteriors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. G</td>
<td>1. U</td>
</tr>
<tr>
<td>2. L</td>
<td>2. V, VS or VL</td>
</tr>
<tr>
<td>3. M</td>
<td>3. W</td>
</tr>
<tr>
<td>4. N</td>
<td>4. X</td>
</tr>
<tr>
<td>5. S</td>
<td>5. Y, YS, or YL</td>
</tr>
</tbody>
</table>
Justi Imperial Posterior Teeth

Imperial posterior teeth come in six types. Four of them differ in occlusal design to give a posterior tooth for each of the principle theories of articulation. They are:

1. Full anatomical, (M).
3. Shallow Cusp (X).

0° posteriors:

Designated by the letter Z, i.e., 29Z, 31Z, and 33Z. These are cuspless carvings which eliminate much lateral stress during use. Many prosthodontists prefer zero degree posterior teeth in all full denture cases. Zero degree teeth are particularly beneficial in cases of cross-bite, flabby alveolar ridges, and those cases where the alveous has resorbed so that little stability exists.

10° degree posteriors:

Designated by the letter X, i.e., 30X, 32X, 33X, and 34X. Functional and aesthetic occlusal surface make them easy to set up and occlude. They may be set up to function similar to 0° or for a “three point contact” arrangement with minimal cusp interference. A shallow facet inclination of the occlusal surface will inhibit tilting of the denture while in balanced or working excursion. Having more stability in function will give the denture more retention.

20° degree posteriors:

Designated by the letters XX, i.e., 29XX, 31XX, and 33XX. An occlusal carving which gives a minimum of lateral thrust, improved chewing efficiency, and great adaptability of recarving after occlusal adjustments.
**33° Short bite posteriors:**

Designated by the letter S, i.e., 30S, 32S, and 34S. Anatomical occlusal carvings with a short body, especially on the lingual side. Designed to reduce tedious time spent grinding in the posterior teeth when intermaxillary space is small. Most useful to reduce adjustment time fitting the posteriors in lingual bar cases.

**33° Medium posteriors:**

Designated by the letter M, i.e., 28M, 30M, 32M, 34M. The number indicates the distance in millimeters from the mesial of the first bicuspid to the distal of the second molar. These are natural cusp teeth carved to perfect working occlusion.

**33° Long posteriors:**

Designated by the letter L, i.e., 28L, 30L, 32L, and 34L. Anatomical occlusal carvings with extra length from occlusal to gingival. They give full tooth length to full denture cases where space permits, and is especially useful in partial denture cases where excessive resorption has occurred.
CHAPTER VI

IMPERIAL SHADE GUIDE

The Imperial shade guide has shades 20, 25, 35, 45, 50, 59, 60, 62, 64, 65, 66, 67, 68, 69, 70, 77, 81 and 82. These represent the shades most often found in beautiful natural dentition. The selection of these shades is based on the *Justi Eterna System* which is a patented system to facilitate reading shades. The shade number is related to the ideal shade for the age of the patient. The shade guide comes with the *Kroma Shield*, and one sample of the patented *Kroma Tab*.

Justi is the largest manufacturer of shade guides in the world. In addition to the *Imperial “Age Shades” Guide*, other shade systems available from Justi include:

- **Justi Eterna Shade Matching Reference System**
  This system is based on Shades by Age, however the system also includes reference tooth tabs which can be sent to the lab and also kept in the patient’s file. Eighteen shades are available.

- **Justi Imperial VIVO Shade System**
  This system offers an incisal and interproximal blend that give this beautiful line of teeth the unique ability to absorb and reflect surrounding color. Available in the 13 newest Vita type shades.

- **Justi Teen and Young Adult Shade System**
  Justi Imperial has come up with a few new shades that will make you feel and look like a teen again. Our bleach shades are made for a whiter and brighter looking restoration.

- **Justi Blend Shade System**
  This is a highly sophisticated color system for tooth shade matching. It is produced in nine hues with maxillary central, lateral and cuspid. Each of these three tabs have different values. The cuspid is definitely darker than the central, creating a natural-looking aesthetic effect. Characterizations in the centrals are also a special feature of this shade system. The system comes complete in nine shades (maxillary central, lateral and cuspid), or nine maxillary centrals only.

- **Dymon Hue Shade System**
  This system emphasizes the most common shades used in the dental market prior to the 90’s. The twelve shades are produced on one range selection and are also displayed in two different ranges or sequences. Face A in front and Face B in the back. This allows the professional to read the shade two times from two different scales which display the same tabs in different sequences.
Justi is the manufacturer of many different personalized and patented systems which are sold by other dental manufacturers and dental laboratories. Some of these include:

- Sensation SL™ and Cerpress SL™ Shade Guides of Leach and Dillion Company.
- Signature Shade Guide by Renzo Casselini, M.D.T. - Swiss Quality Dental Ceramics, Inc.
- Mosaic Posterior Shade Guide by Da Vinci Dental Laboratory - Dental Illusions.

**KROMA TABS**

Justi Products invented this accessory to be used in the patient’s mouth as a neutral background for choosing the correct shade from the *Justi Blend, Justi Imperial, Dymon-Hue, and Regal-D-Blend* shade guides. The natural blue background enables the eye to focus on the shades and not be distracted by surrounding colors.

![Fig. 17. Kroma Tab.](image)
CHAPTER VII
JUSTI TOOTH LINES & SHADE GUIDE SYSTEMS

In this manual we have explained in detail the Imperial Mold System.

While we are using the Justi Imperial line of teeth as an example in this manual, Justi also manufactures several other tooth lines featuring different mold systems. Each system is outlined in an individual mold chart.

Following is a brief description of each line according to the design of the maxillary anterior molds and the final aesthetic of the teeth. We have also included Justi Imperial in this list for easy comparison. Justi Hardened Plastic Teeth comply with ANSI/ADA Specification #15 Published in 2008, identical adoption of ISO Standard #22113:2005.
**Justi Imperial**

- Original Anterior and Posterior Molds designed by Justi.
- Molds sculptured according to a skeletal relationship.

**Justi Imperial VIVO Shade System**

- This system offers an incisal and interproximal blend that give this beautiful line of teeth the unique ability to absorb and reflect surrounding color. Available in the 13 newest Vita type shades.

**Justi Teen and Young Adult Shade System**

- Justi Imperial has come up with a few new shades that will make you feel and look like a teen again. Our bleach shades are made for a whiter and brighter looking restoration.

**Justi Blend®**

- Maxillary anterior molds match the original Bioform® molds.
- The aesthetic of the maxillary anterior is similar to Bioblend® however the final prosthetic case made with Justi Blend teeth appears superior to Bioblend®.
- Posteriors are designed to articulate to, and match anteriors of Justi Blend, Bioblend®, and Bioblend IPN®. They are available in 0°, 10°, 20° and 33°.
- Shades are similar to Bioblend® shades. Nine shades are available: 200, 202, 204, 206, 208, 210, 212, 214 and 216.

**Justi ViForm®**

- Maxillary anterior molds match the original Bioform® and Portrait® molds.
- The shade system of the ViForm is a match to the Vita® system.
- Posteriors are available in 0°, 10°, 20°, and 33° to articulate to the ViForm anteriors.

**Regal-D-Blend®**

- Maxillary anterior molds match the original Bioform® molds.
- The aesthetic of the maxillary anterior is similar to Bioblend®.
- Posteriors were designed to articulate to and match Justi Blend, Bioblend®, and Bioblend IPN® anteriors. They are available in 0°, 10°, 20°, and 33°.
**Justi Dymon-Hue HPT**

- Maxillary anteriors are a match to New Hue® and Biotone® molds.
- Shades match Bioform®, Biotone®, and New Hue®.
- Posteriors are available in 0°, 10°, 20° and 33° to articulate with Dymon-Hue anteriors.

**Justi Triplex® MSLV System**

- Unique system featuring European aesthetics and American technology.
- Super Lux maxillary male anterior molds designed and sculpted in Italy.
- Major Dent female anterior molds designed and sculpted in Italy.
- Triplex posteriors designed and manufactured in the United States are available in 0°, 10°, 20° and 33° to articulate to the Super Lux and Major Dent anteriors.
- The Triplex MSLV System utilizes a Vita-type shade system.
CHAPTER VIII

HARDNESS AND WEAR RESISTANCE OF ARTIFICIAL TEETH

In a discussion of the following factors, an immediate distinction between hardness and wear resistance must be made.

Hardness, or resistance to penetration, has little relationship to the wear of the material concerned. The typical example is that a steel automobile tire would wear out in a fraction of the time required to wear out a modern resilient rubber tire. Leather heels wear out faster than rubber heels. It is obvious that plastic can be formulated to increase the wear resistance of teeth without increasing the hardness, and sacrificing the resilience of the tooth.

Years of use in the mouth have conclusively proven that the Justi Imperial teeth possess the degree of hardness to withstand the stresses of mastication. These plastics have proven themselves “tougher” than the previous artificial teeth. This fact is best illustrated by the low incident of breakage of Justi Imperial dentures.

Some earlier plastic teeth were seen to wear rapidly, and would lose vertical dimension. In many cases the teeth that had been exposed to organic solvents or flaming lost their fine properties, and did wear excessively. Since the introduction of the Justi Imperial tooth in 1950, this hazard has been removed. With a cross-linked and solvent resistant formula we may confidently expect the following:

1. Imperial teeth against Imperial teeth will wear at approximately the same rate as the best porcelain.

2. Imperial teeth opposed to natural teeth tend to preserve the natural teeth because of Imperials non-abrasive and resilient structure.

3. Using Imperial teeth against gold the Imperial tooth will wear slightly faster than the gold, thus preserving the restoration.

Clinical observation and laboratory testing has shown that when the occlusion is well balanced, little or no wear will be seen.

It is important to remember, in selecting teeth, that we are substituting for the human tooth. The periodontal membrane and resilience of living tissue are important to the health of the teeth rooted in the bone. Resilient teeth should be placed on restorations that are to be totally supported by the
delicate mucous membranes. Any increase in hardness beyond the point of adequate resilience is a disadvantage in denture teeth. By the same token, it may be reasoned that if natural teeth are so constructed by nature as to wear somewhat during the abrasive forces of mastication, there should also be some slight wear in the denture teeth.

It is logical to assume that the wear resistance of artificial denture teeth should be slightly less than that of natural teeth which were firmly supported by the bone of the alveoli.

No practicing prosthodontist will deny that even with perfect occlusal relationships, some tissue resorption will eventually occur under tissueborn dentures. As soon as vertical relationship is reduced, traumatic forces are encountered in the most destructive area, the anterior teeth. If no wear is possible, the trauma produces irritation and greater destruction. The ability of the Justi Imperial tooth to wear slightly under normal use conditions is of great benefit to patients and their oral health.

Another liability is encountered when an artificial tooth is placed in opposition to natural teeth or any structure supported by natural teeth. Every effort should be made to prevent traumatic interference between them. If any attrition occurs in such a relationship, it should result in the wear of the artificial tooth. The artificial tooth can be replaced. Under these conditions, unyielding porcelain teeth have caused premature loss of many natural teeth and fixed bridges.

At the time the denture is inserted, patients should be told of this possibility, and the effort you are making to preserve their remaining teeth and tissue.
CHAPTER IX
POSTERIOR TEETH ARRANGEMENTS

The compensating curve: An average compensating curve is developed in the complete denture by successive angulation of the posterior teeth as shown in (Fig. 18), from bicuspid to second molar.

1. By a fraction of a millimeter, the first bicuspid's lingual cusp misses the plane of occlusion as established by the lower occlusal rim.

2. Both cusps of the second bicuspid are in contact with the plane.

3. The mesial lingual cusp of the first molar is the only cusp touching the plane. The mesial buccal cusp is slightly closer to the plane than the distal buccal cusp. The distal buccal cusp is raised approximately one millimeter.

4. The lingual cusp of the second molar is touching and the distal buccal cusp is slightly above the plane, raised about 1.25 mm.

This arrangement of the posteriors when viewed from the buccal, gives an effect of a curve that becomes progressively higher toward the posterior. All the buccal cusps of the posterior teeth contact this curve (Fig. 19).

Fig. 18. Progressive angulation of the posteriors.
The preceding pages cover the most universally used method of setting teeth. The principles involved are the same regardless of the method. Many prosthodontists prefer one of the following:

1. All the anteriors are set first. This assures the operator that both upper and lower anteriors are related properly to the ridges, and the esthetics are complimentary to the patient appearance. The lower posteriors are set over the center of the ridge, and the upper posteriors are set to articulate with the lowers.

2. Upper and lower posteriors are set first. The lower bicuspid of one side is placed over the center of the ridge, and the opposing upper bicuspid is articulated to it. The same procedure is followed on the opposite side. The four bicuspids are set to balance in the lateral excursions. The second bicuspids, first molars, and second molars are set by the same procedures.

3. Some operators prefer to use the occlusal rims as a template that establishes the plane of occlusion. Others mill their bite blocks into contact by use of an abrasive enclosed in the center of compound or occlusal rim wax. The abrasive is used to develop a curve that can be followed for setting teeth.

The purpose of the preceding procedures was to simply lay down some basic fundamentals which may be helpful in arriving at a sound mechanical and aesthetic result in the trial set-up.
The complete set-up of the upper teeth (Fig. 20). Note particularly the centering of the posterior teeth over the edentulous ridge, and the relations of occlusal and incisal surfaces to the lower bite block.

Figure 20 shows a complete set-up of upper teeth.

Figure 21. Lower first molar in centric relation.

Figure 21 shows an articulation of the lower first molar in centric relation. The mesial buccal cusp of the upper molar fits closely into the buccal grooves of the lower molar.
Figure 22 shows the working position of the lower first molar. Note the close interdigitation of the cusps of the two teeth.

![Fig. 22. First molar in working position.](image)

Figure 23 shows the balancing position of the lower first molar. The articulation of the first molar is often called “the key to occlusion.” Careful articulation of the lower first molars, when they are first set, makes the balance of the rest of the set-up easier.

![Fig. 23. Lower first molar in balancing position.](image)
Figure 24 shows the interdigitation of the complete lower posterior set-up in centric relation. The upper buccal cusps must have adequate overjet to avoid cheek biting, and to allow for balancing of the set-up.

Fig. 24. Interdigitation of complete lower set-up.

The *Just Imperial* anterior teeth may be set to any desired degree of incisal guidance depending on type of posterior teeth used (Fig. 25).

Fig. 25. Horizontal and vertical overlap. Sometimes called “overbite” and “overjet.”
Fig. 26. Proper angulation of the lower anterior teeth.

Fig. 27. Complete set-up in centric occlusion.

Fig. 28. Complete set-up in working occlusion.
Fig. 29. A lingual aspect of a complete set-up in balancing occlusion.

Fig. 30. A complete set-up in protrusive occlusion.

Fig. 31. Ridge relation requiring cross-bite arrangement. The mandibular arch is wider than the maxillary.
The anatomical cross-bite set-up: In many cases with edentulous patients, where prognathism or unusual mandibular development exists, routine arrangement of the teeth would place the lower molars too far lingual from the crest of the ridge. This would cause the tongue to be constricted. In these cases, where the distance between the ridge crest in the upper arch is much less than the lower, the cross-bite set-up may be used (Fig. 32). Lower posterior teeth are set in the upper arch and upper posteriors are used for the lower. This makes it necessary to place teeth intended for the right side on the left, and vice versa (Fig. 33 & 34). This will keep the bicuspids in their correct position. This type of articulation places the posterior overjet in the lower arch instead of the upper. It will widen the distance between the lower posterior teeth by several millimeters.

![Fig. 32. Right side of the completed set-up. Overjet appears on the lower.](image)

![Fig. 33. Right lateral mandibular excursion. Anatomic cross-bite set-up.](image)
Set-up zero degree posterior teeth: Where it is desired to eliminate all lateral cuspal interference, * Justi Imperial* zero degree posterior teeth may be used. Zero degree posteriors are designed to be set to a flat plane occlusal or compensating curve (Figures 35-37). Due to the absence of the posterior cusp elevation, the anterior teeth should not be set with an overbite. Incisal guide pins should be set at zero degrees when setting these teeth.
Fig. 36. Articulation of zero degree posteriors.

Note in (Fig. 36), the peculiar mesial slope of the lower first bicuspid. This is to allow passage of the tip of the cuspid in working position. No overbite is used.

Fig. 37. A set-up of zero degree upper posteriors.

Cross-bite set-up with zero degree posterior teeth: Where zero degree posterior teeth are used in cases that would ordinarily require anatomic cross-bite set-up, it is not necessary to use lower teeth in the upper arch or upper teeth in the lower arch. The buccal-lingual relation of the upper and lower zero degree posterior teeth may be altered to suit the ridge relation and distribute stresses as desired without regard for the cusp relationship. Note that in (Fig. 38), the overjet is present in the lower posteriors rather than the upper posteriors.
Setting Ten Degree Teeth

The ten degree teeth are aesthetically designed and provide the functional and uniform contact needed during centric relation. A bilaterally balanced arrangement is easily obtained with a compensating curve. Ten degree teeth may also be set to a linear occlusal plane. When the incisal table is set to be less than 10°, balance may be achieved for lateral and protrusive excursions. The cusps have a well worn, natural appearance that are suitable for the patient that requires non-interfering cuspal contact during masticatory excursions. As lateral forces decrease in older patients, these ten degree functional posterior teeth may transmit less destructive trauma to the underling tissue.

Suggested arrangement for upper 10 degree posteriors.

Normal articulator settings. Utility template for a mesiodistal alignment.
Setting Twenty Degree Teeth

The twenty degree, semi-anatomical teeth have been developed to combine elements from anatomical and non-anatomical teeth. As suggested by Swenson, “polyplane teeth are designed to balance on changing centers of rotation, which means that they can be set for bilateral balance” (Complete Dentures 338). This provides the practitioner with a tooth having shallow cusps and semi-anatomical surfaces. These teeth may be set either in an anatomical or non-anatomical tooth arrangement. By having inclinations of the cusps reduced, the supporting structures will be less likely to be traumatized. The use of *Justi Imperial* twenty degree teeth will provide the stability needed during masticatory excursions, and the dentures will not likely be dislodged. This is important for the patient’s sense of security and comfort.

*Suggested arrangement of upper 20 degree posteriors.*

Normal articulator settings.  
Utility template for a mesiodistal alignment.

Lateral View  
Facial View
The practitioner’s primary goal is to provide the patient with a denture that has incorporated the elements of function, aesthetics, phonetics, and cleaning efficiency. The first step in providing optimum function is done by establishing centric relationship between the maxillary and mandibular jaws. This depends upon equalized and exact bite relation. A proper centric relationship is the most critical component for successful dentures. It improves the retention and stability of the complete denture, and this will reduce sore spots. The 33° posterior teeth are selected for shade, buccolingual width, and mesiodistal width and length. Because artificial teeth have a different anchorage than natural teeth, the occlusal surfaces are modified to improve masticating efficiency, comfort, and preservation of the underlying bone and soft tissue. The technician will also have to modify the occlusal surfaces to fit the occlusal plane of the denture. To minimize centric and occlusal discrepancies, it is important that the teeth are set on stabilized maxillary and mandibular baseplates. The bases should resemble that of the final denture, and be suitable for insertion during the try-in appointment.
Normal Articulator Settings

After the centric has been transferred to the occlusal rims, it is very important that they are properly oriented and reinforced with staples. The settings for the articulator when using 33° teeth are as follows:

1. The horizontal condyle guidance is set at 30°.

2. The Bennett angle of the lateral posts are set at 15°.

3. For mounting the case to the articulator, the incisal guidance table is positioned at 0°. After the case has been mounted, set the incisal guidance table to 30° when using 33° teeth (Fig. 39).

Apply lubrication to the index keys of the casts. Use dental plaster to attach the casts to the articulator’s mounting rings. Smooth the plaster as it sets, and make the case presentable. After the plaster has completely set, make sure that the incisal pin is touching the incisal guide table. Use a heavy rubber band to maintain vertical dimension until the plaster has set.
The mesial lingual cusps of the maxillary molars are the primary cusps that deliver the forces of mastication against the central grooves of the mandibular molars (Fig. 40). Stability is established when the maxillary mesial lingual cusps of the posterior teeth are positioned so that the primary forces of mastication are directed through the crest of the mandibular ridge. The central grooves of the mandibular posteriors should be directly over the crest of the mandibular ridge. This positioning of the molars will assist in keeping the dentures seated.

Fig. 40. Shows direction of the primary forces during mastication.
Placement Of The Maxillary Posterior Teeth

The following procedures may be used for setting all anatomical posterior teeth. The arrangements and measurements are relative positions and meant only to be a guide. Adjustments are necessary depending on case conditions.

*Maxillary first bicuspid:* The buccal cusp of the maxillary first bicuspid is raised 1/2 mm from the occlusal plane and is positioned over the mandibular crest of the ridge (Fig. 41).

![Fig. 41.](image)

The long axis of the maxillary first bicuspid is perpendicular to the occlusal plane and attunes with the cusp (Fig. 42).

![Fig. 42.](image)
Maxillary second bicuspid: The buccal and lingual cusps of the maxillary second bicuspid touch the occlusal plane (Fig. 43). The lingual cusp is positioned over the mandibular crest of the ridge.

![Fig. 43.](image)

Maxillary first molar: The mesial lingual cusp of the maxillary first molar is the only cusp that touches the occlusal plane, and the cusp is positioned over the crest of the mandibular ridge. The mesial buccal cusp is off the occlusal plane 0.5 mm. The distal cusp is about 0.5 mm above the plane, and the distal buccal cusp is off about 0.5 to 1.5 mm (Fig.44).

![Fig. 44.](image)
Maxillary second molar: No cusps of the maxillary second molar touch the occlusal plane. The mesial lingual cusp is 1.25 mm above the plane, and the mesial buccal cusp is about 1mm above the plane. The distal lingual cusp is 1.5 mm above the plane, and the distal buccal cusp is 1.5 mm above the plane (Fig.45).

Fig. 45.

COMPENSATING CURVE

The compensating curve may be emphasized or reduced in an artificial arrangement of the teeth to help achieve balanced occlusion.

Centric Occlusion
Because of the influence the mesial lingual cusp of the maxillary 1st molar has on the primary forces of mastication, the molar is positioned as close as possible to being parallel, and directly over the mandibular crest of the ridge (Fig.46).

*Fig. 46.*

*Position of the maxillary right 1st molar.*

*Mesial distal alignment:* The maxillary canine, 1st and 2nd bicuspids, and the mesial buccal cusp of the 1st molar are placed in a straight line. The facial line of the 1st and 2nd molars are turned slightly toward the lingual (Fig.47).

*Fig. 47.*

*Occlusal view of the alignment.*
Use the Justi Utility Template to evaluate the buccal alignment of the maxillary posterior teeth, and observe the individual relationship of each tooth to the occlusal plane. Proper placement of the maxillary posterior teeth to the occlusal plane will form the compensating curve (Figs. 48, 49).

**Fig. 48. A relative position of the teeth to the occlusal plane.**

**Fig. 49. Guide plane against the set-up.**

*Mandibular first molar:* Begin the articulation of the mandibular posterior teeth by setting the mandibular first molar in centric (Fig. 50), so that the mesial lingual cusp of the maxillary 1st molar articulates with the central fossae of the mandibular 1st molar. The mesial buccal cusp of the maxillary 1st molar will be positioned to point down the buccal groove of the mandibular 1st molar.
Fig. 50. Mandibular 1st molar in centric.

The central fossa of the 1st molar is positioned to be directly over the crest of the residual ridge (Fig. 51).

Fig. 51. Buccal lingual placement.
HARMONY OF THE POSTERIORS

Set the mandibular posterior teeth to the maxillary posterior teeth, and give consideration to ensure harmonious and consistent relationships in the posterior arrangement. The posterior teeth will be in harmony when the cusps and ridges of the teeth in one quadrant glides smoothly over the slopes and inclines of the posterior teeth in the opposing quadrant. The posterior should move through their excursions without interference.

Working occlusion: Once the lower 1st molar is positioned in centric occlusion, release the right or left centric lock of the articulator. Move the upper member of the articulator to simulate a lateral movement toward the working occlusion. Adjust the mandibular 1st molar until the mesiobuccal cusp interdigitates between the buccal cusp of the maxillary 2nd bicuspid, and the mesiobuccal cusp of the maxillary 1st molar (Fig. 52, 53).

Balancing contacts: Balancing contact occurs when the posterior teeth contacts the mandibular posterior teeth on the opposite side of the working contact. The buccal cusps of the mandibular teeth contact the lingual cusps of the maxillary teeth. From the locked centric of the articulator, release one of the left or right centric locks and move the upper member of the articulator into a lateral excursion until the buccal cusp of the mandibular 1st molar makes contact with the lingual cusps of the maxillary 2nd bicuspid and the 1st molar (Fig. 54, 55).
SEQUENCE TO FINISH SETTING THE MANDIBULAR POSTERIOR SET-UP

Once the first molar has been correctly placed against the opposing teeth, continue the arrangement by placing the 2nd bicuspid and adjust the set-up to make all the proper excursions. Follow the 2nd bicuspid by placing the 2nd molar and finish the quadrant by placing the 1st bicuspid. Check all the excursion movements and begin arrangement of the mandibular teeth in the opposite arch. Once all the posterior teeth have been positioned, all three functional relationships may be observed. From centric to the lateral excursions of the working and balanced relationships. The properly placed teeth serve to stabilize the denture and ensure comfort for the complete denture wearer.

WORKING OCCLUSION

Working occlusion occurs when there is occlusal contact of the teeth on the side to which the lower jaw moves during function.

The buccal and lingual cusps of the upper tooth will touch the buccal and lingual cusps of the lower tooth.
Balancing contacts occur when there is contact between the upper and lower teeth on the side opposite to the working side.

The buccal cusps of the lower tooth touches the lingual cusps of the upper tooth.

Justi Imperial Block Posteriors

Zero degree, *Justi Imperial Block* posterior teeth are an aesthetically carved, non-anatomical, four posterior teeth block joined together on a flat plane. Their zero degree occlusal surfaces make them ideal for arrangement in complete dentures when the ridge condition of the patient indicates their use. They are a time saving factor when articulating, and mounting the blocks in a denture wax-up. For the denture wearer, the zero degree posteriorss eliminate many lateral stresses during use.

The occlusal surfaces are carved with fossae and spillways designed to facilitate masticatory efficiency. The dental appearance of the patient from the mesiofacial aspect will show natural, well worn posteriors. The buccal contour is built into the block posteriors for easy application and proper appearance. Block teeth are set in a flat linear occlusal aspect and individual teeth may be removed to make needed modifications for the posterior extension to the retromolar pad.
Arranging *Justi Imperial Block Teeth*:

1. The posterior arrangement is set with the condyle guidance at 30°, the lateral rotation post at 15°, and the incisal table at 0°.

2. Mark on the mandibular cast the crest of the ridge with the *Justi Technician’s Utility Ruler*. The line should bisect the pear shaped pad, and follow through to the anterior of the canine area. Repeat this procedure on the other side of the arch (Fig.56).

3. The retromolar pad is a guide to the superior-interior space (Fig.57). The occlusal plane is established by which arch is set first. In this case the mandibular arch will establish the plane.
4. Place the mandibular block posteriors with the long axis at a 90° angle to the occlusal plane (Fig. A). The buccal and lingual cusp areas should be touching the plane (Fig. B).

5. The block posteriors are positioned over the crest of the ridge with the height of the plane approximately 1/2 to 2/3 up the pear shape of the retromolar pad (Fig. 58). Follow the same procedure for setting the block posteriors on the opposite side. Never set denture teeth on the retromolar pads. If the block is too long, remove the 1st bicuspid.

6. Set the maxillary block posterior teeth so that they occlude to the mandibular block posteriors with at least a 1 mm maxillary buccal overjet. This will prevent the denture wearer from biting their cheek (Fig. 59).
POSTERIOR TOOTH SELECTION
ACCORDING TO CUSP INCLINE

Anatomical semi-anatomical, and non-anatomical. The dentist will determine the type of posterior teeth needed. The dentist will make the decision based on what will be required to accommodate the occlusal plan. According to Swenson, the occlusal plan or stratagem, “is to have the least possible amount of lateral and protrusive cusp inclines.” There are two factors that govern protrusive movement. They are the condyle inclines, which is fixed by the patient, and the incisal guide inclines, which is set by the dentist. The incisal incline angle is selected for the overbite factor (Fig. 60) when considering the cusp incline of the posterior teeth. Swenson states, “the inclination may be changed by the amount of overbite (vertical) and overjet (horizontal).” And, “when the overbite remains the same, and the overjet has been increased, the more the inclination will be reduced. When there is less overbite the angle of inclination will be less.”

![Fig. 60. (A) Shows no overjet. (B) Same overbite and greater overjet. (C) Same overbite with greater overjet and subsequent less incisal guide angle.](image)

The anchorage of the dental bases is much less than that of natural dentition. This requires the posterior teeth to have a reduced incline for the lateral and protrusive cusps. Swenson felt that, “if the anchorage has changed, the occlusal surface should be changed to meet these conditions of limited anchorage.” Because dentures are merely resting on tissue surfaces, and the patient uses irregular chewing motions during masticatory function, they are easily dislodged.

Justi has dentally engineered their posterior teeth with a variety of chewing surfaces for masticatory efficiency. The dentist can select the type of Justi teeth that would suit the particular needs of each patient. A selection based on the condition of the patient’s residual ridges, for cusp inclines of the artificial teeth, and chewing efficiency design. Artificial posterior teeth for
removable prosthetics are classified into three occlusal form groups: anatomical, semi-anatomical and non-anatomical.

The balance of movement that may be established with a proper selection of tooth form and arrangement will provide more comfort for the patient, and may aid in the reduction of trauma to the underlying bony and soft tissues.

1. **Anatomical posteriors**: “Artificial teeth which more or less duplicate the anatomical forms of natural teeth” (Complete Denture Occlusion 147). These will be posteriors with a 30 or more degree cusp inclination.

2. **Semi-anatomical posteriors**: These posteriors are designed to be a hybrid between anatomical and non-anatomical teeth (University of North Carolina, Denture Prosthetics 59). Functional and 20° teeth are the more commonly used in this category. The posteriors are set for an anatomical or a non-anatomical arrangement. Justi has modified the occlusal cusp design of their 20° and 10° posteriors. They interdigitate well, and have a lifelike appearance. They will function harmoniously with minimal hand adjustments. The anatomical occlusal carvings are shaped to provide a cutting surfaces that won’t interfere with the gliding ease of the opposing cusps through their excursions. This will bring stability to the denture during masticatory movements, and freedom from locked occlusion.

3. **Non-anatomical posteriors**: These posteriors are designed to have no occlusal cusps. They have a zero degree occlusal surface. They provide uniform contact in centric occlusion without intercuspation. The working surfaces have no incline planes that would interfere with lateral or protrusive movements. “They are artificial teeth so designed that the occlusal surfaces are not copied from natural form but rather are given form, which in the opinion of the designer seem more nearly to fulfill the requirements of mastication and tissue tolerance.” (Glossary of Prosthodontic Terms GPT-7).

**Terms of Occlusion**

*Centric Occlusion*: Maximum contact between opposing natural or artificial teeth usually occurring in the midline (Air Force Pamphlet 551)

*Balancing Occlusion*: A complete denture occlusion in which there is multiple anterior and posterior contact on the right, and on the lateral and protrusive excursions (AFP 548).

*Protrusive Occlusion*: Contact relation of the upper and lower teeth when the mandible is brought forward with the anteriors edge to edge (AFP 564). Compensating Curve. Denture teeth are set on anteroposterior and lateral curves for purposes of achieving balanced occlusion (AFP 552).
CHAPTER X
LABORATORY PROCEDURES

Retention of Justi Imperial teeth to the denture base: One of the great advantages of a plastic tooth is its ability to unite with the denture base and give assured retention. To obtain this benefit, the contacting portion of the tooth must be clean and free of wax. At the time of packing, there must be monomer in the denture base material in contact with the tooth long enough to attack it slightly. When the denture material is polymerized, a firm union will occur.

The Justi Imperial Tooth Formula consists of an especially high-grade of cross-linked plastic. This provides a plastic that has high heat resistance and immunity from the harmful effects of organic solvents.

The wax-up may be brush flamed with due caution. Avoid using a pin-point Bunsen flame directly against the teeth. High temperatures would destroy any plastic tooth as well as cause cracking of porcelain teeth.

The teeth may be cleaned with any solvent, but Justi recommends using Justi Wax Solvent No. 20. Note the insistence upon complete removal of wax from the surfaces of the teeth. Justi Wax Solvent No. 20 will remove any minute traces of wax left on the teeth which was not eliminated during the boil out. This leaves a fine crevice between the teeth and the investment so that no separator can enter this void. At the time of packing, some monomer can be squeezed into the space. It enters the investment pores and slightly softens the tooth surface. Curing heat converts this monomer to a solid and polymerizes the tooth. This is the principle cause of difficulty in polishing plastic tooth cases. Time spent cleaning the case before flasking is well rewarded.

WAXING OF THE TRIAL DENTURE

Wax-up: It must be stressed that a careful wax-up saves much time in the final finishing of the case. The most important factor in the wax-up is that all the wax is removed from the teeth and that the trial denture appears identical to the proposed finished denture in every detail. The similarity between the trial denture and finished denture will be accomplished with the proper wax contouring.

The interproximals should be carefully waxed full and smooth to simulate the contour of the gingiva (Fig. 61). This is especially important in order to avoid extensive pumicing in that area during the finishing procedure. Having rough areas in the wax-up may damage the labial anatomy of the teeth if extensive pumicing is needed.
Remove the wax from the teeth to follow the junction between the collar and the crown. Create a clean gingival line for each tooth. The wax edge of the gingival line should be 1 mm thickness on the facial and lingual surfaces (Fig. 61).

After the wax-up has been carefully smoothed with the instruments (figs. 61 & 62) and light flaming, rub the wax surfaces with cotton and cold soapy water to chill the wax surfaces. The teeth may be gone over with a Q-tip slightly moistened with *Justi Wax Solvent No. 20*. Good results may be obtained by applying the solvent to the teeth with a soft brush and gently stroking toward the wax surfaces. Wash the wax-up, and polish again using cotton and soapy cold water (Fig. 63).
After the waxing has been completed and the teeth have been cleaned, return the denture to the articulator and check the occlusion. If there has been any movement of the teeth it can destroy the balanced occlusion of the prosthesis. Ensure that the alignment of the teeth are correct (Fig. 64).

Note: The retention of the denture is directly related to the way the denture contours were waxed and how the polished surfaces were finished. The tongue, lips, and cheeks must adapt closely to the denture. This will prevent any breakage of the denture seal, preventing air from entering between the oral tissues and the denture.

Once the dentist is satisfied with the function and aesthetics, the dentures are ready to be flasked.
JUSTI MIRACLE FLASK SYSTEM

For the microwave irradiation technique

Flasking of dentures: Sectional molds are used to invest the trial denture. The wax will be eliminated from the flask, and the molding will be used to compress and process acrylic for the fabrication of the prosthetic appliance.

MAJOR ADVANTAGES

1. More accurate and dimensionally stable prosthesis.
2. Uniform curing of the acrylic resin.
3. Rapid process
4. Complete curing of the acrylic resin with no significant free monomer residuals.
5. Clean removal method without damage to flask.
6. Reduced energy costs.
7. Expedient service.

Following a preliminary research study of this technique compared to a conventional heat curing method, Dr. William J. Pagan, a prosthodontist with the Veterans Administration, developed the new standardized technique. He and a team of researchers from UCLA found that the curing of acrylic resins is more accurate, and more dimensionally stable than the conventional heat curing methods.

INVESTING

1. The Justi Miracle Flask needs no separating agent. Investment will not adhere to its smooth surface.

2. A 50% mixture of stone and plaster is recommended. Justi Imperial teeth should be flaked with a high-grade, fine-grade denture investment. It is especially important that the investment be carefully painted into the interproximal spaces to eliminate the possibility of trapping air bubbles.

3. Use the standardized method of investing.
Half-flasking the denture: Half fill the lower section of the flask with the investment mixture of half plaster and half stone. Place the cast with the waxed denture into the section until the cast touches the bottom of the flask (Fig. 65). Tilt the labial portions of the alveolar ridge up slightly to facilitate separation of the top half of the flask (Fig. 66).

Fig. 65. Cast properly seated.

Fig. 66. Half-flasking waxed denture.
Smooth the plaster between the land areas of the cast and the inner edges of the flask. Clean the outer edges of the flask of excess investment. Wait for the investment to set, then paint with a separating medium to prevent the investment of the upper half from adhering to the lower half.

Prepare the investment mix to be used in the upper half of the flasking. Be sure to rub some investment into the interproximals of the teeth to eliminate air bubbles. Position the upper half of the flask into place and vibrate the investment over the denture until the top of the teeth are covered. Use your finger to expose the occlusal surfaces of the teeth and feather the investment to the top, inner edge of the flask (Fig. 67).

![Fig. 67. Cross section of the flask.](image)

After the second flask mix has been smoothed to the inner edges, place a single sheet of tissue on the wet investment and pour in the remaining mixture. The flask must be completely filled. Place the cover of the flask and press down until there is complete contact with the rim of the body. Use the wrench and tighten one quarter turn. Let the investment set until it passes the “heat stage.”

**Wax elimination:** After the investment has completely set, remove the bolts from the *Justi Miracle Flask*. The wax is softened for removal by placing the *Justi Miracle Flask* in the microwave oven, and irradiated for 1 minute at HIGH setting (500 watts). Open the flask and extract the softened wax. Then proceed with the conventional method for complete removal of wax. All the teeth should remain in the upper half of the mold. If any teeth have been pulled loose or washed from their position, set them aside until the remaining wax and residue has been flushed away with boiling water that has had detergent added. Use the *Justi Wax Solvent No. 20* to clean the separated teeth, and the teeth in the investment. Flush the lower half of the flask thoroughly of the remaining wax and residue. Use clean, boiling water to remove all the solvent and detergent from the teeth and flasks. Place the flasks on their side and allow them to dry. While the flasks are still hot, use a soft paint brush to apply a coat of liquid foil substitute to the investment.
Be careful not to let the separator pool around the teeth. Allow the separator to dry. Apply a second coat to ensure that the acrylic doesn’t get absorbed into the investment during the processing. This procedure will produce a smooth, and shiny surface onto which the acrylic can be packed.

**Packing the acrylic resin:** Mix *Justi Denture Base Material* using a ratio of 3 parts powder and 1 part liquid to form a dough like consistency. The polymer powder should be poured slowly into the liquid and thoroughly mixed to avoid streaking of the pigmentation. After the mix has the right consistency, the dough is placed between 2 sheets of cellophane or polythene, and rotated to form a roll. Flatten the roll to about a 1/4 inch thickness and cut pieces about the length of the flanges and shape of the palate. Pick up the pieces with the cellophane so as not to contaminate the acrylic, and position them into the mold. Cover the acrylic with a sheet of cellophane and place the two halves of the flask together. The denture material will have enough monomer present to prepare the teeth for bonding. Under pressure, the acrylic will flow freely into all the crevices of the mold. The acrylic will set up at the same rate as the material in the mixing jar. This will assure a dense and porosity-free case after adequate trial packing. Open the flask and remove the excess resin. Be sure that the denture borders are clean. Add an additional amount of acrylic to the areas of the denture that seem deficient and repeat the packing procedure. This is done until the mold is filled sufficiently. Compression should be built up gradually using a minimum of 3 trial packs before finally closing the flasks for the denture processing.

To determine whether the acrylic is still usable or beyond the packing stage, pull a piece of the material in half, then press them together between the thumb and forefinger. If the acrylic molds together, the material is useable. Otherwise, the acrylic should be discarded. Remember that the slightest discrepancies in the closure of the two halves of the flask will cause occlusal errors in the cured case. After the final pack, while the flask is still in the press, insert the bolts. Fasten the nuts with finger pressure. Remove the flask from the press and complete the tightening of the bolts with the wrench 1/4 turn. (Note: excessive torque on the nuts may damage the bolts.) Allow the case to bench set for 20 to 30 minutes to equalize the pressure before curing. Process 1 flask at a time in the microwave oven. Place the flask vertically in the center of the turn table, and close the door.

**SETTING THE CONTROLS AND CURING**

1. The first stage: Set the time for 13 minutes. Set the power to LOW (90 watts).
2. The second stage: Set the time for 1 1/2 minutes. Set the power to HIGH (500 watts).
3. After setting the time and power settings, press the START button. The denture will cure automatically in 14 1/2 minutes.
COOLING

4. After the curing has been completed, remove the flask from the oven and allow to bench cool for no less than 30 minutes or until the case has completely cooled.

CAUTIONS

5. The microwave oven should not exceed 500 watts output, and should include a warm level of 86 to 90 watts.

6. The oven should be designated for curing denture resin only. Do not use for cooking food.

7. Keep the oven clean at all times. Place paper towels under the flask while curing the case.

8. When applying pressure to the flask, the top cover must always be up. Place the flask in the press so that at least two nuts can be tightened to the bolts. The third nut may be tightened to the bolt once the flask has been removed from the press.

9. Excess investment and denture resin must be removed from each section of the flask in order to insure proper closure.

10. The Justi Miracle Flask is constructed of a fiber reinforced plastic (FRP) with more than 2 1/2 times the strength required for the designated process. Care should be taken not to drop the flask. Do not over tighten the nuts to the bolts. Do not tap the flask with anything other than a wooden or leather mallet.

11. Inscribe each section of the flask with the same number or code to avoid interchanging flask parts.

12. Keep a supply of nuts and bolts on hand in case of breakage or loss.

DEFLASKING AND FINISHING

If the waxing has been carefully done, the investment should break clean from around the necks of the teeth and interproximal spaces (Fig. 68). In many cases, undercuts can mechanically lock a margin of plaster around the gingival margins of the teeth. To avoid adherence to the teeth, try to remove the investment casing while it is still damp from the curing.
Occasionally a thin film of plaster will adhere to the necks of the teeth. This is easily removed with a soft Abbott Brush Wheel impregnated with Justi Milling And Polishing Cream (Fig. 69).
DENTURE FLASKING

Traditional Curing Techniques

The flasking of denture cases by the traditional method is accomplished with a metal sectional ejector type flask. The trial denture is invested into the flask to create a mold of the denture. The case should be set in the flask prior to an investment to determine if the case is too high. If the teeth extend past the metal rim of the top half of the flask, carefully reduce the base of the model by using a model trimmer. The denture teeth have to be positioned below the top of the rim, enough to be able to secure the metal lid of the flask.

Note: The index keys of the model will have to be inscribed again and remounted to the articulator. This is a very important step if the casts have been reduced to fit into the flask correctly. Otherwise after processing, remounting the case back to the original articulator indexes will not be possible. The land areas of the cast should be flush with the lower section of the flask rim (Fig. 70). This will protect the case from breaking during separation of the two halves. A proper reduction of the angle at the heel of the retromolar pad area is needed to protect the cast during separation of the two halves (Fig. 71).

Fig. 70. Half flasking of a maxillary case.
Before you start:

1. Check the flask for matching serial numbers.
2. Check the height of the case in the flask. There should be a clearance of 6 mm between the flask cover and the edges of the teeth.
3. Index grooves are needed for the remounting procedure.
4. Lubricate the sections of the flask with petroleum jelly.

LABORATORY REMOUNTING OF THE DENTURE

Before removing the dentures from their casts, reposition the dentures on the articulator with the original plaster mountings. Sticky wax may be used to hold the casts in position. Lock the condylar elements in centric relation and bring the dentures together. If the incisal pin does not touch the incisal guide table, the vertical dimension has been compromised. By using the laboratory remount procedures, the occlusal vertical dimension may be corrected with selective grinding (Fig. 72). If the incisal pin doesn't touch the guide table, the case may have been under packed, and excessive shrinkage has occurred (Fig. 73).
Selective grinding: It is best to spot-grind the Justi Imperial teeth with fine carborundum wheels, stones, and burs (Fig. 74). After the corrections, carefully pumice the teeth with a No. 20 brush wheel using the slow speed of the lathe. Use a cake or liquid polishing medium to bring back the occlusal surfaces to their full luster.
Fig. 74. Markings from the articulation paper.

Once the occlusal vertical dimension has been corrected, the following rules should be adhered to:

1. Do not grind on the maxillary lingual cusps.
2. Do not grind on the mandibular buccal cusps.
3. Grind in the fossae of any tooth.

If there has been considerable flattening of the cusps, and obliteration of the anatomy has occurred, the occlusal surfaces may be recontoured with burs and stones to their original anatomic contour. This should be done before pumicing and polishing the occlusal surfaces of the teeth (Fig. 75). Milling of the *Justi Imperial* teeth should be done with *Justi Milling And Polishing Cream*. This all purpose abrasive cream has been especially developed for the milling and finishing of the *Justi Imperial* hardened plastic teeth. A carborundum paste is not effective for this purpose. A finer and more active abrasive has been found necessary for use on these hardened teeth. Brush polished teeth lightly with a new No.20 brush and fine flour pumice. Then shine, using a new No. 20 brush, with cake or liquid shining medium. Buff teeth with a clean dry rag wheel on the slow speed of the lathe (Fig. 76).

**CAUTION:** Do not compromise the integrity of the teeth. It is very easy to polish away the lingual cusps of the posteriors.
FINISHING THE DENTURE

All the excess acrylic that formed around the teeth, denture borders and surfaces during the processing are removed, and the original form of the denture is perfected. Great care must be given to insure that the finishing process is done carefully to protect the contour and borders of the denture. If the wax-up was done correctly for the try-in phase, there should be little finishing to do.

While the case was under pressure, excess acrylic resin was forced between the two halves of the flask. Remove this material with a coarse 3/4 inch Arbor Band. Set the speed of the lathe to low and press the flash to the outline of the denture (Fig. 77).
If water was left around the teeth when the wax-up was invested, acrylic bubbles will be formed next to the teeth. These bubbles, and any bits of stone caught interproximally, are removed with a sharp pick (Fig. 78).

![Fig. 77. Remove the flash with an Arbor Band.](image)

![Fig. 78. Remove bubbles and stone with a sharp pick.](image)

Polishing the denture: All scratches and discrepancies that are left after the removal of the flash and contour corrections are removed by a progressive use of abrasives. Use a damp muslin buffing wheel and wet pumice.

Note: It is very easy to catch the appliance on the wheel and have it jerked from your hand. Run the lathe on the low speed to polish the surfaces of the denture. Felt cones and small cloth wheels may be used to pumice areas that are inaccessible. Keep the surfaces wet and avoid drying out the area of the denture that is being polished. After the polishing has been completed, wash off the pumice with soap and water. Inspect the case for scratches. Use a dry cloth wheel lightly coated with ‘Tripoli’ and buff the surfaces of
the appliance. Next use a luster to bring out the high shine of the acrylic. Wash off the denture with soap and cool water. Dry the case for final inspection.

**INFECTION CONTROL**

A chemical germicide registered with the EPA as a “hospital disinfectant”, and labeled for “tuberculocidal” (i.e., mycobactericidal) activity is recommended for disinfecting appliances and surfaces that have been soiled with patient material. Laboratory personnel are to wash their hands before and after handling cases from the dentist (i.e., before glove placement, and after glove removal). Impression trays, bite registrations, fixed and removable prosthesis etc., will be cleaned and disinfected after being manipulated by the lab, and before placement in the patient’s mouth.
CHAPTER XI
OTHER USEFUL EDUCATIONAL MATERIALS FROM JUSTI

Tools for Dental Professionals from the Justi Educational Department for use by Schools of Dental Laboratory Technology, Schools of Dental Assisting, Dental Hygiene and many other Dental Professionals.

Technician’s Manuals

A “must” for professional dental technicians
These comprehensive manuals are for technicians who want to study various fabrication procedures used in the dental lab, and the basic sciences needed to successfully communicate with dentists. They are also recommended for technicians who are preparing to take the certification examinations. They are written by U.S. Air Force Dental Laboratory Instructors.

Justi® Papilla Gauge

Denture Measuring Device
The permanent position of the papilla can provide great diagnostic value in reproducing tooth position in the construction of a denture. A measuring device that uses this landmark will record, with accuracy, the horizontal and vertical plane to define the position of the incisal edges and the central incisors. These measurements can be recorded, along with the mold and shade, on the patient’s records for present or future application.
Artificial Mold Selector Guide

A Total Tooth Selecting System
A unique and comprehensive slide chart, which was designed to aid the dental and laboratory professional in the selection of specific Justi tooth molds. It also allows you to set up a denture or partial case with 100% assurance of accuracy in your mold selection. This one-of-a-kind tool was designed and patented by Justi. No dental professional should be without one!
U.S. Patent #5,821,509.

Justi® Pocket Lens

Details, details, details!
You’ll love how clearly details can be seen with our new Pocket Lens. The applications around your lab or dental office are limitless.

Technician’s Utility Ruler

The Justi Technician’s Utility Ruler will aid the technician in the most common situations: Fabrication of occlusal rims, verification of the maxillary central incisor position, determination of normal or cross-bite situations, determination of posterior molds, measuring for the six anterior teeth and related information. Comes complete with instructions for use.

Justi® Utility Template

The Justi Utility Template is a quality stainless occlusal plane guide tool specifically designed for the needs of today’s productive technicians for tooth set-up and occlusal bite rim fabrication. A guide relation of 80 degree angled sides are calibrated with a millimeter rule guide measuring 0 to 70 mm with markings at 18 and 22 mm.

Justi® Caliper

This compass style measuring device can be used for measuring parameter landmarks on a working model or facial dimensions to aid in determining tooth mold selection.

Justi® Crown Gauge

A traditional stainless crown caliper which can also be used for measuring the palatal or buccal flange thickness on an acrylic denture base. It measures in 1/10 mm increments up to 10 mm.
Anatomical/Educational Tooth Model

A large resin, two rooted molar approximately 8” tall. Depicts decay into enamel, dentin and pulp. The beginning and progression of decay resulting in an abscess. Includes a removable crown which reveals a molar crown prep.

Anatomical Study Models

The anatomical study model is perfect for patient education. The crystal clear model shows each tooth in its entirety and its relationship to the rest of the dentition. Each individual tooth may be removed by the Doctor to explain treatment to the patient. The patented Vertex hinge guarantees a lifetime of use with these models.

The Anatomical Orthodontic Study model was not made showing ideal dentition, allowing the practitioner to show the patient some of the common recommendations for treatment.

Denterms - Dental Dictionary

Terminology for the Dental Team

A glossary of dental terminology slanted toward those terms associated with prosthetic dentistry. Much of the “language of dentistry” is defined, keeping in mind that the reader is new to the field. For use by schools of dental laboratory technology, schools of dental assisting, dental hygiene and by many others interested in dental health who seek a basic knowledge of dental anatomy.

THE JUSTI EDUCATIONAL CENTER

The Justi Educational Center is now offering laboratory courses providing the latest Advanced Laboratory Technology (ALT) in principles, practices and concepts in dental laboratory technology. Perfect for the motivated technician who wants to improve his skills in the fabrication of full and partial dentures incorporating bioaesthetics and function from a dental prescription prepared by the dentist.

For class schedule information, contact the Justi Educational Center at (805) 487-9868.
REFERENCES CITED

*Glossary of Prosthodontic Terms* (GPT 7, 1999) - From APF - Mosby

Any missing references are unintentional.
Notes