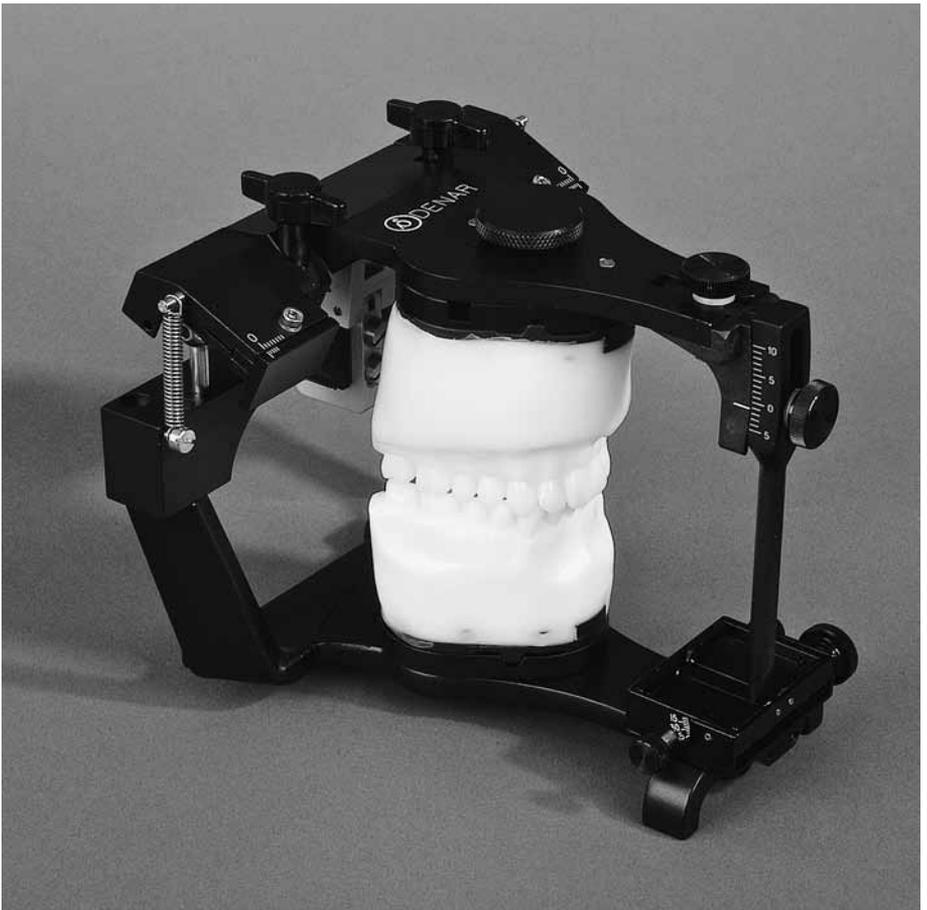




The Denar[®] Mark II System

TECHNIQUE MANUAL



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ACKNOWLEDGEMENTS

The Mark II System was developed to fill a need that existed primarily in dental schools, but also among practicing dentists and laboratory technicians. The Schools of Dentistry expressed a desire for an effective teaching system that was competitively priced. Practicing dentists and technicians expressed a need for a simple Arcon articulator that was anatomically accurate which could be used for simple restorative procedures and to mount diagnostic casts when illustrating occluso-condylar relations to patients for case presentations. There was also a need for an instrument system offering an intermediary step to the incorporation of the principles of occlusion as well as one offering upward potential to more advanced systems.

We set these needs as our objectives and proceeded to accomplish the task with the help of many professionals who provided us with both direction and assistance for which we are most grateful.

Doctors Rex Ingraham, Patrick M. Walker, Donald C. Curntte, Albert Solnit, Howard M. Landesman, Glen D. Richardson, all at the University of Southern California, gave us extremely valuable inputs with respect to the needs of the undergraduate students. We are indebted to them particularly for their constructive criticism, even though painful at the time.

A special word of appreciation is expressed to Doctors Sumiya Hobo and Frank V. Celenza for their contributions in the early design phases of the instrumentation system.

In planning the preparation of the Mark II Technique Manual, it was our intent that it encompass more than just mechanical instruction in the use of the Denar® Mark II System. We wanted to offer more by also providing related instruction in the theory of occlusion as it directly pertains to the use of the instrument. Special credit must go to Dr. Niles F. Guichet for his contributions and the time he spent working with us, particularly in view of the demands of his teaching schedule.

We wish to acknowledge the direction and wisdom that we received from Doctors L. D. Pankey, Loren Miller, Henry Tanner, James Zuccarella, Mel Steinberg, and Mr. Jack Snyder, of the Pankey Institute, with respect to how the system can be used by practitioners wishing to render quality dentistry through the incorporation of the principles of occlusion. A great deal of encouragement in this area was also received from Dr. Peter E. Dawson to whom we are equally grateful.

To insure the System's compliance with the purest theories of gnathology we are most indebted to Dr. Peter K. Thomas. He made what seems like "impossible demands" to arrive at perfection. Fortunately, his toughness was matched with a great deal of patience.

Through the development phases many different opinions were expressed, but there was at all times one common goal: to provide dentistry with a quality occlusal instrumentation system. We believe we accomplished this goal. This feat took the efforts, contributions, dedication and assistance of many more people not mentioned, and to all of them as well: we are very grateful.

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IMPORTANT

Your Denar® Mark II Articulator and Facebow/Earbow are precision instruments manufactured to precise tolerances and designed to give you years of troublefree service. Like all precision instruments they must be handled carefully to avoid damage. A thorough study of the information contained in this instruction manual will insure you of the benefits which these instruments offer.

DO NOT ADJUST the factory adjustment screws illustrated in figure 2A. They are for factory use only. Adjustment of these screws in the field can alter the instrument's operation and may require factory repair.

Also the microadjustable adjustment lockscrews illustrated in figure 2B are used to calibrate the centric relation position of your Mark II articulator to tolerances of plus or minus one thousandths of an inch from the factory reference position. Adjustment of these screws can alter the precise factory alignment of your articulator. Do not modify the setting of these adjustment screws. These microadjustment screws should only be used in conjunction with a Denar®/Hanau™ Verification Gage to calibrate your articulator.

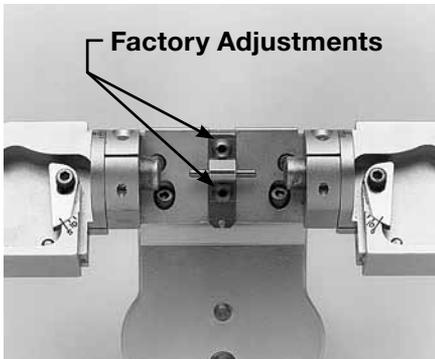


fig. 2A



fig. 2B

I. INTRODUCTION

WHO SHOULD USE THE DENAR® MARK II SYSTEM

DOCTORS WHO WANT:

- To mount casts *quickly and easily* on a semi-adjustable instrument that mechanically and accurately reproduces mandibular movements.
- To produce restorations by means of *checkbite records* and/or the *functionally generated path* (FGP) techniques.
- A useful tool for *diagnosis* and for the fabrication of restorations when not utilizing a pantograph and fully adjustable articulator.
- A semi-adjustable articulator with the *immediate side shift* adjustment capability.
- Casts mounted on a very *rigid articulator* in the position of maximum intercuspation.
- To incorporate the benefits of the *Denar® Two Instrument System*.

TECHNICIANS WHO WANT:

- A *practical, rigid and easy to use articulator*.
- To efficiently produce restorations that require fewer remakes than restorations constructed on articulators of lesser adjustment capability.
- To *receive mounted casts*.
- To service dentists using the *Denar® Two-Instrument System*.

EDUCATORS WHO WANT:

- An *economically priced* articulator and facebow for student issue without violating sound anatomical principles.
- Occlusal instruments that fulfill *the needs of all restorative departments*.
- To *avoid the need for the student having a separate articulator* for each restoration under construction.

STUDENTS WHO WANT:

- To *study Occlusion* and the movement of the temporomandibular joint.
- A means of *progressing to a fully adjustable articulator and pantograph*.

WHY SHOULD THE MARK II SYSTEM BE USED

Simple and Practical to Use

The Denar® Mark II Articulator and Facebow System enables the user to *quickly* and *easily* mount casts of a patient's teeth on an instrument that is both an equivalent of their natural relationship and which also can be mechanically programmed to simulate the mandibular movements of the patient. To accomplish this mechanical equivalence, the Mark II articulator has adjustment capability to duplicate the more clinically significant movements of the mandible. Those condylar paths of movement of lesser clinical significance have not been ignored, but instead, are constructed to average anatomic dimensions.

Accurate Diagnostic and Treatment System

The Mark II System is a particularly useful tool for the diagnosis and for the fabrication of restorations when not utilizing a pantograph and fully adjustable articulator. The simplicity and accuracy with which the system may be used enables the user to produce precision occlusal restorations that require significantly less in the mouth modifications than restorations constructed on articulators of lesser adjustment capability.

Excellent Learning Tool

The Mark II System is built around sound principles of human anatomy and is consequently ideal for study of TMJ characteristics and theories of occlusion. Understanding this system facilitates progress to a fully adjustable articulator as the movements and adjustments are the same.

Constructed with Clinically Needed Features

The Mark II System is easy to use. The articulator is rigid with a very positive centric lock. It is of the Arcon construction with the back designed for maximum lingual visibility to the casts. The upper and lower bows come apart and lock together in the open and closed positions (no rubber bands needed). The articulator can be placed level in the upside down position for mounting the casts without the need of a plastering stand. The facebow sidearms are independently adjustable and can be located to either the hinge axis or the external auditory meatus (opening) of the ears.

Economical

The Mark II Articulator which is competitively priced is also *two instruments in one*. Not only is it a semiadjustable articulator with the features described above, but also because of the micrometer adjustments in the condylar areas, the condyles can be adjusted three dimensionally with the Denar® Verification Gage to tolerances of plus or minus .001 inches (.025 mm) which allows transfer of the mounted casts to other Denar® articulators. This feature reduces the need for a separate articulator for every restoration under construction.

II. THE DENAR® MARK II ARTICULATOR

In order to be proficient in the use of the articulator to diagnose condylar paths of movement and to fabricate occlusal restorations, the operator must have knowledge of:

- The articulator condylar controls and how to adjust them.
- The proper hand grasps for manipulating the articulator through its excursive movements.

In this section of this manual we will first discuss the simple procedure of how to open and close the articulator properly and how to operate the centric latch. Secondly we will discuss the location of the articulator condylar controls and how to adjust them. Lastly we will cover the proper hand grasps for manipulating the articulator through its excursive movements. How to adjust the articulator to checkbite records is discussed in another section of this manual.

ARTICULATOR MANIPULATIONS

To assemble the articulator hold the upper bow approximately parallel to the lower bow and simply place it on the lower bow.

Centric Latch Operation

When the articulator is closed it can be locked in the centric position by pushing the centric latch to the down position. The centric latch is opened by placing the index finger on the trigger located underneath the center of the crossbar of the lower bow and by placing the thumb on top of the upper bow (fig. 3). Next apply pressure with the index finger; it must be released by the trigger. When the centric latch is open the upper bow can be removed from the lower bow by lifting it vertically while maintaining the upper bow parallel to the lower bow.

To Open the Articulator

Apply downward pressure to the top of the upper bow over the centric latch and fossa assemblies with the heel of the palm of the left hand and simply open the articulator. The opening movement of the articulator automatically engages the centric latch and locks it (fig. 4).

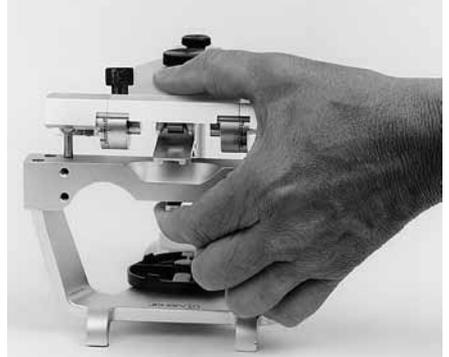


fig. 3



fig. 4

To Lock in the Open Position

When the articulator is opened, the upper bow can be moved downward toward the lower bow so that the condyles move forward in their fossae to engage the lock open position (fig. 5).

To Close the Articulator

To close the articulator move the upper bow up and forward to disengage the lock-open position and close the articulator (fig. 6).

ARTICULATOR ADJUSTMENTS

The articulator is a mechanical equivalent of the lower half of the head— a mechanical jaw so to speak. In order to discuss the adjustments of the articulator or specifically the fossa controls, it would be helpful to discuss the condylar paths of movement of the human mandible. In a lateral mandibular movement the condyle on the side toward which the mandible moves is termed the rotating condyle (fig. 7). The condyle on the side opposite the side towards which the mandible moves is termed the orbiting condyle.



fig. 5

In a lateral mandibular movement the orbiting condyle moves inward, downward and forward and orbits about the rotating condyle which is simultaneously rotating and moving outward during the mandibular side shift.

orbiting path - the path of movement of the orbiting condyle.

rotating path - the path of movement of the rotating condyle.

protrusive path - the path of movement of the condyle in a straight protrusive movement.

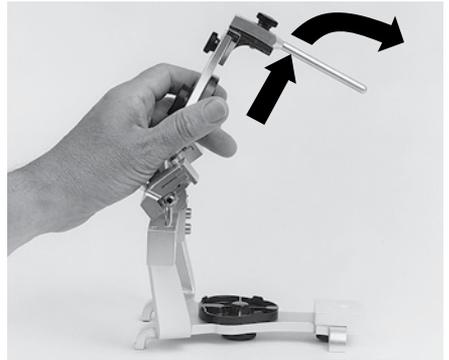


fig. 6

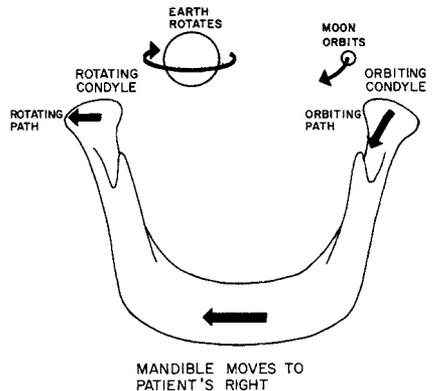


fig. 7

Protrusive Adjustments

The inclination of the protrusive condylar path can be adjusted by loosening the protrusive adjustment lock screw. The protrusive condylar path inclination scale is below the protrusive adjustment lock screw and is calibrated in increments of 5 degrees (fig. 8).

Immediate Side Shift Adjustment

The medial fossa wall can be displaced straight medially by means of the immediate side shift adjustment. The scale for the immediate side shift adjustment is lateral to the adjustment lock screw on top of the fossa (fig. 9). The scale is a Vernier scale calibrated in .2 millimeter increments. The scale reads medialward from its lateral extremity. The index in fig. 10 indicates an immediate side shift setting which is more than 0 but less than 1 full millimeter. By reading the Vernier scale on the lower portion of the scale medialward from the index it can be determined that the immediate side shift is .6 of a millimeter since it is the third graduation that lines up with a millimeter graduation on the upper portion of the scale.

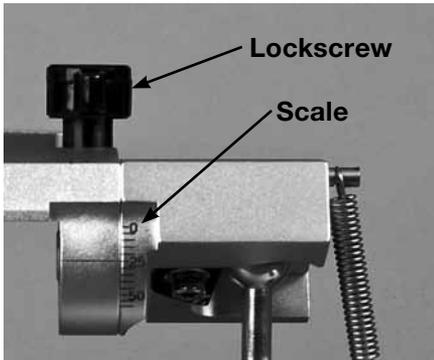


fig. 8

Progressive Side Shift Adjustment

The angle of inclination of the medial fossa wall to the sagittal plane be adjusted by loosening the progressive side shift adjustment lock screw and moving the insert from 5 to 15 degrees. The scale for the progressive side shift adjustment is anterior to the adjustment lock screw and is calibrated in 5 degree increments. (fig. 11).

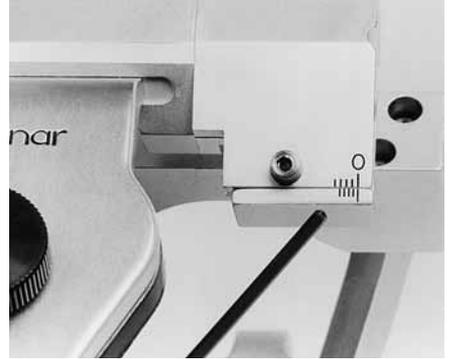


fig. 9



fig. 10

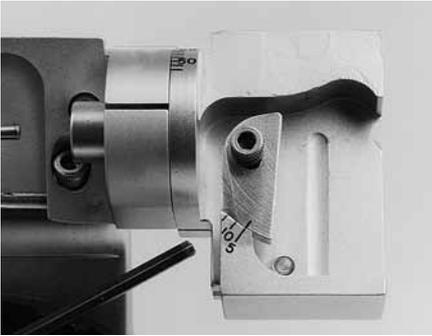


fig. 11

Rear Wall Inclination

The posterior fossa wall of the Mark II Articulator is nonadjustable but is constructed to average anatomic dimensions. It is inclined posteriorly 25 degrees to allow for a backward movement of the rotating condyle as it moves outward (fig. 12).

HAND GRASPS

To use the articulator properly the operator must master the proper hand grasps. A right handed operator curls the fingers of the left hand under the mandibular crossbar and places his left thumb on top of the upper bow (fig. 13). To effect both left and right lateral excursive movements the left thumb guides the back of the upper bow while the forefinger and thumb of the right hand holds the incisal pin moving it in the desired direction. These hand grasps can be best described as the underhand push-pull grasps and the underhand protrusive grasps. In order to execute lateral movements the centric latch must be open.

Underhand Push Grasps

To effect a right lateral mandibular movement be sure the latch is open and move the upper bow to the left. (The left side of the articulator is the left side of the instrument as it is viewed from the rear.) Pressure is applied with the left thumb to insure the left orbiting condyle maintains contact with its superior and medial fossa walls and the right rotating condyle maintains contact with its superior and rear fossa walls (fig. 13).

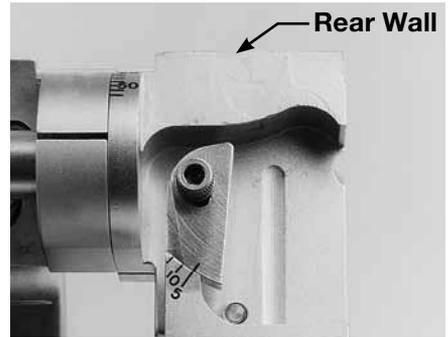


fig. 12

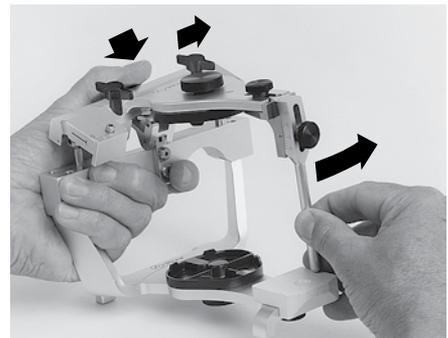


fig. 13

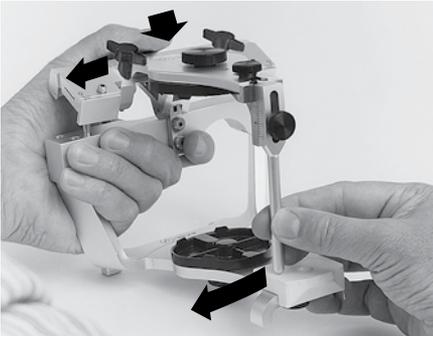


fig. 14

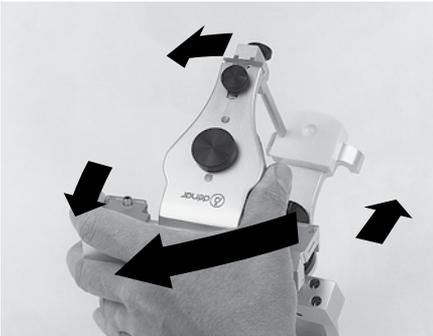


fig. 15

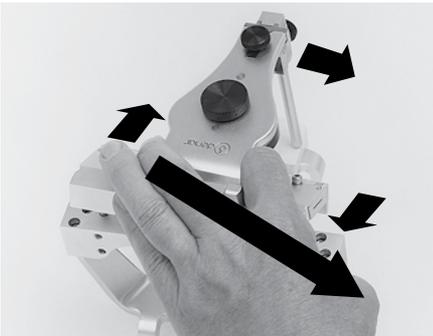


fig. 16

Underhand Pull Grasps

To effect a left lateral mandibular movement the upper bow is moved to the right and pressure is applied with the left thumb to insure that the right orbiting condyle maintains contact with its superior and medial fossa walls and the left rotating condyle maintains contact with its superior and rear fossa walls (fig. 14).

Underhand Protrusive Grasps (Protrusive Push Grasp)

To effect a straight protrusive movement the upper bow is moved straight posteriorly with the right hand and the left thumb is used to apply downward pressure on the back of the upper bow so that the condyles maintain contact with their superior fossa walls.

The overhand grasps as contrasted from the underhand grasps are also useful in manipulating the articulator and are required to efficiently set a fully adjustable articulator to a pantographic record. Figure 15 illustrates the *Overhand Push Grasp*; fig. 16 the *Overhand Pull Grasp*, and fig. 17 the *Overhand Protrusive Grasp*. When employing the overhand grasps to manipulate the articulator be sure to apply pressure to the back of the articulator to insure that the condyles maintain contact with their respective fossa bearing surfaces.

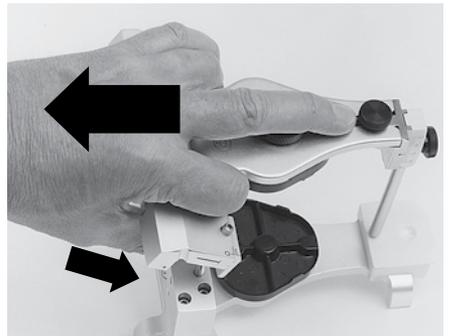


fig. 17

III. RELATING CONDYLAR MOVEMENTS TO OCCLUSAL ANATOMY

The Denar® Mark II Articulator is of the Arcon construction; i.e., the condyles are attached to mandibular bow and the fossa assemblies are fixed to the maxillary bow. This construction which is a facsimile of the anatomical structures, enables the articulator to more accurately simulate condylar paths of movement. In addition this construction makes it easy to understand the relation of condylar paths of movement to occlusal anatomy.

An understanding of the relationships which exist between condylar paths of movement and occlusal anatomy is an invaluable aid in the use of an articulator for diagnosis and treatment. The following exercises which utilize the articulator as a teaching method are helpful to enable you to quickly understand these relationships.

Set the left immediate side shift adjustment to 1 millimeter and left progressive side shift adjustment to 15 degrees. By observing the articulator movements from the back of the articulator it is easy to understand why the *immediate* and *progressive* side shifts are so named (fig. 18). Hold the articulator in centric relation. Since the left medial fossa wall is set to permit a one millimeter immediate side shift, centric relation is achieved when the right condyle touches its medial fossa wall.

Move the articulator in a right lateral mandibular movement until the left orbiting condyle contacts its medial fossa wall and note that the rotating condyle and mandible move *immediately* to the right. As you continue the right lateral mandibular movement the orbiting condyle move downward, forward and inward. Note that during this movement of the orbiting condyle the rotating con-

dyle and mandible move progressively more to the right as the orbiting condyle advances. Repeat this articulator movement and note that the rotating condyle moves *immediately* to the right and then *progressively* more to the right as the orbiting condyle advances.

mandibular side shift (Bennett Shift): the bodily side shift of the mandible which occurs during a lateral jaw movement.

immediate side shift: a mandibular side shift in which the orbiting condyle moves essentially straight medially as it leaves centric relation.

progressive side shift: a mandibular side shift which occurs at a rate or amount which is directly proportional to the forward movement of the orbiting condyle.

By observing a right lateral mandibular movement from the front of the articulator you can see that the path of movement of the orbiting condyle (orbiting path) as it moves inward, downward and forward is guided by the superior, rear and medial fossa walls (fig 19). This condylar path of movement is associated with and has its principal effect on the balancing inclines of cusps on the orbiting side (fig. 20B).

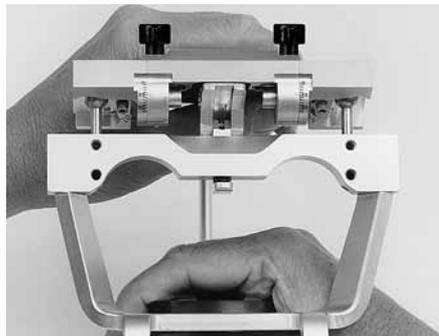


fig. 18

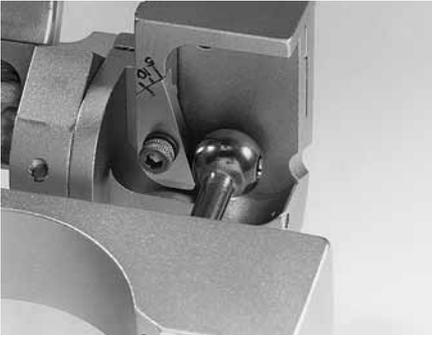


fig. 19

An increase of the progressive side shift movement of the articulator has an effect of flattening the balancing inclines of cusps on the orbiting side mediolaterally (fig. 22).

The closer a cuspal incline is to a condylar path of movement the greater is the influence that condylar control has on occlusal anatomy. Consequently due to the fact that the orbiting condyle is moving downward so rapidly as it moves forward, we observe that as we move more distally in the dental arches the lingual cusps of maxillary molars project increasingly downward and the buccal cusps of mandibular molars project increasingly upward to harmonize the occlusion to condylar paths of movements (fig 23).

Again by observing a right lateral condylar movement from the front of the articulator you can see that the path of movement of the rotating condyle (rotating path) as it moves outward is guided by the rear and top fossa walls (fig.24). This path of movement is most closely associated with and has its principle effect on the working inclines of cusps on the working side (fig. 20A).

The rotating condylar path may be inclined upward or downward as the rotating condyle moves outward. This upward and downward inclination of the rotating condylar path in the coronal plane has its principle influence on the height of the working inclines of posterior cusps on the rotating side (fig. 25). If the rotating condylar path is inclined upward the cusps must be flatter (fig. 25A). If the rotating condylar path is inclined downward the cusps may be steeper (fig. 25C). The Mark II Articulator cannot be adjusted to upward or downward movements of the rotating condyle.

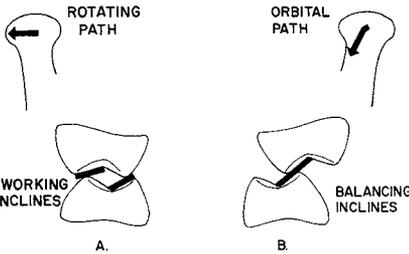


fig. 20

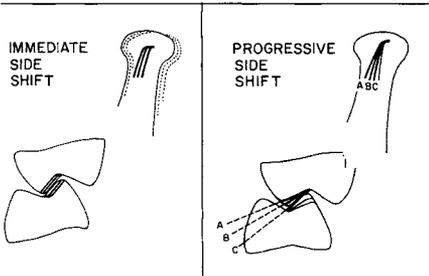


fig. 21

fig. 22

Three articulator adjustments establish the character of the orbiting path on the articulator: the immediate side shift adjustment, the progressive side shift adjustment and the protrusive inclination of the superior fossa wall.

An increase of the immediate side shift movement of the articulator has an effect of increasing the bucco-lingual dimension of the marginal ridge, fossa, or central groove of the tooth (fig.21).

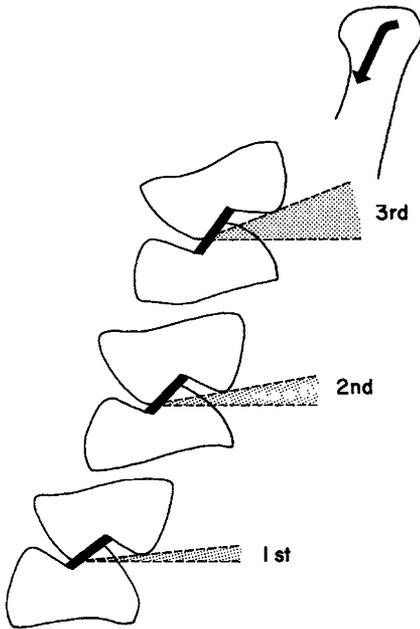


fig. 23

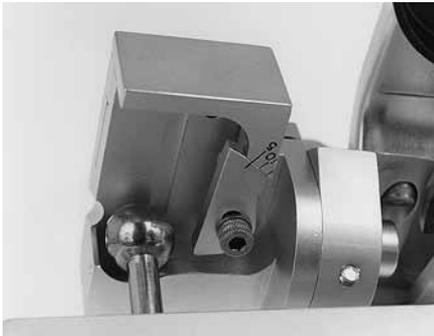


fig. 24

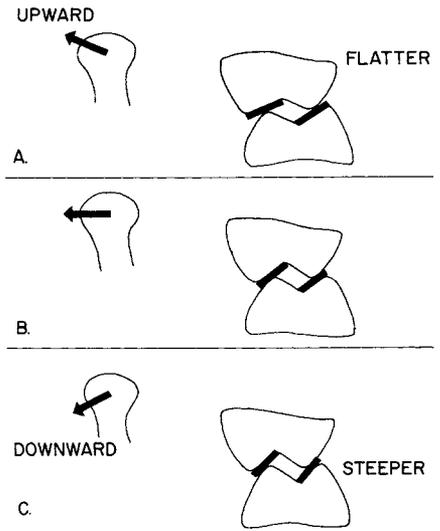


fig. 25

The rotating condylar path may be inclined forward or backward as the rotating condyle moves outward. This forward and backward inclination of the rotating condylar path in the horizontal plane has its principle effect on the intermeshing of the working inclines of cusps on the working side (ridge and groove direction).

The Denar® Mark II Semi-adjustable Articulator has the rotating condylar path reset to the average anatomic inclination (out and backward 25 degrees).

Figure 26A illustrates a frontal view of molar tooth relations in a right lateral mandibular movement. Although the rotating condyle moves straight outward, the functioning tooth inclines on the rotating side have a slight downward inclination due to the fact that the path of movement of the orbiting condyle is inclined remarkably downward.

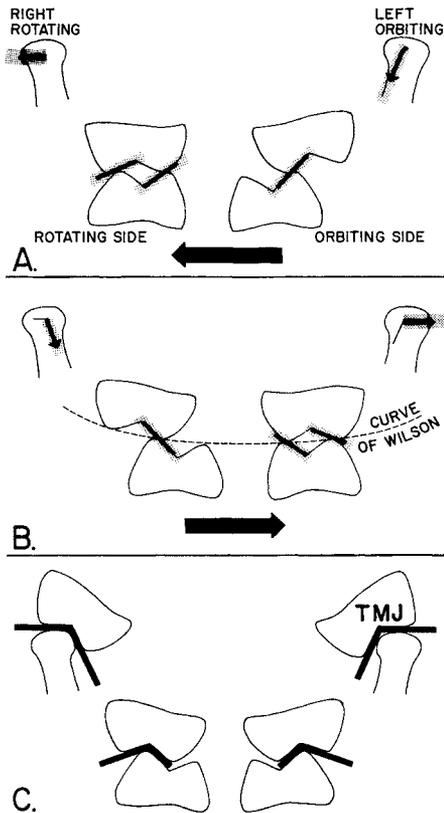


fig. 26

The closer the functioning tooth incline is to the condylar path of movement the more the tooth incline simulates that condylar path of movement. The interrelating tooth inclines on the orbiting side in figure 26A have steep inclines to complement the path of movement of the orbiting condyle.

Figure 26B illustrates a left lateral movement. Due to the fact that the left rotating condyle is moving straight outward the left maxillary buccal cusps must be kept short to allow the left mandibular buccal cusps to escape. It is this influence of the rotating and orbiting condylar paths on occlusal anatomy that establishes the Curve of Wilson. The

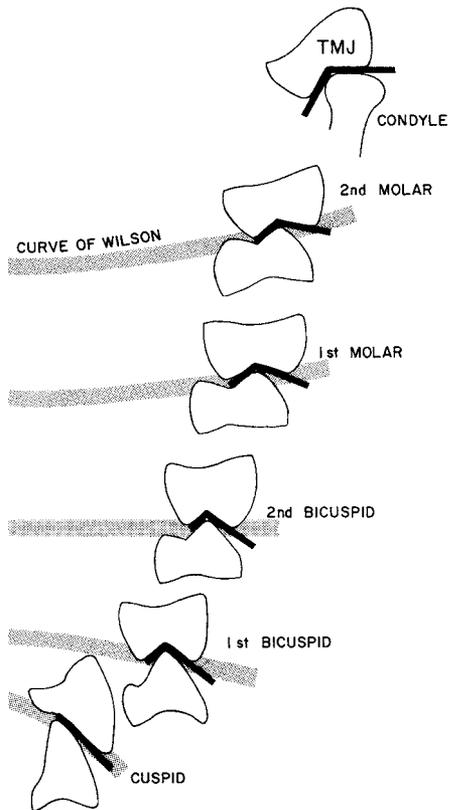


fig. 27

more posteriorly we progress in the dental arches the mandibular teeth take on a greater lingual inclination and the maxillary teeth take on a greater buccal inclination to harmonize occlusal anatomy to condylar paths of movement (fig. 27). The condyle tracks a path in its fossa just as a buccal cusp of a lower molar tracks a path in its fossa on the occlusal surface of an upper molar. For all practical purposes in the use of articulators to establish dental articulation, the temporomandibular joint can just be thought of as another tooth, the fourth molar – another anatomic control of jaw movement (figs. 26C and 27).

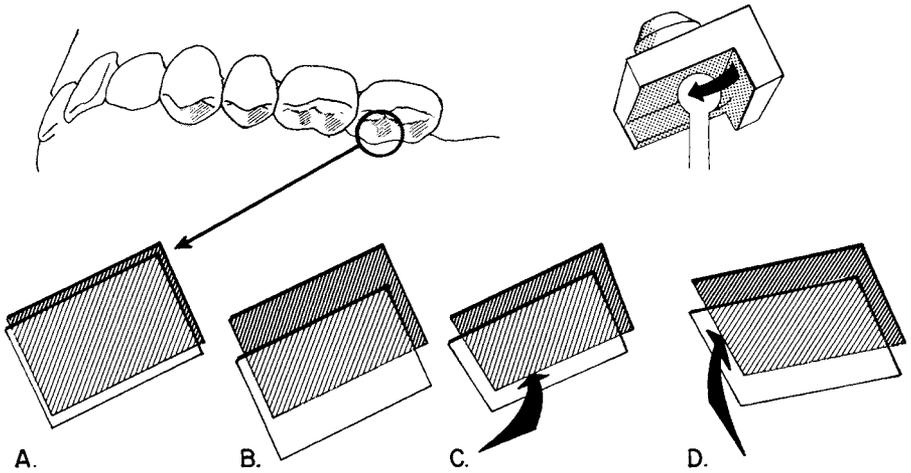


fig. 29

To facilitate a clear understanding of the relation of the orbiting condylar path to occlusal anatomy study fig. 28. Illustrated are the cuspal inclines of the left bicuspids and molars which are associated with the orbiting condylar path. It is the distal aspects of the maxillary lingual cusps' buccal inclines (shaded) which interrelate with the mandibular buccal cusps' lingual inclines, mesial aspects. In your mind's eye it is helpful to dissect out these cuspal inclines (fig. 28A) and visualize what influence a change in the character of the orbiting path on the articulator would have on these aspects of the cusps. Three artic-

ulator controls establish the character of the orbiting path on the articulator – the immediate side shift adjustment and the inclination of the medial and superior fossa walls. Increasing the immediate side shift adjustment on the articulator increases the clearance between these cuspal inclines (fig. 28B). Increasing the progressive side shift movement of the articulator (increasing the inclination of the medial fossa wall) flattens the cuspal inclines mediolaterally (fig. 28C). A decrease of the inclination of the superior fossa wall flattens the cuspal inclines antero-posteriorly (fig. 28D).

IV. THE IMMEDIATE AND PROGRESSIVE SIDE SHIFT ADJUSTMENT (Bennett Shift)

It should be noted that unlike most semi-adjustable articulators the Denar® Mark II Semi-adjustable Articulator has the capability of more accurately simulating the mandibular side shift (Bennett Shift) by more accurately simulating the component condylar movements: the immediate side shift and the progressive shift. The immediate side shift is expressed in units of tenths of a millimeter (fig. 29A). The progressive side shift is expressed in degrees (fig. 29B).

The immediate side shift of the mandible has primary influence on the width of the central groove of posterior teeth. The progressive side shift has its principal influence on the balancing inclines of posterior cusps on the orbiting side and on the direction of the ridges and grooves of posterior teeth, primarily on the orbiting side.

Figure 30 illustrates the protrusive, orbiting and rotating path records of the right and left temporomandibular joints of 50 patients (100 TMJ records).¹ The X and Y axes are calibrated in increments of 1 millimeter. You will note that the orbiting path is divided essentially into two components: immediate side shift and progressive side shift. Furthermore with few exceptions once the immediate side shift has occurred the progressive side shift records are approximately parallel to each other and are inclined approximately five to seven degrees to the sagittal plane. The biggest variable is the immediate side shift component of the orbiting path.

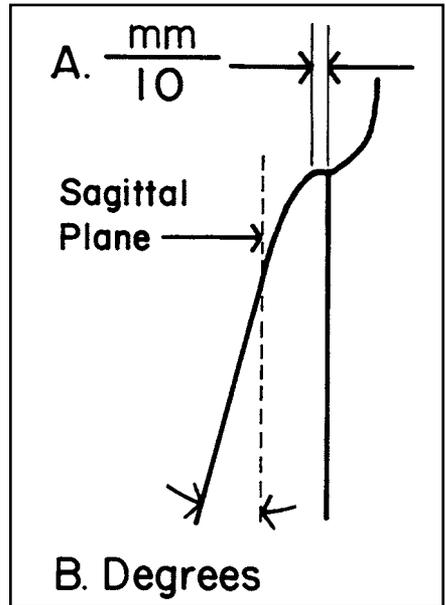


fig. 29

Points A, B and C on one orbiting path represent three different condylar positions at which lateral checkbite positional records may be taken on one patient. It should be noted that if an articulator possessing a progressive side shift and not an immediate side shift adjustment were set to each of the three condylar positions A, B and C as shown in fig. 30. It would produce three different progressive side shift inclinations corresponding to the three dotted lines in figure 30 – all of which inclinations would be wrong. On the other hand, if an articulator possessing a progressive as well as an immediate side shift ad-

1. Lundeen, Harry C. and , Carl G.: Condylar Movement Patterns Engraved in Plastic Blocks, J. Prothet. Dent. December 1973. Pages 870-875.

justment (Denar® Mark II) were adjusted so that the progressive side shift was pre-set to the average anatomic dimension of six degrees, one immediate side shift adjustment setting would intersect with all three condylar position check-bite records (A, B, and C) *which remarkably reduce the amount of irritation that otherwise might be introduced in the occlusion.* Therefore when adjusting the Mark II Articulator to lateral check-bite records, always set the progressive side shift adjustment to the 6° average anatomic dimension for this diagnostic procedure.

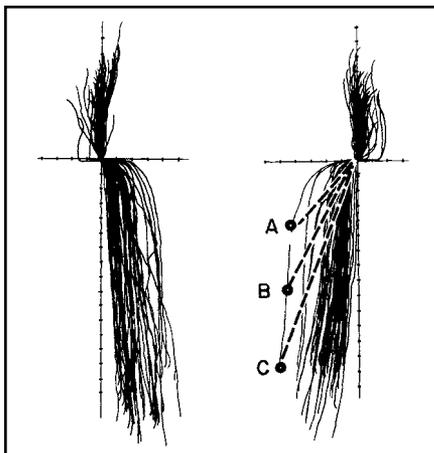


fig. 30

V. THE DENAR® MARK II FACEBOW/EARBOW (Model D31AB)

The Denar® Mark II Facebow/Earbow is used to register the correct position for the patient's maxillary cast to be mounted in the articulator. In other words, the facebow/earbow records the relation of the patient's maxillary dental structures to the horizontal reference plane and transfers this relationship to the articulator.

The use of the Denar® Facebow/ Earbow involves three overall procedures:

- A. Locating three reference points on the patient's face
- B. Assembling the facebow/earbow on the patient
- C. Transferring the facebow/earbow to the articulator

The detailed steps of each of these three procedures is as follows.

LOCATING THREE REFERENCE POINTS ON THE PATIENT'S FACE

The components of the facebow kit needed are: the reference plane locator and reference plane marker. These two items are used to locate three anatomical reference points on the patient's face. Of these three points, two are posterior and one is anterior.

There are two means of locating the posterior points. The first is by precise location of the terminal hinge axis



fig. 31

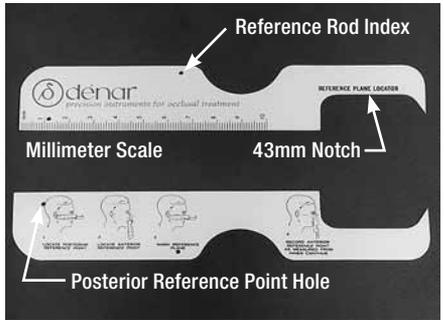


fig. 32

with a hinge axis locator.¹ The second means is by locating the points by average anatomical measurement, which is simpler and faster, and is the procedure described in this section of this manual.

1. Other reference material must be consulted for detailed instructions on how to precisely locate the terminal hinge axis position (i.e., the "Denar® Procedures Manual – Procedures for Occlusal Treatment" or the "Denar® Office Tutor").

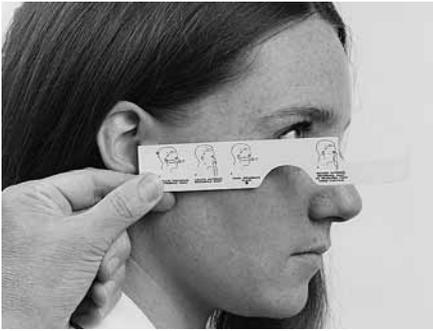


fig. 33

Average measurement may be used to locate the posterior reference points whenever you do not vary the vertical dimension of the casts on the articulator, or, in other words, when the mandibular cast is to be transferred to the articulator by means of an interocclusal record taken at the correct vertical dimension and the vertical dimension is not going to be changed on the articulator.

Place the “reference plane locator” along the right side of your patient’s face. It should extend from the middle of the upper border of the external auditory meatus to the “outer canthus” of the eye. In other words, the reference plane locator should extend from the middle of the upper border of the ear-hole to the outer corner of the eye (fig. 33).

There is a small hole in the upper posterior area of the locator. Once the locator is in position on the patient’s face, use your felt-tipped pen to gently mark through the hole onto the face (fig. 34).

Make the mark on both sides of the patient’s face.

The position of the “anterior reference point” is measured up 43 millimeters



fig. 34



fig. 35

from the “incisal edges” of the central or lateral incisor, toward the inner corner of the eye. The notched out area of the “reference plane locator” is used to make this measurement. The notch is 43 millimeters in length.

Simply rest the lower edge of the notch on the incisal edge of the right central or lateral incisor. On an edentulous patient measure up from the low lip line. The “low lip line” is the lower border of the upper lip when it is in repose. In either case, mark the anterior reference point below the inner canthus of the right eye where the top point of the locator touches the patient’s face (fig. 35).

Measure the distance between the anterior reference point and the inner canthus of the eye (fig. 36). Record this measurement in the patient's file for future reference. In this way, if the anterior teeth are removed or modified the same anterior reference point can be located by measuring downward from the fixed immovable inner canthus of the eye.

The final step is to mark the "horizontal reference plane" on the right side of the patient's face. Just line the ruler up between the anterior and posterior reference points. Hold the ruler so that it is just out of contact with the patient's skin, so that it will not displace the skin, and then draw a short line on the side of the face. This line represents the "horizontal reference plane" (fig. 37).



fig. 36



fig. 37

You will therefore notice that the horizontal reference plane is identified on the face of the patient by two posterior reference points in the area of the terminal hinge axis and one anterior reference point located 43 millimeters above the incisal edges of the maxillary anterior teeth or low lip line of the patient.

MAKING THE FACEBOW/ EARBOW REGISTRATION (Assembling the Facebow/ Earbow on the patient)

The components of the kit needed are: the bitefork, anterior crossbar, reference rod, reference rod clamp, and the right and left facebow side arms with nylon earplugs at the ends of the posterior reference slides (fig. 31).

Attach the bite fork to the crossbar so the reference rod clamp is to the patient's right, and the u-shaped part in the bite fork is above the crossbar (fig. 38). Then load the upper surface of the bite fork with two thicknesses of baseplate wax (fig. 39). Soften the wax to a dead soft consistency in warm water or an open flame, and then put the loaded bite fork in the patient's mouth to get a light indexing impression of the maxillary teeth. When the bite fork is first placed in the mouth, be certain to line up the crossbar so that it is parallel to the coronal and horizontal planes of the patient. Also be sure to be careful not to depress or displace any mobile teeth – all you really need is a slight impression of the tips of the cusps (fig. 40).

Remove the bite fork from the patient's mouth, and place the maxillary cast, if available, in the bite fork to confirm accurate seating. If the maxillary cast seats accurately in the bite fork, you can now begin assembly of the facebow record.

Put the bite fork assembly back in the patient's mouth, indexing it to the maxillary teeth. Have the patient hold the bite fork in place (fig. 41). This can be done most conveniently by having the patient bite on the index and middle fingers of the left hand. Alternatively position cotton rolls on the occlusal surface of the

lower posterior teeth and instruct the patient to maintain the bite fork in place with gentle biting pressure.

Adjust the reference rod clamp so it is parallel to the reference plane marked on the patient's face (fig. 42).

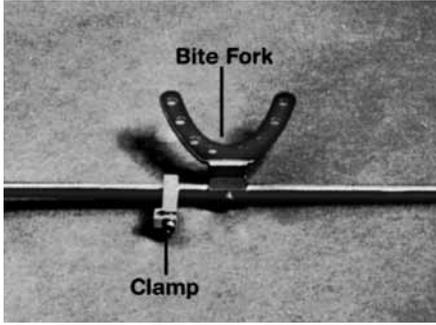


fig. 38

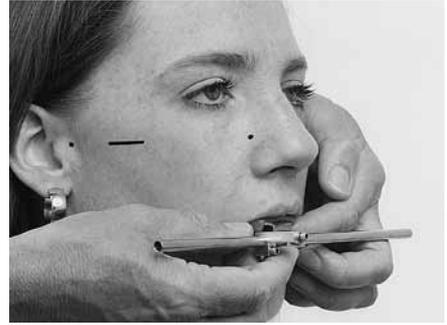


fig. 40

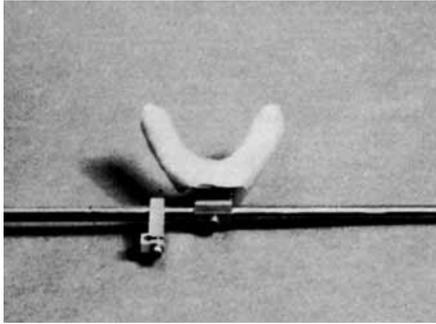


fig. 39



fig. 41

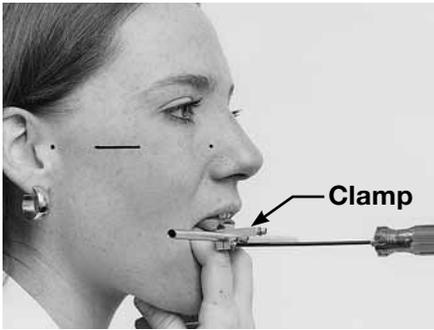


fig. 42

At this point you will be ready to attach the facebow side arms. Note that they are marked right and left and refer to the patient's right and left. Make sure that the scales on the posterior reference slides are adjusted to their zero positions.

A. Facebow Application

Remove the nylon earpieces on both the posterior reference slides and begin the attaching of the side arms (fig. 43). First you will need to locate the right side arm on the crossbar so that the lockscrew on the crossbar clamp faces upward and the posterior reference pin at the end of the posterior reference slide lightly touches the posterior reference point. Secure the side arm clamp to the anterior crossbar. Then attach the left side arm similarly.

B. Earbow Application

Make sure the nylon earpieces are on both posterior reference slides. Position the right arm on the crossbar so that the lockscrew on the crossbar clamp faces upward and the nylon earpiece fits snugly in the external auditory meatus. Secure the side arm clamp tightly and attach the left side arm similarly.

At this point the facebow/earbow records the relationship of the maxillary dental structure to the posterior refer-

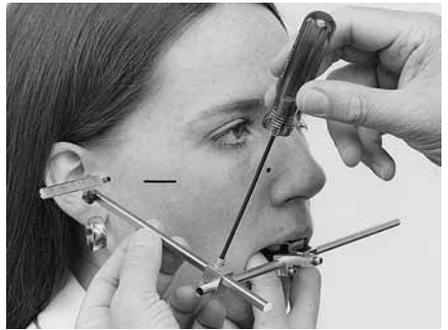


fig. 43

ence points. The only thing remaining to be done is to relate the maxillary dental structures to the anterior reference point.

Insert the reference rod into its clamp bringing it up from underneath the clamp, with the step in the rod facing toward the patient's right (fig. 44). Hold the reference plane locator between the thumb and index finger of your left hand so that you can read the instructions on the back. The semilunar notch on the locator's inferior surface should be placed over the bridge of the nose. Note the small hole in the center of the locator. Turn the locator down flat so that the instruction side faces downward and index the hole on the locator over the small dowel-like projection on the upper extremity of the reference rod. Position your eye approximately six inches in front of the locator. By line of sight adjust the locator by inclining it antero-posteriorly and medio-laterally until a projection of its broad surfaces pass through both posterior reference points as indicated by the posterior reference slides (fig. 45). At this time the anterior reference point marked on the patient's face may be above or below the reference plane locator.

Adjust the height of the reference rod so that a projection of the locator's broad surfaces passes through the anterior reference point as well as the posterior

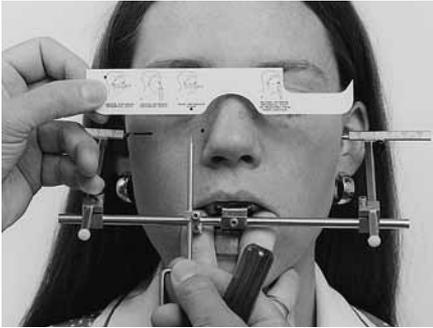


fig. 44

reference points (fig. 45). Then with your left hand pull the locator to the side so that the reference rod is wedged in its clamp. With the wrench in your right hand tighten the clamp to secure the reference rod in its support.

OPTIONAL The Anterior Reference Pointer, Part No. D145, shown on page 58, is an optional accessory to the facebow which may be used in lieu of the reference plane locator (ruler) to adjust the reference rod to the anterior reference point marked on the patient's face.

Now slightly retract the posterior reference slides so that they will not scratch the patient's face or hurt the ears as you remove the facebow/earbow assembly from the patient's face. Once removed reposition the slides to their original zero positions. The facebow can now be used to accurately locate the maxillary cast on the articulator.

TRANSFERRING THE FACEBOW/ EARBOW TO THE ARTICULATOR

To prepare the articulator to accept the facebow, set the immediate side shift adjustments to zero, the progressive side shifts to 5 degrees and protrusive condylar paths to 30 degrees. The vertical dimension of the incisal pin should also be set to zero (fig. 46).

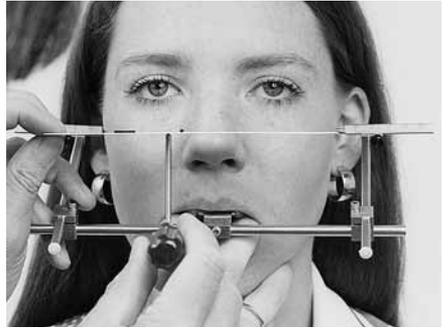


fig. 45

Next secure a mounting plate to the upper bow of the articulator and a maxillary cast support to the lower bow (fig. 47). The maxillary cast support fits onto the lower bow of the articulator in lieu of a mounting plate. It will help support the weight of the cast and prevent deflection of the facebow.

When attaching a mounting plate to the bow of an articulator always turn the mounting plate in the same direction the lock screw is turned as the mounting plate is secured to the articulator bow. (fig. 48).

Progressive Side Shift	5°
Protrusive Adjustment	30°
Incisal Pin & Table	0°
All Other Settings	0°

fig. 46



fig. 47

A. Facebow Transfer

If the facebow/earbow is used as a facebow (the posterior reference points are oriented to the posterior reference points marked on the side of the patient's face in the area of the terminal hinge axis) the facebow will be attached to the articulator by indexing the posterior reference pins into the facebow indexes on the lateral aspects of the condyles (fig. 50).

A. Earbow Transfer

If the facebow/earbow is used as an earbow the nylon earplugs are removed for attachment of the bow to the articulator and the posterior reference pins are indexed into the earbow index holes on the lateral aspects of the fossae (fig. 50).

If the facebow was oriented to the patient to posterior reference points located precisely with a hinge axis locator, marked readjustment of the posterior reference slides of the facebow to accommodate it to the articulator could introduce a slight mounting error. In order to minimize this error, mounting studs are inserted into the lateral aspects of the condylar elements to minimize the amount of adjustment of the posterior reference slides (fig. 51).

Attach the facebow (or earbow) assembly to the articulator by equally adjusting both posterior reference slides so that both scales give the same reading when the posterior reference pins are firmly seated in their respective condylar or earbow index holes. This can be done most conveniently by indexing both posterior reference pins in their respective holes. Observe the setting to which the slides are adjusted. The sum of these settings divided by 2 is the setting to which the posterior reference slides are adjusted for proper transfer of the facebow to the articulator. (For example, the sum of +30 and -10 = 20 divided by 2 = +10.)

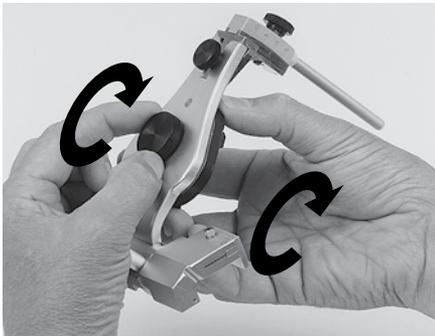


fig. 48

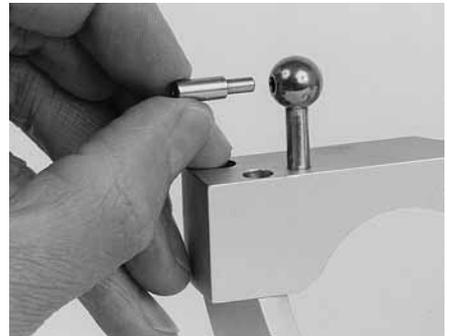


fig. 51



fig. 50

The maxillary cast support is adjusted so that the support crossbar firmly contacts the undersurface of the bitefork without lifting the reference rod from its bearing surface (fig. 52).

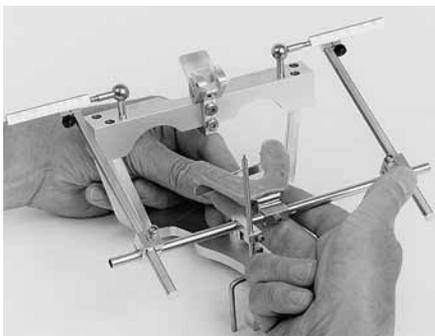


fig. 52

VI. MOUNTING THE CASTS IN THE ARTICULATOR

The procedures for constructing casts are not discussed in this manual. Once you have obtained impressions of the upper and lower arches for purposes of constructing the casts, you will in addition require four interocclusal checkbite records in order to mount the mandibular cast in the articulator and to adjust the fossa controls of the articulator: a centric relation record, one right and one left lateral checkbite record and a protrusive record. The selection of the method and material used for obtaining these records is left to the preference of the operator. One recommended checkbite procedure is presented in Appendix A of this manual.

THE MAXILLARY CAST

First secure the maxillary cast to the bite fork with sticky wax or with a light elastic band (fig. 53).

With the mounting plate secured in the upper bow of the articulator, fill the mounting plate with stone and also apply stone to the top of the cast. Be sure the mounting stone completely fills the recesses of the mounting plate. The cast is secured to the mounting plate with a “one mix” or “two mix” procedure.

“One Mix” Procedure Use one mix of fast set mounting stone to secure the maxillary cast to the mounting plate. With a little experience a neat mounting can be achieved with this technique.

“Two Mix” Procedure Use one mix of fast set stone to completely fill the recesses of the mounting plate and to tack the cast to the mounting plate. After the stone is set, remove the mounted cast from the articulator and use a second mix of fast set stone to complete the mounting. The “two mix” procedure is recommended to easily obtain a neat mounting.

Bring the upper bow down on top of the cast, so the stone bonds the two together. Now engage the centric latch. Throughout this procedure be sure that the condyles maintain centric relation and the incisal pin touches the incisal platform (fig. 54). Once the stone has set, remove the maxillary cast support from the articulator.

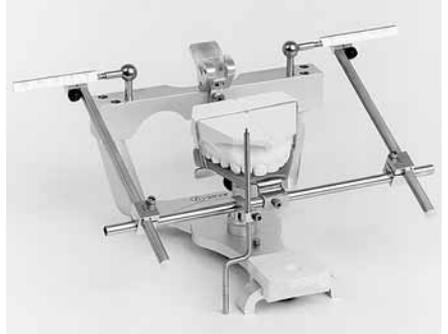


fig. 53

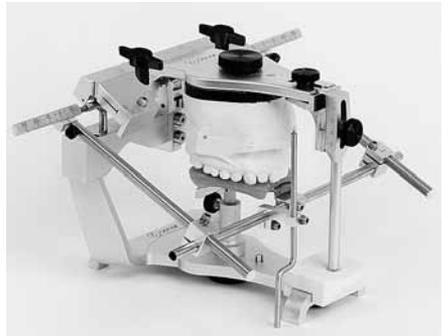


fig. 54

With the facebow application (not the earbow) it is usually easier to fill the mounting plate with stone and stock a pile of mounting stone on the maxillary cast if the maxillary bow is removed and inverted on the working surface beside the facebow-mandibular bow assembly (fig. 55).



fig. 55

THE MANDIBULAR CAST

With the maxillary cast in the articulator, separate the upper bow from the lower bow and turn the upper bow upside down. Orient the mandibular cast to the maxillary cast by accurately seating and luting the centric relation record between the two casts. Secure the casts assembly with sticky wax or a light rubber band (fig. 56).

If the centric relation record was taken at an increased vertical dimension, estimate the distance the vertical dimension was increased by the centric relation record and adjust the vertical dimension of the incisal pin to this dimension.

Fill the lower bow mounting plate with fast set stone and put an appropriate amount of stone on the base of the mandibular cast (fig. 57). Then invert the lower bow and seat it on top of the upper bow. Make sure the condyles are seated in their fossae (fig. 58). Make sure that the incisal table is on the incisal pin. *Lock the centric latch to its most*

closed position. Complete the mounting of the mandibular cast with the “one mix” or “two mix” procedure previously described.

An alternate method of mounting the mandibular cast is to first load the mounting plate with fast set stone and then put an appropriate amount of stone on the base of the mandibular cast. Next grasp the maxillary bow and support the centrically related casts with the thumb, index and middle fingers as illustrated in fig. 59. Invert the maxillary bow-casts assembly over the mandibular bow and firmly seat the condyles in their fossae. Close the articulator until the incisal pin contacts the incisal table. While maintaining this hand grasp have an assistant move the centric latch to its most closed position. After the initial set of the mounting stone has occurred

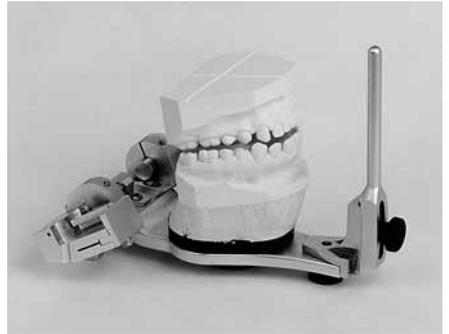


fig. 56

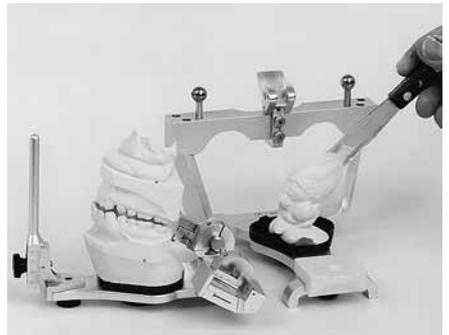


fig. 57

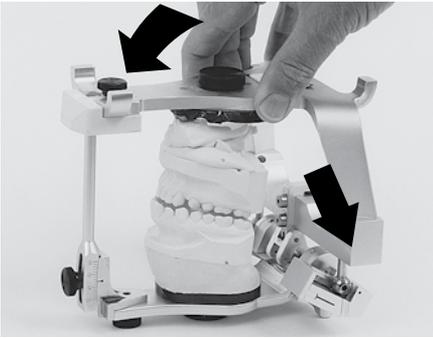


fig. 58

to support the mandibular cast, the fingers are removed from the assembly. Subsequently the mounted mandibular cast is removed and the mounting is completed with the “two mix” method.

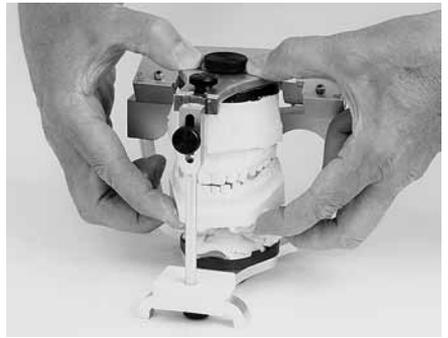


fig. 59

A recommended procedure is to initially obtain three centric relation check-bite records to verify the accuracy of the centric relation mounting as detailed in Appendix B of this manual.

VII. SETTING THE ARTICULATOR TO CHECKBITE RECORDS

To set the articulator to checkbite records you will need the articulator to which have been mounted both the maxillary and mandibular casts. You will also need right and left lateral checkbite records and a protrusive record. (Alternate techniques require fewer checkbite records and use average anatomical dimensions for those condylar path dimensions not recorded and measured.)

In this section we will first diagnose and record the characteristics of the patient's orbiting paths of movement from the two lateral checkbite records, and then diagnose and record the inclinations of the protrusive condylar paths with protrusive checkbite record.

SIMULATING THE ORBITING CONDYLAR PATH

First remove the maxillary bow from the articulator and confirm that both progressive side shift adjustments are set to the 6° settings. The reason for this setting was explained in the previous section on the Immediate and Progressive Side Shift Adjustments.

Next loosen the protrusive and immediate side shift adjustment lock screws on both sides of the articulator (a total of four screws). Set the protrusive condylar

paths to 0° and move the medial fossa walls medially to the limit of their range of movement. Do not tighten the lock screws.

Seat the right lateral checkbite record on the mandibular casts. Firmly seat the maxillary cast in the checkbite record by grasping the maxillary cast as illustrated in fig. 60 or by applying pressure to the top of the upper bow to immobilize the maxillary cast (due to the fact that the Mark II Articulator has the rotating condylar paths built to average anatomic dimensions, impingement of the rotating condyle against its rear and superior fossa walls may sometimes prevent complete seating of the maxillary cast in the checkbite record). At this time the left condyle is positioned inward, downward, and forward from its centric related position (fig. 61). Increase the inclination of the left protrusive condylar path until the superior wall of the fossa contacts the top of the condyle (fig. 62). Secure the protrusive condylar path in this position by tightening the lock screw.

Move the left medial fossa wall laterally until it contacts the condylar element. Lock the immediate side shift adjustment lock screw.



fig. 60



fig. 2A

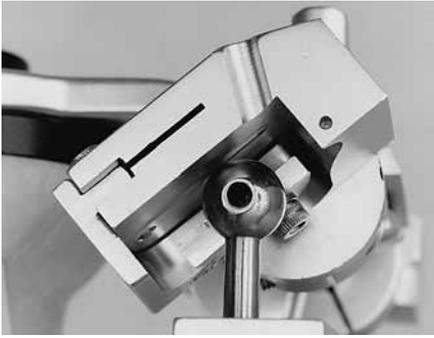


fig. 62

Note: These three articulator adjustments, the immediate side shift, the progressive side shift and the protrusive inclination of the superior fossa wall establish the character of the orbiting path on the left side of the articulator.

Use the left lateral checkbite record and follow the same procedure to adjust the settings of the right articulator fossa and diagnosis the character of the orbiting path of the right condyle.

Record the articulator settings on the patient's record.

Note: *It is the adjustment of the right medial fossa wall medialward that allows for a mandibular side shift to the left as the right condyle moves medially to bear and move against its medial fossa wall. Therefore, when the operator writes on the patient's record "right immediate side shift .6mm" the reference is to the articulator adjustment on the right side of the articulator and not to the side to which the mandible moves. The right articulator adjustment will allow for a mandibular side shift to the left. The articulator's right side is the right side of the articulator. A medialward adjustment of the right medial fossa wall (right immediate side shift adjustment of the articulator) allows for*

a mandibular side shift to the left. Repeat. It is important to note that the right immediate side shift adjustment refers to the articulator setting on the right side of the articulator which allows for a mandibular side shift to the left and not to the right.

SIMULATING THE PROTRUSIVE CONDYLAR PATHS

The inclinations of the protrusive condylar paths are diagnosed in the following manner.

Again loosen the lockscrews of the protrusive adjustment on both sides of the articulator. Set the protrusive condylar path inclinations to zero degrees. Do not tighten the lockscrews. Seat the protrusive checkbite record on the mandibular cast and seat the maxillary cast in the checkbite record. Apply downward pressure to the maxillary cast or upper bow to stabilize the maxillary cast in the record. Note that the condyles do not contact their superior fossa walls. Increase the inclination of the protrusive condylar path on both fossae until the superior fossa wall contact their respective condyles. Lock the protrusive adjustments lockscrews. The inclinations of the patient's protrusive condylar path have now been diagnosed. Record the protrusive condylar path settings on the patient's record.

A recommended manner for utilizing the diagnostic data obtained by adjusting the articulator to protrusive and lateral checkbite records for fixed and removable prosthodontics is presented in the "Treatment Procedures" section of this manual on page 35.

VIII. INCISAL TABLE ADJUSTMENTS

CUSTOM INCISAL TABLE

There are two different custom incisal tables that fit Denar® Articulators. They are shown in fig 63. Part No. D41 is used with articulators with the long centric adjustment on the foot of the incisal pin. Part No. D4 1 AB is used with articulators having the rounded foot on the incisal pin.

To use either of the custom incisal tables first attach a small mount of cold cure acrylic to the posterior portion of the incisal table. Part No. D41 has a machined precision stop on its anterior portion to maintain the correct vertical dimension and care should be taken to ensure that no acrylic is positioned on the top of the stop. Also the long centric adjustment at the foot of that incisal pin should

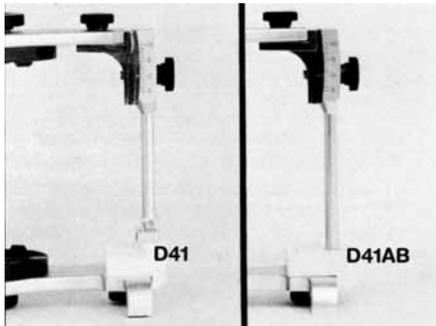


fig. 63

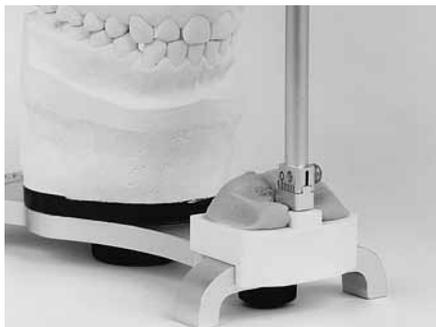


fig. 64

be turned so that the rounded end will more efficiently mold the acrylic. This is done by adjusting the foot so that its anterior extremity is flush with the anterior surface of its dovetail support.

When the acrylic has reached a rather firm consistency, the articulator is moved in right lateral, left lateral, and protrusive excursions allowing the anterior teeth which are kept in contact to guide these excursive movements thereby functionally generating a custom incisal guide. This recording is transferred to the incisal table and small fleur-de-lis is generated in the cold cure acrylic (fig. 64). This is later perfected with a vulcanite burr.

The custom incisal table can be used to best advantage in adjusting to the vertical and horizontal overlap relation of the anterior teeth. This is particularly true in adjusting the incisal guidance of the articulator to natural teeth which exhibit varying amounts of horizontal overlap of the teeth which bear the horizontal load in the protrusive, right lateral, and left lateral excursive movements.

ADJUSTABLE INCISAL TABLE

Long Centric Adjustment.

The Long Centric Adjustment is located on the foot of the incisal pin. When there is a horizontal overlap of the anterior teeth, or a "long centric", the foot of the incisal pin is adjusted to complement this tooth relationship in the following manner. Set the protrusive inclination of the incisal table to its maximum angle. Loosen the foot of the incisal pin and slide it forward (fig. 65). Move the upper bow posteriorly until the lower anterior teeth contact the lingual surface of the upper anterior teeth (fig. 66).

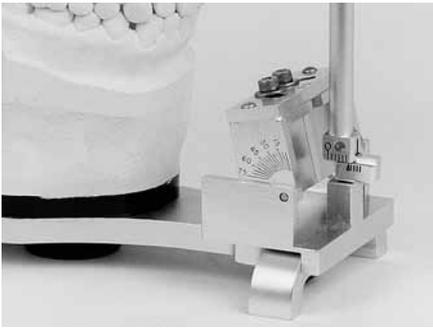


fig. 65

With the right index finger, push the foot of the incisal pin back until it just contacts the inclined platform of the incisal table, and tighten the incisal pin foot lock screw in that position (fig. 67). By allowing the incisal pin to come forward into the centric related position again, a space will be noticeable between the foot of the pin and the incisal table – this space is equal to the horizontal overlap of the anterior teeth. (fig. 68).

Protrusive Adjustment

To adjust the incisal table for the inclination of the lingual bearing surfaces of the anterior teeth, first loosen the incisal platform and set it back to zero. Do not tighten the lock screw. Then, move the upper bow posteriorly until the incisal edges of the lower anterior teeth contact the lingual surface of the upper anterior



fig. 66

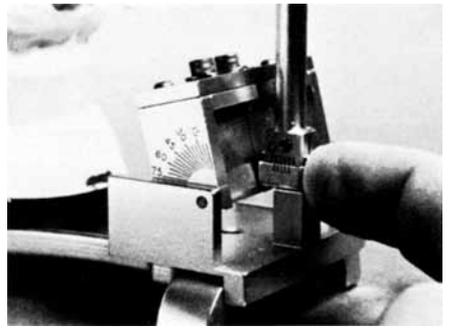


fig. 67

teeth just lingual to their incisal edges. Note that the incisal pin does not touch the incisal table now (fig. 69). Increase the angle of the table until it touches the foot and lock the table in that position (fig. 70).

Lateral Wing Adjustment

The lateral wings of the incisal table are adjusted to complement the lateral relationships of the anterior teeth – most frequently the vertical and horizontal overlap relationships of the cuspid teeth. To make this adjustment, first remove the incisal table and loosen the lateral wing lock screws (fig. 71). Then replace the incisal table on the articulator to observe visually the angle to which the lateral wings must be adjusted to complement the anterior tooth relationships in the following manner. Hold the

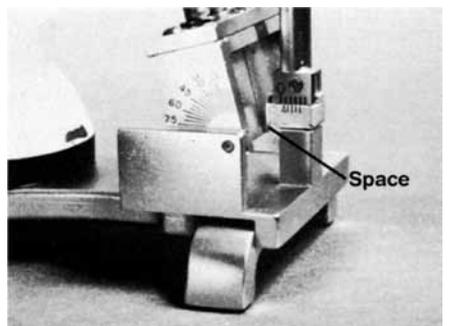


fig. 68

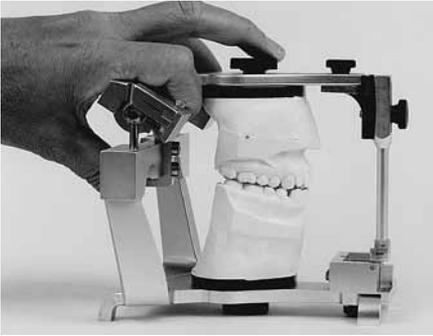


fig. 69

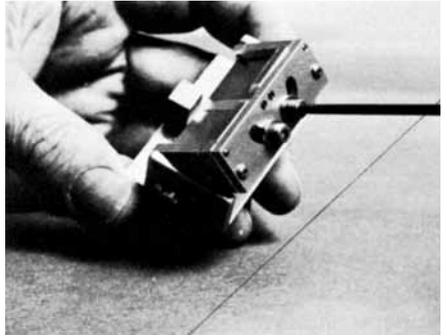


fig. 71

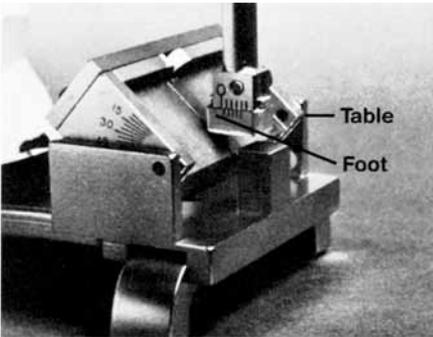


fig. 70

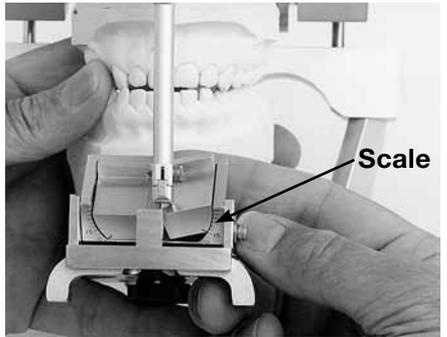


fig. 72

articulator in a right lateral mandibular position so that the right cuspids are in function. (The upper bow is pushed to the left.) Note that the incisal pin does not contact the incisal table. With the right index finger, reach behind the tilting platform, and elevate the left wing of the table until it touches the foot of the

incisal pin (fig. 72). Visually take a reading on the front scale to note its angular setting. Do this same procedure on the other side wing. Now remove the incisal table from the articulator and tighten the lockscrew wings at those settings. Then attach the table to the articulator again.

IX. TREATMENT PROCEDURES

The rationale for utilizing the diagnostic data obtained from protrusive and lateral checkbite records is as follows.

When the protrusive inclination of the superior fossa wall is adjusted to the lateral checkbite record, a characteristic of the orbiting condylar path is diagnosed. This characteristic is associated with the balancing inclines of posterior teeth on the orbiting side – the mandibular buccal cusps' lingual inclines' mesial aspects and the maxillary lingual cusps' buccal inclines distal aspects.

When the protrusive inclination of the superior fossa wall is adjusted to the protrusive checkbite record, the inclination of the patient's protrusive condylar path is diagnosed. This inclination of the superior fossa wall is associated with the protrusive contacts of posterior teeth – the mesial aspects of mandibular cusps and the distal aspects of maxillary cusps.

The orbiting path inclination of the superior fossa wall adjusted to lateral checkbite records is always equal to or greater than the protrusive path inclination of the superior fossa wall adjusted to the protrusive checkbite record.

FIXED RESTORATION AND REMOVABLE PARTIAL DENTURE RESTORATIONS

Adjusting the protrusive inclination of the superior fossa to an angle which is slightly less than the patient's protrusive condylar path (5 to 10 degrees less) when the restoration is fabricated will prevent the fabrication of protrusive contacts, or balancing contacts on the orbiting side of posterior teeth in the laboratory. This is due to the fact that when the restoration is seated in the patient's mouth and the patient's condyle

tracks a steeper protrusive and orbiting condylar path, the posterior teeth will separate in both the protrusive excursion and in the lateral excursion on the orbiting side.

COMPLETE DENTURES

Method 1. Adjusting the articulator to the patient's protrusive condylar path inclinations for both the protrusive and lateral excursive movements allows the fabrication of protrusive balance in the laboratory. When the restoration is seated in the patient's mouth and the patient executes a lateral mandibular movement with the teeth in contact, the patient will feel the primary occluding pressures on the working side. If the patient's orbiting path is slightly steeper than the articulator setting when the restoration was fabricated, the patient would perceive minimal occluding pressures on the balancing side. However orbiting side occlusal contact would prevent loss of peripheral seal.

Method 2. Adjusting the inclinations of the superior fossa wall to the patient's orbiting path inclinations allow the fabrication of bilateral balanced occlusion in lateral excursive movements in the laboratory. Subsequent adjustment of the articulator to the patient's protrusive condylar path inclinations permit adjustment of the occlusion to protrusive balance. This method permits development of full arch balanced occlusion. (Note: Obtaining accurate eccentric checkbite records on extensive tissue borne restorations, although theoretically attainable, is a difficult accomplishment).

APPENDIX A

CHECKBITE PROCEDURE

The mandibular cast is transferred to the articulator by:

1. occluding it with the maxillary cast
2. checkbite procedure
3. a combination of the above

In the transfer of the mandibular cast to the articulator, if the mandibular cast can be occluded accurately in the desired most intercusped position, the most accurate way to transfer the mandibular cast to the articulator is by occluding it with the maxillary cast. However, if deflective contacts exist in the patient's mouth, they must either be removed by grinding prior to the time impressions are taken so the cast can be accurately oriented in the desired most intercusped position or the centric relation record must be taken at an increased vertical dimension by checkbite procedure.

There are many satisfactory recording agents such as waxes, bite registration pastes, etc., and many techniques with which these agents can be employed to advantage in checkbite registration procedures. However, there is no universal method which proves optimum for all situations. Therefore, the dentist must be knowledgeable of the anatomy of the related structures, neuromuscle physiology, mandible manipulation techniques and in the physical properties of the dental materials employed which determine checkbite accuracy. This will enable him to effect a method of choice as varying situations present themselves.

It is not within the scope of this text to present an exhaustive discourse on checkbite procedure. However, one recommended procedure which effects basic principles of checkbite techniques is

presented. Variations of this technique can be employed as circumstances dictate.

The following basic principles should always be employed in any checkbite technique.

1. The checkbite record should be obtained as close to the vertical dimension at which the restoration is to be constructed as possible.
2. The dentist should always manipulate the patient's mandible in obtaining the checkbite. The patient must not be instructed or allowed to bite or close down in such a manner as to cause flexion of the mandible or movement of teeth in obtaining the record.
3. The recording media interposed between the teeth should be of a dead soft consistency as the mandible is brought to the desired position. This prevents deflection of the mandible and/or mobile teeth, or the programming of muscle function.

TECHNIQUE FOR WORKING CASTS

The following technique can be used to register the mandibular position at the correct vertical dimension or at an increased vertical dimension. It can be used to register centric or eccentric position. Described will be the registration of the centric relation position of the mandible at the minimal increase of vertical dimension which will result in lack of posterior tooth contact.

Fabricate an occlusal programmer by softening a small piece of base plate wax in a water bath to a soft consistency and adapt it over several teeth in the anterior segment of the mouth as illustrated in fig. 73. Manipulate the mandible into anterior centric relation and gently guide

the patient repeatedly in terminal hinge closure to lightly tap the soft wax to establish simultaneous contact of several mandibular teeth on the wax. The wax is removed from the mouth and chilled in tap water. The number of thicknesses of wax used should be the minimum number to effect posterior disclusion.

A small amount of denture adhesive cream is applied to the wax occlusal programmer in the area that adapts to the lingual surfaces of the maxillary anterior teeth (fig. 74) The occlusal programmer is repositioned in the mouth by reindexing it to the maxillary teeth. The occlusal programmer thus establishes a predetermined stop to vertical closure with the condyles in centric relation. There is an absence of contacting deflective inclines posteriorly as a result of group functioning of teeth in the anterior segment of the mouth where the occluding pressures are the least. The occlusal programmer reprograms muscle function so as to eliminate resistance to terminal hinge closure previously programmed by deflective contacts. The dentist can now more easily manipulate the mandible in terminal hinge closure to obtain the centric relation checkbite record.

Similar occlusal programmers can be fabricated in eccentric positions to facilitate obtaining of eccentric checkbite records.

Suitable checkbite recording media such as Bosworth's Superbite (a rapid and hard setting zinc oxide and eugenol base material) is placed on the mandibular posterior teeth and the mandible is guided in terminal hinge closure until the anterior teeth make light contact with the occlusal programmer. Since it is undesirable to register deep fissures, grooves and undercuts on teeth and cavity preparations with the checkbite record media, these areas are blocked out by wiping Vaseline or soft wax over



fig. 73



fig. 74

the teeth with the index finger before the zinc oxide and eugenol paste material is used for checkbite registration. The checkbite record media is allowed to harden without the patient executing a biting pressure. Figure 75 illustrates an occlusal programmer and checkbite records accomplished with a hard fast setting zinc oxide and eugenol (ZOE) base material.

If the patient brings the mandible moving muscles into function during the setting of the record media, as may occur during swallowing or bruxing, flexion of the mandible or displacement of teeth may occur which would result in an inaccurate record. To insure that the patient does not bring the muscles into function during the securing of the centric relation checkbite record, the dentist should periodically gently arc the mandible in small terminal hinge rotary

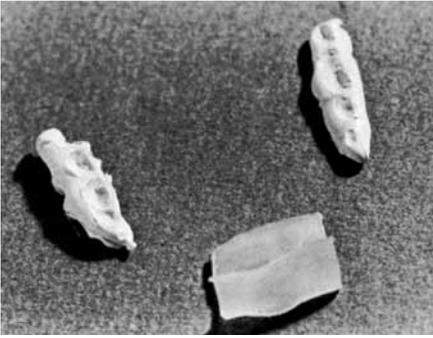


fig. 75

movements preceding the set of the record media and immediately following the set. Resistance to this movement immediately prior to or after the set indicates functions of the patient's mandible moving muscles and the checkbite record should be discarded and a new one taken. If resistance to this movement is not encountered, the dentist can be reasonable sure the patient did not effect muscle function. This technique is termed "dynamic technique" and the record termed "dynamic checkbite" because of the small movements of the patients mandible executed by the dentist during the securing of the record.

The record media selected for this technique should allow an adequate, consistent and not extended working time. It should have a flash set to a hard consistency that will fracture without warping

so the parts can be accurately reassembled if fractured. The material should be of a dead soft consistency when mixed but it must also have sufficient body to resist flow so that it will stay in place when positioned on the teeth.

To facilitate the placement of the record media on the occlusal surfaces of the mandibular teeth construct small paper cones from sheets of paper approximately 4 x 6 inches in dimension. Twist the paper around the index finger as illustrated in fig. 76 to fashion a cone that has an opening at its large end approximately 1 1/4 inches in diameter (fig. 77A). The margin of the paper is sealed with Scotch Tape so the paper will not unwrap. The small end of the cone is cut with a scissors to produce an opening at the apex approximately 1/8 inch in diameter (fig. 77B).

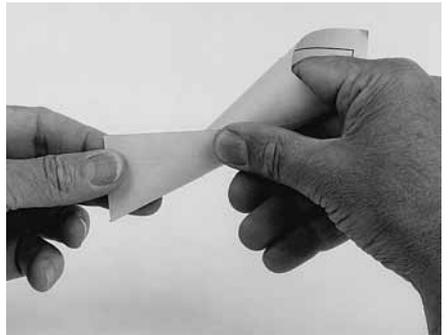


fig. 76

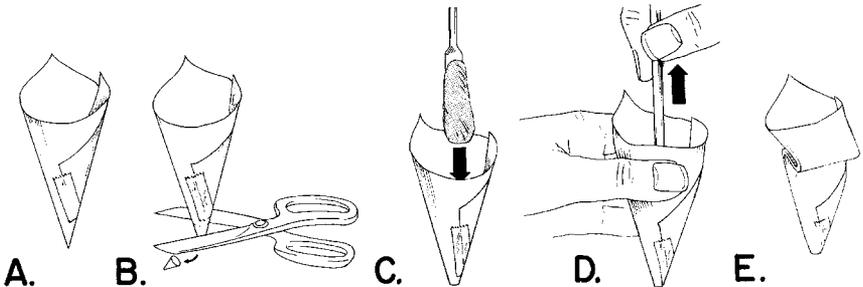


fig. 77

Mix record media and gather it into one mass on the end of the cement spatula. Load the media into the bottom of a paper cone (fig. 77C). Squeeze the paper cone behind the record media to capture the media near the apex of the cone and to clean the spatula as it is withdrawn (fig. 77D). After the spatula is removed the cone is squeezed with the index finger and thumb of both hands to push all the media to the apex of the cone and then the cone is folded back on itself to prevent movement of the media toward the large end of the cone when it is compressed (fig. 77E).

The cone is squeezed to dispense the media into the central groove of the mandibular teeth (fig. 78). As soon as a cone is loaded the operator can proceed to apply the media to the teeth as the assistant immediately begins to mix another batch of material for securing additional centric relation records.

An inexpensive file jacket is used as a mixing pad and provides for convenient disposal of the record media after use. It is good procedure to obtain three centric relation records. One is used to mount the mandibular cast and the remaining two are used to double check the mounting for accuracy with the Denar® Vericheck technique presented in Appendix B of this manual.

The setting times of zinc oxide eugenol record medias vary with temperature, humidity, spatulation time and batch number. Under certain conditions the material will set very rapidly and the operator must work quickly to get the material to place before the set occurs. Alternately the material may set slowly. Since it is difficult for the operator to maintain the patient's mandible in centric relation for extended periods of time,

time, the operator using a slow setting record media should wait for a period



fig. 78

of time after the media is placed on the mandibular teeth until the set is about to occur before manipulating the patient's mandible to centric relation. Therefore, the operator should dispense record media for four batches of material on the mixing pad (fig. 79). The first batch is use to time the set of the media and is discarded. The remaining three batches are used to obtain the centric relation records.

To time the set, mix the first batch of material according to the manufacturers recommendations. Load the cone and apply the first batch of record media to the mandibular teeth. Do not bring the mandible to centric relation. The operator should then start to count slowly until the set occurs. Once the set has been timed the operator knows how long to pause after the media has been placed on the lower teeth before bringing the

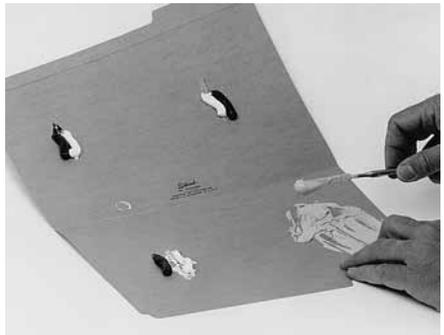


fig. 79

mandible to centric relation. It is desirable to bring the mandible to centric relation just before the set occurs. For best results it is important that the operator and assistant work with consistent technique throughout this procedure.

TECHNIQUE FOR DIAGNOSTIC CASTS

Checkbite records made of hard base plate wax can be used to advantage when mounting diagnostic casts. The wax used should be of a hard, brittle consistency and fracture without bending at room temperature. For obtaining centric relation records develop wax wafers composed of two thicknesses of wax to the dimension illustrated in fig. 80. It is best not to include the anterior teeth in the centric relation record if sufficient posterior teeth are present to stabilize the casts in the record.

To develop the wax wafers soften a sheet of base plate wax in a water bath or open flame. Flame one surface of the wax and fold the wax over on itself on the flamed surface to bond the wax into a wafer consisting of two thicknesses of wax. With a warm spatula trim the wax slightly oversize of the desired dimension. With the wax slightly softened so the wafer is pliable, position the wafer on the maxillary teeth and using the index fingers adapt the wax to the teeth to obtain very light indexing impressions of the cusps tips and to contour the wafer to the plane of occlusion. Do not impress the mandibular teeth into the wax at this time. Chill the wax with air so that it will maintain the shape of the plane of occlusion and remove the wafer from the mouth. With a warm scalpel trim the wafer to the desired dimensions. Check the wafer in the mouth or on a maxillary cast to confirm that the wafer is contoured to the plane of occlusion and is stable on the maxillary teeth.

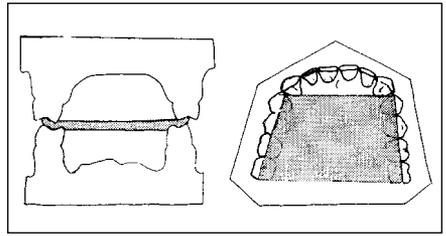


fig. 80

Figure 80 courtesy
Dr. P. Dawson and C.V. Mosby Co.

Soften the lateral edges of the wax in an open flame until it is dead soft. Quickly temper the wax in a water bath and position the wafer on the dry maxillary teeth to obtain light impressions of the tips of the cusps as previously described. Guide the mandible in centric relation closure to obtain light impressions of the mandibular cusp tips in the record. It is important that the operator guides the mandible to the desired position. The patient should not be instructed to bite down or close. As soon as the impressions are obtained, chill the wax with air and remove it from the mouth. The record is chilled in cool water and returned to the mouth and checked for accuracy. The wafer is placed on the maxillary teeth and the mandible is arced in centric relation closure to occlusal contact. The mandibular cusp tips should come into simultaneous even contact with their impressions in the record. When the mandibular teeth are brought into extremely light occlusal contact with the record the patient should perceive no premature contact or uneven pressure on questioning.

Lateral Checkbite Records

A technique for fabricating a right lateral checkbite record is described. The left lateral record is obtained in a similar manner.

Train the patient to allow you to arc the mandible in hinge rotation with the patient's rotating condyle in its most retracted position and the orbiting condyle advanced approximately seven millimeter. This can be done with the "thumb on chin" method with the thumb on the antero-inferior border of the mandible in the area of the left cuspid.

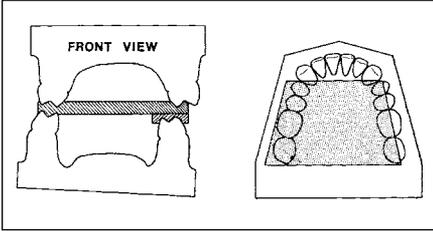


fig. 81

Construct a wax wafer composed of two thicknesses of hard base plate wax to the dimensions illustrated in fig. 81. This is done by fabricating an oversized wafer as previously described and adapting it to the maxillary teeth with the index fingers to conform the wafer to the plane of occlusion and to obtain

light imprints of the cusp tips. Chill the wafer with air and remove it from the mouth. Use a warm scalpel to trim the wafer to the desired dimensions. Return the wafer to the mouth, and position it on the maxillary teeth to confirm that it is stable on the maxillary teeth and conforms to the plane of occlusion. Guide the mandible in right lateral closure to contact the wax and determine the number of additional strips of wax which must be added to the lateral extremities of the mandibular side of the wafer to establish even contact with the mandibular teeth. Lute additional thicknesses of wax to the mandibular side and then heat the lateral extremities of the wafer in an open flame to soften the wax. Quickly temper the wax in a wafer bath and position the wafer on the dry maxillary teeth. Guide the mandible in right lateral closure to obtain light imprints of the cusp tips in the wax. Chill the wax with air and remove the wafer from the mouth and place it in cool water. The wafer can be returned to the mouth and checked for accuracy.

APPENDIX B

DENAR SYSTEM PROTOCOL FOR DENTIST-LABORATORY RELATIONS

The following protocol was developed by a panel of experts in occlusal treatment on the philosophy that a dentist seeking good laboratory support will give the technician complete specifications for fabrication of the occlusal aspects of the restoration.

Recognizing that the position of maximum intercuspation is of paramount importance, it is the responsibility of the dentist who takes the centric relation or centric occlusion interocclusal record to mount the mandibular cast. Complete specifications furnished by the dentist to his laboratory for fabrication of the occlusal aspects of restorations include:

1. Full arch master casts mounted in an instrument with trimmed dies or dies with margins that are easily identifiable.
2. Instructions for adjusting articulator condylar controls (if adjustable) when the restoration is fabricated plus records for adjustment of the incisal table.
3. Specifications as to which teeth are to bear the load in eccentric bruxing movements.
4. Specifications for the class of occlusal anatomy desired and the character of the position of maximum intercuspation as described below.

DISCUSSION

Mounted Casts with Trimmed Dies

To specify that it is the responsibility of the dentist to mount the mandibular cast does not mean that he cannot delegate this procedure to a dental auxiliary. For example, in limited restorative procedures in which there are sufficient unprepared teeth to accurately index full arch casts in the position of maximum

intercuspation, the mounting procedure could certainly be delegated to a dental auxiliary. However, as the restoration becomes more extensive, if the dentist delegates the mounting of the casts to a dental auxiliary and an error is introduced, the dentist should still assume full responsibility for the mounting error.

Instructions for Adjustment of Condylar Controls

To specify that the dentist should provide instructions for adjusting condylar controls does not mean that the restoration is to be constructed on a fully adjustable articulator. An example of instructions for adjustment of the condylar controls could be: "Lock the instrument in centric relation throughout the laboratory procedure". It is the responsibility of the dentist to specify to his technician if he wants consideration given to eccentric factors of occlusion in the laboratory, and if so, to what extent.

Dentist-Laboratory Relations

Currently, most dentists send unmounted casts to the laboratory for fabrication of prosthetic restorations. Restorations are returned to the dentist on unmounted casts. If the occlusion is found to be in error when the restoration is inserted in the patient's mouth, who made the error – dentist or technician? This condition can result in strained dentist-laboratory relations.

It is the responsibility of the dentist who takes the centric relation record to mount the mandibular cast. When the restoration is returned to the dentist on full arch mounted casts the dentist has a basis for accurate communication with his laboratory. If the laboratory services are found to be satisfactory and occlusal discrepancies are identified in the mouth, the dentist is confident that the

error was not introduced in the laboratory. He can then re-evaluate his procedure to determine the source of error. In other words, if the restoration fits the mounted casts but not the mouth, the technician cannot be expected to participate in the additional cost of remakes not attributed to laboratory procedures.

CLASSIFICATIONS OF OCCLUSAL CARVINGS

The following classification of occlusal carvings as illustrated in figure 82 enables the dentist to specify to the laboratory the relative amount of time and effort he desires the laboratory to expend (and consequently the laboratory fee) to fabricate the prescribed occlusion.

Alloy Restorations

Class A – Refined Occlusal Carving

The restoration is fabricated in the manner the technician might employ when using a simple crown and bridge hinge mechanism. When the occlusion is semi-developed, the technician simply bruxes the instrument to burnish away eccentric interferences and refines the anatomy of the remaining wax. Eccentric irritations are removed from the occlusion in the laboratory. This is the application of principles of occlusion in its simplest form and consequently is a minimum fee laboratory service.

Class AA – Modified Drop Wax

Basically, this is a Class A carving with more refinement. The technician carves in supplemental grooves and then accentuates triangular, cuspal and marginal ridges with the drop wax technique. The ultimate appearance will be similar to a Class AAA carving. A Class AA carving requires more laboratory time than a Class A carving and so the laboratory fee should reflect 10% to 30% increase in the labor factor of the Class A carving.

CLASSIFICATION OF OCCLUSAL CARVINGS			
CLASS	DESCRIPTION	ILLUSTRATION	LABOR FACTOR
A	REFINED		MINIMUM LABOR
AA	MODIFIED DROP-WAX		10-30% INCREASE
AAA	DROP-WAX		50-100% INCREASE
CENTRIC CONTACTS			
(•)	POINT CONTACT		MINIMUM
(△)	TRIPOD CONTACTS		SURCHARGE

fig. 82

Class AAA – Complete Drop Wax

The drop wax technique is employed to restore the total occlusal surface and all restored axial surfaces to obtain the maximum esthetic cusp height, optimum cusp distribution, and to harmonize the occlusal anatomy with condylar paths of movement. This type of occlusal fabrication requires more time and skill than a Class A or Class AA carving and consequently the laboratory fee reflects a 50% to 100% increase in the labor factor of a Class A carving. However, this can only be done on a restoration involving extensive tooth reduction. For example, if the restorations are MOD inlays or onlays with minimum tooth reduction, the cusp distribution has already been accomplished and the laboratory only needs to do the fill-in-procedures of the drop wax technique. Consequently, a Class AA or AA+ carving would suffice.

Centric Contacts

The character of the centric contacts must produce axial loading of the teeth. This can be accomplished by:

1. Point Contact (•). There is an absence of contacting inclines. Centric stops are on high spots or low spots of cusps.

2. Tripod Contacts (··). Centric cusps do not hit on their tips but are supported by three or sometimes only two centric contacts on the perimeter of cusp tips.

Developing tripodized centric contacts (··) requires more laboratory time than point contacts (•). Consequently, an additional laboratory fee is required. When the dentist's prescription specifies a Class AA (··) occlusion, it means he desires a Class AA carving with tripodized centric stops and he anticipates a laboratory fee which will allow the technician adequate time to perform this service.

PORCELAIN RESTORATIONS

An extension of the above classification for alloy restorations is used for specifications of porcelain restorations.

Class A porcelain restorations are carved to look like Class A alloy restorations. Class AA porcelain restorations are carved with more detail to accentuate supplemental grooves and cusp height to look like a Class AA or AAA alloy restoration. A plus symbol (+) denotes additional staining and characterization. Thus a Class AA (•)+ porcelain restoration is carved to be similar to a Class AA alloy, has point contact centric stops with an absence of contacting inclines and has special staining characterization.

DISCUSSION

Laboratory Fees and Instruments for Occlusal Treatment

The laboratory fee is for the time and skill which the technician employs in harmonizing the occlusion to condylar paths of movement and is not determined by the instrument used. A fully adjustable or semi-adjustable articulator can be bruxed as easily as a simple crown and bridge hinge mechanism that has springs for condylar posts.

The above classification of occlusal carvings is not an attempt to establish laboratory fees. It is offered as a means of establishing more accurate communications between dentist and laboratory.

SUMMARY

The protocol which requires the dentist to mount the mandibular cast gives the dentist "laboratory-control". This control of services usually results in better laboratory work. The laboratory on the other hand receives "dentist control" and less reduced fee remake discussions.

The dentist who mounts his mandibular cast and provides the technician with complete specifications for fabrication of the occlusal aspects of the restoration enjoys the benefits of improved communications with his laboratory, laboratory control, better laboratory work, and improved dentist – laboratory relations.

APPENDIX C

OCCLUSAL PLANE ANALYZER

The Broadrick Occlusal Plane Analyzer is used for analyzing the Curve of Spee and developing an acceptable curve of occlusion, and is recommended for laboratory procedures employing the Functionally Generated Path Technique.

Note: This text describes the mechanical function of the Broadrick Occlusal Plane Analyzer. The reader is urged to refer to other textual material as well as classes devoted to the clinical application of this procedure in occlusal correction.

A Broadrick Occlusal Plane Analyzer, fig. 83, consists of (1) Card Index, (1) Bow Compass #006906-000 with graphite leads of varying hardness,¹ (1) Scribing Knife #006912-000, (1) Needle Point, and (2) Plastic Record Cards #006916-000.

To use the Occlusal Plane Analyzer the casts are mounted in the articulator and the articulator condyles and incisal controls are adjusted in the conventional manner. The Occlusal Plane Analyzer is attached to the upper bow of the articulator as illustrated in fig. 84 by securing it beneath the screws which hold the maxillary mounting plate and incisal pin assembly in place.

It is pointed out that during the ensuing procedure, the maxillary cast must be removed from the articulator during the survey.

Secure a plastic record card on the right side of the flag. The plastic record cards are matte finished on both sides and readily accept pencil or ink markings.

The relatively small divergence between arcs of $3\frac{3}{4}$ " , 4" , and 5" radii over the functional occlusal surfaces on the lower posterior teeth is shown in fig. 85. An average of 4" radius may be used in the majority of surveyed cases. Variation is only necessary when a pronounced Curve of Spee may require a selection of up to a 5" radius.

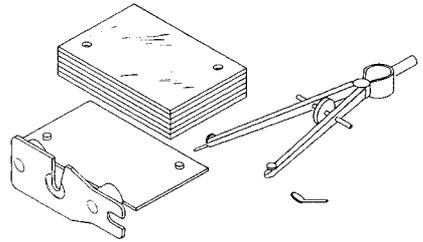


fig. 83

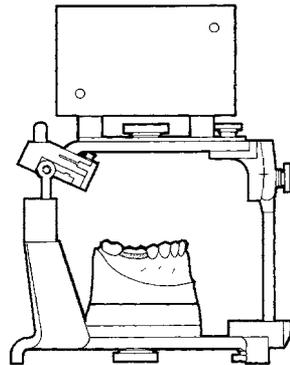


fig. 84

1. Graphite leads of preferred hardness may be obtained locally from drafting supply houses.

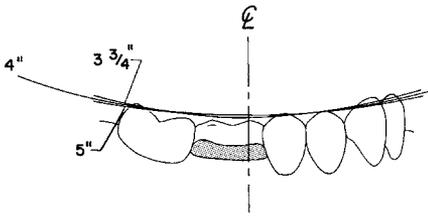


fig. 85

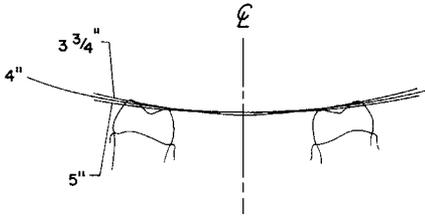


fig. 86

A view through both lower second molars, fig. 86, illustrates the small divergence between arcs of the same three radii at the functional occlusal surfaces on the Curve of Wilson.

Insert a piece of graphite lead into the bow compass, tighten thumbscrew, and sharpen to a suitable point. Adjust the bow compass to the radius selected (in this instance 4") (fig. 87).

Remove the upper cast, fig. 88, and position the center point of the bow compass, set at the 4" radius, on the anterior survey point (A.S.P.) which is usually the disto-incisal angle of the cuspid. If the cuspid is worn flat, the A.S.P. may be at the incisal edge. In any event, this point must be selected as the most desirable to "beam" the line and plane of occlusion posteriorally. Once selected, it is marked on the cuspid and NOT CHANGED. With the center point of the bow compass positioned on the A.S.P., apply a long arc with the graphite lead (about 3") on the plastic record card. The occlusal plane survey center

(O.P.S.C.) will ultimately be located on some point on this arc.

Select the posterior survey point (P.S.P.) at the disto-buccal cusp tip of the last lower molar (fig. 89). Should non molars exist, replace the upper cast and place soft modeling compound over the lower ridge and close the articulator until the incisal in contacts the incisal guide in centric relation. Chill the compound and carve away any excess, leaving only the compound contacting the upper fossae (simulating the lower buccal cusp). Remove the upper cast and select a P.S.P. on the modeling compound in the same manner as the P.S.P. was selected on the last molar as described above.

Position the center point of the bow compass on the P.S.P. and apply an arc with the graphite lead to intersect the arc from the A.S.P.

Alternate to the molar P.S.P. is a position on the condylar element of the articulator at the middle of the anterior margin

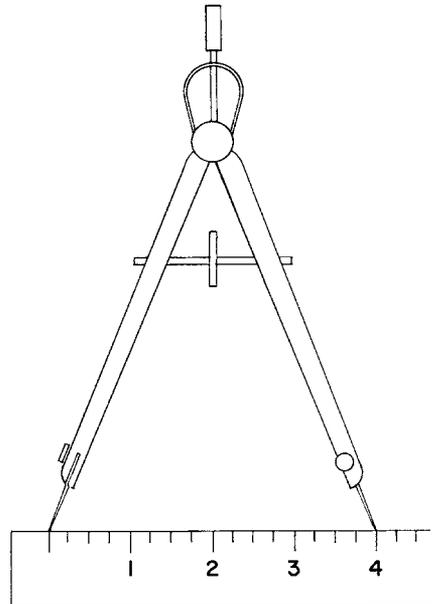


fig. 87

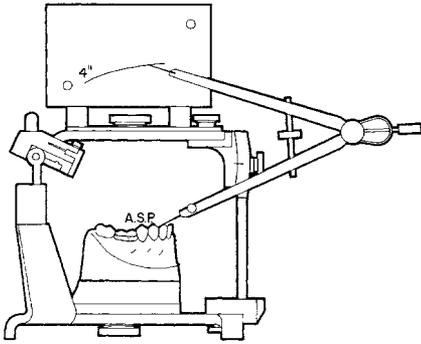


fig. 88

of the hole on the lateral aspect of the condyle (fig. 90). Position the center point of the bow compass on the condylar posterior survey point (C.P.S.P.) and apply an arc with the graphite lead to intersect the arc formed from the A.S.P.

Continue with fig. 89 or 90 and substitute the needle point for the graphite lead. Place the center point of the bow compass adjusted to the 4" radius at the intersection of arcs on the plastic record card (initial occlusal plane survey center). Sweep the needle point over the occlusal surfaces of the lower posterior teeth to see how the arc conforms to the existing occlusal plane. Shift this occlusal plane survey center (O.P.S.C.) on the long arc on plastic record card (A.S.P. line) until the most acceptable line and plane of occlusion is found. To raise the line and plane of occlusion at the distal end, move the point anterior to the arc intersection.

To lower the line and plane of occlusion, move the point posterior of the intersection. By trial and retrial, the ideal survey center forming the most acceptable line and plane of occlusion will be located.

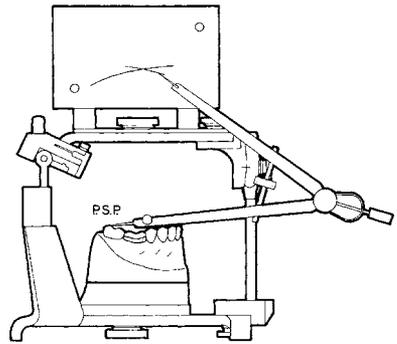


fig. 89

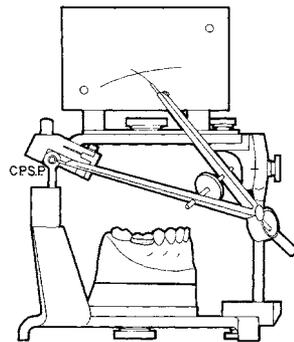


fig. 90

Upon thorough and considered study, locate the best possible line and plane of occlusion for the lower posterior teeth to harmonize with all other factors. The center point of the bow compass is now pierced into this ideal O.P.S.C. on the plastic record card and circled with pencil or ink for subsequent relocation. It may be advantageous to mark "R" (right) in the upper corner of the plastic index card for identification (fig. 91).

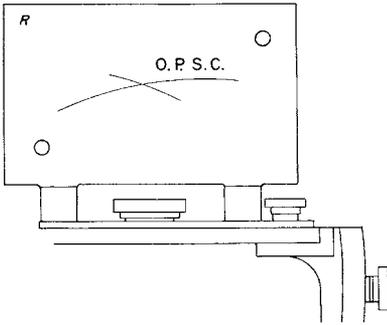


fig. 91

A plastic record card is now secured to the left side of the flag and marked "L." Repeat the procedure commencing with figure 87 for the left survey.

The scribing knife, as furnished, is for placement into the bow compass for scribing or cutting plaster, compound, or wax during the occlusal plane correction. The edge of the scribing knife may be sharpened to individual requirements as the edge supplied may not meet your preference.

APPENDIX D

SELECTING INSTRUMENTS FOR OCCLUSAL TREATMENT

Articulators and other occlusal instrumentation exists to facilitate both the diagnostic and treatment procedures for the fabrication of restorations from the single tooth to the complete dentition. The question often arises regarding the selection of the instrument of choice for treating a particular prosthodontic problem. To answer this question it is of value to first briefly review the progress that has taken place with the development of instruments for occlusal treatment and its impact on prosthodontic techniques. This will also shed light on why there are so many different instruments being used.

The earliest articulators, which were of the hinge type, were developed primarily for full denture construction; i.e., to fill the need for a mechanical device to relate casts in an anatomically correct position for the arrangement of artificial teeth.

The next breakthrough resulted from the desire to duplicate nature's scheme and provide patients with improved appearance and speech. This led to improved denture teeth of anatomical form. Also, understanding the anatomy and functions of the temporomandibular joints and their relation to the occlusal scheme brought about the development of articulators of anatomical dimensions with some adjustment capability to simulate the more pronounced condylar movements of a given patient. These articulators were adjusted primarily to interocclusal records.

Since the articulators were still not completely adequate, the mouth was found to be the best articulator to fabricate wax patterns and casting that would be attached to the natural teeth and be compatible with the excursive move-

ments of the jaw. These early articulators and occlusal schemes, that were used to construct dentures resting on mobile tissues, had to be supplemented with more "in the mouth" procedures to produce satisfactory results for fixed restorations.

A great advance came in the late 1940s and early fifties with the popularization of the "indirect technique" i.e., the use of impressions, casts and dies to duplicate the dentition so that most of the work could be done in the laboratory at a bench rather than "in the mouth." The introduction of improved dental materials to conveniently develop accurate impressions and full arch working casts coupled with the advent of high speed cutting tools in dentistry popularized restorative procedures for the general public which heralded in a new era in the development of instruments for occlusal diagnosis and treatment.

Dentists sought more practical means to accurately record and simulate the movements of the jaw in order to deliver better restorations in less time through both improved laboratory work and operating efficiency. **The goal was to produce better dentistry faster.** It was this effort and series of events that resulted in the development of the Denar® Pantograph and Fully Adjustable Articulator and subsequently the Denar® Mark II System and the Denar® Two Instrument System.

Questions often asked are: "Should a pantograph and fully adjustable articulator be used to fabricate a single gold crown?" and "How extensive must the restoration be before the use of a pantograph is indicated?" The simplest response to these questions is as follows. If after tooth preparation, there are

sufficient unprepared teeth to provide positive stops and guidelines to which to construct the restoration, the restoration can be constructed in harmony with the existing occlusion and the use of a pantograph is not necessarily indicated. On the other hand, if after tooth preparation, there are insufficient guidelines in the remaining occlusion to which to construct the restoration, the restoration should be constructed in harmony with the patient's temporomandibular joint characteristics. These characteristics can be diagnosed most efficiently with a pantograph and fully adjustable articulator although other treatment methods are available.

In order to better understand the criteria for selecting the instrument of choice for occlusal treatment a discussion of the examples on the chart below is helpful. In this discussion reference is made primarily to the pantograph and fully adjustable articulator; however the Mark II System utilizing checkbites and supplemented with occlusal equilibration and the functional generated path

technique, when indicated, can be used to produce excellent results.

To keep the discussion pertinent, it is assumed that none of the patients in the following examples have temporomandibular joint disease.

PATIENT A is a finished orthodontic patient who has a full complement of teeth in good alignment. The patient has a slight occlusal prematurity which has triggered facial pain. The patient has a pathologic occlusion and occlusal treatment is indicated. The treatment is primarily occlusal equilibration. An articulator can be used in diagnostic procedures although it is not always needed in treatment.

PATIENT Z on the other hand exhibits many missing teeth. The remaining teeth are badly broken down. There is extensive drifting of teeth and the occlusion is totally disorganized. This patient requires a complete mouth reconstruction. This restoration could be fabricated most efficiently by employing a pantograph and fully adjustable articulator.

SELECTING THE INSTRUMENT OF CHOICE FOR OCCLUSAL TREATMENT

Patient	Occlusal Scheme	Centric Prematurities	Occlusal Disease	Recommended Procedure	Comments	Treatment Methods
A Completed Orthodontic Patient	Complete Complement	Yes	Yes	Occlusal Equilibration	Patient needs occlusal treatment No occlusal instrumentation needed	EQUILIBRATE
B Right second bicuspid missing		Yes	No	3-Unit bridge	Patient has a physiologic occlusion Build bridge in harmony with existing physiologic occlusion	
C Right second bicuspid missing		Yes	Yes	Occlusal Equilibration 3-Unit bridge	Patient first needs occlusal treatment Equilibrate to establish physiologic occlusion and then build bridge in harmony with physiologic occlusion established	EQUILIBRATE & or
D Right 2nd bicuspid missing 2nd Molar needs full crown		Yes	Yes or No	Pantograph and Build to Centric Relation	After tooth preparation there are no physiologic occlusal and anatomical guides to which to build the restoration. Therefore use of a pantograph and fully adjustable articulator are indicated for operating efficiency	
E Right bicuspid and second molar missing		If patient "B" above had the second molar missing the recommended procedure would be the same as for patient "D"				
F	Restorations more involved than those previously listed could all be operated more efficiently by employing a pantograph and a fully adjustable articulator					
Z	Complete Mouth Reconstruction -- Utilization of a pantograph and fully adjustable articulator for operating efficiency is indicated					

Symbols:



Johnson Ogelsby cast relator or similar device



Semiaadjustable articulator



Pantograph and fully adjustable articulator

FGP

Functional Generated Path Technique

At what point between the two extremes represented by Patient's A and Z is the use of a pantograph and fully adjustable articulator indicated? The answer to this question is presented in the following discussion of Patient's B through E who exhibit increasingly complex occlusal problems.

PATIENT B has a missing right second bicuspid and a minor centric prematurity. There are no symptoms which can be related to the occlusal condition. The patient has a physiologic occlusion. The recommended treatment is a three unit bridge. To perform this laboratory procedure the cast can be accurately related to the correct vertical dimension in a nonrigid cast relating device such as a Johnson Olgesby Articulator (which has springs for condylar posts so that the casts can be gnashed together) and the bridge fabricated in harmony within the anatomical guides provided by the prevailing physiologic occlusion. This procedure could be used successfully if the restoration were one, two or three crowns on one, two or three of the teeth involved in the bridge. Alternately a method preferred by many operators is the use of the functional generated path technique (FGP) to fabricate this prosthesis.

PATIENT C has the same mouth conditions and occlusal scheme as Patient B with the exception that the occlusal scheme has triggered bruxism and the sequelae of bruxism (occlusal disease). This patient first requires occlusal treatment and in addition, a three unit bridge. The recommended procedure is to first

equilibrate the natural occlusion to establish a physiologic occlusion and subsequently fabricate the three unit bridge (or inlays) as outlined for Patient B.

PATIENT D has the right second bicuspid missing and in addition the right second molar has indications for full coverage. Slight occlusal discrepancies exist. Whether this patient has related symptoms or not, the procedure many dentists would recommend when this many teeth are involved in the prosthesis is to fabricate the restoration in centric relation. Since after tooth preparations there are no more anatomical controls in the occlusion on the right side of the mouth to use as anatomical guides to which to fabricate the restoration, then the next most posterior anatomical control, the temporomandibular joint, is used as a control for the fabrication of the prosthesis (see figures 26C and 27 and related discussion). This could be accomplished most efficiently by utilizing a pantograph and fully adjustable articulator.

PATIENT E. If Patient B had in addition to the missing right second bicuspid the right second molar missing, the recommended treatment would be the same as for Patient D.

Restorations more involved than those previously listed could all be operated more efficiently by employing a pantograph and fully adjustable articulator or alternately by means of the Mark II System supplemented with the functional generated path technique and/or occlusal equilibration as described above.

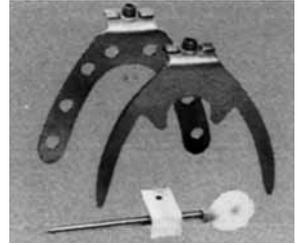
APPENDIX E



Denar® Mark II
Semi-Adjustable
Articulator



Earbow/Facebow D31AB



Bite Fork - Standard
Dentulous
Bite Fork - Edentulous
Anterior Reference Pointer



P4 (#300270) round short
Incisal Pin functions with the
Flat Custom Table (#110240)



P2 (#11093) Adjustable Incisal Pin
functions with the Flat Custom
Table (#110240) and Adjustable
Incisal Table (#110109)





Maxillary Cast Support



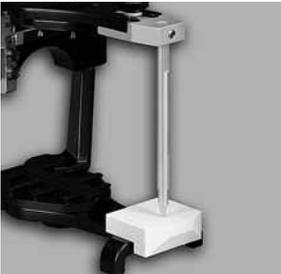
Denar/Hanau Verification Gage



Mounting Plates



Magnetic Mounting System



Dawson Fossa-Guide Pin

APPENDIX F

ARTICULATOR

CARE AND MAINTENANCE

Your Whip Mix® Articulator is a precision instrument and requires care and maintenance. Periodic cleaning and lubricating as described below will assure prolonged life and dependable service from the instrument. Failure to follow these instructions will void your warranty.

CLEANING

Use a mild soap and water solution with the aid of a brush to dissolve accumulations of wax and to wash away carborundum grit. Then air dry and lubricate. **DO NOT** use strong detergents, alkalines, gasoline or naphtha as cleaning agents.

LUBRICATION

Lubricate the working and bearing components with thin film of sewing machine or high speed handpiece type oil. Wipe off excess oil to prevent accumulations of dust or grit.

A thin coating of petroleum jelly must be applied to all articulator surfaces that will be contacted by the gypsum mounting material

STORAGE

Store the articulator in a clean, dry atmosphere free of plaster and carborundum dust; away from acids, alkalis or corrosive medicaments. **Wait a full day after mounting casts before storing the articulator in a carrying case or corrugated carton.** Moisture dissipation from the stone in an enclosed area causes alkalinity of the stone mixture which can damage the articulator surface.

WARRANTY

Whip Mix Corporation warrants the articulator system to be free from defects in material and/or workmanship for a period of one year. In the event of a defect, please notify the factory in writing of the defect prior to returning the instrument. Whip Mix will, at its option, either repair, replace or issue credit for such defects.

Because Whip Mix Corporation is continually advancing the design of its products and manufacturing methods, it reserves the right to improve, modify or discontinue products at any time, or to change specifications or prices without notice and without incurring obligations.

APPENDIX G

PRESCRIPTION FORM

Copy this form as needed.



Prescription Form (Mark II Articulators)

Patient _____ Case No. _____ Date _____

Posterior Reference Points: Precise Hinge Axis Arbitrary H. A. Ear

Anterior Reference Point _____ mm. below inner canthus of eye

Fossa (Posterior) Controls

Indicates side of articulator

Left Right



1-Protrusive Path

2-Orbiting Path

_____ deg. _____

_____ deg. _____



3-Immediate Sideshift

_____ mm. _____

_____ deg. _____



4-Progressive Sideshift

5-Vertical Axis-
(Intercondylar Distance)

_____ mm.

Incisal Table (Anterior) Controls

Mechanical Incisal Table Settings: Protrusive _____ deg.

Lateral Wings: Left _____ deg.

Right _____ deg.

Custom Incisal Table

The purpose of this form is to communicate to the technician the articulator adjustments to use when fabricating the restoration. Thereafter it can be placed with the patient's records. The form is divided into three sections: The patient's reference points, the posterior controls and anterior controls.

Reference Points

Check the appropriate box depending on how the posterior reference points were located. The anterior reference point is located below the inner canthus of the eye.

Fossa (Posterior) Controls

The figures indicate three adjustments: protrusive, immediate sideshift and progressive sideshift. The vertical axis (intercondylar distance) is fixed at 55 mm for the Mark II.

Incisal Table (Anterior) Controls

If a mechanical table is used, record in this section the angles of lateral wings (horizontal over jet) and the protrusive angle (anterio-posterior) inclination.



RESTORATIVE ORAL HEALTH

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