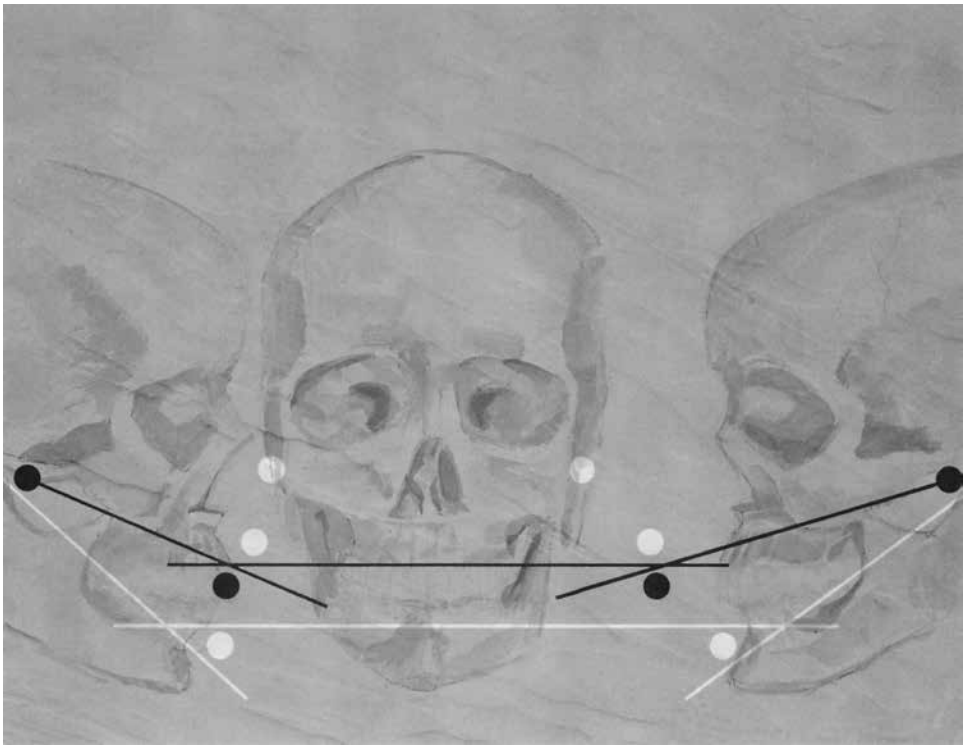
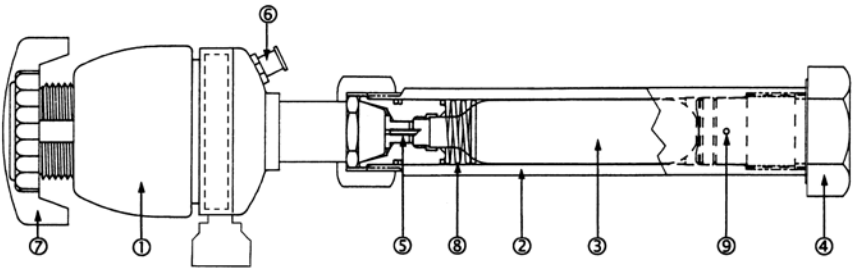
Denar®
Fully Adjustable
Procedure Manual



Power Supply Instructions For Use

Please read all instructions and warnings before attempting to use or to replace CO_2 cartridge.



1. Regulator Assembly
2. Storage Cylinder
3. CO_2 Cartridge
4. Plug
5. Perforating Pin
6. Nipple
7. On/Off Adjustment Valve
8. Spring
9. Vent Hole

WARNING: To prevent injury, always point the plug away from the operator and never towards another person.

Instructions

The Denar® Power Supply is shipped with the Storage Cylinder (2) empty and the On/Off Adjustment Valve (7) closed (unscrew counterclockwise). To charge the unit, remove the Plug (4) by unscrewing the plug from the cylinder. Place a fresh CO_2 Cartridge (3) into the cylinder as shown, small end first. Install the plug with "O" ring into the cylinder and hand-tighten as far as possible. **NOTE:** The plug should be seated against the cylinder.

When the plug is tightened, the Perforating Pin (5) pierces he CO_2 cartridge and releases its pressure. The gas is now released into the Regulator Assembly (1). Securely attach the stylus control valve or foot pedal of the pantograph to the Nipple (6) and slowly turn the adjustment valve (7) open (screw clockwise) until all styli contact the recording tables.

Cut off the gas supply by turning adjustment valve (7) counter-clockwise until it stops. Depress the button on the stylus control valve or depress foot pedal to exhaust the gas the system. Then detach the pneumatic nipple of the stylus control valve or foot pedal from the pantograph manifold.

Warning

To prevent injury, always point the plug away form the operator and never towards another person. Before loosening the plug to change the CO_2 cartridge, make sure the CO_2 supply is completely discharged. Turn the On/Off adjustment valve (7) clockwise (to open the valve) while the supply hose of the stylus control/foot pedal is disconnected from the nipple (6). Determine the CO_2 cartridge has been completely discharged by checking two things:

A) Whether the sound of air has stopped, and

B) Whether the storage cylinder is cold. If the storage cylinder is cold, allow the unit to return to room temperature then repeat process until the cartridge has been completely discharged.

Once the sound of air has stopped, and the CO_2 cartridge has been completely discharged, ***unscrew the plug slowly***. If there is any pressure remaining in the storage cylinder, the gas will vent through the Vent Hole (9). This venting occurs when the "O" ring on the end of the plug is moved past the vent hole in the storage cylinder.

To load a new CO_2 cartridge, confirm that the adjustment valve (7) is closed (turn counter-clockwise) before puncturing the cartridge with the perforating pin. To puncture, screw the plug all the way into the cylinder.

Replacement Parts

Additional CO_2 cartridges can be purchased from a sporting goods store, use only Crosman Powerlets model 231B. Replacement of any other parts requires factory repair.

Fully Adjustable Procedure Manual Denar® Pantograph and D5A

Excerpts from "Procedures for Occlusal Treatment, A Teaching Manual" by Niles F. Guichet, D.D.S.

The styli of the recording assemblies have been redesigned to eliminate the use of rubber bands and some of the pictures contained in this manual refer to the older design. The redesign also incorporates the use of a foot pedal to actuate the styli and offers a Quick Connect regulator assembly that may be used with a remote air supply such as a dental chair. Please refer to the instruction sheet titled Denar® pantograph upgrade for specific instructions on the use of these components.

The components of the Denar® Pantograph are non-sterile when shipped from the factory. The following items require Sterilization before each use:

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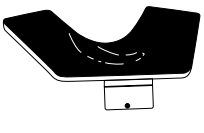
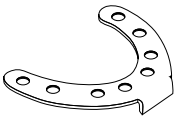
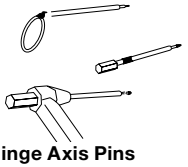


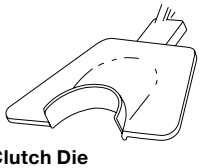
Reusable Clutch



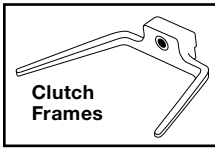
Biteforks



Hinge Axis Pins



Clutch Die



Clutch Frames

DO NOT REUSE

CAUTION: U.S. Federal law restricts this device to sale by or on the order of a dentist.

Pantograph Upgrade

Attention: The Pantograph utilizes new style stylus assemblies.

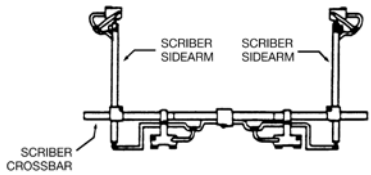
The Pantograph Upgrade Kit is intended as a direct replacement for your existing stylus assemblies and stylus control valve. The new scriber crossbar and the new scriber sidearms may be substituted for your existing scriber crossbar and scriber sidearms by swapping the new assemblies for the old assemblies. The geometry of the styli is the same in both types. The anterior scribers are located in the same manner as the older styles. The close axial alignment of the condylar scribers is also maintained. The air pressure should be adjusted to just allow even contact of all scribers on their recording tables to minimize any deflection of the apparatus due to unnecessarily high air pressure. The Pantograph operates at 20-25 psi air pressure. Pressure in excess of 25 psi should not be used.

The upgrade kit includes a new foot switch to actuate the styli for two reasons. One is to free up hands during the operation of the device, and the second is the new type of styli are normally closed rather than normally open. Your existing stylus control valve will not allow proper actuation of the styli with its configuration of inlet and outlet ports. The foot switch inlet side is terminated with the same male luer fitting that will plug directly into the output of the power supply. The output of the foot switch has the same tapered air fitting that plugs into the manifold of the scriber crossbar. The styli used for the new design will be in the closed or retracted position until the foot switch is depressed. Depressing the foot switch releases the pressurized air that causes the styli to extend; releasing the foot switch causes the pressure to relieve and the styli to retract. As in the stylus control valve, the foot switch should be pressed firmly and quickly for crisp movement of the styli.

Assembly/Connections of replacement parts to existing unit:

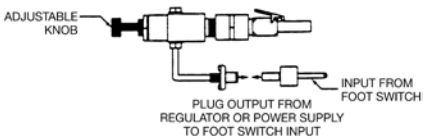
Step 1.

Prior to your next patient recording, replace your scriber crossbar and scriber sidearms with the new style provided in the upgrade kit, assemble as shown at right:



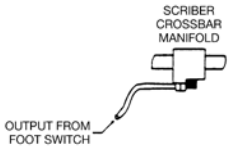
Step 2.

The Quick Connect-Regulator Assembly may be used in place of your power supply if an air supply is available (such as the dental chair). The adjustment knob on the back end of the regulator should be backed out all the way prior to making any connections. This will set the output pressure to zero. After making the required connections, slowly turn knob clockwise to increase air pressure to styli. The input connection to the foot switch uses the same tapered female luer fitting as previously used on the stylus control valve. Its male luer connector is the same on either quick connect-regulator assembly or the power supply.



Step 3.

After connecting the air fittings from the air supply to the foot switch, connect the output from the foot switch to the manifold on the scriber crossbar. The output connection from the foot switch is the same tapered metal fitting used previously on the stylus control valve and connects in exactly the same manner.



Care & Maintenance

Maintenance of the Pantograph

The Denar® Pantograph is a precision instrument specifically engineered to be light in weight and rigid in construction. Special attention has been given to the dimensions of each component to ensure the strength, rigidity, and dependable operation without incorporation of unnecessary weight. Knowledge of the following special instructions will ensure long, satisfactory service of the instrument.

Avoid Damage

To avoid damage to the pantograph during shipment, the instrument has been shipped with each component in its proper place in the organized tray set-up. All screws have been tightened securely when they are shipped. When the pantograph is not in use it should be stored in its case. The pantograph operates at 20-25 psi air pressure. To avoid damage to the pantograph and prevent torque on the crossbar, pressure in excess of 25 psi should not be used.

Screw Tension

The screws which tighten the sidearm clamps must be secured as tightly as possible in orienting the pantograph to the patient. The screws positioning recording tables and scriber housing should be snug but not tightened with great force.

Stylus Function

This design incorporating commercially available pneumatic cylinders as integral styli requires very little maintenance. Introduction of foreign material in or around seals or the stylus itself should be avoided. Any material impeding stylus movement should be carefully removed. The tips of the styli have been rounded and polished to ensure proper function with the pressure-sensitive recording blanks. However, if in the first clinical uses tearing of the recording blank occurs, the tip of the stylus may require additional polishing. This can be easily done with a rubber pumice wheel. The stylus should be extended manually and held in place while polishing. The tips should never be polished while being supported by the inner seals, such as holding the outside of the cylinder, as this may damage the styli. Care should be taken not to bend the styli. If it is suspected the styli are leaking after a recording or setting of an instrument, several manual depressions of the styli while under operating pressure should re-seat the internal seals and stop leakage. If this is still not effective, the pneumatic air cylinders may need to be replaced.

Lubrication

The stylus actuation mechanisms have been lubricated for proper function prior to leaving the factory. No further lubrication is required. Do not put handpiece cleaner or other solvent in or around the stylus mechanisms as this will cause damage to the stylus.

Use Of The Mounting Fixture

The Denar® Pantograph Mounting Fixture is a precision jig used for the plasterless transfer of the pantograph to a Denar® Articulator. The maxillary fixture is identified with a “U” stamped on the side.

Transferring the Pantograph to the Articulator

Prepare the articulator to accept the pantograph by adjusting the vertical axis of the articulator (intercondylar distance) to the position indicated by the telescoping mounting axis in the conventional manner.

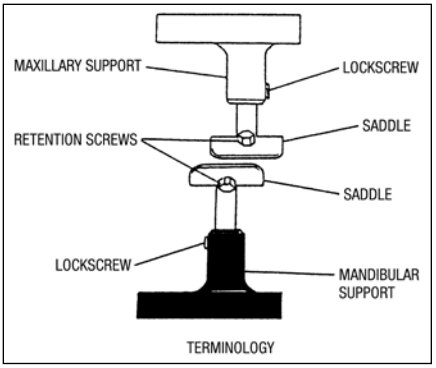


Figure 1

Secure the pantograph mounting fixtures in the articulator as illustrated in Figure 2A. Important: Screw the retention screws all the way in and then back them off one full turn; this will facilitate easy removal of the acrylic.

After the pantograph has been mounted in the articulator and the articulator set, tightening these screws will loosen the acrylic from the saddles of the mounting fixture.

Assemble the scriber assemblies of the pantograph to the recorder assembly by placing the centric pins in their respective wax registers and secure the clutches together with a light rubber band as illustrated in Figure 2B.

Transfer the pantograph assembly to the articulator by indexing the posterior reference pins of the pantograph into the posterior reference pin indexes of the articulator as illustrated in Figure 2C.

(In the D5A Articulator, mounting studs must first be located in the holes in the lateral aspects of the condylar elements.)

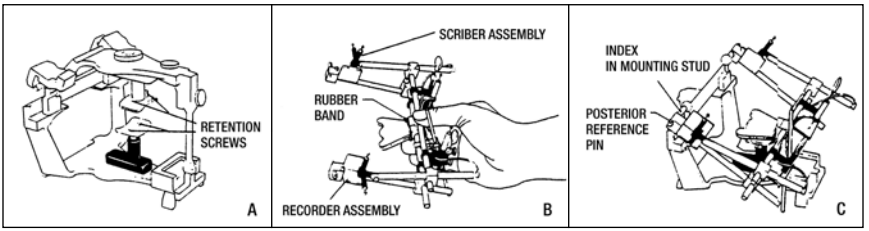


Figure 2

Adjust Each Fixture So Its Saddle Contacts Each Clutch

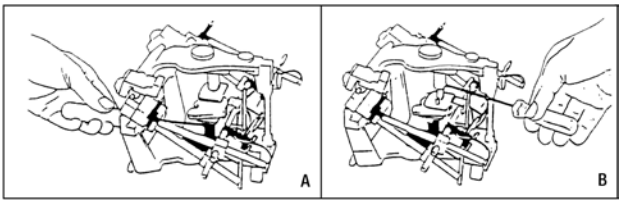


Figure 3

Adjust the mandibular mounting fixture so that its saddle contacts the mandibular clutch as illustrated in Figure 3A.

(Note: The mandibular saddle is offset to accommodate to Class I, II, and III arch relations. By loosening the lockscrew, the saddle can be rotated 180˚. The saddle should be adjusted to provide the closest fit to the mandibular clutch.)

Adjust the maxillary mounting fixture so that its saddle contacts the maxillary clutch as illustrated in Figure 3B.

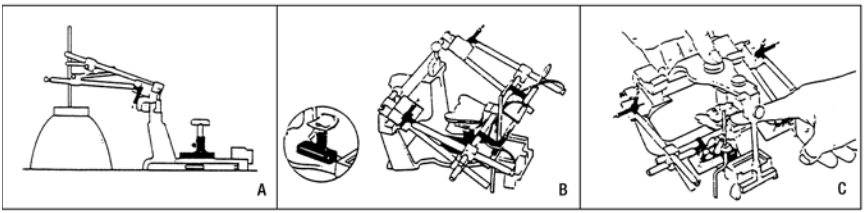


Figure 4

Raise the maxillary bow of the articulator from the mandibular bow and hinge the pantograph up and over so that the reference plane support rod rests on top of the upside down plaster bowl as illustrated in Figure 4A.

Mix three-quarters of a vial of fast cure acrylic, and place half the mix in the mandibular saddle between the retention screws as illustrated in Figure 4B. Hinge the pantograph over until the reference plane support rod contacts its bearing surface.

Place the balance of the soft acrylic in the maxillary saddle between the retention screws. Carefully locate the maxillary bow in position on the mandibular bow while simultaneously stabilizing the pantograph assembly by placing the index finger on the manifold of the pantograph as illustrated in Figure 4C.

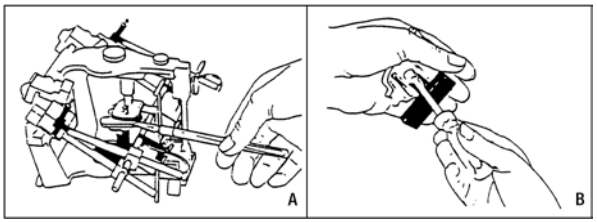


Figure 5

After the acrylic is set, the rubber band binding the clutches is cut with scissors or scalpel and the condylar paths of movement are diagnosed in the conventional manner (Figure 5A).

To separate the acrylic from the pantograph mounting fixture, use the Denar® central bearing wrench to tighten the retention screws until the mounting acrylic separates from the saddles and then unscrew the retention screws from the acrylic (Figure 5B).

Do Not Attempt To Burn The Acrylic Off The Saddles

A Time-Saving Procedure

Maxillary Cast Transfer: When a maxillary cast is to be transferred to the articulator by means of the pantograph, after the Pantograph Mounting Fixture is adjusted to the pantograph as illustrated in Figure 3B, the maxillary mounting fixture is removed

from the assembly and replaced with a mounting plate. The maxillary cast is then located in the maxillary clutch and secured to a mounting plate with the stone. The mounted maxillary cast is removed from the assembly and replaced with the maxillary mounting fixture. The pantograph is then secured to the mounting fixtures with cold cure acrylic as described in the preceding instructions.

Micro-Adjustable Sidearms

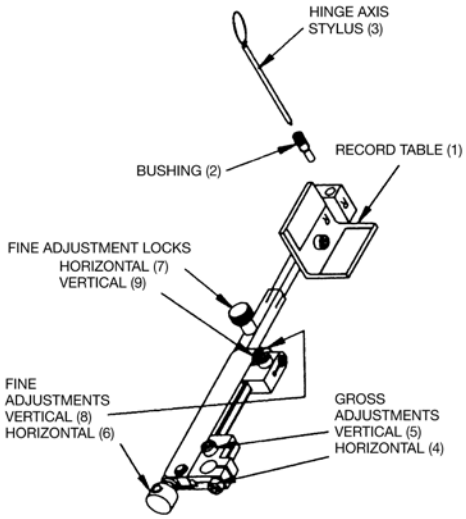
The Micro-Adjustable Sidearms may be used interchangeably as hinge axis locators, pantograph recorders and with the facebow.

I. Hinge Axis Location

A. Remove record table (1) from the micro-adjustable sidearms by means of one screw.

B. Insert bushing (2) and hinge axis stylus (3) into posterior end of each sidearm.

C. After the clutches have been placed in the patient's mouth and the crossbars are attached to the clutches, position the hinge axis analyzer arms on each side of the maxillary crossbar in the general area of the patient's hinge axis. Tighten each screw.



D. Position the micro-adjustable sidearms on each side of the mandibular crossbar. Each sidearm should be pushed inward until the hinge axis stylus touches the hinge axis analyzer arm. Tighten each vertical gross adjustment screw (4).

E. Adjust the sidearm in the general area of the patient's hinge axis by using the horizontal gross adjustment screw (5). Tighten each screw.

F. Using both the vertical fine adjustment (8) and the horizontal fine adjustment (6), locate the terminal hinge axis. After the hinge axis has been located, lock the vertical and horizontal adjustments by means of the screw (9) and the knob (7)

II. Converting Hinge Axis Locator to Pantograph Recorder

A. Remove the hinge axis stylus and bushing (2 and 3) and replace with the posterior reference pin.

B. Install the record table (1) and tighten one screw.

C. Remove the hinge axis analyzers and replace with the pantograph scriber sidearm.

III. Using the Micro-Adjustable Sidearms with the Denar® Facebow

A. Remove the record table (1) from the micro-adjustable sidearm by means of one screw.

B. Install the micro-adjustable sidearms on the anterior crossbar.

C. Orient the micro-adjustable sidearms so that the posterior reference pins are lightly touching the posterior reference points on the patient's face. Both gross and fine adjustments are positioned the same way as with the hinge axis.

Introduction

Denar® Instrument System

Fig. 2

In the fabrication of restorations for occlusal treatments, it is theoretically possible to organize an occlusion for the patient establishing harmony of associated parts using the mouth as an articulator. However, the achievement of a clinically optimum result by this inefficient method is a time-consuming accomplishment. Therefore, the dentist resorts to the aid of measuring methods and recording devices such as checkbite records, face bows, hinge axis locations, and pantographs to register the anatomic determinants of mandibular movements. The information captured by these recording means is then interpreted in the calibrated control of a

measuring instrument - the dental articulator. By interpretation of the data obtained, the dentist adjusts the anterior and posterior control areas of the articulator so that it will produce a movement which will dictate an occlusal form which is well within the physiologically acceptable range of the patient. The movement produced by the articulator establishes a specification within which the occlusal form is to be constructed. The more essential elements of the determinants of mandibular movement incorporated in the articulator setting, the less will the occlusal correction required when the restoration is seated in the mouth. The more compromising the dentist is in capturing these essential elements, the more adjustment will be required or less optimum will be the resultant restoration.

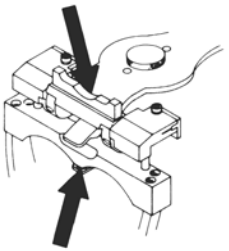
The design of the Denar® Instrument System is such that its use in routine occlusal treatments is encouraged. These instruments provide the dentist with the means to incorporate principles of occlusion in his restoration on a routine basis.

The Denar® D5A Articulator gained the immediate acceptance of the dental profession when the prototype of the instrument was first introduced.

Prior researches in the field of articulation and articulators were comprehensively evaluated in order to determine the desired capabilities of an ideal articulator. To these specifications, Denar added its talents in design engineering and manufacturing and delivered to the dental profession an instrument which offers to the educator a teaching method enabling him to effectively transmit to the student an understanding of the determinants of mandibular movement and the relation of these movements to occlusal anatomy. To the clinical dentist it provides a workhorse enabling him to make a directed approach to efficient occlusal treatments. Simultaneously, it is capable of fulfilling the most exacting requirements of the research scientist – all in realistic time factors.

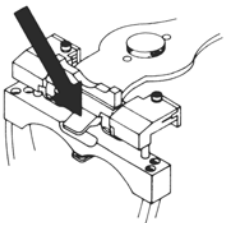
Denar® D5A Articulator

Your Denar® D5A Articulator is a precision mandibular movement simulator – a mechanical equivalent of the lower half of the head. This articulator has total capability to reproduce all mandibular movements or jaw positions recorded by any checkbite or chew-in technique or by the more sophisticated method employing a pantograph. The ability of the Denar® D5A Articulator to accurately reproduce the patient's mandibular movements is limited only by the accuracy of the record to which it is adjusted.



The Denar® D5A Articulator reduces the diagnostic recordings and resultant movements produced by the articulator to numeric values. This permits the instrument to be reprogrammed for treatment functions. The specifications thus established accurately define the parameters within which the restoration is to be constructed in order to eliminate eccentric interferences.

Centric Latch



To Unlock: Place thumb in groove as shown at top right. With forefinger, push up on latch release.

To Lock: Push latch lever down with thumb. (Hinging the articulator open will automatically lock the latch.)

Anterior and Posterior Control Areas

In the application of an articulator in the fabrication of occlusal restorations, the articulator is programmed to produce a motion which is a determinant of the occlusal anatomy being developed. The motion produced by the instrument is dictated by the settings of its posterior or condylar controls and its anterior or incisal guide control.

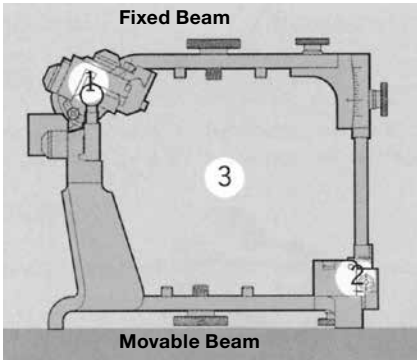


Fig. 3

Dental articulators are conventionally constructed to be reasonable facsimiles of their anatomic counterparts because this construction provides the most convenient means of producing the desired movements. However, better perspective and understanding can be achieved if the motion produced by the articulator is visualized as a motion which occurs between one movable beam extending anterio-posteriorly (one member of the articulator) relative to the second fixed beam running in the same direction (the other member of the articulator) (Fig. 3). The motion produced by the movable beam is determined by the direction each of its two ends, the anterior and the posterior, is guided. The anterior guide and the posterior guide of the beam have equal influence on the motion produced by the beam regardless of the relative complexity of the guiding controls.

The clinical significance of the guide control areas of an articulator is found in the motion produced – not the manner in which the motion is produced. This is to say that the anterior or incisal guide control area is of equal importance to the posterior or condylar control area.

In practical application, tremendous clinical significance of these control areas is found in their capacity to be precisely readjusted after the diagnosis so the instrument will produce a motion which facilitates the efficient accomplishment of the prime objective – fabricating the desired occlusion. The ability of the motion programmed in the articulator to be interpreted in calibrated control areas and expressed in numeric values permits the same instrument or another instrument in a remote location to be programmed subsequently without the expenditure of additional time and expense. This is clinically significant in that it encourages the treatment sequence to be accomplished according to the dentist's or patient's desires rather than be dictated by instrument limitations.

In the utilization of an articulator to facilitate the fabrication of the desired occlusion, there are three general areas of consideration, which are as follows:

1. The Posterior Control Areas
Condylar Controls

These control areas are adjusted in consideration of the patient's temporo-mandibular joint characteristics which are indentified with the aid of a pantograph or alternative condylar movement recording means such as checkbite methods or chew-in techniques.

2. The Anterior Control Area
Incisal Guide

This control area is of equal importance to the posterior control area. In existing occlusions, it is adjusted in consideration of the vertical overbite and horizontal overjet relation of the anterior teeth. In edentulous mouths, the overbite and overjet position of the anterior teeth is established by phonetic and esthetic measurements.

3. The Accurate Orientation Of The Mounted Casts In Correct Orientation To The Control Areas

This is the most important of the three areas of consideration. Accurate orientation of the mandibular cast to the maxillary cast at the correct vertical dimension is of paramount importance and is oftentimes the most difficult and most time-consuming procedure of these three areas of consideration in occlusal treatments. Here the dentist must relay on his knowledge of neuromuscular physiology, hinge axis theory, and on his equilibration, checkbite and laboratory technique.

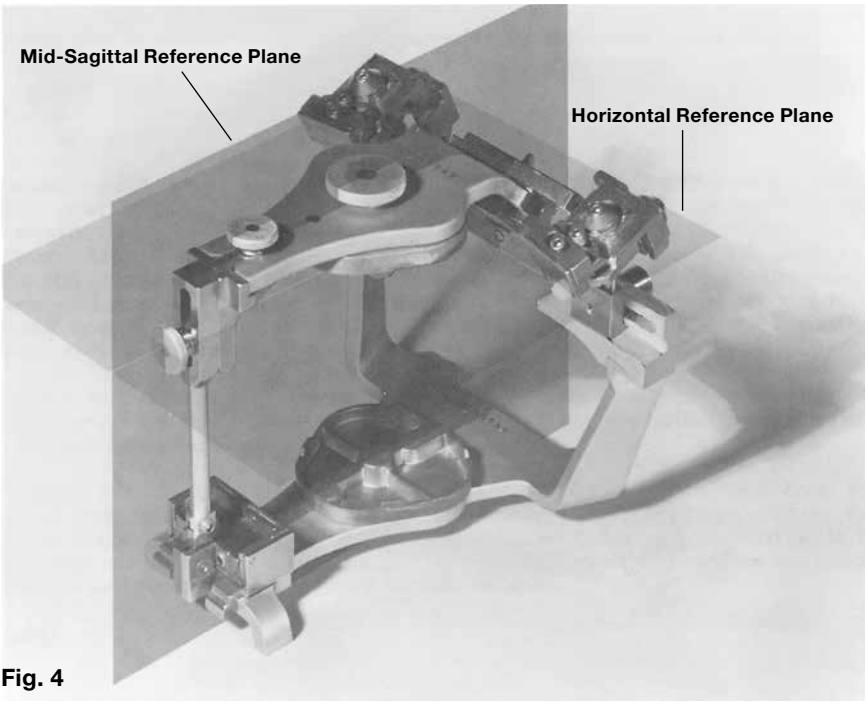


Fig. 4

Articulator Calibrations

In diagnosis, the articulator is used to measure temporomandibular joint characteristics. In treatment, it is used to establish the specifications or measurements to which the restoration is to be constructed. In any measuring procedure, the measurement is made in relation to an initial reference or starting position. In measuring the anatomical determinants of occlusion, the initial references are the horizontal reference plane and the mid-sagittal reference plane (Fig. 4). These initial reference planes established on the patient are also identified on the articulator – the mechanical equivalent of the lower half of the head.

Horizontal Reference Plane

The horizontal reference plane of the articulator is the horizontal plane which intersects the centers of rotation in the condylar elements and is parallel to the upper and lower bows of the articulator.

Mid-Sagittal Reference Plane

The mid-sagittal reference plane of the articulator is the vertical plane which passes anterio-posteriorly through the middle of the articulator.

The diagnosis data registered by the mandibular movement record is interpreted in the calibrated control adjustments of the articulator and expressed in numeric values of millimeters and degrees. These numeric expressions are in relation to specific positions or planes of reference which can be precisely relocated.

Posterior Control Adjustments

Vertical axis adjustment

Medio-Lateral Location of the Vertical Axis

The vertical axis can be adjusted medio-laterally from 45–75 millimeters as measured from the mid-sagittal reference plane. The scales for this adjustment are calibrated in one-millimeter increments.

In locating the medio-lateral position of a vertical axis, the fossa assembly must be adjusted first. In order to do this, the fossa assembly slide lockscrews (Fig. 5) must be loosened. After the adjustment, the medio-lateral position of the fossa can be maintained by gently tightening only one of the lockscrews provided on each slide. (Two screws are provided because in some positions one of the screws on the upper slide will be behind the centric latch index.)

The medio-lateral position of the condylar element is subsequently adjusted to a position one or two millimeters lateral to the fossa element by loosening the condylar adjustment lockscrew (Fig. 6).

The maxillary bow of the articulator is then brought to rest on the mandibular bow and the correct medio-lateral orientation of the respective bows is accomplished by engaging the centric latch in the centric position.

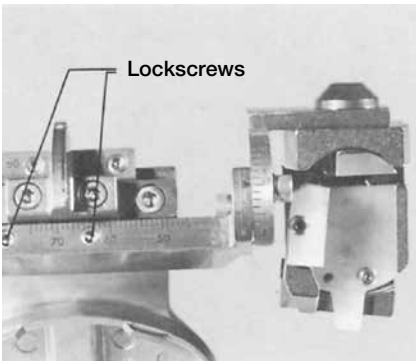


Fig. 5

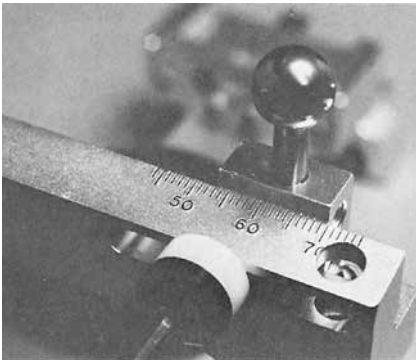


Fig. 6

The thumb is then used to push the condylar element medially until it engages the medial wall of the fossa and the lockscrew is secured (Fig. 7). It is important that the immediate side shift adjustment is set to zero when the condylar element is moved medially to engage the medial wall of the fossa.

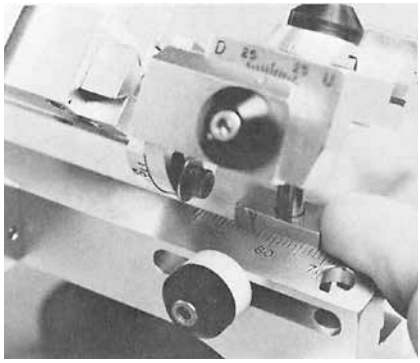


Fig. 7

The dovetail slides which position the fossa assemblies medio-laterally have been lubricated and moved freely on assembly. However, after the fossa assembly lockscrews have been tightened and the instrument allowed to set for prolonged periods, the dovetail slide assemblies may become fixed in the adjusted position. If this should occur, do not apply heavy pressure to the fossa assemblies. Freedom of movement can be restored by applying slight pressure to the dovetail slide assembly. It is recommended that only one lockscrew per slide be gently snugged in order to secure the slide firmly in the adjusted position.

Protrusive Condylar Path Adjustment

Angle of the Eminentia/ Arterio-Posteriorly/A-P Adjustment

The anterio-posterior inclination of the superior fossa wall or fossa assembly can be adjusted from 0–60 degrees from the horizontal reference plane by loosening the A-P adjustment lockscrew (Fig. 8). The scale for this adjustment is calibrated in five degree increments.

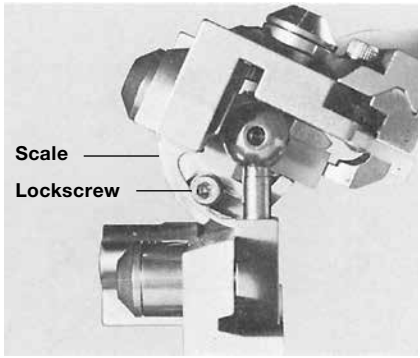


Fig. 8

Immediate Side Shift Adjustment

The medial fossa wall can be displaced medially by loosening the immediate side shift adjustment lockscrew (Fig. 9).

The amount of the displacement and the amount of immediate side shift allowed is indicated on the vernier scale. The adjustment is set to zero when the apex of the reference mark (Δ) is indexed to the lateral most mark on the upper scale. The lines on the upper scale marked with the numeral 0 are one millimeter apart. The lines on the lower scale identified with the reference mark (Δ) are .8 millimeters apart. Consequently, when the medial fossa wall is displaced more medially .2

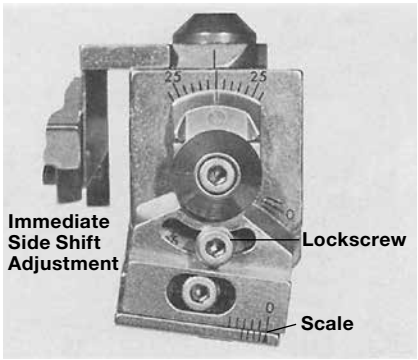


Fig. 9

millimeters to allow a .2 millimeter immediate side shift, the second pair of lines will line up indicating the .2 millimeter displacement..

As the medial fossa wall is displaced more medially, each successive pair of lines that register indicate an additional .2 millimeter displacement of the medial fossa wall or immediate side shift permitted (Fig. 10).

Progressive Side Shift Adjustment

A superior view of a fossa assembly detailing the progressive side shift adjustment is illustrated (Fig. 11). The medial fossa wall can be set at any pitch from 0-30 degrees to the sagittal plane by loosening the progressive side shift adjustment lockscrew. This permits the mandibular bow of the articulator to move progressively laterally as the orbiting condyle functions along the medial wall of the fossa.

Rear Wall Adjustment

Rotating Condylar Path – Forward or Backward Adjustment

The posterior fossa wall can be inclined anteriorly or posteriorly up to 30 degrees from the coronal plane by loosening the rear wall adjustment lockscrew. The degree of anterior inclination of the rear wall is indicated on the lateral portion of the scale. The degree of posterior inclination of the rear wall is indicated on the medial portion of the scale. The scale is calibrated in five-degree increments (Fig. 12)

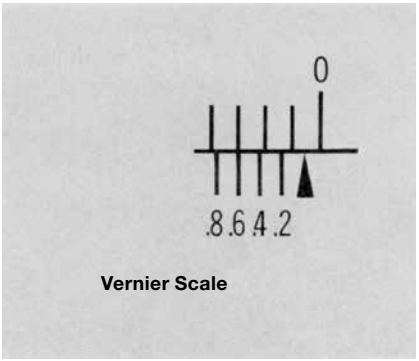


Fig. 10

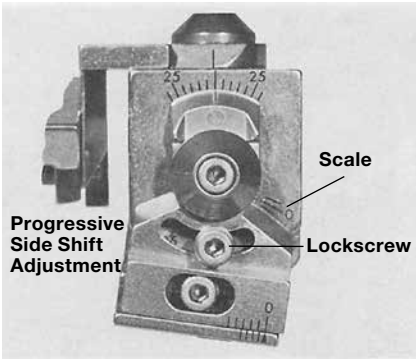


Fig. 11

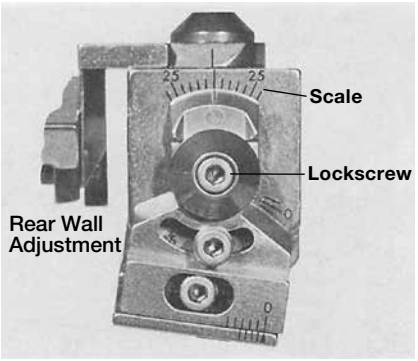


Fig. 12

Top Wall Adjustment
Rotating Condylar Path– Upward or Downward Adjustment

The superior fossa wall can be inclined medio-laterally superiorly or inferiorly up to 30 degrees from the horizontal plane by loosening the top wall adjustment lockscrew. The degree of superior inclination of the top wall is indicated on the lateral portion of the scale. The scale is calibrated in five-degree increments (Fig. 13).

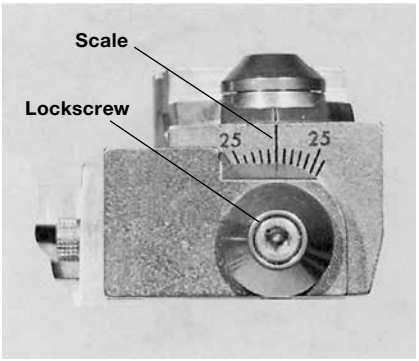


Fig. 13

Orbiting Path Adjustment
A-P Adjustment

As a mandibular lateral excursive movement is made, the traveling condyle moves downward, forward, and inward and begins to orbit around the opposite or rotating condyle. The path the orbiting condyle travels along the superior fossa wall will be different from the path it travels when a straight protrusive excursive movement is made. In almost all cases, the anterior-posterior inclination of the orbiting path to the horizontal plane is equal to or greater than the protrusive path traveled in the protrusive excursive movement.

The adjustment for the angle of the eminentia anterio-posterior (A-P adjustment) is also used to establish the anterior-posterior inclination of the orbiting path on the articulator. Sometimes one anterio-posterior angle of the eminentia setting will establish the correct anterio-posterior angle for both the protrusive condylar path and the orbiting path. If it does not, the shallower path is used in routine clinical treatments. This will be the protrusive path with very rare exceptions. If the correct angle of the eminentia for both the protrusive path and orbiting path is not established at one A-P adjustment setting and it is desired to accurately reproduce mandibular movement, the anterio-posterior angle of the eminentia should be set to the steeper path (generally the orbiting path) and then the correct inclination of the shallower path is established by custom grinding the inferior surface of the superior fossa wall.

Fossa Inserts

The insert lockscrews can be removed with a .050 “L” key and the superior and medial wall inserts can be replaced with inserts of various anatomic curvatures. A space is provided posterior to the superior fossa wall insert for the insertion of the Denar® Wrench to facilitate removal of the superior wall insert (Fig. 14).

The superior and medial fossa wall inserts are available in various anatomic curvatures. They are available in nylon for continuous usage, and in acrylic. The

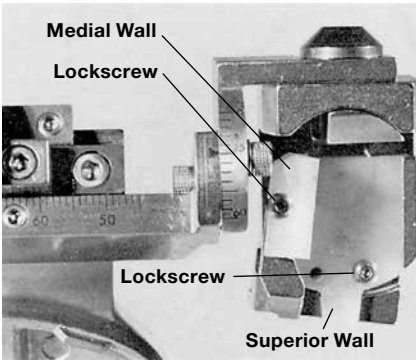


Fig. 14

acrylic inserts are available to facilitate custom modifications of these inserts by grinding or by the addition of cold cure acrylic. This may be necessary in order to get the instrument to produce a movement which will enable the styli of the pantograph to accurately track all recorded lines.

Media Fossa Wall Inserts

Protrusive Path. The path the condyle travels in a straight protrusive movement.

Orbiting Path. The path the condyle travels in a right lateral perimeter movement.

Rotating Path. The path the condyle travels in a left lateral perimeter movement.

Mandibular movement studies have shown that as the condyle traverses the orbiting path it may move essentially straight medially, varying dimensions up to one or two millimeters (immediate side shift). A horizontal plane study of the orbiting path reveals that the orbiting path is essentially straight after the orbiting condyle has traveled forward approximately four millimeters from the centric relation position. The straight portion of the orbiting path may be inclined at various angles to the sagittal plane (progressive side shift adjustment). The orbiting path may be straight or curved during the first four millimeters of forward movement of the orbiting condyle (Fig. 15).

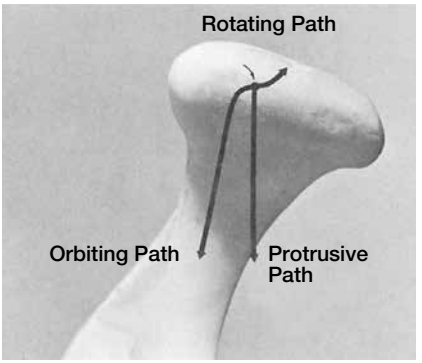


Fig. 15

To facilitate the most efficient setting of the articulator to pantographic tracings, Denar® provides medial fossa wall inserts with the following anterio-posterior character: (Fig. 16)

1. Straight. A straight medial wall insert is used when no curve is exhibited in the orbiting path.

2. Early. This insert provides for a one-millimeter side shift early in the first four millimeters of the orbiting path.

3. Distributed. This insert provides for a one-millimeter side shift distributed throughout the first four millimeters of the orbiting path.

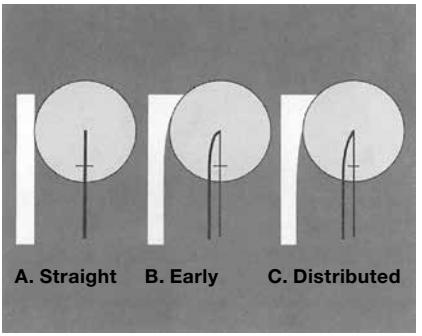


Fig. 16

Since inserts 2 and 3 have a one-millimeter side shift built in, the immediate side shift adjustment should be set to read one millimeter when these inserts are put in the articulator.

The medial fossa walls are available in flat or retentive styles (Fig. 17). The retentive inserts are made of nylon and have a retentive lip which fits beneath the condylar element to resist separation of the maxillary and mandibular bows of the articulator when the instrument is in centric relation. The retentive inserts can only be used with flat superior wall inserts. The flat inserts are made of acrylic and can easily be custom modified by grinding or by the addition of cold cure acrylic. They can be used with all superior wall inserts.

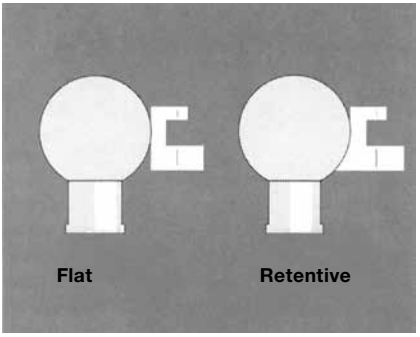


Fig. 17

The following medial wall inserts are available as standard catalog items:

Description: Nylon, Flat, Straight

Superior Wall Inserts

The superior wall inserts are available in nylon or acrylic. The acrylic inserts can be custom modified by grinding or by the addition of cold cure acrylic. The inserts are available either straight or in various curvatures to complement the character of the eminentia (Fig. 18).

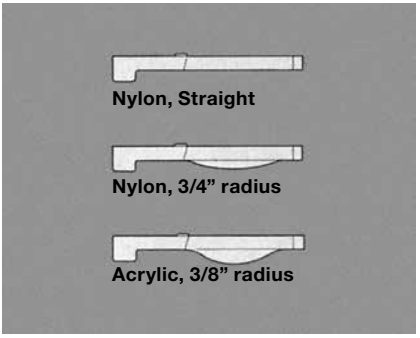


Fig. 18

The following superior wall inserts are available as standard catalog items:

Description:

Nylon, Straight

Nylon, 3/4" radius

Acrylic, 3/8" radius

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, alkalies, gasoline or naphtha as cleaning agents.

Lubrication.

Lubricate the working and bearing components with a **thin film** of sewing machine or high speed hand-piece type oil. Wipe off excess oil to prevent accumulation 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, alkalies 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.

Denar® Pantograph

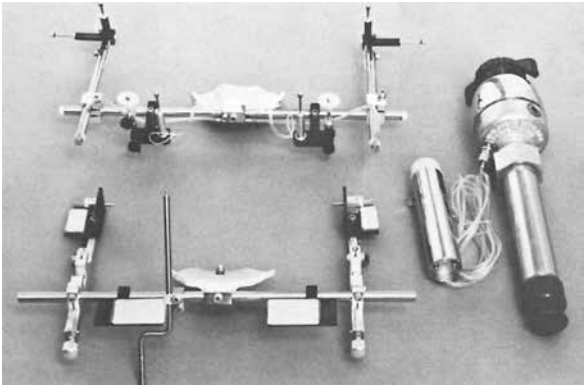


Fig. 19

The Denar® Pantograph is a precision mandibular movement recording instrument. It provides the dentist with the most accurate, simplest and fastest means of recording mandibular movement and jaw positions. Pneumatically powered from the dental air syringe, a push-button control device automatically and simultaneously lifts all styli upon the dentist's command. This enables the dentist to obtain a total recording of the patient's mandibular movement and to discriminate between erratic abnormal jaw movements and pure peripheral movements in a practical, efficient manner. Additionally, the pantograph permits each record and procedural step to be double checked for accuracy before proceeding to the next step.

Although there are many reasons for the dramatic increase in simplicity and ease of operation of the Denar® Pantograph, two of the most important are the ease of clutch construction and one-step transfer.

Ease of Clutch Construction

The Denar® Pantograph being small and lightweight allows the use of lightweight plastic clutches which are contained almost entirely within the patient's mouth. Clutch construction consists simply of loading the Denar® Clutch Former with fast cure acrylic, placing it in the mouth to obtain an indexing impression of the patient's teeth, and withdrawing it for hardening. The total process can be accomplished at one patient visit in minutes. Clutches for the partially or totally edentulous patient can be constructed with equal ease.

One Step Transfer

The Denar® Pantograph, unlike the original research instruments, can be transferred directly to the articulator, eliminating the necessity of additional procedural steps employing a mounting stand. In addition, due to the rigidity of the pantograph, it can be handled in a rapid, efficient manner without fear of loss of tolerance.

Special Instructions

The Denar® Pantograph is a precision instrument specifically engineered to be light in weight and rigid in construction. Special attention has been given to the dimensions of each component to ensure the strength, rigidity, and dependable operation without the incorporation of unnecessary weight or cumbersomeness. Knowledge of the following special instructions will ensure long, satisfactory service of the instrument.

Avoid Damage

To avoid damage to the pantograph during shipment, the instrument has been shipped with the centric pins in place and all screws snug. Before orienting the pantograph on a patient, remove the centric pins from their guide tubes. Also loosen the screws which secure the clamps marked R and L on the anterior extremity of the sidearms so the clamps move freely. When the pantograph is not in use it should be stored in its case. Do not store the pantograph with the stylus elastics under tension. The pantograph operates at 20-25 pounds air pressure. Pressure in excess of 25 pounds should not be used.

Screw Tension

The screws which tighten the sidearm clamps must be secured as tightly as possible in orienting the pantograph to the patient. The screws positioning the black aluminum castings on the anterior crossbars should be snug, but do not tighten with great force.

Component Alignment

The first time the pantograph is oriented on a patient the components on the anterior crossbars may have to be repositioned. Subsequently, they will occasionally have to be reoriented depending on the patient. Note the four annular rings on the anterior crossbar assemblies. To ensure proper component alignment, note that the clamps for the stylus support assemblies and anterior record tables are positioned immediately lateral to these rings. The reference plane support rod clamp is positioned approximately 1/4 inch medial to the right anterior record table.

Stylus Function

If the stylus action becomes sluggish, replace the elastics. Manipulating the styli manually to distribute the lubricant within the actuating mechanism before the pantograph is assembled on the patient is recommended after periods of storage of the pantograph in a cold climate. The tips of the styli have been rounded and polished to ensure proper functioning with the pressure sensitive recording blanks. However, if in the first clinical uses tearing of a recording blank occurs, the tip of the stylus may require additional polishing. This can easily be done with a rubber pumice wheel. Care should be taken not to bend the styli.

Lubrication

The stylus actuation mechanisms have been permanently lubricated for proper function prior to leaving the factory. They should require no further lubrication. However, if after prolonged use the stylus action remains sluggish after replacement of elastics, a small droplet of high-quality handpiece oil poured into the cylinder or chamber through the small vent hole at the top of the cylinder will restore normal action. A small amount of oil on the stylus itself is permissible. Care should be taken

not to over oil. Do not put handpiece cleaner or other solvent in workings of the stylus assemblies.

Replacement of Elastics

If the stylus action becomes sluggish, replace the elastics which actuate the styli with new elastics. A supply of replacement pantograph elastics are included in each pantograph kit. Elastics are provided in two sizes. The large size is used to actuate the anterior scribers. A piece of dental floss can be used as an aid in replacing the sidearm elastic (Fig. 20). When replacing the elastics, it is important that the loop which engages the hook on the stylus be made as large as possible to ensure proper stylus pressure in recording (Fig. 21). If too much of the elastic is used for anchorage of the elastic to the retention eyelet the loop used to activate the stylus will be too small and can cause excessive stylus pressure which may deflect the sidearms.

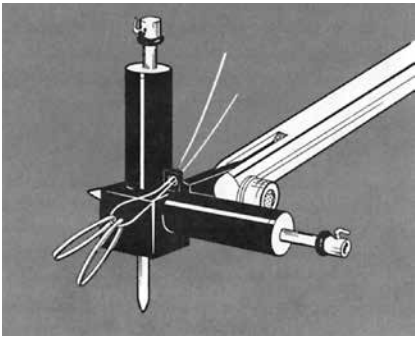


Fig. 20

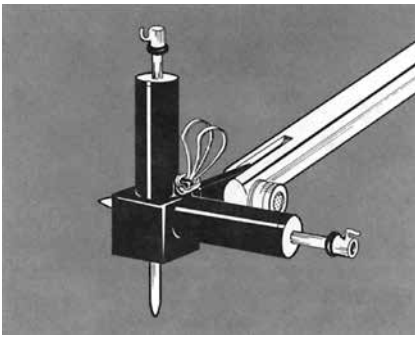


Fig. 21

Pantographic Technique

I. Locating Three Reference Points on the Patient's Face

The components needed are: the reference plane locator (Fig. 22) 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.

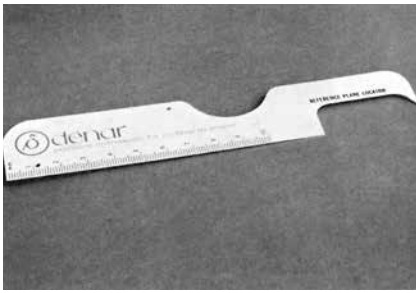


Fig. 22

The are two means of locating the posterior points. The first is by precise location of the terminal hinge axis with a hinge axis locator. 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 the manual.

Average measurement may be used to locate the posterior reference point 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 fight side of the 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.

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 a felt-tipped pen to gently mark through the hole onto the face (Fig. 23).

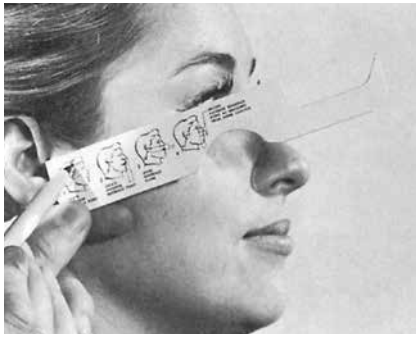


Fig. 23

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

The position of the “anterior reference point” is measured up 43 millimeters from the “incisal edges” of the central or lateral incisors, 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 on the right eye where the top point of the locator touches the patient’s face (Fig. 24).

Fig. 24

Measure the distance between the anterior reference point and the inner canthus of the eye. 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.”

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.

II. Clutch Construction

A dental clutch is an intraoral device which indexes to the teeth or alveolar ridge of a dental arch to which extra oral devices are attached to register anatomical relationships or mandibular paths of movements.

In order to locate the hinge axis or perform a pantographic survey, a pair of clutches are necessary to index the hinge axis locator or pantograph to the dental arches.

Denar® provides two clutch formers, a dentulous clutch former and an edentulous clutch former, to facilitate the efficient fabrication of clutches. The dentulous clutch former is used for all clutch fabrication procedures except for the totally edentulous patient.

Dentulous Patient

An ideal clutch is one which is very thin over the tips of the cusps but thick for rigidity in the central sections without soft-tissues impingement. The impressions made by the teeth should be very slight with little or no detail, but positive enough to provide accurate indexing to the teeth. With a little experience this can be accomplished routinely.

The clutch former (Fig. 25) is a jig mechanism which locates two acrylic clutch frames in proper position for construction of clutches directly in the mouth. Anteriorly, the clutch frame has a precision index to which an anterior crossbar assembly can be precisely located. Laterally it has retentive sidearms to which cold cure acrylic will bond. Interposed between the clutch frames is the rubber clutch die which prevents the cold cure acrylic of the upper and lower clutches from bonding to each other during clutch fabrication. On the inferior surface of the clutch die a center bearing screw is supported in the correct location for incorporation by cold cure acrylic into the mandibular clutch. On its superior surface is a form over which is cast the area in the maxillary clutch, the center bearing screw bearing area, which the center bearing screw will glide on when the patient executes mandibular movements. This form cast in the maxillary clutch subconsciously encourages patient cooperation in executing directed excursive movements.

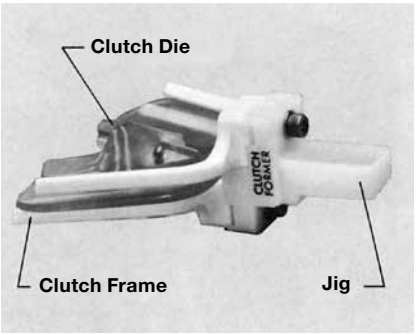


Fig. 25

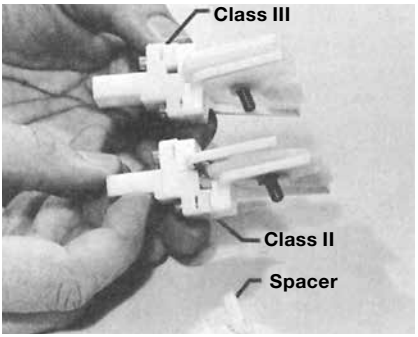


Fig. 26

A spacer is used to relocate the maxillary or mandibular clutch frame distally to accommodate Class II or Class III arch relations (Fig. 26). When the lower clutch frame is repositioned distally with the spacer to accommodate extreme Class II arch relations, the clutch die is pulled to its most distal position and the opening which occurs anteriorly between the clutch frames

is occluded with utility wax in order to prevent the bonding together of the maxillary and mandibular clutches.

In order to accommodate wide arches, the acrylic sidearms of the clutch frames may be reshaped after warming over a flame or they may be modified by grinding. When the sidearms are modified by bending after warming a pattern of the inner contour of the clutch frame is scribed on a flat surface prior to flaming (Fig. 27). A horizontal plane relationship of the sidearms to the vertical plane of the face of the anterior index should be maintained.

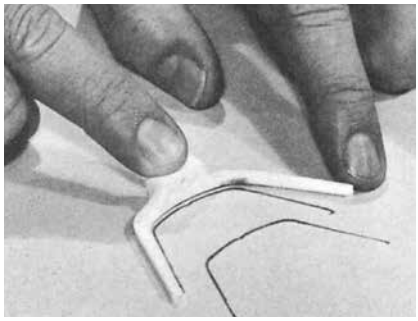


Fig. 27

The patient is instructed in allowing the operator to manipulate the mandible in terminal hinge rotary movement (Fig. 28). The operator's thumb should be placed on the patient's chin under the fat pad.

Fig. 28

The clutch former is tried in the mouth to ensure that the clutch frames fit close to the labial surface of the anterior teeth (Fig. 29). The sidearms should not impinge against the buccal surfaces of the posterior teeth.

Load the clutch former with a smooth creamy mix of fast-setting cold cure acrylic (Fig. 30). Three-quarters vial of monomer will produce the correct amount of acrylic to fabricate clutches. The quantity of both the polymer and monomer should be measured. The quantity of material used is extremely important. If too much material is used, as the mandible is closed in terminal hinge closure into the material to provide a thin clutch over the occlusal surfaces of the teeth, the excess material will be expressed over the height of contour of the teeth or impinge on the soft tissues. Subsequently, it will be impossible to accurately fit a maxillary cast inside the maxillary clutch unless the excess material is ground away.

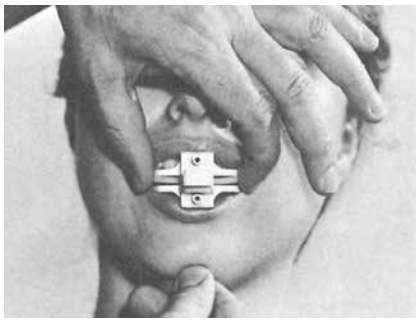


Fig. 29

The consistency of the mix of acrylic is also important. Material which is too soft and runny cannot be handled conveniently. The material should be mixed to a consistency which can be handled

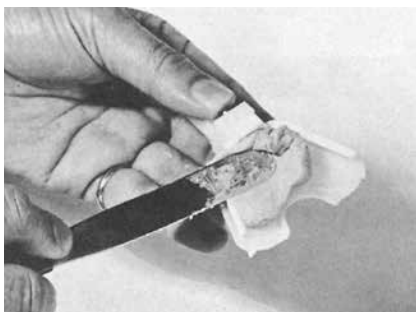


Fig. 30

conveniently, but simultaneously it must be of a smooth, creamy consistency so that it will cast a smooth, wrinkle-free character in the center bearing screw bearing area of the maxillary clutch. Slightly more than half the mix is used to fabricate the maxillary clutch. The balance of the mix is used to fabricate the mandibular clutch. After loading the clutch former, immediately immerse it in warm water to hasten the cure and so the buoyancy of the water will prevent runoff of the acrylic.

When the acrylic has set beyond the tacky stage to a tough consistency which resists displacement remove the clutch former from the warm water and distribute the acrylic so that the acrylic will be thick in the central sections of the clutch for rigidity but thin over the occlusal surfaces of the teeth (Fig. 31).

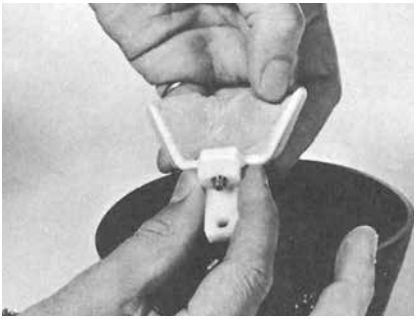


Fig. 31

When the acrylic has set to the proper consistency bring the clutch former to the mouth and support it in the intermaxillary space. Do not press the clutch former up on the maxillary teeth. Guide the mandible in terminal hinge closure to obtain the desired impressions of the teeth and then immediately instruct the patient to open the mouth. Remove the clutch former and immerse it in warm water.

When the acrylic has set to a very tough consistency return the clutch former to the mouth for final cure and maximum accuracy (Fig. 32).

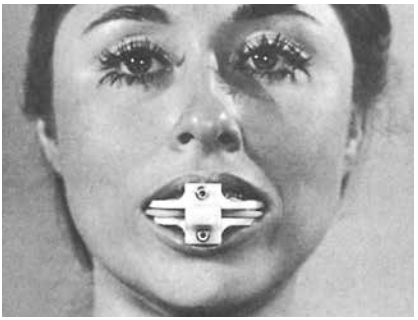


Fig. 32

Adjust the center bearing screw height so that there is one millimeter clearance between the clutches when the clutches are indexed to the teeth and the mandible is in centric relation (Fig. 33). This will require that the center bearing screw be turned counterclockwise approximately three-quarters of one revolution. The clutches are now checked in the mouth for stability and correct interocclusal clearance.

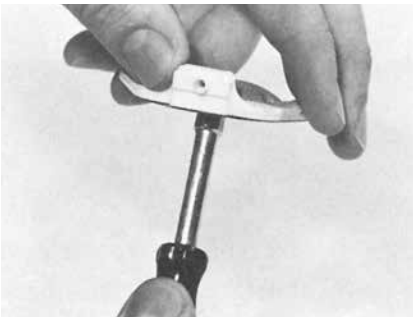


Fig. 33

Important: In attaching a clutch frame to the clutch former or to a crossbar assembly of a facebow or pantograph always completely seat the clutch frame into its index before inserting the screw. This will support the projecting nozzle on the clutch index and prevent it's breakage when the screw is inserted. Always use a screw length which gives full length thread engagement to the clutch frame. Care should be exercised in tightening the screws so as not to strip the plastic threads in the clutch frame.

III. Orienting Pantograph to Patient

The armamentarium or tray setup required to perform a pantographic survey includes the anterior, right and left scriber assemblies; anterior, right and left recorder assemblies; stylus control valve; reference plane marker; reference plane locator; record blanks; protective overlays; centric pins; reference plane support rod; and wrench (Fig. 34).

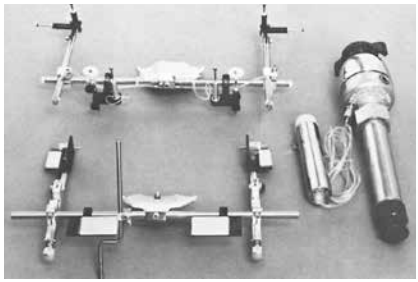


Fig. 34

The pantographic survey supplies are composed of 24 pantographic survey record forms and are included in the Denar® Clutch Frame Kit which includes 24 clutch frames. These are sufficient supplies to construct clutches and perform pantographic surveys for 12 patients. Two record forms are provided for each patient. One should remain in the pantographic survey record book; the other is a lab copy (Fig. 35).

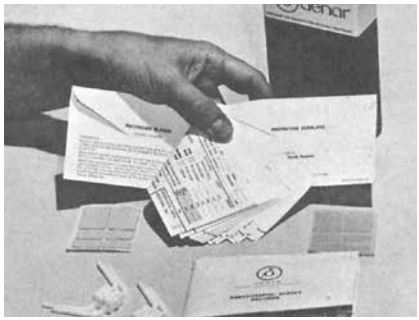


Fig. 35

It is important to have a tray setup of all the components necessary for the recording properly prepared before the pantograph is assembled on the patient. The record blanks should be positioned on the record tables. The vertical posterior blanks should be positioned flush with the superior and anterior margins of the record tables. The posterior horizontal record blanks should be positioned flush with the lateral and posterior margins of the record tables.

Before assembling the pantograph on the patient the following checks should be made:

1. The wax wells on the anterior recorder should be free of index holes.
2. The lockscrews in the centric pin guide tubes should be retracted so as not to inhibit the insertion of the centric pins.
3. The posterior reference pins should be screwed in all the way.
4. The stylus control valve should be attached to the air supply and ready to operate.

Locate the initial reference marks on the patient's face and construct clutches as detailed in prior sections of this manual. Place the clutches in the patient's mouth and instruct the patient in mandibular movements while they maintain a gentle biting pressure (Fig. 36). When the patient first attempts to execute these move-

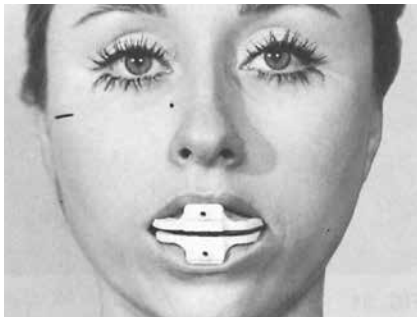


Fig. 36

ments, he or she will have a tendency to open the mouth and drop the clutches. This tendency is quickly overcome with a little training.

When training the patient to execute perimeter mandibular movements, the dentist should use the same hand grasp on the patient's chin to help support the mandible and perceive condylar paths of movement as he or she will employ when performing the pantographic survey. Right-handed dentists should place the right thumb on the patient's chin under the fat pad so as to accomplish an intimate relation between the bone of the thumb and the bone of the patient's mandible. This will effect the most optimal tactile perception of condylar position and movements, permitting the dentist to determine if the desired movements are being executed.

Train the patient in the same sequence of movements you will have him or her execute when making the recording. Have the patient repeat the same movement until his or her ability to execute it on command is perfected before starting to train him or her to execute other movements.

The terminology used in instructing the patient is extremely important in order to avoid confusing the patient. Use the same pattern of commands to the patient which will be used when making the recording. In instructing the patient to make successive movements in the same direction, it is less confusing to the patient to issue an order such as "again to the right" rather than issue an order such as "move to the right." With the latter terminology the patient has to make a decision. With the phrase "again to the right" he or she just repeats the prior excursion. Use the word "again" whenever possible in instructing the patient to effect mandibular movements.

Always have the patient execute a protrusive movement and then have him or her retrude the mandible to the centric relation position before instructing him or her to execute any eccentric movement. The patient must be able to return to the terminal hinge position, and make protrusive, right lateral and left lateral mandibular movements on command before assembling the pantograph to the clutches.

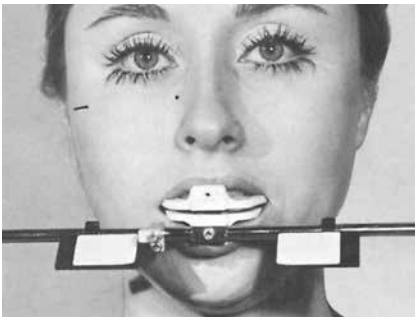


Fig. 37

Have the patient maintain the mandible in centric relation and assemble the pantograph on the patient. Attach the anterior recorder assembly to the mandibular clutch. Note the wax wells on the lateral ends of the record tables (Fig. 37).

Orient the recorder sidearm assemblies so that the posterior reference pins are horizontal and lightly touch the posterior reference points marked on the patient's face (Fig. 38). Secure the sidearm clamps as tightly as possible. Adjust the reference plane support rod clamp parallel to the reference plane scribed on the patient's face. Adjust the anterior record tables parallel to the recorder sidearms.

Fig. 38

Retract the posterior reference pins so they will not impinge on the patient's face when the patient executes excursive mandibular movements (Fig. 39).

Attach the anterior scriber assembly. Adjust the anterior scriber supports so that the centric pin guide tubes are above the wax wells and so that the anterior scriber supports are parallel to the anterior record tables as viewed laterally (Fig. 40). Remove the pneumatic nipples plugged into the extremities of the scriber crossbar.

Attach the scriber sidearms so that the posterior styli are located in relation to the posterior record tables. Secure the sidearm clamp as tightly as possible. Firmly seat pneumatic nipples into the fittings at the anterior end of the scriber sidearms.

Important: The posterior styli should be positioned so that their tips will engage the record blanks equidistant from their inner, outer, and anterior margins when the mandible is in the rearmost position. This will position the styli so that they will touch the record blanks when the styli are in the recording position with the mandible in centric relation (Fig. 41).

Connect the stylus control valve to the pantograph manifold (Fig. 42). Depress the level of the air syringe and the styli will be retained in the retracted position. Engage the elastics in the hooks on the styli. Depress the button on the stylus control valve to engage the styli, release the button to retract the styli. You are now ready to obtain a pantographic record.

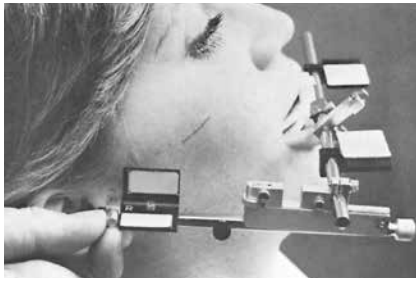


Fig. 39

Fig. 40

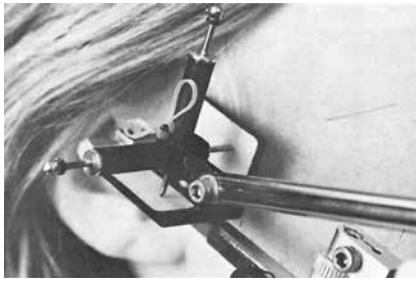


Fig. 41

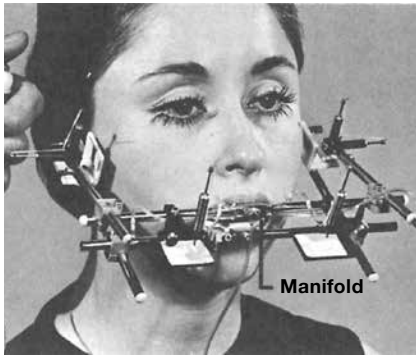


Fig. 42

The pantograph should not be operated on air pressure in excess of 25 pounds. Denar® Power Supply can be used to furnish a constant 25 pound pressure. It has an on and off valve and operates on Crosman CO_2 cartridges available from Denar® or any sporting goods store (Fig. 43).

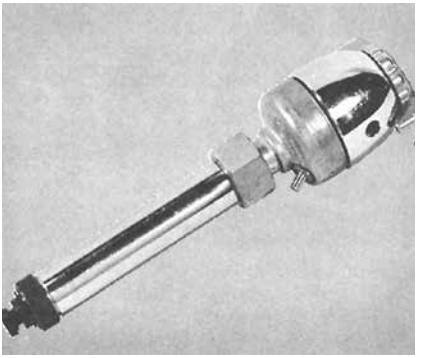


Fig. 43

IV. Performing a Pantographic Survey

In obtaining a pantographic record, it is best to have the patient's head firmly seated in a headrest and oriented to the torso in the normal postural position. Right-handed dentists should hold the stylus control valve in the left hand and use the right hand to help support the mandible and to perceive condylar position and movement. The thumb should be place on the patient's chin under the fat pad. The dentist should position the thumb so as to accomplish the most intimate relation between the bone of the thumb and the bone of the patient's mandible to effect optimum tactile perception on condylar movement.

You are now ready to commence recording condylar paths of movement. Attempt to record only the desired mandibular positions or movements. Do not record all the movements the patient may make. For example, in recording the centric relation or rearmost position of the mandible, have the patient protrude and retrude the mandible to the rearmost position. If you doubt that the patient is in the most retruded position, do not press the button to activate the styli. Have the patient protrude and retrude the mandible until you are confident they are in the most retruded position and then record that position. Similarly, in recording lateral excursive movements, do not attempt to record the first lateral excursive movement the patient executes.

Have the patient repeat the same excursive movement by using the phrase "again to the right" or "again to the left" until you are confident a pure peripheral movement is being executed. Then record the successive movements. Always have the patient execute a protrusive movement and return to the centric relation position before recording eccentric excursive movements. Never attempt to record movements from eccentric positions to the centric relation position as these are not perimeter movements.

While maintaining the patient's mandible in the centric relation position, depress the button momentarily to register a dot on the record tables recording the centric relation position. Confirm the centric relation position by having the patient protrude and retrude the mandible and repeat the above procedure. If the two recordings are coincidental, centric relation is confirmed. If the recordings are not coincidental, the recording should be repeated until centric relation is confirmed. After confirming the centric relation position of the mandible, obtain two coincidental right lateral records, two coincidental left lateral records, and lastly, have the patient execute a singe straight protrusive movement and obtain a protrusive record.

Contra-indications: If in obtaining a pantographic survey, the patient exhibits difficulty in maintaining the terminal hinge position or experiences pain in the temporomandibular joint areas, a decision to proceed with restorative procedures when these conditions exist should be cautiously re-evaluated.

When the pantographic writing has been accomplished, disengage the stylus elastics, turn off the pressure supply, and disconnect the stylus control valve.

Loosen the centric stops on the centric pins and warm the tips of the centric pins in an open flame (Fig. 44).

Insert the centric pins in their respective guide tubes and advance them to the bottom of the wax wells while the patient maintains the centric relation position. The centric pins must have been heated warm enough to cause the wax to freely puddle about the centric pins. While the wax is melting, tighten the centric lockscrews and allow the wax to chill (Fig. 45).

To ensure accuracy, manually depress the styli and observe their relation to the scribings to confirm that the patient maintained the centric relation position while obtaining the centric pin centric relation record of the pantograph. Secure centric pin stops against the guide tubes (Fig. 46).

Loosen the centric pin lockscrews and with a slight twisting motion, remove centric pin records (Fig. 47).

nsert the reference plane support rod in the reference plane support rod clamp, approaching it from its inferior surface. Index the reference plane locator on the reference plane support rod in the hole provided on the reference plane locator. With the reference plane locator resting on its support rod, adjust the position of the reference plane support rod up or down. By line of sight, accurately orient the reference plane locator coincidental to the horizontal reference plane on the patient's face indicated by the posterior reference pins and the anterior reference

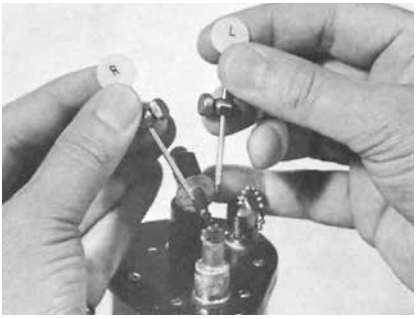


Fig. 44

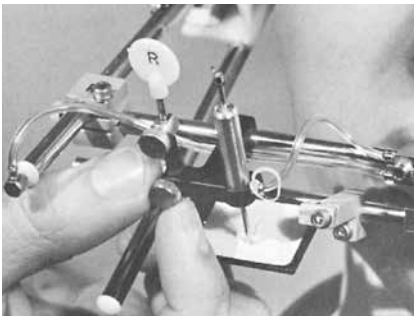


Fig. 45

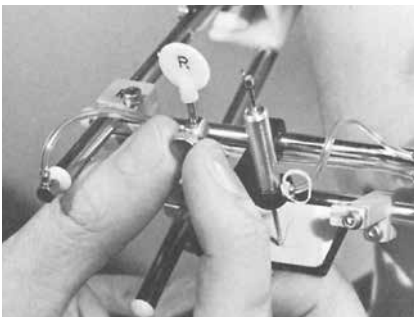


Fig. 46

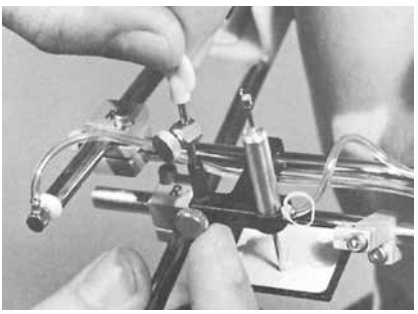


Fig. 47

point. Secure the reference plane support rod in its clamp with the offset in the rod to the patient's right (Fig. 48). Note: The length of the reference plane support rod used should be equal to the distance of the horizontal axis of the articulator above the bottom of the feet of the articulator used. The Denar® Facebow and Pantograph are normally supplied with reference plane support rods for transfer of the pantograph or facebow to the Denar® D5A Articulator. This rod is 109 millimeters long and is identified by two annular rings on the lower end of the rod. Reference plane support rods for transfer of the Denar® Pantograph or Facebow to other articulators are available.

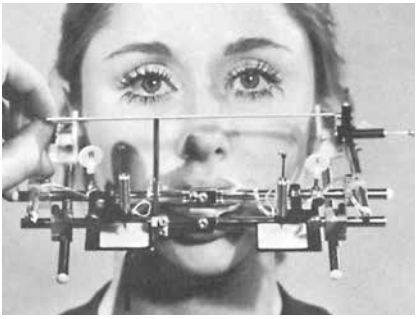


Fig. 48

Have the patient maintain the centric relation position and reseat the centric pins in position with the centric pin lockscrews. Grasp the pantograph and have the patient open his or her mouth (Fig. 49). The pantograph can now be easily removed.

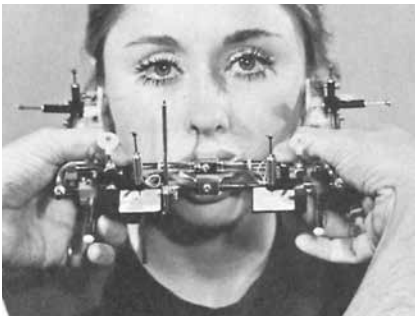


Fig. 49

Remove the scriber from the recorder assembly and desensitize the record tables to protect the scribings by covering them with protective overlays (Fig. 50). This is called "fixing the records."

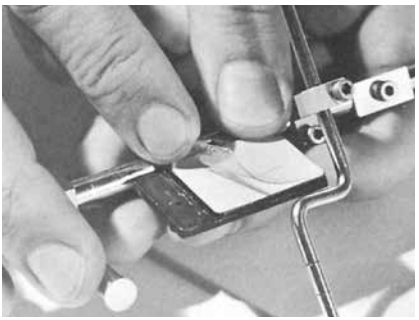


Fig. 50

Return the hinge axis pins to their extended position. Index the scriber assembly to the recorder assembly by positioning the centric pin tips in their respective wax registers and allowing the maxillary clutch to rest on the center bearing screw. Grasp the pantograph (Fig. 51). Manually depress the styli and confirm accuracy to this point.

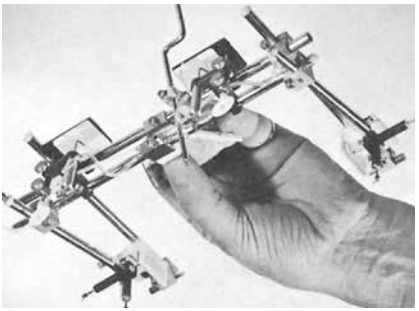


Fig. 51

V. Transferring the Pantograph to the Denar® D5A Articulator

The posterior reference pins are screwed all the way in. The telescoping mounting axis is expanded to index over the tips of the posterior reference pins (Fig. 53). The number on the scale indicates the position to which the vertical axes of the articulator must be adjusted to accept the pantograph.

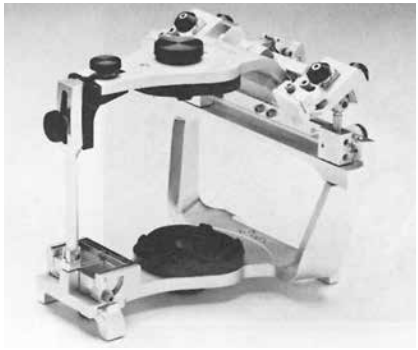


Fig. 52

The articulator is prepared to receive the pantograph by adjusting the vertical axes to the position indicated by the telescoping mounting axis. The anterio-posterior angle of the eminentia is set to 25-30 degrees. The progressive side shift is set to 5-10 degrees. All other adjustments, including the vertical dimension of the incisal pin and the incisal table adjustments, are set to zero. Mounting studs are positioned in the holes provided in the lateral aspects of the condylar elements (Fig. 54). The recorder is transferred to the articulator by indexing the posterior reference pins provided in the lateral extremities of the mounting studs (Fig. 55). The reference plane support rod is allowed to rest on the surface bearing the articulator. A mounting stand is constructed by attaching the recorder to the lower mounting plate with dental stone.

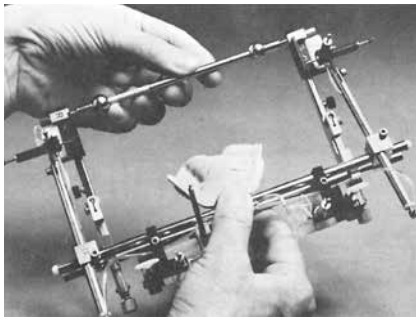


Fig. 53

The maxillary bow of the articulator is positioned on the mandibular bow and engaged in the lock open position with the centric latch. The scriber is oriented to the recorder by indexing the centric pins in the impressions they made in the wax wells of the recorder. The maxillary clutch is allowed to rest on the center bearing screw in the mandibular clutch. A cast may or may not be placed in the maxillary clutch for mounting (Fig. 56). To ensure positive seating of the condyles in their respective fossa, an elastic is used.

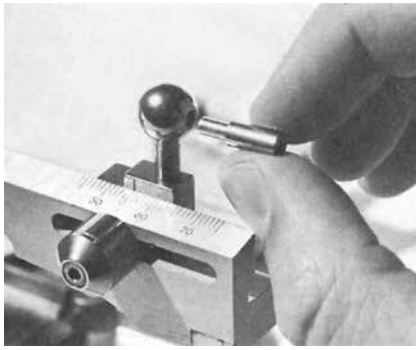


Fig. 54

In almost all cases, clutches are constructed and the pantographic record obtained prior to tooth preparation. If sufficient unprepared teeth remain after tooth preparation for accurate orientation of the working cast in the clutch, a working cast may be transferred to the articulator simultaneously with the pantograph. If a maxillary cast is to be transferred to the articulator simultaneously with the pantograph, the

cast is accurately indexed in the maxillary clutch and secured with sticky wax. If the cast does not seat accurately in the clutch, it may be necessary to remove the maxillary clutch from the scriber and trim away excess acrylic with a vulcanite burr or Fascut stone.

If extensive tooth preparation is to be performed, it is recommended that the pantographic record be obtained prior to tooth preparation, and subsequently after the teeth are prepared, a facebow record be obtained to transfer the working cast to the articulator. If the dentist elects not to transfer a maxillary cast to the articulator with the pantograph, but elects to transfer only the pantograph to the articulator to diagnose condylar paths of movement, additional retention for the maxillary clutch to the mounting stone is achieved by adapting additional cold cure acrylic retentive nodules to the superior surface of the clutch (Fig. 57).

The mounting studs which may interfere with adjustment of the posterior and superior fossa walls are removed by supporting the posterior reference pins and loosening the reference pin supports. Retract the posterior reference pins and remove the reference pin supports posteriorly. The mounting studs can then be removed. Remove the centric pins and the reference plane support rod. Retract the styli. Open the centric latch. The maxillary bow with attached scriber assembly can now be easily removed from the mandibular bow for convenient modification of the fossa inserts if desired (Fig. 58). Proceed to diagnose condylar paths of movements by adjusting the articulator to the pantographic record.

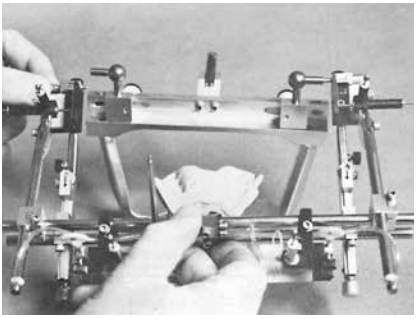


Fig. 55

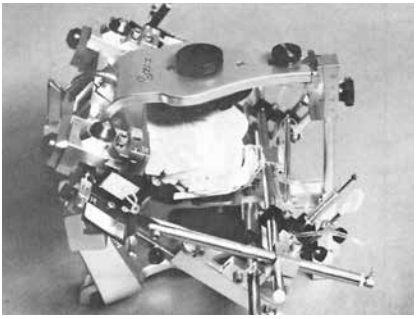


Fig. 56

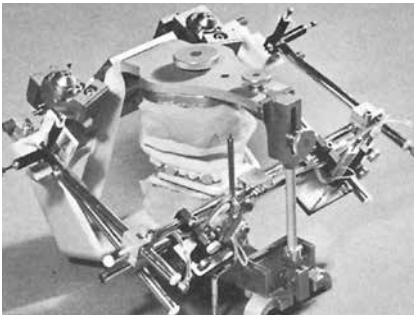


Fig. 57

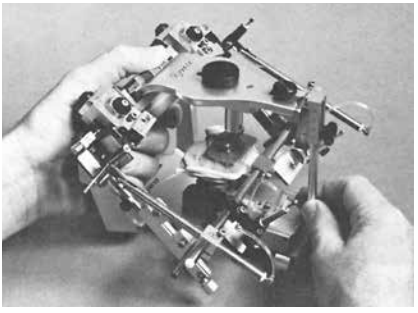


Fig. 58

VI. Adjusting the D5A Articulator to the Pantographic Record

The lines of the pantographic record graphically reflect condylar paths of movement. A condylar path of movement is the movement the condyle makes as a result of temporomandibular joint characteristics. These characteristics include the shape of the bearing surfaces of the fossa, interarticulator disc, and condyle; the degree of tautness and/or elasticity of the capsule and associated suspensory ligaments; and the way these component tissues function against each other when muscular force vectors motivate the condyle to action. It is to be noted that a line on a pantographic tracing graphically reflects the condylar path of movement which occurs as a result of a composite of these factors and does not graphically reflect any single anatomical characteristic.

When the pantograph is transferred to the articulator, if the articulator is adjusted to exactly follow the recorded lines, the articulator will accurately describe the protrusive, orbiting and rotating condylar paths of the patient. Furthermore, the character of these paths will have been reduced to numeric values of millimeters or degrees expressed on the calibrated control adjustment scales of the articulator.

Depending on the dentist's objectives, the articulator may be adjusted so the styli: (a) accurately follow the recorded lines, or (b) follow a path relative to the lines. Accurate reproduction of the patient's mandibular movements can be accomplished most efficiently by selecting the appropriate fossa inserts and/or by custom modification of these inserts. Indications for setting an articulator to accurately follow the recorded lines is discussed later in the manual.

This section of the manual deals with the functions of the calibrated control adjustments on the D5A Articulator in adjusting it to a pantographic writing. However, the Denar® Pantograph can be transferred to most adjustable articulators. The ability of the articulator to produce a movement which will enable the styli to track the recorded lines is limited only by the adjustment capability of the articulator to which the pantograph is transferred.

When adjusting the D5A Articulator to pantographic writings the operator should be thoroughly familiar with the significance of each line in the tracings, which characteristic of the temporomandibular articulation it most graphically reflects, and how the lines are generated. The operator should also be thoroughly familiar with the location of the articulator adjustments which control the mechanical equivalents of these temporomandibular joint characteristics and with the location of the corresponding lockscrews and scales for these adjustments.

In adjusting an articulator to pantographic tracings, the operator must manipulate the articulator in a manner to maintain positive contact with the condyles against the appropriate fossa bearing surfaces. With a little experience, the operator will soon develop the best hand grasps of the instruments to accomplish this most conveniently.

The recommended technique to employ in adjusting an articulator to pantographic scribings is to move the articulator in a text excursive movement in the appropriate direction while observing the movement of the styli relative to the line to which it is being adjusted. If a modification of a condylar path of movement of the articulator is indicated, the adjustment is made and another test excursion is executed. This procedure is repeated until the desired setting is achieved.

When the medio-lateral locations of the condyles are adjusted to accept the pantograph in the transfer procedure, they are located by average anatomical measurement. This location will be confirmed or modified in step 5 below with the pantograph.

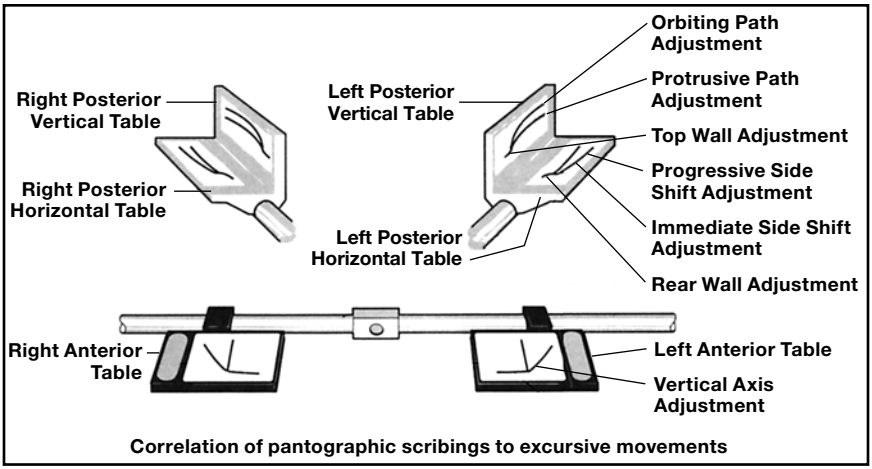


Fig. 59

Sequence of Adjustments

1. Protrusive Condylar Path Adjustment: The articulator is manipulated so that all vertical styli track the protrusive condylar path recording (Fig. 59). The protrusive condylar path is adjusted by setting the posterior horizontal styli relative to the line (Fig. 60).

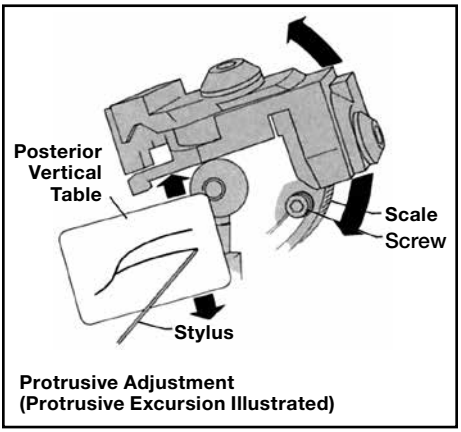
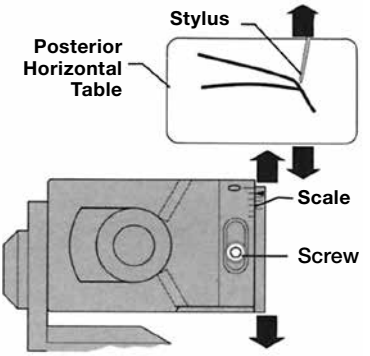


Fig. 60

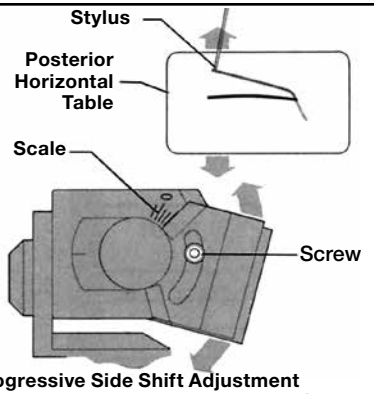
2. Immediate Side Shift Adjustment (Timing of the Side Shift):
The outer line on the horizontal record table is inspected to determine its character and the appropriate medial fossa wall insert is selected and located in the articulator. The articulator is manipulated in the appropriate lateral excursive movement and the immediate side shift is timed by adjusting the posterior vertical styli relative to the outer line on the posterior horizontal table (Fig. 61).



Immediate Side Shift Adjustment
(Right Lateral Excursion Illustrated)

Fig. 61

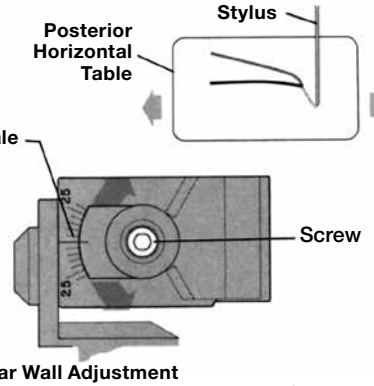
3. Progressive Side Shift Adjustment (Timing of the Side Shift):
The articulator is manipulated in the appropriate lateral excursive movement and the progressive side shift is adjusted by setting the posterior vertical styli relative to the outer line on the posterior horizontal table (Fig. 62).



Progressive Side Shift Adjustment
(Right Lateral Excursion Illustrated)

Fig. 62

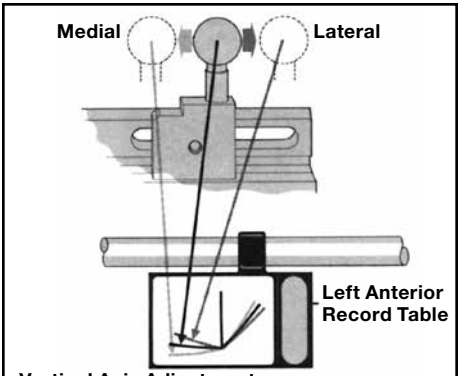
4. Rear Wall Adjustment (Anterio-Posterior Inclination of Rotating Condylar Path):
The articulator is manipulated in the appropriate lateral excursive movement and the rear wall is adjusted by setting the posterior vertical styli relative to the short line on the posterior horizontal record table (Fig. 63).



Rear Wall Adjustment
(Left Lateral Excursion Illustrated)

Fig. 63

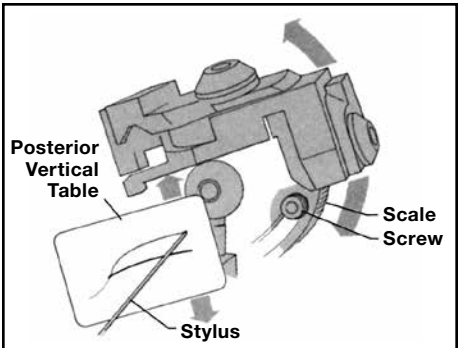
5. Vertical Axis Adjustment (Medio-Lateral Location of Fossa-Condylar Elements): After the rear wall adjustment is made the anterior vertical styli will most often accurately track the anterior gothic arch tracings. If the styli do not track the medial legs of the anterior tracings accurately, the articulator is manipulated in appropriate lateral excursive movements and the vertical axes are adjusted until the styli track the medial legs of the anterior tracings (Fig. 64). Relocating a vertical axis more medially relocates the medial path of the anterior stylus on the same side more anteriorly. Relocating a vertical axis more laterally relocates the medial path of the anterior stylus on the same side more posteriorly.



Vertical Axis Adjustment
(Left Side Illustrated)

Fig. 64

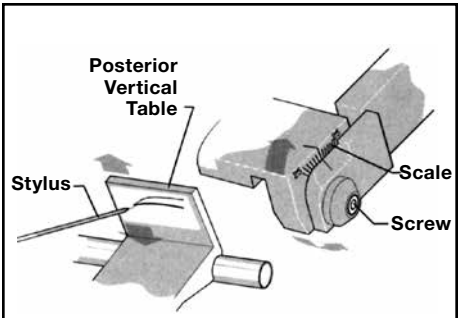
6. Orbiting Path Adjustment: The articulator is manipulated in the appropriate excursive movement and the anterio-posterior angle of the eminentia is adjusted by setting the posterior horizontal styli relative to the long upper line on the posterior vertical record table (Fig. 65). This is the same articulator adjustment used to diagnose the protrusive condylar path inclination.



Orbiting Path Adjustment
(Right Lateral Excursion Illustrated))

Fig. 65

7. Top Wall Adjustment (Superior-Inferior Inclination of the Rotation Path): The articulator is manipulated in the appropriate lateral excursive movement and the inclination of the superior fossa wall is adjusted by setting the posterior stylus relative to the short line on the vertical record table (Fig. 66).



Top Wall Adjustment
(Left Lateral Excursion Illustrated)

Fig. 66

Reciprocal Influence of Adjustments

Reciprocal: Expression of mutual influence or relation (definition).

When the pantograph is assembled, although the styli will move in and out of the respective cylinders, they all have certain fixed relations to each other. Therefore, when an articulator is adjusted to move one stylus relative to a line, that adjustment may have a mutual or reciprocal influence on other styli relative to their recorded lines.

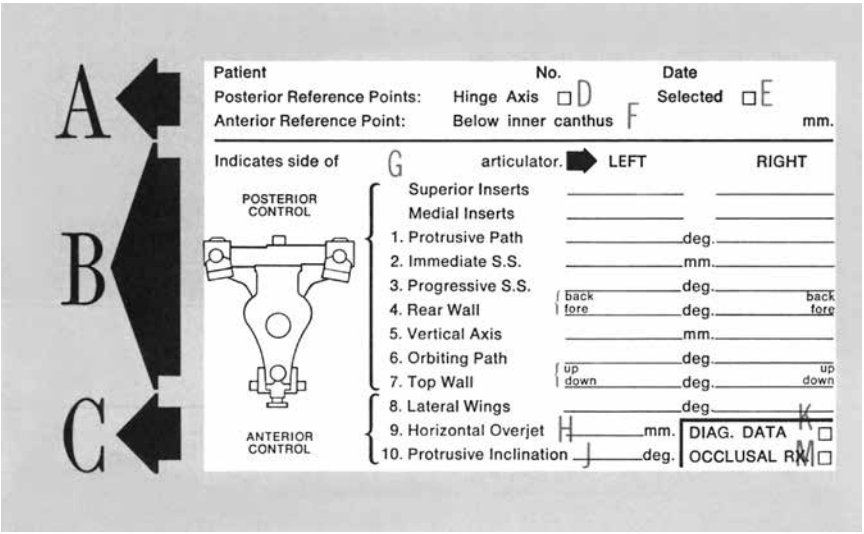


Fig. 67

VII. Pantographic Survey Record Form

When the articulator has been set to the pantographic scribings of the patient and/or to the overbite-overjet relation of the anterior teeth, the articulator settings are recorded on the pantographic survey record form (Fig. 67). This form is designed to be used with any articulator. The pantographic survey record form is divided into three sections:

Section A
To record pertinent references including the location of the horizontal reference plane and the manner in which the posterior reference points were established.

Section B
To record data to which the posterior control areas of the articulator are adjusted.

Section C
To record data to which the anterior control area of the articulator is adjusted.

VIII. Transfer Procedure

A maxillary cast or restoration can be transferred to the articulator by use of a:

A. Pantograph

B. Facebow

C. Remount record jig

When a pantograph record is obtained and transferred to the articulator as a diagnostic procedure prior to the time the teeth are prepared, a study cast of the maxillary teeth may be secured in the maxillary clutch when the pantograph is transferred to the articulator. After the articulator is adjusted to the pantographic record, the pantograph, clutches and mounting stand are removed from the articulator leaving only the mounted maxillary cast in the instrument. The remount record jig can now be secured to the mandibular bow of the articulator and a remount record (occlusal core) of the maxillary cast made with quick-set stone (Fig. 68).

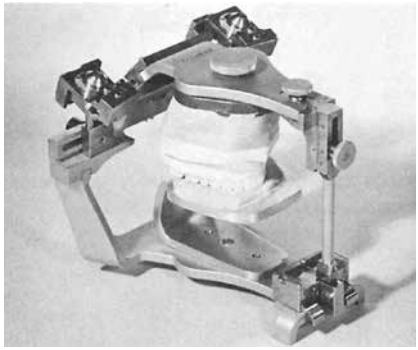


Fig. 68

This record will subsequently provide the means to transfer a maxillary cast to the articulator providing there are a sufficient number of unprepared teeth to accurately orient the cast in the core.

The remount record jig is also used to make a remount record (occlusal core) of a restoration such as a full denture or extensive fixed restorations to facilitate their subsequent remounting in the articulator. Utilization of the remount record jig in this manner saves much valuable chair time and laboratory time as it eliminates the need to return the patient to obtain a facebow transfer record.

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