

Complete Denture – Flasking, Dewaxing & Packing

م.م اریج مفید

Compression molding technique: داخل

The act of pressing or squeezing together to form a shape within a mold; the adaptation, under pressure, of a plastic material into a mold.

1- Mix P/L = 3:1 by volume, or 2.5:1 by weight. Sandy stage, sticky stage, doughy stage, stiff rubbery stage.

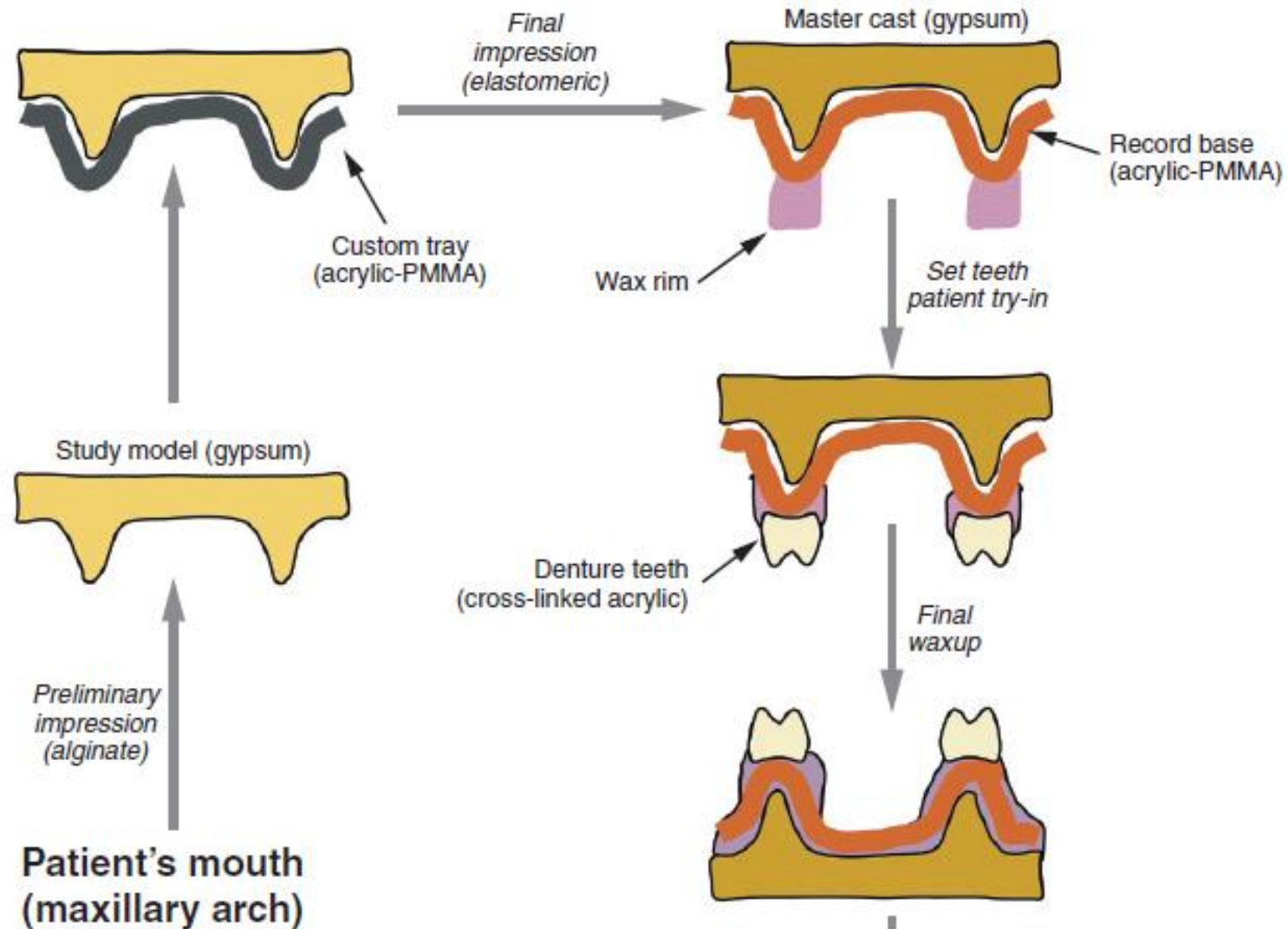
2- Place it aside until it reaches dough stage for packing.

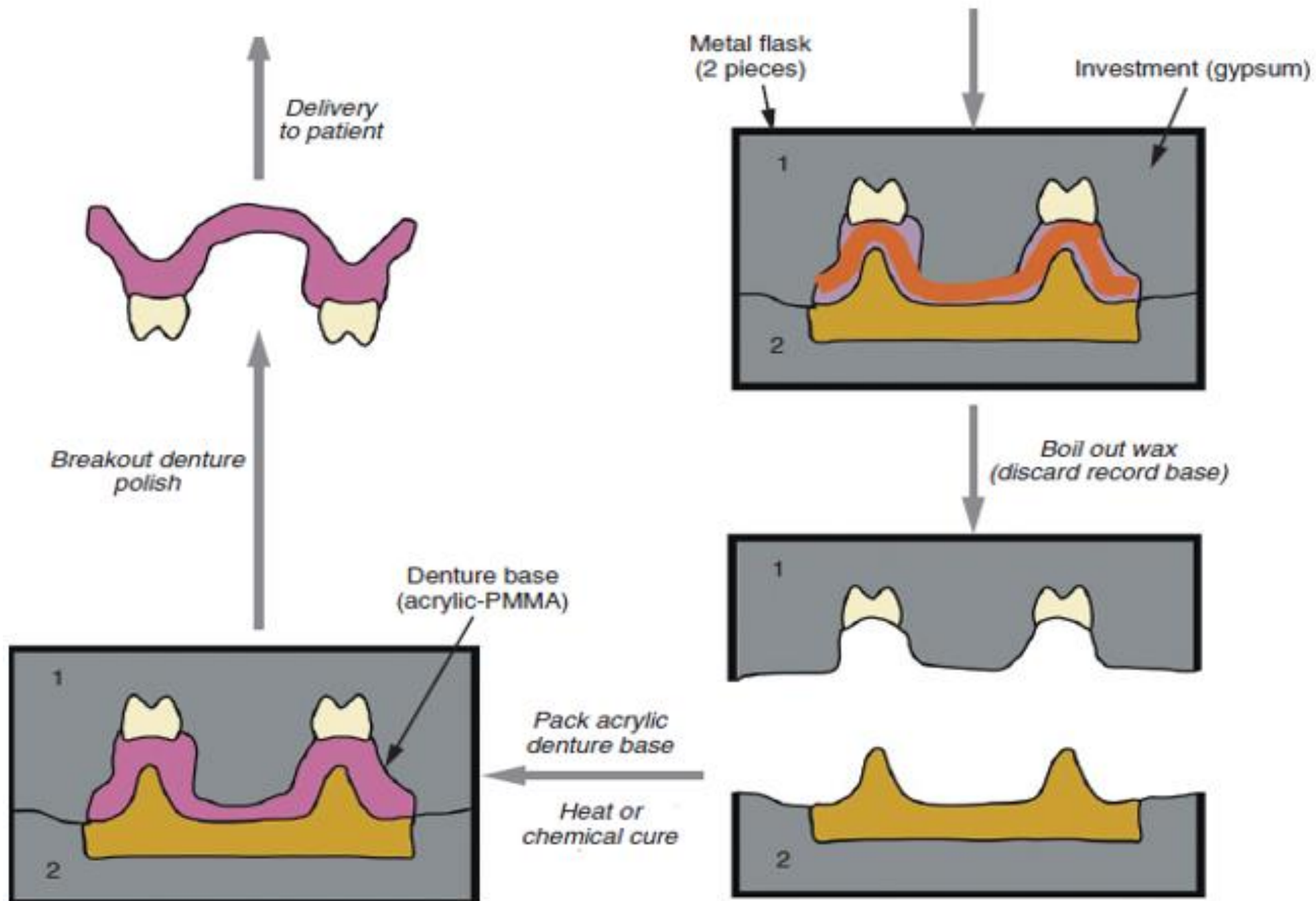
3- After the resin has reached dough stage remove from the jar from it into a roll and adapt it to the flask.

4- Place the plastic sheets over the resin, place the flask in position and close it slowly in a bench compress to permit the flow of acrylic resin into the minute details of the mold.

Polymerization reaction is exothermic, should be carefully controlled to avoid exceeding boiling point of unreacted monomer (100.8 C).

Construction of a complete denture diagrammatically showing key steps





داخل FLASKING

- Flasking is the process of **investing the cast** with the waxed denture in a **flask** to make a sectional mold that is used to form the acrylic resin denture base. Therefore it is also known as investing.



- داخل

- **Components of a Flask**

- The flask is a metallic mold that supports the models and the try-in denture during the flasking procedure.

- It is composed of **3 parts**:

- 1.The **base** in which the model & the try-in denture will be placed.

- 2.The **mid-part** in which the teeth will be placed.

- 3.The **cover**



Flasking / Investing Procedure

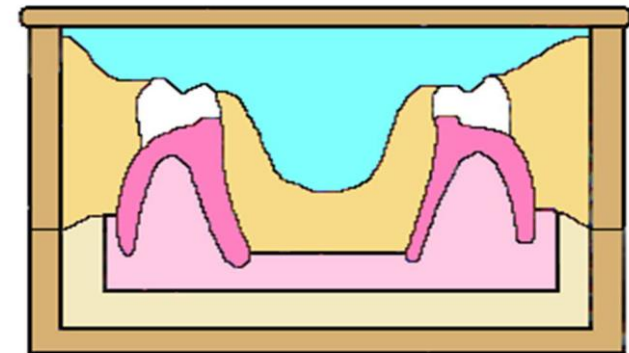
1. Flask must close fully and accurately without resistance. If a flask fails to do this, air-blows, distortion or excess increase in vertical dimension may occur.
2. The model with the sealed try in denture must be covered with very thin layer of Vaseline.



- 1.Any **undercut** should be covered by wax.
- 2.All parts of the flask must be **clean** and covered by thin layer of **Vaseline** from inside.
- 3.Models with the sealed (try in) are to be placed in **cold water** for **10 min.** before flasking.
- 4.Thin mixture of **POP** poured in the **base** of the flask, **place** the **model**, teeth should be vertical.
- 5.All the parts of the model should be covered with POP and all the wax and teeth must be uncovered.



1. After setting of POP cover it by **thin layer of cold mold seal or Vaseline.**
2. Prepare a mixture of **gypsum**, put the mid part in its correct place and pour the gypsum without covering the occlusal surfaces.
3. After setting of this layer also cover it with cold mold seal.
4. **Fill the flask** with another layer of gypsum, cover it, put the **flask under mild pressure** to prevent gypsum from expanding, **wait for complete setting.**

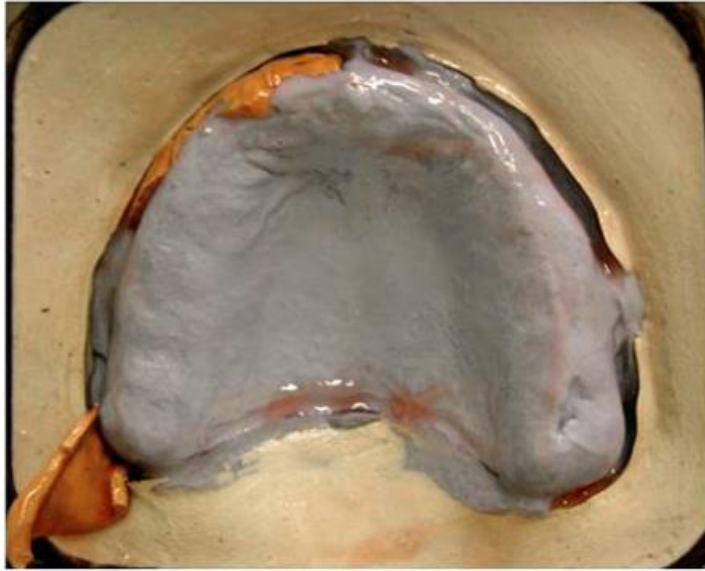


**COMPLETED FLASKING
FOR THE MANDIBULAR
COMPLETE DENTURE.**

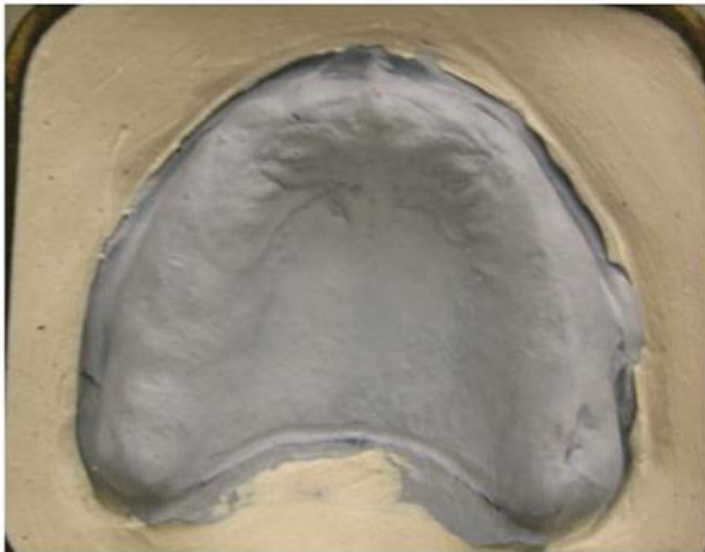
Dewaxing / Wax Elimination Procedure داخل

1. After setting of gypsum, wax elimination procedure is to be done.
2. Put the flask in boiling water for 5-7min.
3. Separate the 2 parts of the flask.
4. Remove the shellac base plate and the wax using the boiled water and detergent.
5. Place the clean flask in open air to dry and cool it.





Left over wax after dewaxing



Complete cleaning from wax



Dewaxing path unit

Acrylic Packing Procedure

1. Isolate the gypsum of the flasking by using one of these systems of isolation: •

Physical separator or isolator: tin foil. •

Chemical isolator: solution of alginate (cold mold seal). It reacts with the calcium of the gypsum to form a film of insoluble calcium alginate. •

2. Use the brush, move it in one direction to **spread** the **cold mold seal**. •

3. The cold mold seal should be **thin** and even on **all the parts** of the mold **except** the **teeth** which should not be separated. If the teeth covered by cold mold seal, they will not adhere to the denture base. •

4. Mixing •

Acrylic resin is a resinous plastic material of various esters of acrylic acid. It is used as a denture base material. It is formed of a powder and liquid. **Powder:** polymethyl methacrylate PMMA (polymer) + Benzoyl peroxide (initiator) + pigments. •

Liquid: methyl methacrylate (monomer) + hydroquinone (inhibitor) Powder and liquid are mixed in a ratio of **3 to 1** by volume for an average sized denture.

داخل Stages of acrylic mixing •

1. A **sandy** stage : where a fluid mass occur due to the settling of the polymer into the monomer.
2. A **stringy** or **fibrous** stage: where the monomer starts to attack the polymer. In this stage the mix is tacky, sticky and adheres to the sides of the mixing jar.
3. **Smooth** dough like stage: where the monomer diffuses into the polymer.
4. **Rubber** like stage: further penetration of the monomer into the polymer. In this stage the acrylic resin cannot be packed or molded being too stiff.
5. **Stiff** stage : hard

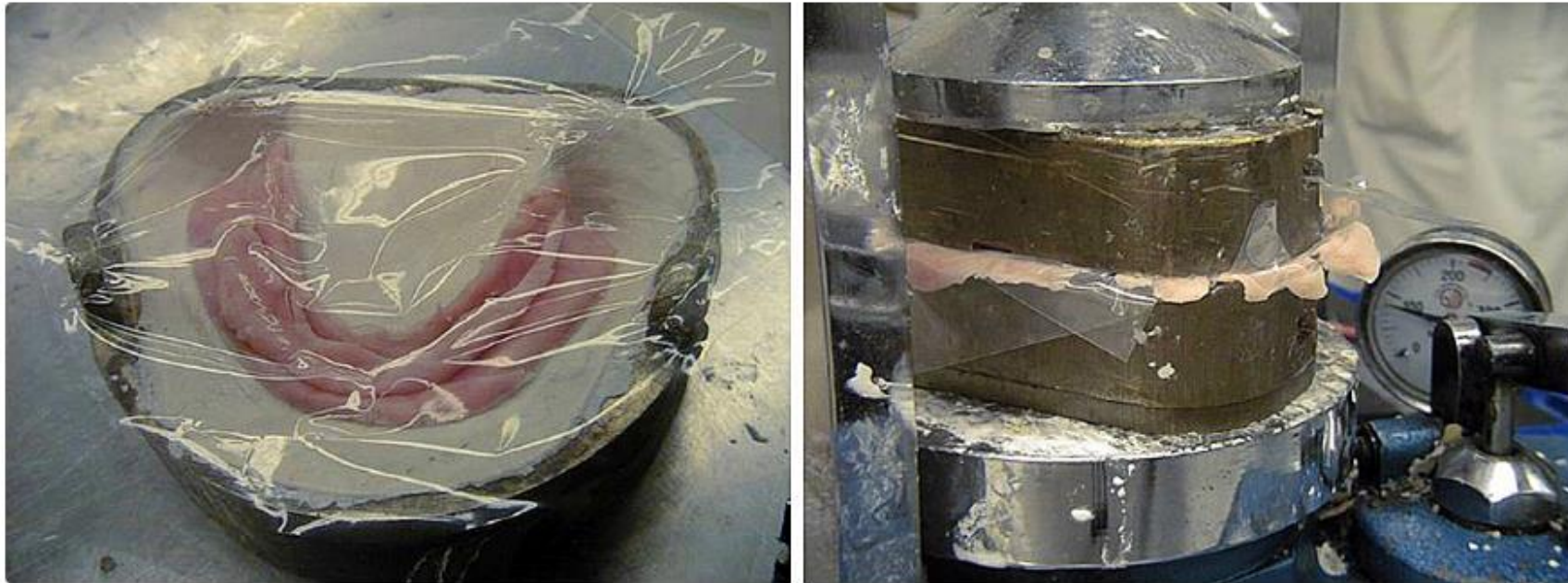


- **Packing of acrylic** داخل

- It is the procedure of application of acrylic resin into the mold and pressing the flask by using sufficient pressure to compensate for the contraction of the acrylic after polymerization to prevent shrinkage and porosity.
- Put acrylic in the mold, press in a clamp, do curing immediately.



- Note: داخل
- **Too early**– (Stage II) – acrylic resin has too low viscosity to densely fill the mold. Results in porosity in the final prosthesis.
- **Too late**– (Stage IV) – inability to close the flask, loss of detail and increase in vertical dimension of occlusion in final prosthesis, as well as, movement and/or fracture of teeth.



Acrylic placed into mold cavity and covered with **cellophane** for **trial pack**.

- Flask pressed until **excess acrylic squeezes out** around edges.
- Acrylic **flash** to be **trimmed** away, **small amount** of acrylic to be **added where needed**. Take note of the wrinkles from cellophane.



- The mold is full when the acrylic is pressed smooth and dense. A small amount will be added at wrinkles.
- **Close** the upper and lower parts of the **flask** together.



Press of acrylic

Curing of Acrylic داخل

- The packed mold is heated (cured) in an oven or in water bath. Temperature and time should be controlled.
- Two water bath heating techniques may be used:
 - a) **Long curing cycle** Heating the flask in a special bath of water, beginning from the **room temperature** until **reaching 72°C for 16 hours**.
 - b) **Short curing cycle** Heating the flask in an ordinary water bath beginning from the **room temperature**, until **reaching 72°C**, lasting for **2 hours**, then the temperature is **raised to boiling** for another **1 hour**.
- This technique takes shorter time but there is a likelihood to be distorted during de-flasking. Also, the free monomer is more.

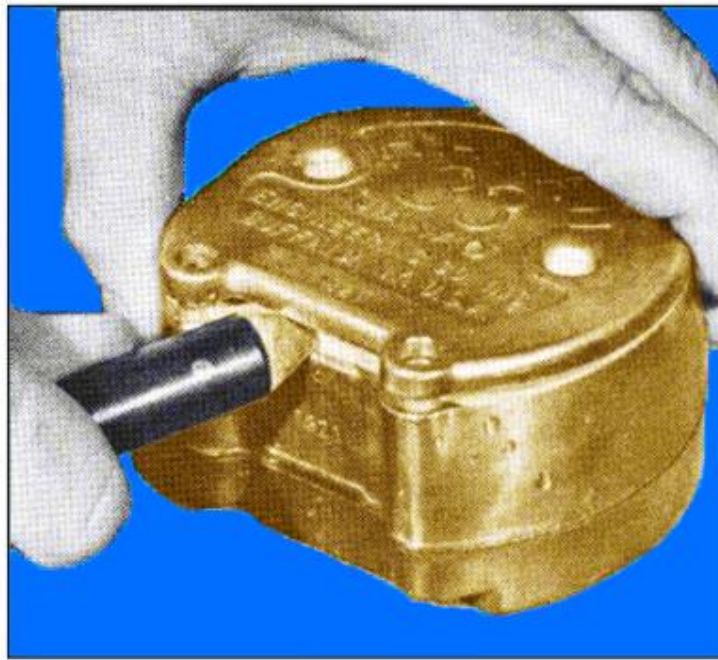
Cooling of the flask / Bench Cooling:

- After curing, the flask is to be **cooled slowly on the bench in its water bath.**
- The **slow cooling** will permit the **relief of the internal stresses** caused by the difference in contraction between the acrylic and the mold material.



De-flasking Procedure

- It is the procedure of **opening the flask** after curing of acrylic resin. It should be done carefully to prevent the breakage of the denture. It includes the following steps:
 1. **Remove the flask from the clamp.**
 2. **Remove the upper and lower lids.**
 3. **Separate the 2 parts** of the flask with attention using the **plaster knife**.
 4. Liberate the denture with its model, then try to **remove the model carefully**. If there is undercut, split the model into 2 or 3 parts to remove them easily.
 5. After gaining the denture, **remove the excess of acrylic** using the acrylic bur.



Removing the lid



Separate the flask



Instruments of removable and Fixed Prosthodontics Restorative

م.م اریج مفید

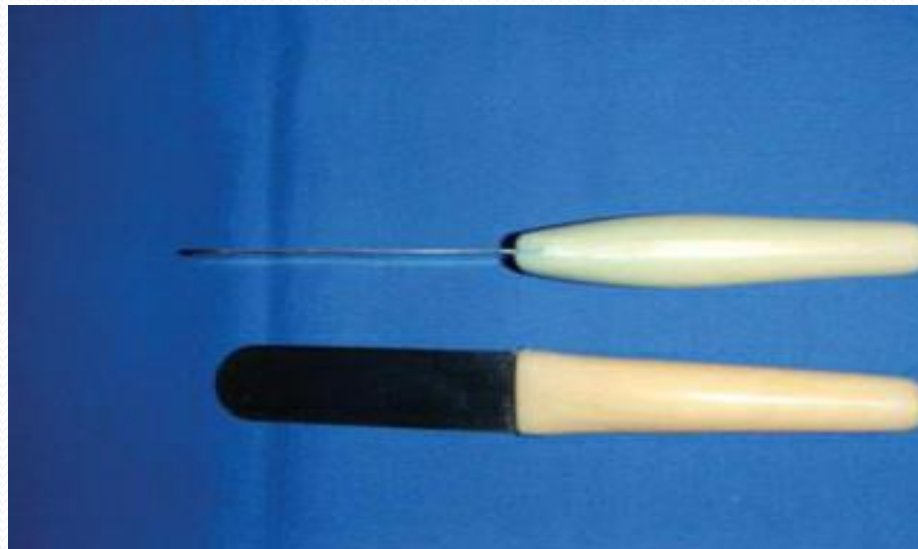
Rubber bowl

- Rubber bowl is used for the manipulation of plaster, stone, and alginate.
- It is available in different sizes.
- It is made of stiff and flexible rubber.



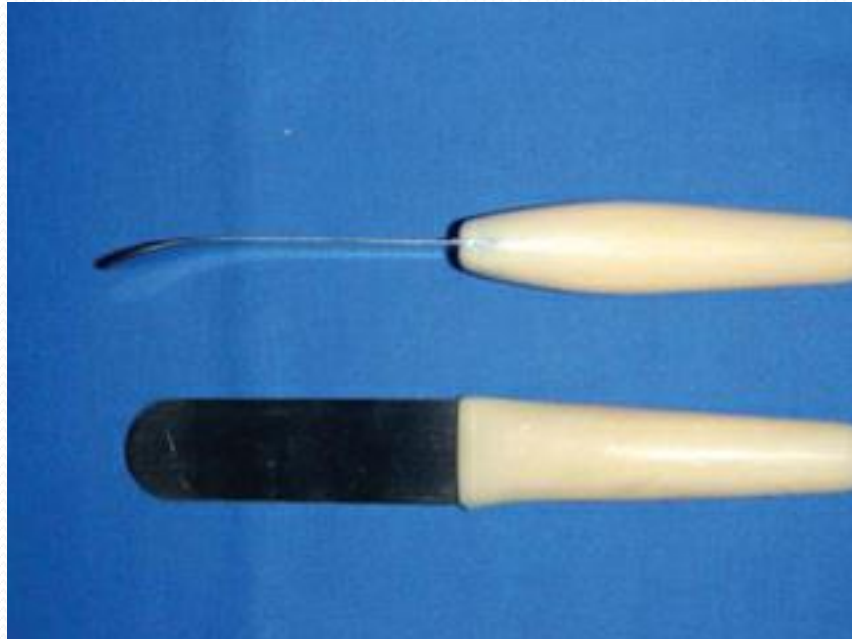
Straight mixing spatula

- Straight mixing spatula is used for mixing dental plaster and dental stone.
- The blade of the metallic spatula is straight with a rounded end.
- The handle is made of plastic



Curved mixing spatula

- Curved mixing spatula is used for mixing alginate.
- The blade of the metallic spatula is curved with a rounded end.
- The curved end helps in the mixing of the alginate material.



Plaster knife

- Plaster knife is used in trimming of plaster models.
- The blade of the plaster knife is metallic and is sharp.
- The handle is made of plastic.
- It can also be used during the manipulation of other gypsum products.



Hot plate

- Hot plate is used for uniform reduction of occlusion rims.
- It has a broad metal plate with a plastic handle.



Edentulous stainless steel stock tray داخل

- Edentulous stainless steel stock tray is used for making
- impressions of edentulous patients with impression compound.
- • It is a prefabricated nonperforated impression tray made of
- stainless steel.
- • The impression tray has a carrier for carrying the impression
- material and a handle for positioning and handling the impression.
- • The lower tray is U-shaped to accommodate the tongue whereas
- the upper tray is shaped to accommodate the palate and alveolar
- ridge.



Perforated dentulous stock tray داخل

- Dentulous metallic stainless steel stock tray is used for making impressions of dentulous patients.
- It is a prefabricated impression trays made of stainless steel with
- perforations which aids in the retention of impression material, such as alginate.



Fabrication of wax pattern داخل

- PKT₁:
- **Tip**: round, curved, tapered
- NO 1,2 wax addition instrument to apply large increments of wax to form cusp ridge on wax pattern and fill voids
- PKT₂:
- **Tip**: round, curved, tapered
- NO 1,2 wax addition instrument to apply small increments of wax and eliminate voids on occlusal surface



- داخل

- PKT₃

- Pointed burnisher

- NO₃ for refining occlusal anatomy, enhance supplemental and developmental groove (carve occlusal surface)

- PKT₄

- NO_{4,5} wax carver designed as an all purposes carver

- To define, shape and smoothen external axial surface contours

- To remove excess wax on the cusp ridges and refine triangular ridges and occlusal groove



PKT1



PKT2



PKT3



PKT4



PKT5



PKT₅



PKT₄



PKT₃



PKT₂



PKT₁

Le Cron carver • داخل

Wax carver is an instrument used for carving the wax patterns of

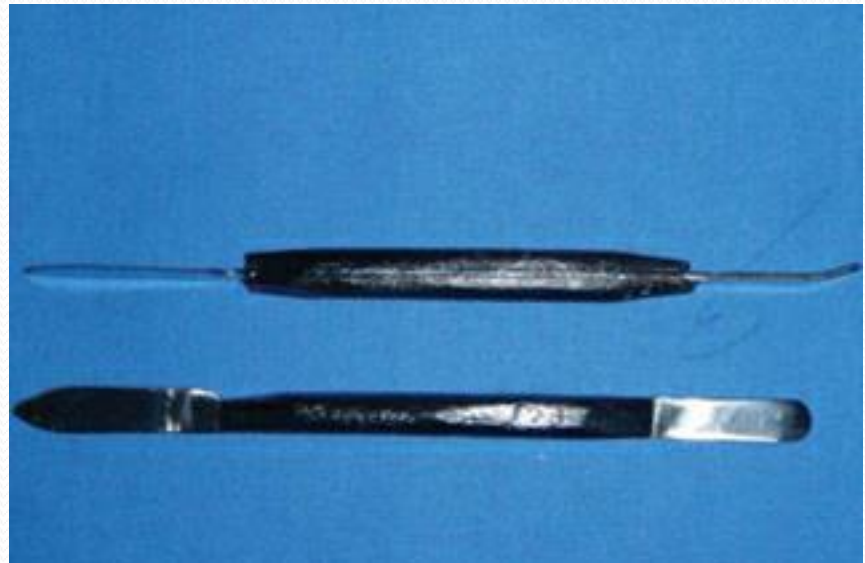
- the tooth.
- The carver has two ends, one end is a scoop used for scooping out wax and the other end has a sharp blade end for carving the pattern in wax.
- Frequent heating of the wax carver may cause bluntness of the carving tip.
- Wax carver is also used in finer manipulation of gypsum products.



Wax knife داخل

Wax knife is used commonly during fabrication of wax occlusion

- rims, teeth arrangement, wax up procedures and for finner
- manipulation of dental plaster during procedures, like mounting
- and flasking.
- • It has a knife-like end on one side for cutting wax and the other
- end has a scoop used for carrying the molten wax and
- manipulating curved wax surfaces.



Gingival Retraction Cord

- **Function**
- To place gingival retraction cord in sulcus area after tooth is prepared for a crown and before final impressions are taken
- **Characteristics:** Smooth or serrated edges Double ended—Different angle on each end Variety of styles
- **Practice Notes:** Gingival Retraction Cord instrument is mainly used on crown and bridge tray setup unless gingiva needs to be retracted for a restorative procedure.



Crown and Bridge Scissors داخل

- **Functions:**
- To trim aluminum temporary crowns on gingival side
- To trim custom temporary crowns
- To cut gingival retraction cord
- To trim matrix bands To cut dental dam septum
- **Characteristics** Short cutting edges—can be straight or curved, narrow or wide Variety of sizes
- **Practice Notes** Crown and Bridge Scissors are used on other restorative tray setups.



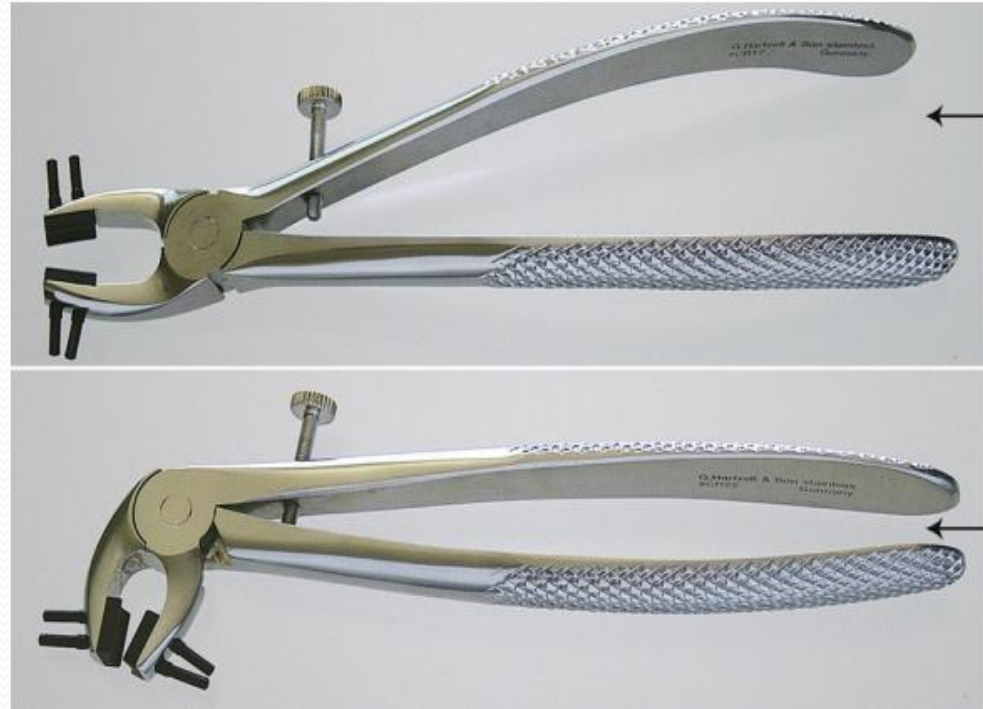
Contouring Pliers داخل

- **Function**
- To crimp and contour marginal edge of temporary crown or stainless steel crown
- **Characteristics** Commonly used type: Johnson Range of sizes available
- **Practice Notes** Contouring Pliers are mainly used on crown and bridge tray setup.



Trial Crown Remover داخل

- **Functions**
- To remove permanent crown from tooth during try-in phase
- To remove provisional crown
- **Characteristics** Types: Maxillary trial crown remover
Mandibular trial crown remover Replaceable pads—
Provide non slipping, tight grip
- **Practice Notes** Trial Crown Remover is mainly used on crown and bridge tray setup.



Crown remover

- Used to remove cemented crowns
- Beak of instrument is placed at the gingival margin of the crown while the weight on the handle is lightly tapped
- The light tapping may result in enough force to remove the crown



Centrifugal casting machine

م.م اریج مفید

Casting

- casting is a process by which a detailed wax pattern of a dental restoration is converted into alloy or ceramic
- Casting is used to fabricate inlays, onlays, crowns, ceramic– alloy crowns, some all-ceramic crowns, partial dentures, implant restorations and frameworks
- casting often uses a technique called the lost-wax technique. Figure 12-1 shows a diagrammatic summary of the steps involved in the lost-wax technique:
 - making the wax pattern,
 - spruing the pattern,
 - investing,
 - burnout,
 - casting,
 - removal of investment (devesting), and
 - finishing.

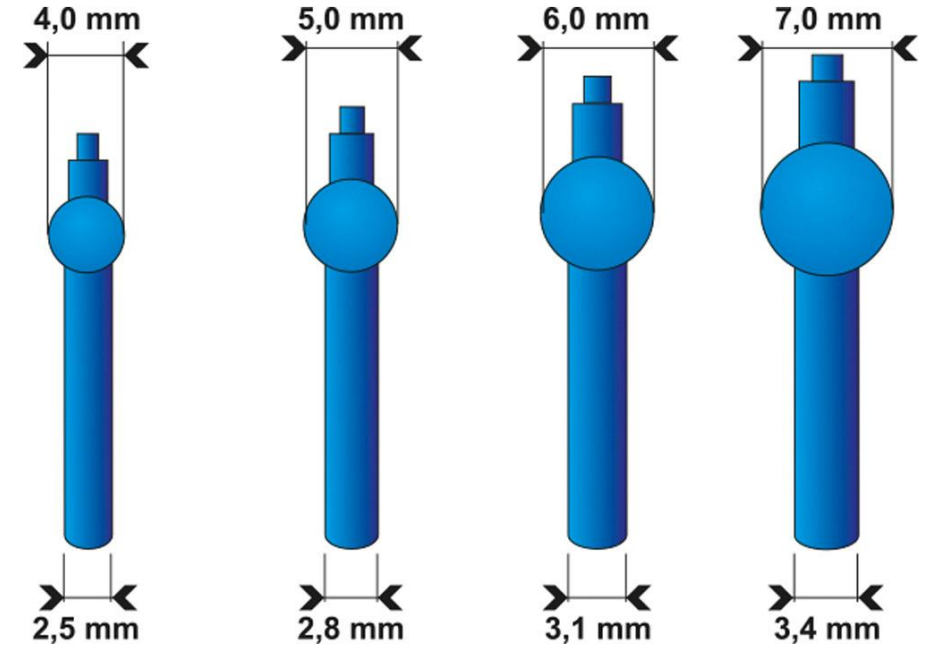
WAXING AND SPRUING

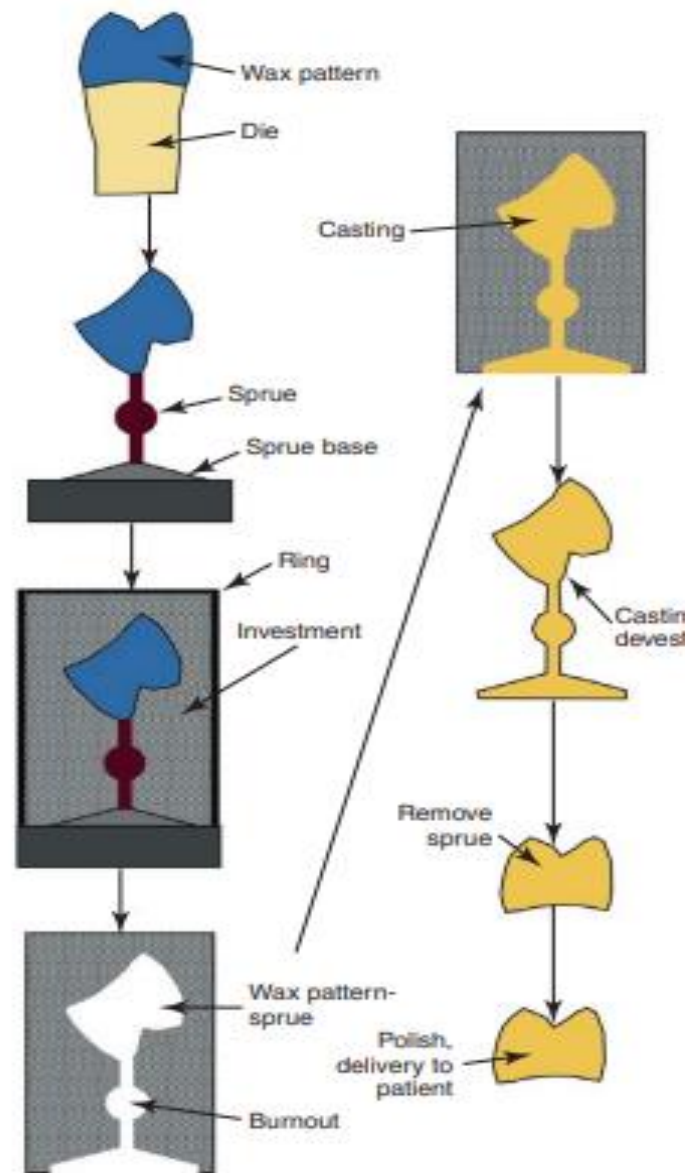
- Waxing داخل
- A wax pattern is a detailed model of the final dental restoration, including all anatomy, contours, occlusal function, and proximal contacts.
- Wax is used because it is easy to manipulate, inexpensive, and well suited to making custom restorations.
- Wax also is easy to completely eliminate (via burnout) after investing



- **Spruing** داخل

- A sprue forms a channel in the investment through which the molten alloy or ceramic travels to form the restoration.
- Sprues often are wax but also may be plastic or even metal. If metal, the sprue must be removed before casting because the metal will not burn out.
- In the simplest case, a single sprue is placed on one of the cusps of the wax pattern





Sequence of steps for dental casting using the lost-wax technique

INVESTING AND BURNOUT

- Investments

- During investing, the wax pattern and sprue are embedded in investment, a stone-like material that withstands the high temperatures and forces of burnout and casting.
- Investments are composed of a binder, which holds the investment together, and a refractory, which helps them to resist the heat of burnout and casting.
- The refractory in most dental investments is a form of silica (SiO_2). Both the binder and the refractory material contribute to expansion of the investment, which is necessary to compensate for shrinkage of the alloy

- Investing

- Investing the wax pattern captures all details of the wax pattern into the investment and,
- once the wax is burned away, provides a defined space into which the molten alloy or ceramic is cast.
- To retain the investment as it sets, a casting ring is placed onto the sprue base.
- The casting ring also supports the investment during the casting process.
- The ring is commonly lined with a ceramic-paper liner to help the investment to expand during setting and burnout.

- casting ring داخل

- a casting ring is placed onto the sprue base.
- The casting ring also supports the investment during the casting process.
- The ring is commonly lined with a ceramic-paper liner to help the investment to expand during setting and burnout.
- The liner is moistened before the investment is added to prevent it from absorbing water from the investment.
- Before investing, the wax pattern may be treated with a surfactant that aids flow of the water-based (hydrophilic) investment material over the water-hating (hydrophobic) wax pattern.



- (A and B) wax pattern is a cut-back
(C), a sprue is attached with wax onto a cuspal area that is least involved with the occlusal function of the tooth. The sprue is then attached to a rubber sprue base with wax
(D); then a steel ring is placed onto the sprue base
(E). A surfactant may be sprayed onto the wax pattern to improve the wettability of the pattern by the investment at this step. A ceramic liner is generally placed inside the ring to allow for investment expansion
Finally, the investment is mixed under vacuum at a precise water–powder ratio (F and G) and carefully poured into the ring, embedding the wax pattern and sprue

- **burnout** داخل

- Once the investment has set (after approximately 45 minutes), the casting ring is placed, sprue end down, into an oven to burn out the wax pattern and sprue.
- burnout provides temperature compatibility between the hot, molten casting material and the investment.
- If the molten casting material were cast into the investment at room temperature, the rapid change in temperature would likely crack the investment. The relatively cold investment also would cause the casting material to solidify prematurely before the restoration space was completely filled.
- The temperature in the burnout oven is commonly 500° to 600° C,
- but it varies depending on the
 - 1-type of investment,
 - 2-the temperature of the casting material, and
 - 3-the amount of expansion needed.

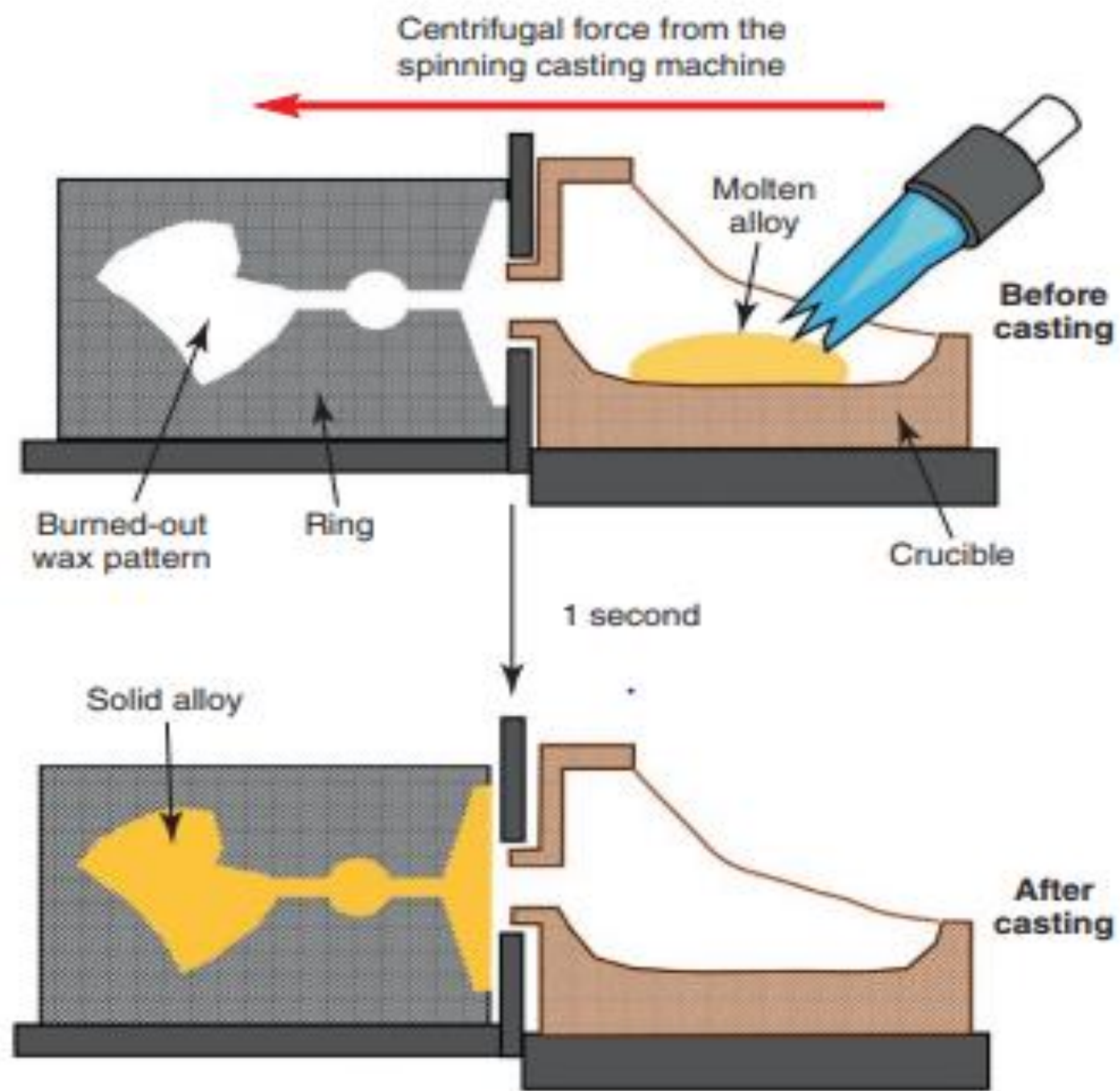
- داخل
- The length of burnout time depends on
 - 1-the size of the ring,
 - 2-the burnout temperature,
 - 3-the number of casting rings in the oven, and
 - 4-whether the oven was hot at the beginning of the burnout.
- Generally, at least 1 hour at full temperature is needed to completely eliminate wax from the ring and provide the necessary investment expansion.
- Once the casting ring and investment are heated, the ring should be cast before it cools to any degree; any delay of more than 20 to 30 seconds will severely compromise the fit and quality of the cast restoration

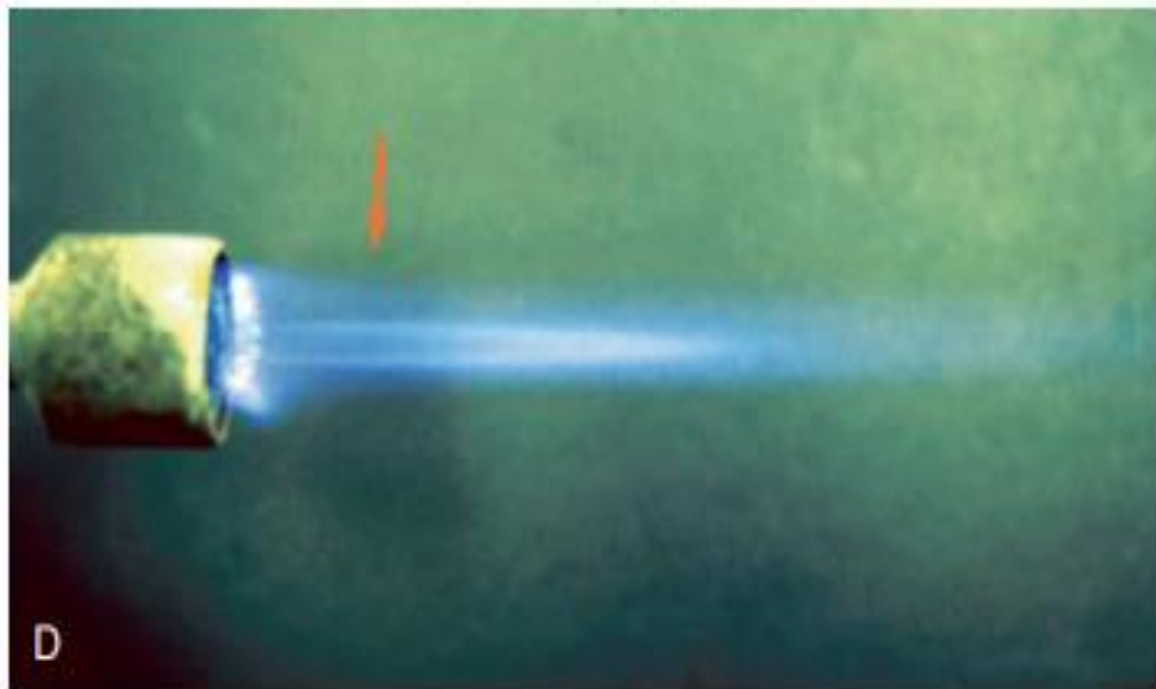
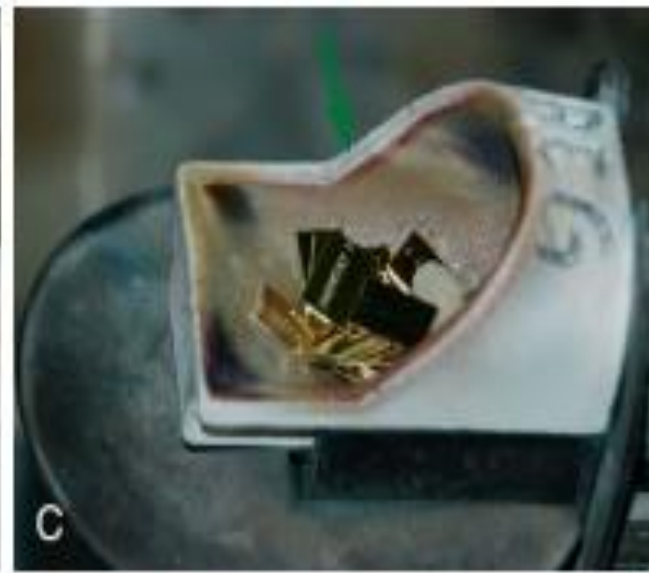


(A) to burn out the wax prior to casting. The **oven** maintains a temperature compatible with the investment used (600° to 900° C for alloys, higher for ceramics); this particular oven allows the operator to program several temperature–time combinations. The muffle (heated area) of the oven is in the upper half. When the oven door is opened (B), the casting ring is placed into the central area of the muffle (arrow) to ensure even heating

CASTING داخل

- Successful casting requires the coordination of the burnout of the ring, the melting of the casting alloy, and the manipulation of the casting machine.
- Most casting of alloys is done in a centrifugal casting machine
- Centrifugal casting machines operate on the principle of centrifugal force, in which the molten material is accelerated outward by rapid spinning.
- The casting machine is driven with a spring or electric motor.
- The casting alloy is heated in a crucible made of heat-resistant ceramic
- Casting alloys may be heated by blowtorch or electric current. The most common method for heating low-temperature alloys







- (A) to place the crucible in close proximity to the ring
- (B). The alloy is added to the crucible itself (green arrows)
- (C), and the torch is adjusted to provide a large brushlike inner cone
- (orange arrow in D), indicating a reducing flame. The torch is applied
- (E) to gradually heat the alloy to its molten state
- (F). While the flame is maintained on the molten alloy, the ring (blue arrows) is added to the cradle
- (G). The casting arm is released, accelerating the molten metal into the ring
- (H). In only a few seconds, the alloy solidifies in the ring
- (I) and the casting is ready to be devested.
- Note that excess alloy is always used to ensure adequate mass to cast the restoration and acceleration force for casting.

- داخل
- After casting, the casting ring either is allowed to cool slowly on top of a bench or is submerged immediately in cold water.
- For some gold-based alloys, bench cooling produces a harder, stronger state of the alloy, and rapid cooling in water (also called quenching) produces a softer condition.
- the best type of cooling thus depends on the type of metal and whether the operator wants the casting in a hardened or softened condition.

PICKLING

- a freshly cast alloy restoration will be covered with dark surface oxides.
- These oxides are easily removed from gold-based alloys by the casting with an acidic solution.
- The casting is grasped with special insulated tongs and submerged for 5 to 10 seconds in a hot solution of phosphoric acid, potassium dichromate, and urea (Previnox).
- Protection from the acid, which can cause severe burns and blindness, is imperative.

CAD-CAM

م.م اریج مفید

Development of the dental CAD/CAM systems

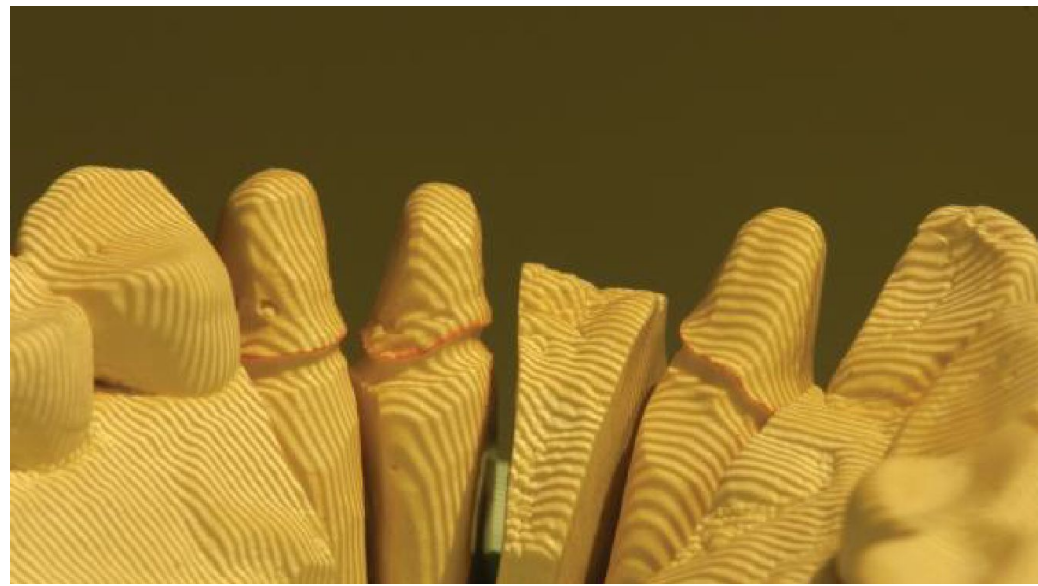
- A new products are available as a digital impression in dental offices: A camera has used in Sirona dental system to take serial pictures that are collected together within software. The E4D (D4D TECH) captured several images, by using a red laser beam to reflect the tooth structure as a negative replica and needs the application of spray powder within limited cases.
- The iTero dental system uses a camera with a small probe that touches all tooth surfaces (without spray powder) to give a perfect focal length.
- A new (CEREC and LAVA)[®] systems need spray powder to record teeth topography.

Phases (Components) of the system داخل

- Three Components (phases) are mainly exist by the use of this system including:
- The **first** Component is the **scanning phase** (computer surface digitization), this be divided into two options:
 - 1. Optical scanning .
 - 2. Mechanical scanning.
- **Optical camera**: This scanning device is based on the collection of 3-D structures called "triangulation procedure". Here, the light source with the receptor unit presented
- in a specific angle in relationship to each another. With the aid of this angle a 3-D data calculated by computer from the image on the receptor unit. White light or laser beam can be used as a source of lighting.

- **2. داخل Mechanical scanning devices:** For this type of scanning device, the poured cast is mechanically scanned (read) line-by-line by the use of a ruby ball and the object three dimensionally was measured and characterized by a high quality of scanning accuracy. Then, all digital data collection would be designed then milled.





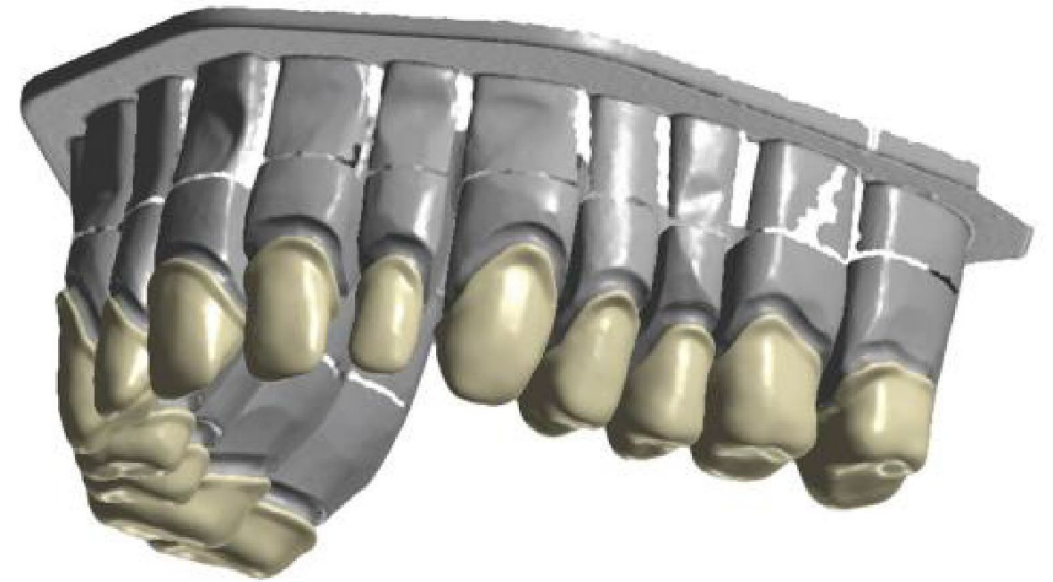
White light projector pattern by optical scanner



Scanning devices



- داخل
- The **second** component is the **designing phase**. After a three dimensional image is captured by the use any of scanning techniques,
- 3-D image processing is finished and the digitized data is designed within the computer followed by the construction programs



Three dimensional images

- **داخل** The **Third** and final component is **manufacturing phase**. This step transforms the digital data of the restoration into a physical product by milling machine with the aid of computer using a high quality diamond (disks or burs) which cut the restoration from ingots .
- This process is known as "subtractive method Other method is “additive”

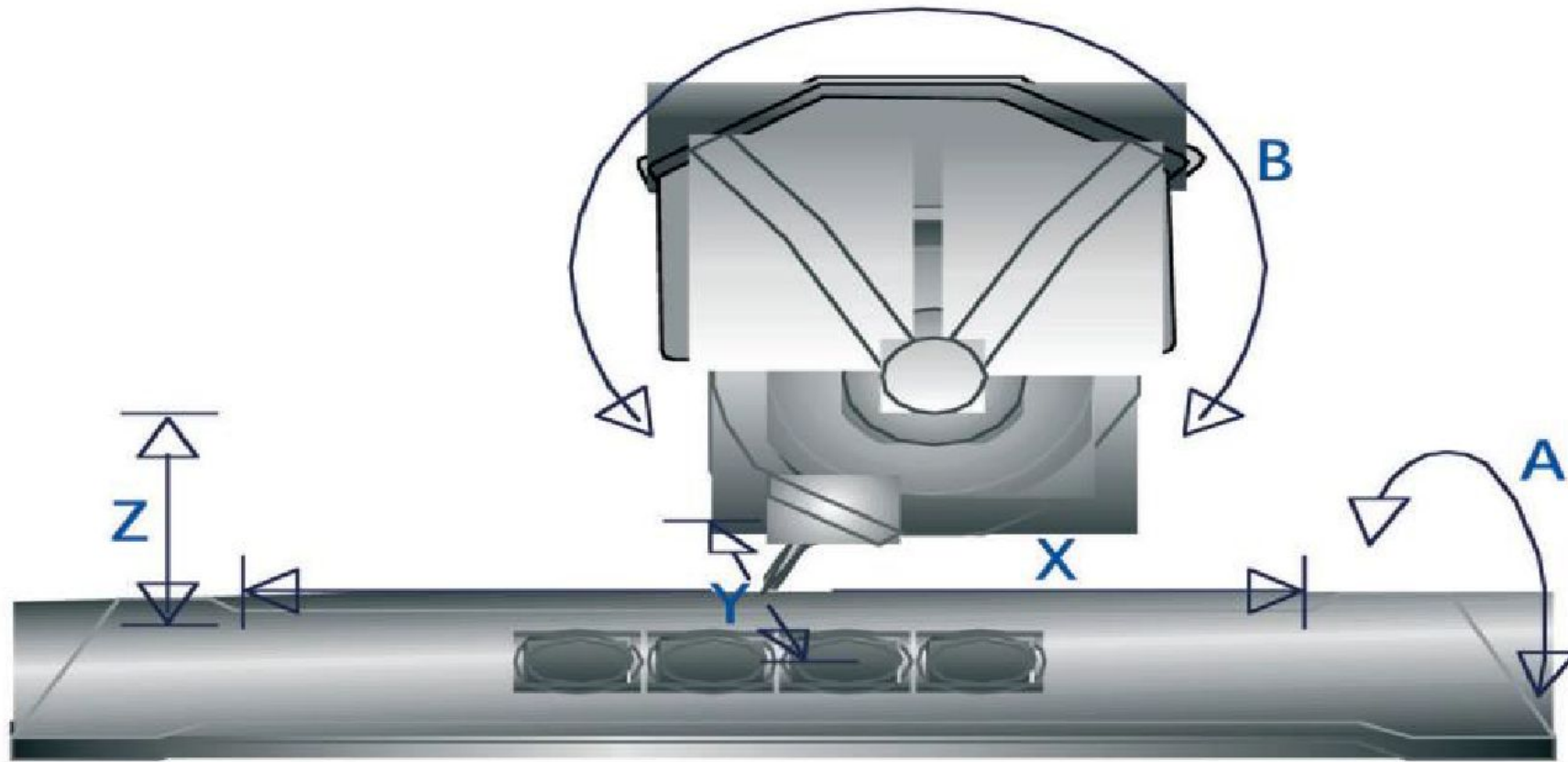


Milling machine

Milling Processing devices داخل

- The digitizing data designed with a specific CAD software are transferred to a physical product (strips) for the CAM- processing phase
- then transformed to the milling machine . According to the number of milling axes manufactured devices can be divided into:
- **a. Three-axis milling:** has a degree movement a path of three axial directions denoted by (X ,Y, Z values)
- Three-axis milling machine can turn the component in 180° in the cycle of milling process.
- The advantages of this milling device are short time of milling procedure, easily control, less cost compared with other type of milling.

- **b. Four-axis milling:** In this type, makes it easy to control bridge fabrication with a long displacement in a vertical direction into the usual mold dimension. The main advantage is saving both milling time and used materials
- **c. Five-axis milling:** In addition to 3,4 axes, new rotatable tension bridge and spindle of milling (5-axis) with complex geometries subsections are presented
- This is indicated in the construction of crown and fixed bridge for inclined abutment teeth "when molar tipped towards the medial plane".



Milling Processing device: (3 axis milling devices include X -Y -Z); (4 axis milling devices include X, Y, Z and tension bridge A); (5 axis milling devices include X, Y, Z, tension (bridge A and milling spindle B

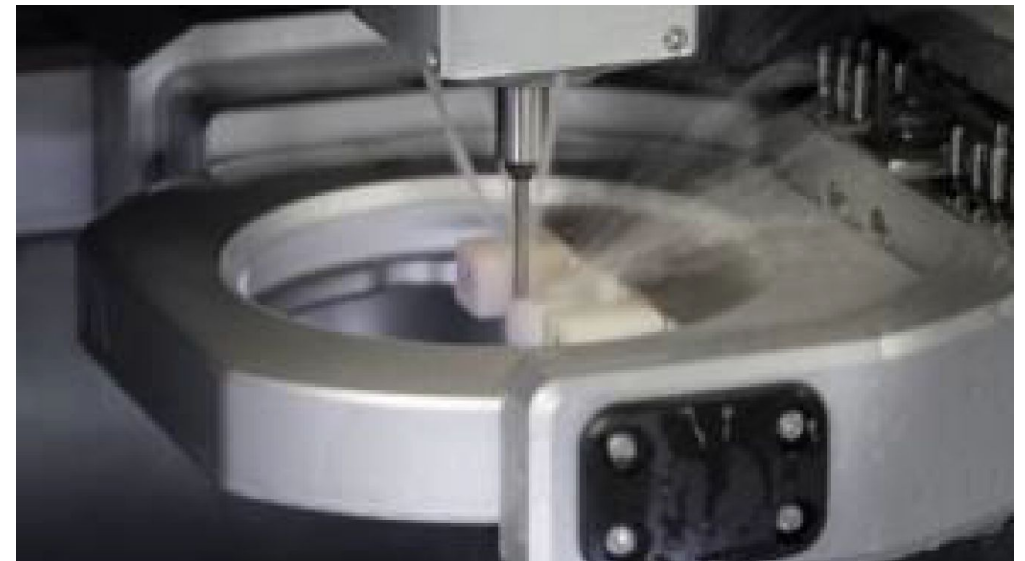
Milling variant داخل

- **a) Dry field milling:** This field of milling is mostly applied to mill ZrO₂ blanks having lower degree of pre-sintering. One of dry milling process recommended by manufacturers is milling a resin material
- **Advantages**
 - 1- Low costs are used as a milling procedure.
 - 2- No need for drying of the ZrO₂ frame prior to sintering because there is no moisture absorption by the die ZrO₂ mold.
- **Disadvantages:**
 - Higher shrinkage values where obtained for the frameworks are due to the lower degree of pre-sintering.

- **b) داخل Wet field milling:** In this process as a protection, a spray bath of cooling system applied to reduce overheating within the milled material by the use of diamond or carbide burs
- This Wet field milling is indicated for all metal-alloys and glass-ceramic to prevent damages by heat generation.



Dry field milling



Wet field milling

MISCELLANEOUS DENTAL DEVICE

م.م اریج مفید

Dental Vibrators داخل

- Dental vibrators are used to de-bubble plaster, stone or viscous solution.
- A dental vibrator should feature varying intensity vibration. The power between dental vibrators varies greatly and corresponds to the amount of use and type of compounds being debubbled.
- The size of the platform varies between vendors and should be detachable for proper cleaning.
- A higher powered dental vibrator may not always be a better dental vibrator, choose the product that will best fit with your laboratory uses.



Model Trimmers داخل

- Dental model trimmers are necessary in a dental laboratory for trimming gypsum or refractory casts.
- The first classification of dental model trimmers is choosing a wet, dry or combination wet/dry model trimmer.
- If using a dry dental model trimmer, be sure a dust retraction device is in place.
- a single wheel or dual wheel model trimmer.
- A dual wheel dental model trimmer will feature one coarse wheel for rough cutting and a second fine wheel for finishing work. This eliminates changing the wheel throughout the trimming process, which can save time and is very convenient.
- Single wheel dental model trimmers may feature a reversible wheel, a carborundum side, and a diamond side. A diamond wheel is extremely hard and may last 2 to 5 years depending on use.



Double wheel trimmer



Single wheel trimmer

Dental Lathes داخل

- Dental lathes are an important piece of equipment for finishing restorations in dental labs. These powerful motors make trimming and polishing restorations of all types simple and efficient.
- Dental lathes are designed to be mounted to the bench for stability, and can feature one or two spindles.
- The motor turns a bur or wheel allowing easy access for grinding or polishing models, crowns, substructures and other dental restorations and parts.
- Different lathes offer different speed and torque controls



TECHNICAL DATA

Model	100
Power (kW)	0.75
Power (HP)	1.0
Speed (rpm)	1440
Current (A)	1.8
Voltage (V)	230
Frequency (Hz)	50
Efficiency (%)	85
Power factor	0.85
Service factor	1.15
Insulation class	F
Protection class	IP54
Weight (kg)	1.5

UL and CE certified

SAFETY INFORMATION

Read this manual carefully before using the motor.

1. The motor must be grounded (earthed) properly.

2. The motor must be protected from overcurrent.

3. The motor must be protected from short-circuit.

4. The motor must be protected from overheating.

5. The motor must be protected from mechanical damage.

6. The motor must be protected from vibration.

7. The motor must be protected from dust and dirt.

8. The motor must be protected from moisture.

9. The motor must be protected from oil and grease.

10. The motor must be protected from all other hazardous substances.

Ultrasonic Cleaner داخل

- Ultrasonic cleaners use the power of cavitation – the violent implosion of billions of microscopic bubbles – to remove contaminants from any surface that can be safely immersed in biodegradable cleaning solutions formulated for specific cleaning tasks.
- Ultrasonic cavitation is created in an ultrasonic cleaner tank by generator-powered ultrasonic transducers bonded to the tank bottom.
- Vibrating at ultrasonic frequencies such as 37 kHz (37,000 cycles per second) the transducers cause the tank bottom to become a vibrating membrane that produces the cavitation bubbles.
- Low-frequency cleaners such as those operating at 25 kHz create relatively large bubbles that implode more violently against surfaces than higher frequencies such as the smaller bubbles created at 80 or 130 kHz.



IND-Series

IND-Series

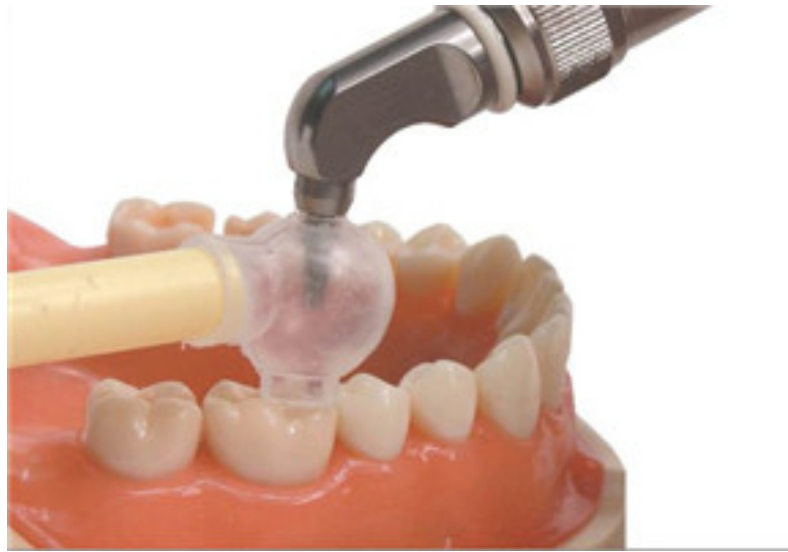


Ultrawave



Dental Laboratory Sandblasters داخل

- Sandblasting uses a high-speed stream of aluminum oxide particles propelled by compressed air to remove unfavorable oxides and contaminants, increase surface energy, bonding surface area, and surface roughness.
- Dental laboratory sandblasters are used to
 - 1- increase bond strength by divesting the casting investment and
 - 2- increasing effective surface area as well as
 - 3- polishing the surface of restorations.
- Sandblasters used in dental laboratories are enclosed and often operate through a vacuum or via air compressor, with integrated gloves for hand protection and containment of the blast media.
- Some sandblasters can also be used intraorally in a dental operator. This is referred to as air abrasion
- Intraoral dental sandblasters have a variety of angled tips allowing the technician to reach any part of the mouth.



Intraoral dental sandblasters



laboratory sandblasters

Dental wax heater

- A **wax heater** is an essential device in the dental laboratory and is a system that serves to **melt wax at high temperatures** and obtain it liquefied, which guarantees greater precision when making crowns.



Electric wax spatula

- The **electric spatula** is a machine that in the dentistry laboratory is very useful and easy to handle for **performing dental modeling** .
- It works by means of a heat system that receives from the motor and connects with the tip of the spatula by means of a cable.

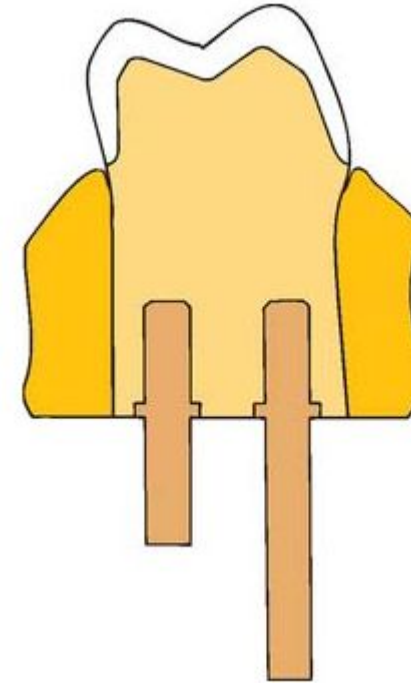


PINDEX

- The PINDEX System provides a simple way to fabricate precise parallel drill channels. Laser Drilling Machine- Assures parallel channels for quick, easy, and reliable pin placement
- More accurate drill positioning for better die registration
- Visible beam in all lighting for reduced eye fatigue
- Manual drilling to pre-set depth System Accessories
- Complete range of pins and mating sleeves
- Durable, high quality carbide drill
- Flexible rubber base molds
- Handsaw with blades

coltène whaledent 





Removable dies made with the Pindex (Whaledent) dowel system

د داخل 3D PRINTING DENTAL

- 3D printing It's known for reliability and high quality.
- Dental 3D printers is another manufacturing approach to build object one layer at a time and add multiple layers to form an objects
- Also known as additive manufacturing or rapid prototyping
- Dental 3D printers feature a light or laser that polymerize a liquid with the computer-guided precision required to produce small objects with intricate details.
- The dental 3D printing workflow has four-steps:
 - **Scan** – collect a digital impression with an intraoral scanner. Send the scans to a lab or to a design station.
 - **Design** – import the digital scan into design software (CAD) and design.
 - **Print** – once designing is complete, import the file to print preparation software for print setup.
 - **Prepare** – wash, dry and post-cure printed parts.

Modalities of 3D printer

- **Selective laser sintering**: scanning laser fuse fine material powder to build up structure layer by layer. As a powder bed drop down incrementally, and new fine layer of material is evenly spread over the surface

**Materials
:used**
Polymer nylon
Metal alloy

Advantage
autoclavability -1
of material
low cost -2
material

Disadvantage
increased -1
inhalation risk of
powder
sensitive -2
technique

Stereolithography داخل

- Light sensitive polymer cured layer by layer by scanning highly focused ultraviolet laser to trace out successive layer of 3D object in a vat of liquid photosensitive polymer

**Materials
:used
Light sensitive
polymer**

Advantage
high accuracy, -1
,good surface finish
rapid fabrication -2
produce -3
complex shape
with high
resolution

Disadvantage
only used with -1
polymer
use of photo -2
initiator may be
cytotoxic
3- In ability to creat
composition in
horizontal plane

- **WHAT CAN A 3D PRINTER MAKE?**

- Dental 3D printers can produce applications such as:
- Crown/Bridge Models
- Clear Aligner Models
- Surgical Guides
- Splints/Occlusal Guards
- Patterns for Casting and Pressing
- Hawley Retainers
- Full Dentures

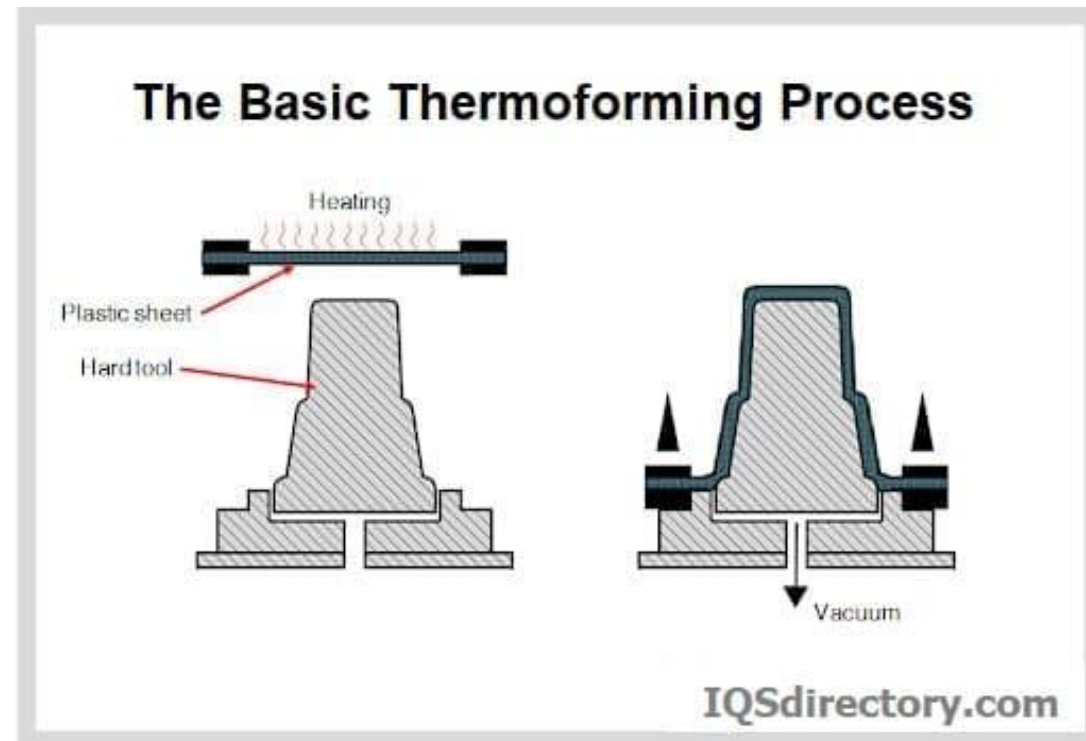


BIOSTAR

م.م اریج مفید

What is Thermoformingداخل

- Thermoforming is a plastic manufacturing process that uses pressure or the force of a vacuum to stretch thermoplastic material over a mold to create a three-dimensional shape, part, configuration, or other form of plastic product.



Thermoforming Process

- The thermoforming process takes a sheet of thermoplastic, carefully heats it until it is sufficiently pliable, places it over a forming mold that forms it into a three-dimensional shape, and completes the process by trimming and finishing it into the desired shape of the product.
- It is a simple process that is quick, efficient, time-saving, and highly productive.
- Regardless of the simplicity of thermoforming, each step of the process has to be completed with precision and accuracy in order to produce quality parts and products. Any errors can lead to deformed, damaged, and useless sheets of plastic.

Steps of thermoforming

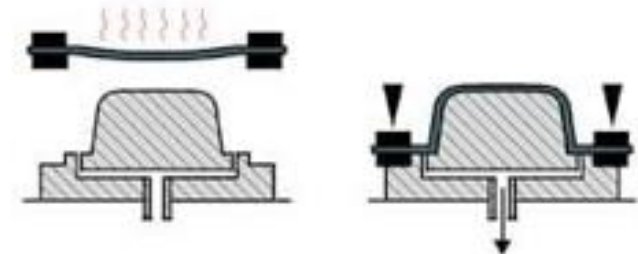
❖ Heating Plastic Sheets:

- Plastic sheets to be molded, which has length and width greater than the finished product, is clamped into a holding device and transported into a heating equipment to raise it to the forming temperature. The sheet is heated by contact heating using panel and rods (conduction), by exposing them to circulating hot air or using infrared heaters.
- The type of heating system is chosen depending on the material and the amount of necessary heat. The heating process is critical to the forming process since it creates the necessary pliability and flexibility.

❖ Forming Plastic Sheets in Mold Cavities:

- Heated plastic sheets are removed from the heating equipment and transported to a temperature-controlled and pre-heated mold tool. At this stage, the plastic sheet takes the shape of the mold cavity, which contains the desired form of the finished product. This stage gives the product its three-dimensional characteristics (length, width, and height).
- The mold tool may be a positive or a negative tool, depending on its form:
- **Positive Tool** داخل
- Positive Tool, or "male mold" is convex-shaped - the heated plastic sheet is positioned above the convex tool. The "humped surface", or the convex surface, will now give the plastic sheet its final shape. The exterior surface of a positive mold tool will give the shape of the inner surface of the part.

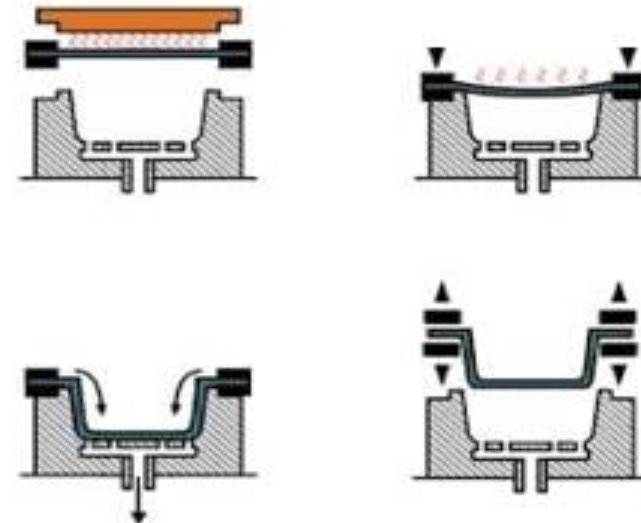
Positive Tool



- **Negative Tool** داخل

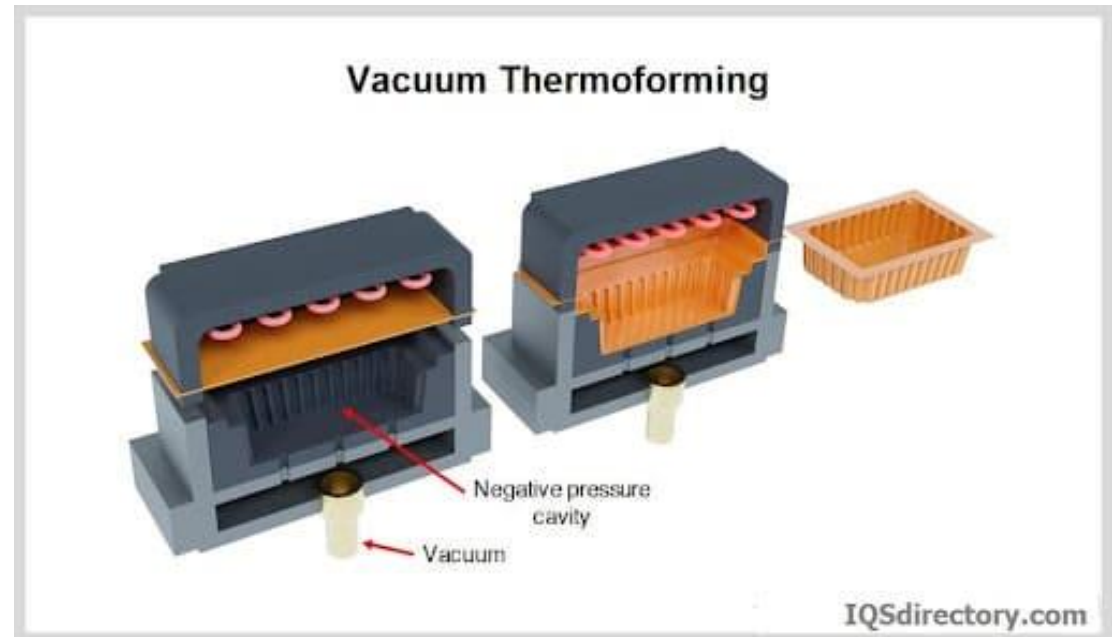
- Negative Tool, or "female mold", on the other hand, is concave-shaped - the interior surface contour of a negative mold tool will give the shape of the outer surface of the part.

Negative Tool



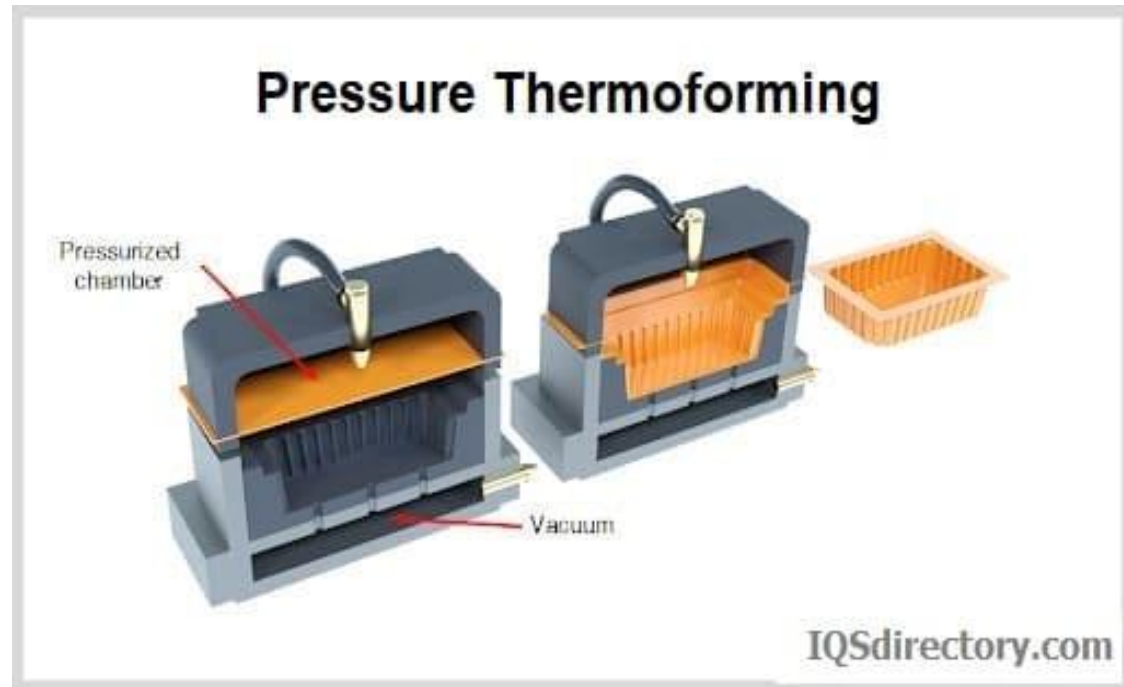
Thermoforming Methods

- **Vacuum Forming:**
- With vacuum forming a vacuum is generated underneath the sheet to draw the plastic sheet against the mold cavity until it takes its desired shape. Vacuum forming is the simplest of all thermoforming methods. However, part thickness distribution is difficult to control. Vacuum pressure should be uniform and sufficient throughout the mold.



- **Pressure Forming:**

- Similar to the vacuum forming method, air pressure is utilized together with the vacuum applied under the cavity to push the plastic sheet. The added air pressure creates greater detail (e.g. textured surfaces, undercuts, and sharp corners) on the finished product; that is not easily created by vacuum forming, making this method suitable for products with complex designs.



Materials Used in Thermoforming

- Thermoplastics are the raw material of the thermoforming process.
- Thermoplastics are a broad class of polymers that can be heated to a certain elevated temperature and re-casted reversibly, without altering their chemical properties and associated phase change.
- It can survive multiple cycles of heating and cooling. Given this nature, thermoplastics can be reprocessed, and are recyclable materials.
- **Amorphous Thermoplastics**
- **Semi-crystalline Thermoplastics**

BIOSTAR داخل

- **Thermoforming machine BIOSTAR**

- This is a versatile pressure moulding machine with many applications in dental pressure moulding and orthodontics, together with
- an extensive range of materials and accessories,
- offers maximum efficiency and results,
- It has a display that provides technical data and guides the user through all the steps. All parameters adjustable.



Machine Description

- Patented thermostatic heater control
- 6 bar working pressure
- Working temperature reached in 1 second
- Working pressure: 0.5 – 6.0 bar
- Dimensions: W 450 x H 230 x L 260 mm

Mode of action

- the heater is swiveled over the material following scanning or programing the code,
- the BIOSTAR reaches its working temperature immediately and the material can be plasticized.
- the BIOSTAR heats the side of the material which faces the model during pressure moulding. Together with the superior working scan function for prompt bar code reading pressure of 6 bar, the up to 60°C higher surface temperature





Insulating and embedding



Pressure moulding



Finishing

Material used with biostar داخل

- 1. Hard-elastic material
- BIOCRYL C – acrylic monomer-free sheets – clear-transparent or coloured for dentures and orthodontic plates with a good compound to acrylic.
- DURAN is a high transparent and abrasion-resistant material for all indications in splint therapy.
- IMPRELON clear or opaque is suitable for temporary use in the mouth, e.g. custom trays, dressing carriers or bite plates.
- 2. Hard/soft compound material
- DURASOFT pd is a transparent two-layer sandwich material destined for splints with a soft inner side for extremely convenient wearing, especially comfortable for snoring devices.

- 3. Soft-elastic material داخل
- BIOPLAST belongs to this material group – clear transparent, coloured or multi-coloured for soft splints, sports mouth guards
- BIOPLAST bleach for bleaching. A similar application is covered by
- COPYPLAST, which is slightly tougher, and can be used for bleaching transparent and visco-elastic COPYPLAST C is used in orthodontics
- for aesthetic adjustment and retention splints.



Dental application of biostar داخل

- Custom tray
- Functional tray



Duplication mould

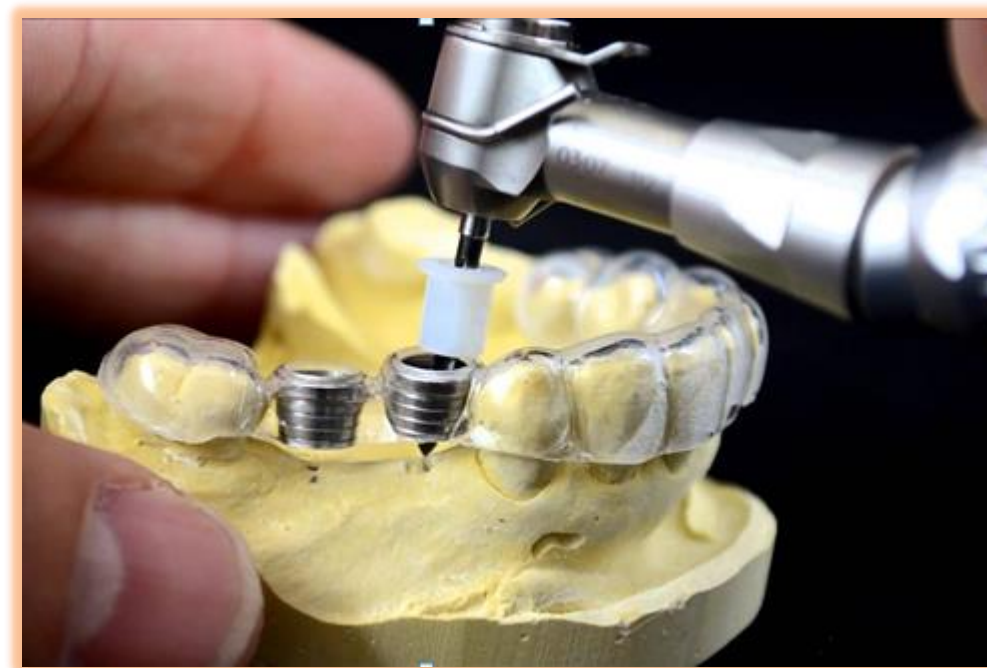


- Bite registration tray



داخل

surgical splint



داخل

- Retention plate
- Partial denture

Bleaching splint



داخل

- Mould for temporary crowns and bridges



Bruxism analysis



- Expansion Aligner



داخل

Occlusal splint

TMJ splint, functional splint



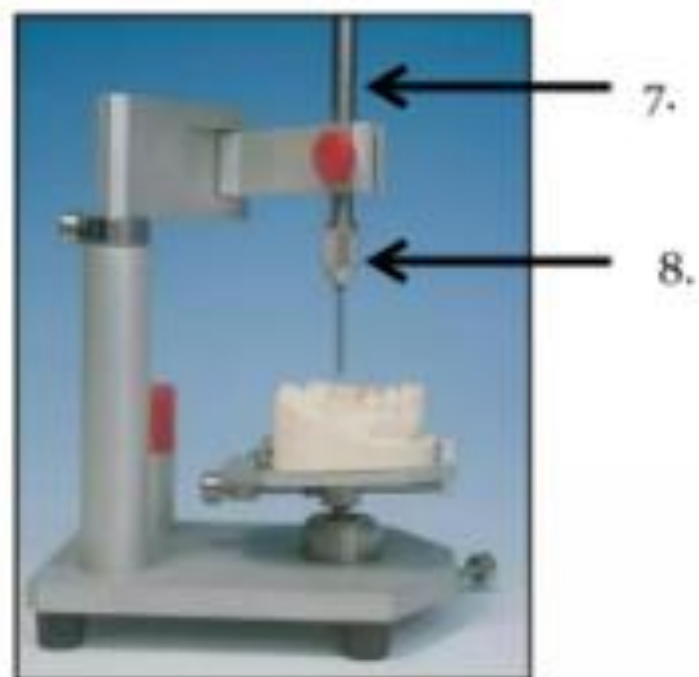
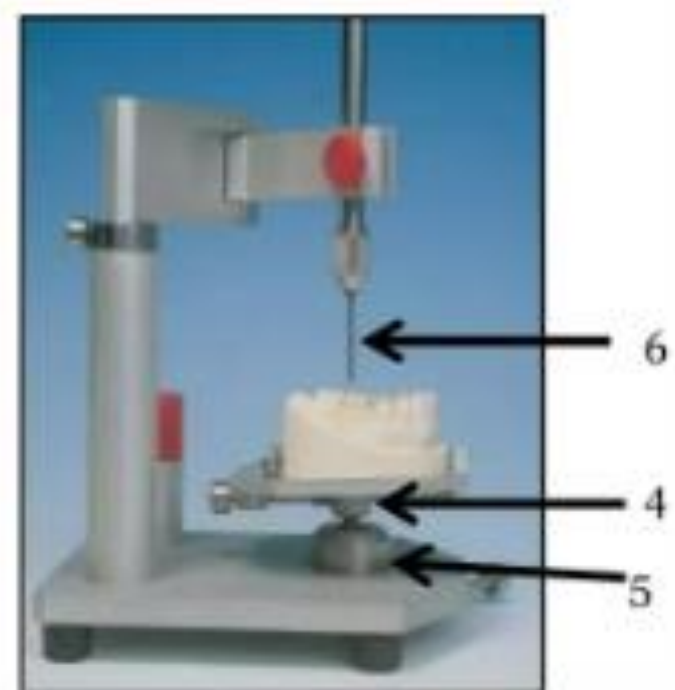
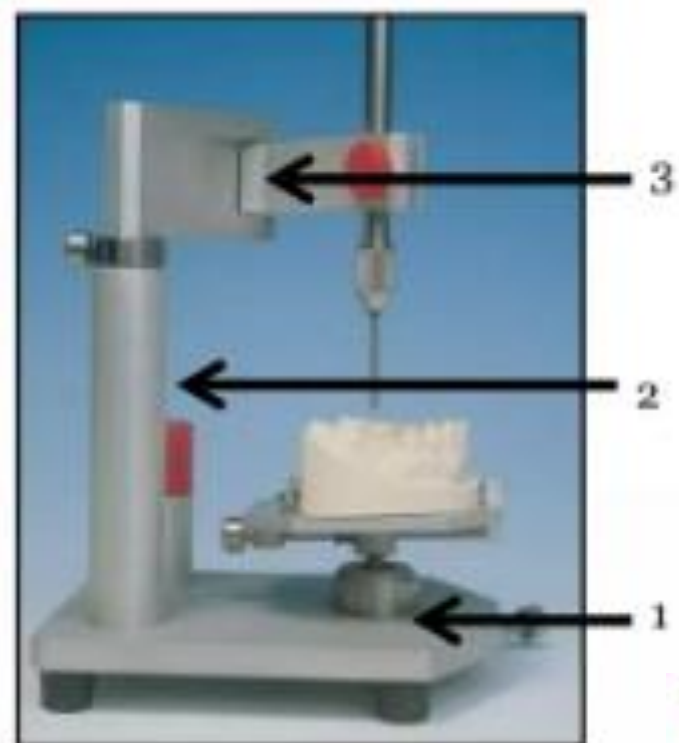
Surveyor

م.م اریج مفید

- داخل
- A dental surveyor has been defined as an instrument used to determine the relative parallelism of two or more surfaces of the teeth or other parts of the cast of a dental arch.
- Therefore the primary purpose of surveying is to identify the modifications of oral structures that are necessary to fabricate a removable partial denture that will have a successful prognosis.
- It is the modification of tooth surfaces to accommodate placement of the component parts of the partial denture in their designated ideal positions on abutment teeth

Description of Dental Surveyor

- The most widely used surveyors are the Ney and the Jelenko.
- Both of these are precision made instruments.
- The principal parts of the Ney surveyor are as follows:
 - 1. Platform on which the base is moved
 - 2. Vertical arm that supports the superstructure
 - 3. Horizontal arm from which the surveying tool suspends
 - 4. Surveying Table to which the cast is attached
 - 5. Base on which the table swivels
 - 6. Paralleling tool or guideline marker (this tool contacts the convex surface to be studied in a tangential manner; the relative parallelism of one surface to another may thus be determined; with substitution of a carbon marker, the height of contour may be delineated on the surfaces of the abutment teeth and on areas of interference requiring reduction on blackout)
 - 7. Vertical arm drop from the horizontal arm (surveying arm) capable of moving vertically
 - 8. Mandrel for holding special tools



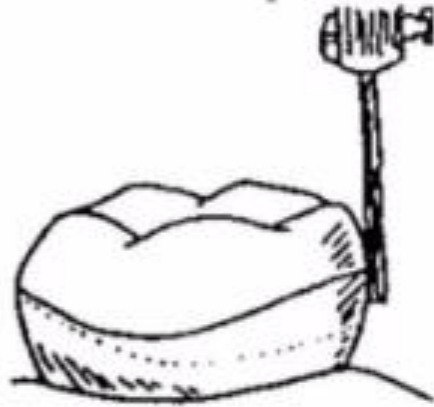
PARTS OF A SURVEYOR:



Attachment of surveyor

1. Analysing rod
2. Graphite marker
3. Undercut gauge
4. Trimming knife





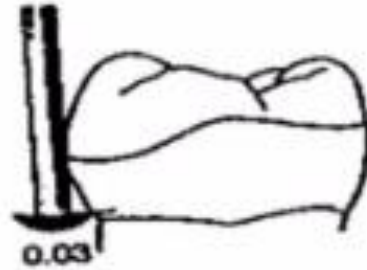
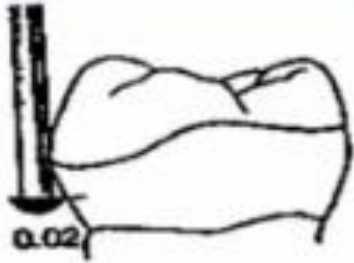
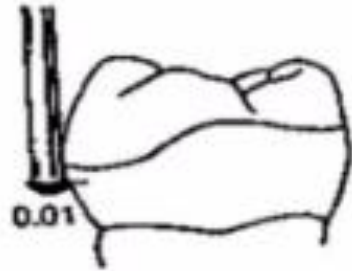
Analyzing Rod

- Analyzing rod:- This metal rod is placed against the teeth and the ridge during the initial analysis of the cast to identify undercut areas and areas of parallelism without marking the cast.



Graphite(Carbon) marker

- The graphite marker is moved along the teeth and the alveolar ridge to identify and mark the position of maximum convexity. (SURVEY LINE)



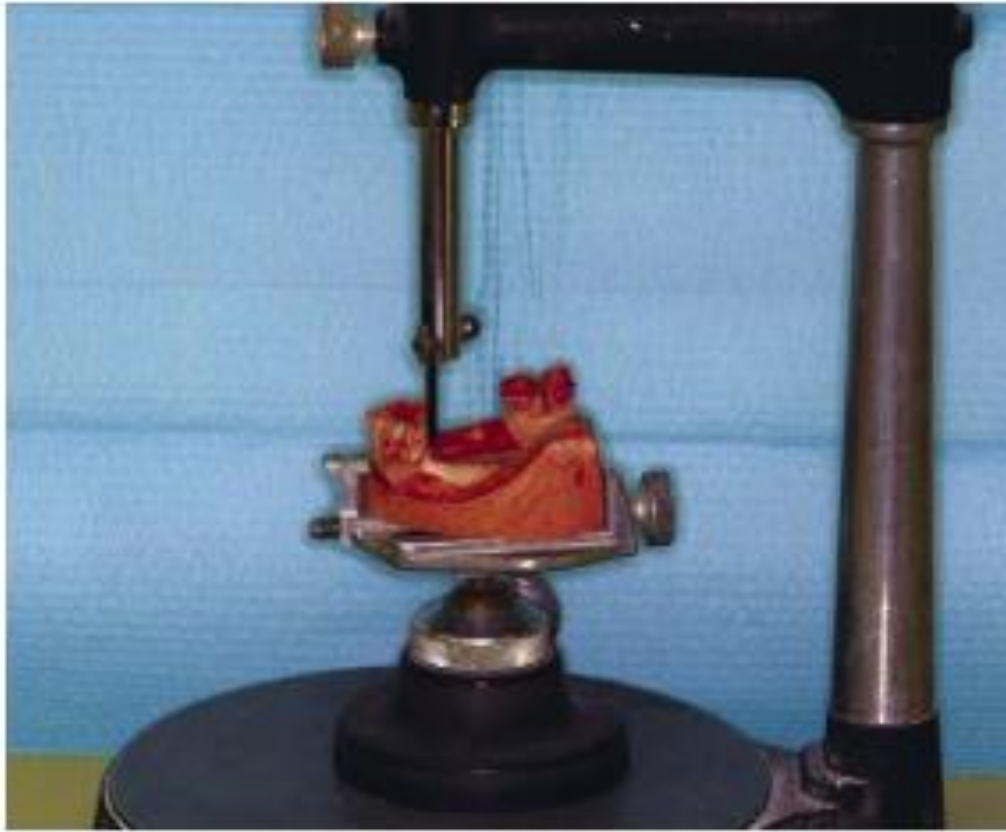
Undercut gauge

- They are used to determine the amount and location of retentive undercut on the surface of an abutment tooth and are available in sizes; 0.010inch, .015 inch and 0.020 inch (**Mccracken**- .010inch, .020 inch, .030inch)

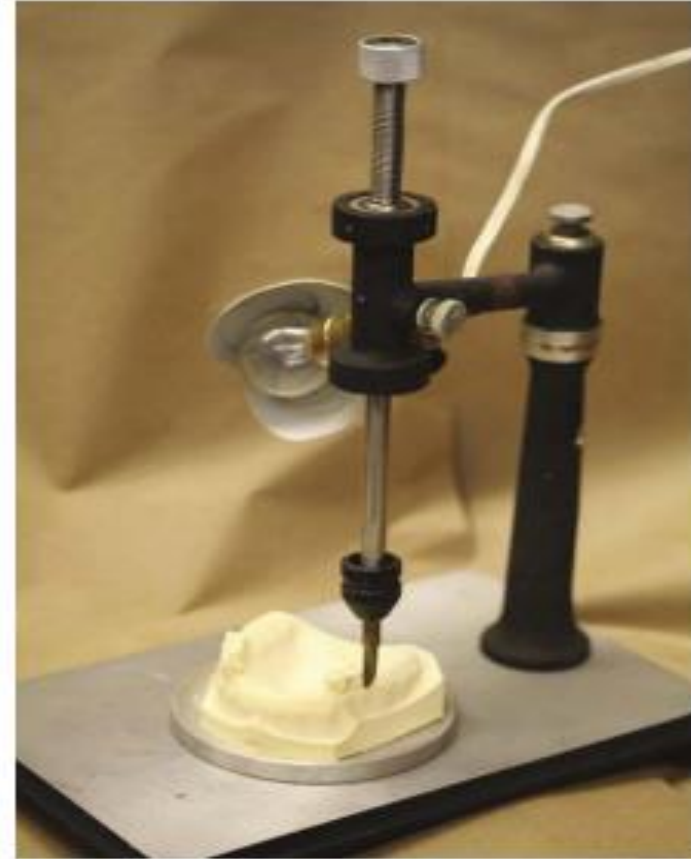


Wax trimmer

- Trimming Knife: Wax is added to block the unwanted undercut and the wax trimmer is used to remove the excess wax.



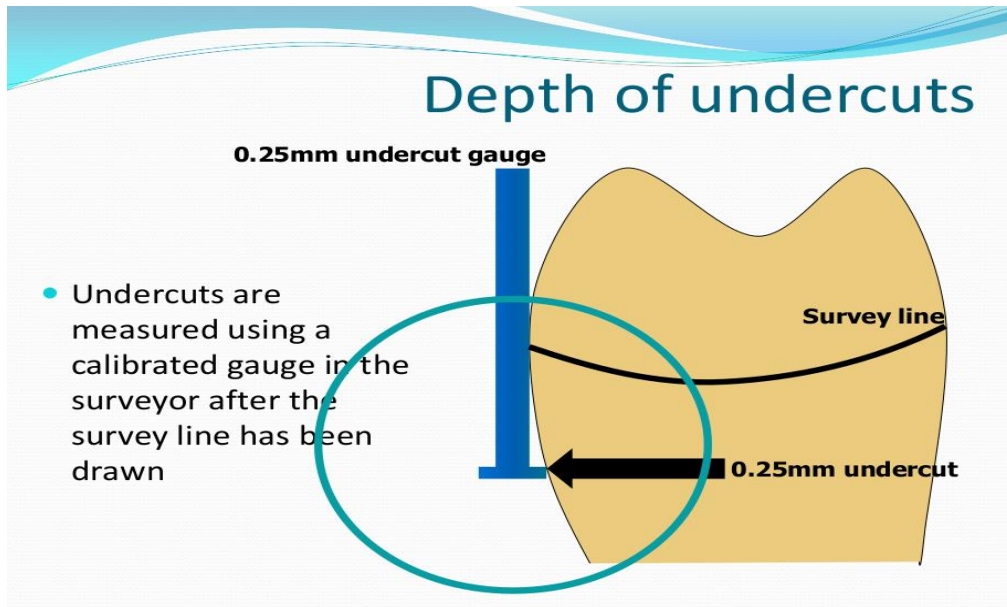
The Ney surveyor



The Jelenko surveyor

Purposes of the Surveyor داخل

- The surveyor may be used for
- 1-surveying the diagnostic cast,
- 2-recontouring abutment teeth on the diagnostic cast,
- 3- contouring wax patterns,
- 4- measuring a specific depth of undercut,
- 5- surveying ceramic veneer crowns, and
- 6- surveying and blocking out the master cast.
- It is an essential instrument in designing removable partial dentures. The act of using a surveyor is referred to as surveying.



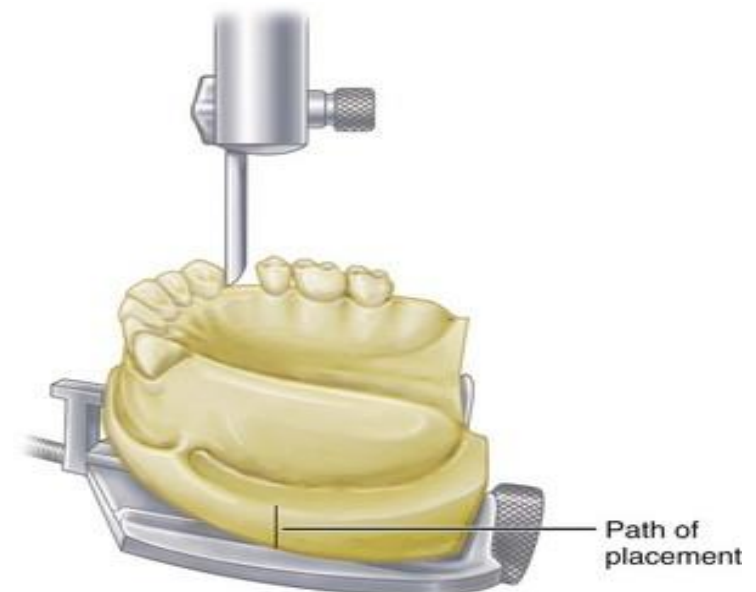
measuring a specific depth of undercut



contouring wax patterns



recontouring abutment teeth on the diagnostic cast



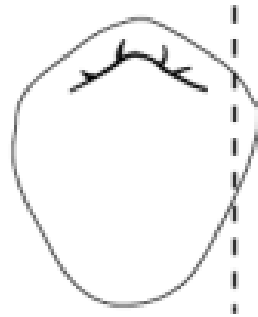
surveying and blocking out the master cast

Factors that Determine Path of Placement and Removal

- داخل
- A path of insertion (or removal) is the path along which a prosthesis is placed (or removed) intraorally. A removable partial denture is usually fabricated to have a single path of insertion or removal from the mouth. A single path of insertion is advantageous because it:
 - 1. equalizes retention on all abutments
 - 2. provides bracing and cross-arch stabilization of teeth
 - 3. minimizes torquing forces of the partial denture
 - 4. allows the partial denture to be removed without encountering interferences
 - 5. directs forces along the long axes of the teeth
 - 6. provides frictional retention from contact of parallel surfaces on the teeth

- In order to provide a single path of insertion for a partial denture, some axial surfaces of abutments must be prepared so that they parallel the path of insertion.
- These parallel surfaces are called guiding planes.
- Guiding planes are prepared wherever rigid components of a partial denture contact abutment teeth. Specifically, guiding planes should usually be prepared for:

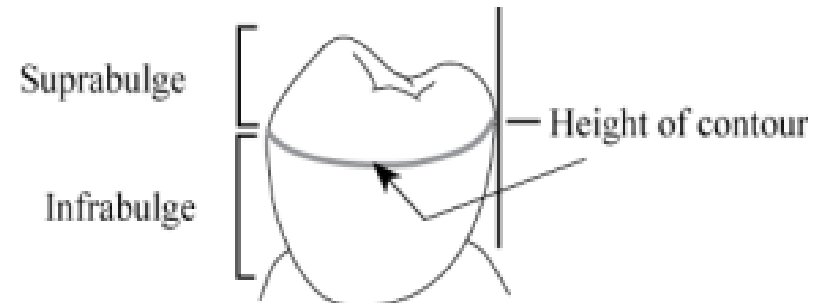
Tooth with
normal contour



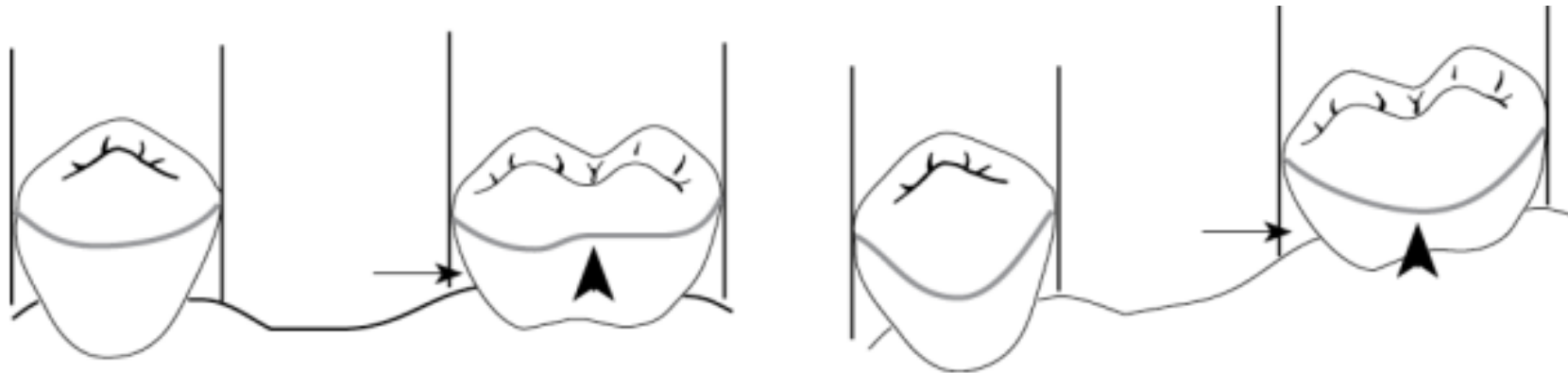
Flattened guiding plane
prepared on proximal surface

Selecting the Path of Insertion of a Removable Partial Denture

- A path of insertion is selected to provide the best combination of retentive undercuts and parallel surfaces for ALL ABUTMENTS. Use the following steps to do so:
- **STEP 1** Place the cast on the surveyor table and orient the plane of occlusion relatively horizontal. The final tilt of the cast for the ideal path of insertion is seldom more than 10° from this position.
- **STEP 2** Place the analyzing rod against the axial surface of a proposed abutment teeth (any tooth adjacent an edentulous space). The tip of the rod should be at the level of the free gingival margin. The point where the tooth touches the analyzing rod is greatest convexity (bulge) of a tooth and is called the height of contour.

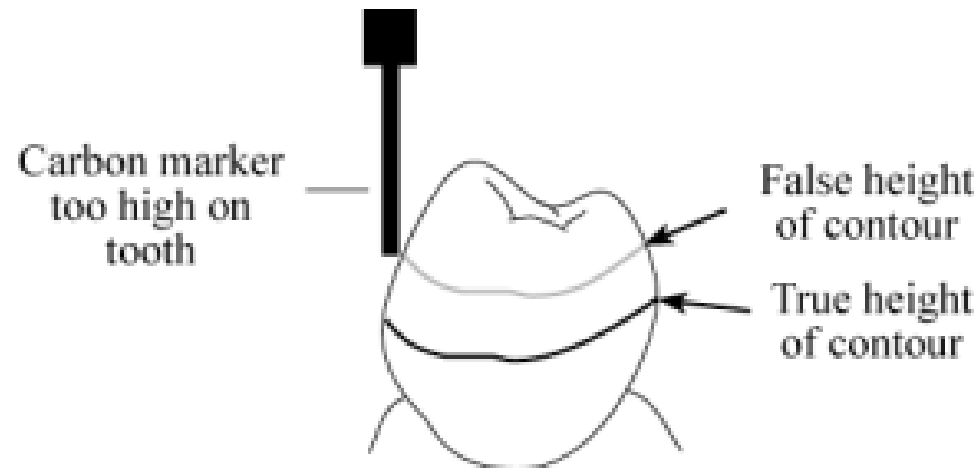


- **STEP 3** Tilt the cast to gain maximum parallelism of axial surfaces of all of the proposed abutments. Maximum parallelism is present when the heights of contour of all teeth and all surfaces are as close as possible to the same position occluso-gingival.
- **STEP 4** Use an undercut gauge to check for adequate and relatively equal retentive, undercuts for retentive arms on all abutments. Alter the tilt of cast if required.



Note that when cast is tilted and the surveying arm remains vertical, the height of contour (large arrows) changes, as does the distance of the analyzing rod to the tooth (small arrows)

- **STEP 5** Change the tilt of the cast if there are any major soft tissue interferences (i.e. mandibular tori, residual ridge undercuts), or if the selected path of insertion will cause an esthetic problem
- **STEP 6** Lock the diagnostic cast in position on the surveying table and mark the heights of contour on the denture abutments and soft tissues with the carbon marker. When marking the heights of contour, ensure that the carbon tip follows close to the free gingival margin so that you do not register a false height of contour.

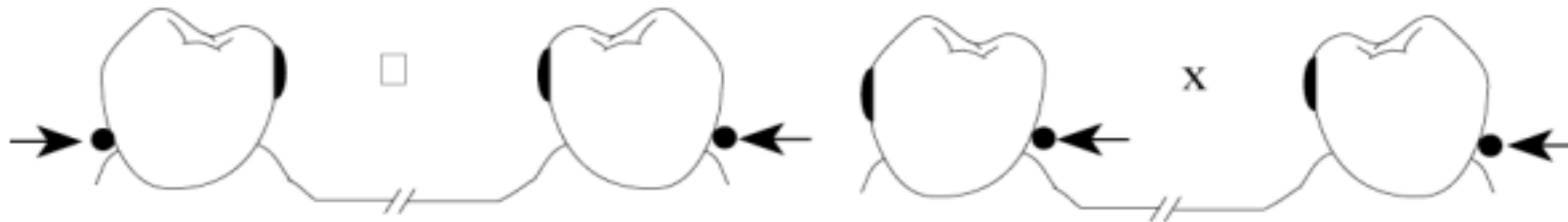


The Optimal Path of Insertion

The optimal path of insertion of a partial denture is determined by: داخل

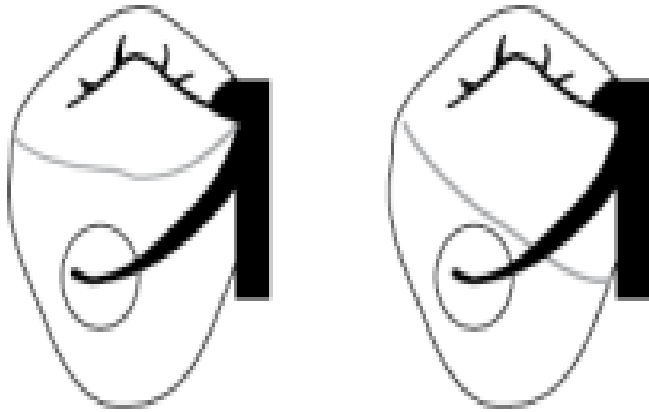
- A. Retentive undercuts - equalized on all abutments.

Clasp has different path of escapement (dashed arrow) than guiding plane (solid arrows) and therefore must flex when the denture is removed. This provides retention for the denture.



Retentive clasps(•) oppose each other when correctly designed (left). Retention at each principle abutment should balance that of the tooth on the opposite side of the arch (i.e. equal in magnitude and opposite in relative location).

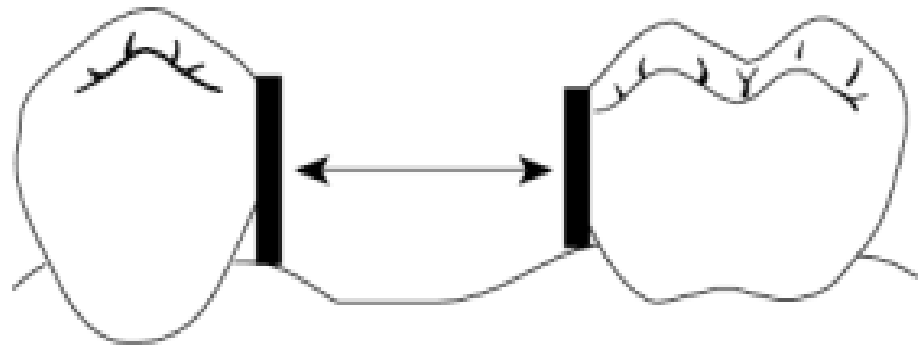
- داخل
- B. Interferences



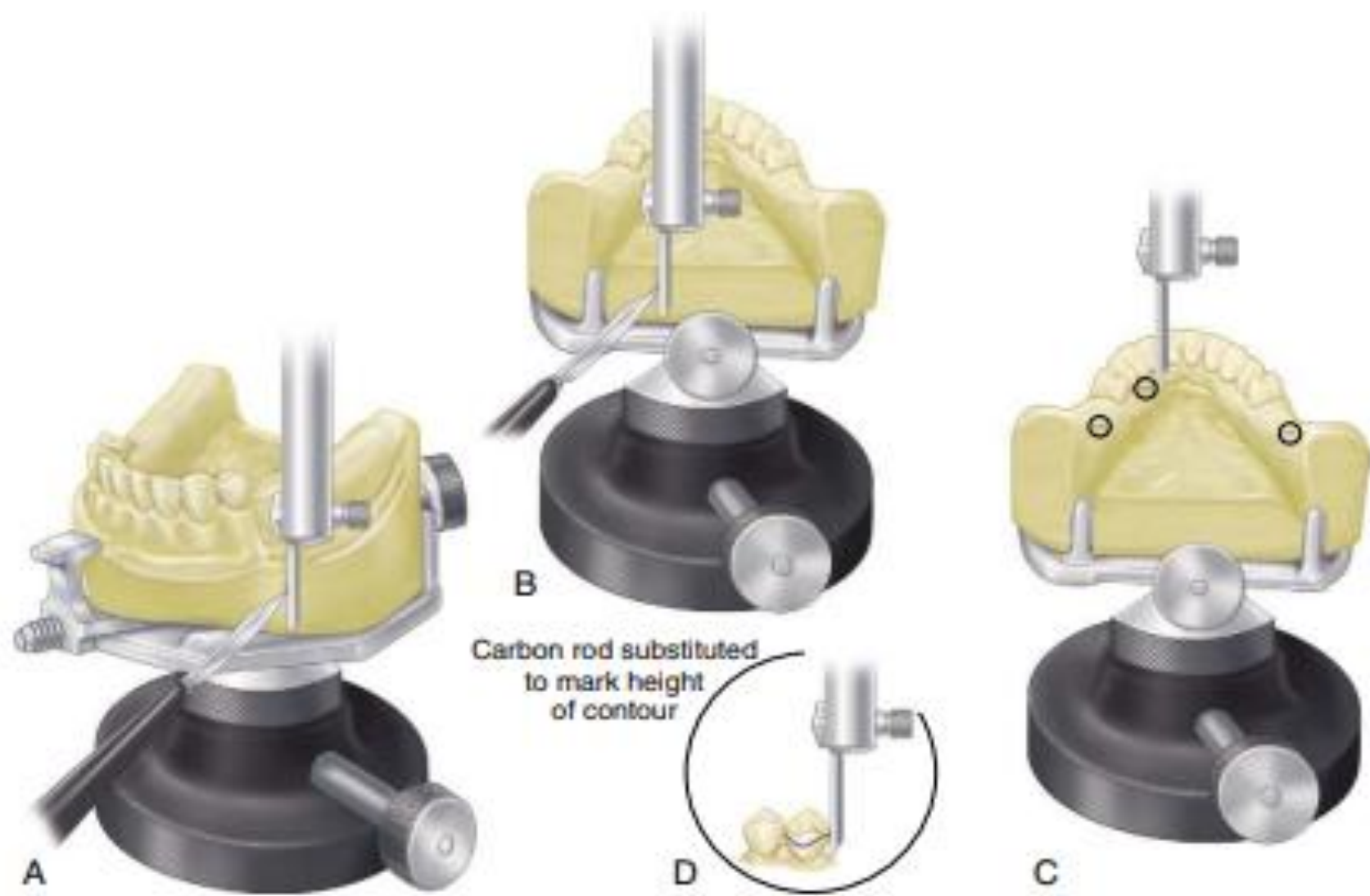
Since only the terminal end of the retentive arm flexes (circled area), the clasp on the left will lock on the cast. The rigid portion of the clasp will not release from the undercut. The clasp on the right will release since only the flexible tip is in the undercut.

C. Esthetics. A path of insertion should be selected to provide the most esthetic placement of artificial teeth and the least amount of visible metal on the abutment teeth. Ensure that the retentive undercut and the height of contour are not placed too far occlusally, so that the retentive clasp and that anterior proximal plates are close to the gingival contours making these components as inconspicuous as possible.

- داخل
- D. Guiding planes.



These guiding planes are parallel, include more than one common axial surface (i.e. distal of premolar, mesial of molar), directly oppose one another and are fairly long. They will be very effective.



- A-B, The path of placement is determined, and the base of the cast is scored to record its relation to the surveyor for future repositioning.
- C, An alternate method of recording the relation of the cast to the surveyor is known as tripoding. A carbon marker is placed in the vertical arm of the surveyor, and the arm is adjusted to the height by which the cast can be contacted in three divergent locations. The vertical arm is locked in position, and the cast is brought into contact with the tip of the carbon marker. Three resultant marks are encircled with colored lead pencil for ease of identification. Reorientation of the cast to the surveyor is accomplished by tilting the cast until the plane created by three marks is at a right angle to the vertical arm of the surveyor.
- D, Height of contour is then delineated by a carbon marker.

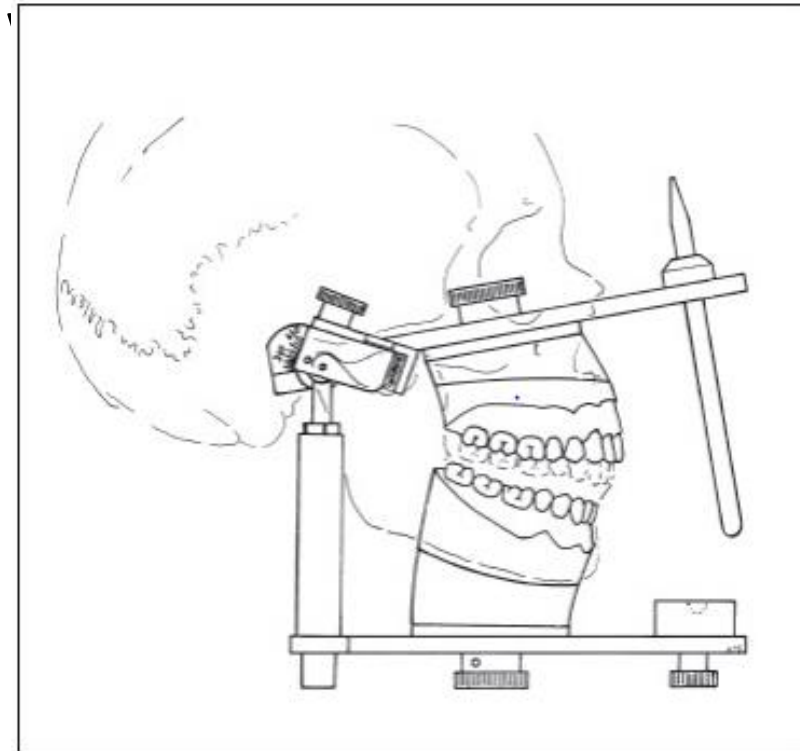
Articulators

م.م اریج مفید

• داخل

ARTICULATOR

- A mechanical device that represents the temporomandibular joints and
- jaw members to which maxillary and mandibular casts may be attached
- The instrument is then used in the fabrication of fixed and removable dental restorations that are in harmony



FUNCTIONS داخل

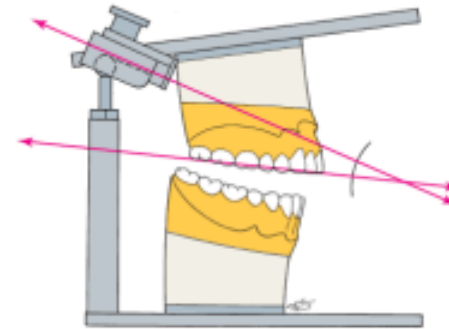
1- It allows most of the prosthetics work to be done in the absence of the patient.

2-Maintain jaw relation record during setting –up of teeth.

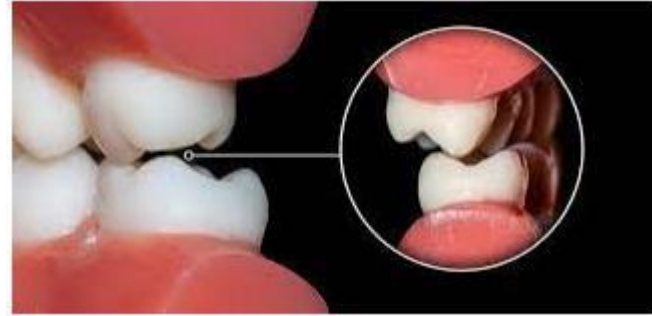


3-Denture re mounting after processing for correction of occlusal disharmony.

4- To simulate jaw movements



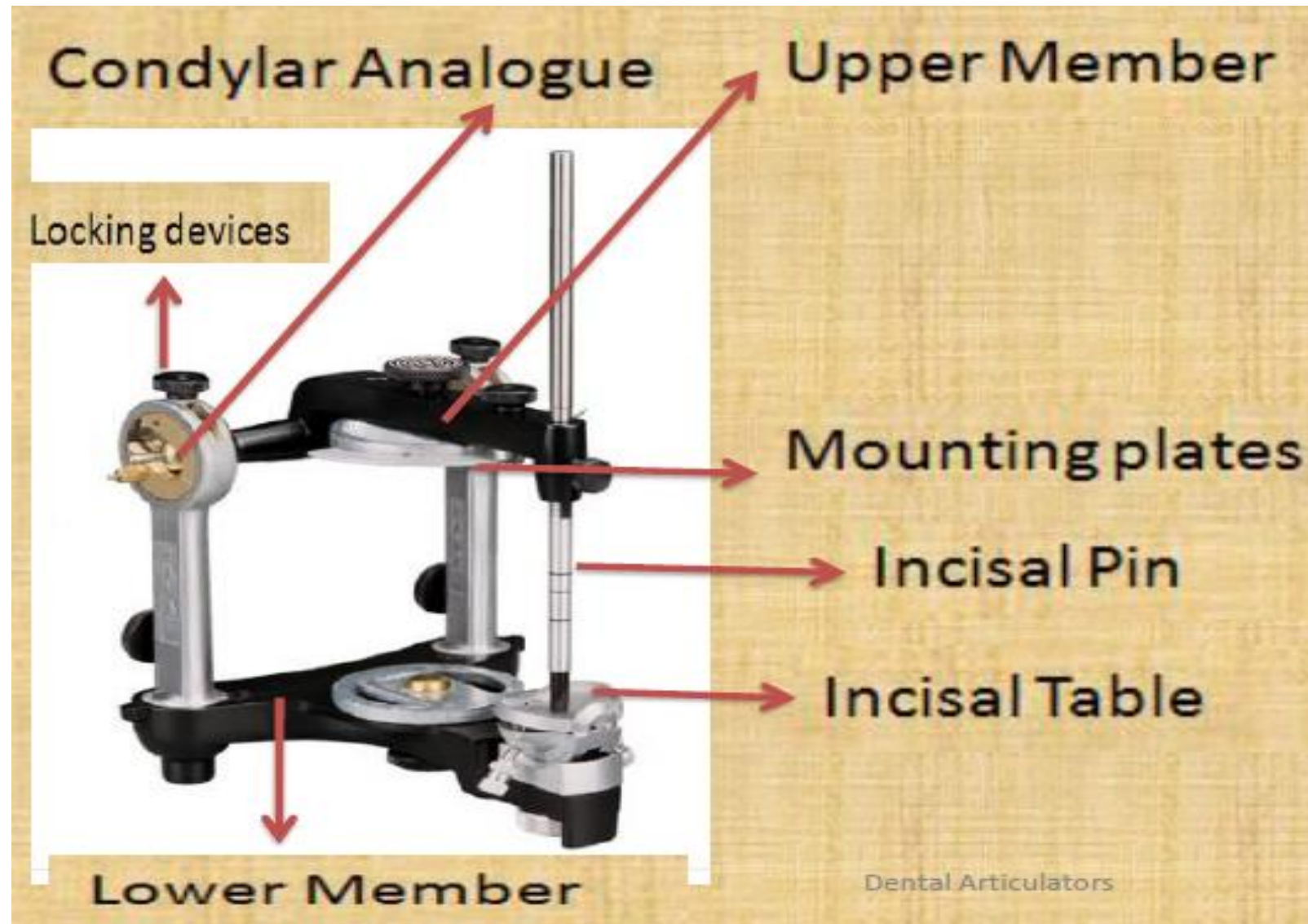
- داخل
- 5- To diagnose the state of occlusion in both natural and artificial dentitions





- 6- To plan dental procedures based on relationship between opposing natural and artificial teeth, eg. Evaluation of possibly balanced occlusion

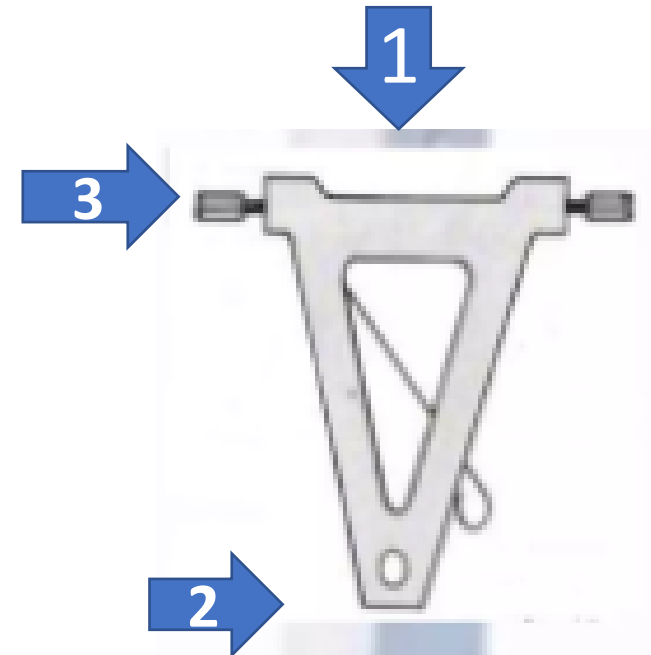


Parts -Articulators



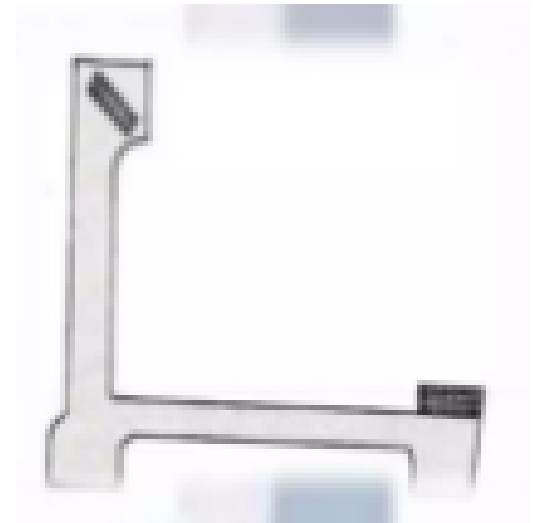
- ***Upper member = Maxilla***

- Triangular frame  1- base placed posteriorly.
-  2- Apex has the Incisal pin
- 3- Two Condylar elements on either side of the base of the triangle.
- They articulate with the Condylar guidance of the lower member.
- The maxillary cast is attached to the upper member during articulation



- ***Lower member:***

- L-shaped frame with a horizontal and vertical arm
- **Horizontal arm** -triangular in shape and correspond to upper member
- The apex of the triangle of the horizontal arm contains the incisal guide table.
- **The vertical arm** -rectangular in shape and contain the
- condylar guidance at the upper position



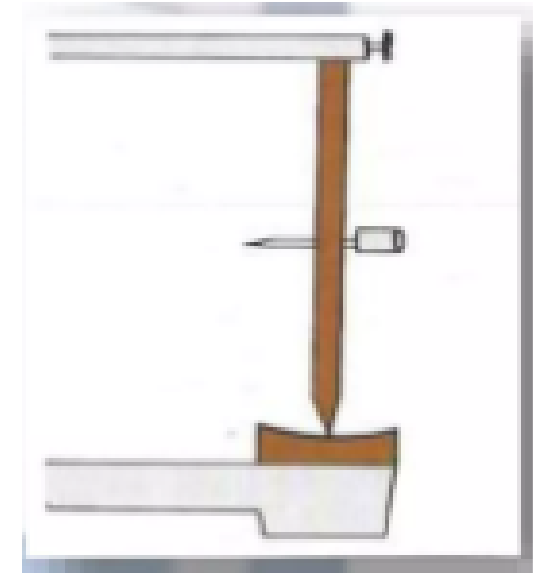
- ***Incisal Guide Table***

- •It is the part of the articulator which maintains the incisal guide angle
- It gives the fixed incisal guidance of the articulator
- •The incisal guide angle is very short cylinder whose upper surface is concave
- The vertical rod should rest on center of incisal guide table during articulation.



- ***Incisal Pin:***

- Help to keep fixed distance between upper and lower parts in the anterior end
- Vertical rod has pointed tip which rest on center of incisal guide table during articulation. and consider anterior reference point in articulation



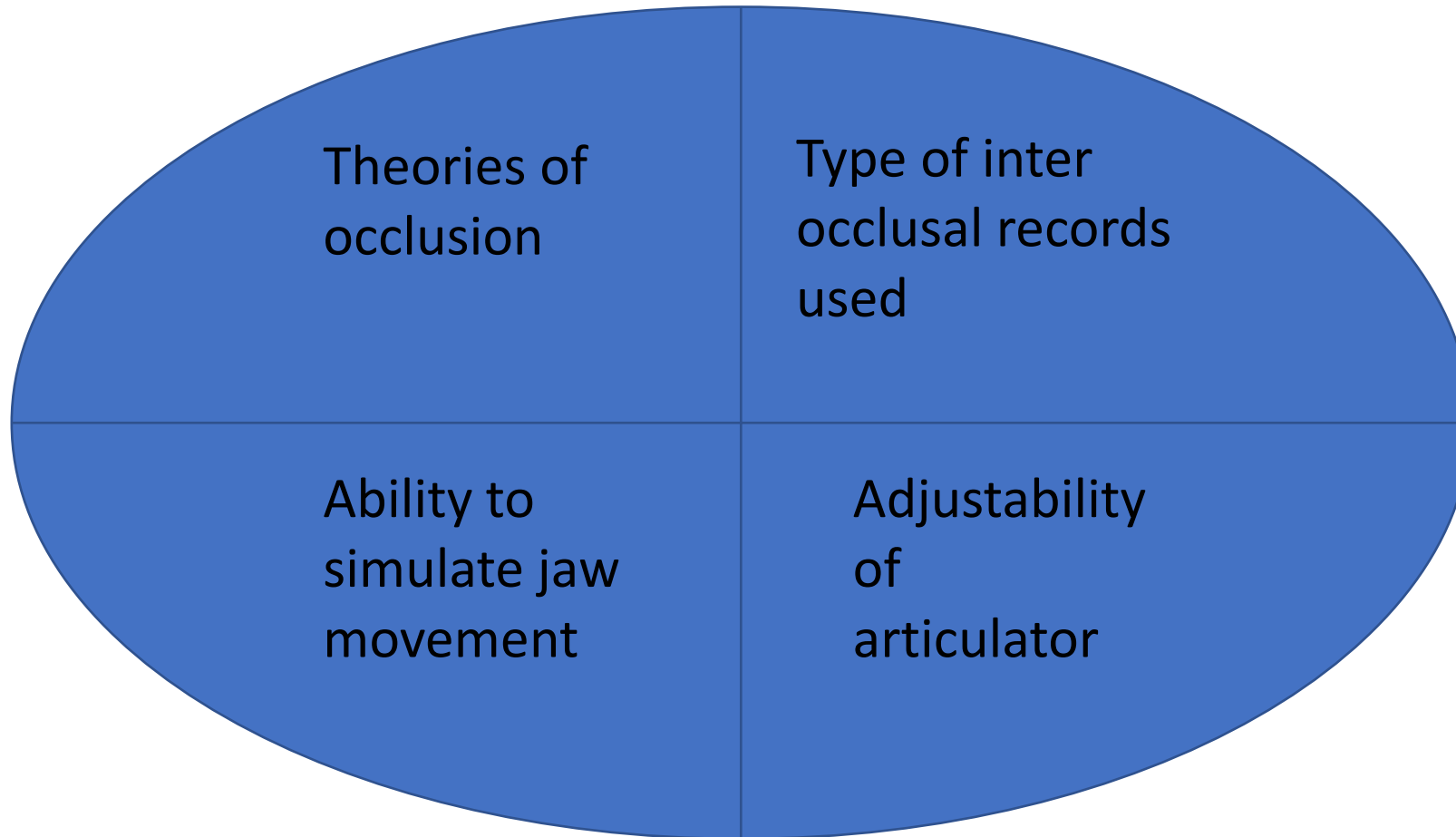
- **Condylar guidance**

- Represented by a slot
- Condylar element of upper member passes through this track
- Spring is mounted within this track to establish the condylar element



CLASSIFICATION

- Classification based on



Classification based on jaw movement

- Articulators are divisible into four classes.
- **A class I** articulator: is a simple holding instrument capable of accepting a single static registration; vertical motion is possible.
- **A class II** articulator permits horizontal as well as vertical motion but does not orient the motion to the temporomandibular joints



Class II articulators

- **A class III** articulator simulates condylar pathways by using averages, or mechanical equivalents, for all or part of the motion;
- these instruments allow for orientation of the casts relative to the joints
- **A class IV** articulator will accept three dimensional dynamic registrations; these instruments allow for



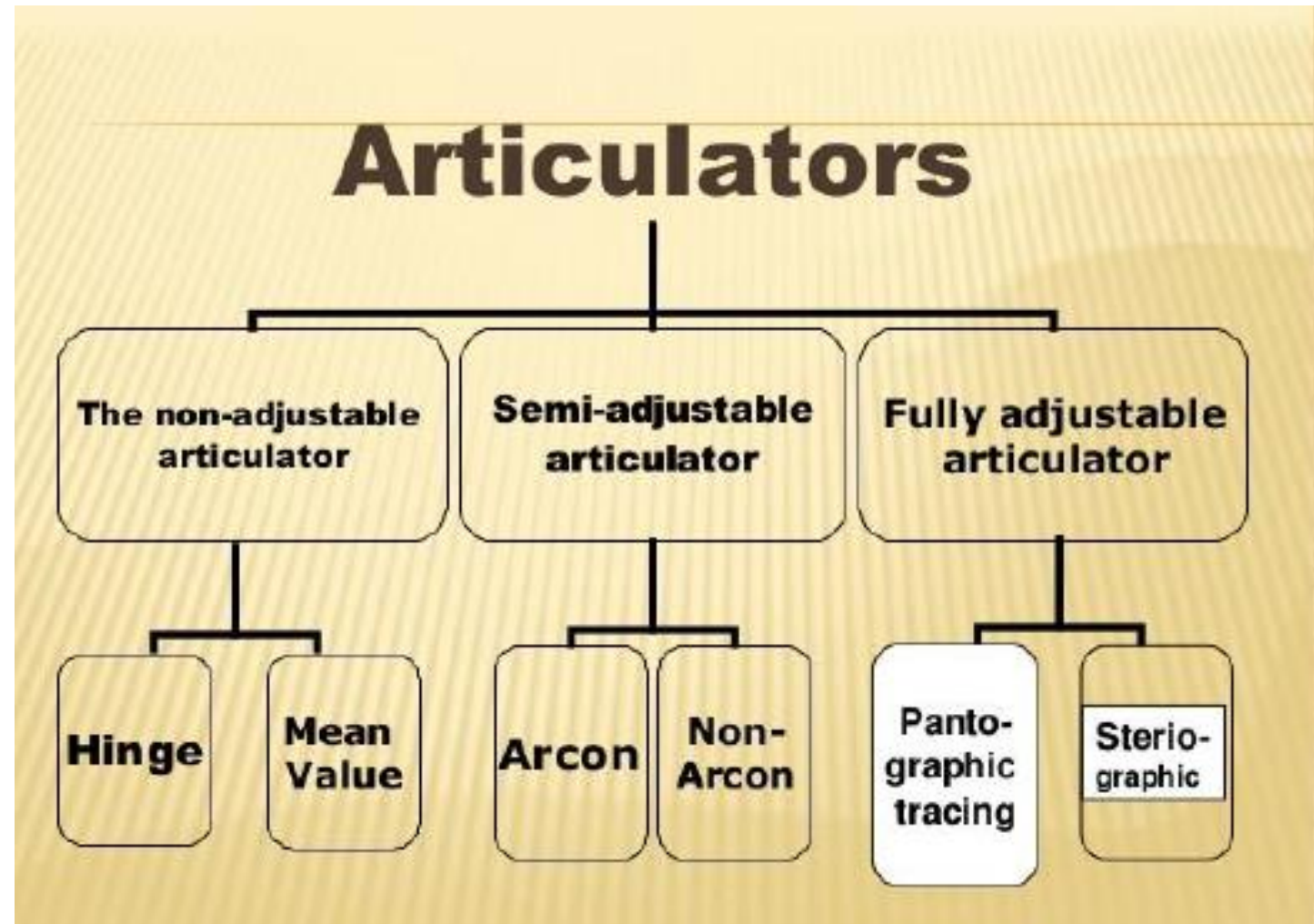
Class III articulators



A class IV articulator

Classification based on adjustability

- Non adjustable
- Semi adjustable
- Fully adjustable

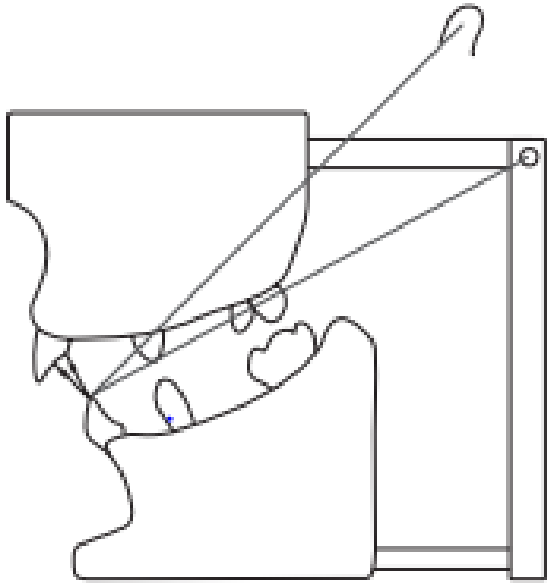


Non adjustable (Simple hinge) داخل

- This type of articulator only allows a hinge movement to be made and does not allow any lateral or protrusive excursions. It is therefore only of value when only the Inter Cuspal Position is required to be observed.
- however, this is the limitation of simple hinge articulators. Once the models are moved on the simple hinge articulator they travel on a different arc to that of the teeth in the mouth because the hinge is in the wrong place in comparison to the patient's temporomandibular joint. Therefore they do not replicate the opening movement of the mandible and cannot make lateral or protrusive excursions.

- Possible movement
- 1-Single hinge movement
- only (opening & closing).
- 2-No lateral movement.
- Record required
- -Vertical dimension of occlusion.
- -Centric relation
- Disadvantages
- Not represented TMJ

- Simple hinge articulators



- To duplicate the movement of the patient's mandible or teeth accurately, their relationship to the condyle must be duplicated on the articulator. This requires an anatomical articulator.
- semi-adjustable or fully adjustable – which is capable of replicating the anatomical arrangement.
- **داخل** Positioning the models correctly on the articulator allows them
 - 1- to be opened and closed in centric relation.
 - 2- allows adjustment of the vertical dimension while remaining in centric relation. Furthermore.
 - 3- positioning the models in the correct position allows movement into lateral excursions.

Average value articulators (mean value)

- This type of articulator has straight condylar paths that are set at 30°. The angle cannot be changed. The condylar path is flat, rather than curved like the natural condylar articular eminence.

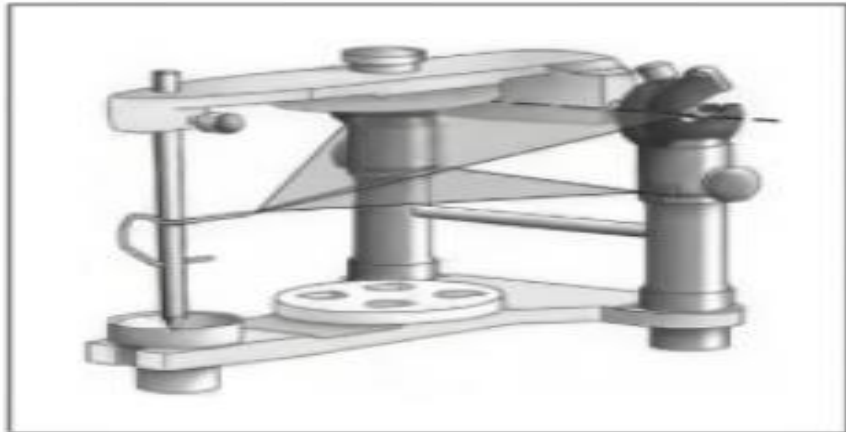


Fig 8-11 Average-value articulators are constructed according to statistical average values: a condylar inclination of approximately 30 to 34 degrees; a Bennett angle of approximately 15 to 20 degrees; the intercondylar distance, position of the occlusal plane, and incisal point determined according to the Bonwill triangle; and the occlusal plane at an angle of approximately 22 degrees to the Bonwill triangle. The devices contain markings or calibration keys for mounting the models.



- Possible movement
 - 1-Opening and closing
 - 2-Protrusive movement
- Record required
 - -Vertical and centric
 - -Face bow record
- DISADVANTAGES
 - Most of these articulator not accepted face bow record
 - No lateral movement
 - It is successful in patient whose condyle approximate that of articulator

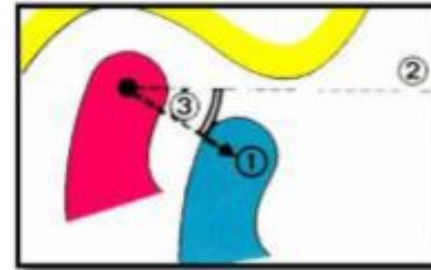
Semi adjustable articulator

- The majority of these articulators again have straight condylar paths, however they have adjustable
- Lateral Condylar path
- Incisal guide table path
- Intercondylar distance

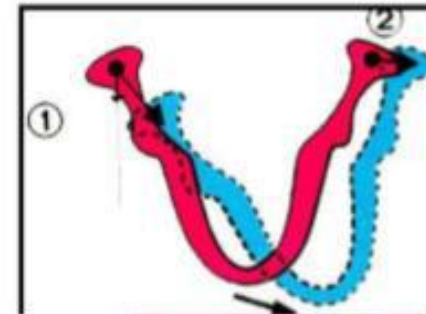
The inclination of the condylar path

Types :

A- Sagittal (HORIZONTAL) condylar path angle



B- Lateral condylar path angle



Intercondylar width

- Some semi-adjustable articulators can be adjusted to take into account the differences that occur in intercondylar width. The width can be adjusted between 100 and 120mm. The effect of adjusting this parameter has less effect on the pathway of the teeth or mandible than the adjustment of the condylar pathway.

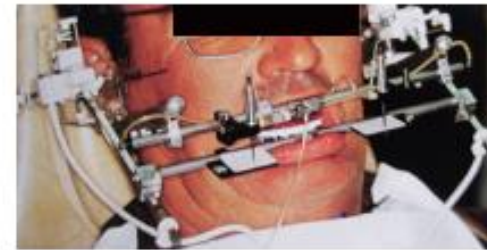
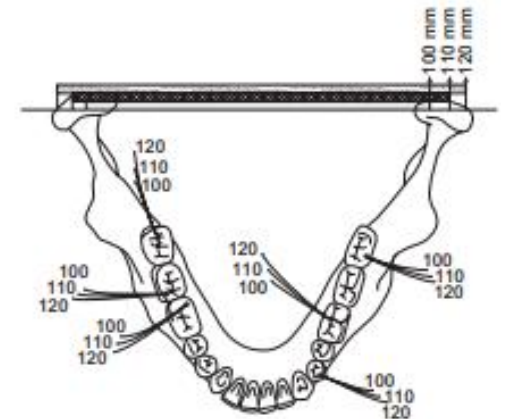


Figure 123



Figure 124



Arcon' or 'non-arcon' داخل

- These terms are used to describe the condylar arrangement of the articulator. They can be remembered by the words 'mandibul(ARCON)dyle'. Thus an arcon articulator has the condyle on the mandibular member of the articulator, as in the human skull, whereas a non-arcon has the condyle on the maxillary member. For most practical purposes the difference in accuracy between the two is insignificant.

- Semi adjustable articulator are two type داخل
- 1- Arcon
- 2- Non arcon

	ARCON	NON-ARCON
1	Condylar element attached to lower member and condylar guidance attached to the upper member.	Condylar element attached to the upper member and the condylar guidance attached to the lower member.
2	Condylar guidance pathway – curved straight	Only straight condylar guidance pathway.
3	Allows condyles to move in a curved pathway during eccentric movement.	Allows condyles to move in a straight line during eccentric movement.
4	Bennett movement can be produced	Bennett movement can be produced in a straight line in a progressive form.
5	e.g Whip-mix articulator	e.g Hanau model –H ,Dentatus,Gysi

SEMI ADJUSTABLE ARTICULATOR

- **ARCON:** condylar elements are on the lower member of the articulator, mechanical fossae are placed on the upper member of the articulator
- **NON ARCON:** condylar path simulating the glenoid fossae are attached to the lower member, condylar elements are placed on the upper portion of the articulator



- Possible movement
 - -Opening and closing
 - -Protrusive and lateral movement
 - -Some types have bennett movement
- Record required
 - -Face bow record to mount the upper cast
 - Vertical and centric relation record
 - -Protrusive record to adjust the horizontal condylar path inclination of the articulator
- Disadvantages
 - -The lateral condylar path angle is determined from the formula.
 - -Most of them have no bennett movement

ARCON VS NON-ARCON ARTICULATOR

Condyle attached to the lower member



Condyle attached to the upper member



(A) Arcon semi-adjustable articulator. (B) Nonarcon semi-adjustable articulator

Condylator articulator داخل

- The Condylator articulator is a semi-adjustable non-arcon design with a biconical axle that reproduces the anatomy of the condylar head. The Protrusive condylar pathway is adjustable but average values are used for intercondylar width. This articulator can be used for all types of restorative work, particularly complete and partial denture work.



Fully adjustable articulators

- Can be adjusted to follow mandibular movement in all directions
- The condylar movements are recorded using pantographic, stereographic or a computerised pantographic system.
- So they have numerous reading and can be customized for each patient
- They are not commonly used
- Possible movements
- -The same movements of the semi adjustable articulators in addition they have Bennett movement.

- Records required:
 - -Face bow, vertical, centric and protrusive record. In addition:
 - -Right lateral record to adjust the left lateral condylar path inclination.
 - -Left lateral record to adjust the right lateral condylar path inclination.
- Disadvantages:
 - -Multi records are required with possibility of errors.
 - -Increased treatment cost



Therefore the *semi adjustable*
enough for complete
denture construction

Denar articulators

- Denar produce a range of articulators designed for specific tasks:
- **Model 310** The Model 310 articulator has been specifically designed for use with anterior guidance and posterior disclusion occlusal schemes.
- **Model 320** The Model 320 allows the protrusive condylar angle to be adjusted, but has the fixed progressive side shift of 15°. This articulator is ideal when working with posterior disclusion of the non-working side with canine guidance or group function on the working side.
- **Model 330** allows the immediate and progressive side shift to be adjusted and therefore is ideal for use when working with a balanced occlusion.



Model 310



Model 320



Model 330

- **Non-adjustable articulator:** used for single restoration and small prosthesis, to perfect the occlusal record in centric relation.
- **Semi-adjustable articulator:** used when cross arch and cross tooth balance is to be obtained.
- **Fully-adjustable:** used in cases of ;
 - complicated occlusal T.M.J disturbances
 - Myofacial pain distress syndrome

داخل facebow

- When using a facebow the distance between the teeth and condyles is recorded mechanically and used to establish the position of the model on the articulator.
- Facebows can be used to:
- 1- record the relationship between the condyles and the maxilla/mandible;
- 2- record the incisal plane angle;
- 3- determine the correct vertical position on the articulator;
- 4- record the condylar angle (mandibular facebow); and
- 5- record condylar movements (pantographic facebow).

Recording the relationship between the condyle and the maxilla/mandible

- Facebows are used to record the anteroposterior and mediolateral spatial position of the maxillary occlusal surfaces in relation to the transverse horizontal axis (imaginary **hinge axis** around which the mandible may rotate in the sagittal plane).
- The facebow is then attached to the articulator to transfer the recorded relationship of the maxilla by ensuring that the corresponding cast is attached in the correct position in relation to the hinge axis of the instrument.
- After the maxillary cast has been attached to the articulator with mounting stone or plaster, the mandibular cast is subsequently related to the maxillary cast with an interocclusal record.

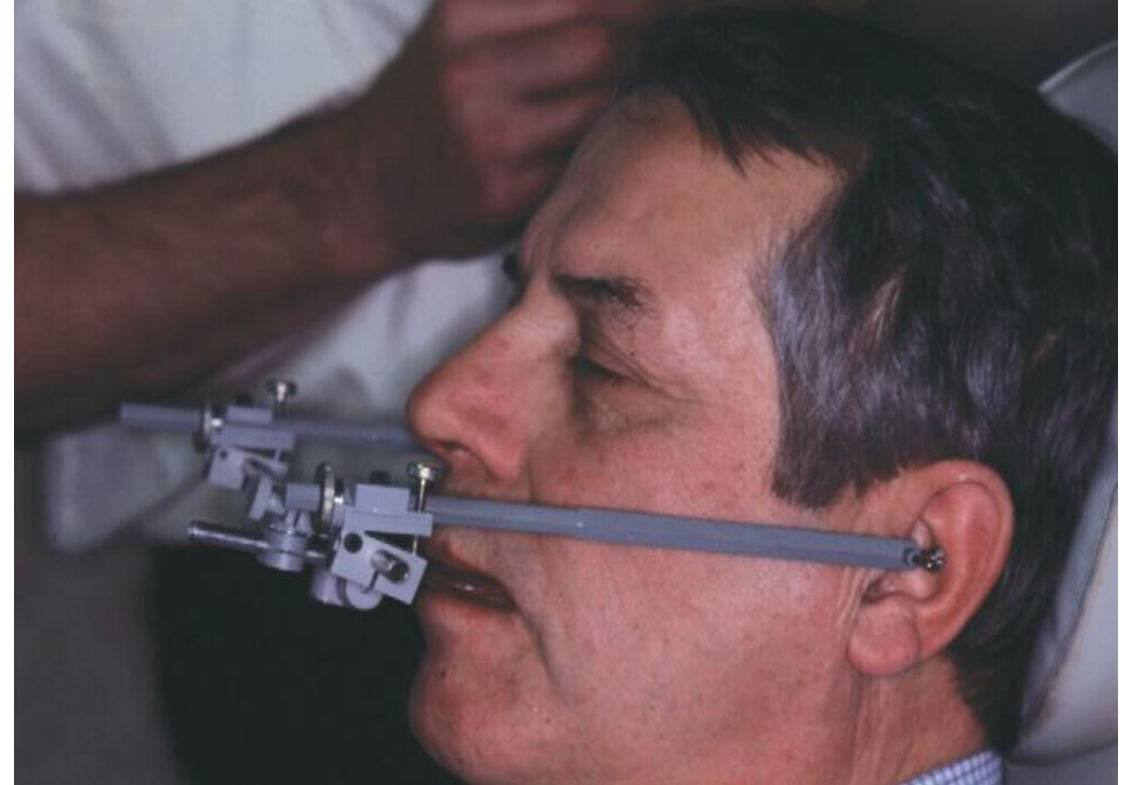
Types of facebow داخل

- Two types of facebows are recognized: arbitrary and kinematic.
- **1- Arbitrary facebows** are less accurate than the kinematic type, but they suffice for most routine dental procedures.
- **2- Kinematic facebows** are indicated when it is crucial to precisely reproduce the exact opening and closing movements of the patient on the articulator

Kinematic hinge axis facebow



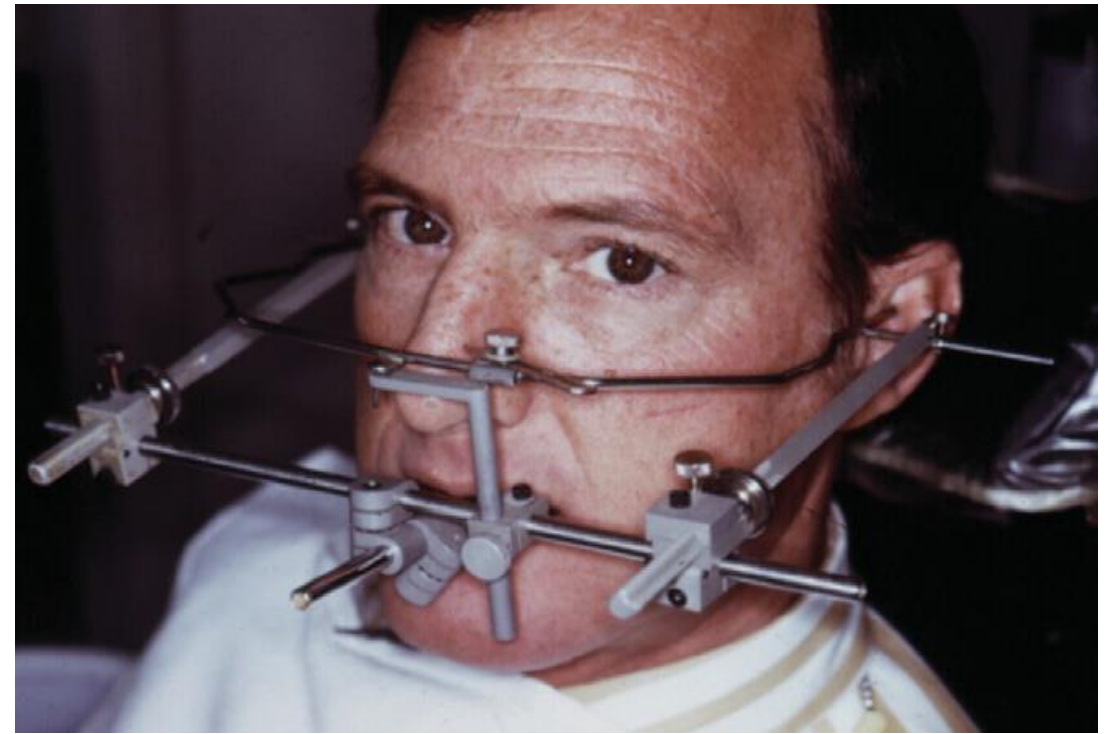
A, Clutch seated on the mandibular teeth. The clutch separates for removal into two components by loosening the screws on left and right sides



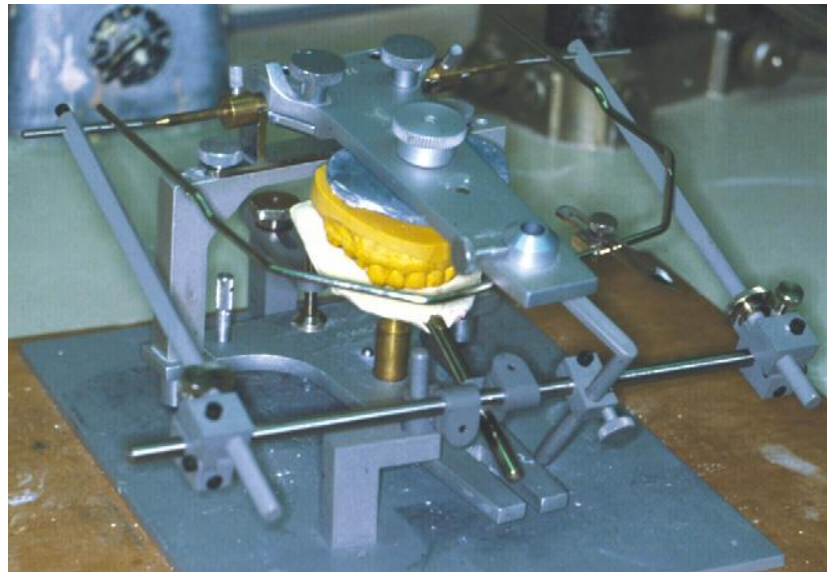
B, Kinematic facebow assembly positioned.



C, Pointers aligned with the previously marked hinge axis location.



D, Assembled kinematic facebow

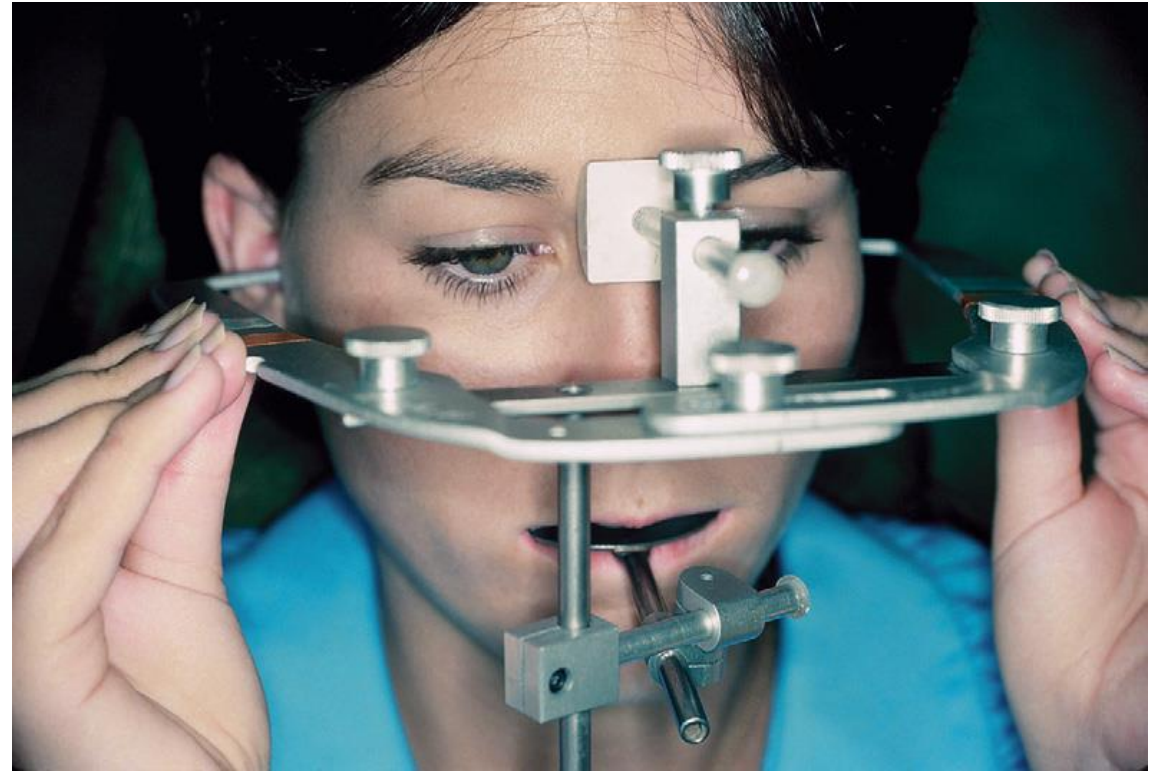


E, Kinematic facebow aligned on the articulator.

Arbitrary hinge axis facebows



A, The Denar Slidematic.



B, Whip Mix Quick Mount. Note the nasion relator as the anterior reference point.

- داخل
- four types of facebow:
- 1-Dentatus facebow
- 2-Denar facebow
- 3-Condylator facebow and
- 4-Denar pantagraphic facebow.
- The facebow is used to position the respective model on the articulator so that the relationship between the patient's teeth (or edentulous ridges) and their condyle heads can be replicated on the articulator
- A bite registration or registration rims, are used to mount the opposing model when a facebow has been used. The facebow is more accurate and positions the models onto the articulator in the same relationship to the articulator's condylar elements as exist in the patient.



Dentatus facebow



Denar facebow



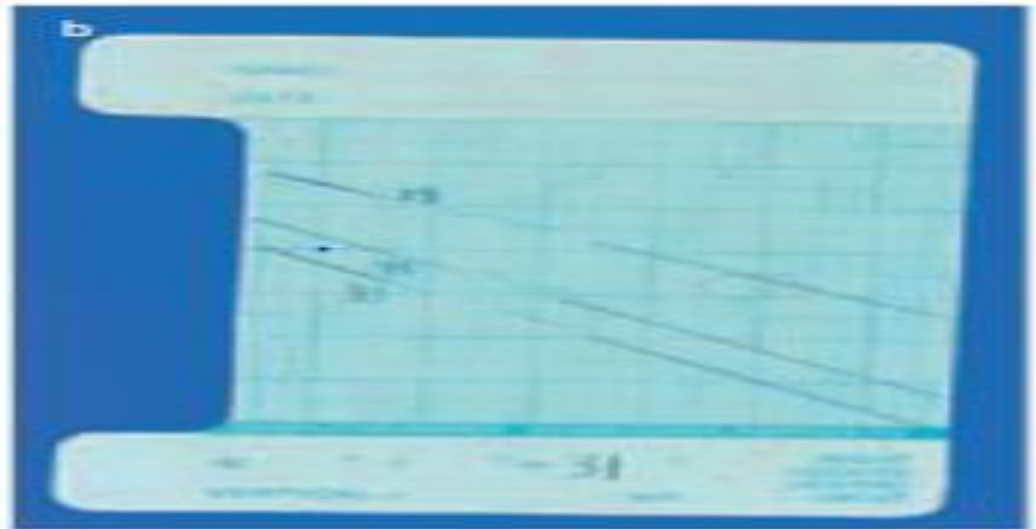
Condylator facebow



Denar pantagraphic

Recording the condylar angle

- Mandibular facebows have the advantage that they allow the condylar angles to be recorded easily. a Condylator mandibular facebow being used to make condylar angle recordings which can then be transferred to the articulator.



Recording the incisal plane angle Facebows

- help maintain the incisal plane angle. The facebow is aligned with the condyles and the eyes; this is then transferred to the articulator to mount the models in line with the articulator condyles.

Determining the correct vertical position on the articulator داخل

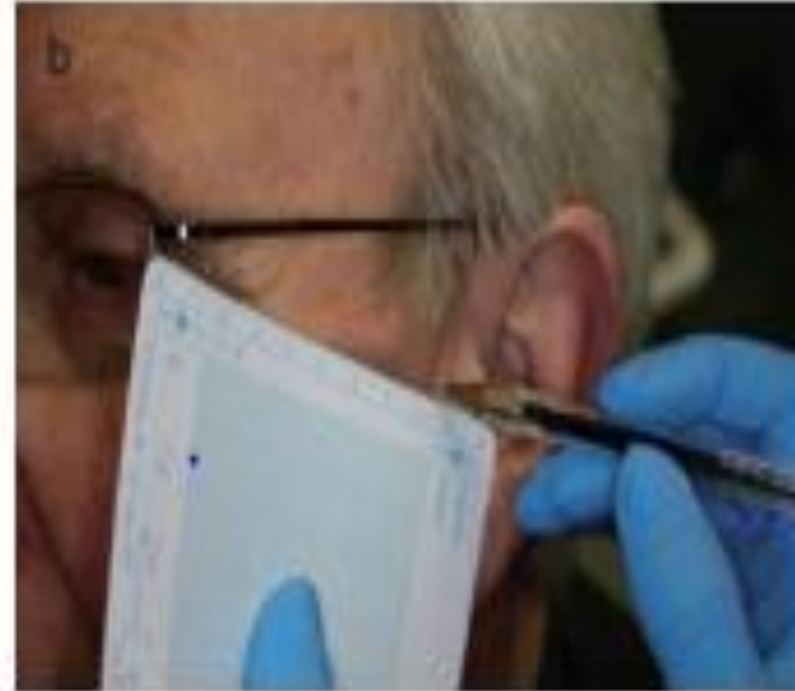
- Facebows also establish the vertical height of the models on the articulator. This ensures the condylar angle remains correct relative to the occlusal plane. A typical facebow procedure, using a Denar facebow.



Determining the correct vertical position on the articulator

Recording condylar movements Pantographic facebows داخل

- are used in conjunction with fully adjustable articulators to recreate the condylar pathway. They do this by recording both horizontal and vertical tracings of the condylar movement.
- Kinematic facebows locate the condyle precisely by positioning the arm of the facebow over the condyle. As the mandible is open and closed on the terminal hinge axis; the arm rotates over the condyle. A pencil lead is incorporated to draw the result. The arm is adjusted until a single point tracing, rather than an arc tracing, is achieved. The facebow then uses this position to transfer the models to the articulator.
- Arbitrarily positioned facebows have a method of locating the condyle built into the bow. For example, the Denar uses an earbow that is designed to compensate for the distance at which it sits behind the condyle. These are often used because of their ease of operation.



Kinematic facebows

Recording condylar movements Pantographic facebows

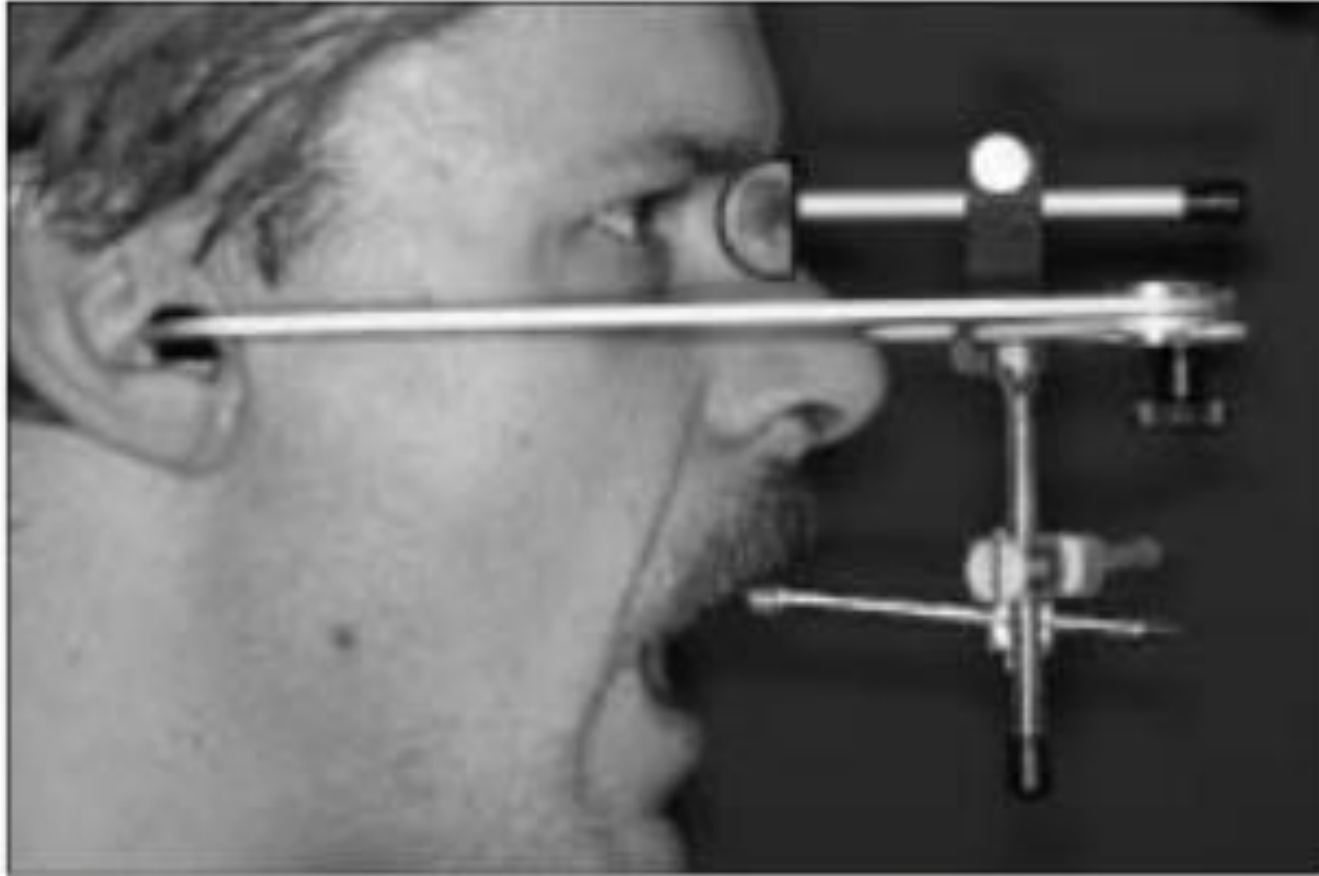


Fig 1 Patient with mounted arbitrary earpiece facebow system.

Arbitrarily positioned facebows

Procedure for using a Denar facebow

- 1. Attach the bite fork to the occlusal surface of the upper registration rim, ensuring that the bar exit is on the patient's right.
- 2. Mark a reference position on the patient's face to establish the vertical position of the facebow .
- 3. Secure the transfer jig in the earbow with the numbering facing you.
- 4. With the screws loosened to allow free movement, slide the transfer jig onto the bite fork until the earbow is securely seated in the ear.
- 5. Adjust the bow so that the vertical height indicator on the bow lines up with the reference position marked previously.
- 6. Tighten the screws on the transfer jig and check the bow to ensure that the registration rim is seated, the bow is in the ears and the height is correct.
- 7. The RCP record may now be taken and the facebow removed.
- 8. Next remove the transfer jig from the earbow ready for mounting the models on the articulator.
- 9. Remove the incisal table from the articulator and replace with the articulating jig.
- 10. Position and secure the transfer jig onto the articulator.
- 11. The working cast may now be placed in the upper registration rim ready for plastering and secured if necessary.
- 12. Next, mount the maxillary model to the articulator
- 13. Then attach the mandibular model using the RCP record.

