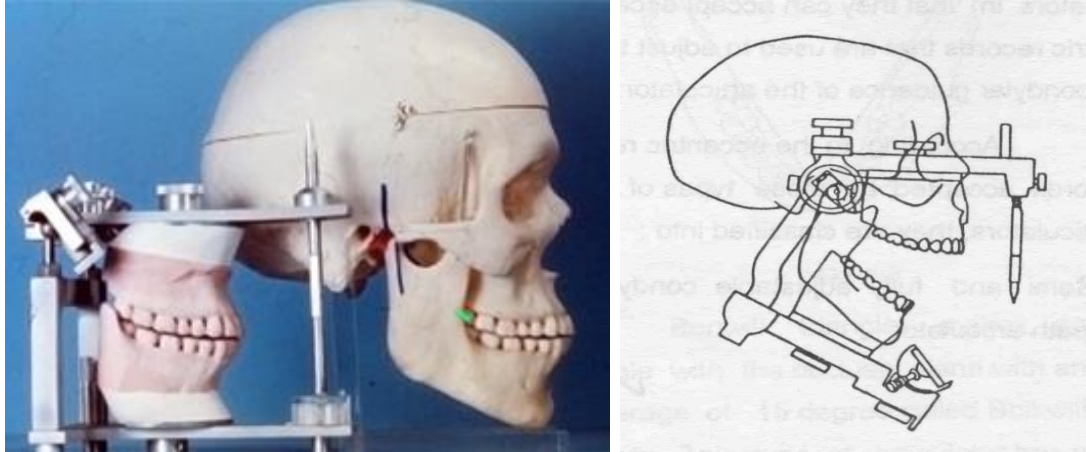


## Articulator

It is a mechanical instrument that represents the temporomandibular joints and jaws, to which maxillary and mandibular casts may be attached to simulate some or all mandibular movements.



### Uses of an Articulator

1. To hold the upper and lower casts in fixed relationship.
2. To simulate the jaw movements like opening and closing.
3. To produce border movements (extreme lateral and protrusive movements) and intraborder movements (within the border movement) of the teeth similar to those in the mouth.
4. It allows most of the prosthetic work to be done in the absence of the patient (diagnosis, treatment planning, setting – up of teeth and development of balanced articulation and waxing-up of dentures).
5. To remounting the dentures after processing for correction of occlusal disharmony.

### Requirements of an Articulator

1. It should hold casts in the correct horizontal relationship.
2. It should hold casts in the correct vertical relationship.
3. The casts should be easily removable and re-attachable.
4. It should provide a positive anterior vertical stop (incisal pin).
5. It should accept face-bow transfer record.
6. It should open and close in a hinge movement.
7. It should be made of non-corrosive and rigid materials.
8. It should not be bulky or heavy.
9. There should be adequate space between the upper and lower members.
10. The moving parts should move freely without any friction.

## Classification of Articulators based on adjustability

### I. Non-adjustable condylar path articulator

- a. Simple hinge articulator (*Class I*).
- b. Mean value or fixed condylar path articulator (*Class II*).

### II. Adjustable condylar path articulator

- a. Semi-adjustable condylar path articulator (*Class III*).
- b. Fully-adjustable condylar path articulator (*Class IV*).

#### 1. Simple hinge articulator.

These are simple holding instruments capable of accepting a single static registration. Only vertical motion is possible. They orient the opposing casts to each other without reference to anatomical landmarks.

**Design:** It consists of upper and lower members held apart at certain distance by a screw which acts at the back. The screw can increase or decrease the distance between the two members, and permits only a hinge like movement.

**Possible movements:** This type of articulators gives only hinge opening and closing movement.

#### **Records required:**

1- Vertical dimension of occlusion. 2- Centric relation records.

#### **Disadvantages:**

These articulators do not represent the temporomandibular joint and the dynamic mandibular movements.



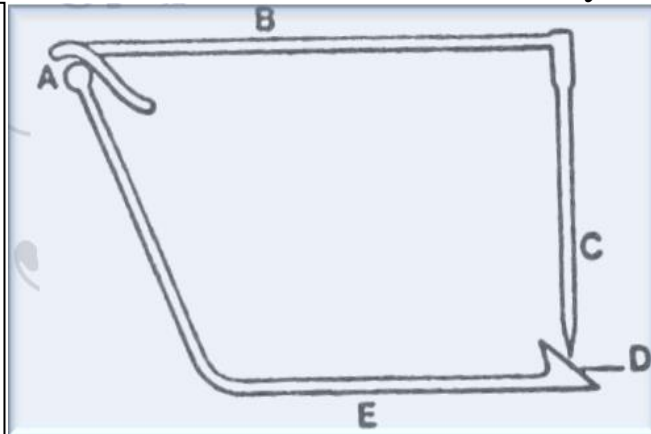
## 2. Mean value or fixed condylar path articulator.

These are an instrument that permits horizontal as well as vertical motion but does not orient the motion to the temporomandibular joints.

**Design:** The two members of this type of articulators are joined together by two joints that represent the temporomandibular joints. The horizontal condylar path is fixed at certain angle that ranges from  $30^\circ$  which is the average (*mean*) of the most patients. The incisal guide table is also fixed at a certain angle from horizontal. The distance between the condylar and incisal guide is derived from the average (*mean*) distance of the population. In the most fixed condylar path articulators, the upper member is movable and the lower member is stationary.

### Design of mean value.

- A. Condylar path (fixed).
- B. Upper member.
- C. Incisal pin.
- D. Incisal table (fixed).
- E. Lower member.



### Possible movements:

1. Opening and closing.
2. Protrusive movement at a fixed condylar path angle.

### Records required:

- a. Vertical dimension of occlusion.
- b. Centric relation record.
- c. Face-bow record: In some designs of these articulators, the upper cast can be mounted by a face bow transfer.

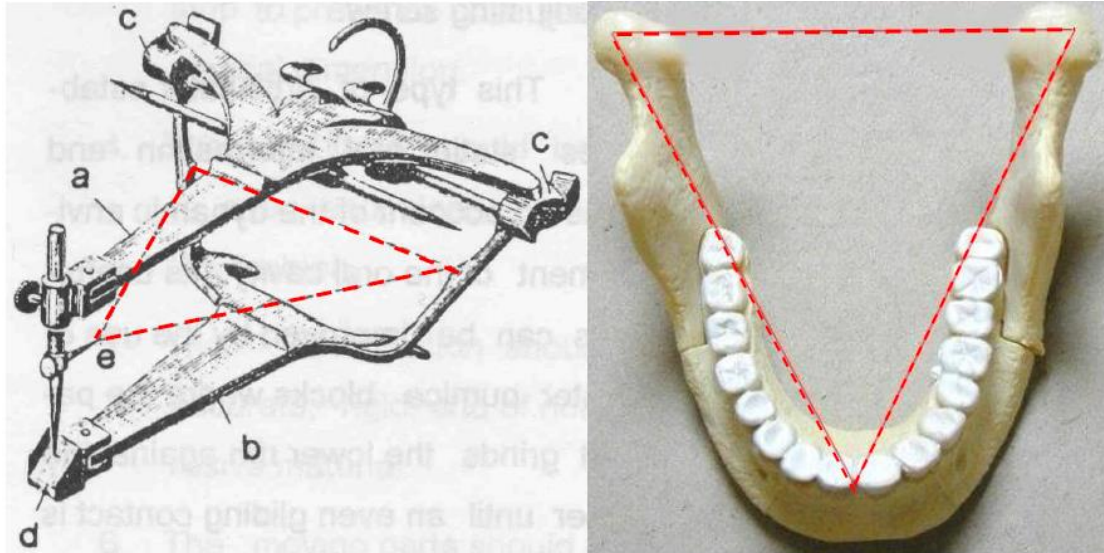
When the articulators do not accept face-bow record, the mounting is made according to *Bonwill triangle*.

Bonwill found in mandibles that the inter-condylar distance as well as the distance from each condyle to the contact point of the lower central incisors was **4 inches** (*equilateral triangle*).

An anterior pointer is attached to the incisal pin of the articulator to locate the tip of the occlusion rim labially and thus to orient cast in relation on the Bonwill triangle.

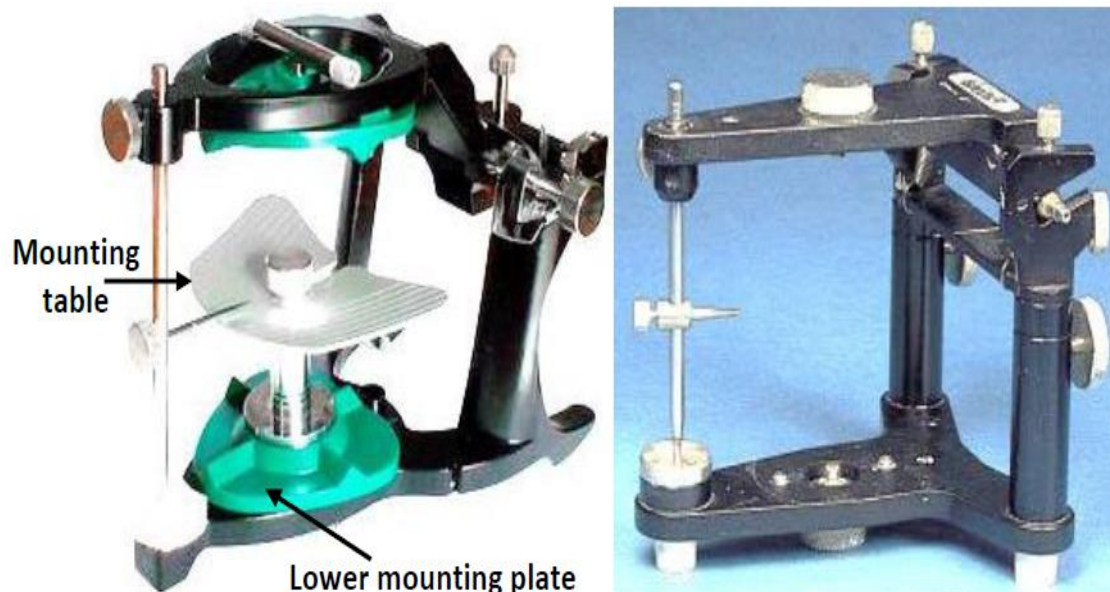
**Disadvantages:**

- a. Most of these articulators do not accept face-bow record.
- b. The condylar path moves to a fixed angle and it is successful in patients whose condylar angle approximates that of the articulator.
- c. No lateral movements.



*a- Upper member. b- Lower member. c- Fixed condylar path inclination. d- Fixed incisal guide table. e- Anterior pointer.*

**Bonwill triangle:** An equilateral triangle formed by lines from the contact point of the lower central incisors (or the median line of the residual ridge of the mandible) to the mandibular condyles on each side and from one condyle to the other.





**Adjustable Condylar Path Articulators:**

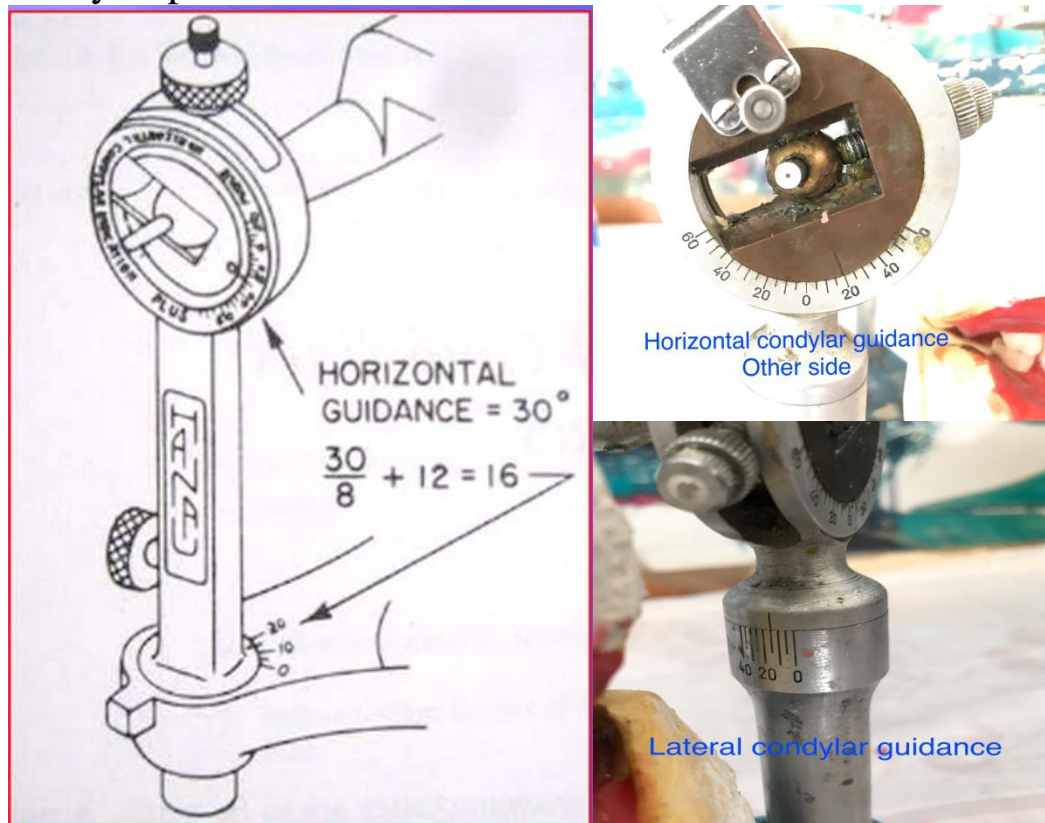
This type of articulators differs from the fixed condylar path articulators in that; it has adjustable condylar and incisal guidance. They can be adjusted so that the movements of its jaw members closely resemble all movements of the mandible for each individual patient.

**3. Semi-adjustable condylar path articulators:**

**Design:** In these articulators, the horizontal condylar path is adjusted by a protrusive record obtained from the patient, and the lateral condylar path inclination is adjusted according to the **Hanau's formula** when use Hanau type of semi-adjustable articulator.

**Hanau's formula:**  $L = H / 8 + 12$ .

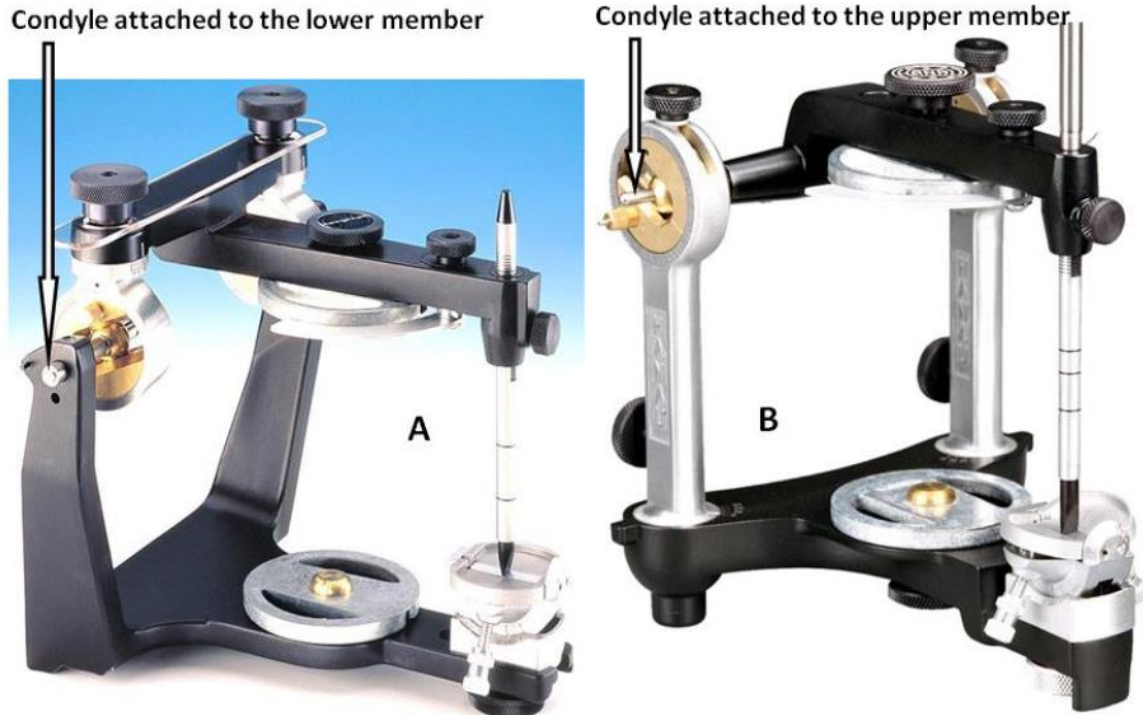
Where; L= The lateral condylar path. H= The horizontal condylar path.



**They classified as :** a. Arcon semi-adjustable articulator.

b. Non-arcon semi-adjustable articulator.

The term **arcon** comes from (mandibular **con**dyle). It is commonly used to indicate an articulator that has its condyles on the lower member and the condylar guide on the upper member.



**Possible movements:**

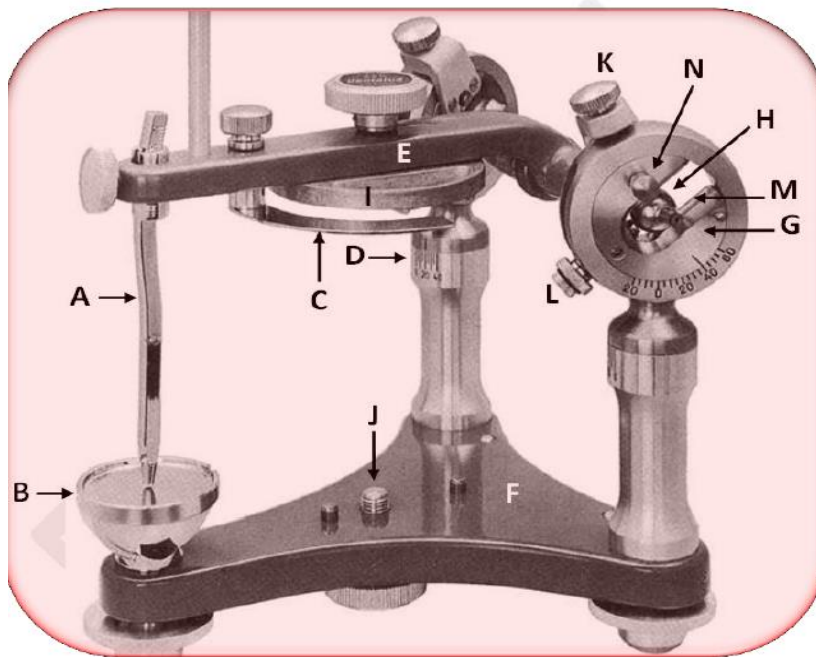
- a. Opening and closing.
- b. Protrusive movement according to the horizontal condylar path angle determined from the patient.
- c. Lateral movement to the angle estimated from the Hanau's formula.
- d. Some types have Bennett movement (immediate side shift).

**Records required:**

- a. A Maxillary face bow record to mount the upper cast.
- b. Centric occluding relation record (vertical dimension and centric relation) to mount the lower cast.
- c. Protrusive record to adjust the horizontal condylar path inclination of the articulator, and to find the lateral condylar path inclination from *Hanau's formula*.

**Disadvantages:**

- a. The lateral condylar path angle is determined from a formula, not from the patient directly.
- b. The condyles travel on a flat path cannot be used to reproduced eccentric movements exactly.
- c. Most of these articulators have no Bennett movement.



- A- Incisal pin.
- B- Incisal table.
- C- Orbital plane guide.
- D- Lateral condylar path inclination.
- E- Upper member.
- F- Lower member.
- G- Condylar guidance.
- H- Condyle (attached to upper member).
- I- Upper mounting plate.
- J- Attachment screw of lower mounting plate.
- K- Screw for horizontal condylar guidance inclination.
- L- Anterior stop screw for condyle.
- M- Condylar track.
- N- Centric lock.

#### 4. Fully-adjustable articulators:

An articulator that will accept three dimensional dynamic registrations; these instruments allow for orientation of the casts to the temporomandibular joints and simulation of mandibular movements. They differ from the semi-adjustable articulators in that the lateral condylar path inclination is adjusted according to records taken from the patient.

##### **Possible movements:**

1. Opening and closing.
2. Protrusive movement according to the horizontal condylar path angle determined from the patient.
3. Lateral movement according to the lateral condylar path inclination determined from the patient.
4. Bennett movement.

\* The same movements of the semi-adjustable type, in addition they have Bennett movement.

##### **Records required:**

1. A maxillary face-bow record to mount the upper cast.
2. Centric occluding relation record to mount the lower cast.
3. Protrusive record to adjust the horizontal condylar path inclination of the articulator.
4. Right lateral record to adjust the left condylar path inclination.
5. Left lateral record to adjust the right condylar path inclination.



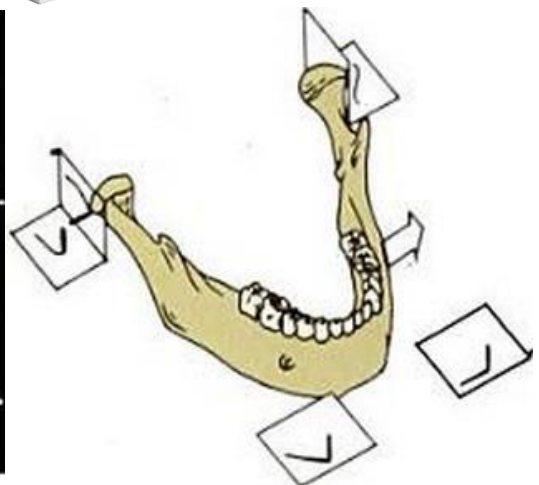
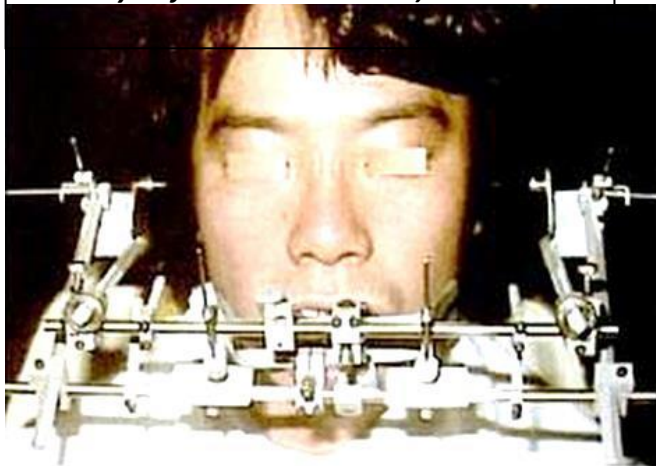
**Disadvantages:**

Multiple records are required with the possibility of errors.

\* Fully-adjustable articulators where the condylar and incisal guidance are fabricated individually with acrylic can travel in the path of the condyle using pantographic tracings.



*pantographic tracing (used to programmed the fully-adjustable articulator).*



**Virtual articulator:** application in prosthetic dentistry based on virtual reality reduce limitations of mechanical articulator.

