

Myofunctional Appliances

Presented by:-

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 - *Bionator*
 - *Function regulator*
 - *Twin block*

Classification

“Tom Graber” when functional appliances were removable:-

- **GROUP A** - *Teeth supported appliances.*
 - *Catlans appliance*
 - *Inclined plane*
- **GROUP B** - *Teeth/tissue supported.*
 - *Activator*
 - *Bionator*
- **GROUP C** - *Vestibular positioned with isolated support from tooth/tissue.*
 - *Frankel appliance*
 - *Lip bumper*

With the advent of fixed functional appliances, a new classification evolved:-

- *Removable functional.*
 - *Activator*
 - *Bionator*
 - *Frankel*
- *Semi-fixed functional appliances.*
 - *Denholtz*
 - *Bass appliance*

■ *Fixed functional appliances.*

- *Herbst appliance*
- *Jasper jumper*
- *Churro jumper*
- *Saif springs*
- *Adjustable corrector*
- *Eureka spring*
- *Mandibular ant. repositioning appliance*
- *Klapper super spring*
- *Sabbath universal spring*

With the concept of hybridization:-

“Peter Vig”

- *Classical functional appliances*
 - *Activator*
 - *Frankel*
- *Hybrid appliances*
 - *Double oral screen*
 - *Hybrid bionator*
 - *Bass appliance*
 - *Propulsor*

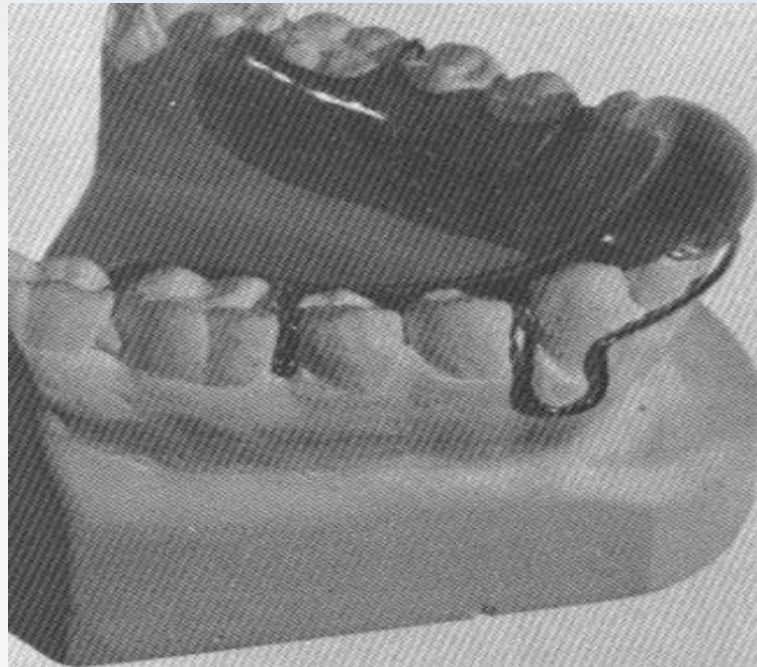
As given by “Profitt”

- *Teeth Borne:-*
- *Teeth borne passive appliances (Myotonic).*
 - *Andresen/Haupl activator*
 - *Herren activator*
 - *Woodside activator*
 - *Balter’s bionator*
- *Teeth borne active appliances (Myodynamic).*
 - *Elastic open activator*
 - *Bimler’s appliance*
 - *Modified bionator*
 - *Stock fish appliance*
 - *Kinetor*

Tissue Borne:-

- *Tissue borne passive appliances.*
 - *Oral screen*
 - *Lip bumper*
- *Tissue borne active appliances.*
 - *Frankel appliances*
- *Functional orthopedic magnetic appliances.*

Bite Planes



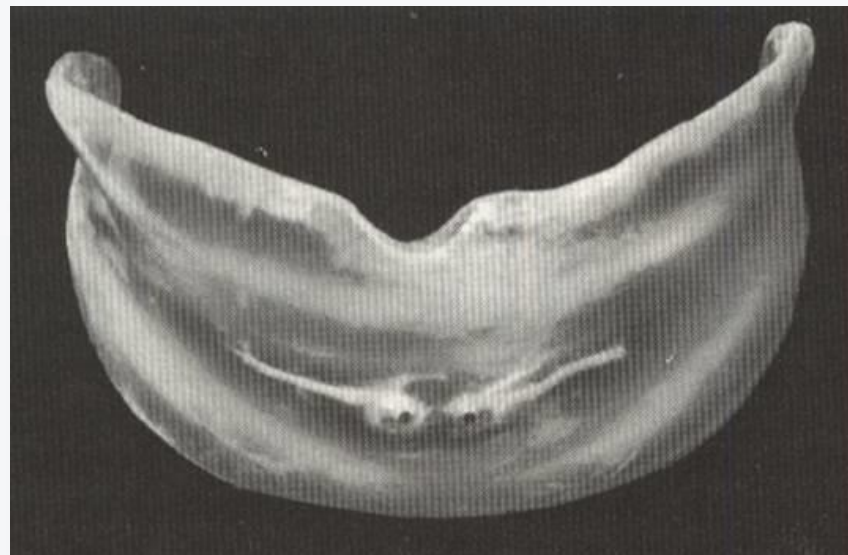
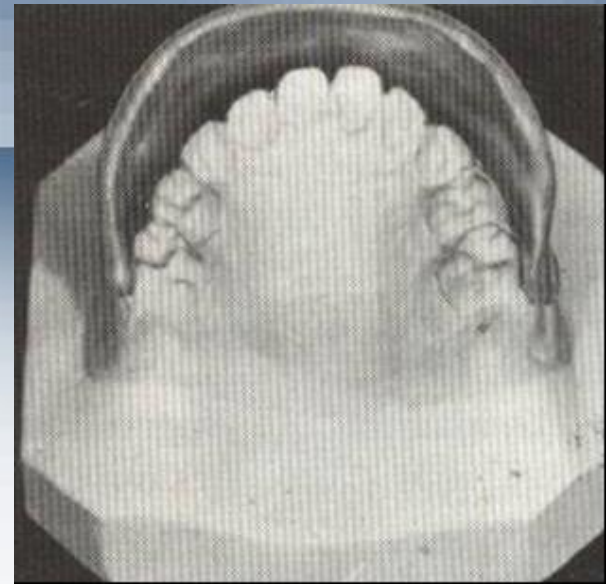
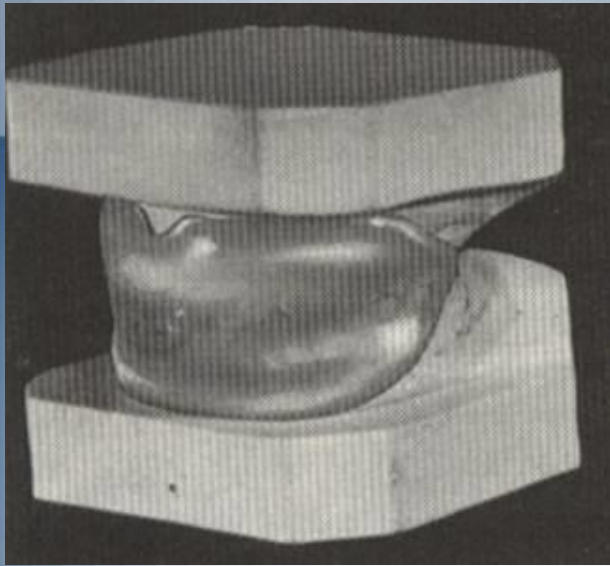
Oral Screen

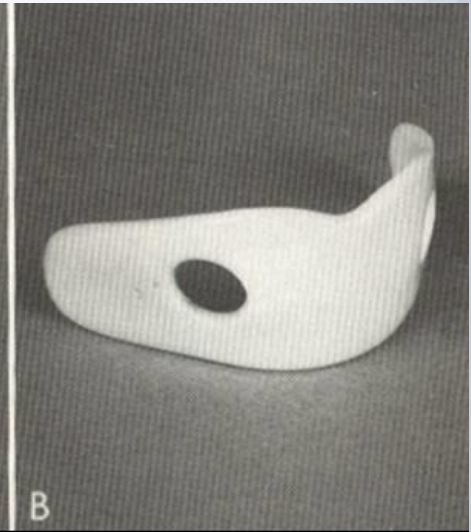
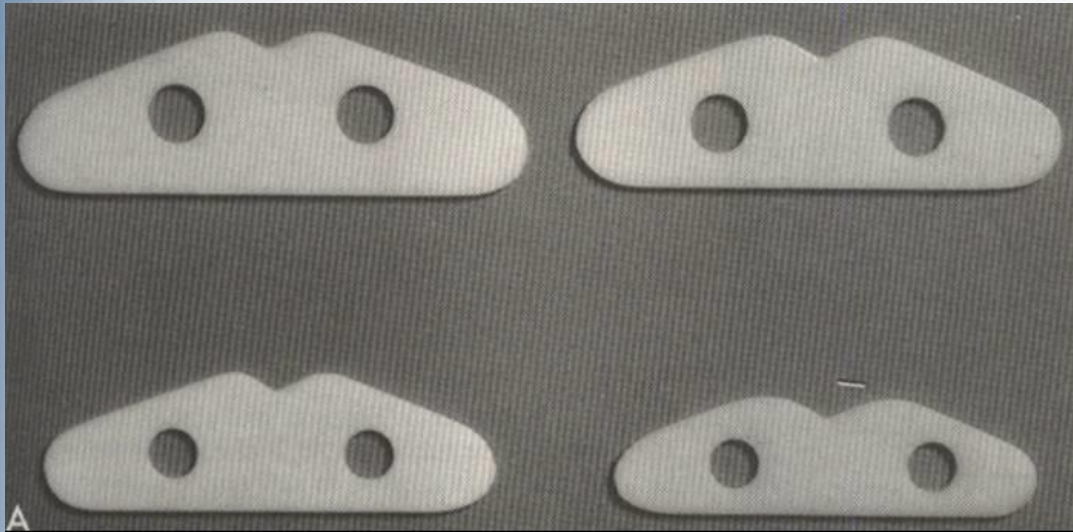
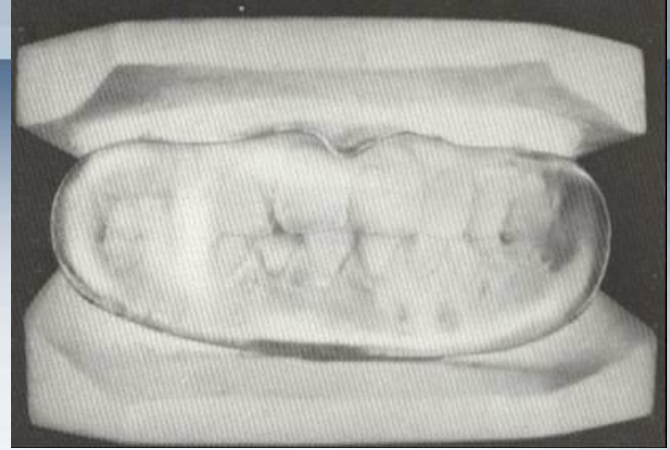
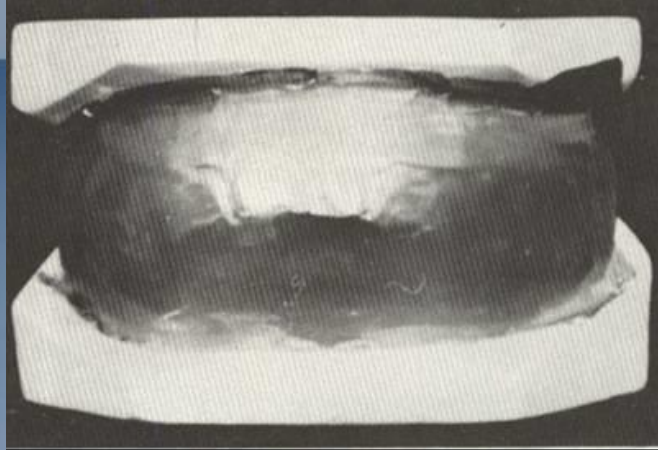
- *Was introduced in 1912 by “Newell”.*
- *The vestibular screen has turned out to be a versatile and simple appliance in the early interceptive treatment of dental arch deformities.*
- *Uses:*
 - *Thumb sucking, lip biting, tongue thrust, mouth breathing.*

Fabrication

- *Upper & lower impressions should be made.*
- *Working casts are made from the impressions & sealed in centric occlusion.*
- *A sheet of modeling wax, which is used as a spacer is adapted on the buccal surface of the teeth extending well into the depth of sulcus, relieving frenal & muscle attachments. Posteriorly, it should cover half of buccal surface of last erupted tooth.*
- *Expose either the incisal third or the whole of the labial surface of the proclined teeth.*

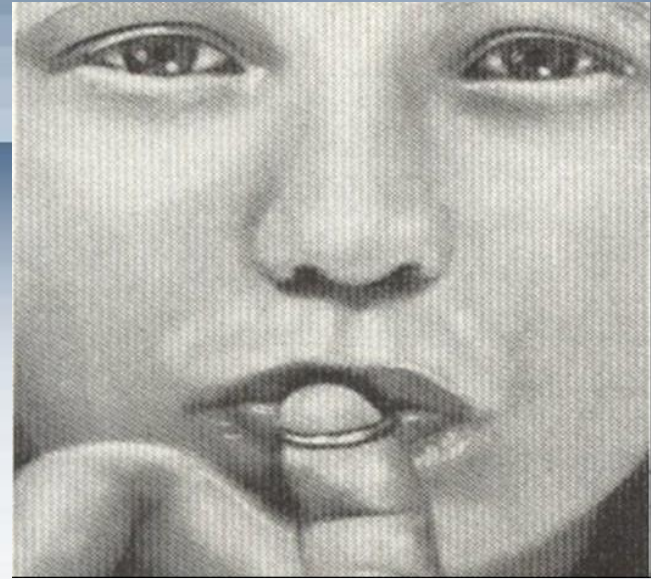
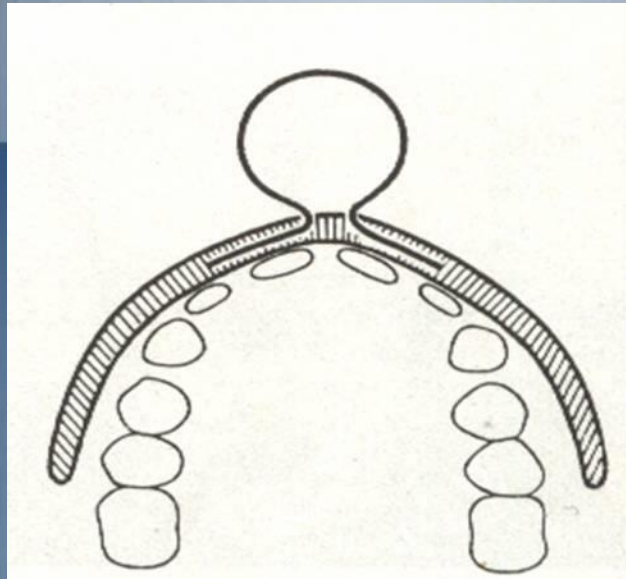
- *Apply french chalk on to the spacer, to act as a separating medium & adapt the second layer of wax confining to the limits of the spacer.*
- *Remove this wax pattern & acrylize it. OR*
- *The second layer can be directly processed by using autopolymerising acrylic resin, instead of wax.*
- *A thick wire ring should be incorporated in the anterior region while acrylising which will help the patient in carrying out muscle exercises.*



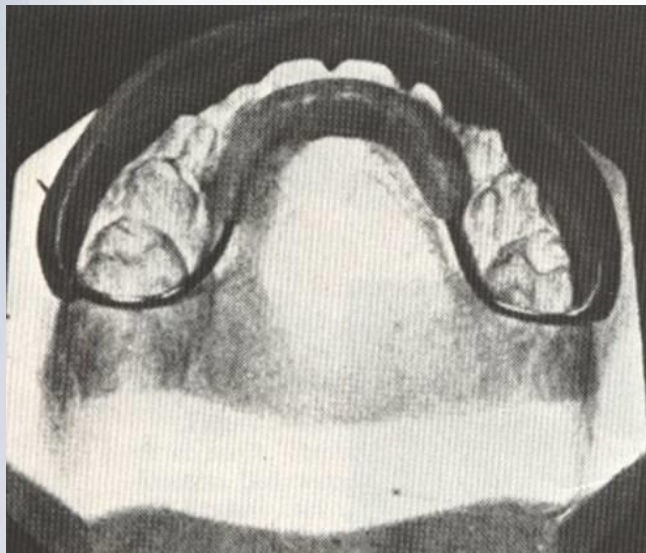
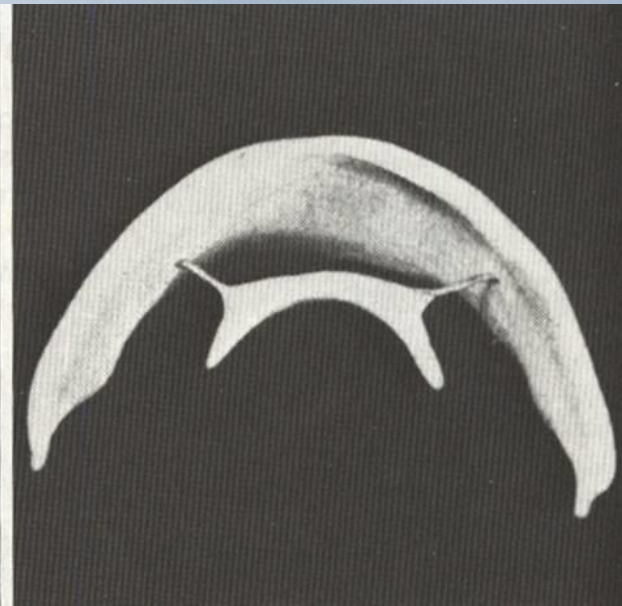
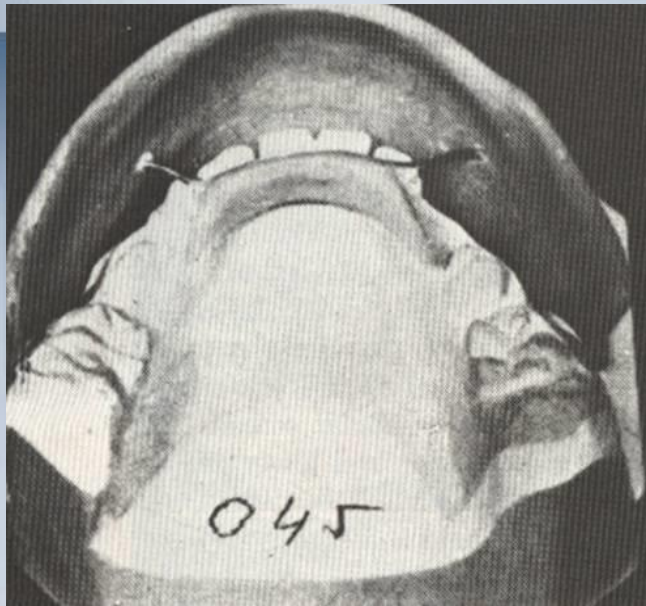


A

B



Double Oral Screen

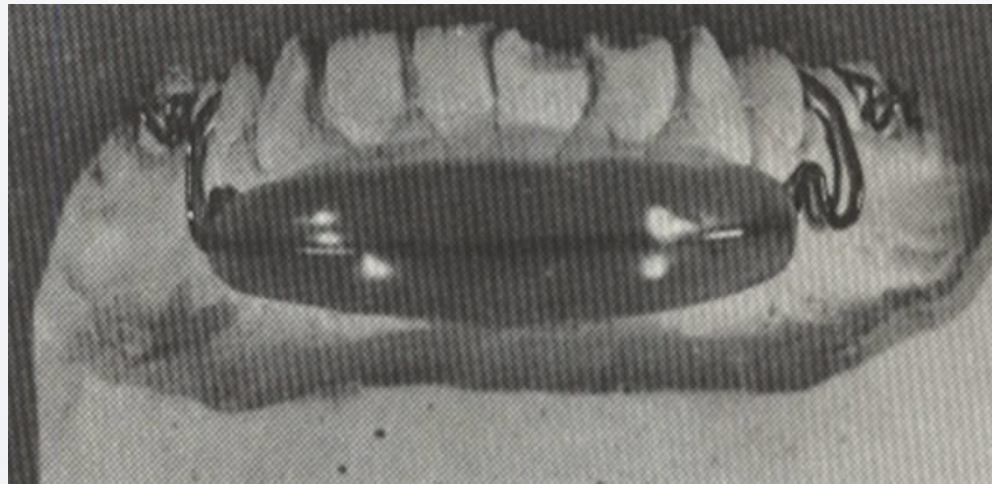
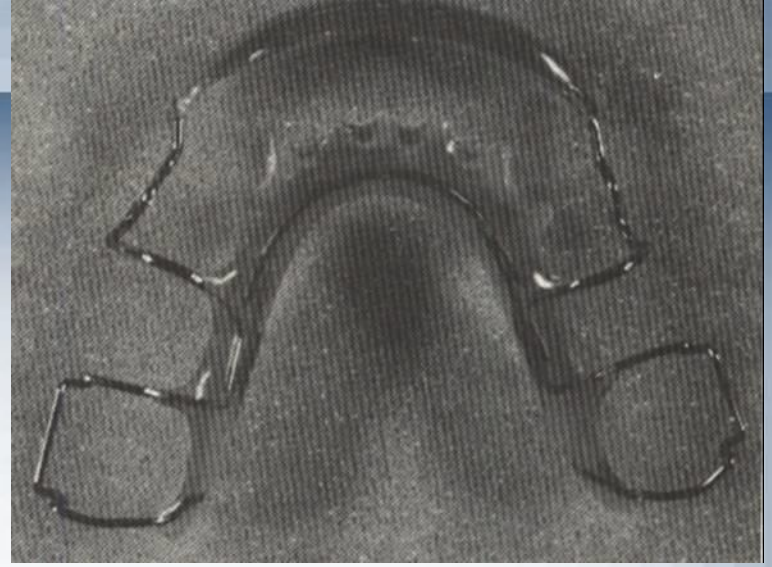
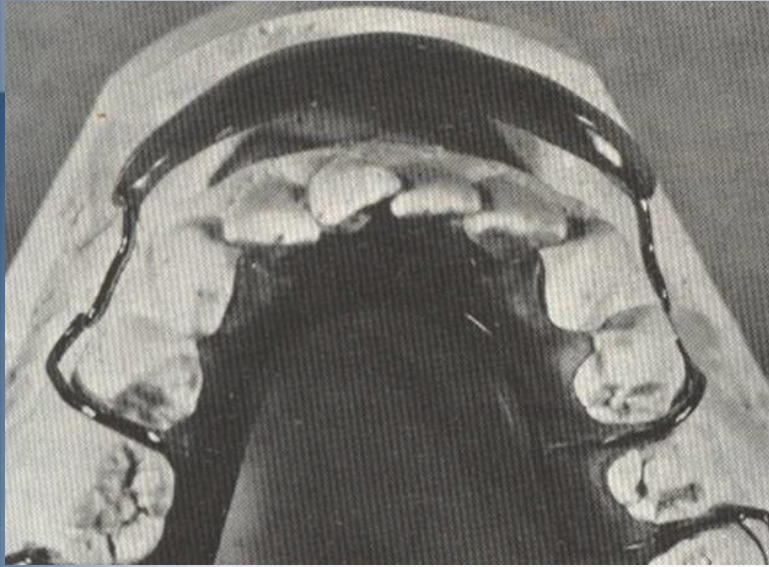


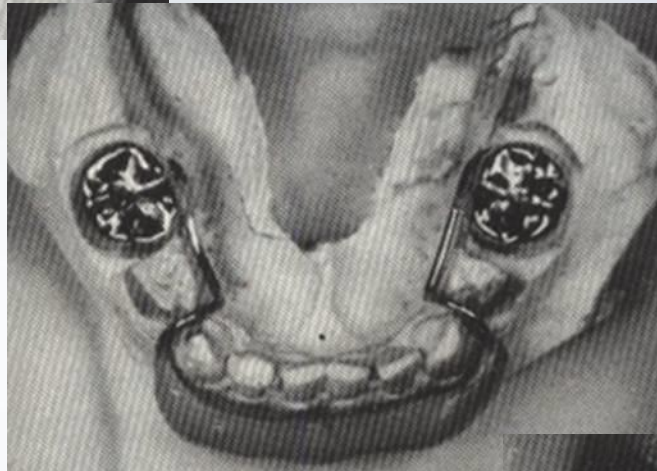
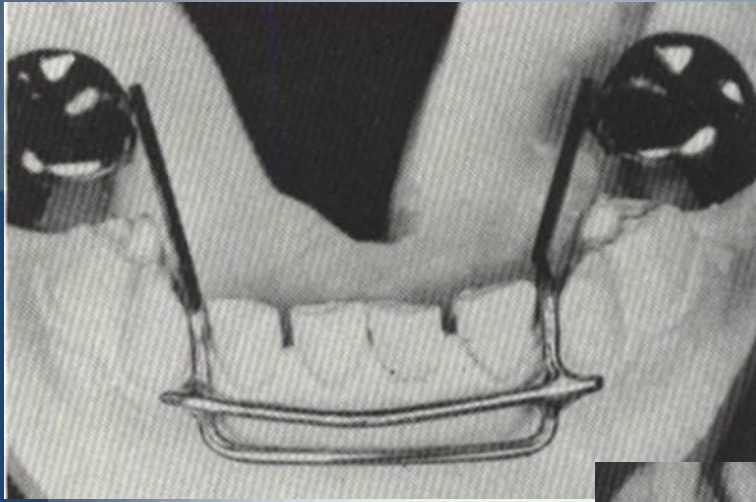
Lip Bumper

- *Combined removable – fixed appliance.*
- *Can be called as modified vestibular screen.*
- *Lip sucking & hyperactivity of mentalis muscle can be eliminated.*
- *By removing soft tissue forces from the labial aspect of the lower anteriors it may produce forward tilting of these teeth under the influence of tongue pressure.*
- *Thus, they increase the arch length, reduce crowding & decrease the excessive overjet.*

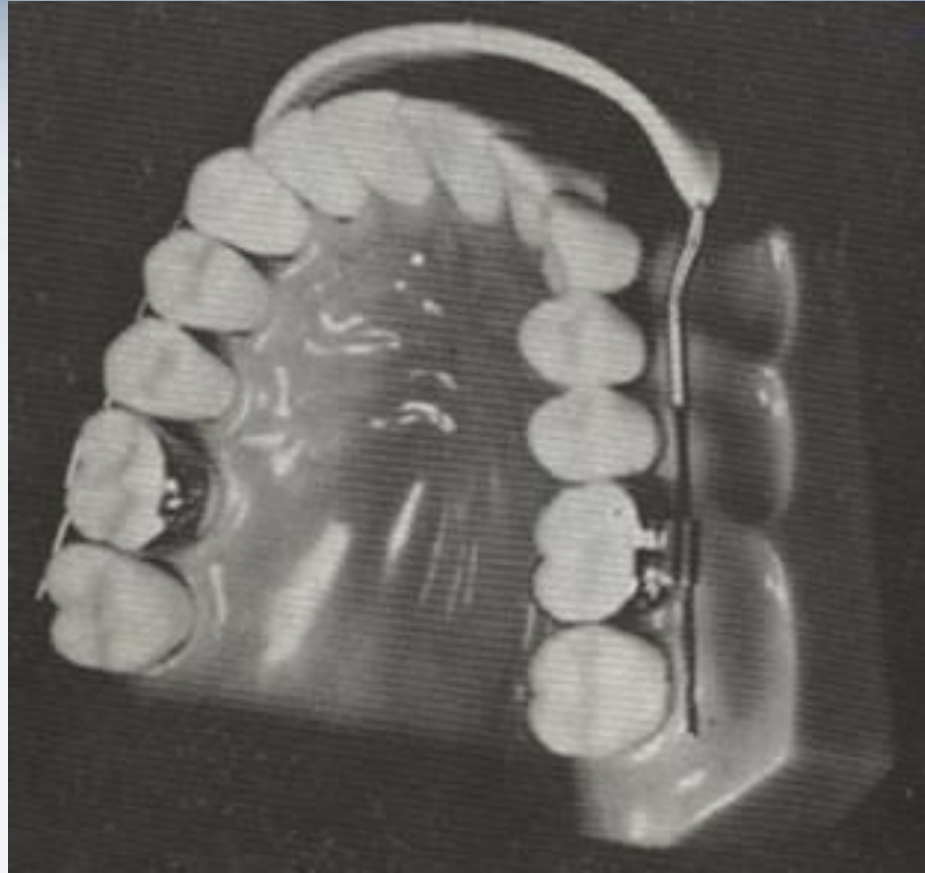
Fabrication

- *Bands or crowns will be placed on the first permanent or second deciduous molar with horizontal buccal tubes soldered to receive 0.93 mm wire or labial wire assembly can be soldered directly to the band or crown.*
- *Anterior portion of the wire from canine to canine can be reinforced with acrylic.*
- *Removable lip bumper retained by Adams clasp can be used when the patient's compliance is assured.*





Denholtz Appliance



Activator

- **Kingsley** 1879 – 'Vulcanite plate' consisting of anterior incline plane to position mandible forward.
- **Hotz** – 'Vorbissplatte' used to correct retrognathism with deep bite.
- **Pierre Robin** – 'Monobloc' to correct airway obstruction.
- **Viggo Andresen** 1908 – 'Biomechanical working retainer'
This is modified Hawley's type of retainer on maxillary arch to which he added a lower lingual flange which helps in positioning the mandible forward.
- Later **Haupl** and Andresen teamed up and brought about a lot of changes in the device and called it 'Functional jaw orthopedics' & 'Norwegian appliance' which later came to be called the 'Activator'.

■ *Indications:-*

- *Class II div I malocclusion.*
- *Class II div II malocclusion.*
- *Class III malocclusion.*
- *Open bite malocclusion.*

- *Contraindications:-*
 - *Class I with crowding.*
 - *Excessive lower facial height.*
 - *Lower proclination.*
 - *Case of nasal stenosis.*
 - *Non- growing individuals.*

- *Advantage:-*

- *Existing growth.*

- *Minimal oral hygiene problems*

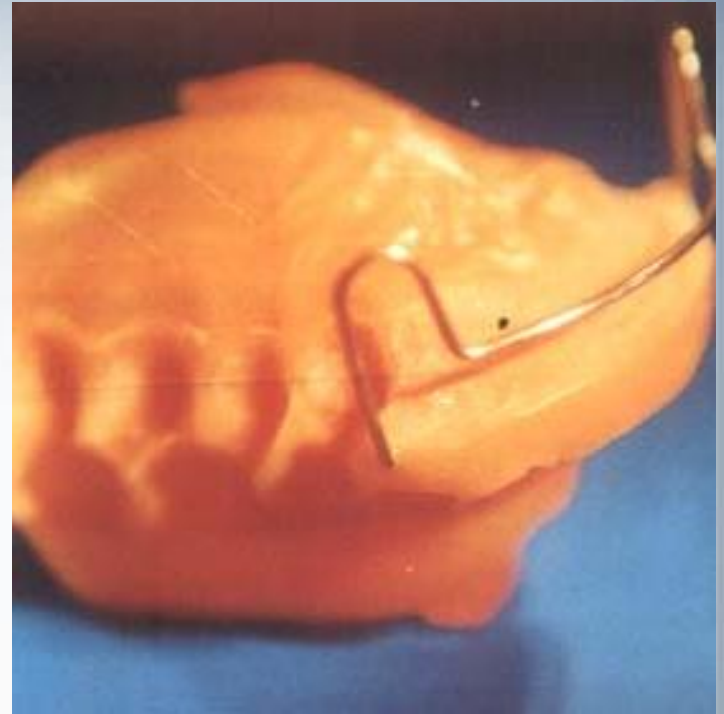
- *Appointment usually short*

- *Disadvantage:-*

- *Requires good patient co-operation.*

- *Cannot produce precise detailing and finishing of occlusion.*

- *Components:-*
 - *Labial bow of 0.9mm wire.*
 - *Jack screw*
 - *Acrylic portion*



Construction bite

- *Upper & lower impressions should be made to construct study model & working model.*
- *Bite registration:-*
 - *It is an inter-maxillary record which helps in recording a 3-d relationship of mandible to maxilla.*
 - *Purpose:-*
 - *To bring the lower jaw forward.*
 - *To prevent the supra eruption of lower anteriors.*
 - *To promote the eruption of posterior teeth.*

Antero-posterior movement:-

- *Optimal forward movement for recording bite is half of maximum distance to which the mandible can move forward during protrusion or should not exceed more than 3mm posterior to the most protrusive position.*
- *Vertically opening should be minimal & within the limits of the inter-occlusal clearance.*
- *In most cases, mandible is advanced by 4-5mm & the bite opened to the extent of 2-3mm beyond the freeway space.*
- *This kind of activator is called as H-activator.*

Vertical opening:-

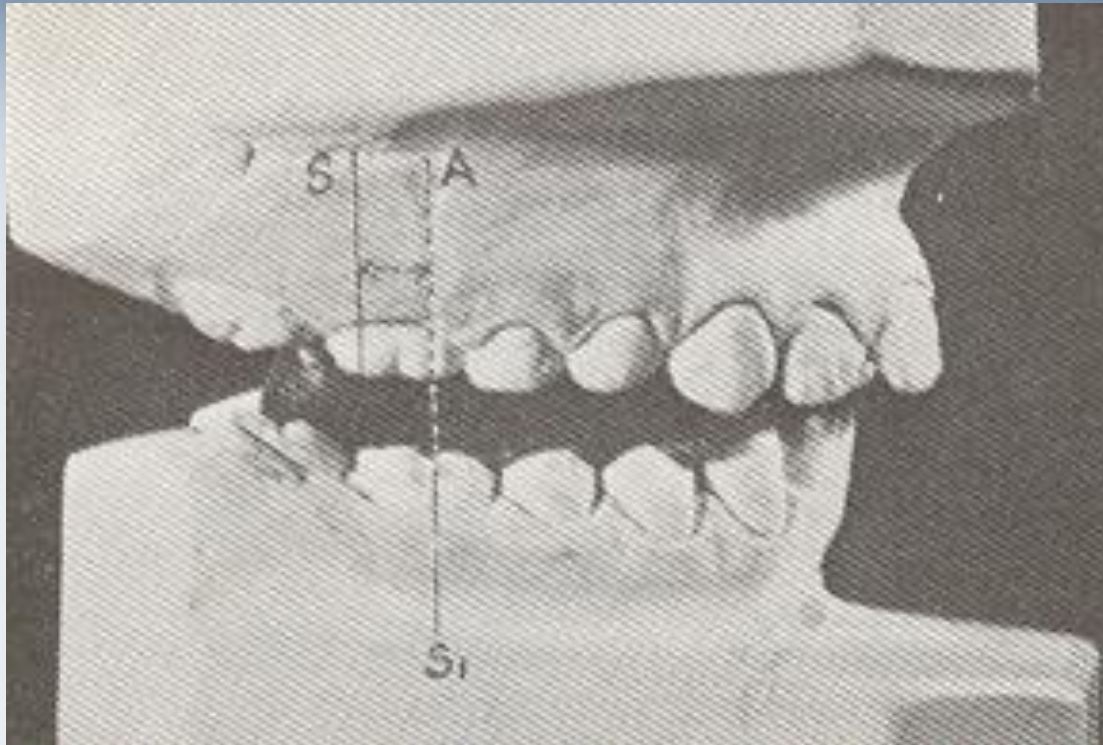
- *In most individuals the freeway space is 2-3mm in molar area & 4-5mm in incisor area.*
- *An opening of 4-5mm in molar area & 6-7mm in incisor area is adequate.*
- *This kind of activator is called as V-activator.*

Midline:-

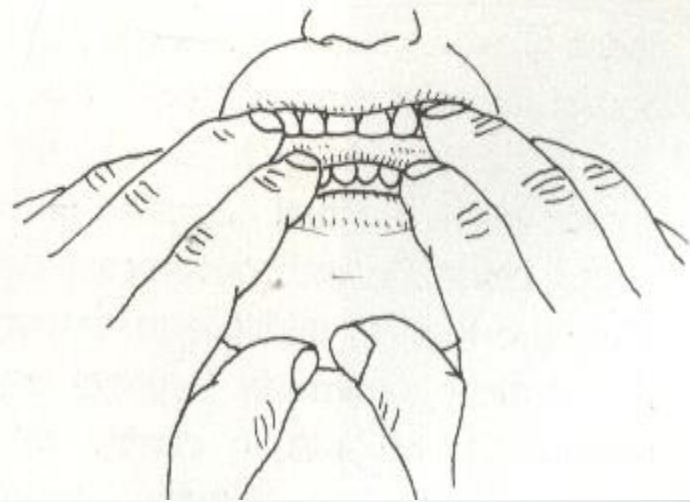
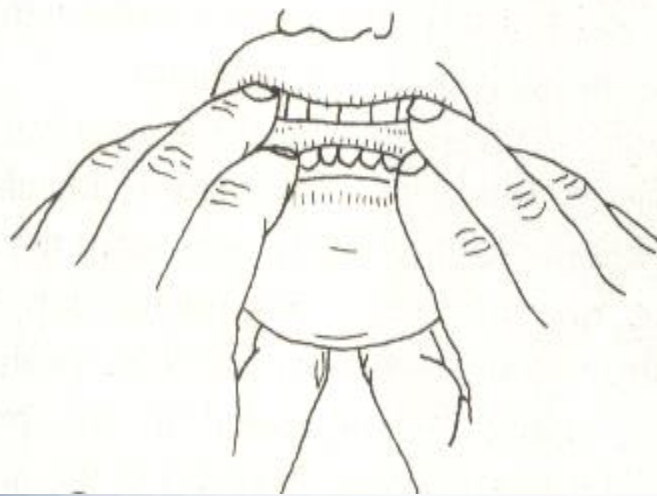
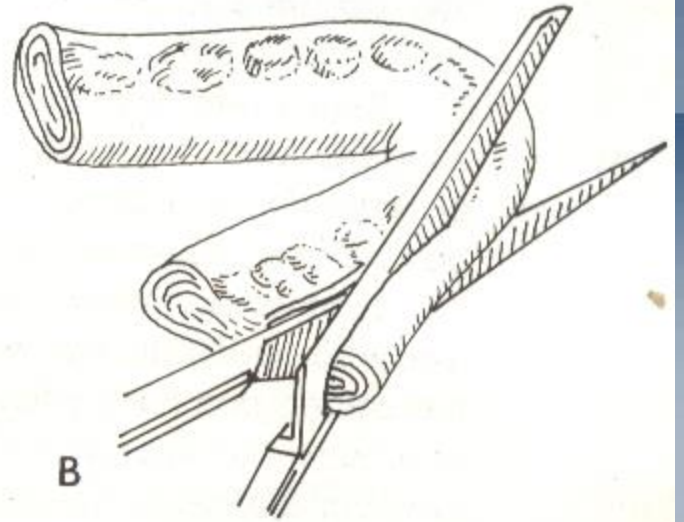
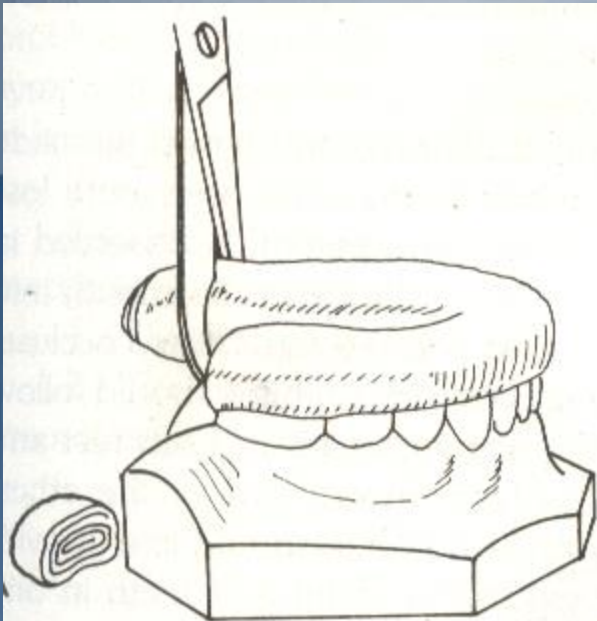
- *If midline deviation is due to skeletal asymmetry, it should be corrected during bite registration.*
- *If it is due to dental asymmetry, it should not be corrected while recording the bite.*

Clinical procedure:-

- *Educate the patient about the necessity & purpose of recording the bite with the help of study models.*
- *Reproduce the maximum forward movement of the mandible & correct occlusal clearance.*
- *Observe whether a functional lateral shift occurs & register the true mandibular midline with a pencil on the labial surface of the upper & lower incisors on the casts & in the patient's mouth.*
- *Determine the amount of mesial and vertical mandibular displacement necessary for the construction bite. It is helpful to mark the amount of mesial shift with a pencil on the buccal surfaces of the first molars.*

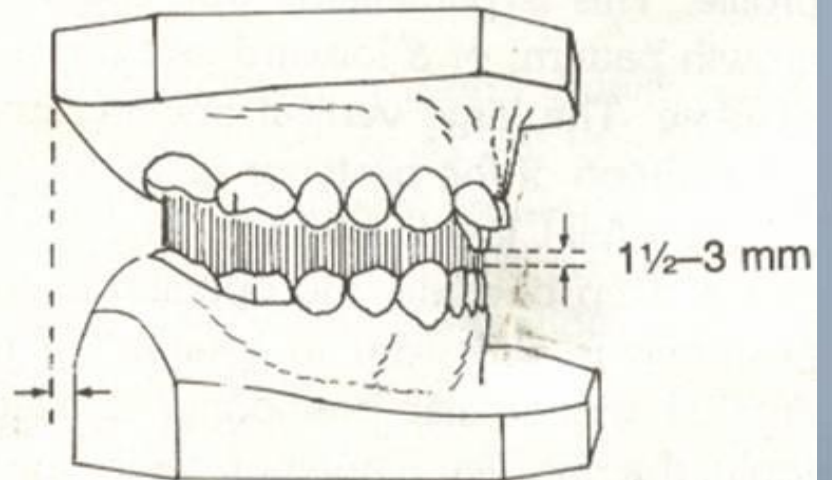
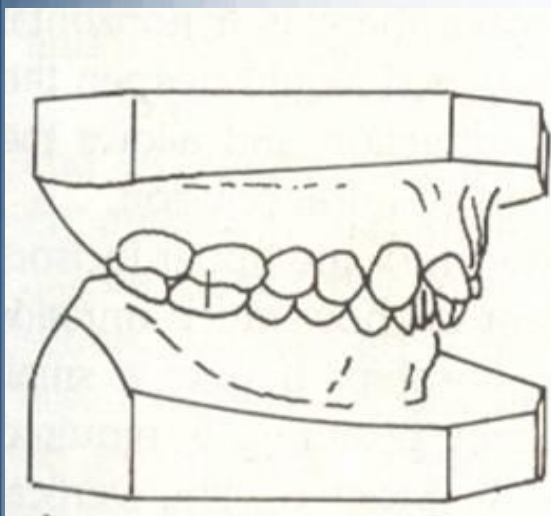
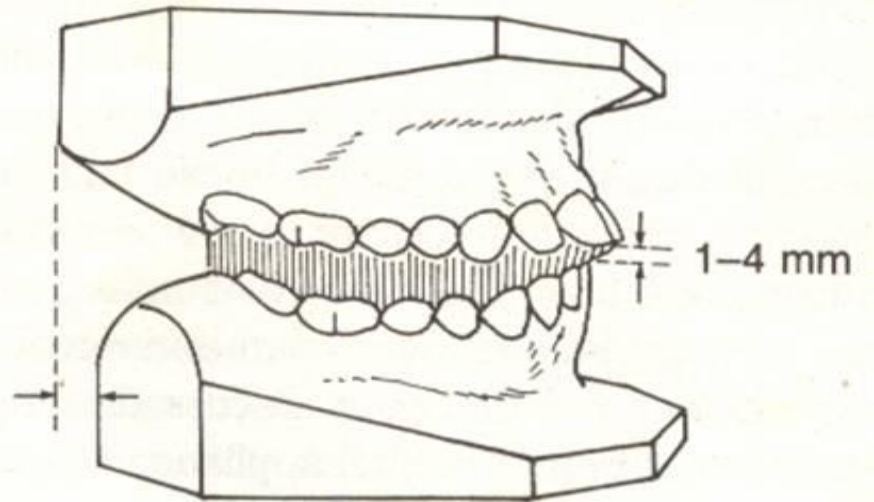
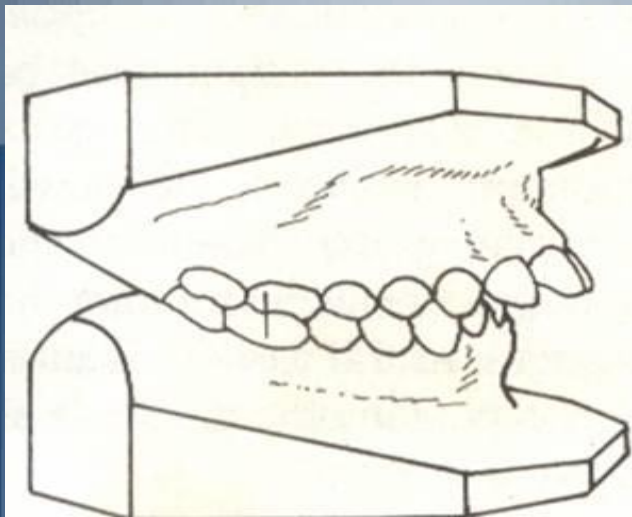


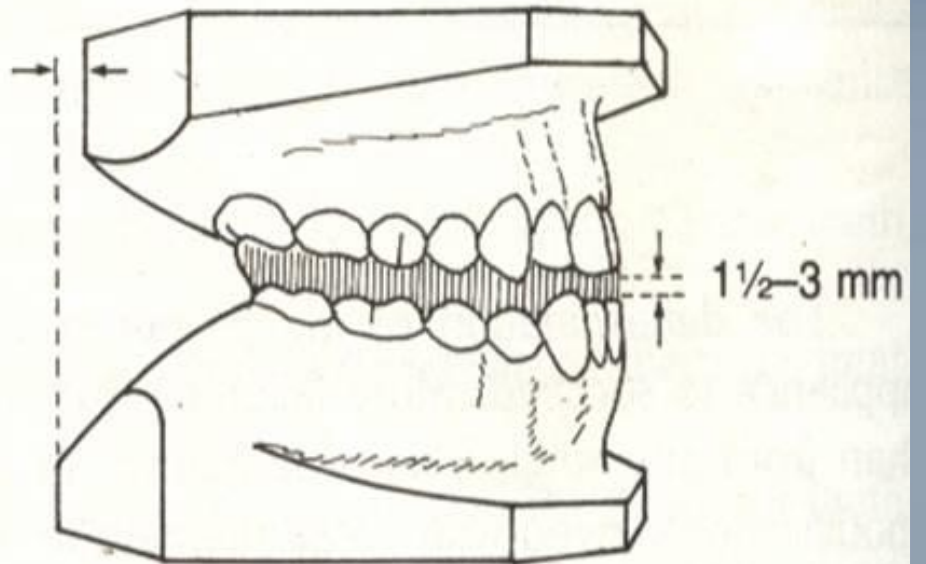
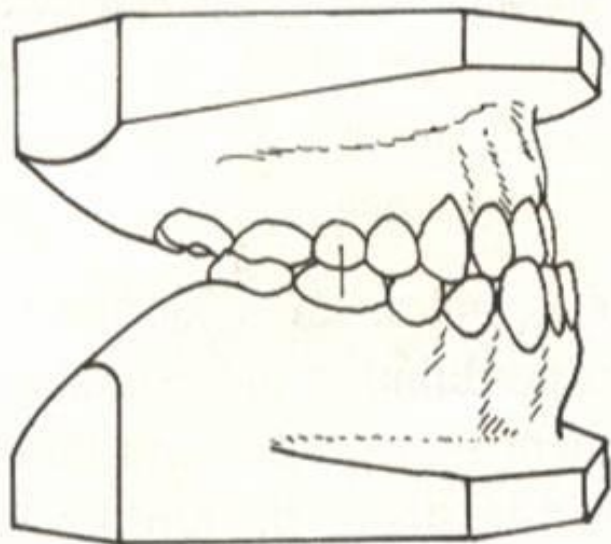
- *Show the patient on the casts and in the mirror in which direction the mandible should be moved. Practice the forward mandibular movement by gently guiding the mandible in the desired direction. Advise the patient to move the jaw slowly according to the verbal instructions and to stop movement immediately when asked to do so. Talk to the patient in a calm, reassuring manner.*
- *Soften a sheet of wax sheet and make a tight roll, approx 1cm in diameter. Shape the roll to conform to the lower dental cast, leaving the seam on the inside. Press the softened roll of wax on the lower arch so that only the buccal teeth are covered. In the front, the wax roll lies just lingual to the lower incisors. Make a groove on the wax to indicate the midline.*



- *Remove any excess wax that extends onto the retro molar tissue. The distal half of the last molar tooth should not be covered with wax.*
- *Transfer the wax to the patient's mouth, fitting it on the lower arch in the same manner that it was fitted on the plaster cast. Move the mandible forward as was previously practiced. If the registration fails, make a new wax roll and repeat.*
- *Remove the wax bite from the mouth and chill it. With a sharp knife, trim the excess buccal wax until the occlusal surfaces of the molars are visible. By carefully checking the plaster casts, also remove all wax that is contacting the soft tissues, the interproximal papillae, and the palate.*

- *Place the wax bite between the casts and check that the mandible is moved forward the desired amount in the three planes of space. If the construction bite is incorrect, replace it on the lower cast, soften its superior surface, and add a layer of warm wax. Repeat the procedure.*
- *Replace the hard wax bite in the patient's mouth and have the patient close the jaw slightly more firmly to assure the correct fit.*



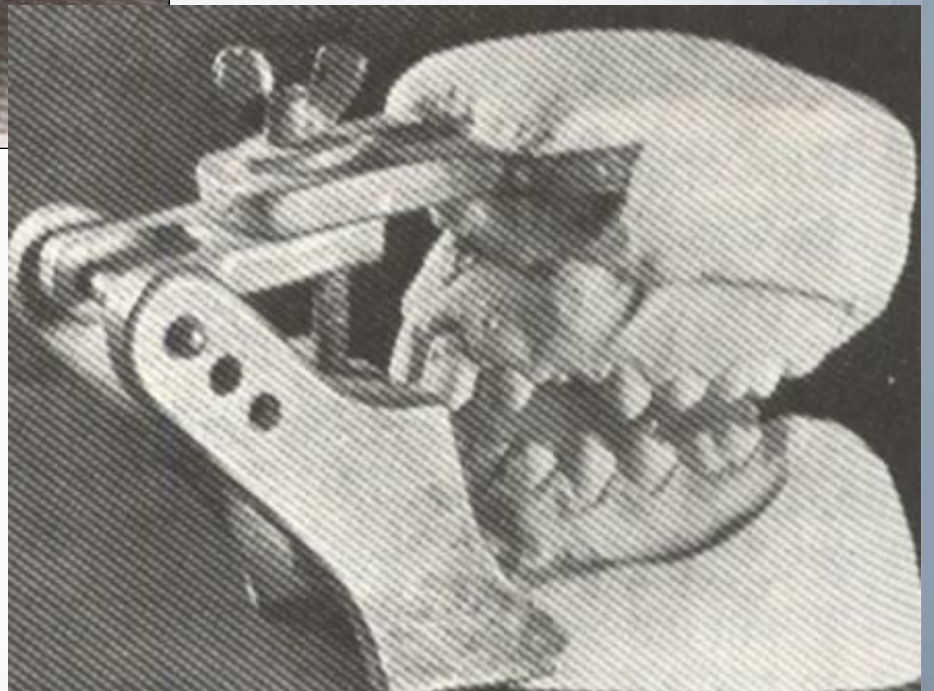
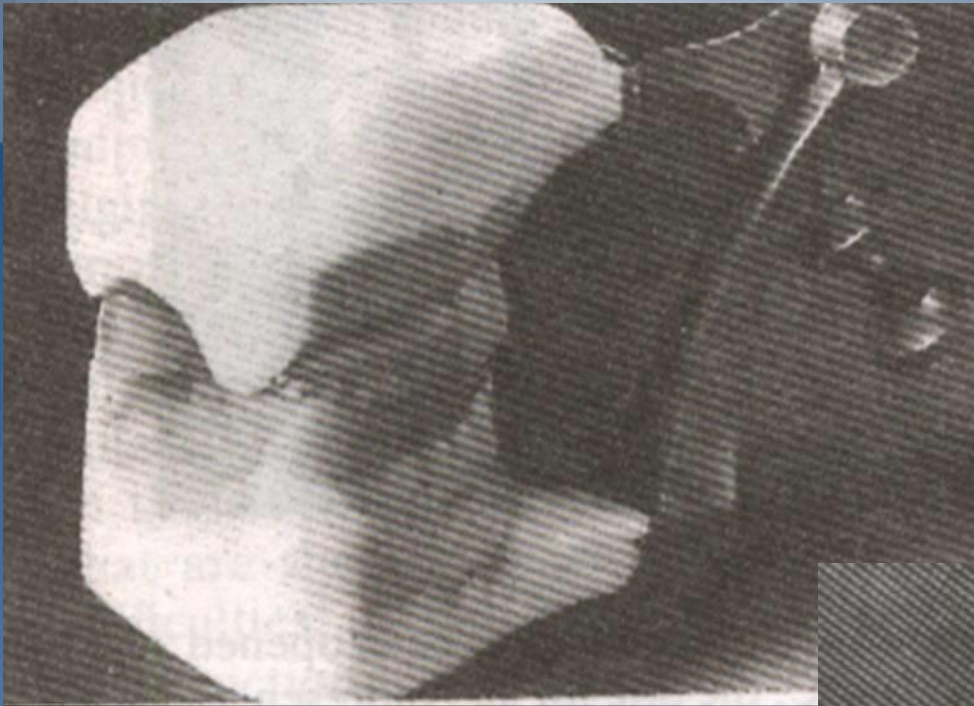


Laboratory procedure:-

- *Articulating the models.*
- *Construction of labial bow.*
- *Waxing the base plates.*
- *Inserting the labial bow.*
- *Joining the base plates.*
- *Flasking, packing & finishing.*

Articulating the models:-

- *Easiest way of articulating the models is to use a standard plane line articulator & fix the casts with the incisor teeth facing towards the hinge of the articulator.*
- *The lingual aspect of the models faces outwards which facilitates the waxing up of the baseplate.*
- *After proper articulation the vertical dimension is measured & registered on the bottom of the lower model before the models are disturbed from their positions in the wax bite for later reference.*

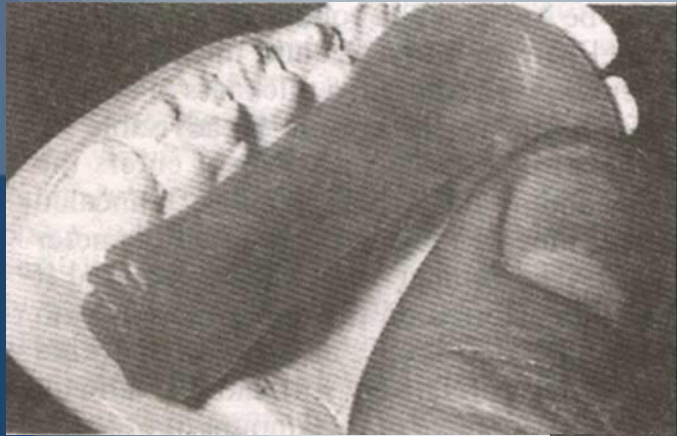


Construction of labial bow:-

- *Plane labial bow of 0.9mm wire is constructed from canine to canine.*
- *If more resilient bow is required, 0.8mm wire can be used which is reinforced with stainless steel tube at a point where it enters the baseplate.*
- *When bringing the ends of the bow into the palate, it is important to keep the wire clear of the teeth & to make the tags pass equidistantly between the upper & lower teeth.*

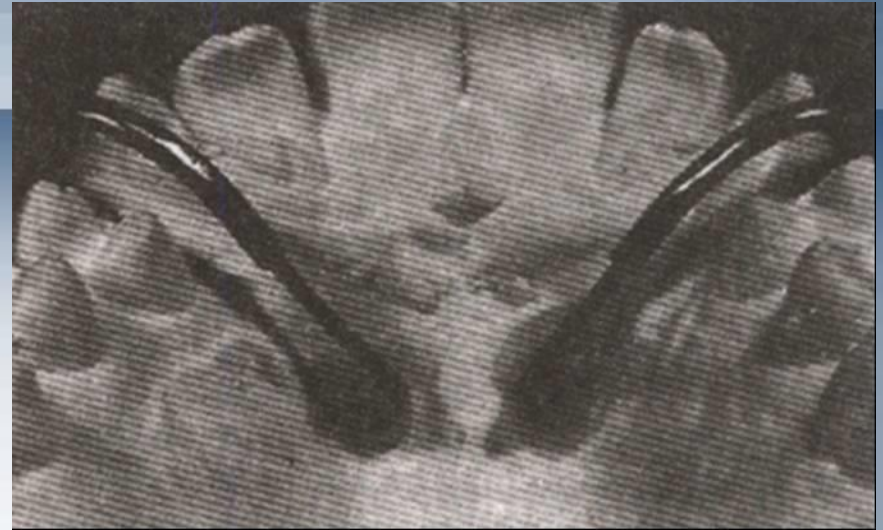
Waxing the base plates:-

- *Wet the model in warm water, but not to soak so long that free water remains lying on the surface when the model are left for a few moment in air.*
- *It is essential to see that the wax is soft enough to take a good impression of the embrasures between the lingual aspect of the teeth.*
- *In the lower model the soften wax should be taken over the incisal edges in a thin layer. Avoid thick layer which can later due to excessive pressure cause fracture.*
- *In the upper it should extend till the incisal edges.*
- *From the gingival margin the soften wax should be taken over the half of the occlusal surface of the posteriors in a very thin layer.*



Inserting the labial bow:-

- *The simplest method for placing the labial bow in the upper base plate is to soften the appropriate area of the base plate with a hot knife sufficiently to place the bow in its required position.*
- *The softened wax is cooled with an air stream & the bow fastened with pink wax flowed around the tags.*
- *Method of heating the tags of the bow & melting them into the baseplate is clumsy & liable to be inaccurate.*



Joining the base plates:-

- *After adapting baseplates on both models articulator will be closed & make sure that occluding surface of the two plates do no actually touch, but there is at least 2mm clearance between them for the required adaptation of the wax bite.*
- *Occlusal surfaces of the two baseplates & the wax bite should be heated slightly & all the three parts will be united correctly by closing the articulator.*
- *Vertical dimension between the upper & lower models must be checked using the registration marks & recorded dimension.*
- *Waxing-up is completed by smoothing the joint between the upper & lower parts which can be done with chip blower precisely.*
- *After waxing-up, the wax is then chilled in cold water & the wax pattern is carefully removed from the models later.*

Flasking, packing & finishing:-

- *Wax pattern is flaked upside down in deep part of the flask with the plaster brought to the posterior edge of the palate & the lower edge of the lingual flange of the lower baseplate.*
- *Fitting surface of the appliance should be in one half of the flask so that distortion of appliance during packing will be avoided.*
- *Second half is poured after applying separating medium to the lower half.*
- *When plaster sets dewaxing will be done & flask then packed with the acrylic.*
- *After processing & cooling, the appliance is deflaked, cleaned, trimmed & polished.*

Trimming of Activator-

■ *Trimming for sagittal control:*

- a) Class II correction*
- b) Protrusion of incisors*
- c) Retrusion of incisors*

Trimming for Vertical control:

- a) Intrusion of teeth*
- b) Extrusion of teeth*

Trimming for Vertical control:

- a) Jack screw*

Bionator

- Developed by “**Balters**” in 1950’s has much in common with the Andresen-activator.
- Bionator is less bulky, the anterior section of the palate is free of acrylic thus children are free to speak normally, can be worn day and night except at meals.
- For Balters, the essential factor is the tongue. He quoted “The equilibrium between tongue & cheeks, especially between the tongue & the lips in the height, breadth & depth in an oral space of maximum size & optimal limits, providing functional space for the tongue, is essential for the natural health of the dental arches. The tongue is essential factor for the development of dentition. It is the center of reflex activity in the oral cavity”.

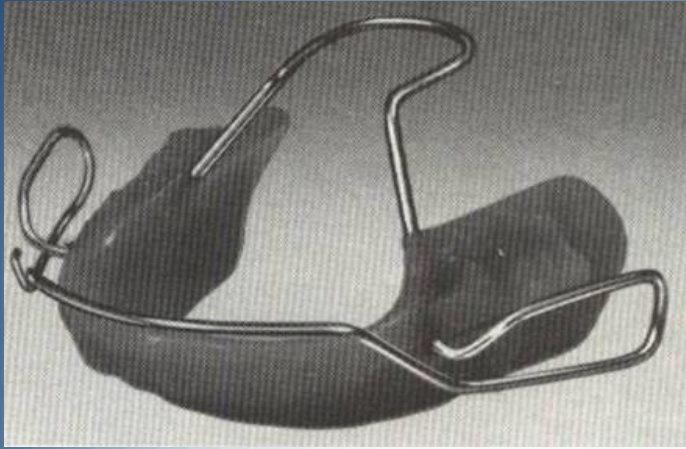
Indications:-

- *In correction of class II div 1 malocclusion with well aligned arches, proclined incisors and retruded mandible.*
- *In correction of class III malocclusion.*
- *Correcting open bite cases.*
- *Treating bruxism, periodontal disease and TMJ disorders.*
- *Treatment of deep overbite during mixed dentition or even later.*

Treatment objectives by Balters:-

- *To accomplish lip closure and bring the back of the tongue into contact with the soft palate.*
- *To enlarge the oral space and to train its function.*
- *To bring the incisors into edge to edge bite like what Beggs did.*
- *Elongation of the mandible which will enlarge the oral space and improve the tongue position.*
- *To achieve an improved relationship of the jaws, tongue and the dentition as well as the surrounding soft tissues.*

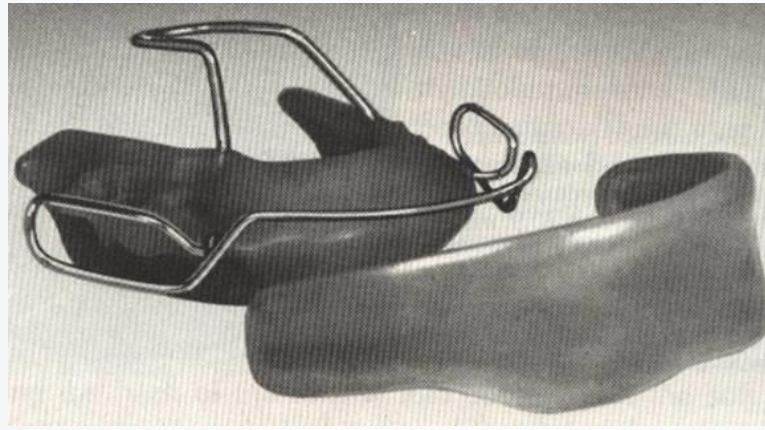
Types of the Bionator



Standard appliance



Class III appliance



Open bite appliance

Standard Appliance

- *It is used for the correction of class II div 1 malocclusion in order to correct the backward position of the tongue and its consequences.*
- *For the treatment of the narrow arches of class I malocclusion.*
- *It consist of acrylic part & wire elements.*
- *Acrylic part:- Relatively slender acrylic body fitted to the lingual aspects of the mandibular arch and part of the maxillary dental arch.*

Maxillary part:- It covers only the molars and premolars, anterior maxillary part from canine to canine remains open. The relative position of the joined upper and lower portions is determined by the construction bite (usually edge to edge bite).

- *Acrylic extends about 2mm below the mandibular gingival margin and about the same distance above the maxillary gingival margin.*
- *Depending on the overjet:-*
 - *If the over jet is increased then the acrylic extended to cover the lower incisors in the same way as the activator does.*
 - *No acrylic covering is necessary, because the incisors already will essentially meet in an edge to edge bite.*

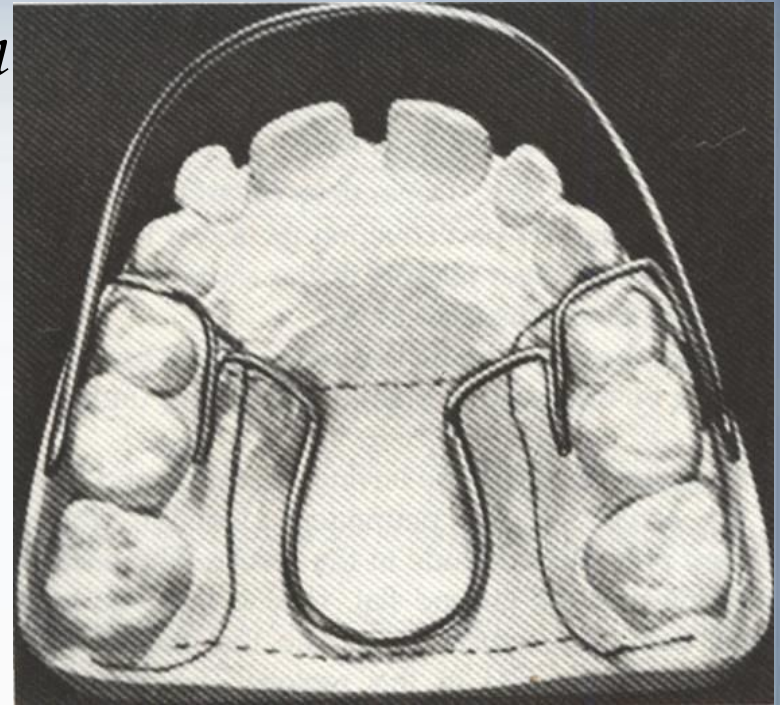
- *Appliance is stabilized in the mixed dentition by having the upper & lower deciduous molars occlude on the acrylic. Occlusal part of the acrylic block can be ground flat to permit transverse expansion of the arch.*
- *In the permanent dentition by having premolars occlude on the acrylic, no acrylic covers the first molars to permit further eruption & leveling of bite in this region.*
- *Acrylic will extend over half of the occlusal surface to stabilize the appliance.*

Choice of the teeth:-

Teeth Present	Stabilization
1 2 III IV V 6	IV and V, upper and lower
1 2 III — V 6	V, upper and lower with space and time of eruption permitting; then the alveolar ridge may also be used for stabilization
1 2 III — — 6	Upper and lower alveolar ridge
1 2 III 4 — 6	Upper 4 and alveolar ridge; mandibular alveolar ridge
1 2 3 4 5 6	Generally 4 and 5; different solutions may be necessary

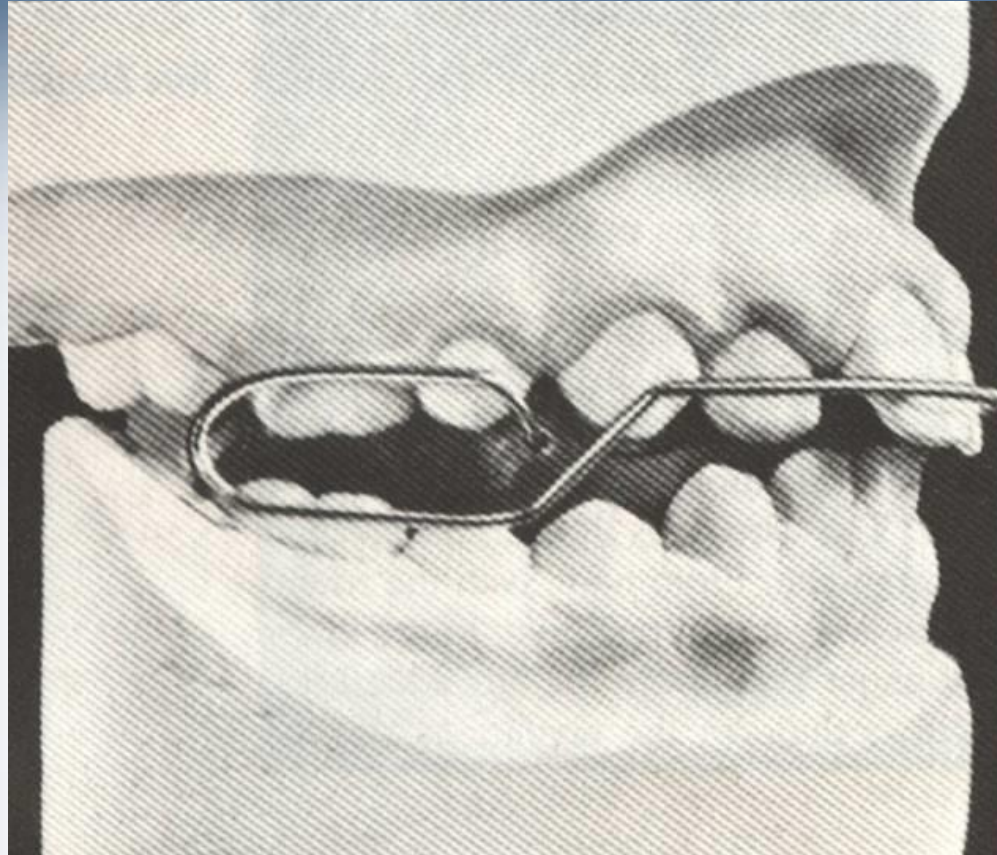
Palatal Arch:-

- Made from 1.25mm diameter hard stainless steel wire. The egg shaped palatal arch emerges from the upper margin of the acrylic approx opposite to the middle of the first premolar. Then it follows the contour of the palate about 1mm distance from the mucosa. The arch forms a wide curve that reaches a line joining the distal surface of the first molar and follows mirror image on the opposite side.



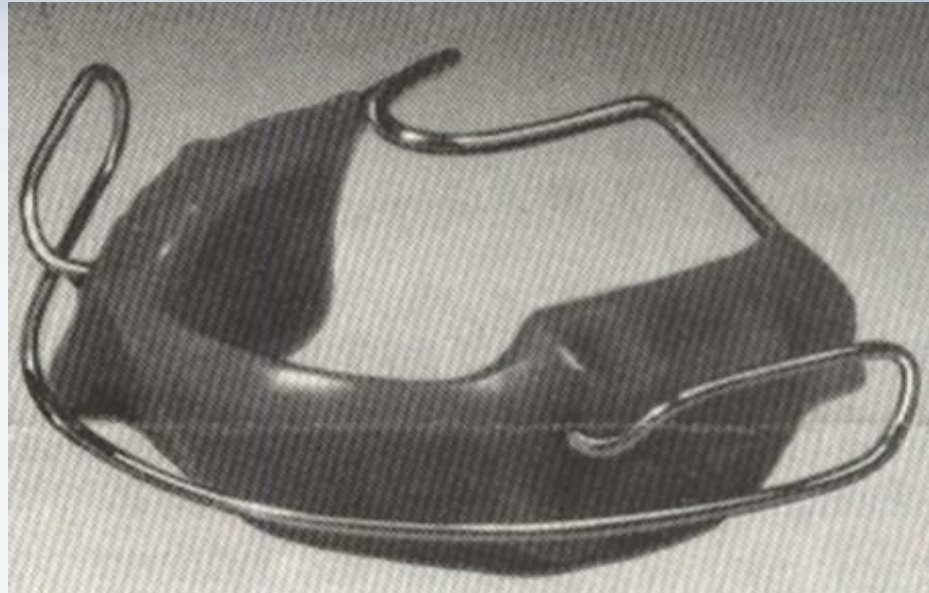
Vestibular Wire:-

- *Made up 0.9mm diameter wire. It emerges from the acrylic below the contact point between the upper canine and the 1st premolar. The vestibular wire rises vertically and is then bent down at right angle to go distally along the middle of the crown of the upper premolars. Just anterior to the mesial contact point of the 1st molar the wire is fashion in a round bend toward the lower dental arch. The wire, maintaining a constant level at height of the papillae, parallel to the upper portion anterior to the mandibular canine. At this point the wire is bent to reach the upper canine, nearly touches the incisal third of the incisors and from there in a mirror image of the side already fabricated, proceeds posteriorly to the acrylic on the opposite side.*



Class III Appliance

- *Meant for treatment of mandibular prognathism, to compensate for the forward position of the tongue.*
- *It consist of acrylic part & wire elements.*
- *Acrylic part:- Similar as that of the standard appliance. A mandibular part and 2 lateral maxillary parts extending from the 1st premolar to 1st premolar are joined together. Bite should be opened by about 2mm to allow the upper incisors to move labially past the lower incisors.*



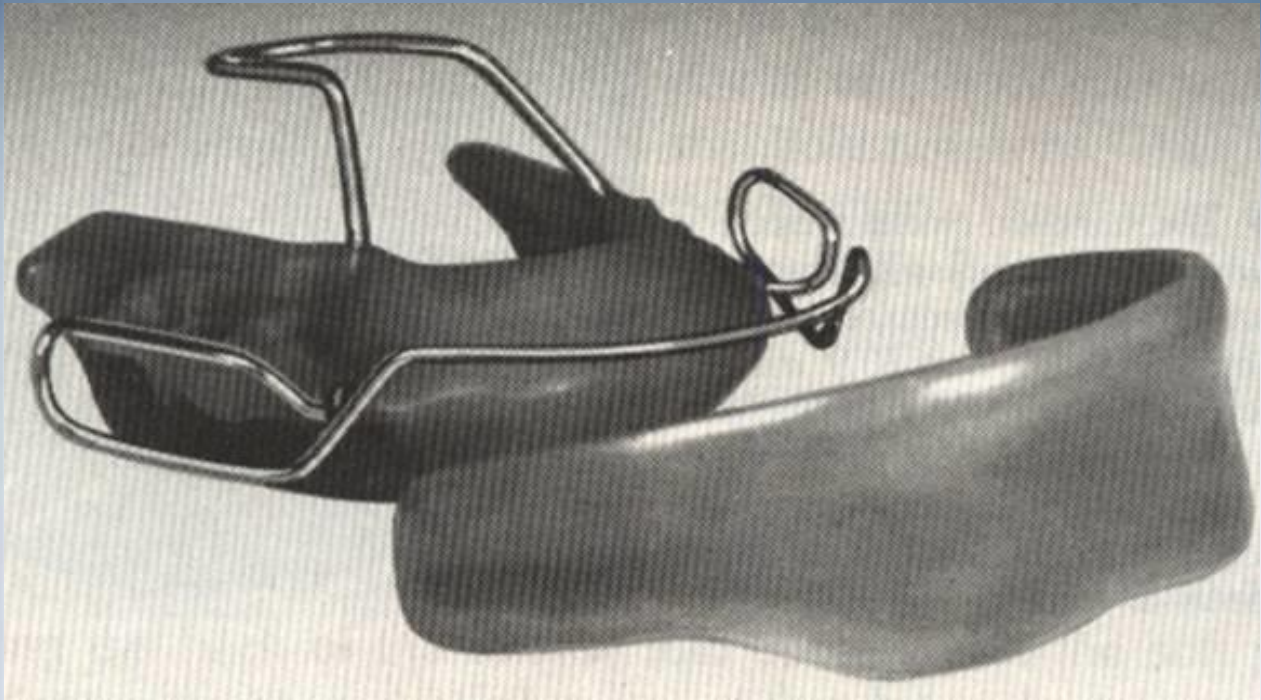
- *This space is covered towards the tongue by an extension of the mandibular portion of the plate from canine to canine.*
- *Upper incisal margin extend 2mm beyond the upper margin of acrylic & 1mm of the thickness of acrylic is removed from behind the mandibular incisors.*
- *Thus acrylic creates a barrier to prevent any forward movement of the tongue toward the vestibule. Its purpose is to teach the tongue by proprioceptive stimuli to remain in its retracted and proper functional space. Tongue thus touches the anterior part of palate and stimulates the forward growth component.*

Wire elements:-

- *Palatal arch*:- Made up of 1.2mm diameter. The curve of the arch faces anteriorly extending forward to a line connecting the middle of 1st premolars and then running parallel along the palatal vault posteriorly till the distal surface of the 1st molar at which point it enters the acrylic at a right angle bend.
- *Vestibular Wire*:- Made up of 0.9mm diameter. Wire placed in front of the lower incisors. It emerges below the contact point of the upper canine & 1st premolar. The buccinator bends are fabricated and then wire runs in a distal direction until it reaches a point just behind the 2nd premolar. Then a round bend is made and wire runs forward along the lower incisors.

Open bite appliance

- *It consist of acrylic part & wire elements.*
- *Acrylic part:- It covers anteriorly to prevent tongue inserting into the aperture. This is free from the teeth and alveolar bone so as not to interfere with the expected growth changes.*
- *Mandibular part is joined with the maxillary part by bite blocks in the posterior region. These bite blocks are made with indentation of the teeth so as to disallow the eruption and at the same time anteriors are free to erupt. This establishes the inter-occlusal clearance. Block must not be so thick as to prevent lip seal.*

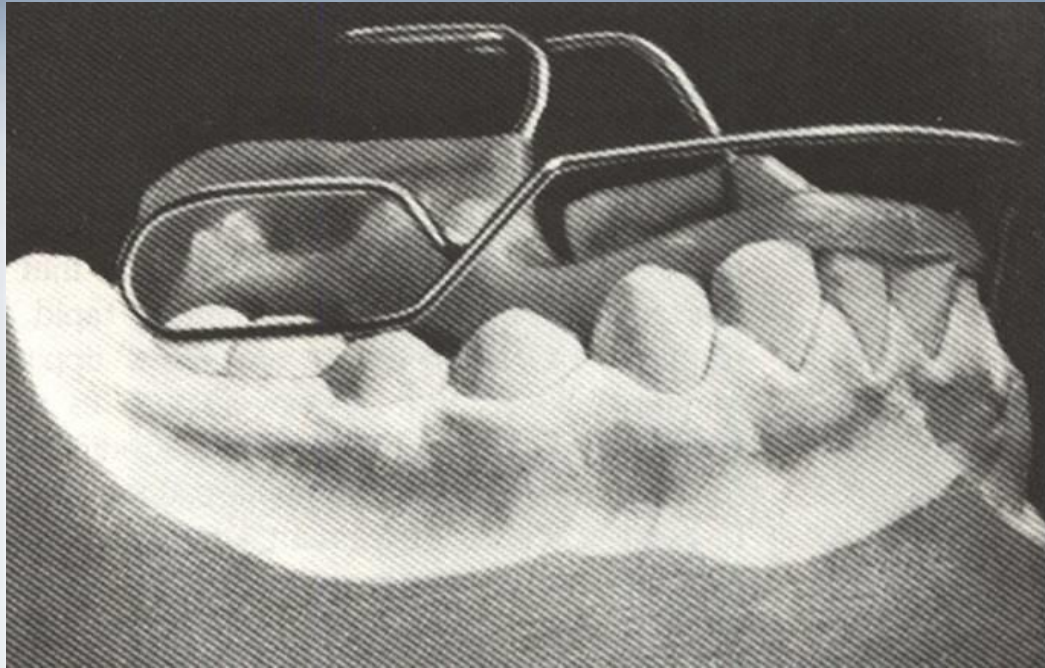


Wire elements:-

- *Palatal & vestibular wires are same as standard type.*
- *In cases where lower lip drawn into the open bite, lip shield may be added which is placed in the vestibule & anchored to the appliance by an acrylic or wire extension over & slightly inside the buccinator bends.*

Construction bite:-

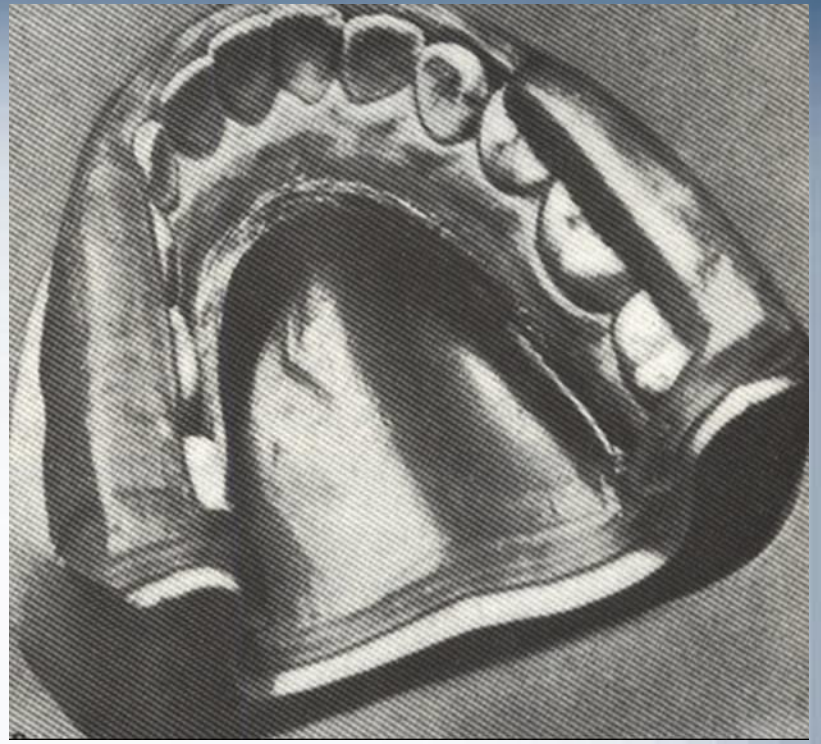
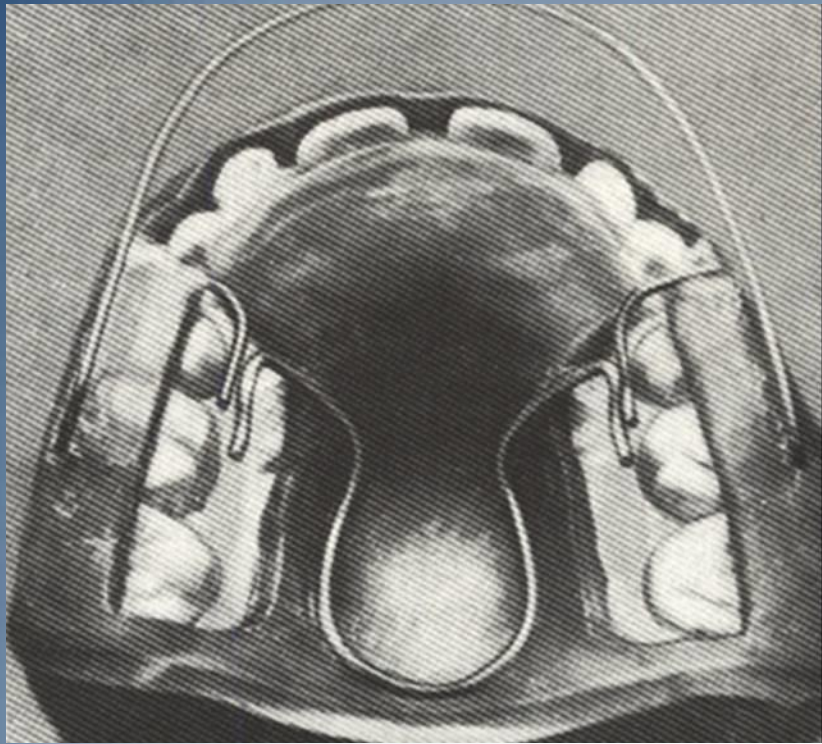
- *Objective is to establish the class I relation.*
- *Incisor teeth position is also important so possibilities are:-*
 - *Preferably edge to edge relationship of all the teeth or at least lateral incisors. This will provide maximum functional space for the tongue.*
 - *If the overjet is too large then step by step protraction procedure is followed. After the reduction of overjet a new appliance with edge to edge bite can be fabricated.*
 - *For class III cases it is registered in the most posterior position that is possible for the mandible.*



Fabrication

- *When cold-cure acrylic is used to fabricate the bionator the maxillary cast is covered with two or three sheets of baseplate wax.*
- *Half of the occlusal surfaces of the first permanent molar and the deciduous molars is uncovered.*
- *In addition, the wax is cut away from the gingival portion, to a distance of approximately 3mm beyond the gingival margin.*
- *The incisal edges are also uncovered, since they will contact the lower incisors when the construction bite is set up in the articulator.*
- *Wax is also applied to the mandibular cast, as in maxillary, & is cut away selectively for application of the cold-cure acrylic.*

- *The occlusal surfaces of all posterior teeth are exposed to the central fissures, incisal edges are also free. As in the maxillary portion, the lower margin of the acrylic will be 3mm below the gingival margin. After both casts have been covered with wax, they are mounted in the articulator. The softened and slightly lubricated wax portions are pressed together to make sure that they are in the proper construction bite relationship.*
- *The casts are then separated again, & the wire elements are fixed in the maxillary wax covering. The wax portions of upper & lower parts are then joined, & the acrylic is added to the parts in which the wax has been cut away.*



- *During the setting process, plaster casts are carefully withdrawn from the wax portion to make sure that there is no acrylic left in the undercuts, which would impede the insertion and removal of the appliance. Acrylic cover on the occlusal surfaces is needed in TMJ cases, in which forward posturing is required along with appliance stabilization.*



Frankel Appliance

- *Developed by “Dr Rolf Frankel”, orthodontist from small town Zwickau, east Germany.*
- *Also called as Vestibular appliance, Oral gymnastic appliance, Function corrector or Function regulator.*
- *Has 2 main treatment effects:-*
 - *Serves as a template against which the craniofacial muscles function. Provides an artificial balancing of the environment thereby promoting more normal pattern of muscle activity.*
 - *Removes the muscle forces in the labial & buccal areas that restrict skeletal growth.*

Frankel Philosophy :-

- 1. Vestibular arena of operation*
- 2. Sagittal correction via tooth borne maxillary anchorage.*
- 3. Differential eruption guidance.*
- 4. Minimal maxillary basal effect*
- 5. Periosteal pull by buccal shields and lip pads*

Types of the FR :-

- FR1 :- Used for treatment of class I malocclusion & class II div1 Malocclusion.

It is further divided into:-

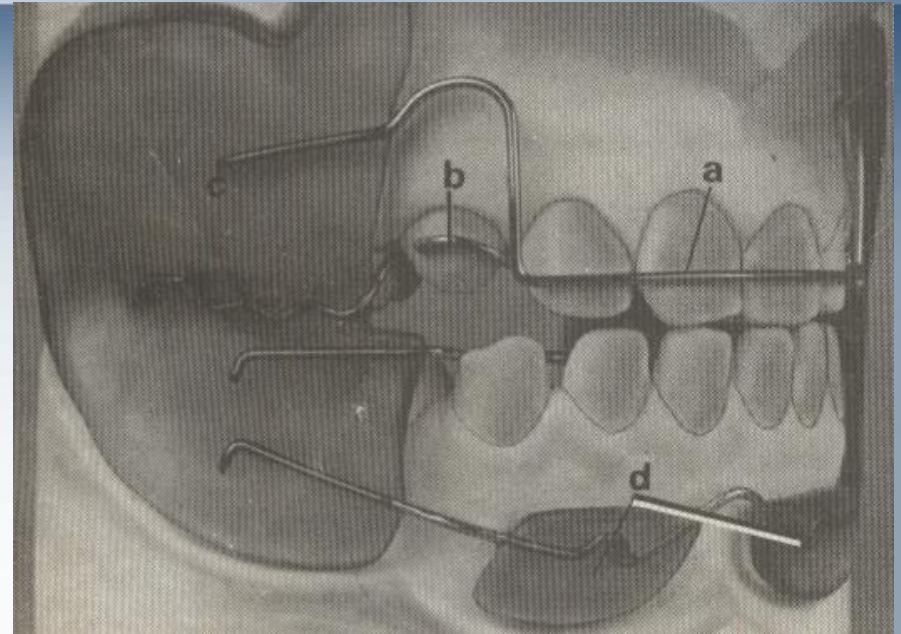
- FR1a :- Used for treatment of class 1 malocclusion with minor to moderate deep bite and crowding.
- FR1b :- Used for treatment of class II div1 malocclusion where overjet exceeds 5mm.
- FR1c :- Used for treatment of class II div 1 malocclusion where overjet is more than 7mm.

- FR2 :- Used for treatment of class II div 1 and div 2 malocclusion.
- FR3 :- Used for treatment of class III malocclusion.
- FR4 :- Used for treatment of open bite & bimaxillary protrusion.
- FR5 :- They are the functional regulators that incorporates head gear.

Function Regulator Ia

■ It consists of :-

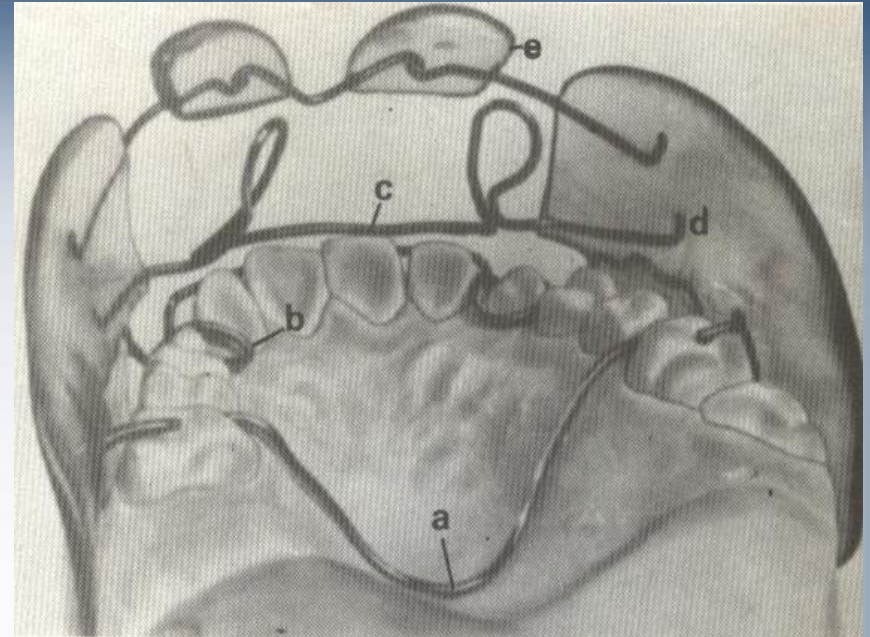
- Labial bow.
- Palatal bow.
- Lingual bow.
- Canine loop.
- Vestibular shields.
- Lip pads.



- Labial Bow:- Formed from 0.9mm wire & is anchored in the buccal shields. Runs in the middle 3rd of the labial surface of maxillary incisors, turns gingivally at right angles at the distal margin of the lateral incisors. Should be bent in an ideal contour & not in the contour of malpositioned teeth.

Palatal Bow:-

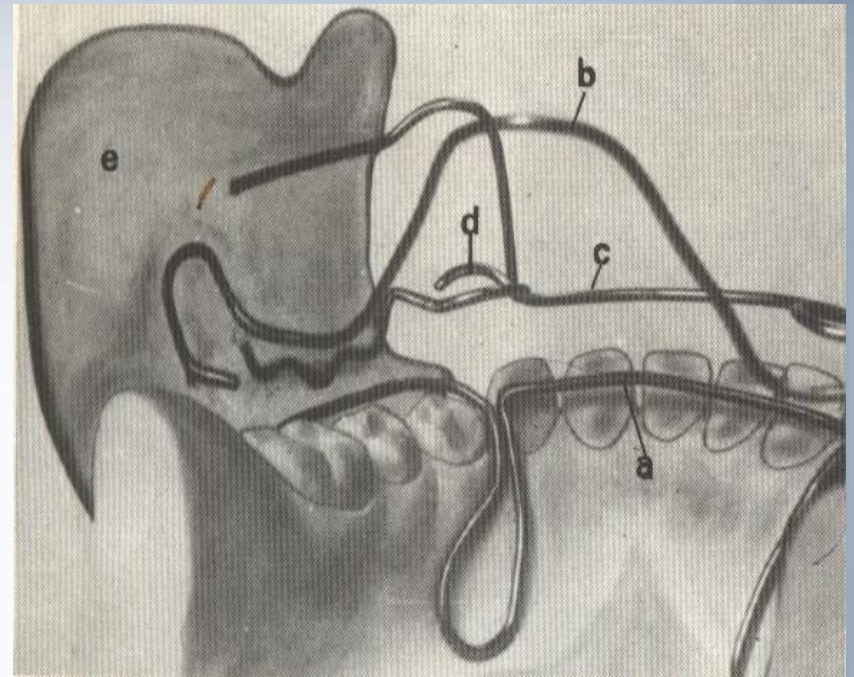
- Formed from 1.0mm wire. Have an omega loop bent in the middle of the palate. Lateral extensions crosses the occlusal surface in the embrasure mesial to the first permanent molar & enters the buccal shield.



Recurved ends terminate as occlusal rests on the occlusal surface of the first permanent molars between the mesiobuccal & distobuccal cusps. In the mixed dentition the rests can be placed on the second primary molars so that the eruption of the permanent molars will not be impeded.

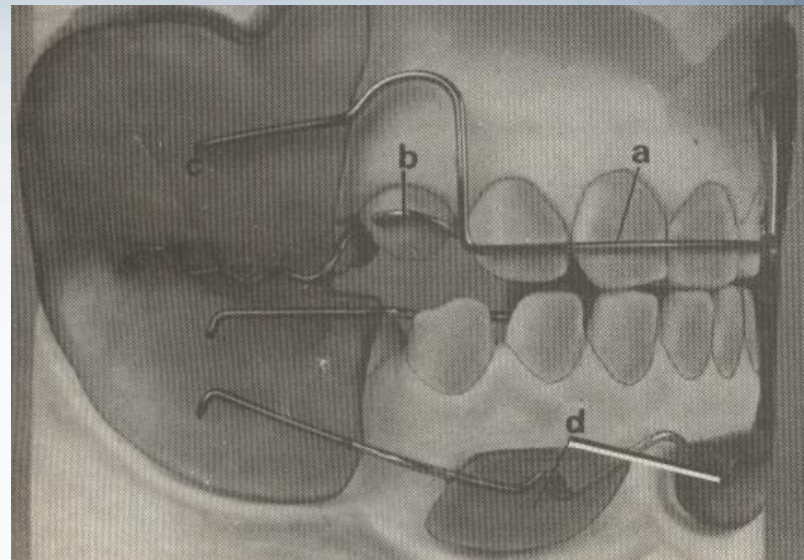
Lingual Bow:-

- FR 1a has a lingual wire bow, instead of an acrylic pad like in FR 1b, to guide or posture the mandible forward. It does not normally contact the teeth, except in cases in which proclination of lower incisors is required.



Canine Loops:-

- Formed from 0.9mm wire. Also called as canine guards. To allow for a better seating of the canine loop and appliance itself, the mesial surface of the first primary molar is reduced to accept the wire. Loop is anchored in the buccal shield at the level of the occlusal plane & must be positioned so that the canine and first premolar can erupt unhindered.

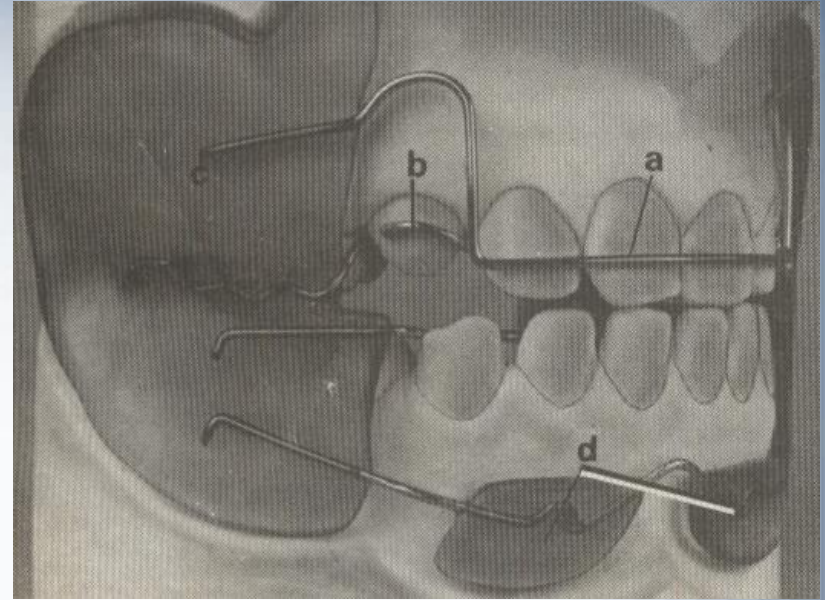


Vestibular Shield:-

- *Also called as buccal shield. Approximate the buccal surface of molars & premolars, is carried deeply into the vestibular sulcus as tissue attachments & comfort of patient will allow. It stands away from the dentition & the basal alveolar bone in the maxillary arch to relieve the pressure from the contiguous musculature, allowing unrestricted alveodental development. It provides constant exercise which will stimulate periosteal pull with an intermittently outward force.*

Lip Pads:-

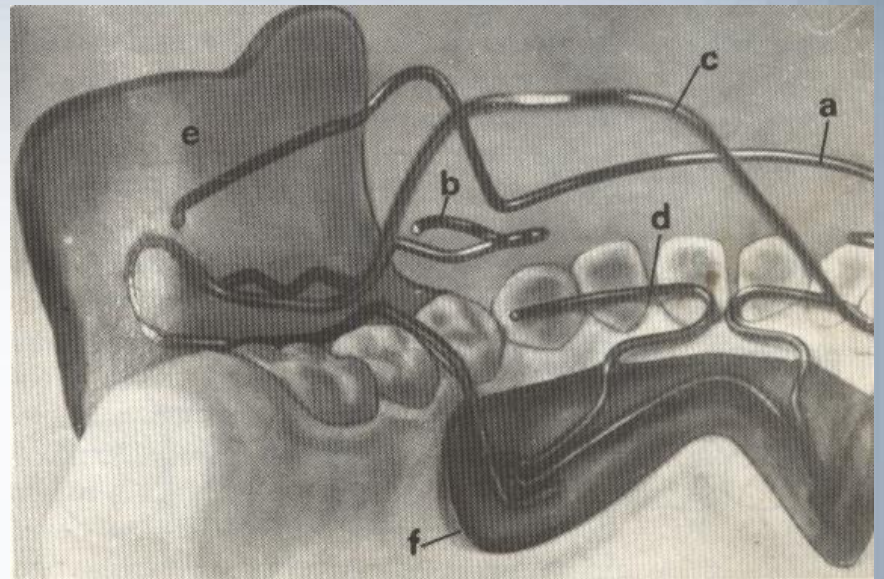
- Also called as Pelots. Placed deep in the vestibule of lower central & lateral incisors. The upper margin of the lip pads should be at least 5mm from the gingival margin.
- Lower labial wire:- Made 0.9mm wire, offer support for the lip pads. Should be at least 7mm below the gingival margin. Central wire is inverted V-shaped to accommodate the lower labial frenum.



Function Regulator Ib

- *It consists of lingual acrylic pad instead of lingual wire loops in contrast to FR1a.*
- *Lingual acrylic pad:- It is anchored in the buccal shields & the cross-over occlusal wires does not contact the upper or lower deciduous molars.*
- *Lower lingual support wire made up of 1.25mm stainless steel wire. It follows the contours of the apical base at approximate 1-2mm from the mucosa & 3-4mm below the lingual gingival margin of the incisors.*

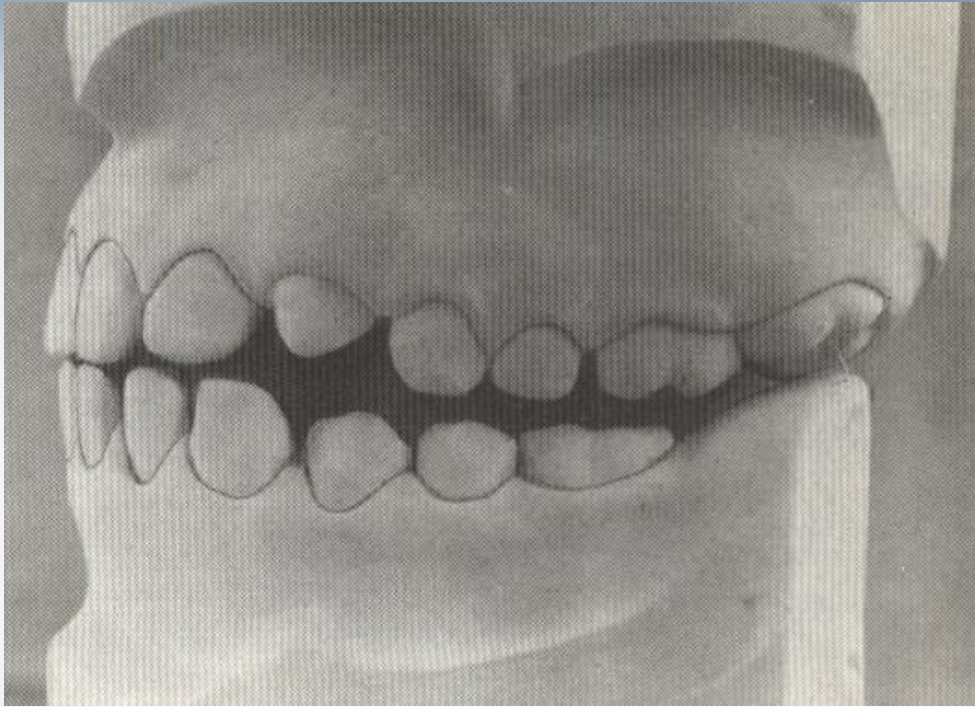
- Among the wire components the lower lingual springs are added. Made up of 0.8mm wire. These recurved springs are contoured to the lingual surface of the lower incisors, right above the cingulum with free ends about 3mm below the incisal margin.



Construction Bite:-

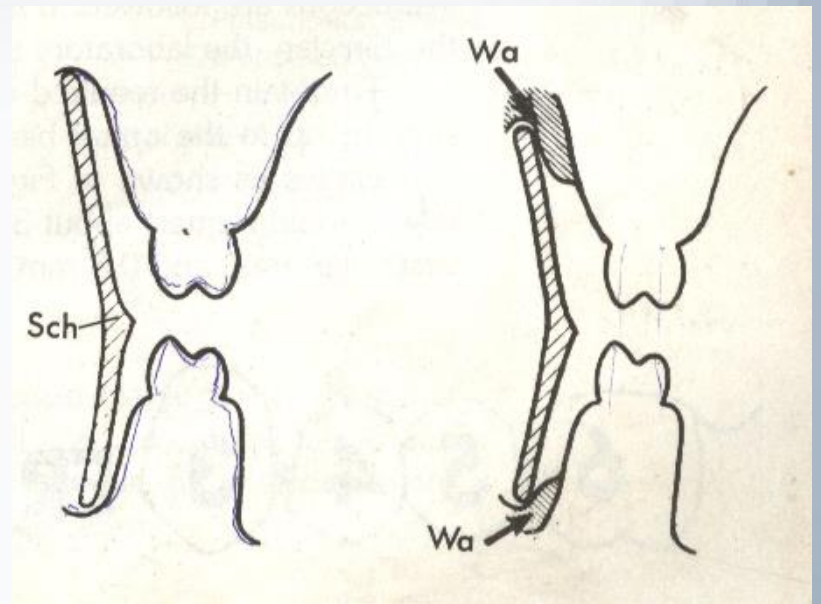
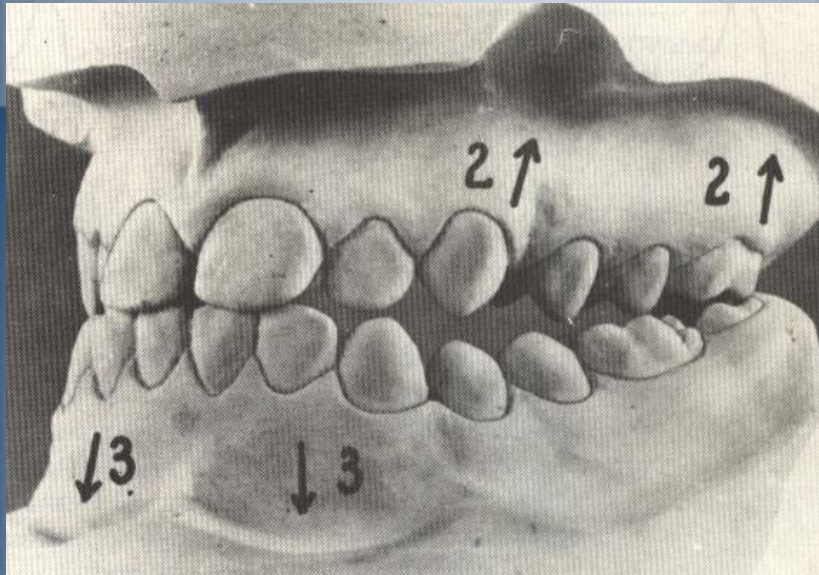
- *A thin yellow or red wax wafer is prepared in the form of horse-shoe shape & softened by keeping in warm water for few seconds.*
- *For minor sagittal problems of 2-4mm, construction bite is taken in an end to end incisal relationships making sure there is no obvious strain on facial muscles.*
- *While taking construction bite care is taken that midline should coincide.*

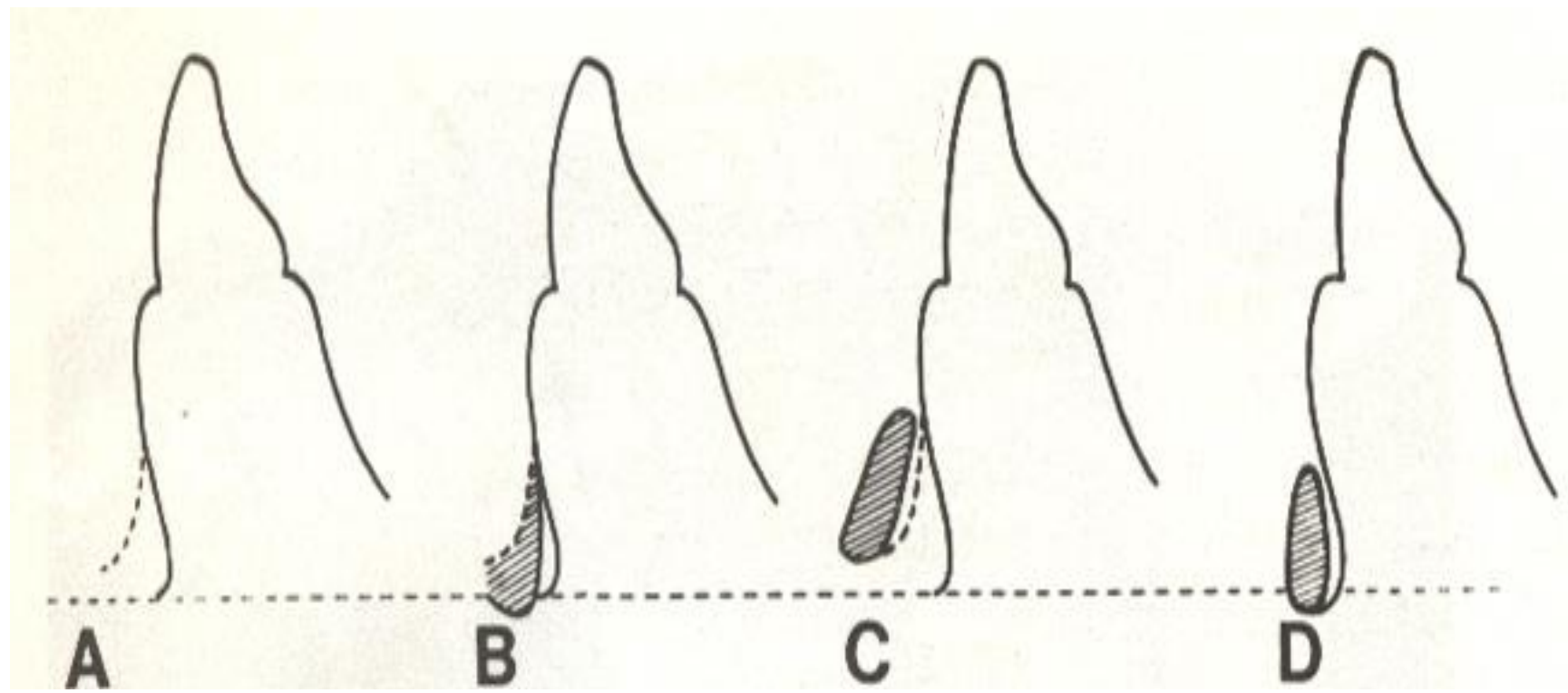
- *According to Frankel, mandible should not be moved farther than 2.5-3mm & vertical opening of about 2.5-3mm in buccal segments to allow the cross-over wires to pass through.*
- *The greater the horizontal movement, the less is the vertical opening.*
- *According to some clinicians like Petrovic who has also did a research on this found that correcting the sagittal discrepancies in two to three stages is more effective.*



Model Trimming:-

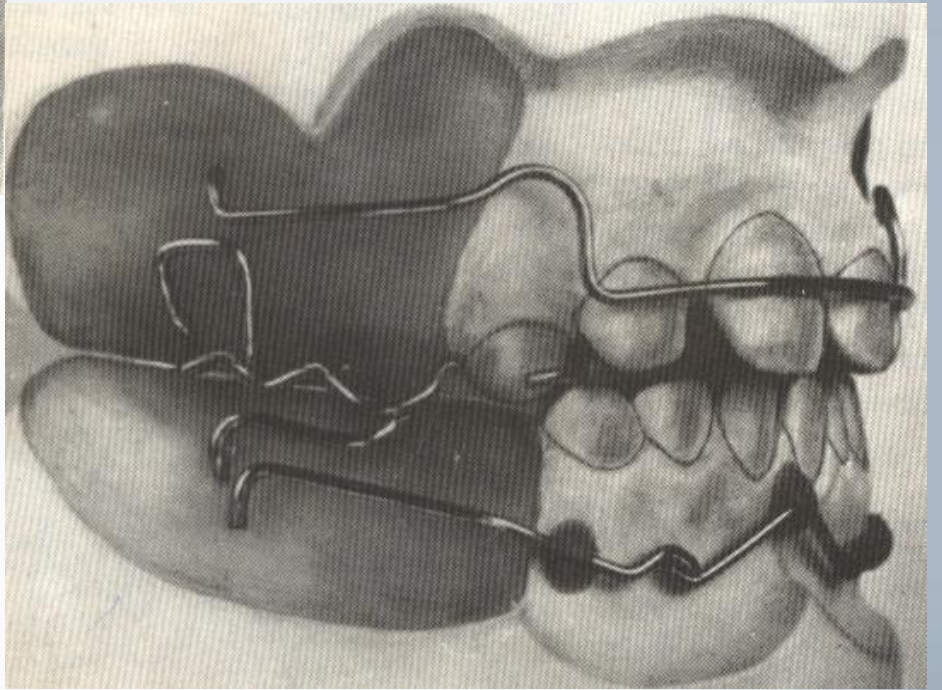
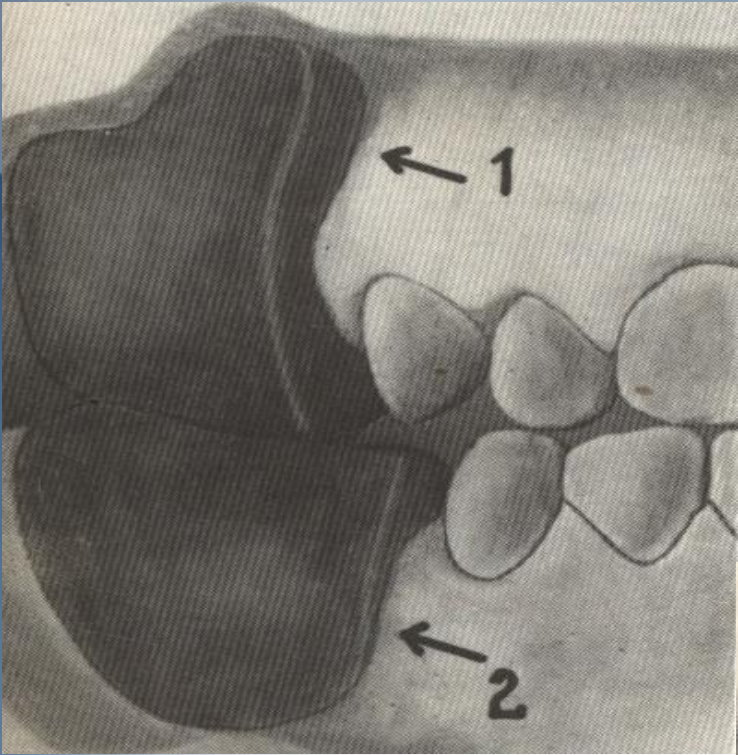
- *Another important step in Frankel appliance construction. The casts are carved or trimmed in the buccal shield or lip pads area to increase the depth of the sulcus.*
- *It is done in order to produce the tissue tension necessary to stimulate appositional bone development in the basal area.*
- *Since the impression taking procedure may distort the tissue & limit the depth of sulcus, it should be carved back 5mm from the greatest curvature of the alveolar base with a pear shaped carbide bur & wax knife.*
- *Frankel has recommended that lower relief be at least 12mm below the gingival margin, so that the lower labial wire will lie 7mm below the incisor gingival margin.*
- *In maxillary models the sulcus depth must be at least 10-12mm above the gingival margin of the posterior teeth.*





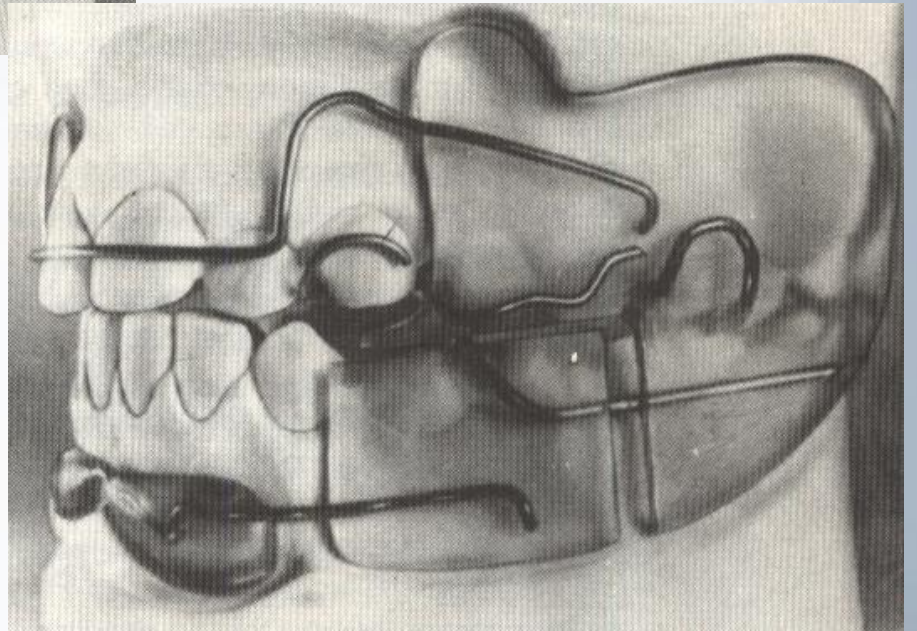
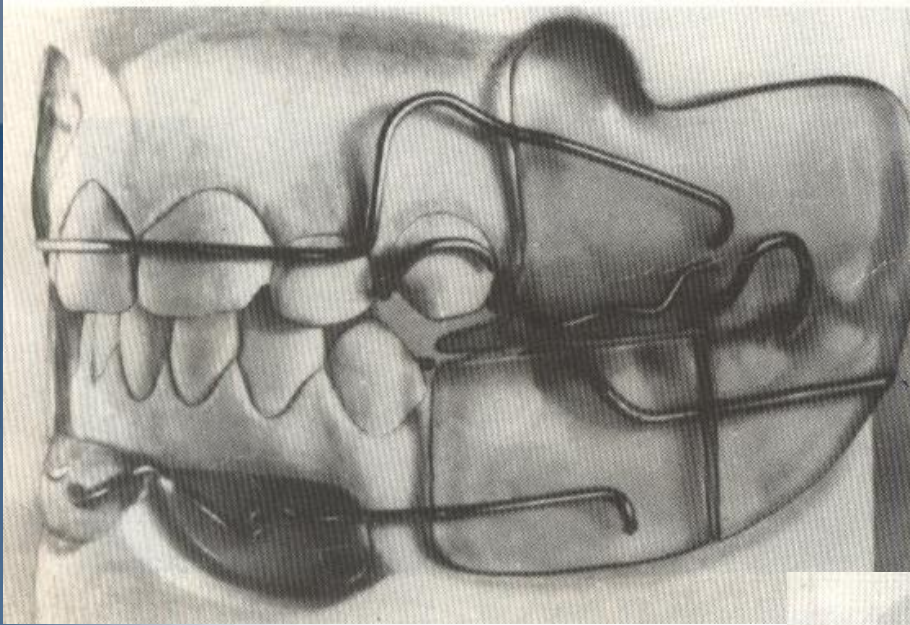
Wax relief :-

- *Outline the lip pads & buccal shields with pencil on the work models.*
- *Thickness of relief is determined individually by the amount of desired expansion needed.*
- *Relief should be approx 3mm in the tooth area, about 2.5mm in the maxillary vestibular area & 0.5mm in the mandibular region.*
- *Waxing-up is done separately on the upper & lower cast, & then joined at the occlusal plane.*
- *A minimum of 2.5mm of interocclusal space must be present for the cross-over wires.*

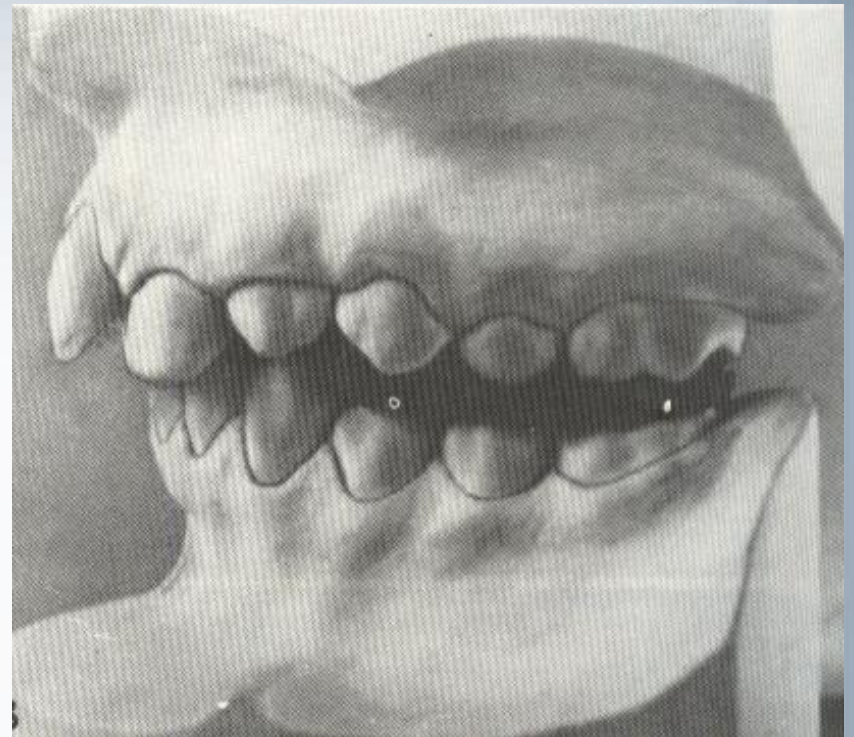
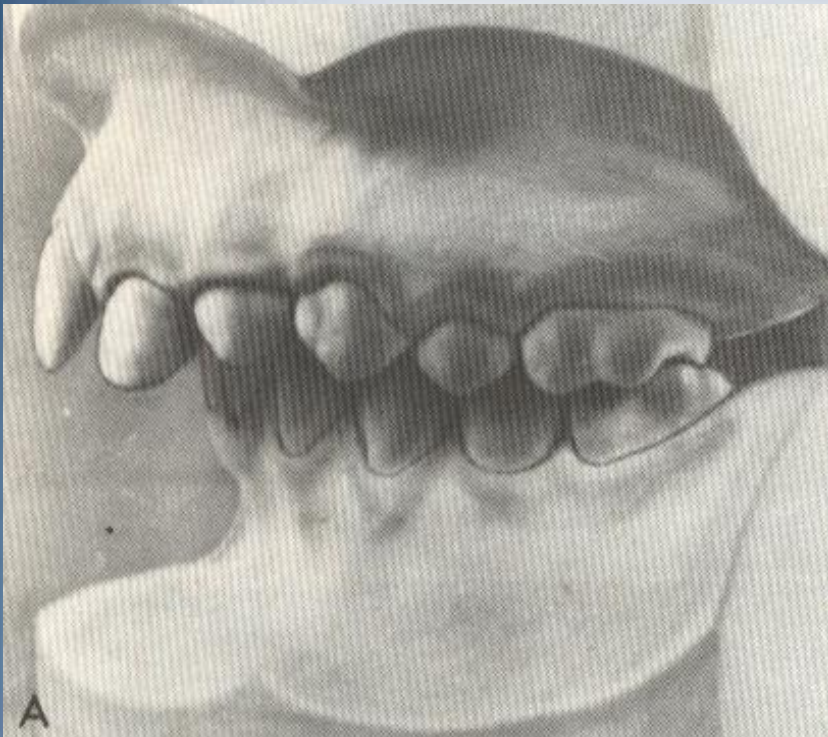


Function Regulator Ic

- *The buccal shields are split horizontally & vertically into parts .The antero-inferior portion contain wires for the lingual acrylic pressure pad or shield & for the lower lip pads. This permits the forward movement of the anterior section of the appliance.*
- *Thus, it is used when multiple advancement is needed.*



Construction Bite:-



Function Regulator II

Acrylic parts:-

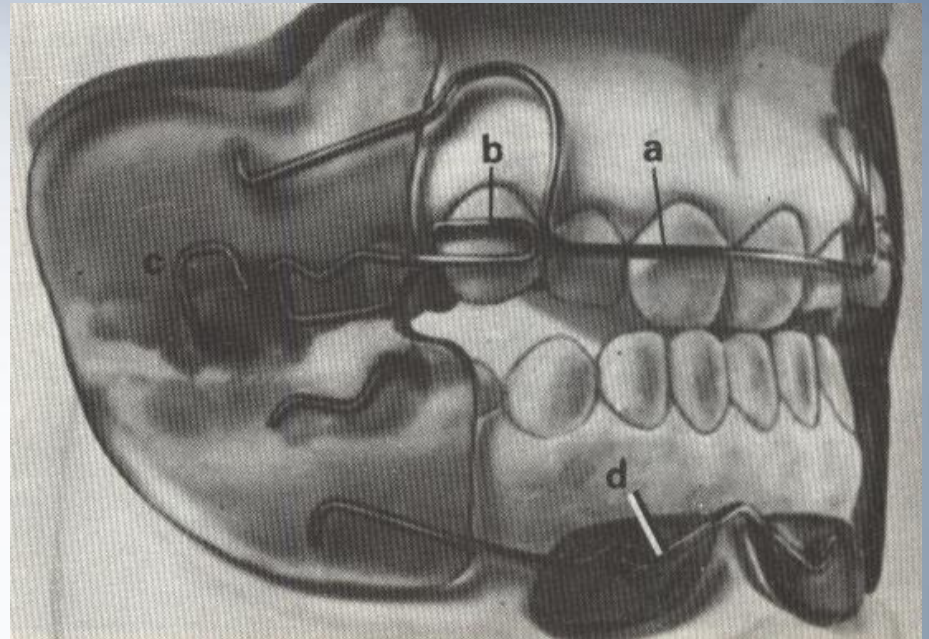
- *Buccal shields*
- *Lip pads*
- *Lower lingual pads*

Wire elements:-

- *Palatal bow*
- *Labial bow*
- *Canine loops*
- *Upper lingual wire*
- *Support wire for lip pads.*
- *Lower lingual springs.*

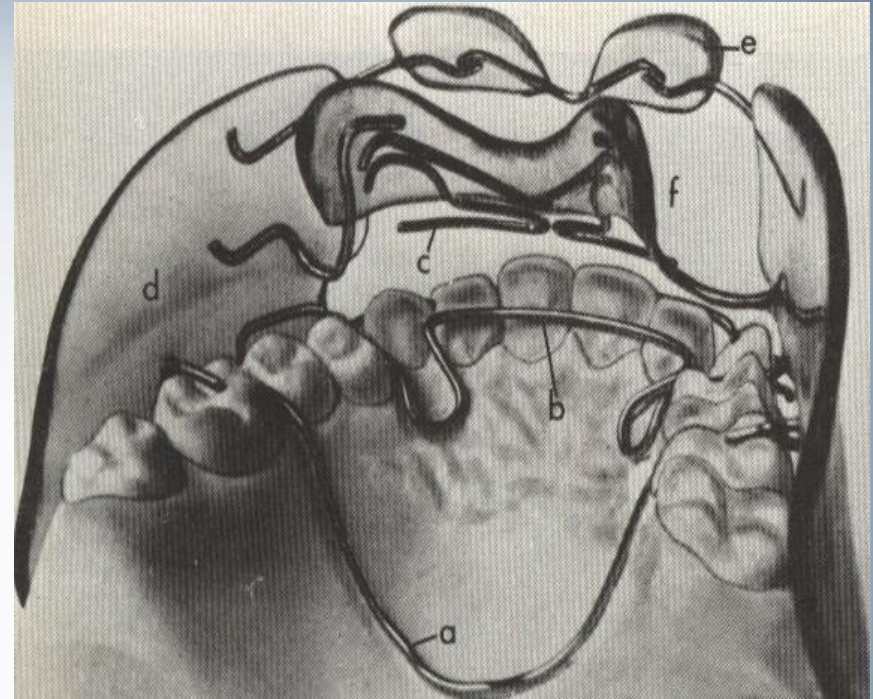
Canine Loops:-

- *Made of 0.8mm wire.*
These act as an extension of buccal shields in canine area staying 2-3mm away from deciduous canine to eliminates the restrictive muscle function in these area and allow the transverse development in the area.



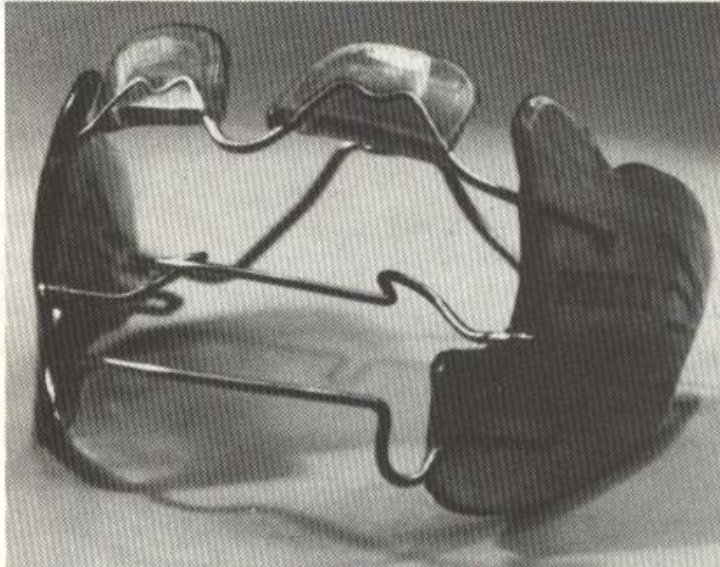
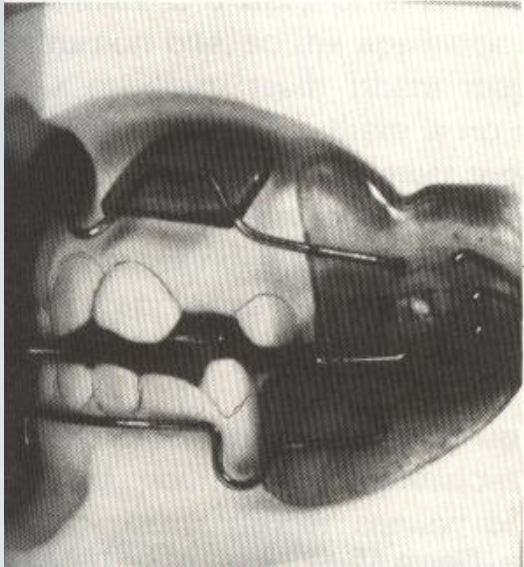
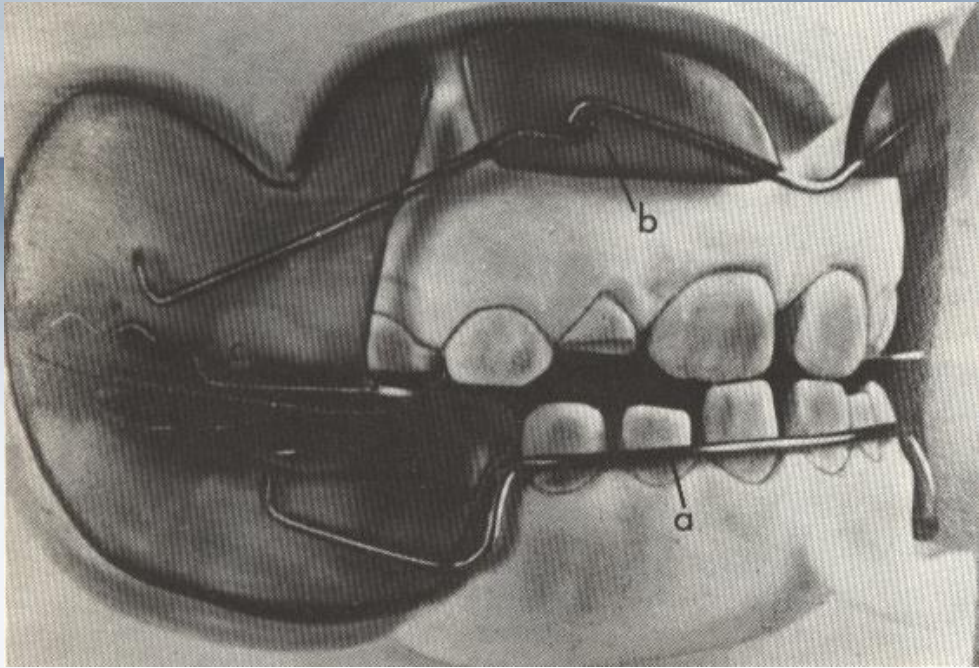
Lingual Stabilizing Bow:-

- Formed from 0.9mm wire. Also called as upper lingual wire or protrusion bow. It originates from the vestibular shields & passes between the upper canines & first deciduous molars & curves along the lingual surface of the upper incisors at the level of the cingulum. The wire forms loops that contact the incisors at the canine-lateral incisor embrasure.



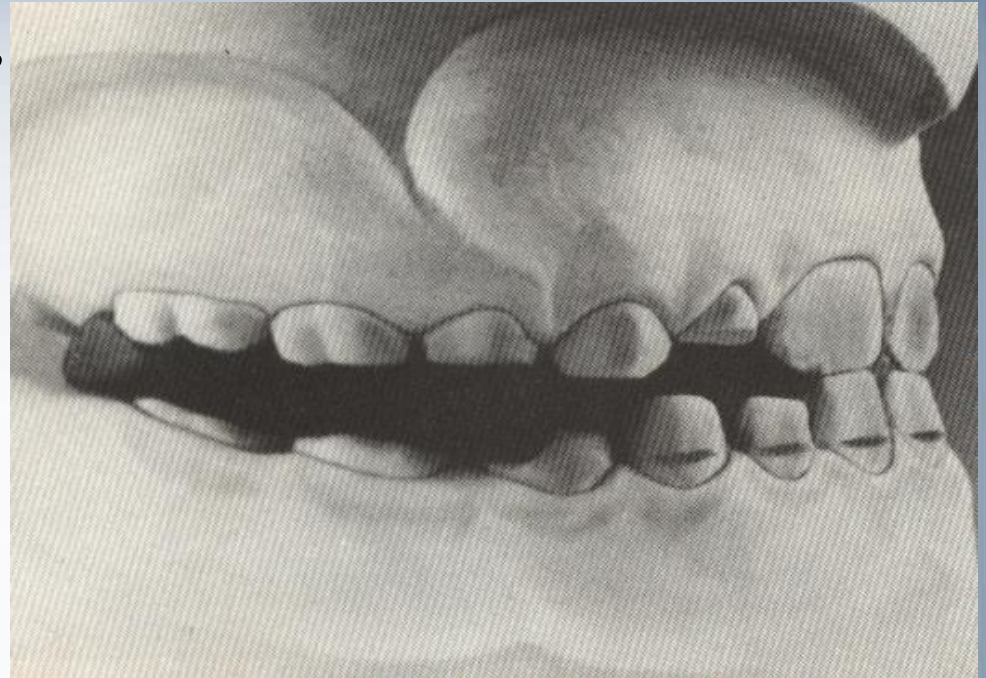
Function Regulator III

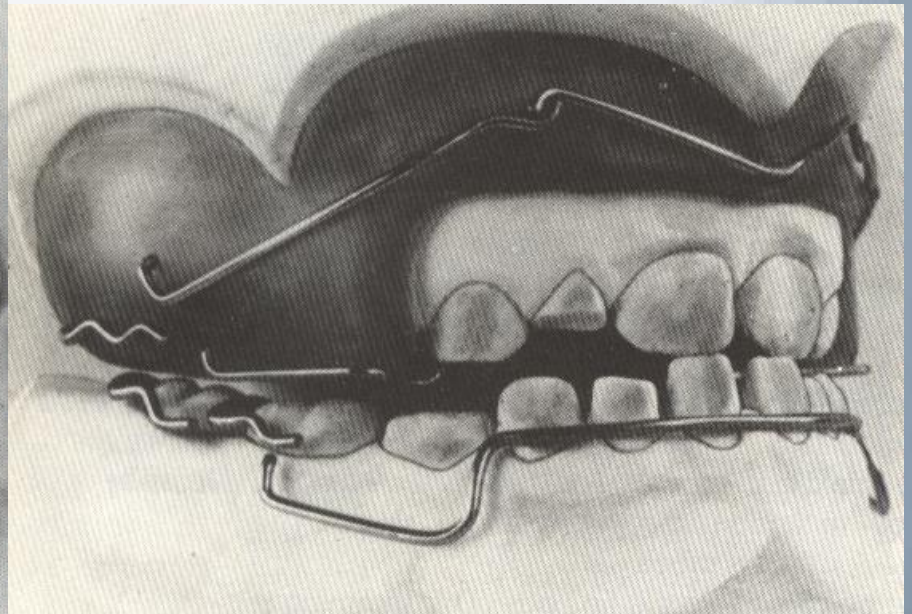
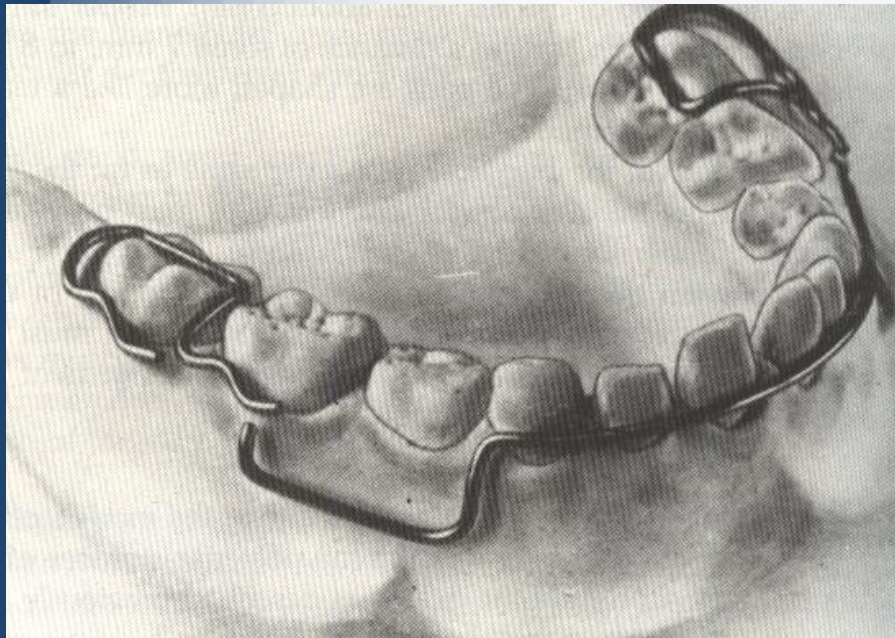
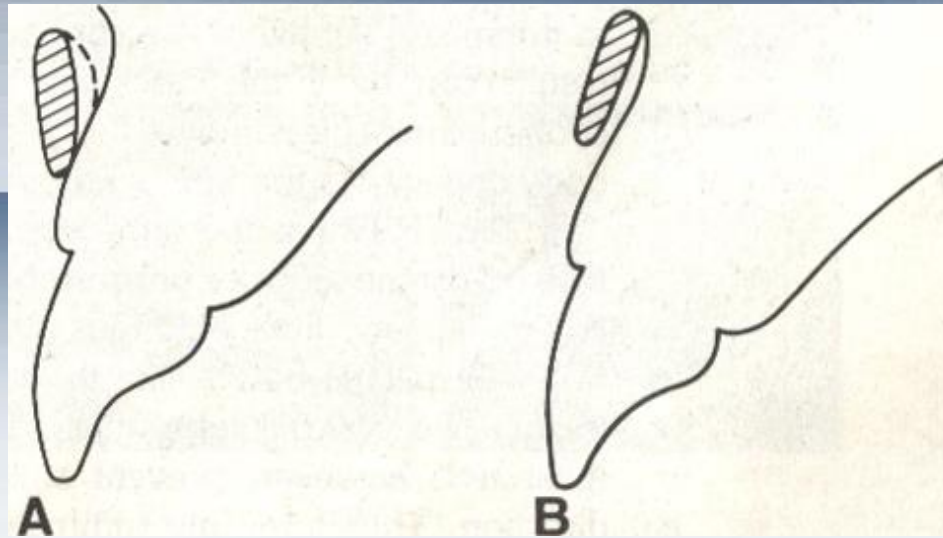
- *Indicated in maxillary retrusion.*
- *Lip pads:- Situated in the maxillary dentition instead of mandibular. They stand away from the mucosa & underlying alveolar bone in the depth of the labial vestibular sulcus. Framework is made up of 1mm wire.*
- *Labial bow:- It rests against the mandibular teeth and not maxillary incisors which are free to move.*
- *Buccal shield:- They contact the mandibular teeth & mandibular apical base so as to eliminate the buccinator and orbicularis oris musculature effect acting on the maxillary dentition.*



Construction Bite:-

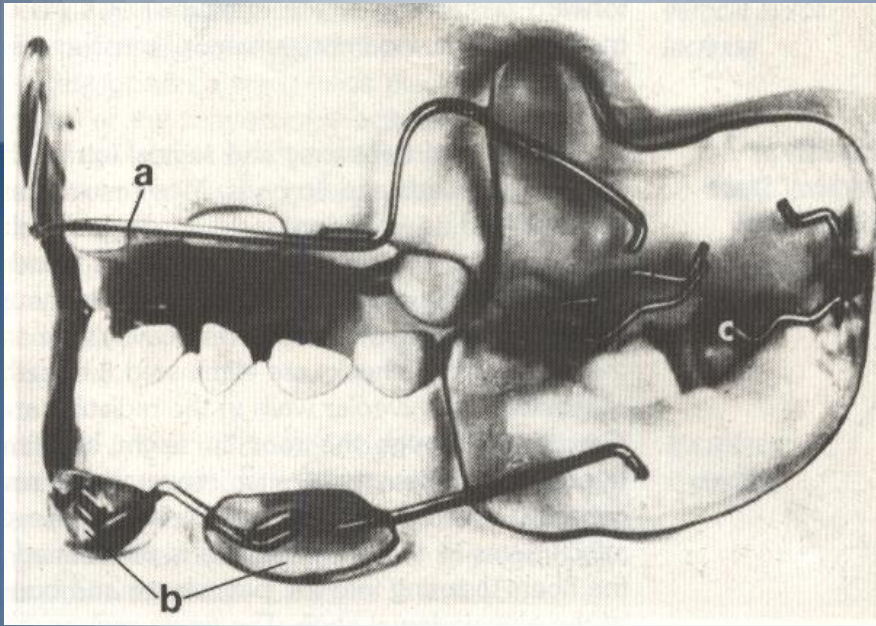
- *Is done by retruding the mandible as much as possible, with the condyle in its most posterior position in the fossa.*
- *Bite is opened enough to let the maxillary incisors move labially past the mandibular incisors.*
- *Vertical opening is kept to a minimum to allow lip closure with minimal strain.*





Function Regulator IV

- *Appliance therapy is preferred in mixed dentition.*
- *Same vestibular configuration as FR I and FR II but canine loops & protrusion bow is absent.*
- *Four occlusal rests on the maxillary 1st molars & 1st deciduous molars to prevent tipping of the appliance.*



Function Regulator V

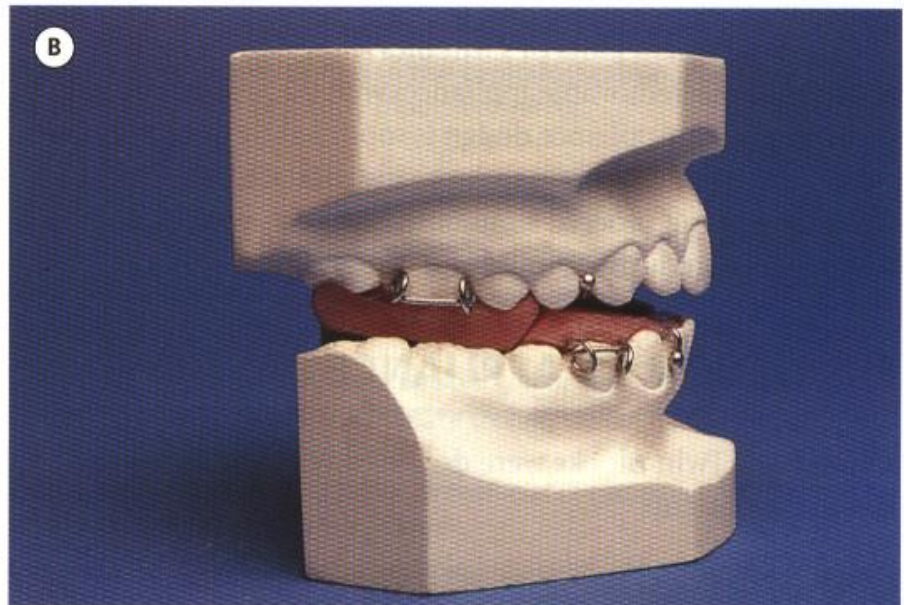
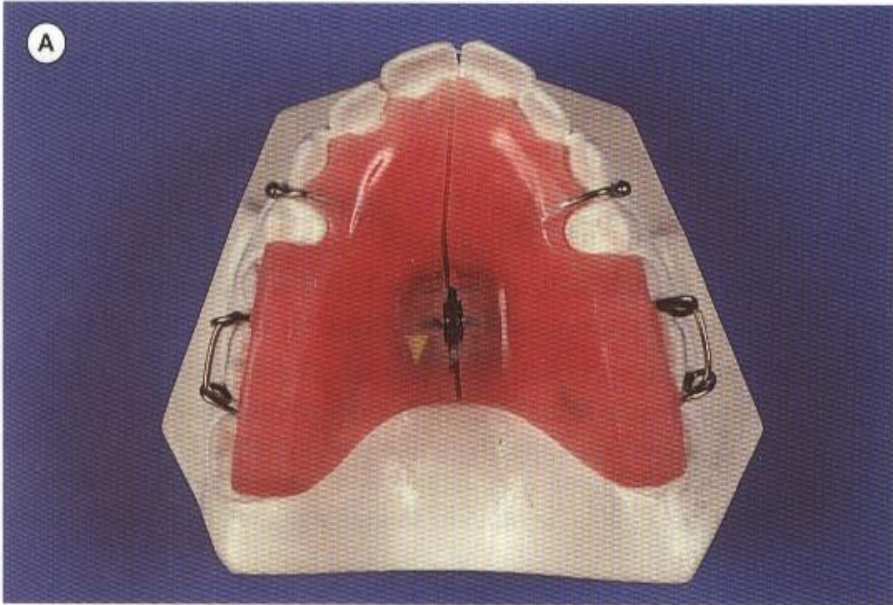
- *Appliance consists of posterior acrylic bite blocks that prevent molar eruption.*
- *Head gear tubes are incorporated that are used for extra-oral traction.*

Twin Block

- *First developed in 1977 by “William J. Clark” as a two piece appliance resembling a Schwarz double plate & a split activator.*
- *The Twin Block technique has two stages:-*
- *Active phase:- Twin blocks use posterior inclined planes to adjust the vertical dimension and correct the malocclusion by functional mandibular protrusion.*
- *Support phase:- An anterior inclined plane is used to retain the corrected incisor relationship until the buccal segment occlusion is fully established.*

Components:-

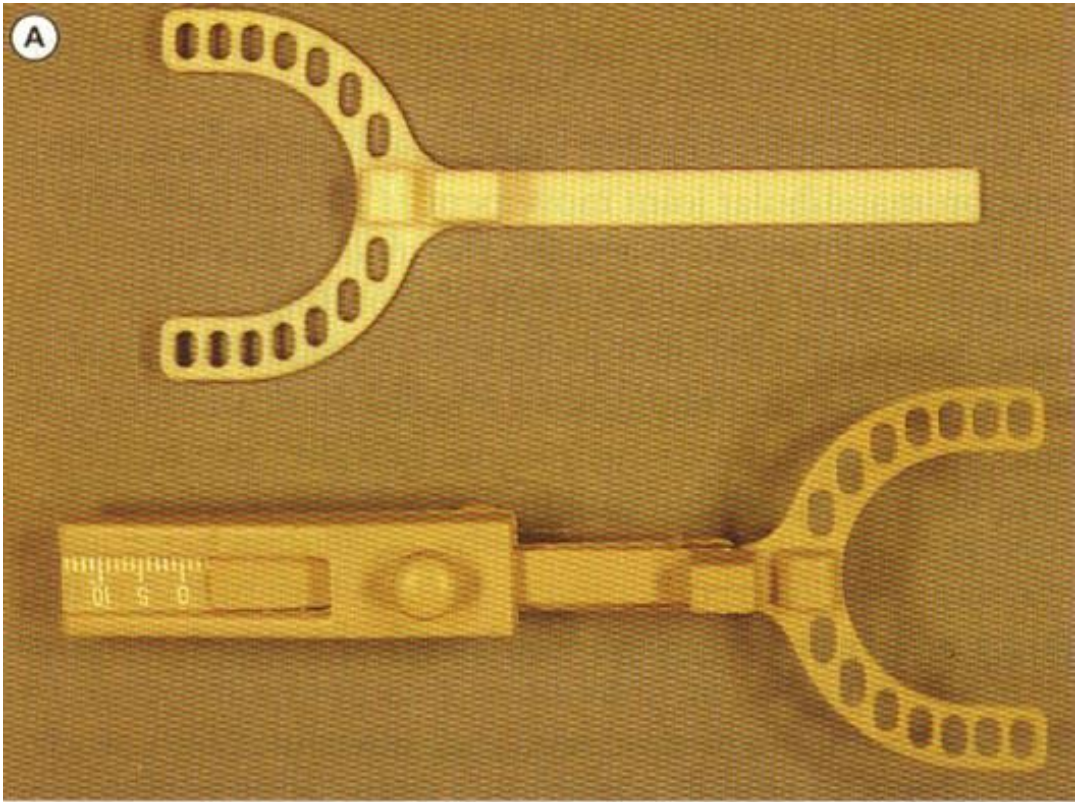
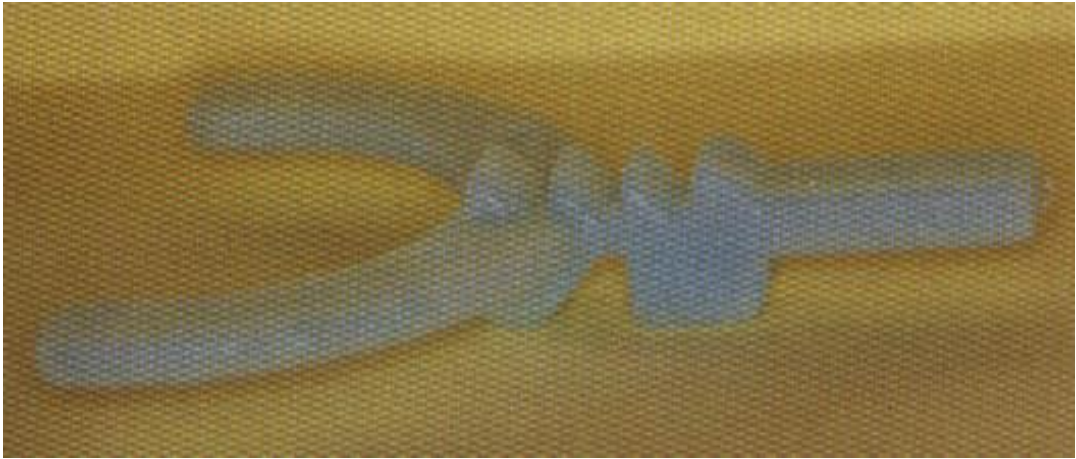
- *The earliest twin blocks were designed with the following basic components:-*
 - *Midline screws to expand the upper arch.*
 - *Occlusal bite blocks.*
 - *Adams clasps on upper molars and premolars.*
 - *Adams clasp on lower premolars.*
 - *Interdental clasps on lower incisors.*
 - *Labial bow to retract the upper incisors.*
 - *Springs to move individual teeth.*
 - *Provision for extra oral traction.*
- *Later to enhance fixation of twin blocks Delta clasp was designed by Clarke in 1985.*



Design & Construction

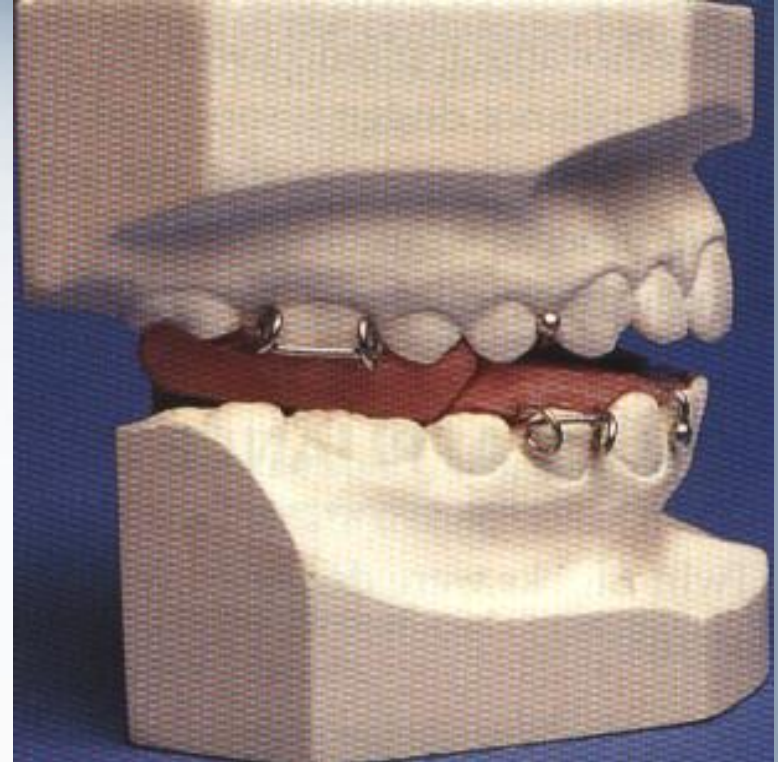
■ Construction bite:-

- *In class II div1 a protrusive bite is registered to reduce the overjet and distal occlusion by 5-10mm on initial activation of twin block depending on the freedom of movement in protrusive function.*
- *In growing children with overjet as large as 10mm, the bite may be activated edge to edge on the incisors with a 2mm interincisal clearance, if the patient can posture forward comfortably.*
- *2mm of interincisal clearance is equal to 5-6mm of clearance in the 1st premolar region. This usually leaves 2mm of clearance distally in the molar region.*

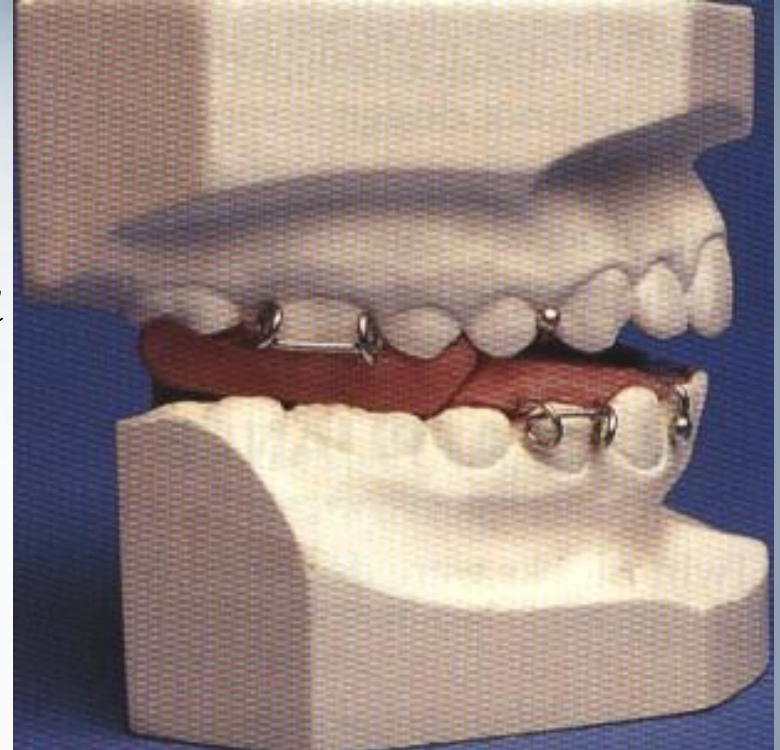


Occlusal Inclined Plane:-

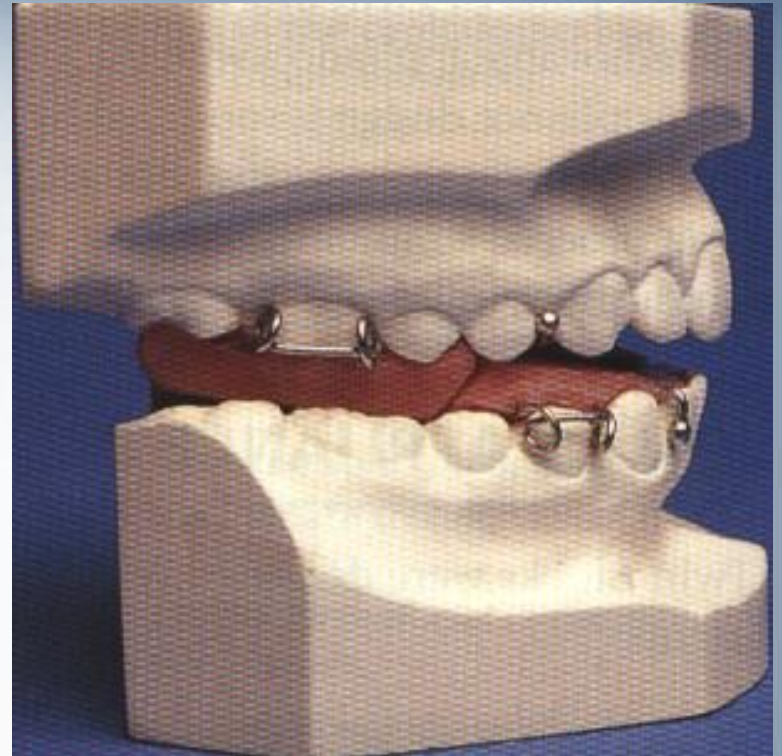
- *The position of the inclined plane is determined by the lower block. The lower inclined plane must be clear of mesial surface contact with the lower 1st permanent molar, which must be free to erupt.*
- *The inclined plane on the lower block is angled at 70 degrees from the occlusal plane from the mesial surface of second premolar or deciduous molar.*

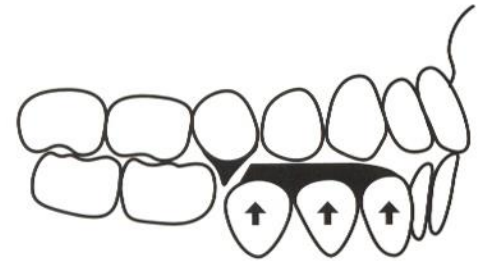
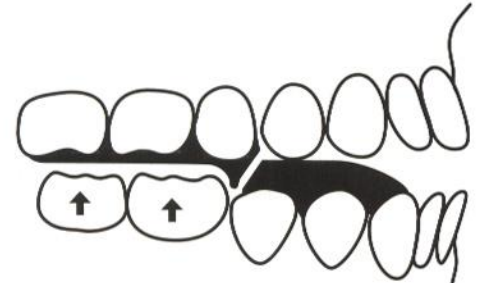
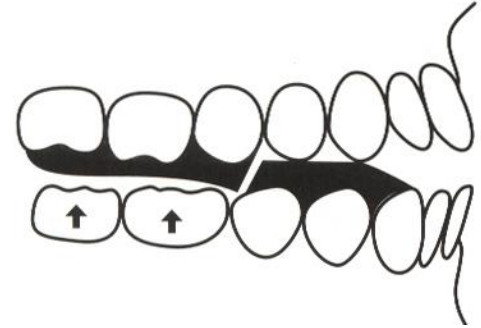
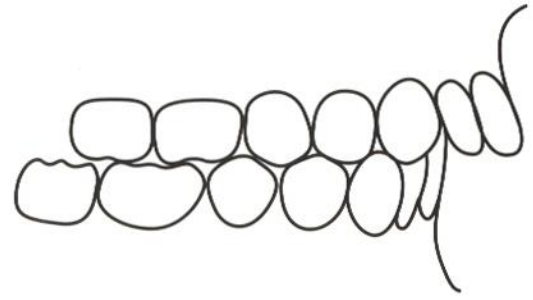
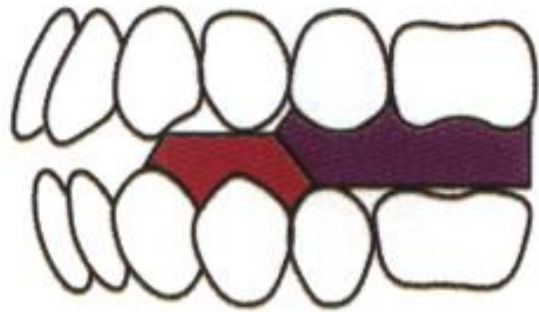
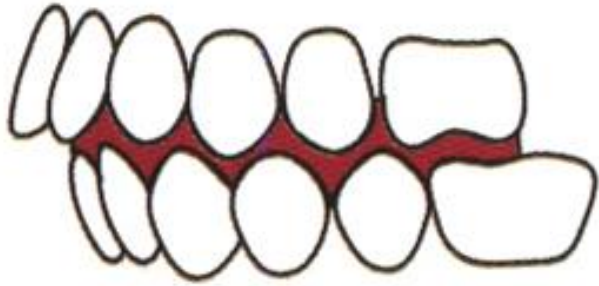


- *Buccolingually, the lower block covers the occlusal surfaces of lower premolars or deciduous molars to occlude with the inclined plane on the upper twin block.*
- *The flat occlusal bite block passes forward over the first premolar to become thinner buccolingually in the lower canine region so as to allow free tongue movement.*



- *The upper inclined plane is angled from the mesial surface of the upper second premolar to the mesial surface of the upper first molar.*
- *The normal angulation of the inclined planes are 70 degrees to the occlusal plane, although the angulation may be reduced to 45 degrees if the patient fails to posture forward consistently and thus occlude the blocks correctly.*





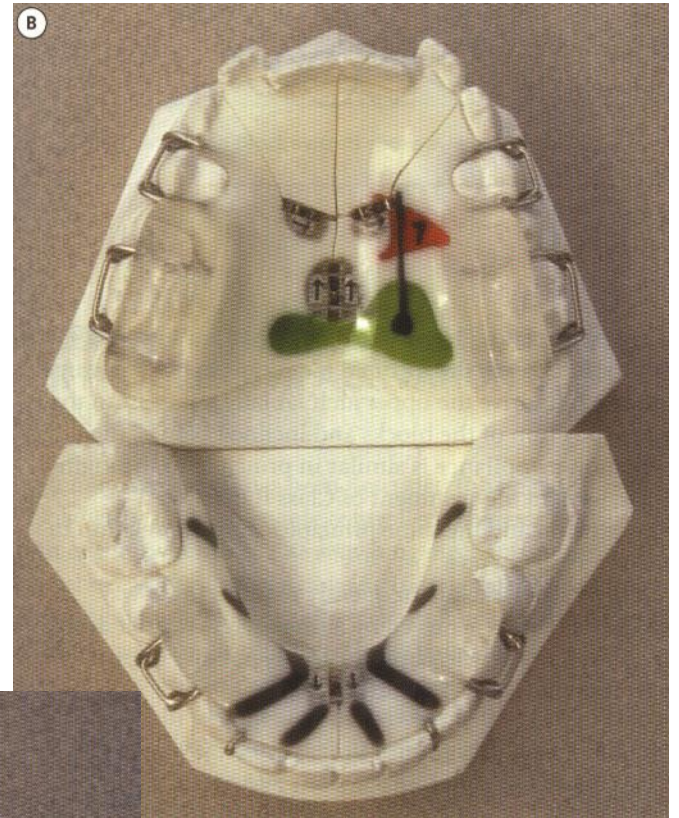
Delta Clasp:-

- *The delta clasp was designed by Clarke in 1985 to enhance the fixation of twin blocks.*
- *It is similar to the Adams clasp but incorporates new features to improve retention, minimize adjustment, and reduce metal fatigue, thereby reducing breakage.*
- *The essential difference is in the retentive loops which are in a closed triangle fashion.*
- *This is used on upper molars and lower first premolars.*
- *Advantage of delta clasp:-*
 - *It prevents opening up of loops during insertion and removal and gives excellent retention in premolar and molar area.*



Reverse Twin Block

- *For correction of class III type of skeletal base.*
- *It is achieved by reversing the occlusal inclined plane to apply a forward component of force to maxilla & downward & backward force to the mandible in the lower molar region.*



Conclusion:-

- *Myofunctional appliances form an useful addition to the clinician's orthodontic armamentarium. But many of these appliances need further studies to substantiate the claims made by their respective originators. Inexperienced clinician should begin with simpler malocclusions in patients who are likely to cooperate and not attempt to treat severe skeletal problems in the beginning. With this in mind, clinicians must take great care in selecting the right patient and also pay attention to every detail in the fabrication of these appliances to attain successful results.*



Thank You