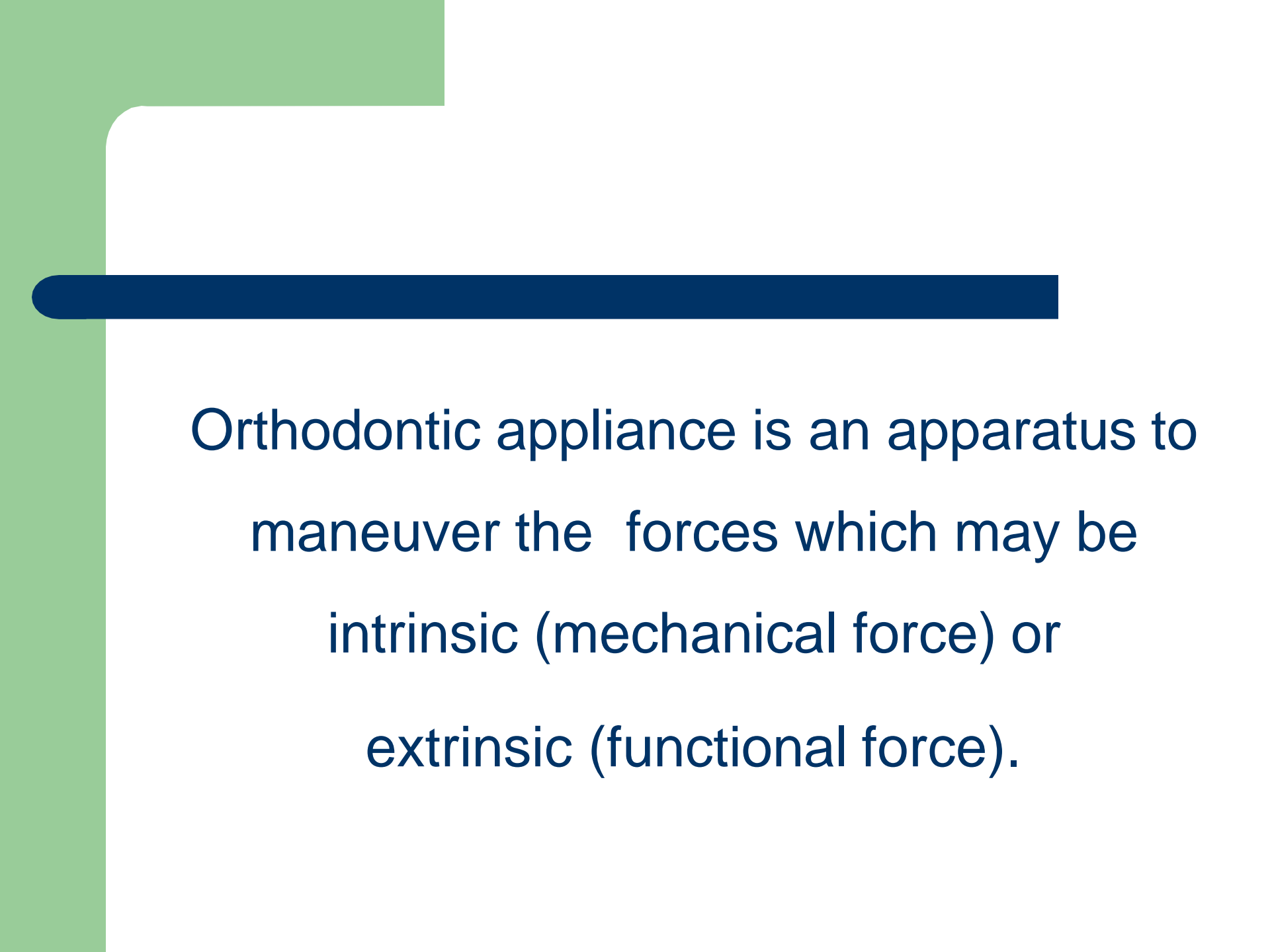


***principles of fabrication
of orthodontic appliances***



Orthodontic appliance is an apparatus to maneuver the forces which may be intrinsic (mechanical force) or extrinsic (functional force).

Orthodontic Appliance is used -

- to deliver force to a tooth or a group of teeth to bring about changes in tooth position.
- to correct, guide and modify growth of the growing and mature dentofacial structure.
- to prevent the actions of abnormal muscle activities and habits on the teeth and alveolar bone.



Removable

Fixed

Fixed-Removable



Hawley Type removable appliance

Screw appliance or wedding appliance

Functional appliance

Orthodontic appliance

- Removable appliance
- Fixed appliance
- (Fixed-removable appliance)
- Functional appliance
- Extraoral appliance

Removable orthodontic appliance.

Orthodontic appliance which can be removed and replaced by the patient.

Hawley type appliance. (Labio-lingual appliance)

-repositioning of individual teeth (mesiodistal and (labiolingual) in the dental arch.

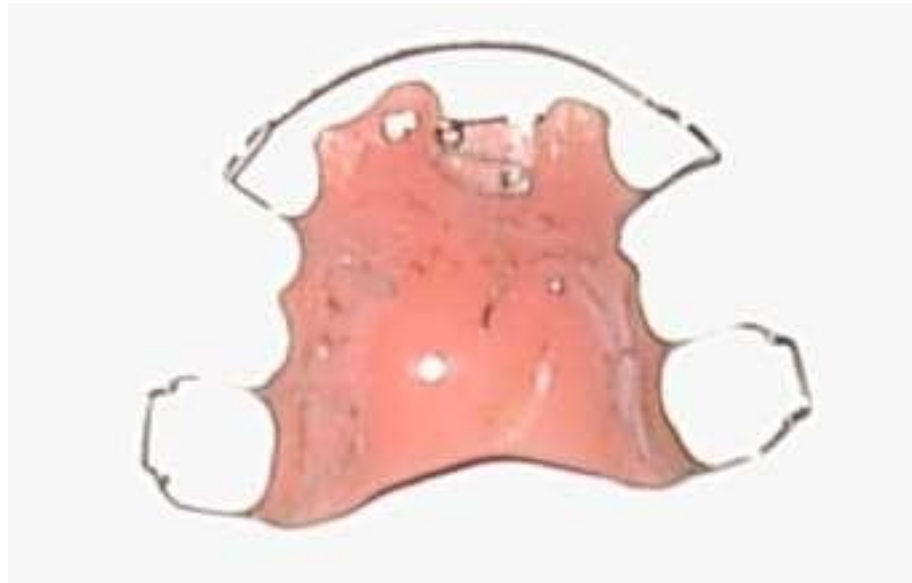
Screw appliance.

- expand the arch perimeter.

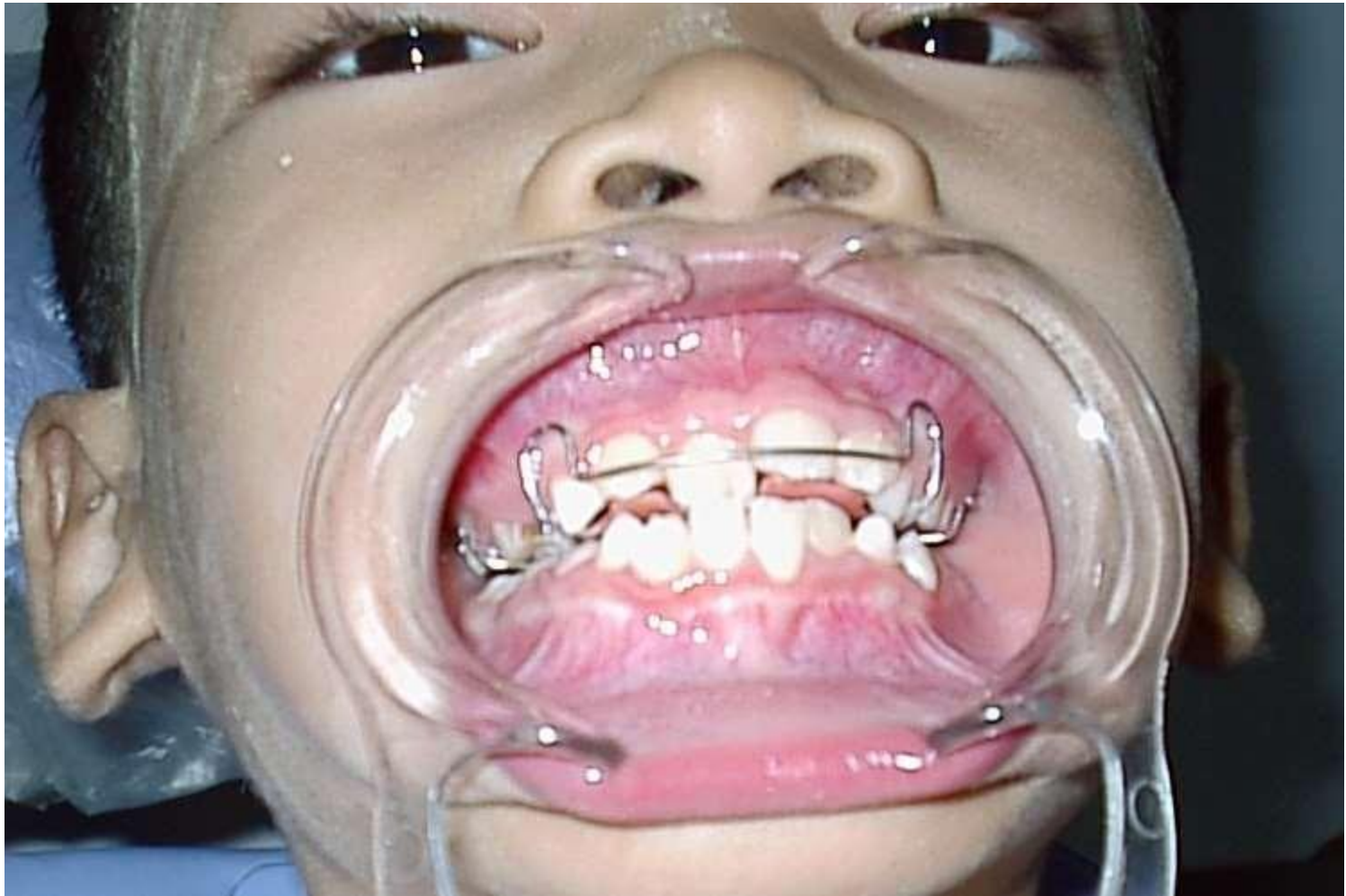
Functional appliance.

-move the teeth and skeletal structures by the use of functional forces to modify growth.

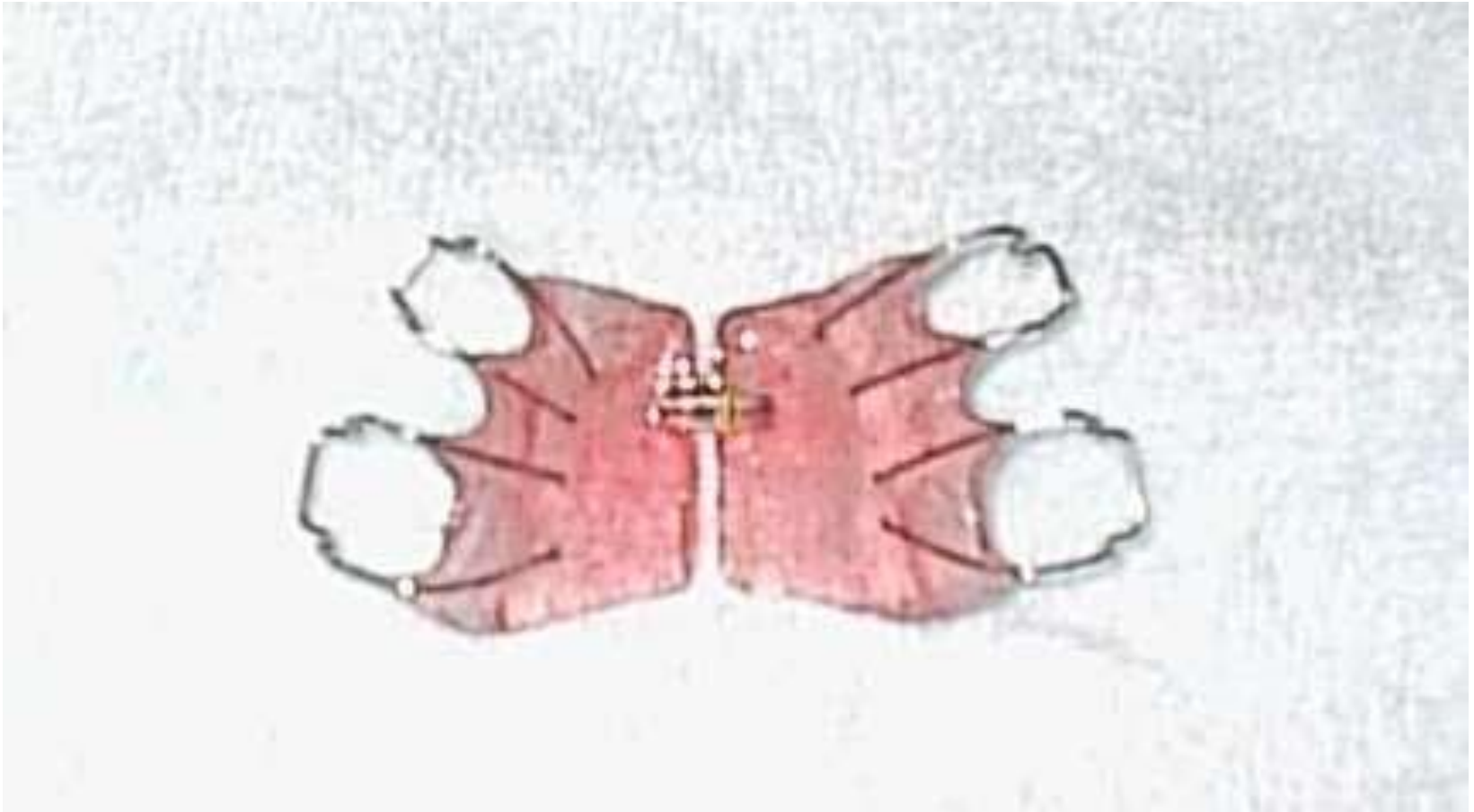
Hawley Type Appliance



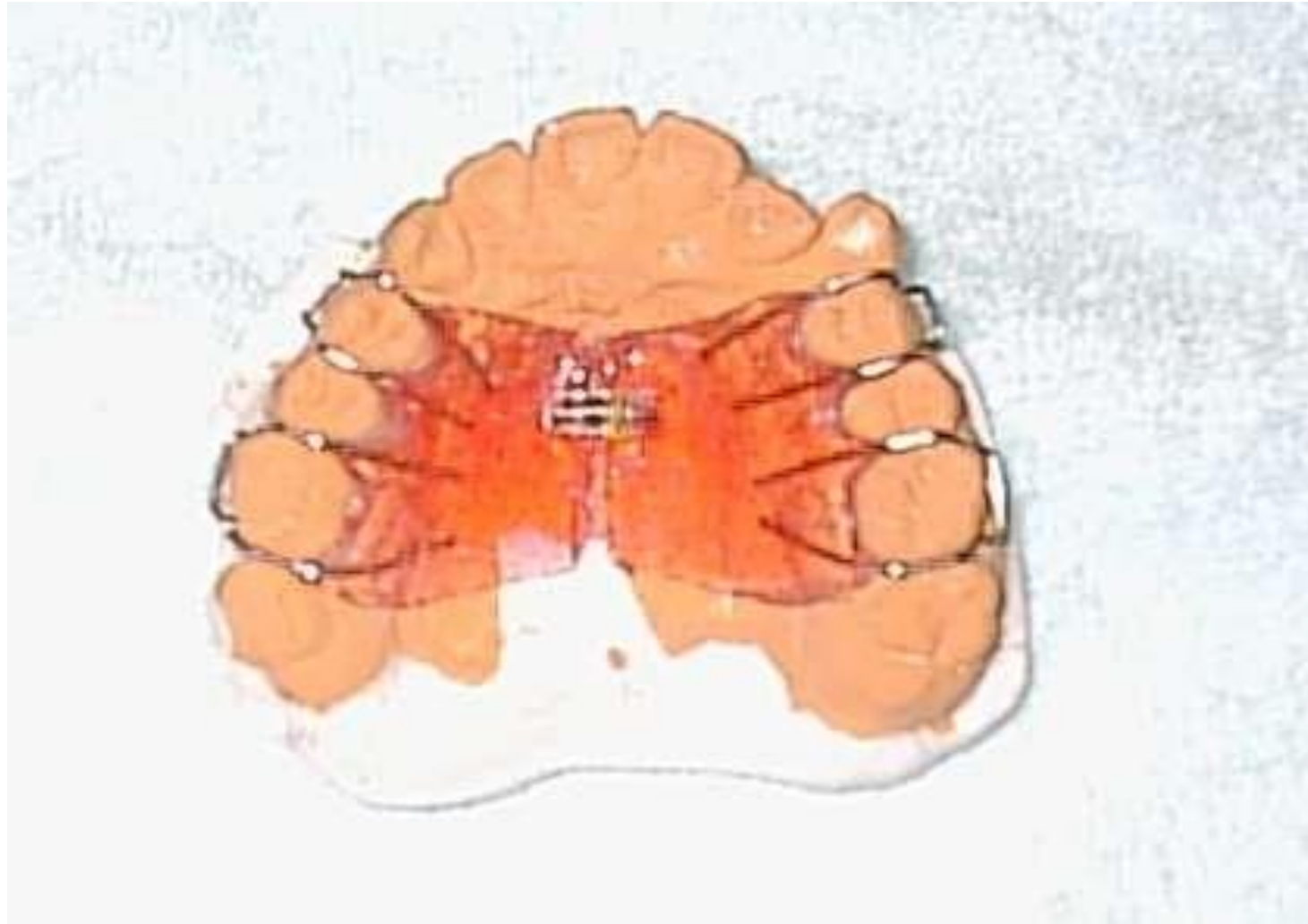
Hawley Type Appliance



Screw Appliance



Screw Appliance



Functional Appliance



Frankel Appliance

Frankel Appliance



Removable appliances

Advantages.

Can be fabricated in laboratory rather than directly in the pt's mouth

- Can be removed by the patient.
- Reducing dentist's chairside time.
- Allow growth guidance treatment.
- Low cost.

Disadvantages.

- Need patient compliance.
- Limited tooth movement.

Indications.

(Uses)

Growth modification treatment.

Control the growth of maxilla and mandible with the use of functional appliance.

Limited tooth movement.

Mesiodistal and labiolingual tooth movement with the use of Hawley type appliance.

Retention.

Stabilization of teeth and alveolar bone after comprehensive orthodontic treatment.

Components of removable orthodontic appliance.

I. Retaining component.

Provides retention to the appliance.

III. Active component.

Delivers force to the teeth.

III. Base plate.

Unify different components.

I. Retaining component.

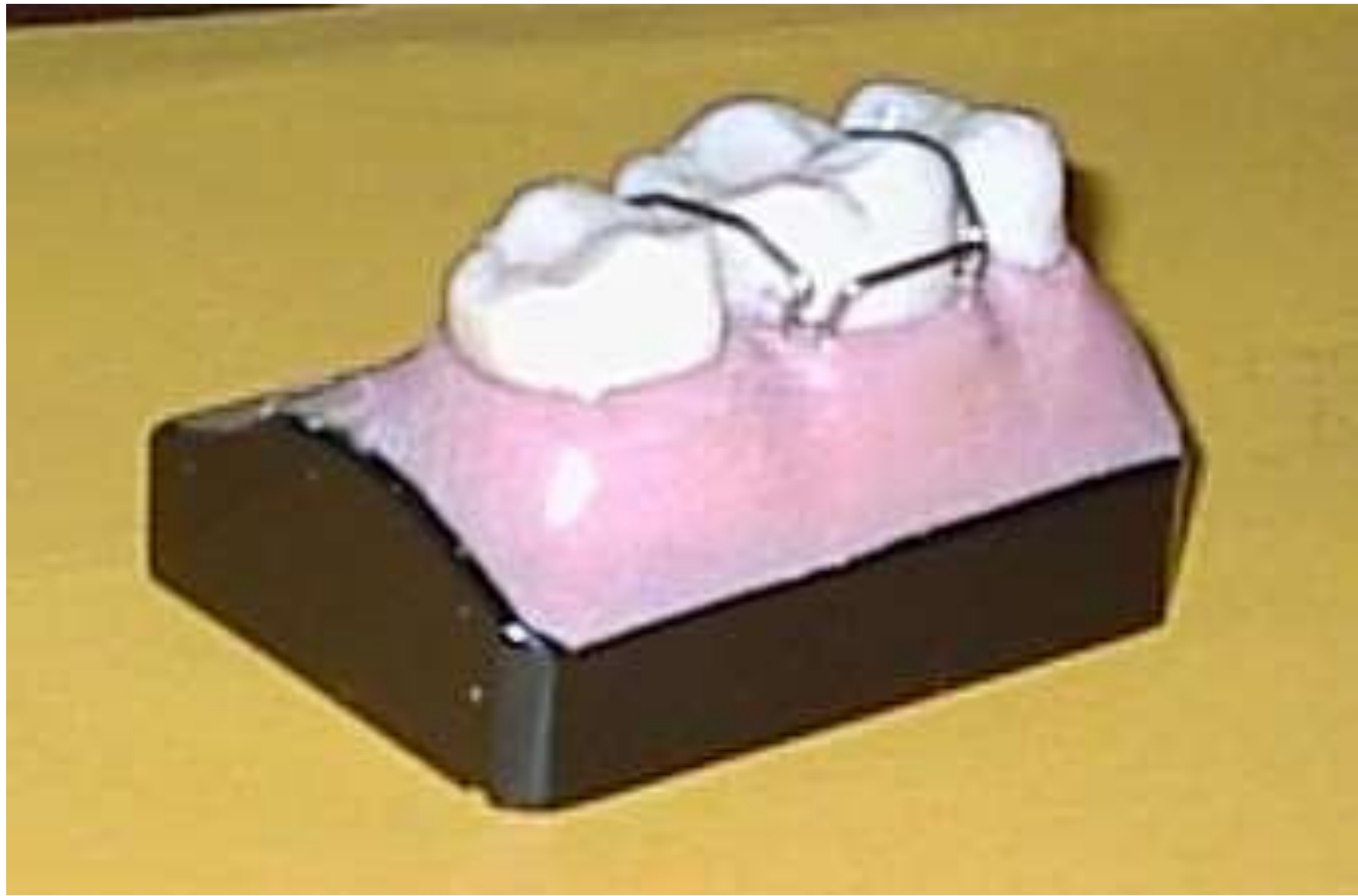
Clapse.

Adam clasp.

- Provides excellent retention, commonly used.
- Designed to engage mesiobuccal and distobuccal undercuts.
- Best used on molars and premolars.
- Teeth must be fully erupted.
- May interfere with occlusion.

Component parts of Adam clasps.

- Arrow head.
- Bridge.
- Intermediate segment.
- Occlusal cross-over.
- Leg.
- Tag.







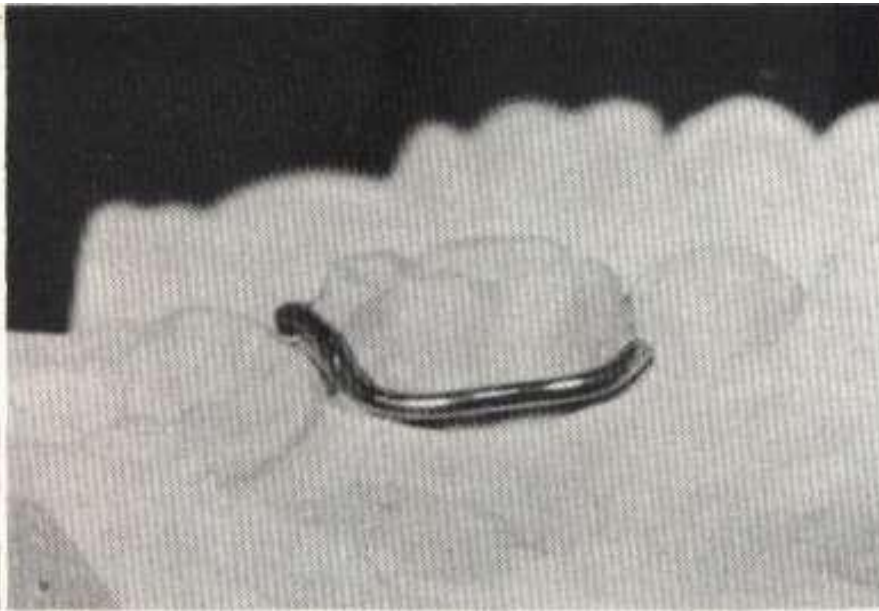
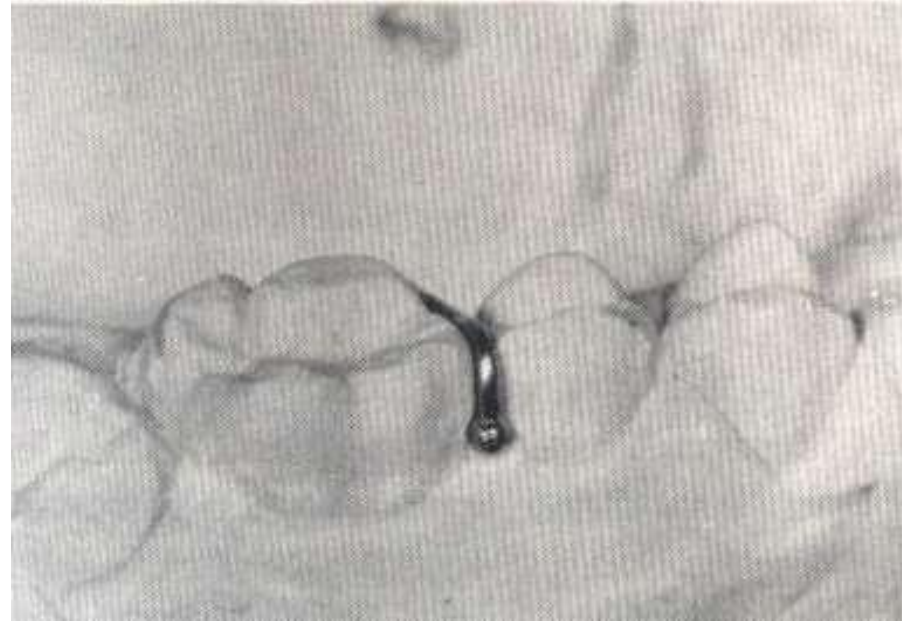
Circumferential clasp.

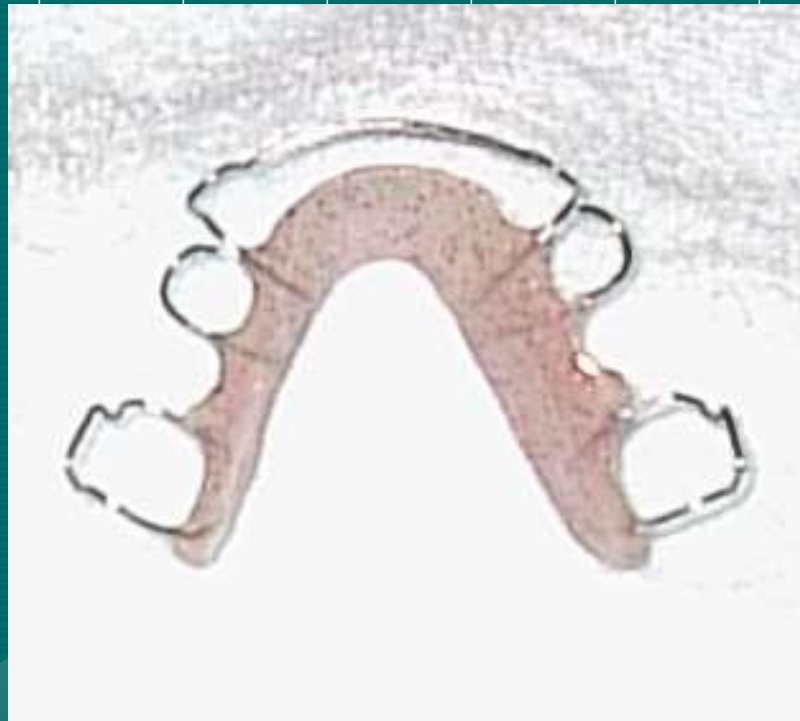
- Easy to bend.
- Commonly used in combination with Adam clasp.
- Does not interfere with occlusion.
- Commonly used in retainers.

Other clasps.

- Ball clasp.
- Lingual extension clasp.

Clasps designs





II. Active components.

Those parts which deliver forces to the teeth and/or skeletal structures to bring about changes in position.

Includes.

- Springs.
- Bows.
- Screws.
- Elastics.

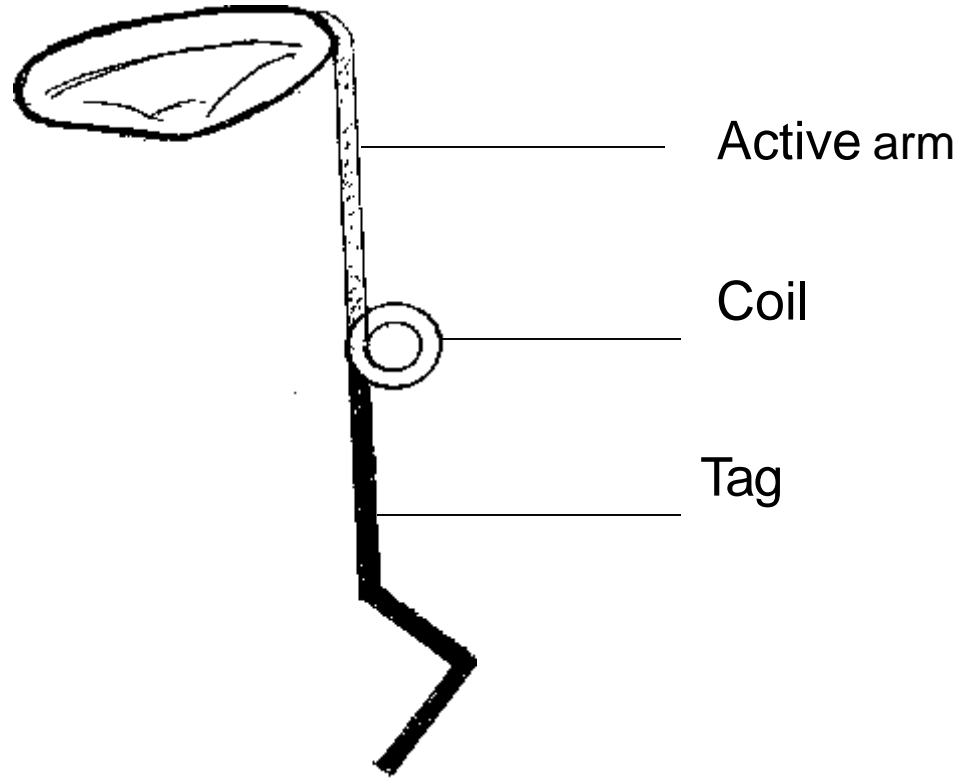
Components of a spring.

- Arm.
- Coil.
- Tag.

Types of springs.

- Finger spring
- Buccal canine spring.
- Springs for arch expansion.
- 'Z' spring, 'T' spring.
- Cantilever, Double cantilever spring.
- Springs for retraction.

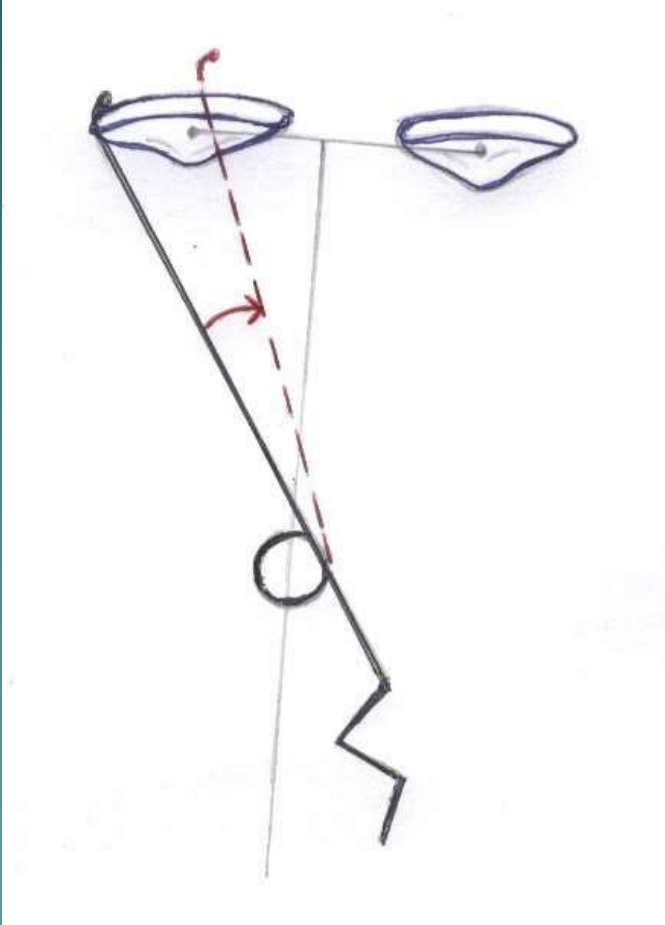
Components of a spring.



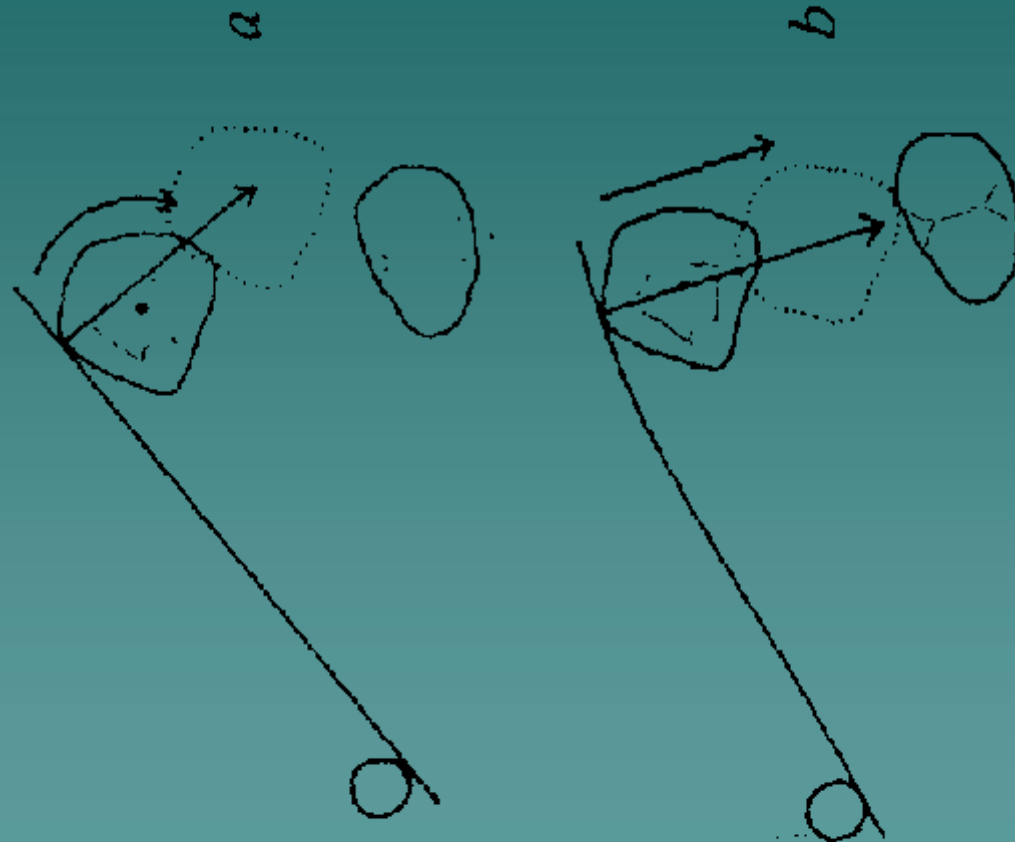
Palatal finger spring.

- Used to move a tooth mesiodistally.
- The direction of tooth movement is perpendicular to the tangent line at the point of contact.
- Coil should be located on the perpendicular line drawn at mid-point of the path of tooth movement.
- Usually made of 0.5 or 0.4 mm stainless steel round wire.
- Activated by opening the coil so that when the appliance is seated the coil wound up and deliver force.

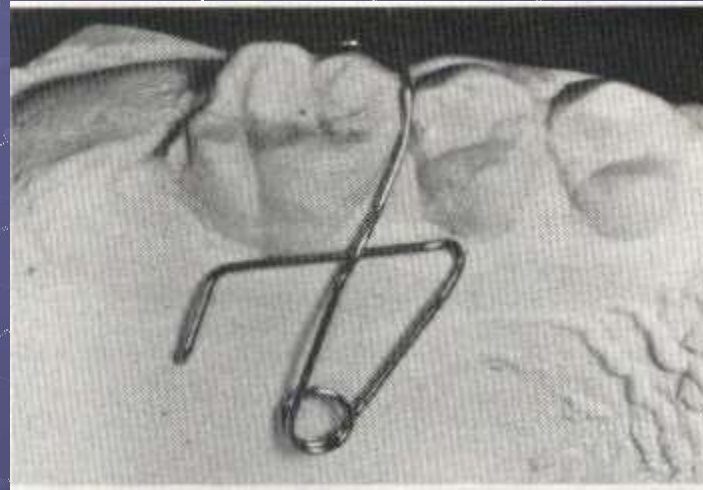
Coil position and activation



Direction of tooth movement

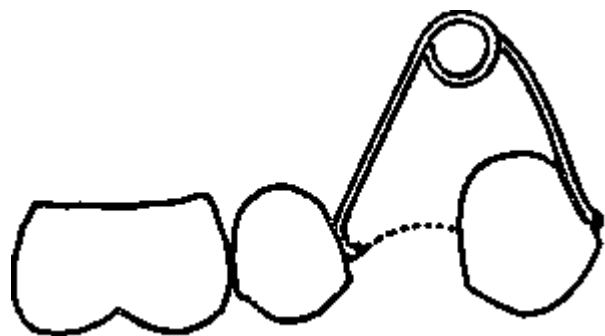


Position of guard wire.

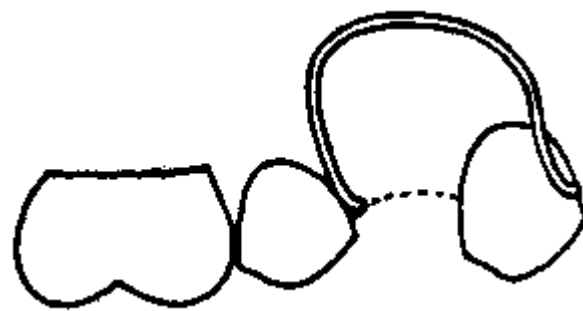


- Buccal canine spring.
 - Used to move the tooth palatally and distally.
 - Useful when buccally erupted canine cannot be engaged from the palatal aspect by finger spring.
 - Poor stability, difficult to adjust.
 - May irritate the tissues or be uncomfortable if the coil is located too high up in the sulcus.
 - Tag should pass the occlusal table as close as possible and above the contact point of premolar tooth.
 - Made of 0.7 mm stainless steel round wire.
 - Adjust by closing the coil.

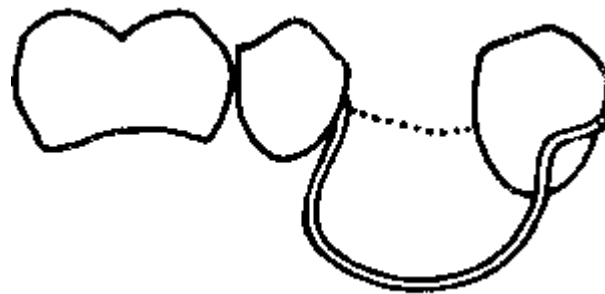
Buccal canine springs



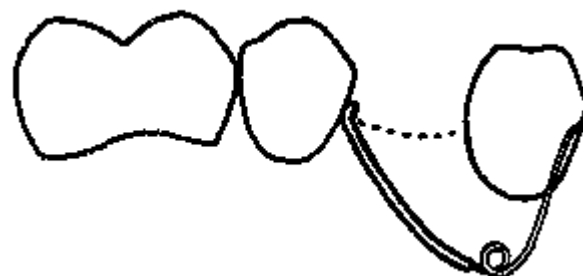
A



B



C

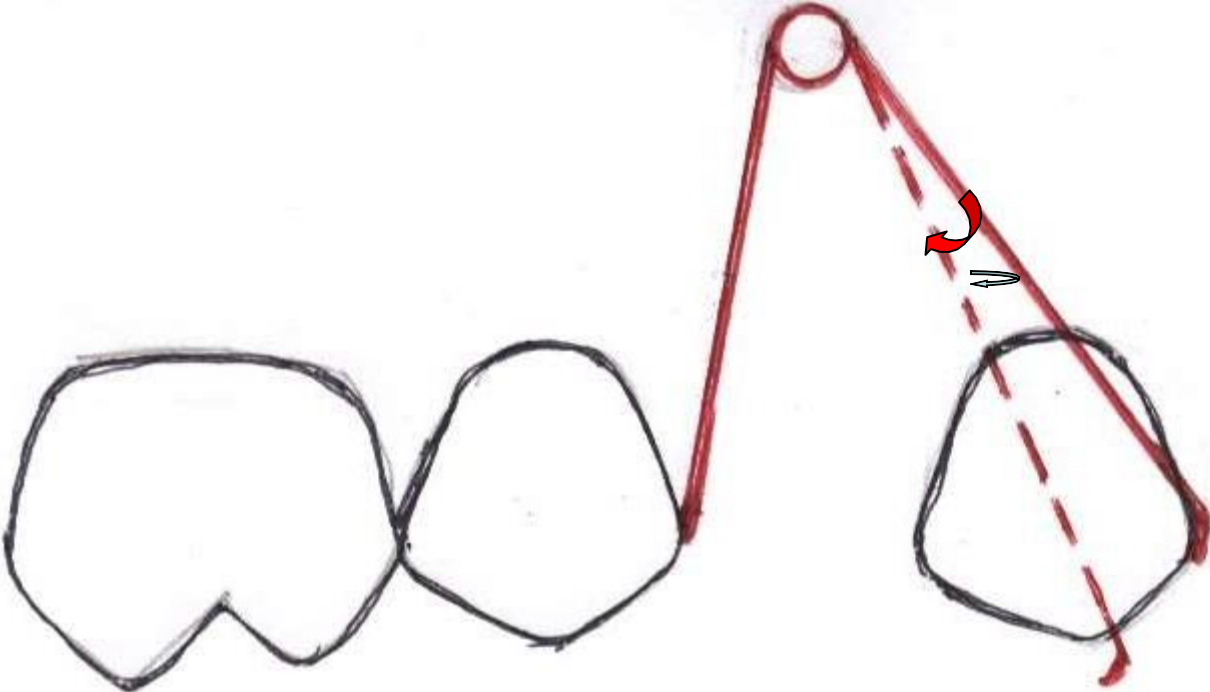


D

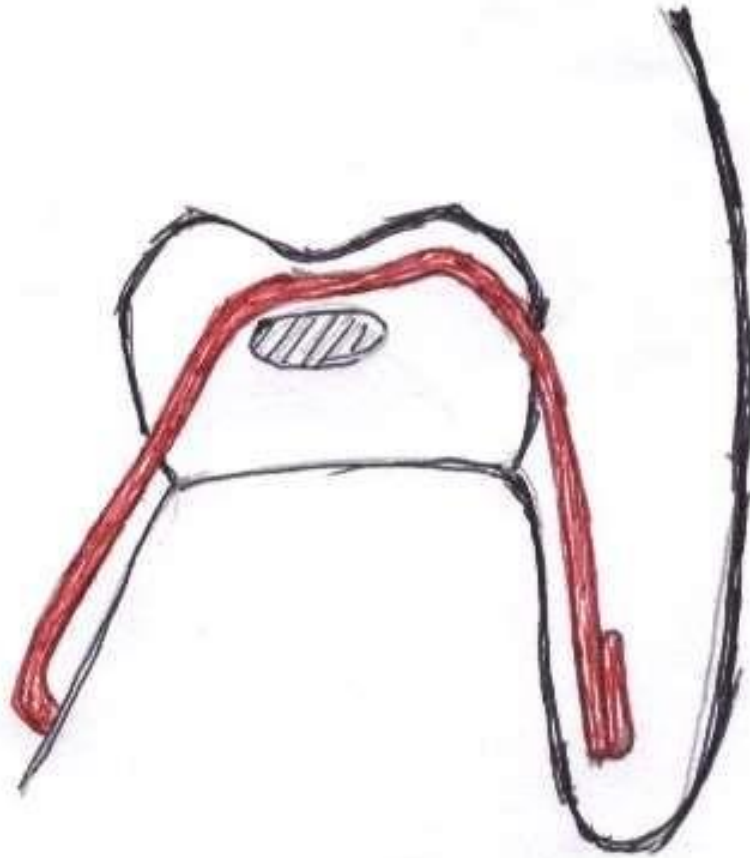
Buccal canine spring.



Activation of buccal canine retractor.



Position of occlusal cross-over



Springs for moving teeth labially and buccally.

'Z' spring.

'T' spring.

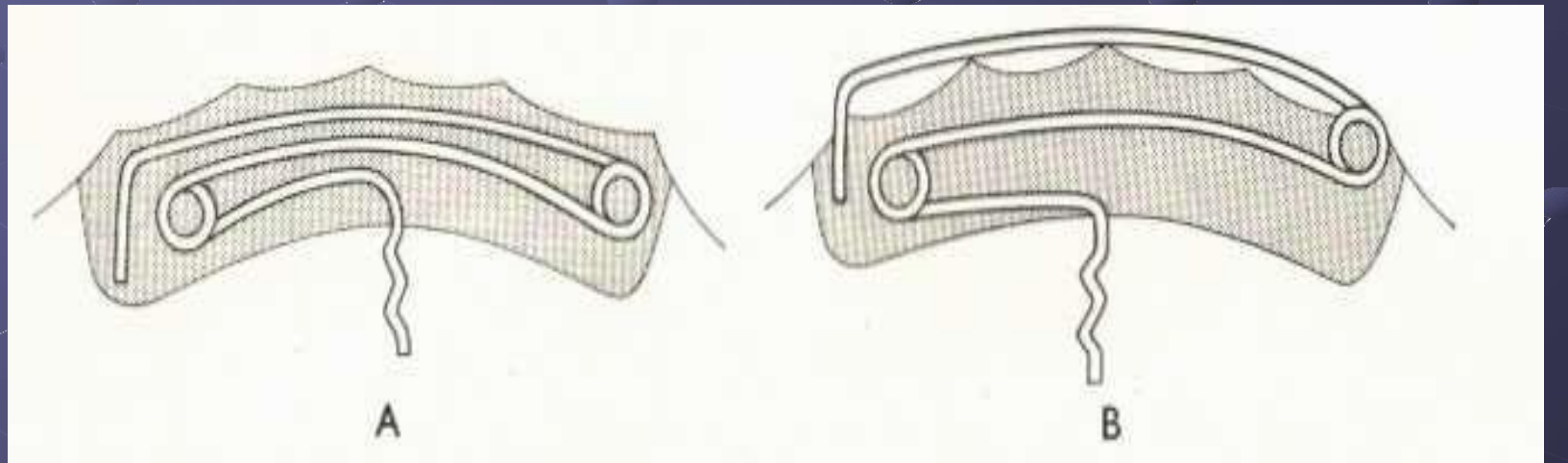
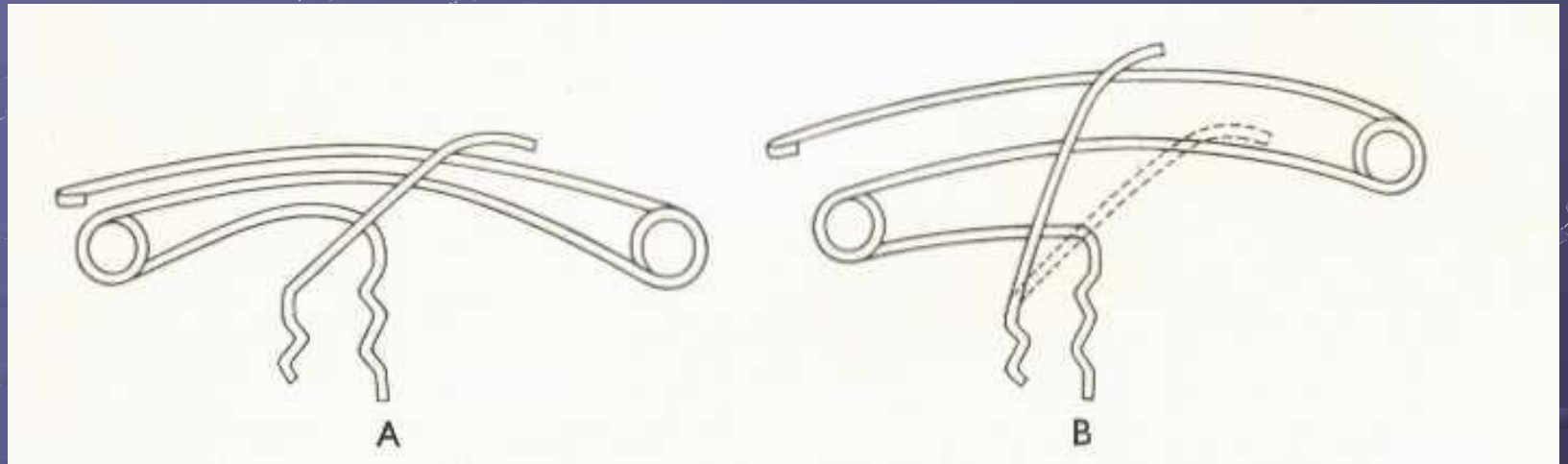
Modified finger spring. (cranked spring)

Cantilever springs

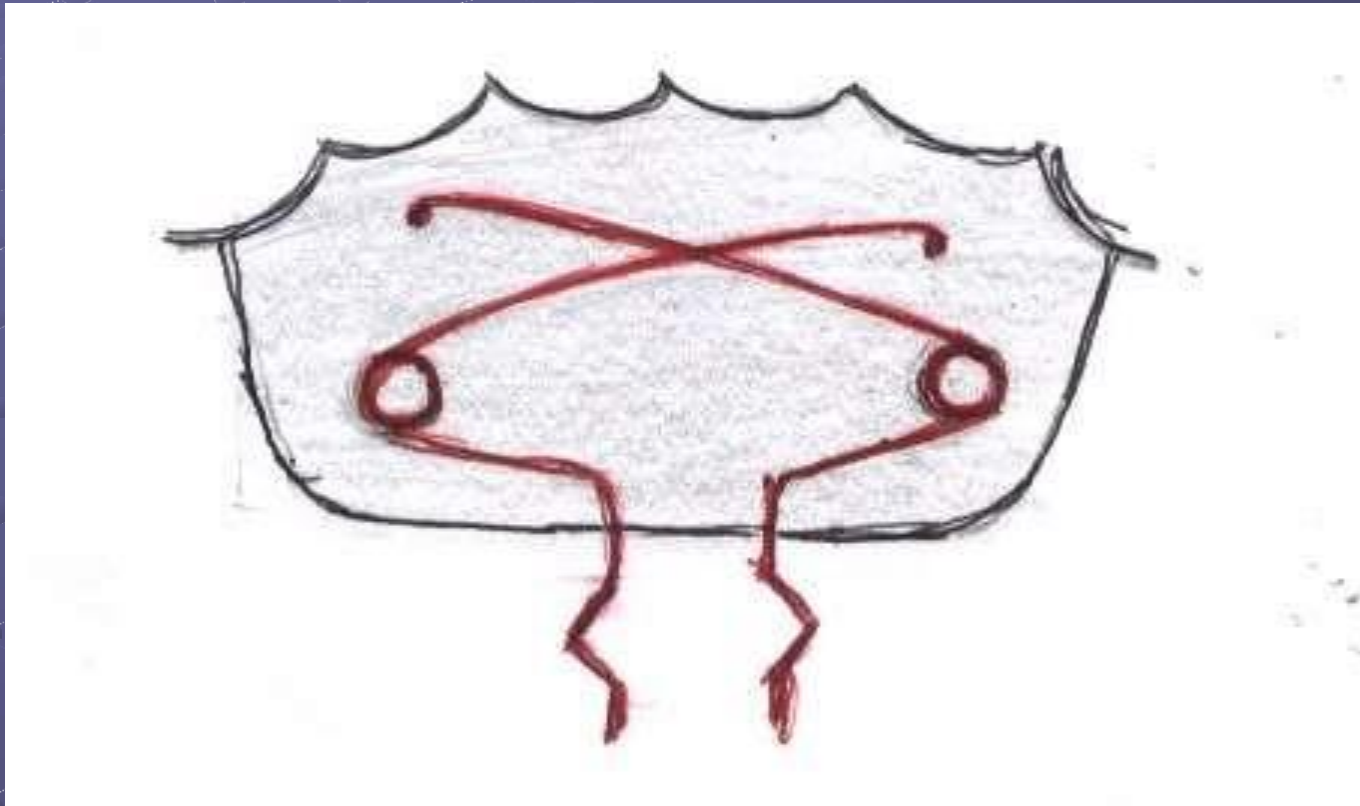
The wire should be supported by a guard (guide) wire so that it will remain contact at the desired position on the tooth.

Made of 0.5 to 0.7 mm stainless steel round wire, depending upon the length of wire and the design of a spring.

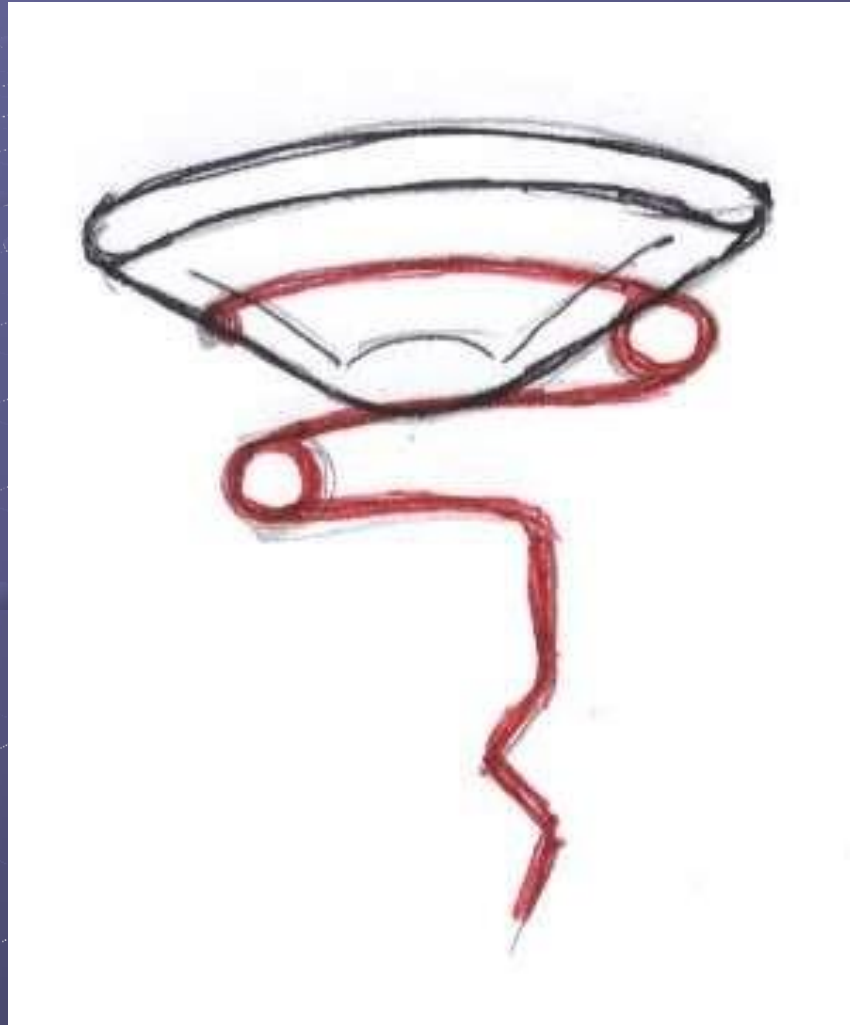
Cantilever springs



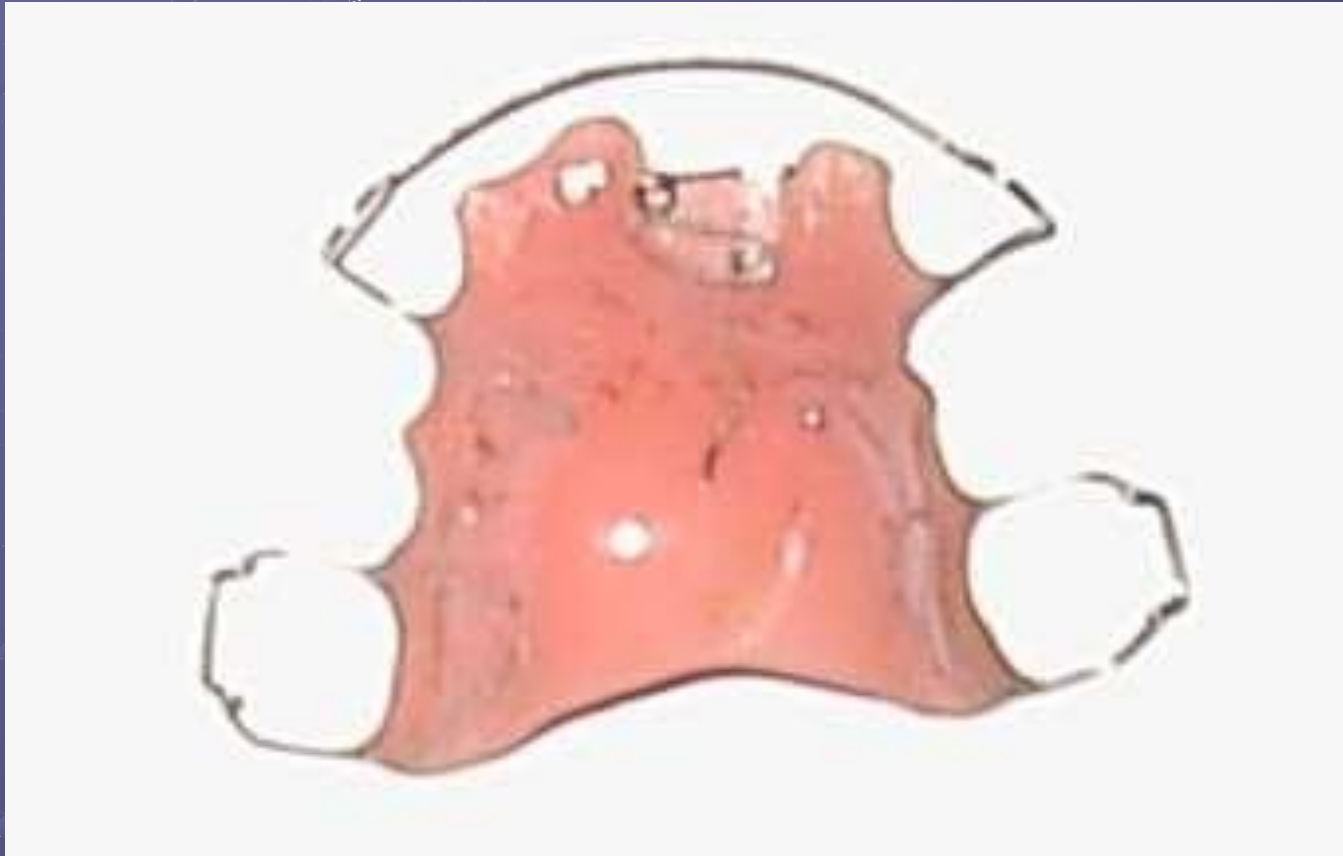
Cantilever springs



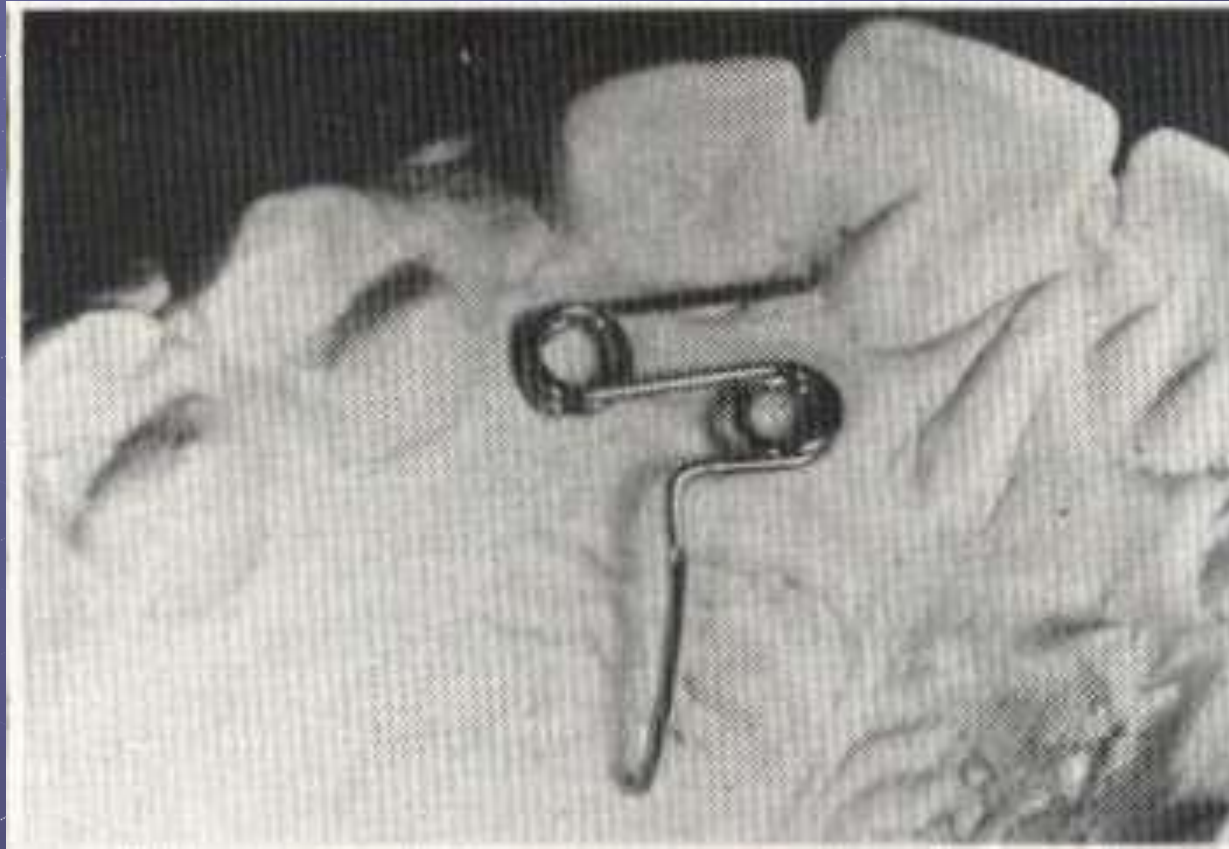
“Z” Spring



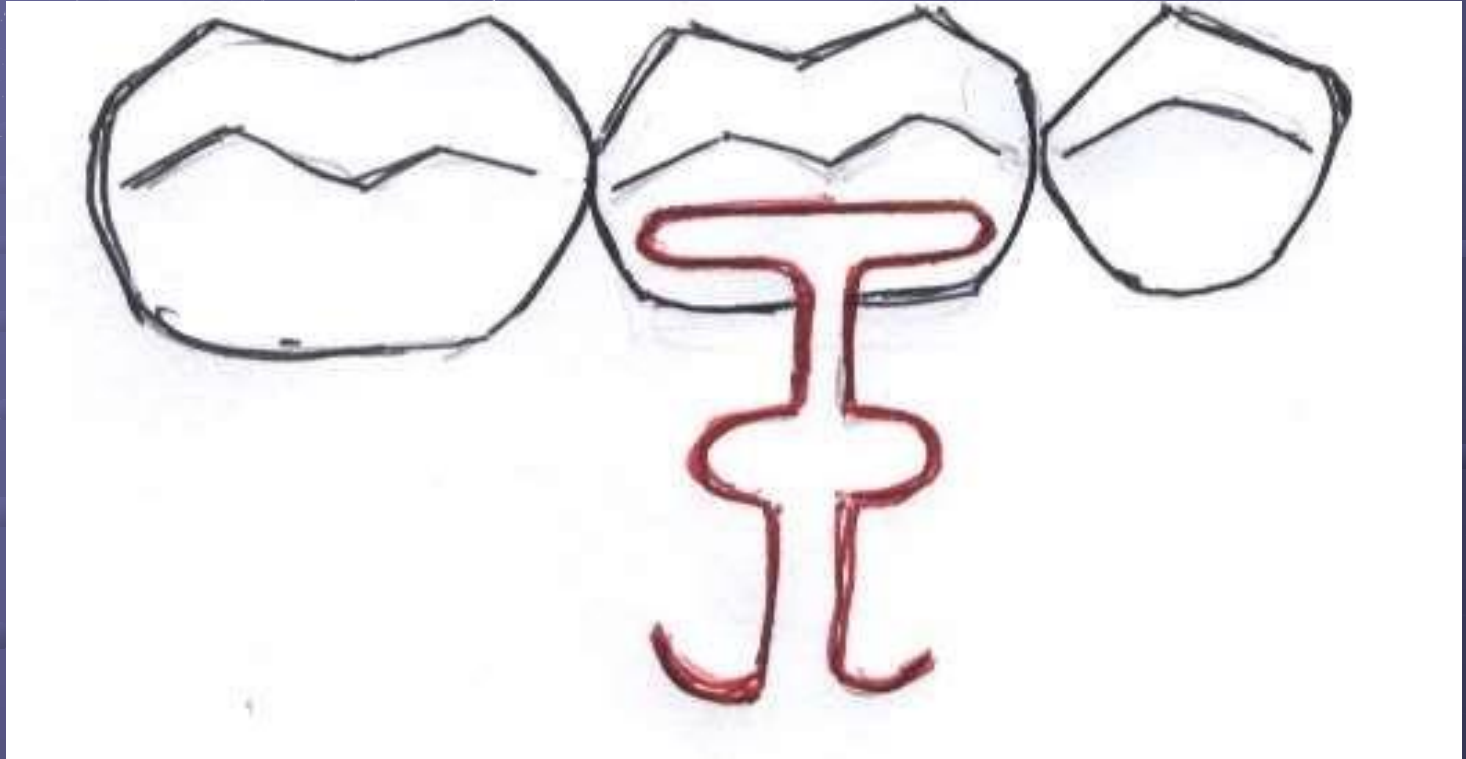
“Z” Spring



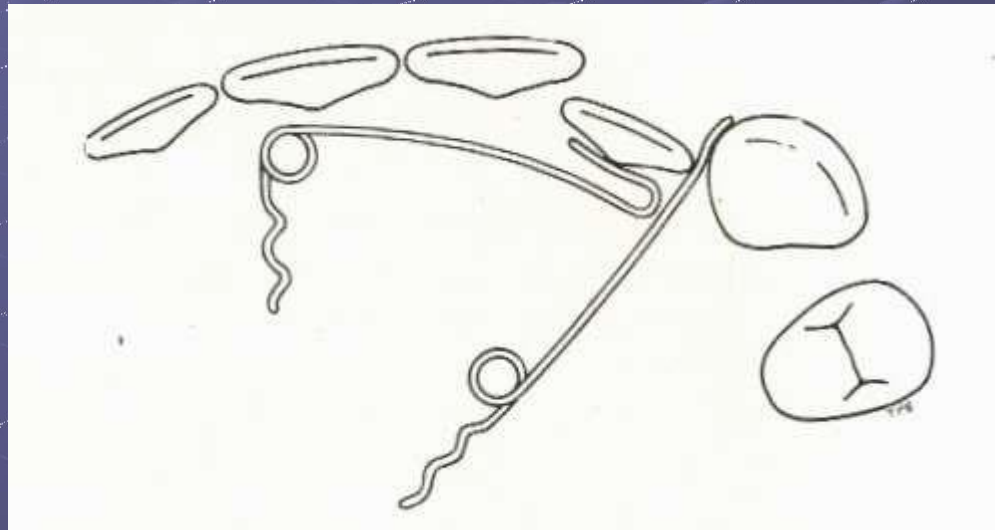
“Z” Spring



“T” Spring



Modified finger spring. (Cranked spring)



Labial bows.

High labial bow.

For the attachment of auxiliary springs.

Usually made of heavy wire size 0.9 or 1mm.

Low labial bow.

For the retraction of incisors.

To aid in retention of an appliance.

To provide force couple.

To restrain labial movement of incisors.

(to reinforce anchorage)

Types of low labial bow.

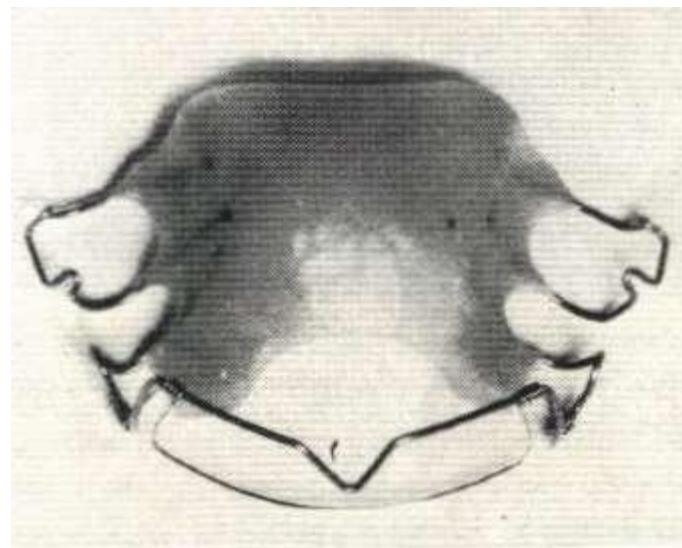
‘U’ loop labial bow

Split labial bow.

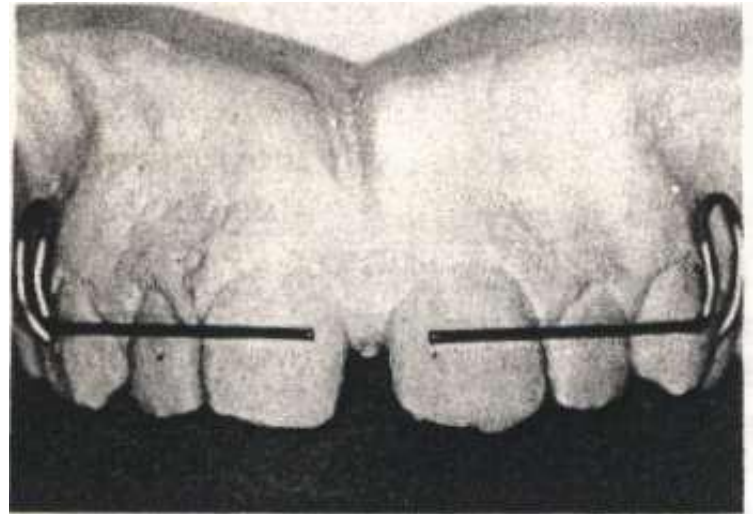
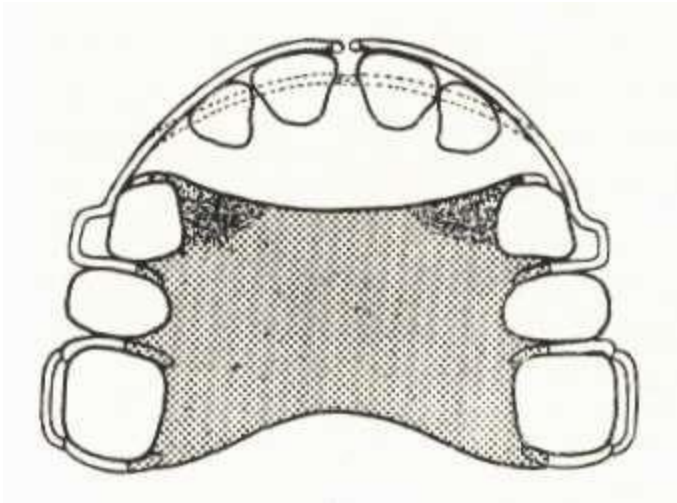
Labial bow with self-straightening spring. (strap spring)

Robert’s retractor.

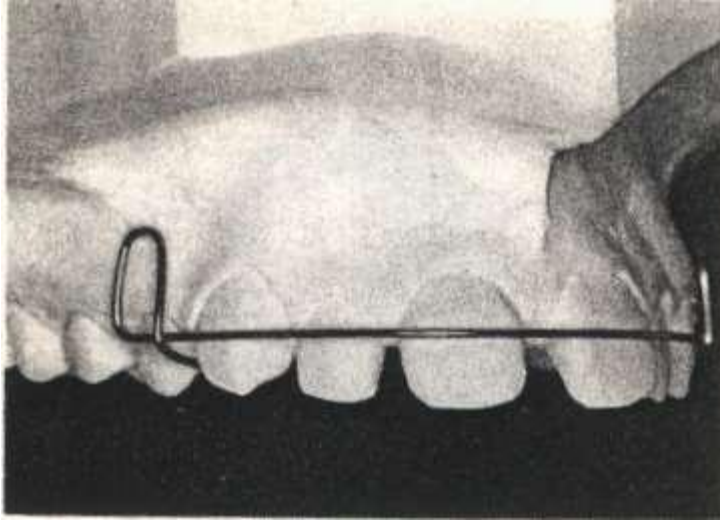
High labial bow with apron springs



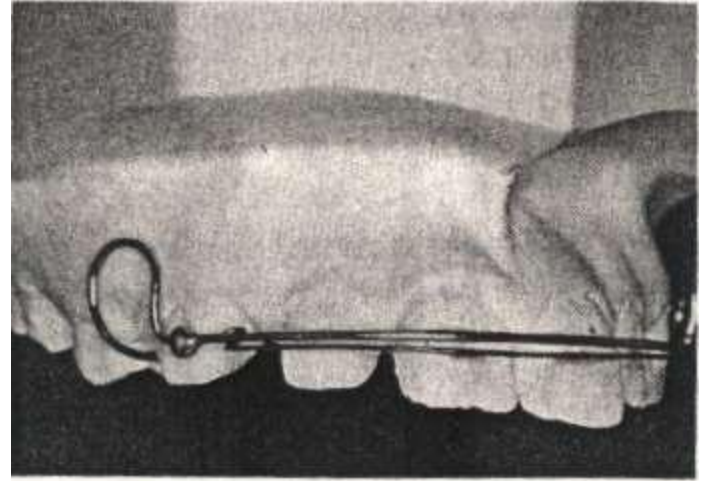
Split labial bow



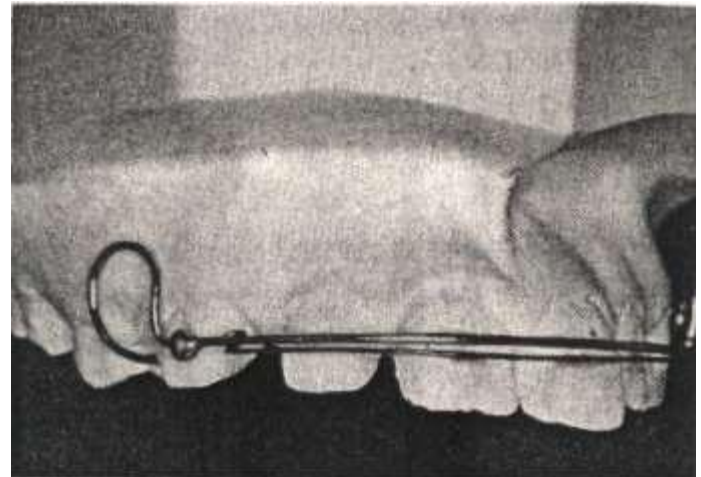
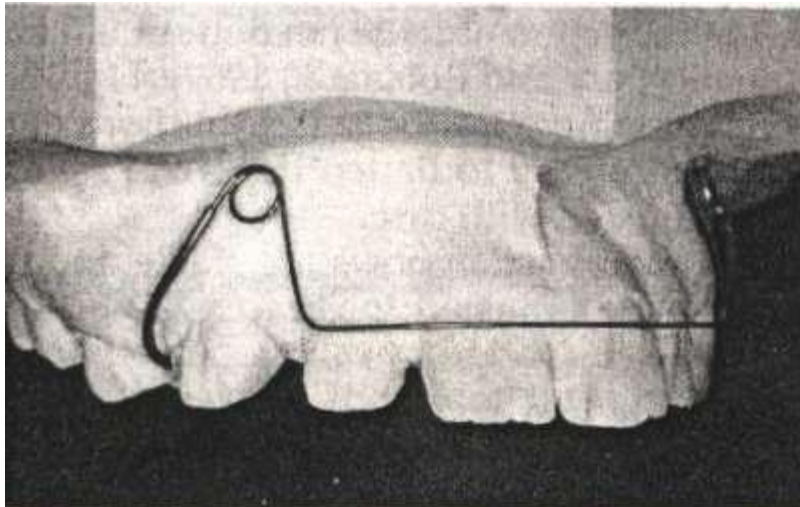
“U” loop labial bow



Labial bow wit strap spring



Labial bows for anterior retraction



III. Base plate.

Made of acrylic usually self-cured.

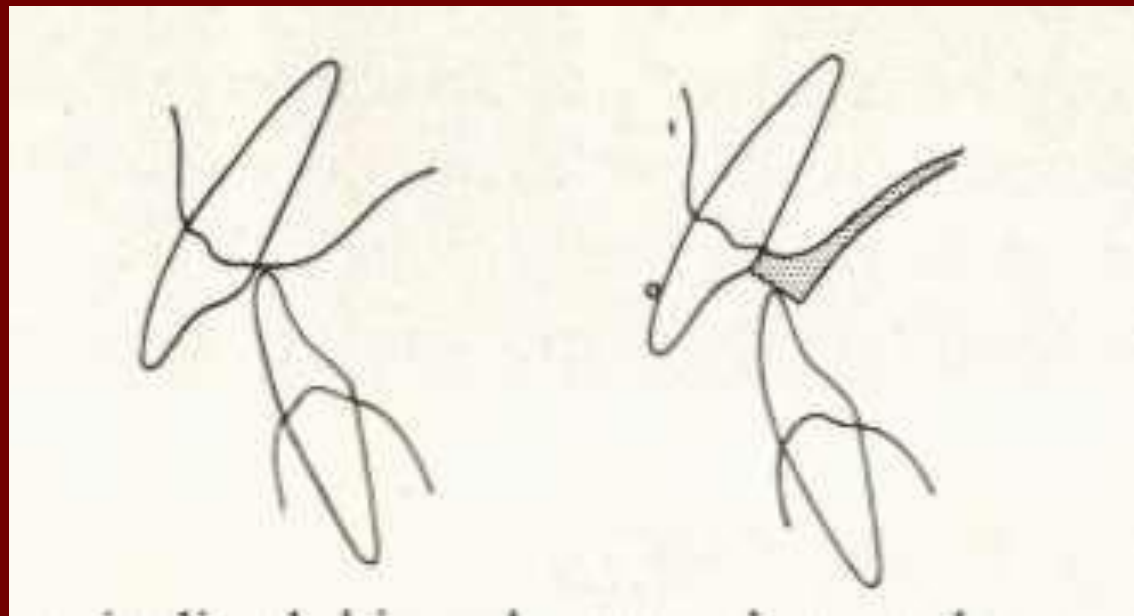
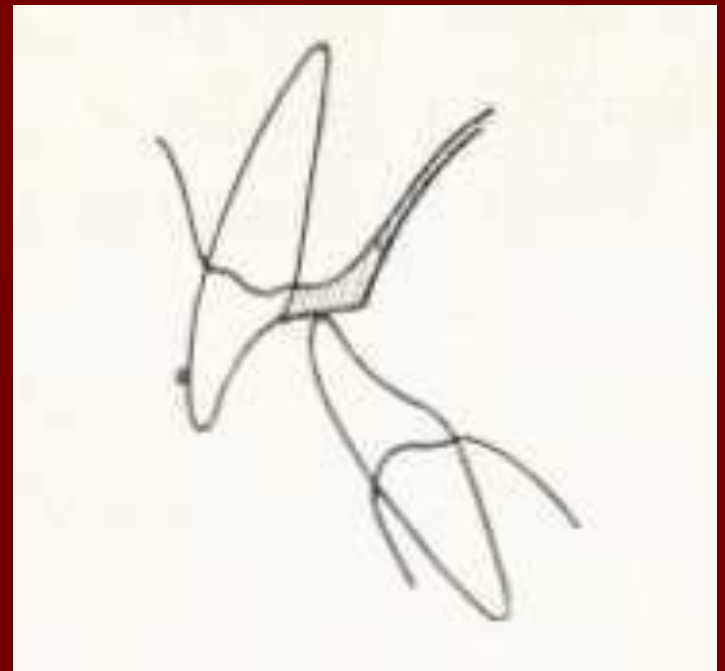
Support, protect and unify the other components of the appliance.

Aid in retention and anchorage by the close fit of the appliance with the mucosa and teeth.

Anterior and posterior bite planes may be added -

- to control tooth eruption in vertical plane.
- to allow the tooth to be moved, free from occlusion.
- to use as an inclined plane.

Inclined bite plane.

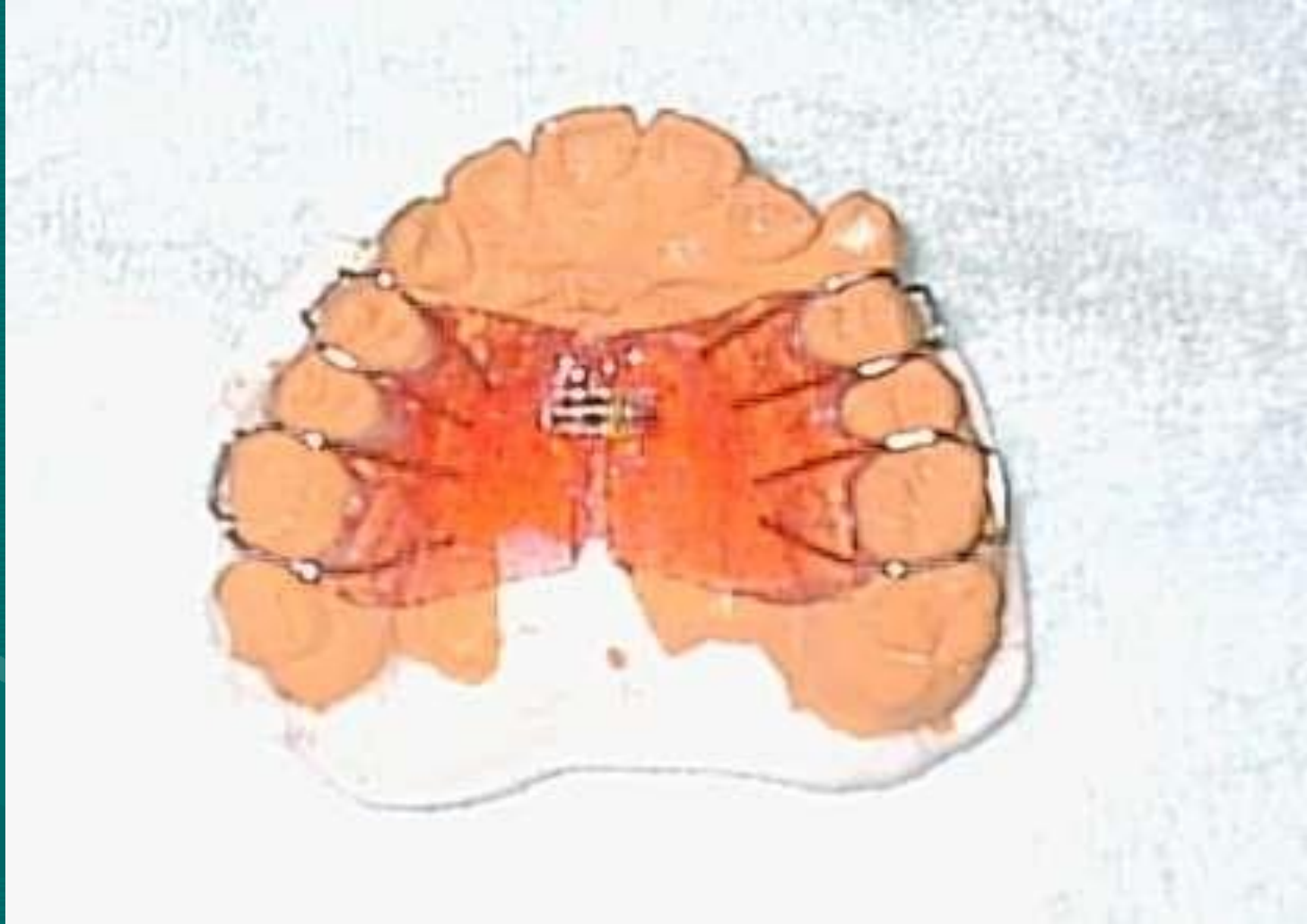


Screws.

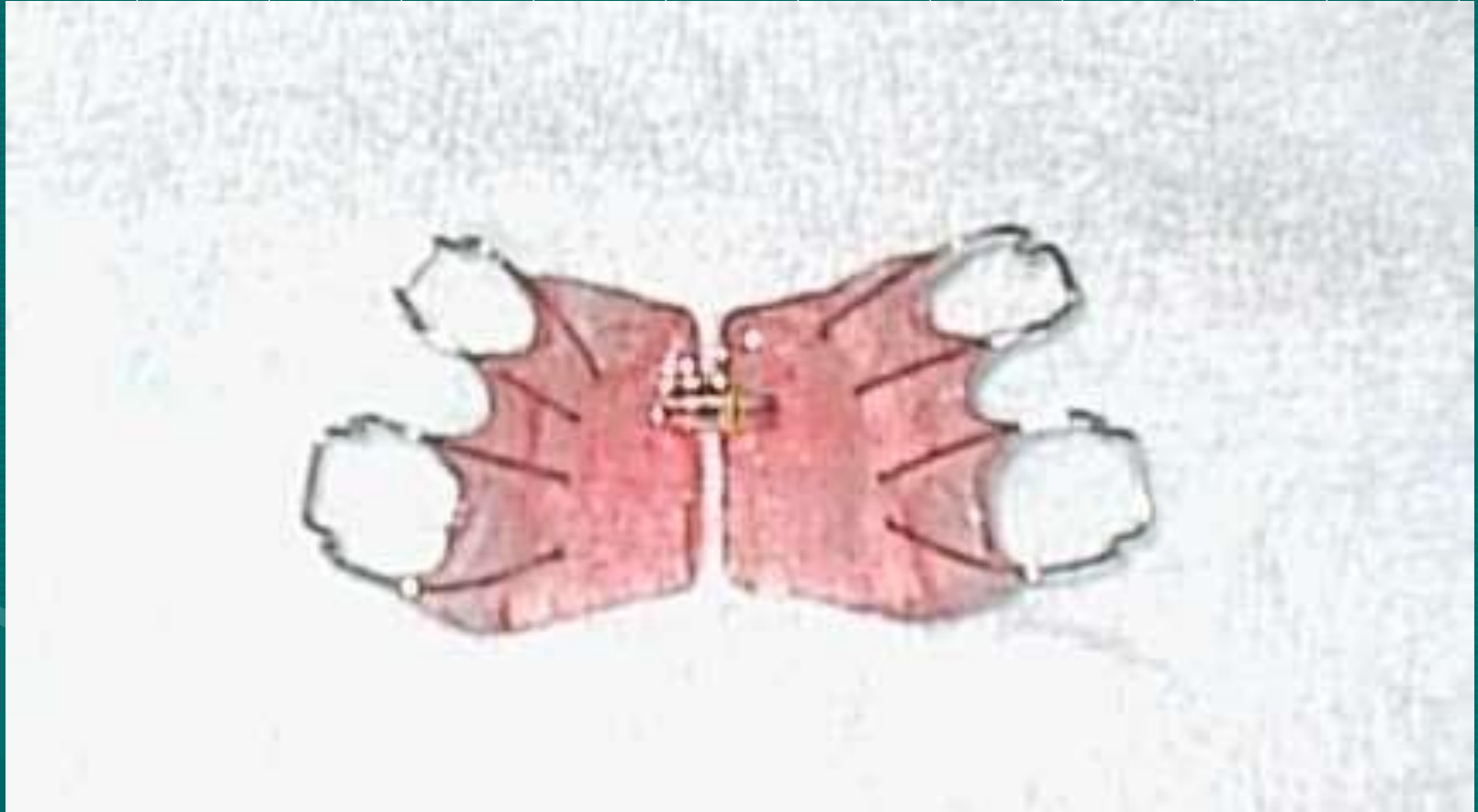
The size and shape is slightly altered from time to time so that when inserted pressure is exerted on a tooth or a group of teeth to move them in desired direction.

- To expand the dental arch laterally or anteriorly.
- To expand the mid-palatal suture.
- May be cemented to the teeth with bands (fixed) or retained by the clasps. (removable)
- Unwound the screw to expand the appliance.
- The appliance should be seated firmly in place to achieve maximum effectiveness.

Screw Appliance



Screw Appliance





Screw appliance



Functional appliances.

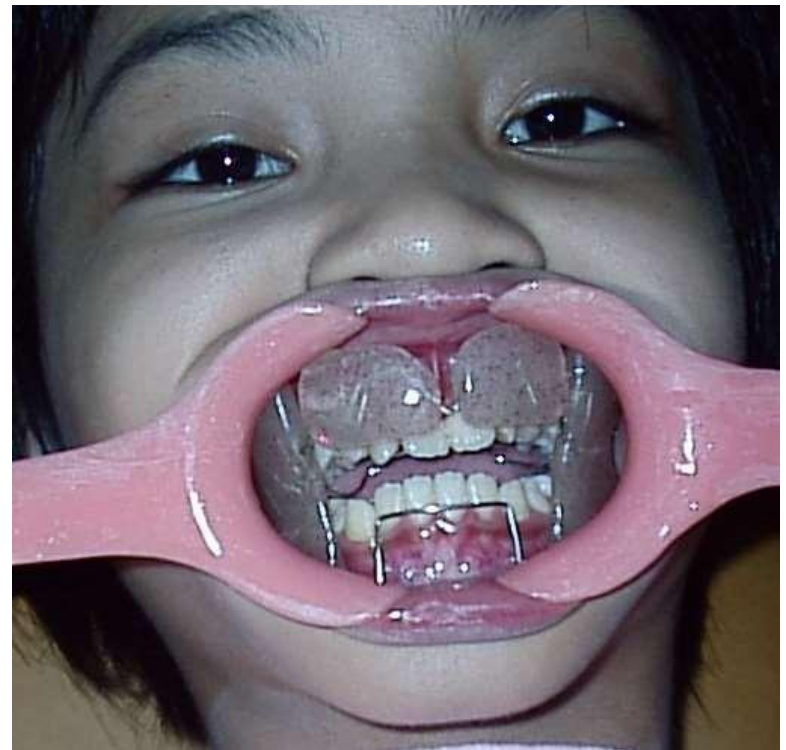
These are loose fitting appliance, the action of which depend upon the activity of the orofacial musculature.

(Function)

Monobloc, Bionator, Andreson appliance.
Frankel appliance

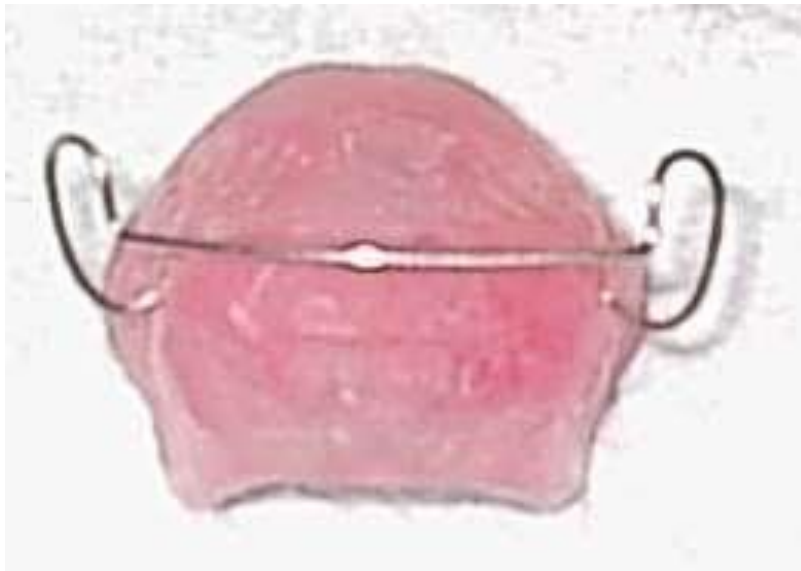
Functional appliance

Frankel (FR III)



Functional appliance

Monobloc



Mechanical principles in appliance design.

Orthodontic tooth movement is produced by an application of force.

When force is applied to the tooth, it tends to move it to a different position in space. In orthodontic appliance force is produced by **the active component**. eg : springs, elastics, labial bow etc.

Equally important is the **retention** of an appliance. The best springs are ineffective if the appliance becomes displaced.

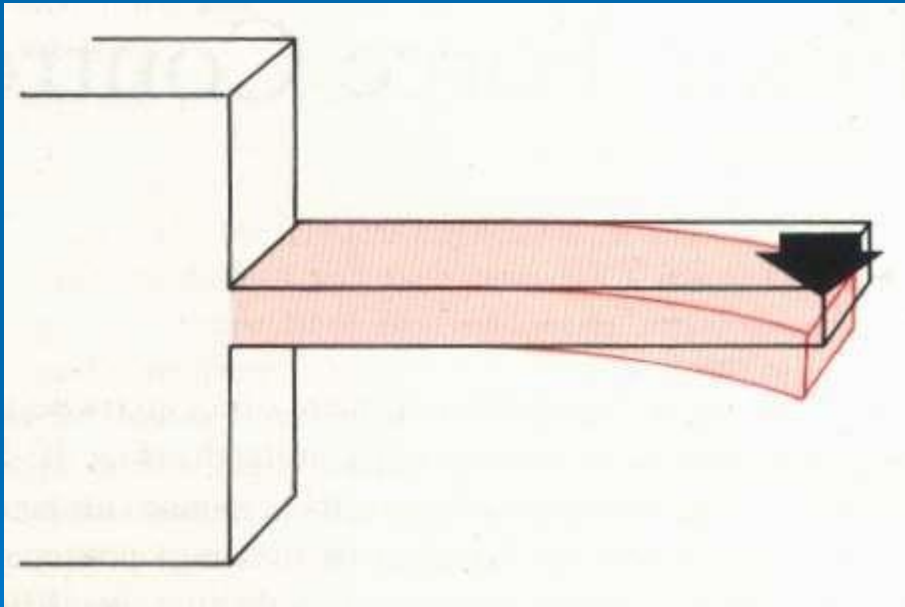
To maximize the desired tooth movement reciprocal effects throughout the dental arches must be analysed, evaluated and controlled. (**Anchorage control**)

■ The design of an orthodontic
■ appliance :
■

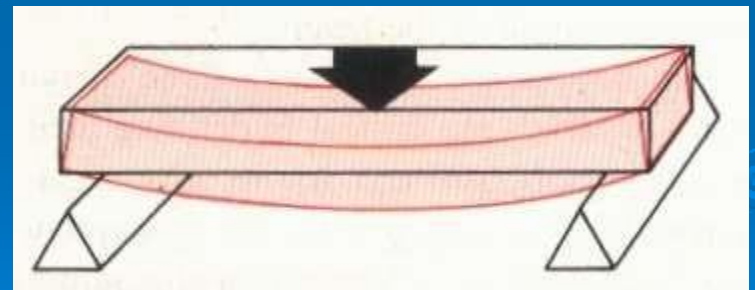
Activating mechanism.

Spring.

Spring can be considered as a beam supported at either or both ends.



Cantilever spring



Supported spring

When load is applied to the spring the wire deformed. The extent of deformation can be expressed as the angle of deflection.

- When the wire is deformed the forces are introduced into the wire. After removal of the load the wire returns to its undeformed state and the force



The magnitude of force released by the wire depends upon :

- applied load
- springiness (stiffness)
- length
- size and shape
- wire type

Addition of coil to a spring

- Lengthen the wire
- Reduce force
- Allow the spring to be able to accommodate in the limited space.

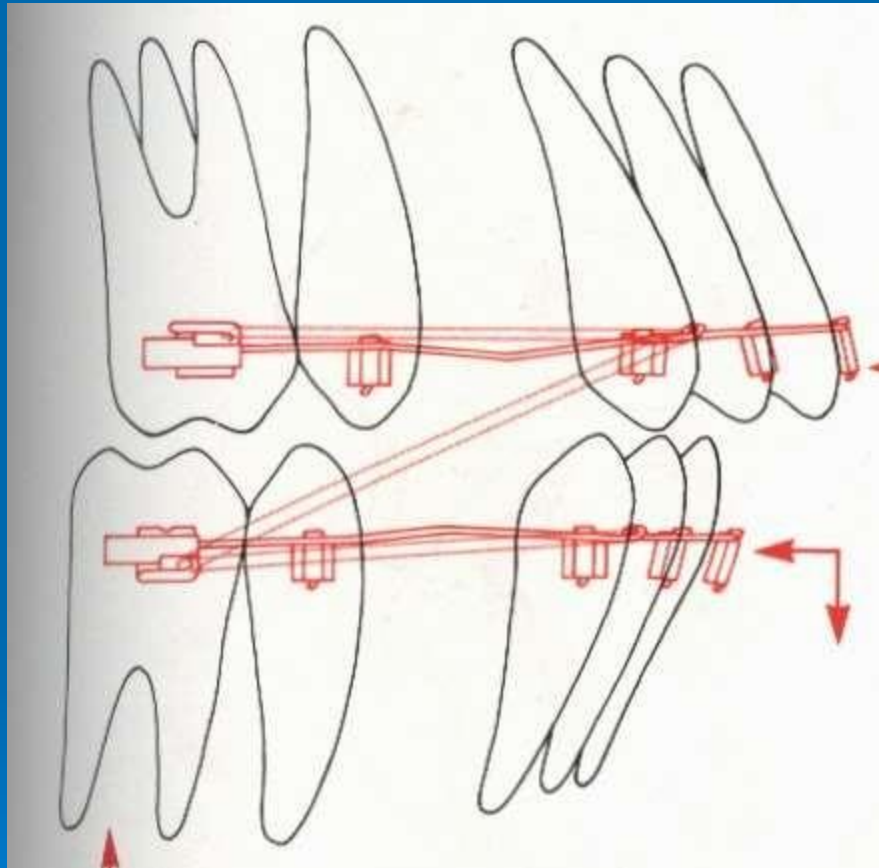
Implants

Provide a secure source of anchorage for orthodontic tooth movement.



Types of anchorage.

- Intramaxillary anchorage.
- Intermaxillary anchorage.
- Extraoral anchorage.
- Simple anchorage.
- Stationary anchorage.
- Compound anchorage. (Reinforced anchorage)



Methods to control anchorage

- Reinforcement

- Subdivision of desire movement

Tipping/ Uprighting

Friction& anchorage control strategies

- Skeletal anchorage

