

REMOVABLE APPLIANCES

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What You Need to Know

- Why use a removable appliance
- Who is involved in fabricating a removable appliance
- Sequence of events in fabrication
- Ideal properties of a removable appliance
- Advantages and limitations of removable appliances
- Principles of design
- Communication
- Wire bending





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Why use a removable appliance

- Simple tipping movements
- Moving only a few teeth at a time
- Less chair-time required
- Relatively cheap; no stock needed
- Oral hygiene is easier
- Damaged appliance is readily removed



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Who is involved in fabricating a removable appliance

- Dentist or Orthodontist
- Dental Technician



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Sequence to follow to fabricate a removable appliance

Dentist

Clinical findings and cast analysis

↓

Treatment plan

↓

Alginate impression → Pour cast

Dental Technician



Sequence to follow to fabricate a removable appliance *

Dentist

Appliance design

communication

Dental Technician

Bend wire elements

↓

Attach wire elements to cast

↓

Fill in undercuts



Sequence to follow to fabricate a removable appliance *

Dentist

Dental Technician

Soak casts

↓

Dry casts

↓

Apply separating medium



Sequence to follow to fabricate a removable appliance *

Dentist

Dental Technician

Form acrylic (salt and pepper technique)

↓

Polymerize in pressure pot

↓

Trim and polish

←

Insert appliance



Sequence to follow to fabricate a removable appliance

Dentist

Adjust clasps and springs

↓

Instruct and motivate patient

↓

Monitor treatment

Dental Technician





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Ideal properties of a removable appliance



- Simple
- Strong
- Good retention
- Allow spontaneous movements
- Long range of action



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Advantages and limitations of removable appliances



Advantages:

- Acrylic can be flattened to form a flat anterior bite plane or buccal capping
- Useful as a passive retainer or space maintainer
- Can be used to transfer forces to blocks of teeth
- Can be removed for tooth brushing
- Palatal coverage increases anchorage
- Can be used for overbite correction in growing children avoiding a lower appliance

Advantages and limitations of removable appliances



Limitations:

- Difficult to move teeth that are unfavorably inclined (tip and torque)
- Difficult to correct rotations
- Difficult to close residual spaces
- Difficult to achieve approximal contacts
- Lower appliances poorly tolerated

Advantages and limitations of removable appliances



Limitations:

- Appliances can be left out
- Only tipping movements possible
- Effects speech
- Good technicians required
- Intermaxillary traction not possible
- Inefficient for multiple individual tooth movements



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Principles of design

Four components need to be considered

- Active Components (springs, bows, screws, elastics etc.)
- Retaining the appliance (clasps bows)
- Anchorage (palate, extraoral)
- Baseplate (palatal acrylic coverage)



Active components

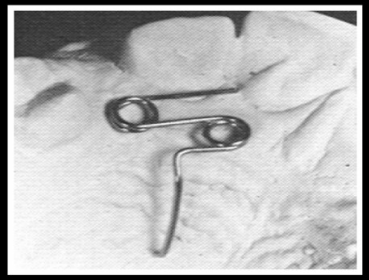
- Springs are the most commonly used active components
- Labial movements of incisors
- Palatal movement (retraction) of incisors
- Mesial/Distal movements of incisors, canines, premolars and molars
- Buccal movements of premolars and molars
- Habit breaking
- Bite opening (anterior bite plane)
- Stabilizing components (proximal spur, occlusal rest)

CONSTRUCTION

Labial movement of incisors

Z-spring

- A small double helices cantilever spring fabricated in 0.5-0.6mm wire
- Needs good anterior retention
- Activated by pulling spring 1-2mm from baseplate at a 45°



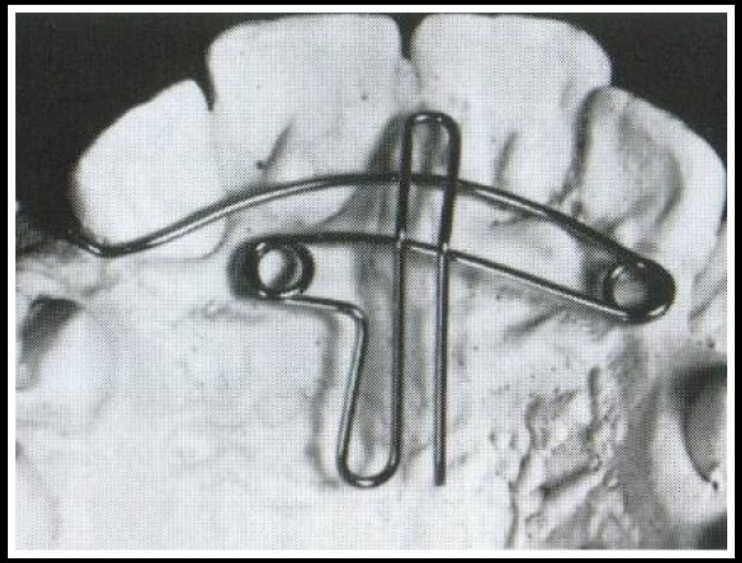


CONSTRUCTION

Labial movement of incisors

Double cantilever spring

- designed to move more than one tooth labially
- fabricated in 0.7-0.8mm wire
- activated by pulling spring 1-2mm from baseplate at a 45°



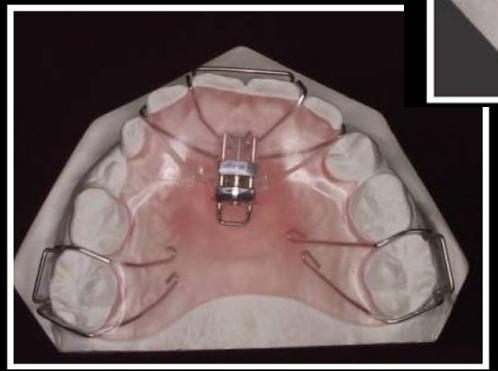
CONSTRUCTION

Labial movement of incisors



Screw

- Can be useful where retention is limited
- Incisors clasped for additional retention
- Bulky
- activated $\frac{1}{4}$ turn every 3-4 days

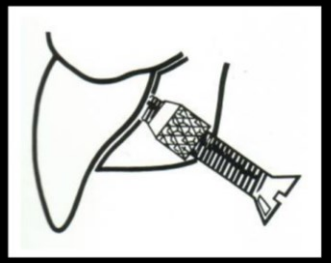


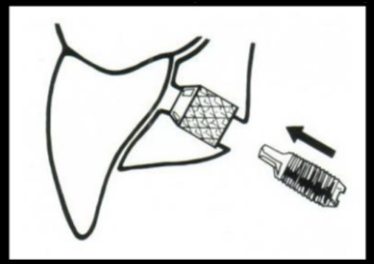
CONSTRUCTION

Labial movement of incisors

Landin screw

- Also called piston screw
- Used to procline one incisor direction determined by placement of screw
- activated turning with flat plastic about 1mm





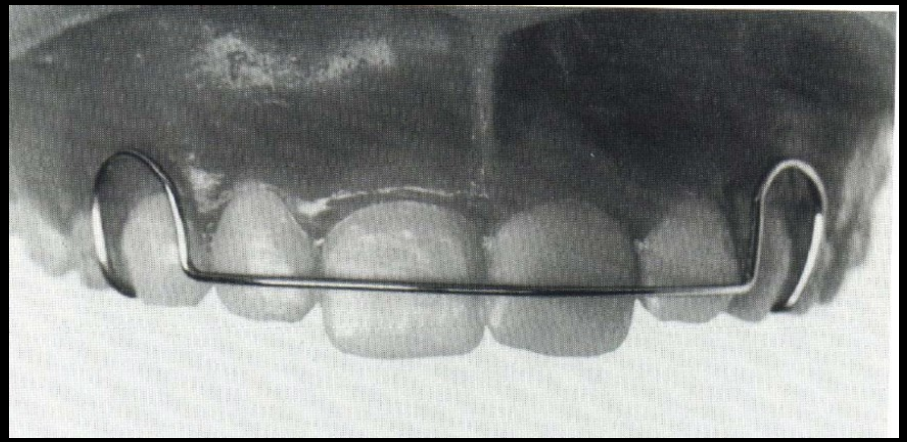




Palatal movement (retraction) of incisors

Labial Bow

- Conventional labial bow can be too stiff for active overjet reduction
- 0.7-0.8mm wire

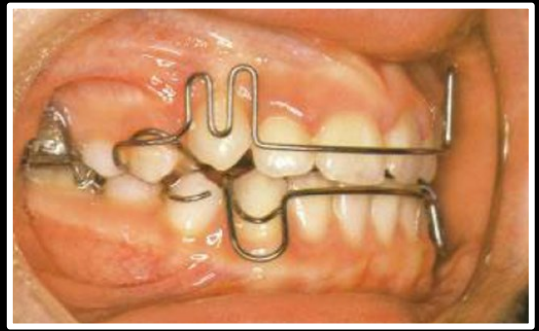


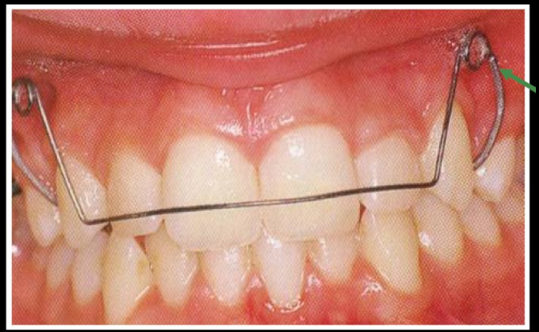
CONSTRUCTION

Palatal movement (retraction) of incisors

Labial Bow Modifications

- Added wire to increase the range of the wire 0.7-0.8mm wire
- Roberts retractor
  - 0.5mm wire with sheathed tubing distal to the helices
  - Useful to retract proclined incisors
  - Need adequate sulcus depth
  - Followed by Hawley retainer

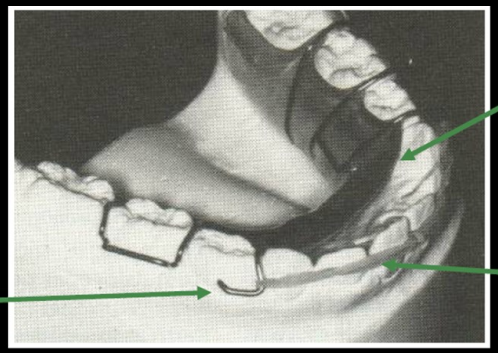




Palatal movement (retraction) of incisors

Elastics

- Popular as less visible to retract to reduce overjet
- Can convert labial bow and bend hooks adjacent to canines
- 5/8" 3.5 oz elastics
- Need to trim palatal of base plate

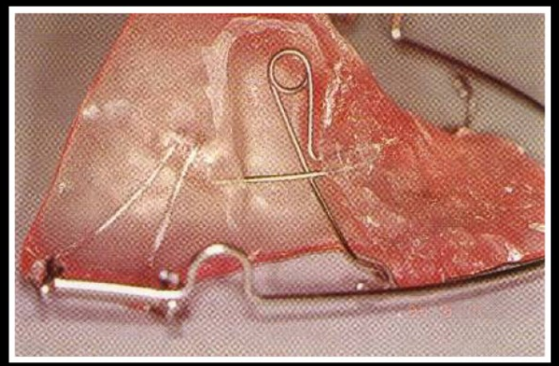


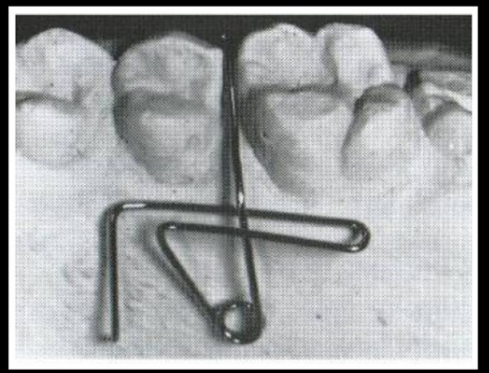
CONSTRUCTION

Mesial/distal movement of incisors, canines, premolars and molars

Palatal Finger Spring

- Activation half a tooth width
- 0.5mm wire



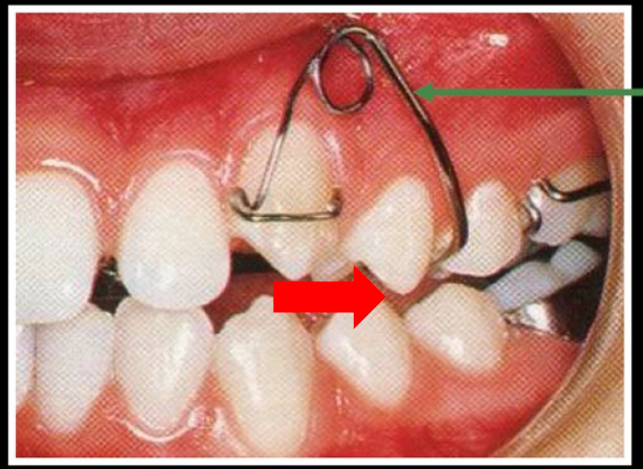


CONSTRUCTION

Mesial/distal movement of incisors, canines, premolars and molars

Buccal Canine Retractor

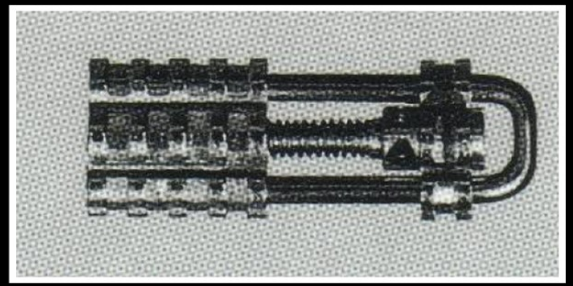
- 0.7mm wire in a tube
- 1.0mm gives optimal retraction force

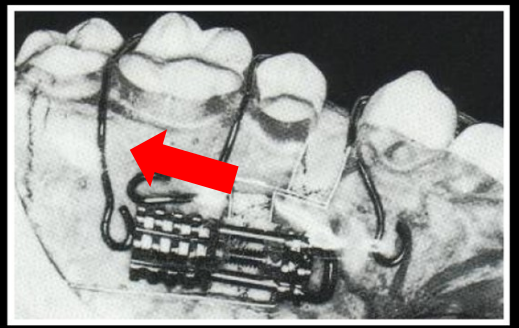


Mesial/distal movement of incisors, canines, premolars and molars

Open Screw

- Used to CLOSE space
- 1 adjustment per week = (0.25mm space closure)





CONSTRUCTION

Mesial/distal movement of incisors, canines, premolars and molars

Small Slow Expansion Screw

- Used to OPEN space
- 1-2 adjustments per week = (0.25-0.5mm space opening)





Buccal movement of premolars and molars

T- Spring

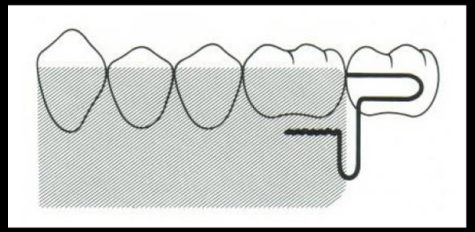
- Used for single molar or premolar
- Requires good retention to resist displacing effect
- Activated by pulling wire away from acrylic at a 45° angle

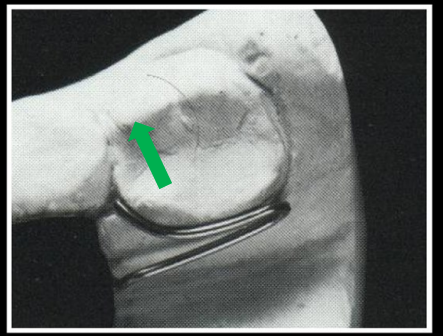


Buccal movement of premolars and molars

Molar spring

- Used for buccal movement of molar
- Activated by bending out towards buccal

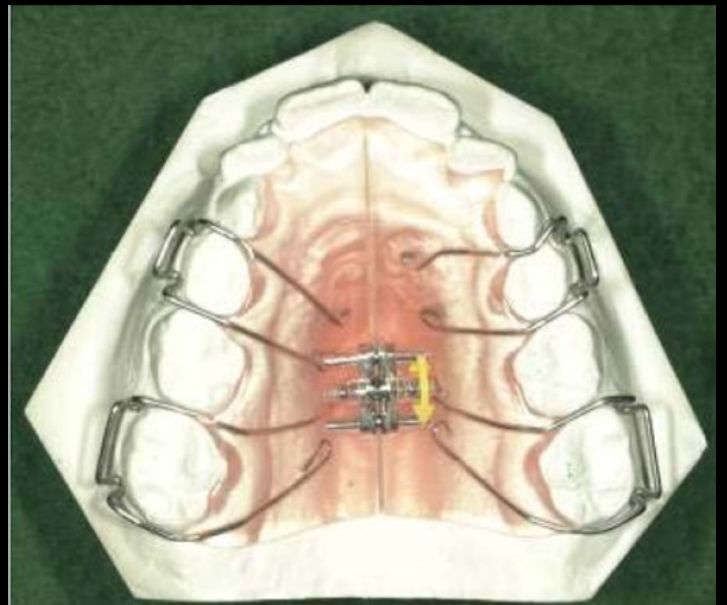




Buccal movement of premolars and molars

Expansion Appliance

- Used for more than one tooth, for example correction of a crossbite by upper arch expansion
- Activated by one adjustment 1-2 times per week
- Posterior bite plate may be necessary to increase anchorage



Buccal movement of premolars and molars

Expansion Appliance

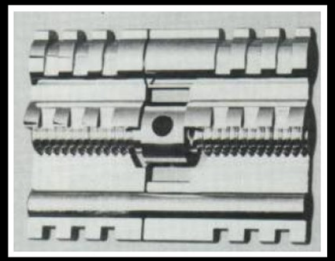
- Can also be used in the lower arch
- Activated by one adjustment 1-2 times per week
- Posterior bite plate may be necessary to increase anchorage
- Not as effective – limited to dental tipping

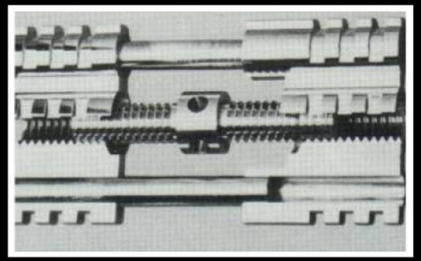




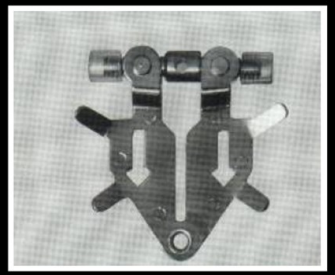
Types of expansion screws

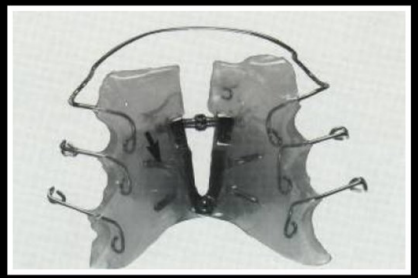
- Symmetrical bilateral expansion screw
- Fan screw





This type gives equal expansion on activation



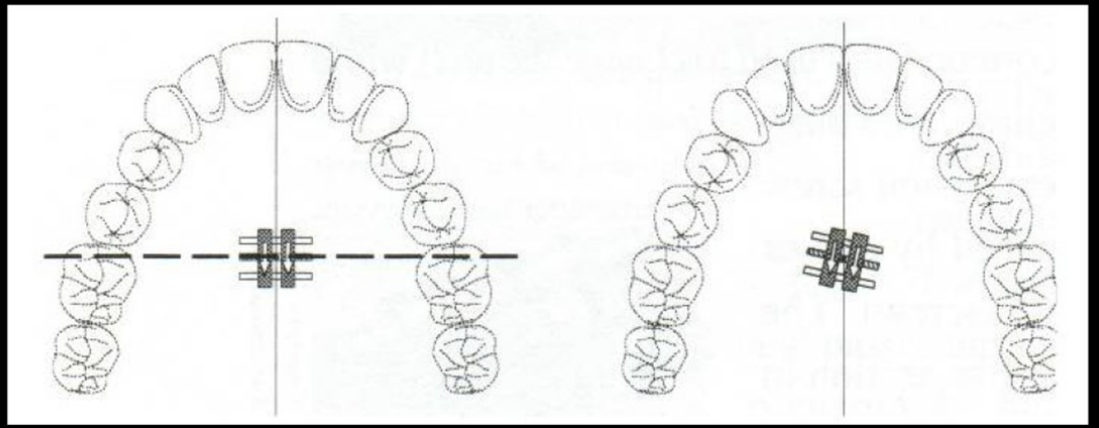


Fan Screw

More expansion anterior/posterior as required

Positioning the screw correctly

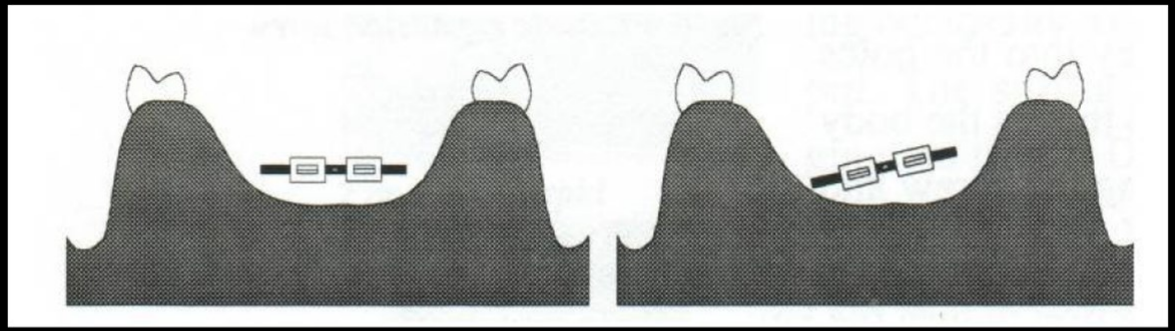
The screw has to be correct in 3 planes of space



Correct **Incorrect**

Positioning the screw correctly

The screw has to be correct in 3 planes of space



Correct

Incorrect

Would result in lifting of the appliance off the right side.

Positioning the screw correctly

The screw has to be correct in 3 planes of space

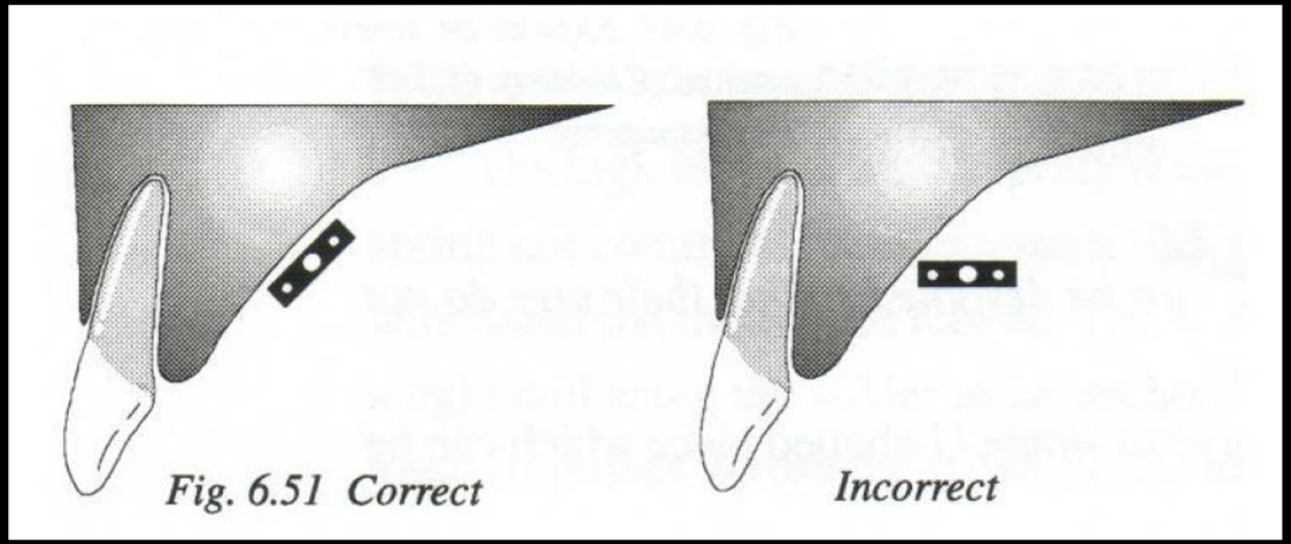
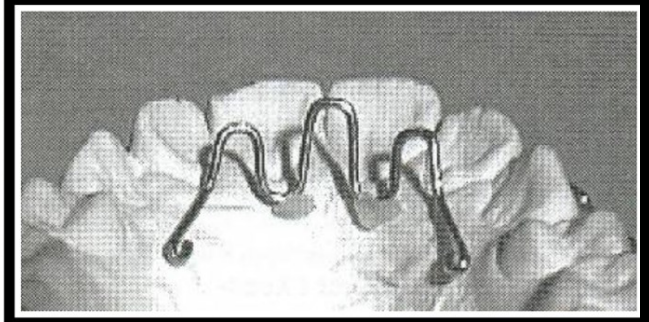


Fig. 6.51 Correct *Incorrect*

CONSTRUCTION

Habit breaking crib(s)





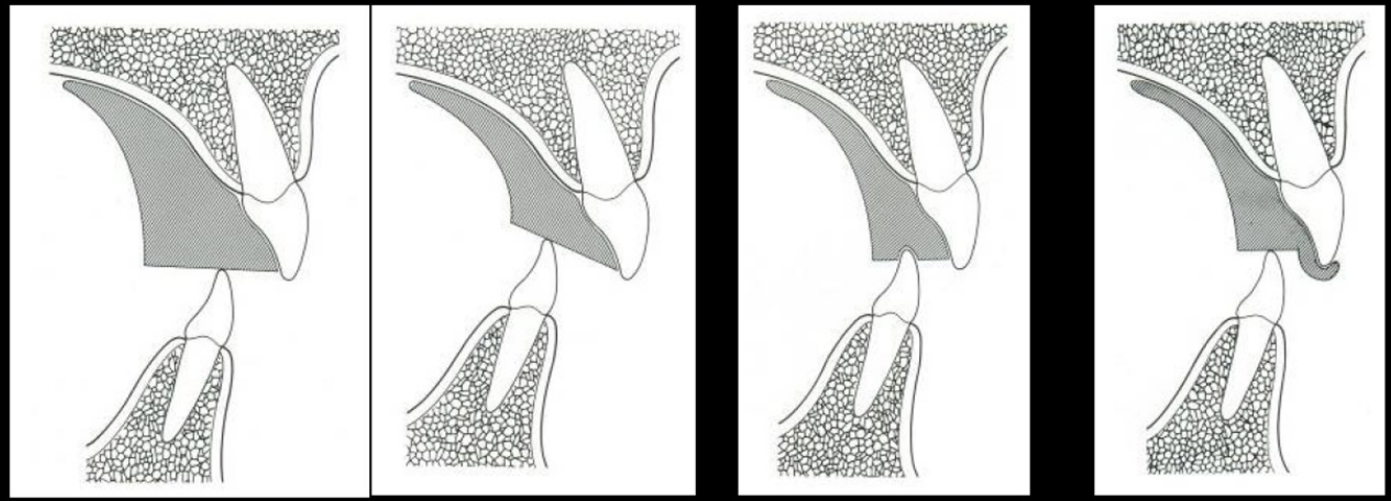
A wire is bent to protrude from the appliance to discourage the child from placement of their digit

CONSTRUCTION

Bite opening

Anterior bite plane

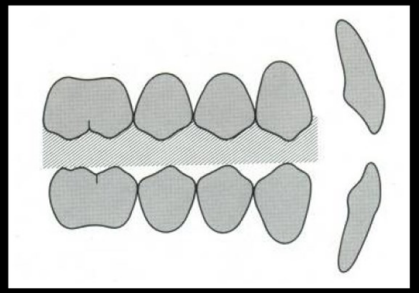
- Correction in the vertical dimension



Bite opening

Posterior bite plane plane

- Correction in the vertical dimension
- Temporarily open the bite so as to allow a tooth that is in crossbite to be proclined
- Control the vertical development of the posterior teeth (can use attachments for headgear – extraoral traction)







Stabilizing components

Proximal spur

- Used to hols space preventing teeth from drifting





Occlusal rest

- Adds stability to the appliance





Retaining the appliance

Retention = What holds appliance in the mouth

- No suction . . . Like full dentures
- Relies on mechanical retention
- That is placing a part of the appliance in an undercut
- Done by various clasps and labial bow
- A properly designed and constructed clasp should be passive and exert no force on the tooth except when the appliance is dislodged



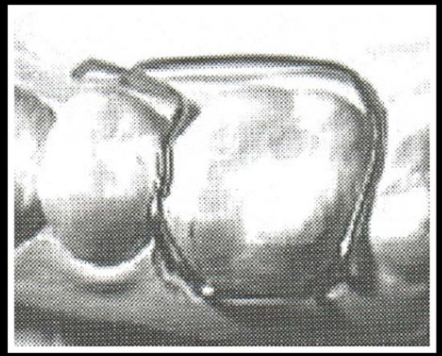
Retaining the appliance

Adams clasp

- Engages undercuts mesial and distal at the buccal surface





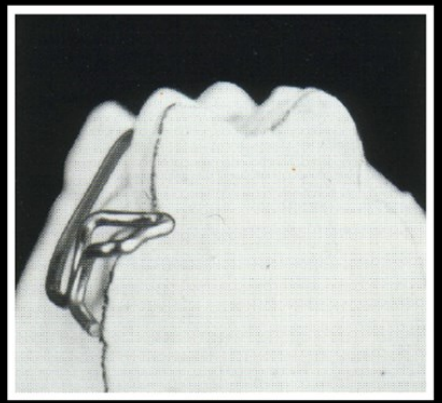


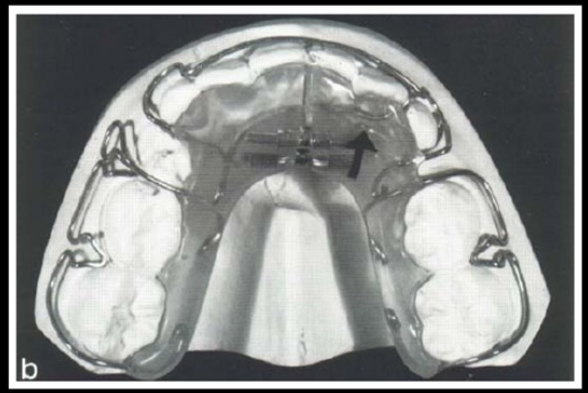


Retaining the appliance

Arrowhead clasp

- Engages undercuts interproximal undercut

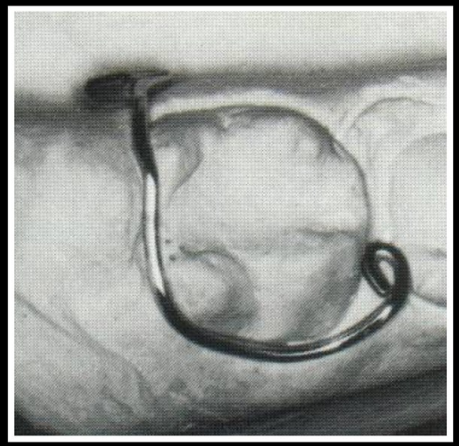




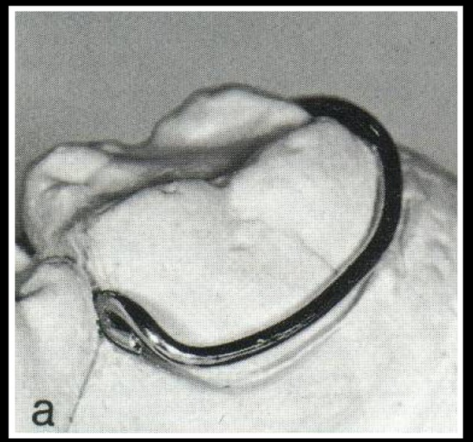
Retaining the appliance

"C" clasp

- Engages undercuts interproximal undercut



HORIZONTAL END

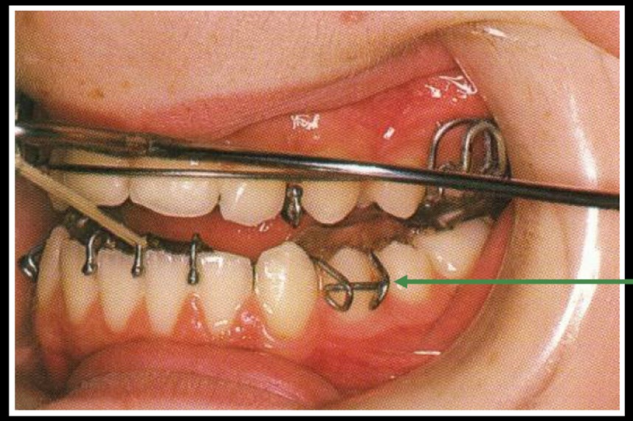


VERTICAL END

Retaining the appliance

Delta clasp

- Engages undercuts interproximal undercut

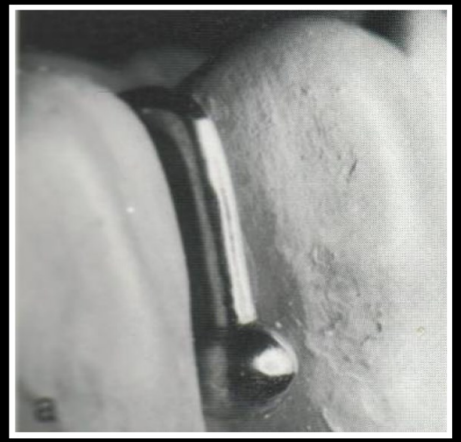


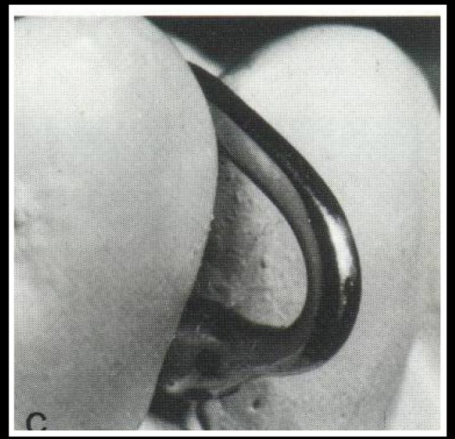


Retaining the appliance

Ball clasp

- Engages undercuts interproximal undercut



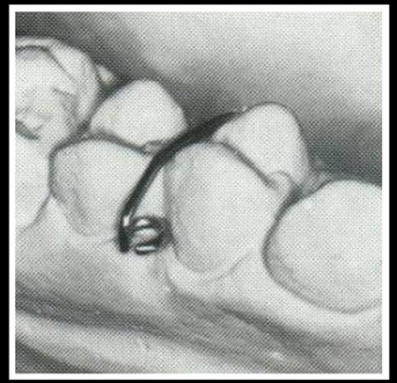


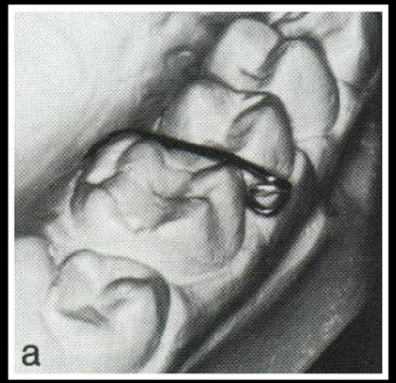
Retaining the appliance

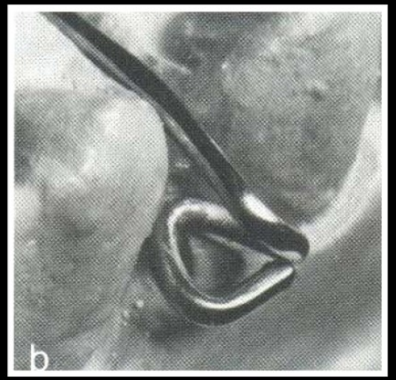
Variations of the Ball clasp

- Engage undercuts interproximal undercut

Eyelet clasp and triangle clasps







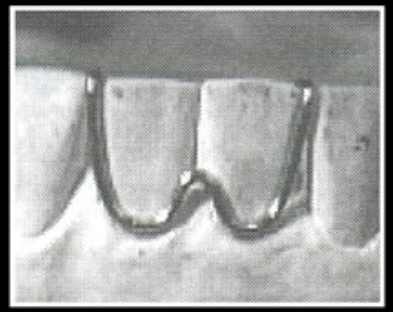
Retaining the appliance



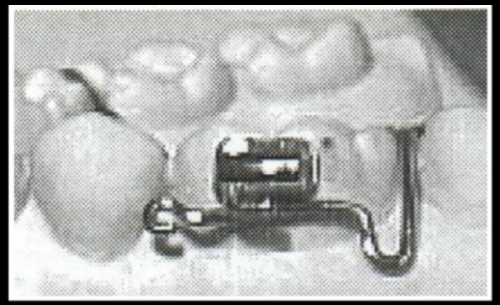
Other clasps

- Engage undercuts interproximal undercut

Townsend Clasp



Other Clasp used when fixed appliances in place





Anchorage

The resistance to unwanted tooth movement

- When we exert force on a tooth, an equal and opposite force is placed on the appliance in the opposite direction.
- This means the unwanted force can move the anchor teeth.
- Therefore when we plan orthodontic tooth movement the reciprocal effects throughout the dental arches must be carefully analyzed, evaluated and controlled.
- The aim is to maximize the desired tooth movement while minimizing the undesirable effects

Anchorage



Ways to improve anchorage

- Incorporate as many teeth as possible to resist the desired movement
- Maximize the coverage by the baseplate.
- Correctly make active components so they work most efficiently (consider point of application, direction and the duration of forces)
- Increase anchorage by the use of inter-maxillary force (elastics) or extra-oral force (headgear)



Anchorage

Baseplate – can be made from:

1) Acrylic with a salt and pepper technique

Or

2) Plastic with a vacuum forming technique.

- Should be extended to maximize anchorage and thick enough to give sufficient strength to prevent fracture
- However should not be too thick as it does overly interfere with speech



Communication

There needs to be good communication between the dentist and the technician to ensure the appliance is made correctly:

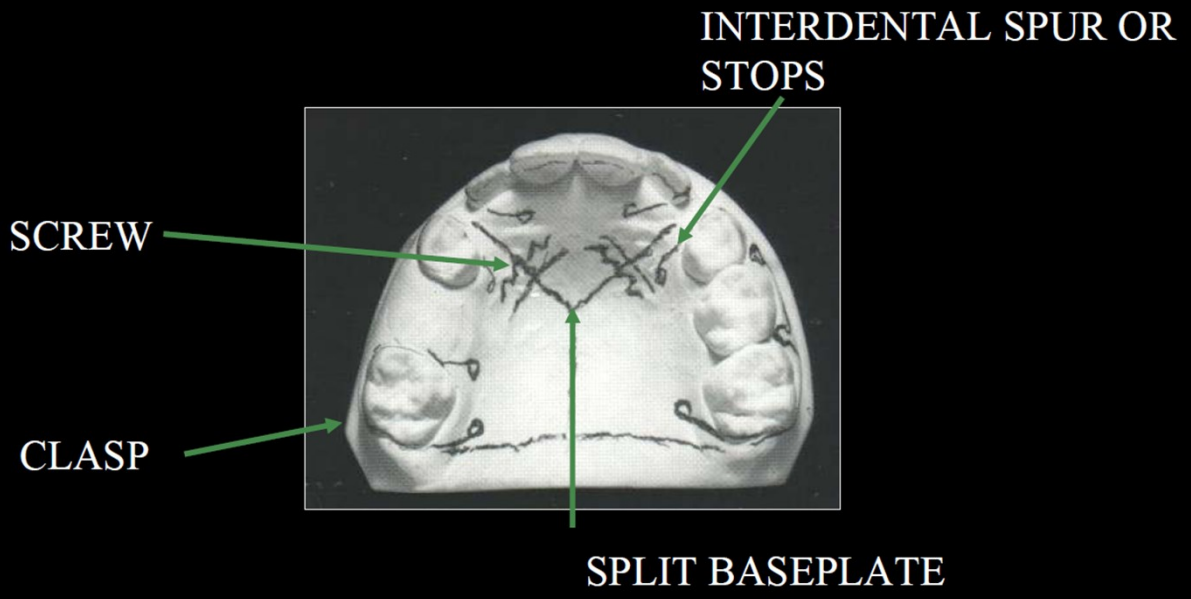
There are two ways to do this:

1) Draw directly onto the cast
2) Complete a prescription form (sheet)



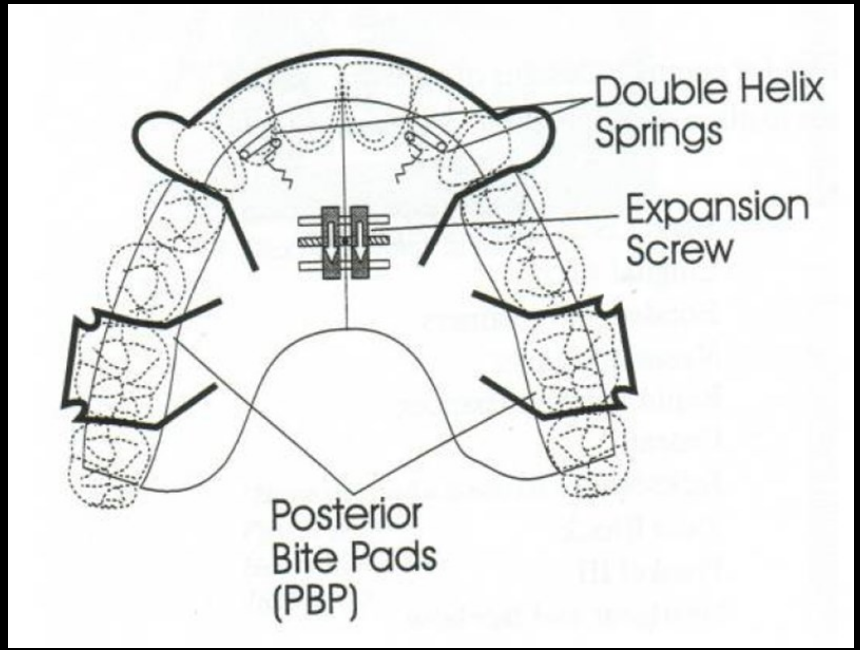
Communication

Draw on the cast:



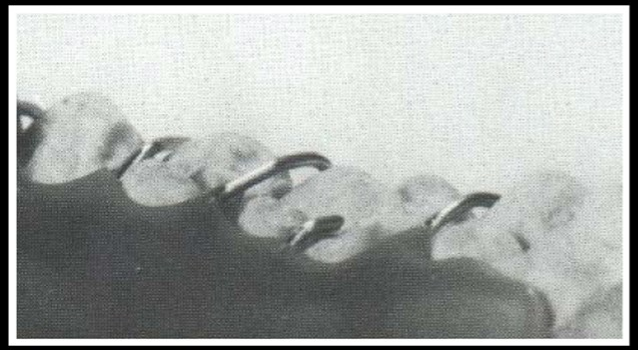
Communication

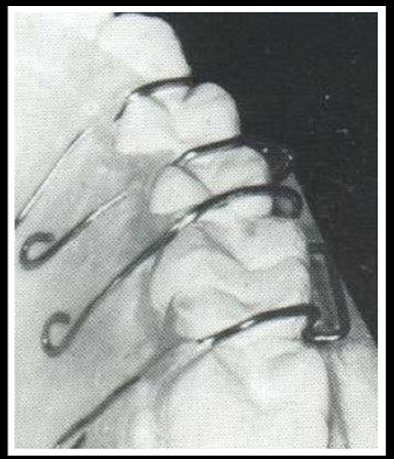
Fill in a prescription sheet:



Common problems in design and fabrication

Failure to adapt the acrylic to the occlusal surface

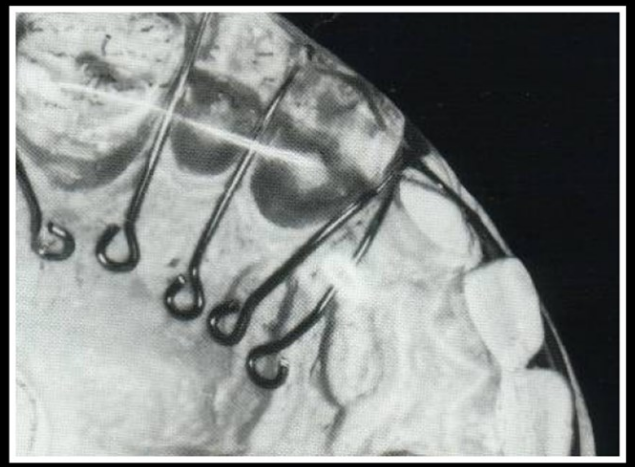


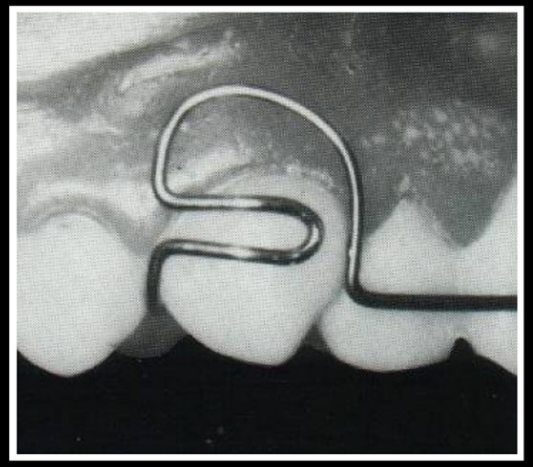




Common problems in design and fabrication

Framework prevents eruption of a tooth

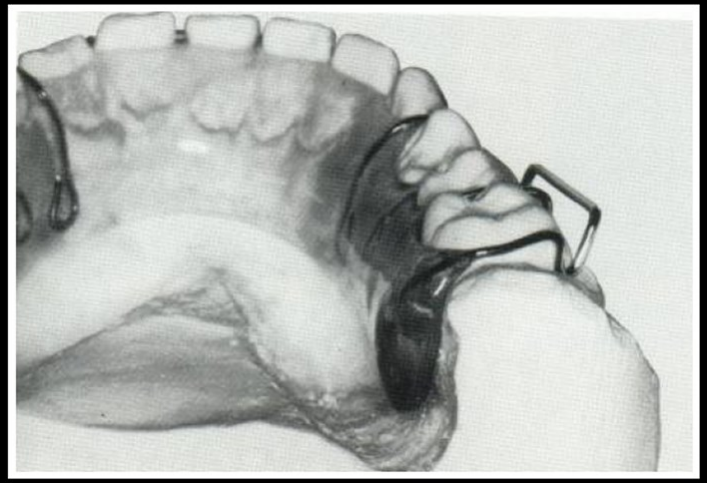






Common problems in design and fabrication

Bridge of the Adams clasp is too large and may interfere with occlusion and be traumatic to the cheek



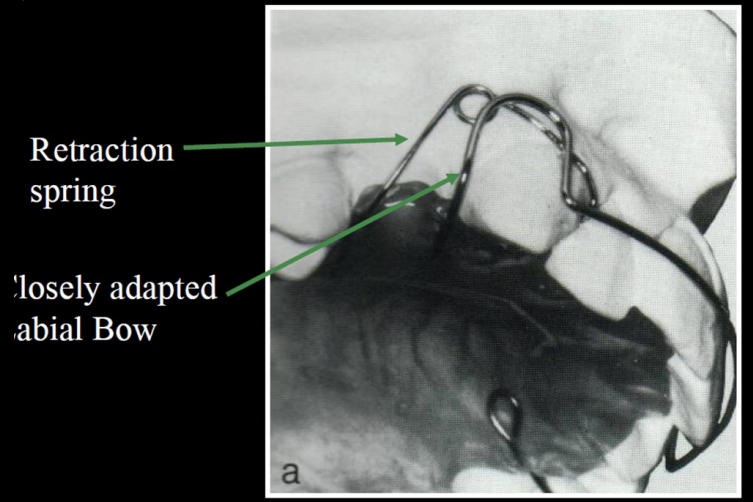


Common problems in design and fabrication

Interference with two aspects of design

- For example the labial bow will prevent retraction of the canine

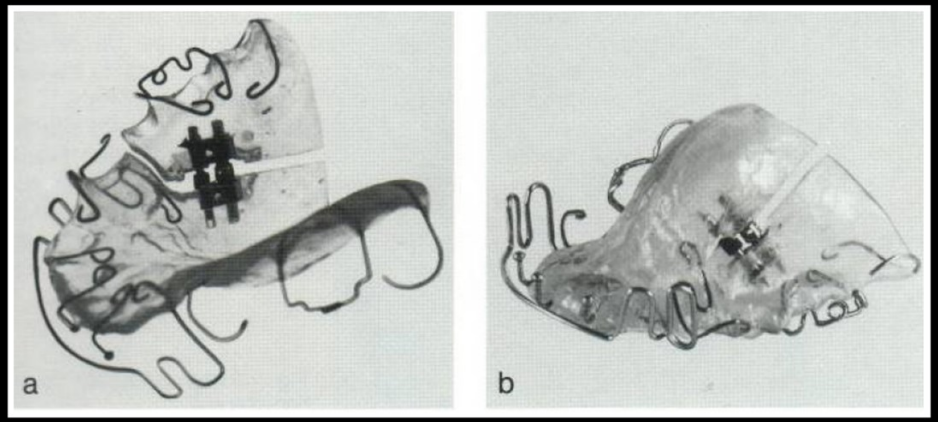




Common problems in design and fabrication

Failure to position the screw correctly

- For example the screw is placed vertically and will just displace the appliance







WIRE BENDING

J. Mike Razza Orthodontics
University of Western Australia - Dental School



What You Need to Know

- Why use a removable appliance
- Who is involved in fabricating a removable appliance
- Sequence of events in fabrication
- Ideal properties of a removable appliance
- Advantages and limitations of removable appliances
- Principles of design
- Communication
- Wire bending



Wire Bending

Ideal properties of wire for removable appliances:

- Strength to withstand deformation
- Constant force over wide arch of deflection
- High resilience (energy for tooth movement)
- Biocompatible and environmentally stable
- Formable so can bend into hooks
- Joinable (weld or solder)
- Low cost



Wire Bending

What type of wire do we use?

18-8 Stainless steel:

- An alloy of Iron and Carbon
- 18-8 indicates there is 18%Chromium and 8% Nickel with 71% Iron and 0.15% Carbon
- Chromium forms an oxide layer which is in effect what makes stainless steel stainless



Wire Bending

Properties of Stainless steel:

- Large ***Modulus of Elasticity / High stiffness***
- Resists deformation
- Produces high forces for small deflection
- Requires frequent activations



Wire Bending

Properties of Stainless steel:

- **Work hardening**
  - The more the wire is bent the more its hardness increases
  - Excessive bending will break the wire due to fatigue
  - Therefore if it has taken many bends to adapt the wire start again as it may break in the mouth which will require a replacement appliance



Wire Bending

Properties of Stainless steel:

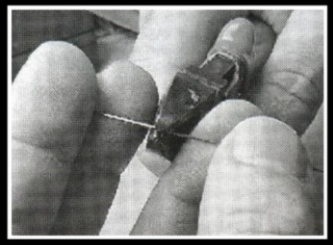
Can be soldered

Stainless steel should never be heated to a point where it glows red hot (sensitive to heat in the range of 700-800˚C)

1) It will loose its temper and become annealed, which significantly softens the wire.
2) The carbon and Chromium combine and are deposited at the grain boundaries causing the metal to become brittle with reduced resistance to corrosion.



Wire Bending



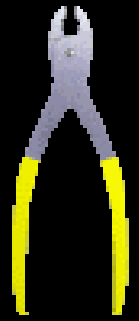
BASIC WIRE BENDING RULES:

- Hold both ends as small cut-offs can fly across the room.
- If the cut-off is too short to hold, then place lab cutters against something to control the cut piece to ensure it doesn't hit anyone.
- Wear safety glasses at all times.





Wire Bending

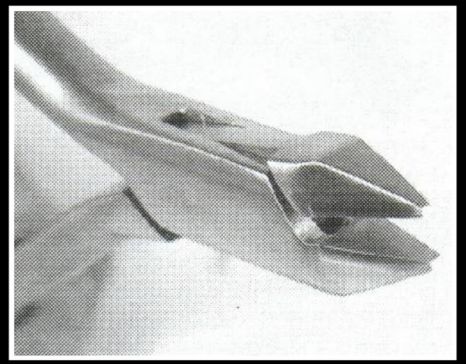


BASIC WIRE BENDING RULES:

- Pliers are used to hold the wire, like a vice.
- Do not use the pliers to apply force that bends the wire as it results in excessive wear and possible damage of the pliers.
- The forces to bend the wire applied by the fingers and thumb.

Wire Bending





Types of Pliers:

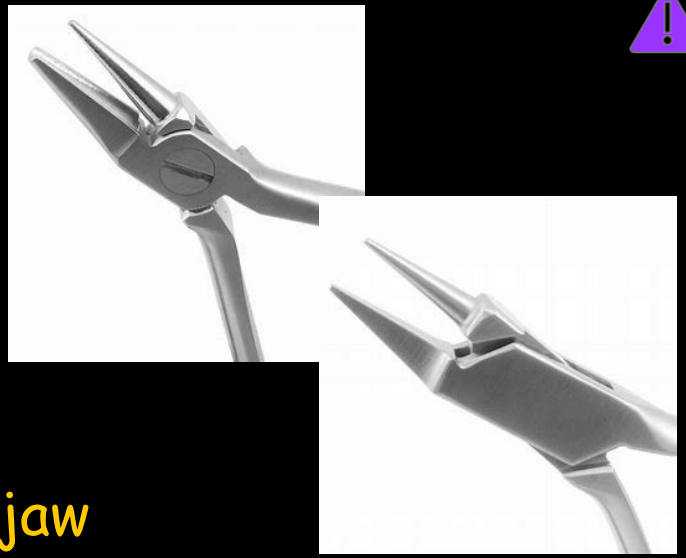
Adams Pliers or (Square jaw)

- Two square jaws terminating at a 1mm square tip
- Available in a number of sizes to bend wire from sizes light to heavy.
- Can be used to place torqueing bends.

Wire Bending

Types of Pliers:

Loop or Spring Forming pliers



- One square one round jaw
- Available in a number of sizes to bend wire from sizes light to heavy.
- The stepping allows you to form uniform loops of various sizes.
- Pressing too hard will leave nicks in the wire.

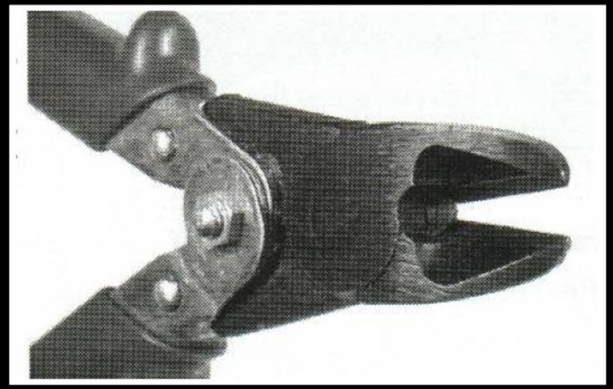


Wire Bending

Types of Pliers:

Wire Cutters

- Orthodontic wire cutters have a hardened tip to cut all materials easily.





Wire Bending

Other Pliers:

See additional power point slide presentation on LMS labeled *Orthodontic Instrumentation*





At the end of this course you DO NOT have the didactic knowledge or clinical skills to treat comprehensive orthodontic cases.