

Passive
appliances

removable

orthodontic

- Space maintainer
- Retainers
- Habit breaker

□ Space maintainer

Removable appliances are also utilized in a passive role as **space maintainers** following permanent tooth extractions and also as retaining appliances following fixed appliance treatment.



Retainers

Removable retainers

Essix (invisible retainer)



Hawley retainer)



□ Habit breaker



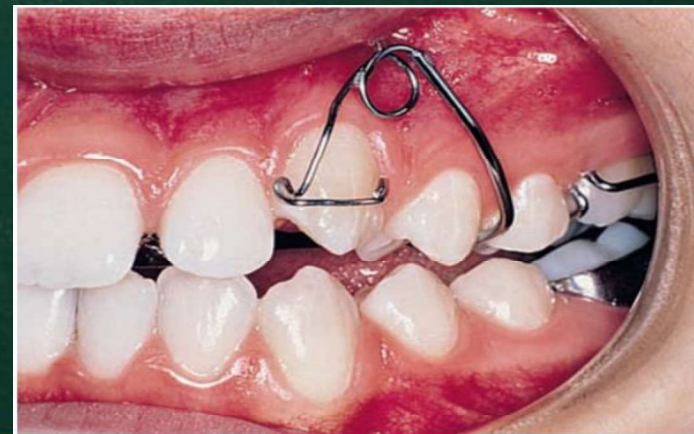
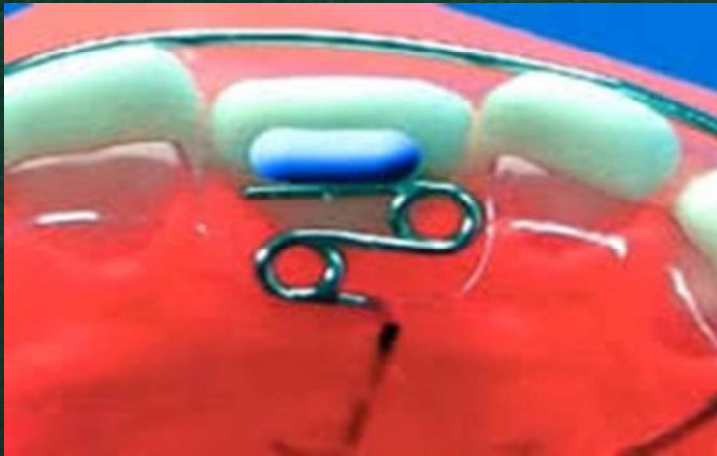
Components of removable appliances

1. **Active component:** Springs, labial bows, screws, and elastics.
2. **Retentive components:** Clasps and bows.
3. **Anchorage:** achieved from acrylic baseplate & retentive components.
4. **Baseplate (acrylic):** Forms the framework and also provides anchorage.

active component

Springs

Springs are the most commonly used active component. Their design can readily be adapted to the needs of a particular clinical situation and they are inexpensive. However, a skilled technician is required to fabricate a spring that works efficiently with the minimum of adjustment on fitting.



active component

Springs

The expression for the force F exerted by an orthodontic spring is according to the following formulae :

$$f \propto \frac{r^4 \cdot d}{l^3}$$

1. f = force
2. r = radius
3. d = deflection
4. l = length

where d is the deflection of the spring on activation, r is the radius of the wire and l is the length of the spring.

active component

spring

Wire Dimension and Force of the Appliance

- ❑ Doubling the diameter of the wire increases the force or stiffness by 16 times.
- ❑ Doubling its length reduces the force by eight times.
- ❑ The deflection for a given load is proportional to the third power of the length of the spring and inversely to the fourth power of its diameter.
- ❑ Incorporation of a coil increases the effective length of the spring and thereby increases the deflection

active component

spring

Thus even small changes in the diameter or length of wire used in the construction of a spring will have a profound impact upon the force delivered,

It is obviously desirable to deliver a light (physiological) force over a long activation range, but there are practical restrictions upon the length and diameter of wire used to construct a spring.

active component

spring

The span of a spring is usually constrained by the **size of the arch or the depth of the sulcus**. However, incorporating a **coil into** the design of a spring **increases the length** of wire and therefore results in the application of a **smaller force** for a given deflection.

spring

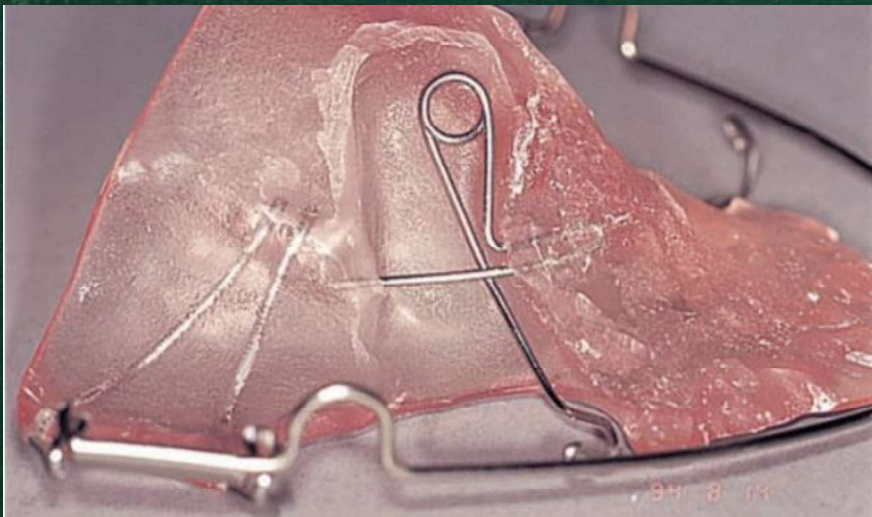
active component

A spring with a coil will work more efficiently if it is activated in the direction that the wire has been wound so that the coil unwinds as the tooth moves.

In practice the smallest diameter of wire that can be used for spring construction is 0.5 mm. However, wire of this diameter is liable to distortion or breakage and therefore some designs are protected by acrylic e.g. the palatal finger spring or strengthened by being sleeved in tubing.

active component

spring



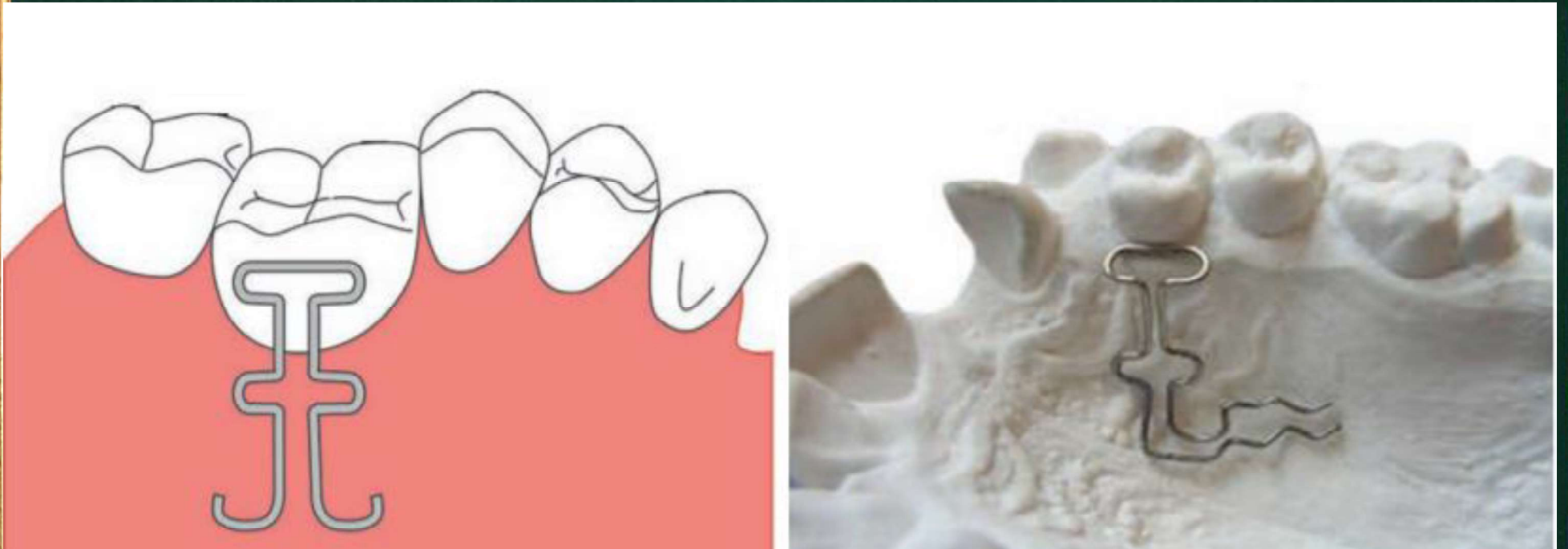
Palatal finger spring. Note that the spring is boxed in with acrylic and a guard wire is present to help prevent distortion



Buccal canine retractor (distal section sleeved in tubing).

T Spring

Alternative to Z spring



active component

Screws

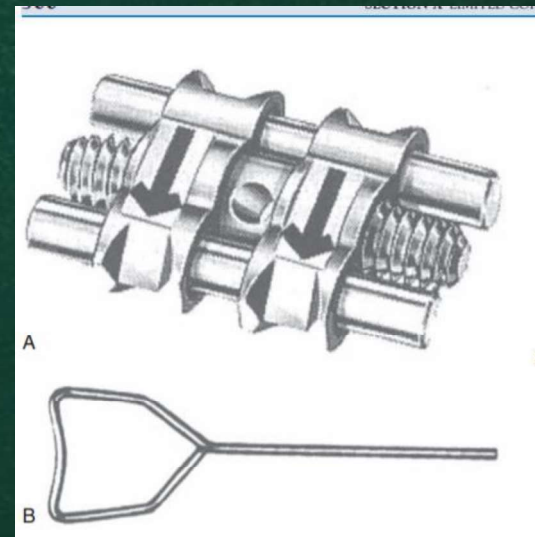
Screws are less **versatile** than springs, as the direction of tooth movement is determined by the position of the screw in the appliance. They are also **bulky and more expensive**. This is helpful when a number of teeth are to be moved together for example in an appliance to expand the upper arch or in the mixed dentition where retaining an appliance is always difficult.



Screws

The most commonly used type of screw consists of two halves on a threaded central cylinder turned by means of a key which separates the two halves by a predetermined distance, usually about **0.25 mm** for each quarter turn.

Activation of the screw: One quarter-turn opens the two sections of the appliance by 0.25 mm



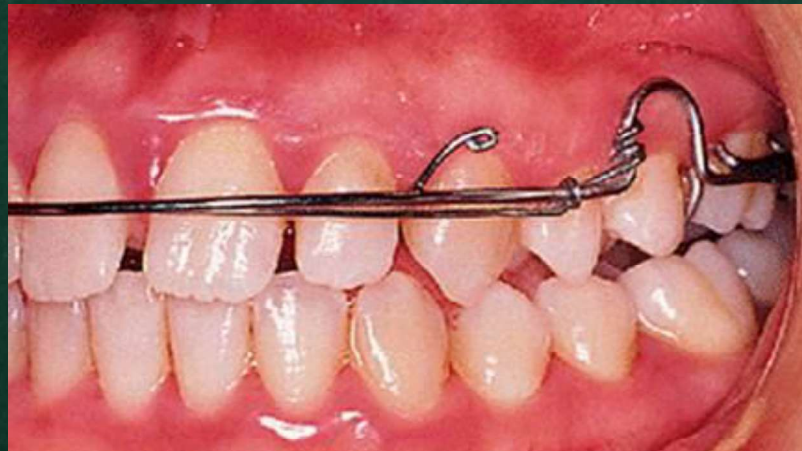
Activation of a screw is **limited by the width of the periodontal ligament**, as to exceed this would result in crushing the ligament cells and cessation of tooth movement

active component

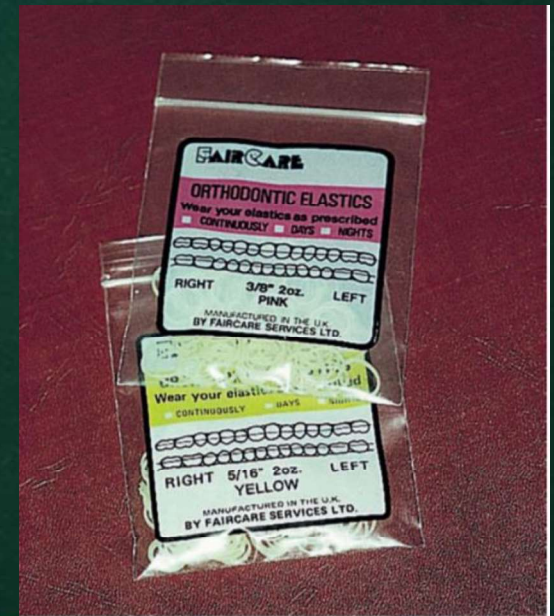
Elastics

Special intra-oral elastics are manufactured for orthodontic use. These elastics are usually classified by their size and the force that they are designed to deliver

Selection of the appropriate size and force is based upon the **root surface area** of the teeth to be moved and the **distance over which the elastic is to be stretched**. The elastics should be changed every day. Latex-free alternatives are now widely available.



Modified removable palatal appliance with elastic hooks substituted for labial bow to retract maxillary incisors.



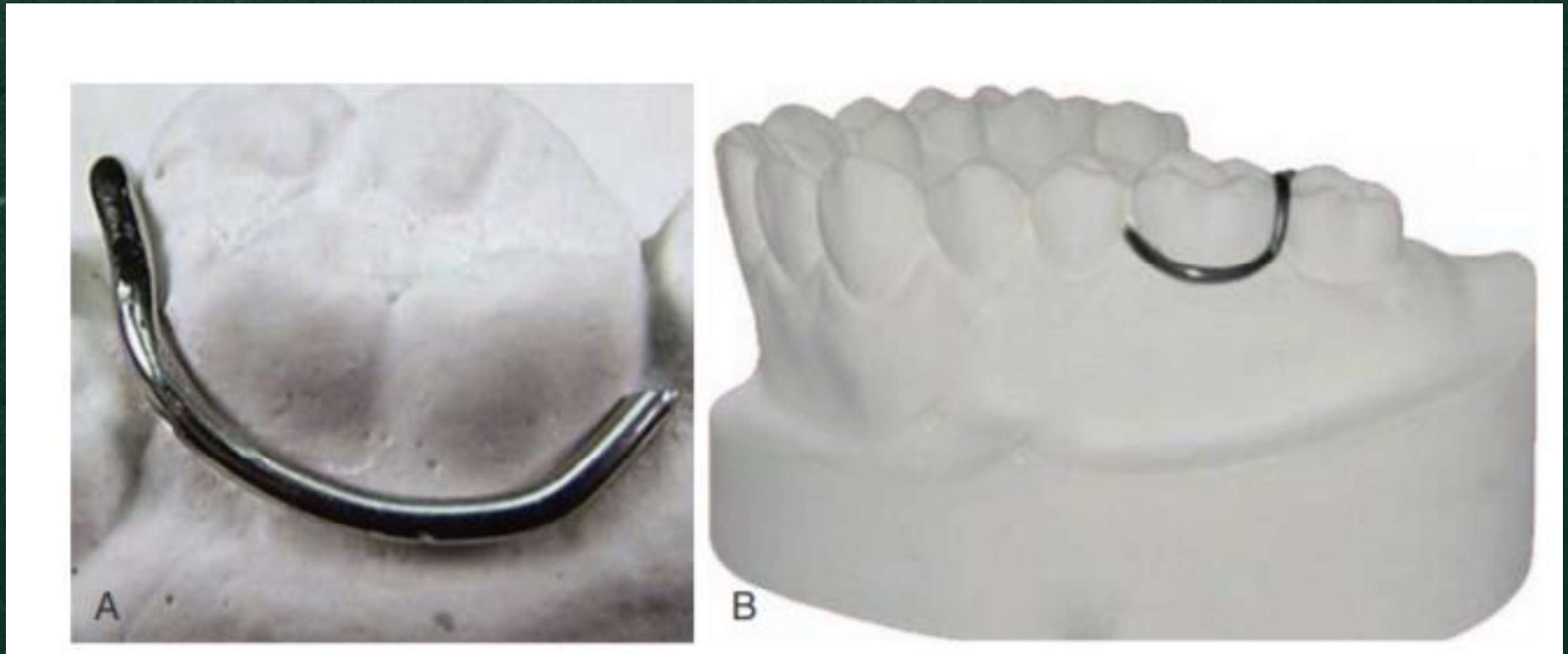
Retentive component

- Adams clasp
- Labial bow
- Ball-ended clasp

Ideal Requisites For A Clasp

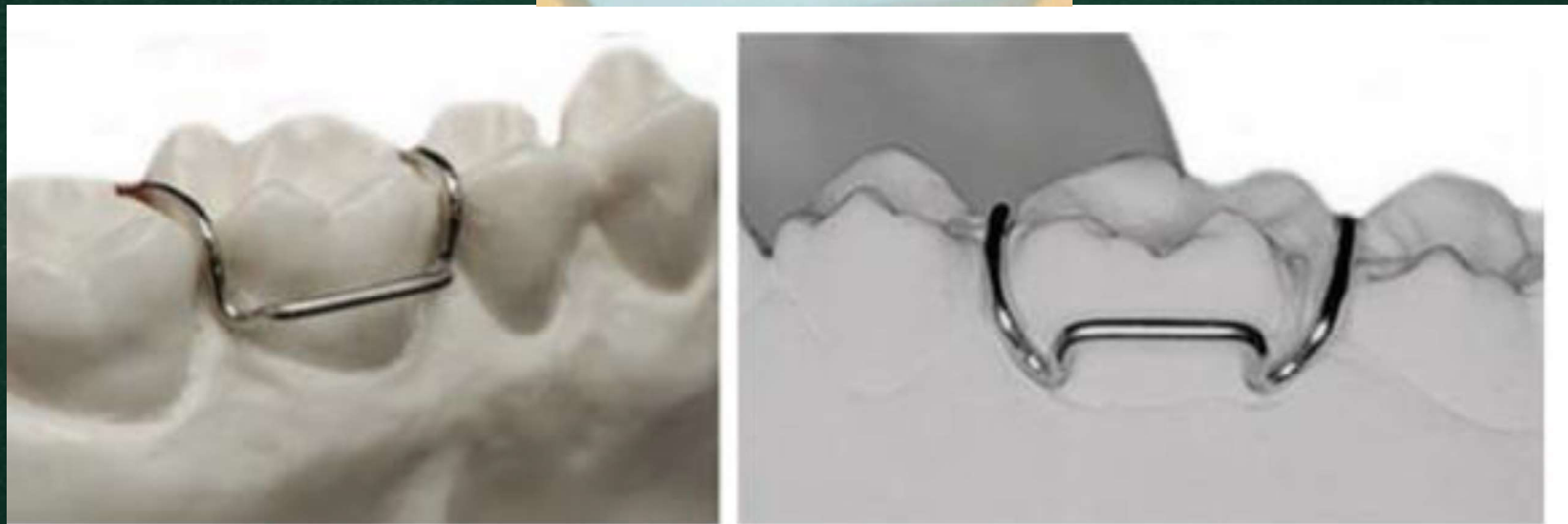
- Clasps should provide adequate resistance against displacement.
- Clasps should be passive.
- They should not produce unwanted tooth movement otherwise active clasps can exert a palatal force on the teeth.
- They should be easy to fabricate.
- Adjustments should be easy.
- It should not get distorted easily due to frequent removal and insertion.
- Clasps should not interfere with occlusion.
- Clasps should be versatile, **i.e. modification** according to usage must be possible.
- Clasps should provide retention in partially erupted and deciduous teeth also.
- They should not irritate the soft tissues.
- They should function as anchorage part also, If required

Clasps



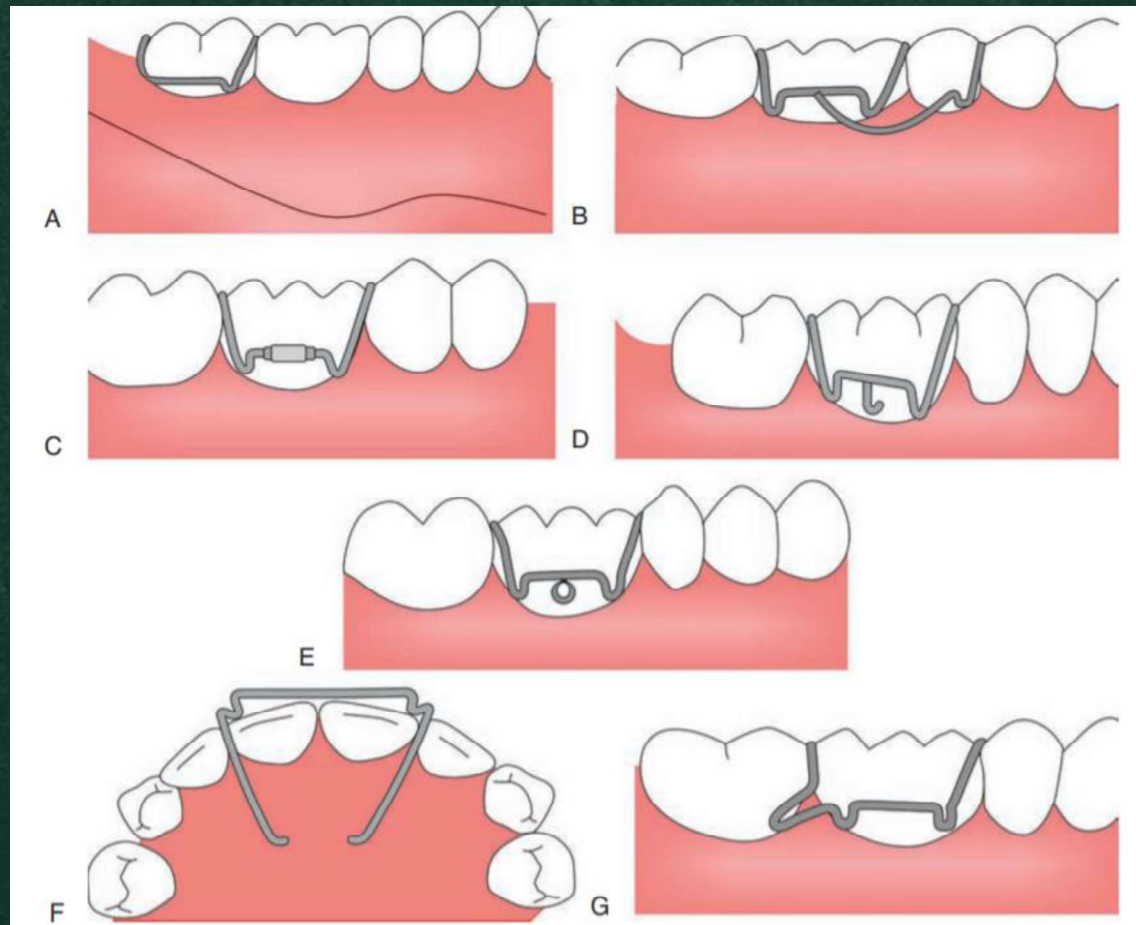
(A) Circumferential clasp extending to the distobuccal undercut. (B) Modification of C clasp.

Clasps should be **versatile**, i.e. modification according to usage must be possible.



Adams' clasp with single arrowhead

Clasps should be **versatile**, i.e. modification according to usage must be possible.



Modifications of Adams' clasp. Adams' clasp with single arrowhead (A); additional arrowhead (B); soldered headgear tube (C); J hooks (D); helix (E); double Adams' clasp (F) and distal extension