



## The pin and tube appliance

By Terry Whitty

It never ceases to amaze me the amount of “new inventions” in removable orthodontic appliances that seem to crop up literally every month in the journals. There is always some new design that some one rushes out to slap a patent on. In all reality however, they are often just reinventing the wheel as most are simply variations of what is or has already been available or described previously in literature elsewhere.

Sure, there are some really good new ideas for appliances that deserve merit, but

most of the “new” ideas can be traced back to fundamental principles described by truly influential people like Jackson, Schwartz and Andreasen. Even the humble Hawley retainer was an idea “borrowed” from Jackson. Dr Charles Hawley openly admits this in his published article introducing his idea for a removable retainer in 1919, so this process of re-invention it has been going on a long time.

Of the more interesting real advances in orthodontics over the years, as far as materials go, has been the introduction of

Nickel Titanium (NiTi) alloys. These alloys are often used for arch wires on fixed appliances as they produce a gentle continuous force helping to move teeth like no other wire can. The science of these alloys is beyond the scope of this article but is worth noting that they have had a huge impact in the specialty of orthodontics. Now laboratory fabricated orthodontic appliances are enjoying the benefits of this material as wires and springs made from NiTi alloys are being incorporated in appliance design.



Figure 1. Reset teeth as per prescription and bend clasps. In this case, 6 anteriors were reset and Adams clasps were placed on the second bicuspids and ball clasps between the first and second molars.



Figure 2. Securely fasten clasps to model with hot sticky wax. If the sticky wax is not really hot so that it penetrates the model, the clasps will loosen when the model is soaked.



Figure 3. Crimp tube at distal end to stop acrylic entering. Position tubes on model and adhere with sticky wax. It is easier to use a long length of tube and cut it later. Don't forget to leave a space under the tube for the acrylic to flow. Stainless steel tubing available from Dentaurum Australia.



Figure 4. Acrylic has been applied, processed and finished. Tubes cut to length. In some cases, areas mesial to the tubes are waxed out under the acrylic to increase the length of the spring.



Figure 5. Bend lingual wire so it will enter the tubes smoothly. Design of this wire varies depending on the length of coil spring required. In this case, I have chosen to keep the coil spring straight so the wire will not be recurved greatly.



Figure 6. Close up of lingual wire bent and entering tube. Note the Diameter of the wire is should be 0.1- 0.2mm less than the inner diameter of the tube. This allows an easy sliding action of the pin and tube. In this case the wire is 0.9mm and the tube is 1.1 mm internal diameter. The wire size is determined by the internal diameter of the NiTi coil spring, this is usually 0.9mm.



Figure 7. Application of acrylic to lingual wire. Apply carefully and avoid spillage onto the baseplate.

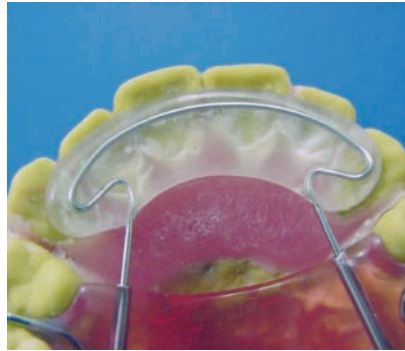


Figure 8. Lingual acrylic shaped and polished.



Figure 9. Connect 1mm tubes to the Adams clasps. The tubes can be soldered however, in this case, they were laser welded faster and much easier than soldering.



Figure 10. Both tubes welded to clasps.



Figure 11. Bend labial wire with loops mesial to the welded tubes. These will act as a stop when the spring is threaded to the wire.



Figure 12. Labial view of wire.

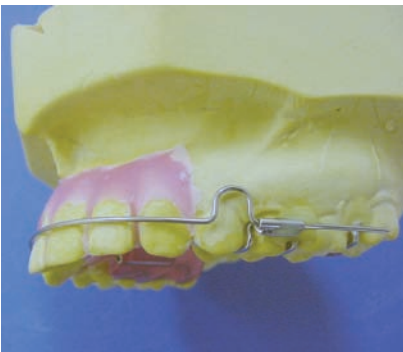


Figure 13. Note position of loop on labial wire in relation to welded tube.



Figure 14. Add acrylic to labial wire.



Figure 15. Finished and polished acrylic on labial wire.

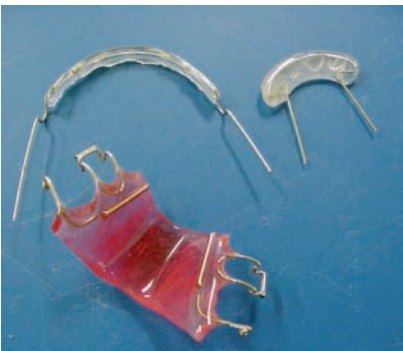


Figure 16. Finished components, baseplate, labial wire and lingual wire.



Figure 17. Thread NiTi coil spring onto wires in areas shown. The coil spring is available from Dentaaurum Australia.



Figure 18. Assembled appliance on model.

# TECHNIQUES

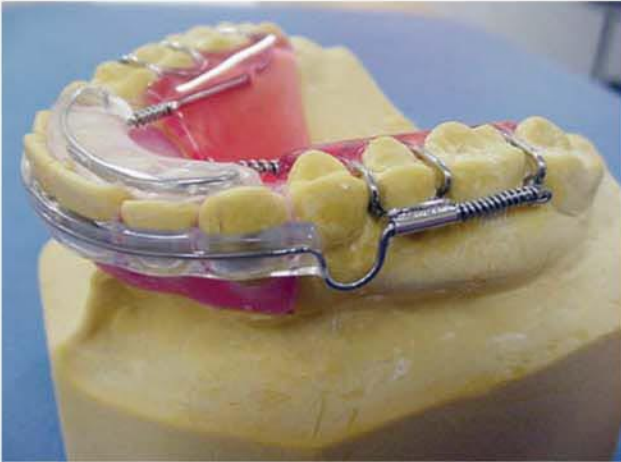


Figure 19. NiTi wire on labial wire is held in place by recurving the distal portion of the wire. Some people like to thread a small bead on prior to the bend, to act as a stop.



Figure 20. Another view of the finished appliance.

About 10 years ago, an orthodontist brought back an appliance from the United States for me to look at. It was a simple tube of stainless steel with a NiTi coil spring threaded onto a wire that was then inserted into the tube. This was the first time I had seen an Arnold "E Arch" appliance and the first time I had seen the

principle of the pin and tube mechanism. I have done extensive redesign work with this appliance to improve on it and to make it into the version now called the "EZ Arch" appliance. It is based on the original appliance but just has modifications to enable it to do more things, more efficiently and is completely fabricated

using a laser welder (*See eLABORATE Vol 1 No 1 for more information on the EZ Arch*). Interestingly, Edward Angle, the father of modern orthodontics, also described an E Arch and a pin and tube appliance in 1913.

Over the past few years, the pin and tube NiTi mechanism has now been



Figure 21. Occlusal view of a similar appliance. Note the lingual springs are recurved to add length in space-limited situations. This appliance was only used to align 2-2.



Figure 22. The previous appliance off the model.

incorporated into a plethora of appliances, both fixed and removable. Some of note are the Series 2000 range from Dr Michael Williams and the Inman Aligner from Donald Inman. Interestingly, a new development of the Inman Aligner called the Bowman Consolidator is now available, and to be honest

I have to say again the wheel is re-invented as it is a simple modification of the Inman Aligner.

The following photographs will demonstrate how to incorporate the pin and tube NiTi mechanism into a simple upper removable appliance. All components are available from Dentaurum Australia.

Terry Whitty is eLABORATE's Technical Editor and the proprietor of Australian Orthodontic Laboratories located in the Sydney suburb of Kensington where he specialises in the production of custom orthodontic appliances. He can be contacted on (02) 9313-7971.