Indirect Band Technic

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Until the discovery of Magic-X, orthodontists will have to continue their band making efforts. Magic-X is that perfect adhesive which will enable brackets and tubes to be cemented directly to the teeth. Perhaps this revolutionary material will be discovered soon — perhaps never. In the meantime, any improvements in band making procedures should be welcomed by the profession. This paper will present an original indirect band technic which has proven itself in several years of clinical practice. It overcomes many of the objections to previous methods and, in addition, it is actually an indirect appliance construction method rather than a band technic alone. It has been designed for indirect construction of a complete edgewise arch appliance; however, any multiple banding appliance can be adapted to this technic.

It has not seemed feasible to most orthodontists to make bands by an indirect method. The quality and fit are believed to be lacking. This may have been the case with some previous methods, but it is no longer true. Orthodontics is in about the same stage now that crown and bridge work was about ten years ago. Until the advent of a good hydrocolloid technique most dentists had the same doubts about indirect inlay work that we orthodontists have about indirect appliance construction. Prior to hydrocolloid few men would cast an inlay without trying the wax pattern in the mouth — even if a so-called indirect method was used. Today the completely indirect hydrocolloid method is very successful and has gained widespread acceptance. This comparison is being drawn merely to promote unbiased thinking.

Band construction by any direct method, including the use of preformed bands and contoured band strips, has always been a time consuming and fatiguing procedure. The mental strain and fatigue of the orthodontist can only be matched by the discomfort of the patient. Most of this discomfort can be eliminated by the procedures to be explained. With the technic to be presented, it is also possible to eliminate the work and discomfort involved in taking individual impressions of each tooth to be banded. Most indirect band technics require individual tooth impressions, usually taken with copper bands or aluminum shells. A single upper and lower impression is all that is now required. From these impressions extremely hard metallic type dies are made of each tooth. After bands have been constructed from these dies all brackets and tubes can be accurately positioned. Initial archwires and a face bow headgear can also be constructed— all from a single impression of each arch. Competent technicians can be trained to do this work, leaving valuable time for the orthodontist to better care for his patients. Added to these obvious advantages is the possibility of constructing a superior appliance, for band adaptation and bracket and tube placement can be definitely better than with direct methods.

Appliance construction by this indirect method is a three stage procedure. Separation, impressions, check

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fitting and cementation are all that is required. A complete appliance can be seated at one appointment after the teeth have been separated and impressions taken. Chair time can be reduced by more than one-half.

The development of this technic was made possible by the introduction of two new materials. The first of these is rubber base impression material. With it an impression can be taken that will extend under the gingival tissues slightly and increase the length of the clinical crown on the model. This material also makes possible the use of some superior die materials. The second new material is a die material that is very accurate and possesses extreme surface hardness and strength. Plastic steel was adapted by the author for use in dentistry with the rubber base impression materials. It is composed of 80% finely powdered steel particles and 20% plastic. The surface hardness is much better clinically than copper plate or low fusing metal dies. Hydro-cal or stone dies exhibit excessive surface wear and are generally unsatisfactory for band construction.

With an impression material that is capable of reproducing the tooth surface slightly under the gingival margin and a superior die material the following technic was evolved over the last three years. In its final form, the die positioning portion was patterned after a technic that is used in crown and bridge work. The dies can be re-assembled to the exact form of the original malocclusion model. Accuracy is so positive that fixed bridges can be constructed by this method.

A detailed step by step procedure will now be given. This will be followed by a discussion of the advantages and disadvantages of adapting this method to a busy orthodontic practice. Finally, the advantages of chrome steel and chrome nickel alloys will be stated in reference to use with the indirect appliance construction technic.

Separation

Adequate separation is an absolute necessity for successful use of this technic. This is essential, however, for good band construction by either direct or indirect methods. Separation must be obtained between each tooth in the mouth. This should be of such degree that all bands can be cemented at one time without binding, or forcing the teeth apart during cementation. The amount will depend upon the thickness of band material used and the closeness of band adaptation. When this amount of separation is obtained, the impression material will flow between the contact areas and accurately reproduce the mesial and distal surfaces of the teeth involved. A septum of this tough rubber material will separate all teeth in the impression after it is removed from the patient's mouth. The importance of this will also be realized when the dies are reassembled to the form of the original model.

Separation of this degree can be obtained with a minimum of discomfort by using some of the so called "physiologic" methods. Kesling separating springs are excellent for use on posterior teeth. Brass wire can also be used on cases where separation is not difficult to obtain. If teeth are to be extracted, this should be done approximately one week before separation is placed. Springs or wires should be placed three or four days before impressions are to be taken. In extremely difficult cases these should be replaced or tightened and allowed to act longer. Anterior teeth can be separated with Maxian elastic separators which are usually placed one day before impressions are taken. Many patients can be instructed to place these at home, thereby eliminating an extra visit to the

orthodontist. If left longer than one or two days, these elastic separators can be irritating to the gingival tissues. On less difficult cases brass wire can be placed on the anterior teeth at the same appointment when the springs are seated. By using the "physiologic" methods, i.e., springs and elastic separators, much of the discomfort of separation can be eliminated and extra appointments avoided.

Impression Technic

All separating springs, wires, or elastics are removed and the teeth thoroughly cleaned. A rubber cup of the B.S. type is used with pumice to clean the tooth crowns. This style cup will flare out and extend below the gingival margin. It is very important that this area be clean. Scalers should be used if calculus is present. The distal surfaces of the lower second molars should be packed with a string or wisp of cotton saturated with a 20% solution of zinc chloride if tissue covers these areas and it is desired to band them. This is placed at the beginning of the appointment. By the time the rubber base impression is ready to be taken the tissue will be retracted, thereby eliminating a waiting period for this action. It is usually unnecessary to pack any other areas since the impression material will flow slightly under the gingival margins if these areas are properly cleaned.

A compound impression of each arch is taken. This acts as a tray for the rubber base material. The compound impressions are jiggled when first seated to enlarge the space for the teeth; by moving or jiggling the impressions, enough room for the secondary impression can be created. This eliminates the need for trimming or removing material after the compound is taken from the mouth. Additional space can be created if needed by working the end of a mirror handle in the soft compound immediately upon removal from the mouth. One of the fundamental principles of using rubber base impressions is to have a close adapting tray which minimizes the thickness of the impression material. The compound impression tray also provides a peripheral seal all around the impression which may help to force the impression material below the gingival margins. For these reasons the use of the compound tray is recommended.

To insure proper working consistency of the compound it is necessary to have water temperature at the manufacturer's recommendation or slightly higher. An automatic saucepan, as shown in Figure 1, is ideal for this purpose. It can be calibrated to the power temperature by using a thermometer and marking the dial. When once calibrated, it will thermostatically keep the water within a three degree variation. The compound can be heated before the patient arrives and will stay at the proper working consistency for as long as desired. Figure 1 also shows the loaded tray. An average size tray will require 1½ cakes of compound. Upon removal from the mouth the impression

Fig. 1

is dried with air. The use of an adhesive is recommended. A thin coat of adhesive will prevent the rubber base material from pulling away from the compound. This is necessary with some rubber base materials. If no difficulty of this type is encountered, the adhesive is unnecessary.

A heavy-bodied type rubber base material such as Kerr's Heavy Bodied Permlastic is used. Three to four inches each of the base and accelerator tubes are squeezed onto the mixing pad. It is thoroughly mixed as quickly as possible and loaded into the tray. A cement spatula is used to mix the material. Seat with firm, but not excessive pressure. Experience will provide the right balance which will force the material under the gingival areas and still keep the compound from touching the teeth as little as possible. The tray is held in place by the assistant or hygienist, leaving the orthodontist free at this point to care for another patient. It is imperative that the material be allowed to set in the mouth for at least seven minutes, regardless of the manufacturer's recommendations. It is extremely important that the patient does not close on the tray during the curing period. A saliva ejector is recommended to eliminate the need for swallowing. If large areas of compound show on the finished impression, it indicates that biting of the tray has taken place. The impression is removed from the mouth with a quick motion thereby preventing distortion. Separation is replaced at the end of this appointment. Figure 2, taken of a completed impression, illustrates nicely the septum of rubber between each tooth. A close-up of another impression as seen in Figure 3 was taken to show the feather edges of material that extend beneath the gingival margins.

Die Construction

Recent research indicates that rubber base impressions should be poured within an hour to retain their accuracy. Formerly it was believed that the completed impressions would remain dimensionally stable for long periods.

Completed impressions are boxed with a weather stripping compound. They should be built up with strips of material to a height of thirty mm. as measured from the cusp tips. This will insure dies of adequate length.

The impression is then poured in

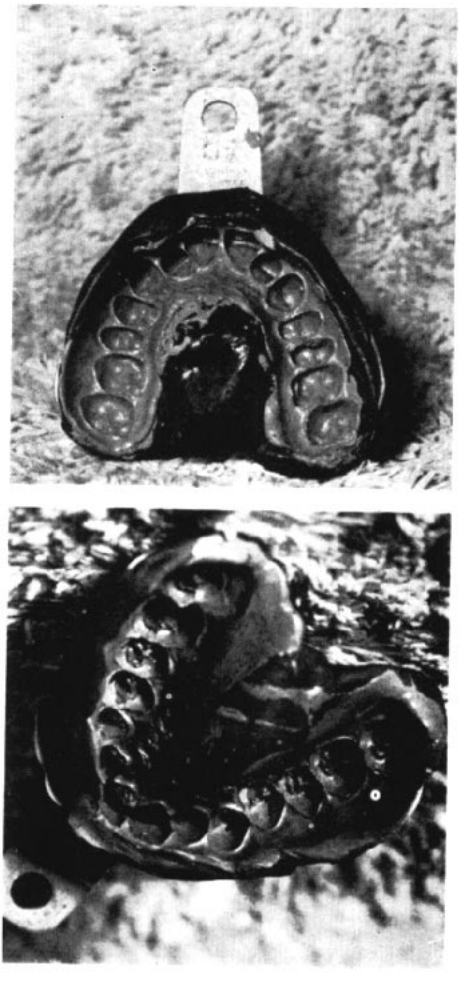


Fig. 2 Above, Fig. 3 Below.

Fig. 4

Devcon Plastic Steel. The resulting dies are composed of 80% steel and 20% plastic. Devcon consists of a putty-type material to which a liquid hardener is added and the two thoroughly mixed. They are combined at a ratio of one tablespoon of putty to a teaspoon of liquid. Two tablespoons of putty are sufficient for the average impression. When mixed, the material has the consistency of a thick syrup. To insure bubble free models, a thin layer of the material is painted into the crowns of the teeth with a fine brush. Figure 4 shows the material being painted into the crown portions. Boxing material was removed to make the photograph possible. After a thin layer is present, the remaining material can be poured into the impression. A poured impression is illustrated in Figure 5. Plastic steel will harden in four or five hours. After this time, or preferably overnight, the model can be separated. The compound is re-heated to the original working temperature and removed. The rubber base material will peel off easily, unless the compound has been overheated.

At this stage we have a plastic steel model of each arch. This will be cracked apart to form individual dies of each tooth. The dies are then trimmed at the cervical region to extend the crown portion three to five millimeters below the original gingival line. Individual dies are held in a vise and bands constructed. Upon completion of banding, the dies are re-assembled to the original model. Brackets and tubes are placed where needed and initial archwires and face-bow headgear constructed, if desired. This synopsis was given to clarify the procedure before describing each step in detail.

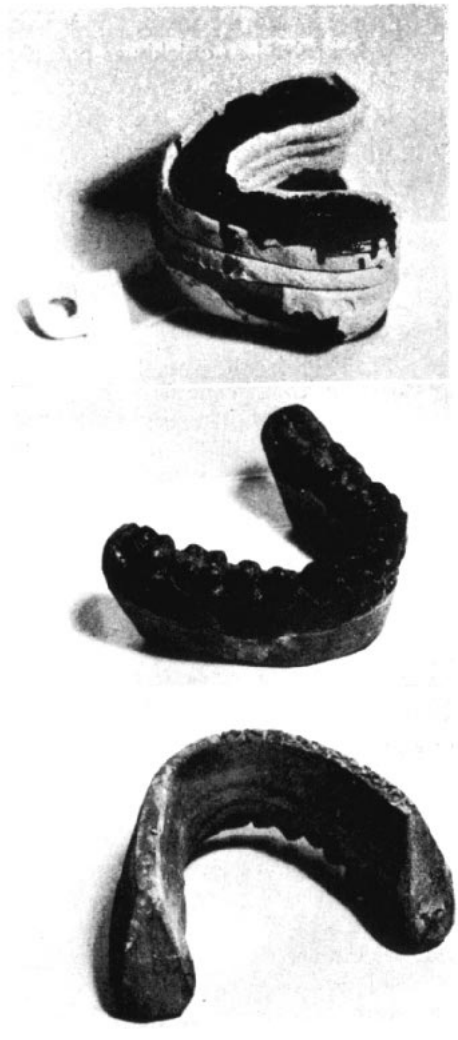
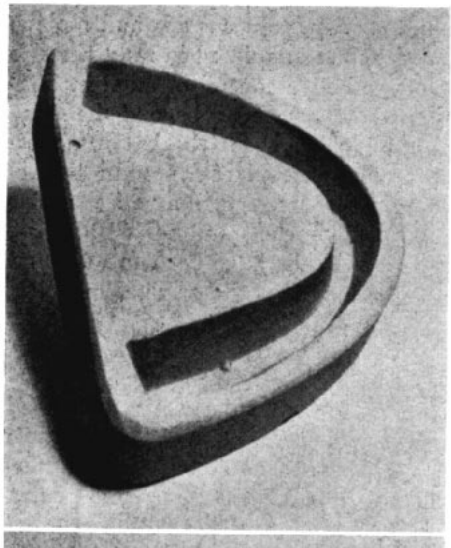


Fig. 5 Above. Fig. 6 Center. Fig. 7 Below.

Tapered sides are formed on the base of the plastic steel model with an arbor band on a lathe. Figures 6 and 7 show the trimmed model. The base is lubricated with vaseline, or other separating material. The model base is inserted into a mix of hydro-cal to a depth of approximately ⅔ of the total model height. The stone core or key that is thus formed is illustrated in Figures 8 and 9. Upon removal from the core, the plastic steel model is separated into dies in the following manner. A ribbon saw blade is passed between the contact areas and a cut made to a depth of approximately three millimeters. These cuts are extended on the labial and lingual of the model with a separating disc or diamond disc. They are shallow cuts not more than two millimeters in depth. The model is not cut apart with the disc or saw; we are merely establishing cleavage lines. These cleavage lines are seen in Figure 10. A cutting plier is inserted into the shal-



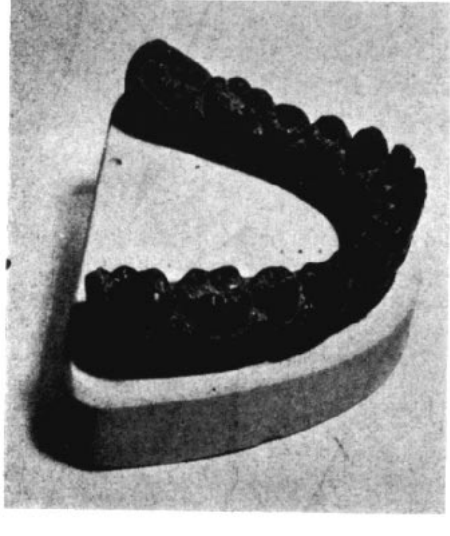
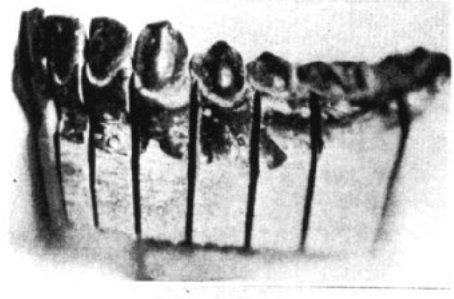


Fig. 8 Above. Fig. 9 Below.



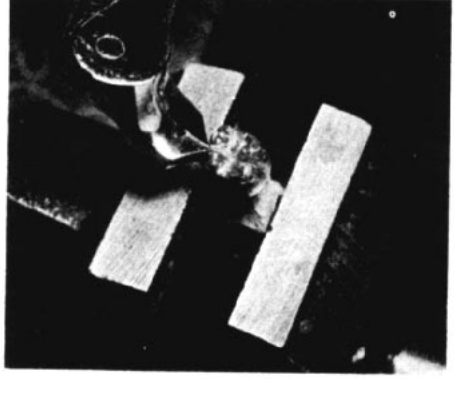


Fig. 10 Above. Fig. 11 Center. Fig. 12 Below.

low cuts and the dies are cracked apart. It is vital to later re-assembly that the dies be cracked apart and not cut apart. A cross section of a die showing the cleavage lines and cracked surface is shown in Figure 11.

A knowledge of dental anatomy is essential for proper trimming of the cervical portion of the dies. A steel vulcanite bur is used to trim this portion of the die. The crown is extended gingivally three or four millimeters below the impression line. It is not difficult to accurately reproduce this portion of the tooth; the contours of the crown are followed and extended into this area. Some type of dust collection is needed while grinding the plastic steel. A suction apparatus designed for this purpose would be ideal. Small steps or parallel lines are cut on the labial and lingual of the die base to enable it to be held in a vise. The dies can be re-assembled into the stone core at any time and the original plastic steel model will be reproduced.

Band Construction

Bands are constructed of chrome alloys for many reasons; however, gold can be used. Both straight band material and contoured blanks are used. Peak pliers are used to form the bands as they are capable of stretching the band material around the contours of the teeth and make superior bands. All band strips except lower anteriors are formed into a contoured convex blank. The ends are welded together and the contoured blank is slipped over the die. The labial or buccal surfaces are adapted to the die with a band pusher before the band forming pliers are used. Figure 12 shows the completed pinch with the pliers. Note how carefully the band is adapted to the die at this stage. Upon removal from the die, the band is welded along the seam. On bell shaped teeth the welding spots are moved a millimeter away from the seam. The excess material is removed and the gingival margins are contoured or cut to the desired shape. The band is returned to the die and the "tail" is folded over. It is again removed and the "tail" welded to the lingual of the band. Figure 13 is a view of a completed molar band. Anterior bands require that the pliers be modified to a convex instead of a concave beak. Howlett or Angle band-forming pliers may also be used. Brackets are pre-welded to all band strips except cuspids and molars. Brackets are angulated in most cases to produce better control of axial inclinations; however, this is beyond the scope of this paper. It is felt that more accurate bracket placement can be accomplished by attaching the molar tubes and brackets and cuspid brackets after the bands have been formed and re-assembled into the original model.

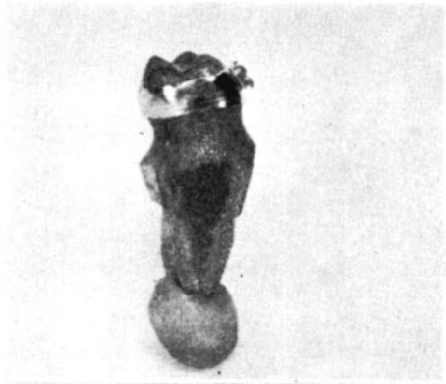
Die Re-assembly

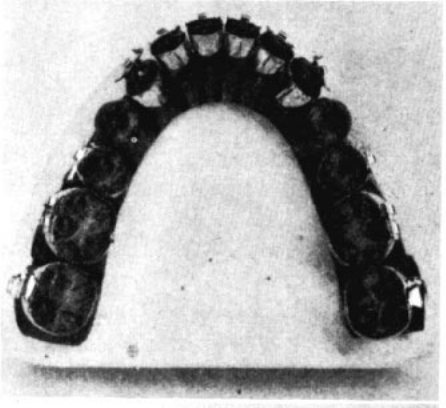
At many times during the band formation process the dies are re-assembled into the stone core. Bracket height can be easily checked. Occlusal interferences with band placement and bracket and tube placement can be checked and corrected if needed. Re-assembly is completely accurate; in fact fixed bridges can be made and assembled on models such as these.

Molar tubes can be tack welded to the bands by the technician as well as molar and cuspid brackets. It is possible for the orthodontist to angulate these attachments if desired without removing them from the bands. If they are incorrectly located, they can be twisted off and relocated in correct positions by the technician. This is a tremendous advantage and is possible only by using chrome alloys. Chrome-nickel alloys make possible the soldering of tubes to bands after they have been tack welded in proper position. Tube placement

by this tack welding and soldering operation is usually more accurate than using tubes with welding flanges.

It is easy to visualize how the complete appliance can be constructed by this method. Band accuracy is such that almost every band will fit the tooth in the same relationship that it does on the re-assembled model. Initial archwires are formed on these models after all bands and attachments are completed. Auxiliary .045 tubes can be soldered to the upper first molar bands and a complete face-bow headgear assembled from this same model. In time we may be able to construct all arch wires needed during treatment before the first band is cemented. Laboratory time will be increased, but chair time drastically decreased. It is possible that a whole new era in orthodontics could be introduced by widespread adoption of indirect procedures. Figures 14 and 15 are photographs of a completed edgewise appliance on the re-assembled model.





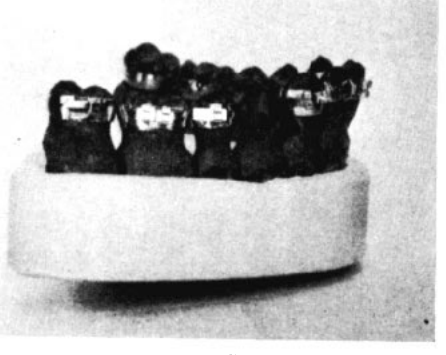


Fig. 13 Above. Fig. 14 Center. Fig. 15 Below.

Band Fitting and Cementation

Very little fitting is required. A Hollenback pneumatic condenser is used to seat the bands. These bands fit in every sense of the word. If properly constructed on the dies, there is no "rock or roll" to them. They go to one position and only one. The cervical fit is of prime importance. Bitewing x-rays will readily convince one of the superiority of the bands in this respect. If a steel band is too large, it is a simple matter to cut it in two on the lingual, overlap the required amount, and weld back together. The contour and fit is not destroyed by this process. If a band is too small, it may be stretched slightly with band stretchers to the desired size. This is necessary only when the dies are incorrectly trimmed, which seldom happens. Bands are cemented a quadrant at a time. With this outline of the procedure completed, a brief outline of the advantages of chrome alloys will be given.

Advantages of Chrome Alloy

1. Stronger bands — better edge strength.
2. Better fit — retains contour better.

3. Takes and retains mirror bright finish.
4. Stretches over a die or tooth during band formation without breaking, and thus gives a better fitting band. The Peak pliers utilize this quality to the utmost.
5. Allows brackets and tubes to be tack welded for a trial fitting or inspecspection. If they are not right they can be twisted off and re-positioned. This is a big advantage since auxiliary personnel place the attachments, but the orthodontist has a final check before they are completely welded.
6. It is much easier to train auxiliary personnel in welding techniques than in soldering. Welding with the newer welders is almost foolproof. Soldering, as we all know, takes quite a little practice.

In closing, a summary will be given of the advantages and disadvantages of adapting this indirect appliance construction method to a busy orthodontic practice.

Advantages and Disadvantages

Advantages:

1. It is much kinder to the patient. Think how much easier it must be from the patient's point of view to have a set of impressions taken, a little band fitting, and then have their appliances cemented. Contrast this to the tearing of the gingival attachment and malleting that are inevitable with direct methods. This consideration of our patients is in my opinion the number one advantage of this method.
2. It is much easier on the orthodontist. Much of the fatigue, both mental and physical, is taken from band construction.
3. It takes less time. The exact amount of time will depend on the speed of the orthodontist but this method should reduce chair time by more than fifty per cent.
4. It results in a superior appliance. Both the bands and the accuracy of attachments are improved.
5. It is tailor made for the use of chrome alloy. The advantages of this have been explained.

Disadvantages

1. It requires the services of a trained technician, either male or female. Every busy practice should be able to absorb a full time technician, not of course for band making alone, but for the numerous other phases of practice that someone else can be trained to do as well as we would do it ourselves.
2. It involves an extra step of chair time. The time it takes for the impressions is, however, quickly saved during the later stages.
3. The adoption of this method requires a change in the office routine. Progress however stops for no one. It is economically unfeasible to both patient and orthodontist to have the orthodontist do things which auxiliary personnel can be trained to do.

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