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MEANS FOR AND METHOD OF APPLYING
A FILLING MATRIX TO A TOOTH
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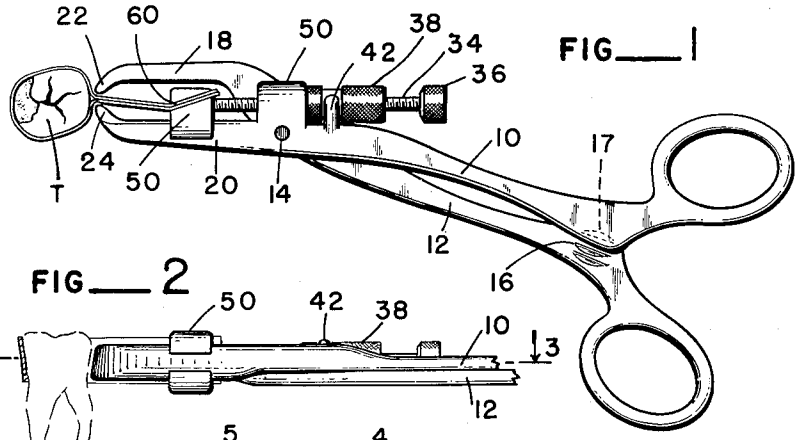


FIG. 1

FIG. 2

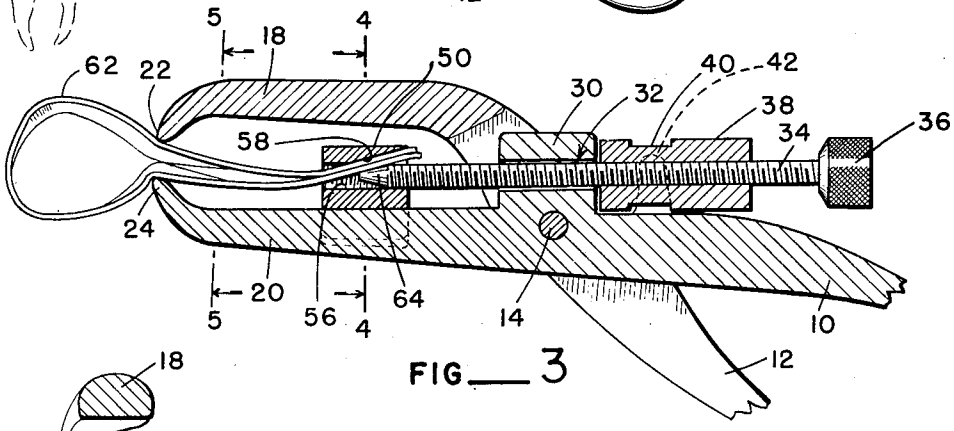


FIG. 3

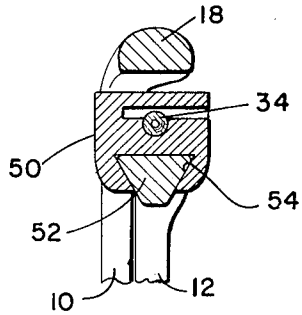


FIG. 4

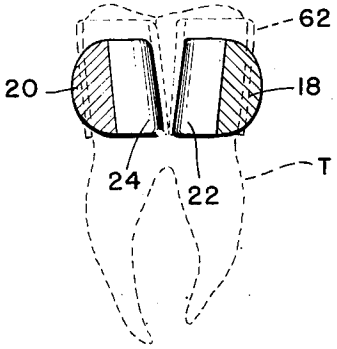


FIG. 5

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MEANS FOR AND METHOD OF APPLYING A FILLING MATRIX TO A TOOTH

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5 Claims. (Cl. 32—63)

My invention relates to dental appliances and, more particularly, to means for and method of applying a filling matrix to a tooth.

Briefly, the invention includes the use of a plier-like tool which is adapted for tensing a malleable metallic band about a tooth in which cavity preparation has involved two or more surfaces of the tooth. In such an instance a cavity is open to a side and to an occlusal surface, and the dentist's problem is to properly band the tooth with a matrix which is rigidly adapted or shaped to the tooth wall at the sides of the cavity, as well as adjacent the gum line. To be appropriately rigid the matrix must be capable of containing the filling material under packing pressure in such a manner as to preclude any of the packing material passing between the band and the tooth adjacent its base.

The novelty in this invention lies in the creation of a tension in the matrix band, as it is being applied to the tooth, in such a manner that the greatest tension results at the base of the band and which moderates or reduces slightly to the top of the band. This controlled tension produces complete adaptation of the matrix band in conformity with the shape of the tooth, no matter whether the tooth is tapering, spheroidal or cylindrical.

It is preferable that the matrix band material be malleable, and for this purpose I have found that brass, approximately .002"–.003" thick properly applied and tensed will support not only the tensing force but also the packing force, as when the cavity is being filled.

The appliance of this invention is useful, particularly in the following matrix required procedures:

1. In the insertion of silver alloy (amalgam);

2. In the direct method of forming a wax pattern for an inlay; and

3. For supporting an impression material to take a positive impression of a tooth cavity preparation to create a tooth model used in the indirect inlay technique.

A word is in order about the prior matrix formers and matrix materials conventionally used to produce a matrix. According to the prior appliances and practices, the matrix that has been formed is either cylindrical or conical in shape. Such a matrix has poor adaptation to the shape and contours of the tooth and quite invariably results in poorly shaped as well as poorly packed fillings in the cavities.

A typical characteristic of such prior matrix bands is a gap between the band and the tooth often found adjacent the gum line. When the filling material, as in the case of a silver alloy or amalgam inlay, is placed in the cavity and is tightly packed and pressed, a portion of the filling material will escape through the gap between the tooth and the matrix. This means that certain of the packing force is dissipated outward and not operable wholly upon the filling material. This causes two things to occur: First, the amalgam filling material is improperly condensed to such an extent that an excess of mercury may be left between the molecules of the amalgam

in the filling. This creates an inherent weakness in the filling and causes the filling to flow under mastication forces. This is poor restoration because such a filling does not have the ability to maintain its internal forces against the walls of the cavity and thus does not properly seal the cavity against bacterial invasion. Secondly the material which is forced past the matrix creates an undesirable overhang of the filling near the gum with resulting pathological problems.

On the other hand, by the use of my matrix applying apparatus and of matrices produced thereby, certain advantages, as a result of this invention, are manifested by:

A. The absence of damage to the gum tissue, because the matrix band placed according to my invention cannot slip or overhang at the point of its basal contact to the tooth;

B. There is an elimination of overhanging fillings since the filling materials cannot be forced below the base adaptation of the matrix band of the tooth;

C. There is a complete confinement of the filling material to the cavity preparation regardless of the amount of force or pressure applied to the same; and

D. All filling and impression materials, which are normally plastic at the time of use and are dependent upon confinement by the matrix band, are properly confined and shaped.

The objects of my invention include, therefore: to provide means for clamping a matrix around a tooth so that the matrix band will conform to the shape of the tooth at the sides of a cavity as well as that portion of the cavity adjacent the gum and irrespective of the shape of the tooth; to devise a method of clamping a matrix band to a tooth in a manner that the downward and inward taper of the tooth will appear in the shape of the band; to provide an improved appliance for positioning a band around a tooth in tight non-leaking adaptation to the shape of the tooth for use in the formation of amalgam fillings and the like; to devise a band that will react with amalgam fillings so as to automatically separate for removal of the band; and to provide method and means with greater accuracy and time-saving to the dentist as well as the patient in the use of a filling matrix.

Further objectives and advantages of my invention will appear from a reading of the following description, when read with reference to the drawings, in which:

Figure 1 is a plan view of an embodiment of my appliance shown as applied to a tooth;

Figure 2 is a fragmentary, side elevation similar to the view of Figure 1;

Figure 3 is an enlarged view, partly in section, taken on line 3—3 of Figure 2;

Figure 4 is a sectional view taken on line 4—4 of Figure 3; and

Figure 5 is an enlarged sectional view showing the band and the jaws of the appliance as applied to a tooth.

The pincers construction

Figure 1 shows a pincer or plier-like tool having handles 10 and 12 pivotally connected by a pin 14 and having lock means comprising teeth 16 and 17 for locking the handle in closed position. The handles have spaced-apart jaw portions 18 and 20 between the pivot pin 14 and forming surfaces or grips 22 and 24 respectively. Jaw portion 20 has integral therewith a boss 30 having a smooth bore opening 32 in which is rotatably mounted a threaded pin or rod 34.

Secured to one end of rod 34 is a knurled knob 36, and intermediate boss 30 and knob 36, is a nut 38 mounted on rod 34 and having threaded engagement therewith. Nut 38 has a relieved portion 40 intermediate its ends and handle 10 has a pair of fingers 42 gripping

opposite sides of relieved portion 40 forming a bearing permitting rotation of nut 38 about rod 34 but preventing movement of the nut longitudinally of handle 10. Thus rotation of nut 38 by gripping its knurled surfaces with fingers produces endwise movement of threaded pin 34.

A traveler 50 is positioned between jaw portions 18 and 20. A guide for traveler 50 is provided by means of a V-shaped guide 52 formed on jaw portion 20 fitting into a slot 54 in traveler 50, having inwardly diverging sidewalls closely fitting guide 52 whereby traveler 50 is guided in movement toward and away from the area of contact of the jaws 22.

Traveler 50 has a threaded through opening 56 in which an end of rod 34 is threadedly engaged. Intersecting opening 56 is an oblique slot 58. The ends 60 of a looped metal matrix band 62 are positioned in slot 58 and clamped in place by movement of a tapered end 64 of rod 34 against the band wedging ends 60 against the walls of slot 58. By these means band 62 can be tightened around a tooth T as shown in Figure 1 by rotation of nut 38. Slot 58 is open to the side for convenient insertion of the band.

Method of operation

As indicated before, it is the purpose of this tool to tense the band 62 around the tooth T in a manner so that it will conform to the contour of the tooth in the area having a side cavity. In tensing the band around the tooth with the appliance, the matrix is usually stretched out of its normal shape so as to arc its longitudinal axis. For this reason it is preferred to use the material which may be described as ductile in having the ability to be shaped to the tooth including some stretching. The normal practice has been to use a ferric band but I have found that a brass band is better adapted for this work. Shim stock of approximately .002"–.003" in thickness may be used by cutting it into bands of appropriate widths and this stock has been found to be well adapted for the following operation. I have found that brass shim stock appears to be the most practical metal to be used because it has the desired malleability as well as an appropriate ductility.

A loop is formed in the band, slightly larger than the tooth, and the ends of the band are positioned in slot 58 and clamped in place by rotation of knob 36. The matrix is placed over the tooth with the jaws partially closed but not clamped and nut 38 is rotated so as to tense the loop tightly around the tooth. The band may be clamped in any position by locking the handles with teeth 16.

As will be observed in Figures 2 and 5, a tooth is usually tapered from its biting surface to its base in the area of a proximal cavity; and, in the operation as described above, and in conventional practice, the band merely assumes the contour of the largest part of the tooth with which it has contact so as to form a more or less uniform outline from top to bottom. In the band as used in this form, as for instance when filling with an amalgam, there will be an overhang in the lower part of the cavity.

To avoid this situation I have shaped the area of the contact 22 of the jaws in a manner so that the jaws only have gripping contact with the band at their lower edges which will be on the lower side of the longitudinal axis of the band. As shown in Figure 5, the jaws are spaced apart at their upper side and gradually converge to the lower area of contact so as to define a space therebetween of V-shaped outline. Having the band initially tensed around the tooth, the appliance, in the manner of pincers, is repeatedly opened and closed and the matrix worked to shape the lower portion of the band around the tooth.

This usually involves the stretching of the upper part of the band so that if the band were removed at this point and folded flat it would be arched. Considering

Figure 1, it will be seen that the jaws attack portions of the band which are tangent to the teeth in the pinching action.

The band in the area of the cavity may not necessarily assume the contour that the dentist wishes to appear on the outer surface of the filling and the handles may be locked and the band may be shaped with a burnisher to assume the proper contour.

If the cavity is to be filled with an amalgam the band is clamped and the handles locked when the band is properly shaped and the amalgam is forced into the cavity and up against the band. When the band is removed, the edge of the filling around the cavity will be flush with the contiguous surfaces of the tooth on the lower as well as the upper portion if the band has been properly tensed.

An unusual and surprising result is achieved with the use of the brass band in thus filling a cavity with amalgam. The shim stock usually has a covering of lacquer to protect it against erosion and if this coating is removed by burnishing, a chemical reaction can take place between the mercury in the amalgam and the brass. Unlacquered brass, even though discolored, will also function in the same way. The mercury eats the brass until the band may be separated in the area of the cavity after approximately two minutes of contact between the amalgam and the brass band. However the band has sufficient strength during the first part of the two-minute period to hold the filling in place while it is initially setting. The separation of the band will be understood to facilitate removal of the same after filling and to minimize discomfort to the patient.

In the direct use of wax in the cavity to form a model for an inlay of gold or plastic, the wax can be forced into the cavity in the same manner as the amalgam. Upon removal of the band, the wax model will have a side surface coplanar with the area of the tooth bordering the cavity and the dentist does not have to shape the lower edge of the wax model as he does in the conventional practice.

Similarly with the use of gum arabic to form a tooth model in which a wax model is made, the material can be forced into the tensed band. Instead of the gum pattern showing an overhang as in usual practice, it will fit as a desired contour in the area of the cavity when removed from the band.

It will be understood by those working in the art that the above-described means and method will save considerable time in the particular operation and will facilitate accurate work. The patient is saved discomfort in several ways, as, for example, the filling is completed at the removal of the matrix.

The manner in which the various objectives have been met by the described invention will be observed. I do not wish to be limited to the exact structure described and shown, but wish to cover those modifications that will occur to those skilled in the art, as defined in the appended claims.

I claim:

1. A dental appliance, comprising: a plier-like tool having a pair of jaw members and handle means manually operable to open and close the jaw members, the tool having support means supporting a traveler between the jaw members inside of the area of contact of the jaws, the support means including a guide for the traveler guiding the same in movement toward and away from said area of contact of the jaws and including means manually operable to move said traveler along said guide which will hold the traveler in position when not operated, a looped band of malleable metal and the traveler having means fixedly clamping the ends of said looped band which is manually operable to clamp and release the band, the band extending from said traveler through said area of contact of the jaws and forming the loop outside thereof in which a tooth may be positioned, said

jaws at the area of contact with the band being beveled so that when closed they are spaced at one side and gradually converge to meet at the other side defining a V-shaped space therebetween.

2. The subject matter of claim 1 in which said means for moving the traveler along the guide includes a threaded rod aligned with the path of travel of the traveler having one end connected to the traveler, one of said jaw members having a boss adjacent the handle means in which said rod is journaled, a nut having a threaded opening in which said rod is engaged which is positioned on the opposite side of said boss from said traveler, there being means connected to said one jaw member preventing other than rotary movement of the nut.

3. The subject matter of claim 2 in which said traveler is connected to said threaded rod by having a threaded opening engaging the threads on the rod, the end of the rod positioned in the traveler being tapered and the traveler having a slot diagonal of and intersecting said threaded opening in which the ends of said band are positioned and the tapered end of said rod wedging said band forming said means fixedly clamping the band.

4. The subject matter of claim 1 in which said guide includes a guideway formed on one of said jaw members fitting into a slot in said traveler having side walls diverging as they extend inward, the guideway having a similar shape so as to prevent dislodging of the traveler

therefrom by movement laterally of the guideway and so as to prevent pivoting of the traveler.

5. A dental appliance, comprising: a plier-like tool having a pair of jaw members and handle means manually operable to open and close said jaw members, a looped band of malleable metal positioned with the loop disposed outside of the area of contact of the jaws and with the ends of the band extending between the jaws in said area of contact and into the space between the jaw members, manually operable means positioned inside of said jaw members clamping the ends of the band against withdrawal and including means manually operable to pull said band through said jaws so that the looped band may be tensed around a tooth, said jaws at the area of contact with said band when closed being in contact at one side and being spaced at the other side so that the band may be grasped by the jaws to place additional tension at one side of the longitudinal center line of the band to fit and shape the loop of the band to the tooth therein.

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