Dec. 7, 1971 L. I. LINKOW 3,624,904

TEMPLATE FOR IMPLANT DENTURE

Filed May 10, 1968 2 Sheets-Sheet 1

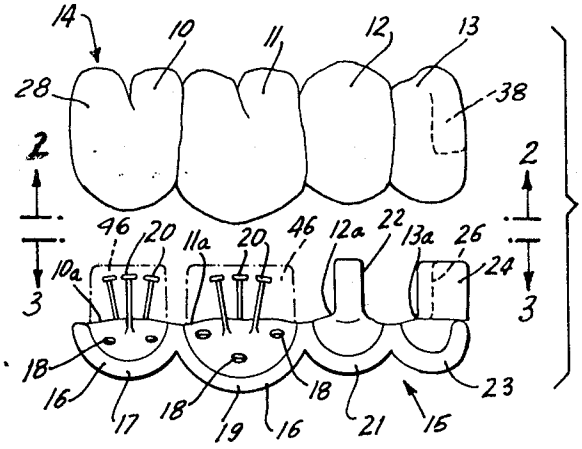


FIG. 1

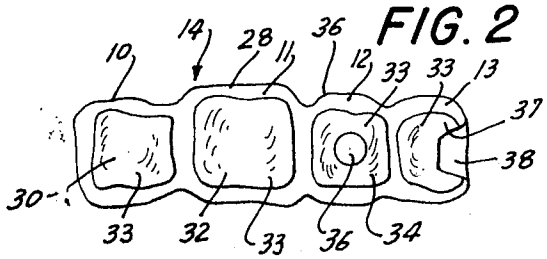


FIG. 2

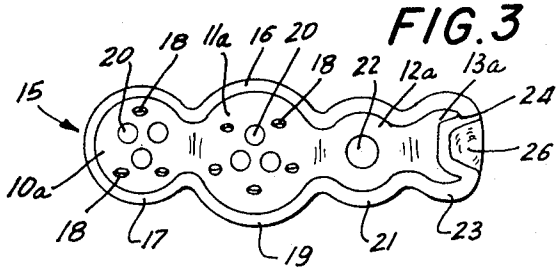


FIG. 3

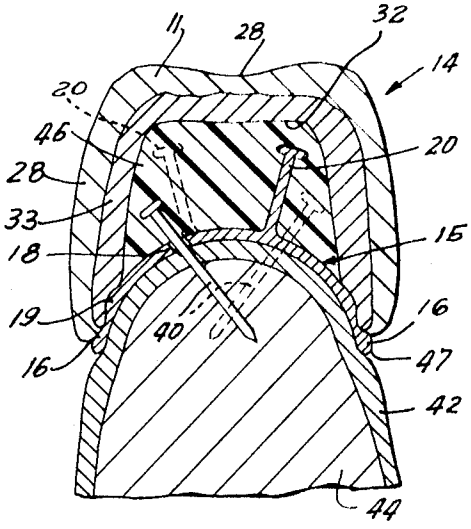
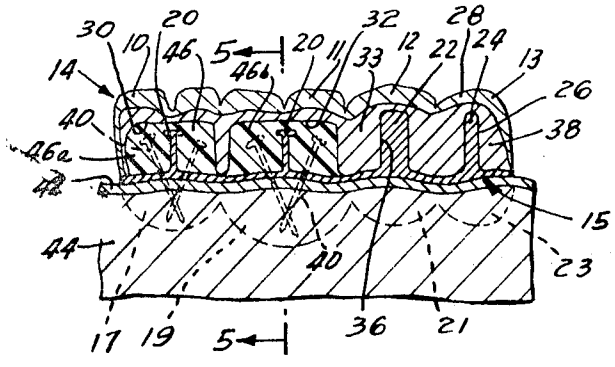


FIG. 5

FIG. 4



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Filed May 10, 1968 2 Sheets-Sheet 2

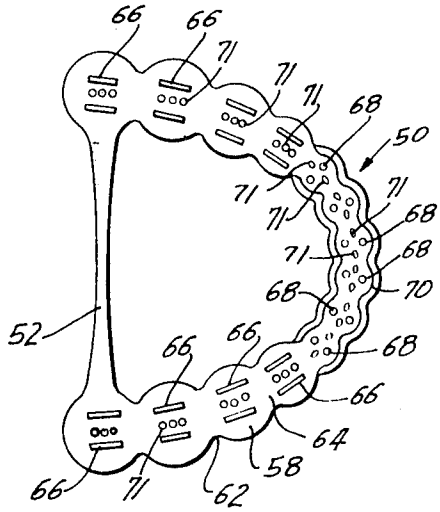


FIG. 6

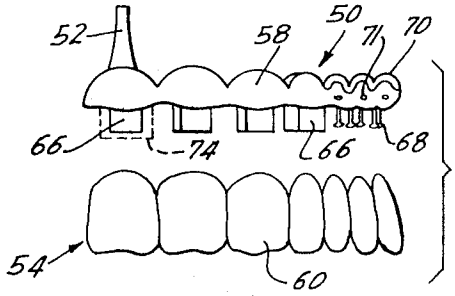


FIG. 7

FIG. 8

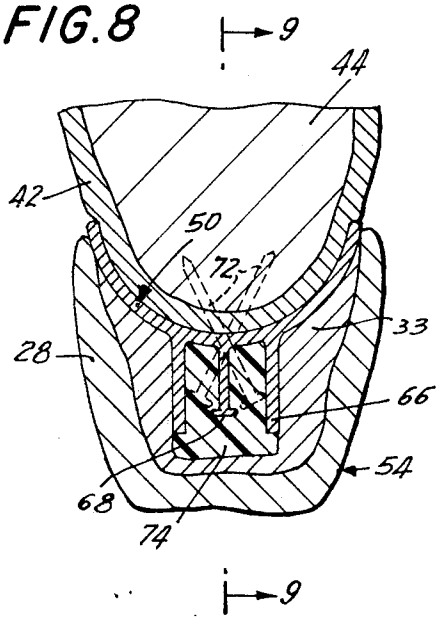
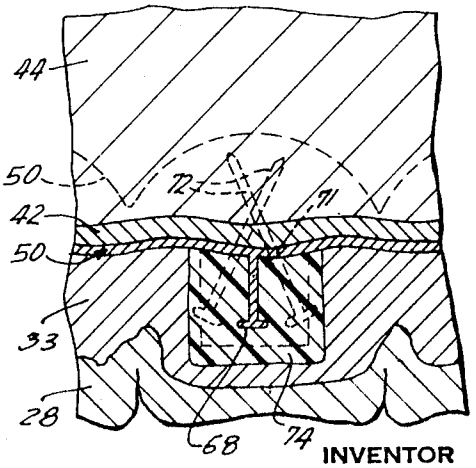


FIG. 9



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United States Patent Office 3,624,904 Patented Dec. 7, 1971

3,624,904

TEMPLATE FOR IMPLANT DENTURE

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Filed May 10, 1968, Ser. No. 728,304
Int. Cl. A61c 13/00
U.S. Cl. 32—10 A 23 Claims

ABSTRACT OF THE DISCLOSURE

In order to implant a fixed bridge into a patient's mouth when no teeth are present or large edentulous spaces exist with only a few teeth left, a template is formed having a configuration corresponding to the contour of the gum and bone structure, as well as the contour of the teeth that will form the superstructure in the area of the mouth in which the prothesis is to be placed. Securing elements at the tooth area are passed through the template into the bone structure and a plurality of projections are provided on the template adjacent the securing elements. Tooth supports are formed around those projections and securing elements. The template may also have a vertical post projecting therefrom which, like said tooth supports, is adapted to be snugly received within a mating recess in the denture. Said post may cooperate with the denture in precision attachment fashion, and a gingival shoulder may be provided on the template to provide further support for the artificial tooth structure and to prevent contact of the denture with the gum tissue.

The present invention relates to a prosthetic support structure, and particularly to a template adapted to be securely placed within the patient's mouth for supporting a fixed bridge.

When teeth are lost, because of aging, decay or neglect, replacement is necessary for cosmetic purposes, as well as to provide a proper chewing surface and to maintain the remaining teeth in their proper position. Two basic methods are generally used for the replacement of lost teeth, the selection of the method being determined mainly by the state of the remaining tooth structure. Where there is remaining tooth structure on both sides of the lost tooth or teeth, a permanent or fixed bridge may be installed, utilizing the structure of the surrounding teeth, which are generally ground down to form stubs, the artificial denture being fixedly secured to these stubs, either directly or through the use of precision attachments.

In cases where there has been only a partial loss of teeth, there is often insufficient remaining tooth structure to provide a permanent bridge. A removable bridge has been used in such instances, held in place by resilient, metallic clasps which engage adjacent natural teeth.

Where a full denture is required, either on the upper or lower gum surface, the denture is generally held in place by creating a suction force between the gum surface and the denture, thereby retaining the denture in place. The retention obtained in this manner, however, is somewhat imperfect in that the patient wearing such dentures cannot freely and securely utilize his dentures for biting into hard objects, such as apples, etc., and therefore the patient may, on occasion, place an adhesive on the dentures to provide a more secure retention. This procedure is relatively annoying and unpleasant to the denture wearer and is clearly undesirable.

With removable dentures, food particles tend to collect in the regions between the dentures and the gum, forming an unsanitary and unpleasant condition for the denture wearer. Hence, the patient must periodically remove the bridge to provide proper cleaning of the affected area. This operation is also somewhat cumbersome, unpleasant and unsanitary, and for this reason, a dentist will usually attempt to apply a fixed denture wherever possible.

In my co-pending application, Ser. No. 714,550 (which issued as Patent 3,465,441, Sept. 9, 1969), entitled "Ring Type Implant for Artificial Teeth," and filed March 1968, I have disclosed an implanting device having a sharpened edge, which is wedged into the jawbone structure, and onto which a single tooth or partial bridge may be permanently secured, thereby enabling a permanent bridge to be utilized in areas where previously only a temporary bridge was feasible. However, while the device disclosed in said application is advantageous and very useful in providing a denture comprising a relatively small number of artificial teeth, it is somewhat less practical for use in larger dentures, and particularly in full dentures, where the number of such implanting devices required would become cumbersome and render the operation relatively impractical.

It is, therefore, an object of the present invention to provide a structure which can be used in forming a fixed denture in situations where that was not previously practical or feasible.

It is a further object of the present invention to provide a structure which can be securely implanted into an edentulous region of the patient's mouth, said region being of any size and involving any number of teeth, up to and including a completely edentulous mouth.

It is another object of the present invention to provide a denture implant construction of the type described, which is relatively easy to manufacture and to install in the patient's mouth and which provides secure and long-lasting retention of the denture.

It is a further object of the present invention to provide a denture implant structure of the type described, which can be readily used for both partial and full dentures and in which a natural appearance of the denture is achieved.

It is yet another object of the present invention to so design a permanent denture that dislocating stresses applied to the artificial teeth will not, to any appreciable degree, be effective to displace the denture from its proper position in the mouth.

To these ends, the present invention provides a template configured or shaped in conformance with the portion of the patient's mouth into which the denture is to be formed. A plurality of groups of openings are provided along the template, preferably at the areas where teeth are to be mounted, and a plurality of securing elements, such as pins, are thrust therethrough into the jawbone in sets so as to firmly secure the template to the patient's mouth. A plurality of sets of projections are provided on the tooth-supporting surface of the template adjacent the pins, and a core, preferably of a synthetic resin such as an acrylic, is formed around each set of pins and projections, the cores being formed in the areas where teeth of the denture are to be subsequently secured.

The template so formed acts as a stress distributing member to support the securing elements that are driven therethrough and also acts as a separation or buffer medium between the fibro-mucosal tissue which covers the alveolar crest of bone and the acrylic core material. In this manner, no acrylic material will come into contact with the soft tissue, the smooth metal surface of the template being much less irritating to the gum tissue than the acrylic core material.

It may be desirable in a partial denture to also provide an integral vertical post on the upper surface of the template which is adapted to be snugly received within a bore of corresponding cross-section provided in the artificial tooth structure, and a vertical slot may be formed therein which is adapted to engage an insert provided in the artificial tooth structure, the insert and slot being precision

formed to define a precision attachment effective to fix and retain the teeth in proper position on the template.

The sets of projections from the template as herein specifically disclosed may be in the form of spaced nailheads, or a plurality of parallel rails, the acrylic core being formed on the nailheads or in the space between the rails, as the case may be. The template is preferably scalloped buccally, labially, lingually and/or palatally, depending on the area of the patient's mouth in which the denture is to be placed, so as to conform precisely to the gumline and bone structure of the mouth area in which the denture is to be placed. A gingival shoulder, following the scalloped configuration of the template, is formed about at least a portion of the periphery of the template, the lower ends of the artificial tooth structure being adapted to engage the shoulder to prevent any uncomfortable contact of the artificial teeth and the patient's gum. The scallops further serve to define individual tooth supporting regions on the template.

The scallops formed about the periphery of the template define separate areas, each such are being formed to receive an individual tooth of the artificial tooth structure. Each such area is provided with a set of projections and a group of said openings. The securing pins are preferably driven into the jawbone through the openings for only a portion of their lengths, so that a portion of each pin extends above the template, thereby to provide further support for the core. The core material thus serves to maintain the securing pins in a rigid position and thus minimizes the possibility of the template becoming loosened or dislocated.

To the accomplishment of the above, and to such other objects as may hereinafter appear, the present invention relates to the construction and manner of use of a template for use in denture formation, as defined in the appended claims and as described in this specification, taken together with the accompanying drawings in which:

FIG. 1 is an elevation view of the template of this invention in proximity and alignment with an exemplary artificial tooth structure prior to the securing of the artificial tooth structure on the template;

FIG. 2 is a bottom plan view of the tooth structure of FIG. 1 as viewed in the direction of line **2—2**;

FIG. 3 is a top plan view of the implant of FIG. 1 as viewed in the direction of line **3—3**;

FIG. 4 is a cross-sectional view taken across a denture structure formed by using the template of FIG. 1;

FIG. 5 is a cross-sectional view taken along the line **5—5** of FIG. 4;

FIG. 6 is a top plan view of a second embodiment of a template according to this invention, shown used for forming a full denture;

FIG. 7 is a side elevation view of the template of FIG. 6 illustrating an exemplary artificial tooth structure which is to be secured to the template;

FIG. 8 is a cross-sectional view, somewhat enlarged in scale, of an individual tooth of the complete denture formed with the template of FIG. 6; and

FIG. 9 is a cross-sectional view as taken along the line **9—9** of FIG. 8.

The embodiment of the invention illustrated in FIGS. 1–5 is particularly useful for forming a denture in a partially edentulous case. The partial denture specifically illustrated comprises four artificial teeth **10**, **11**, **12** and **13** joined together in a known manner to form a superstructure generally designated as **14**. A template **15** of a metal, such as gold or Vitallium, or an acrylic, is formed from a suitable mold made of the area of the patient's mouth into which the denture is to be placed. Template **15** is preferably no more than .5 mm. in thickness, and a plurality of scallops **17**, **19**, **21** and **23** is formed about the periphery thereof, the scallops extending either buccally, labially, lingually and/or palatally, depending on the particular area of the mouth in which the template is to be placed. Each of the sections of template **15** defined by the scallops is adapted to receive one tooth of superstructure **14**. As may be seen best in FIG. 5, template **15** is arcuately formed in cross-section to conform to the contour of the gum and bone structure, the scalloped periphery of template **15** also conforming to this contour so as to provide a secure fit of template **15** in the patient's mouth.

A gingival shoulder **16** is formed adjacent the scalloped periphery of template **15**, the shoulder thereby also extending lingually and/or palatally, and sets of apertures **18** are formed in template **15** at the individual tooth receiving sections **10***a* and **11***a* of template **15** defined by scallops **17** and **19** and associated respectively with the artificial teeth **10** and **11** of superstructure **14**. Also provided in each of template sections **10***a* and **11***a* are sets of projections **20** in the form of individual nailheads arranged in a triangular pattern adjacent to the apertures **18** within that section.

Centrally located in the section **12***a* of template **15** defined by scallop **21**, which is adapted to receive artificial tooth **12**, is an integral metallic vertical post **22**, which extends upwardly from the base of template **15** to an elevation of between one and two millimeters, slightly above the upper surfaces of projections **20**. The section **13***a* of template **15** defined by scallop **23** and associated with artia vertical dovetail slot **26**. Rather than being formed on template **15**, post **24** may also be fixedly mesially or distally of the last remaining tooth abutment in the patient's mouth which is immediately posterior or anterior to template **15**.

As seen best in FIG. 2, superstructure **14** comprises an outer porcelain coating **28** having the texture, color and appearance of the enamel coating of the patient's teeth, each tooth **10–13** having a downwardly opening hollow formed in the interior thereof, and coated with a lining **33**, preferably of an appropriate metal. Thus, teeth **10** and **11** are provided with hollows **30** and **32**, and tooth **12** is provided with hollow **34**, comprising a centrally-located counter-bore **36** having a cross-section corresponding to the vertical post **22** extending from section **12***a* at the upper surface of template **15**. Artificial tooth **13** is provided with an interior region **37** from which depends an insert **38**, formed in a dovetail cross-section corresponding to and adapted to mate with the cross-section of dovetail slot **26**. The parts **24–26** and **38** will be seen to constitute, in effect, a precision attachment type of structure.

To fix the denture **14** in the patient's mouth, the template **15** is first secured onto the gum region of the mouth by forcing securing elements, such as sharp implanting pins **40**, through, the openings **18** and through the fibro-mucosal tissue layer **42** into the bone structure **44**, preferably at an angle, as shown best in FIGS. 4 and 5. The angular disposition of the pins **40** within the bone structure **44** prevents the template **15** from becoming loosened from its position on bone **44**. The beaded upper ends of the pins **40** extend up above the template **15**, preferably to slightly below the height of the projections **20** (FIGS. 4 and 5).

Next, a post-like structure **46** is formed over the projections **20** and the headed upper ends of the pins **40**. This structure **46** may be formed of a suitable synthetic plastic such as acrylic resin, cast or molded in place. The projecting pinheads **20** embedded within the acrylic core **46** secure the core **46** onto the upper surface of template **15**. The embedment of the upper ends of pins **40** within the plastic core **46** serves to hold the template **15** in position in the mouth and the pins **40** in position relative to the template **15**. Dislocative forces applied to the core **46** are taken up by the projections **20** integral with the template base, and hence the effect of such forces on the pins **40** is minimized. The acrylic cores **46** are precisely shaped so as to correspond to the contour of the hollow interior regions **30** and **32** of artificial teeth **10** and **11**. Hence, when superstructure **14** is positioned over template **15**, teeth **10** and **11** are placed about cores **46***a* and **46***b*, respectively, a suitable adhesive being ap-

plied to the contacting surfaces of cores **46***a* and **46***b* and the interior regions **30** and **32** of teeth **10** and **11** to firmly secure these teeth onto the acrylic cores. Similarly, vertical post **22** is securely received within the hollow **36** formed in artificial tooth **12**, and the insert **38** is securely received within the dovetail slot **26**, a suitable adhesive being applied between the engaging surfaces as needed to thus securely retain the entire superstructure **14** on the template **15**. In the case in which vertical post **24** is fixed to the adjoining remaining natural tooth structure rather than to template **15**, the precision engagement between the mating insert **38** and the vertical post can be re-established if the need for removing the template **15** ever arises.

The scalloped gingival shoulder **16** extends interproximally and ends labially or buccally with a chamfer **47** at its lower end. As shown best in FIG. 5, the lower ends of the artificial teeth of superstructure **14** abut against the chamfer **47** of the scalloped gingival shoulder **16**, this abutment providing additional support for the artificial teeth, and preventing the ends of these teeth from contacting the sensitive gum tissue directly adjacent the template. Shoulder **16** further acts as a guide to limit the lateral extent of the acrylic core **46**.

The superstructure **14** is thus secured to the template **15**, template **15** being secured to the jawbone structure **44** of the patient. The template **15** serves as a stress distributor for the implanting pins **40** which secure the template **15** to the bone structure **44** and provide a smooth surface contact with the fibro-mucosal tissue **42**, rather than having the artificial tooth structure contact that sensitive tissue.

A second embodiment of the invention is shown in FIGS. 6–9 in the form of a full denture for a completely edentulous upper portion of the patient's mouth. The template **50** is of a configuration corresponding to the contour of the entire upper region of the patient's mouth and has a palatal connecting bar **52** extending between the free ends thereof which is adapted to be placed over the upper palate of the patient to stabilize the template **50** and to distribute the forces which template **50** encounters during its use in the patient's mouth. The template **50** is adapted to have affixed thereon a superstructure **54** formed of a plurality of artificial teeth connected to one another in a known manner. As in the embodiment illustrated in FIGS. 1–5, the template **50** of the embodiment of FIGS. 6–9 is scalloped buccally, labially, lingually and/or palatally and is arcuately formed in cross-section so that it assumes the contour of the natural mouth area in which the full denture is to be placed, the scallops once again defining sections of the template **50** associated with individual teeth of superstructure **54**, these sections being defined intermediate the restrictions defined by the scallops. For example, section **58** is adapted to receive artificial tooth **60** and is defined intermediate the restrictions **62** and **64** of the template **50**. It will be noted that the sections of template **50** located at the rear of the mouth, corresponding to the molar region, are of a relatively greater area and are each provided with a pair of parallel upstanding ails **66**. The individual tooth receiving sections located in the central portion of template **50** are of a generally smaller area, corresponding, for example, to the incisor and canine tooth regions, and are provided, as in the embodiment of FIGS. 1 and 5, with a plurality of upstanding projections in the form of pinheads **68**. A gingival shoulder **70** is preferably provided along the central portion of template **50** to provide support for the lower ends of the individual artificial teeth of superstructure **54** and to prevent the contact of these teeth with the sensitive gum tissue, all as in the previously described embodiment.

A plurality of openings **71** are provided through each section of template **50**. As shown, three of such openings are formed intermediate the rails **66**, while two of such openings are provided in the central tooth receiving sections from which the pinheads **68** project.

The template **50** is fastened to the bone structure **44** of the patient in the same manner as the previous embodiment; that is, by forcing a plurality of implanting pins **72** through openings **71** into the bone structure **44** of the patient, the pins **72** being driven into the bone at an angle to provide a greater retention force for the template **50**. A plurality of acrylic core **74** one such core being provided for each of the artificial teeth of superstructure **54**, are formed in a predetermined configuration about the groups of pinheads **68** and in the spaces between the rails **66**. Once the acrylic cores have been formed on the implanted template, the superstructure **54** is placed onto the supports defined by the plurality of cores **74**, and is securely adhered thereto, as by means of a suitable adhesive, to permanently secure the denture in the patient's mouth.

Thus, an improved denture implanting device has been described which is capable of being used in either partially or completely edentulous areas and which may be securely and substantially permanently implanted into the patient's mouth in a manner requiring a minimum amount of special equipment and operating skill. The provision of the thin metal template as the base for the denture distributes the stress along the denture for the securing means and also provides a protective layer between the denture material and the sensitive gum tissue. The same structure which secures the artificial teeth to the template also acts to hold the implanting pins in position and to minimize the possibility of loosening or dislocation of the denture. The resultant denture is reliable, sanitary, economical and relatively simple to both manufacture and install.

While only a limited number of embodiments of this invention have been specifically disclosed, it will be appreciated that many variations may be made thereto without departing from the scope of the present invention as defined in the appended claims.

I claim:

1. A device for securing a denture structure in a patient's mouth, said device comprising a template configured to conform to the shape of the area of the patient's mouth at which the denture structure is to be secured, said template being provided with a plurality of apertures adapted to receive therethrough a plurality of securing elements adapted to extend into the bone area therebeneath, said template thereby being adapted to be secured in the patient's mouth, and a plurality of projections formed on the upper surface of said template adjacent said apertures, at least one of said projections being in the form of a post integral with and projecting up from said template and adapted to be received within and secured to said denture structure, said projections defining a framework on which said denture structure is adapted to be formed.

2. The device of claim **1**, in which said projections are in the form of pinheads.

3. The device of claim **1**, in which said projections are in the form of opposed pairs of upstanding rails.

4. In the device of claim **1**, securing elements comprising headed nails passing through through said apertures, portions of said nails extending above said template, said portions further defining said framework.

5. In the device of claim **4**, in which said projections are in the form of pinheads.

6. In the device of claim **4**, in which said projections are in the form of opposed pairs of upstanding rails.

7. In the device of claim **1**, securing elements partially extending through said openings, a portion of said securing elements extending above said template, thereby to further define said framework.

8. The device of claim **7**, in which said projections are in the form of pinheads.

9. The device of claim **7**, in which said projections are in the form of opposed pairs of upstanding rails.

10. In the device of claim 7, a plastic post-like structure formed around and encompassing said projections and said upwardly extending portions of said securing elements.

11. In combination with the device of claim 10, artificial tooth structure having a recess on its underside in which said post-like structure is received and to which said post-like structure is secured.

12. In the device of claim 1, a plastic post-like structure formed around and encompassing said projections.

13. In combination with the device of claim 12, an artificial tooth structure having a recess on its underside in which said post-like structure is received and to which said post-like structure is secured.

14. The device of claim 12, in which raised, curved portions conforming to the gum line contour are provided adjacent the periphery of said template, thereby defining a plurality of individual tooth supporting areas.

15. In combination with the device of claim 1, a denture structure comprising an artificial tooth structure receiving said post and secured thereto.

16. The combination of claim 15, in which said artificial tooth structure is provided with a recess in which said post is received and to which said post is secured.

17. The combination of claim 16, in which one of said posts and said artificial tooth structure comprises a vertically extending, open-ended lateral slot having a given cross-sectional shape, and the other comprises a vertically extending lateral projection matingly received within said slot.

18. In the combination of claim 15, securing elements comprising headed nails, portions of which extend above said template, said portions further defining said framework.

19. The device of claim 1, in which raised, curved portions conforming to the gum line contour are provided adjacent the periphery of said template, thereby defining a plurality of individual tooth supporting areas.

20. The device of claim 19, in which said projections are in the form of pinheads.

21. The device of claim 19, in which said projections are in the form of opposed pairs of upstanding rails.

22. In the device of claim 19, securing elements partially extending through said openings, a portion of said securing elements extending above said template, thereby to further define said framework.

23. The device of claim 22, said securing elements comprising headed nails.

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