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(54) **NOTCHED PONTIC AND SYSTEM FOR
FABRICATING DENTAL APPLIANCE FOR
USE THEREWITH**

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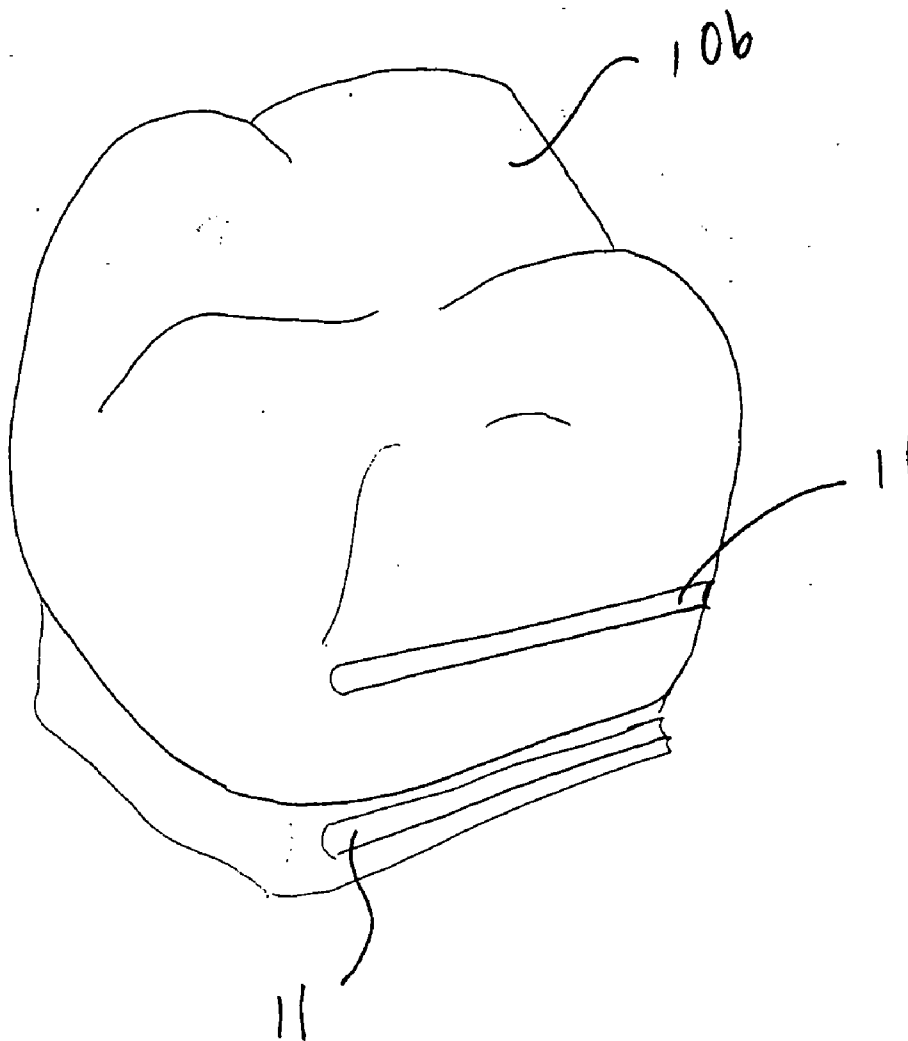
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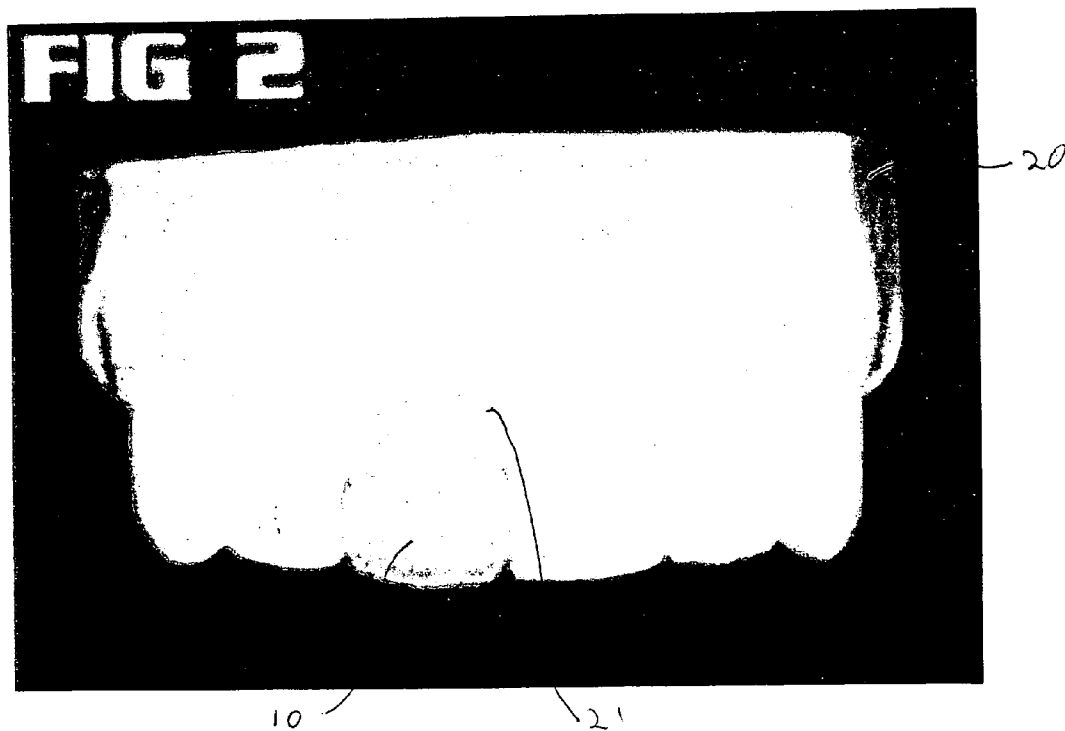
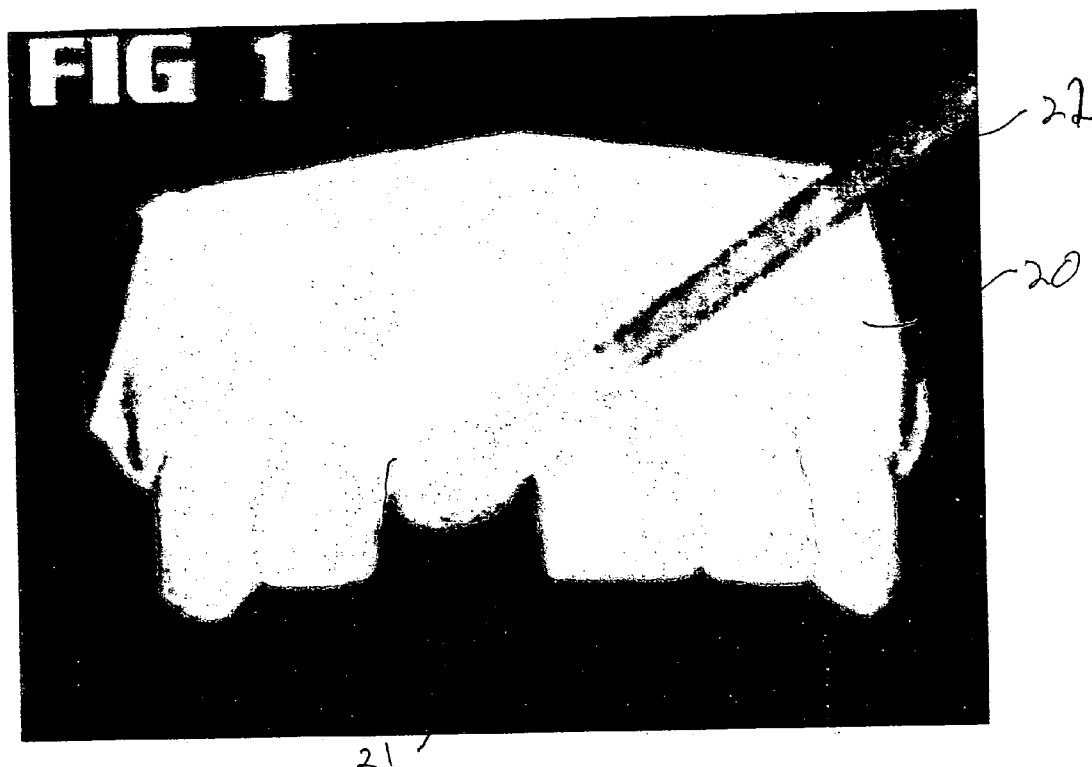
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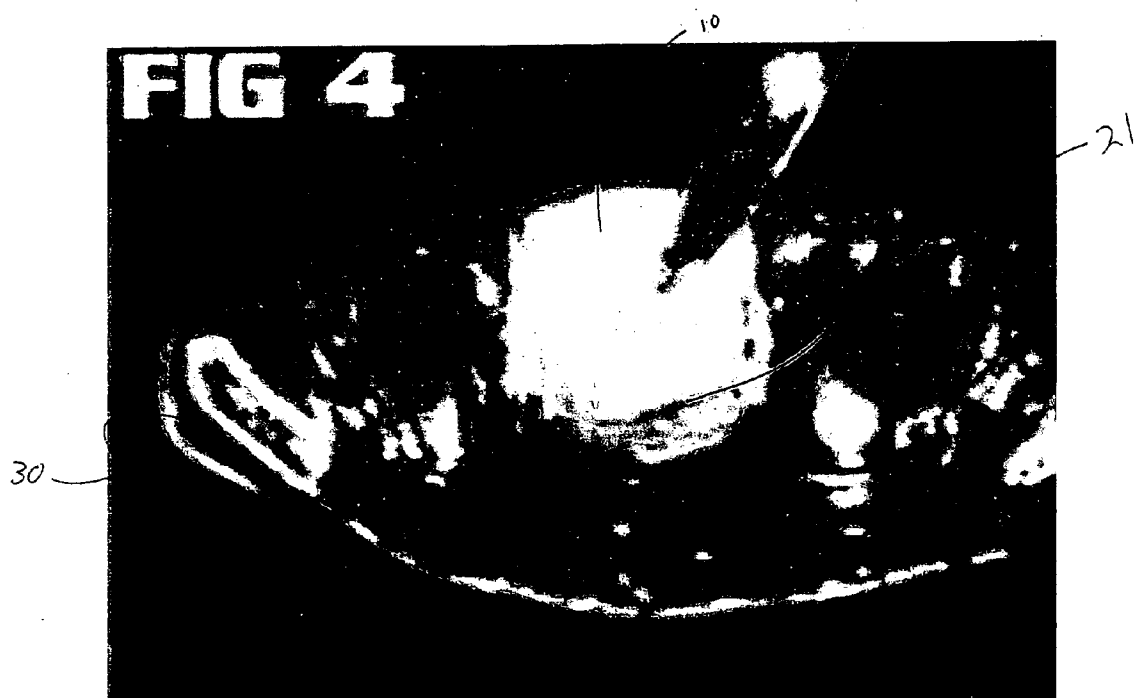
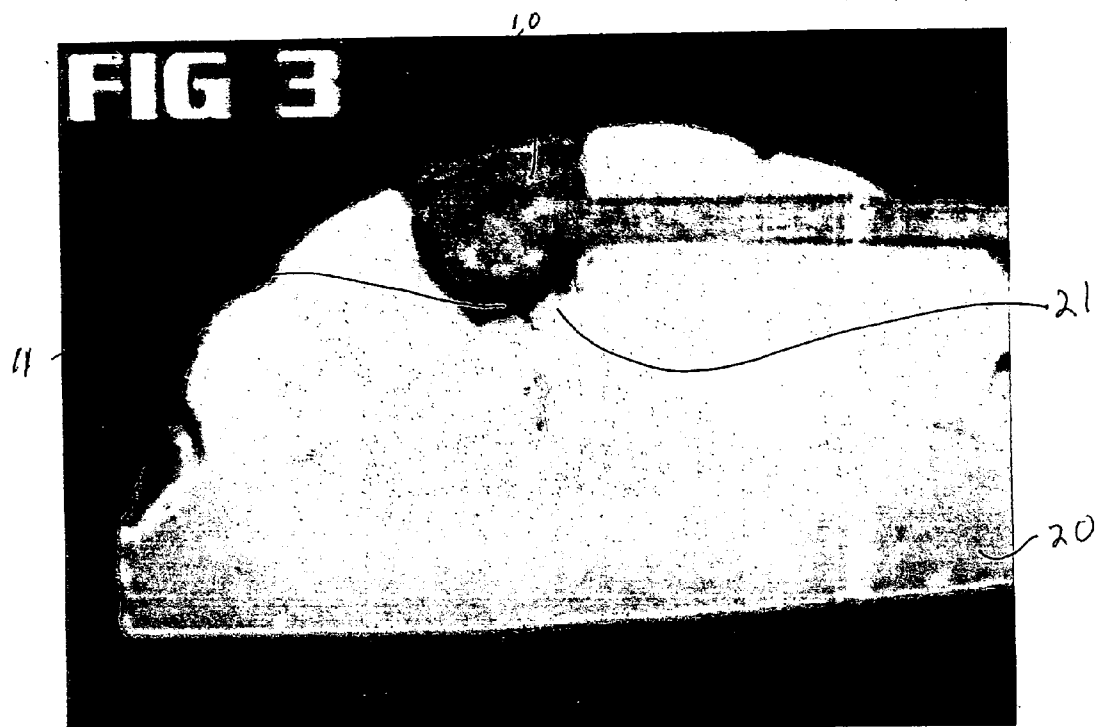
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(57) **ABSTRACT**

A pontic (10) having a prefabricated notch, channel or slot (11) to physically engage and ensure a secure mechanical lock with the dental appliance (30). The invention also pertains to a method of fabricating a dental appliance (30) and a kit for facilitating the same. The invention has particular application to thermoformed, removable appliances.







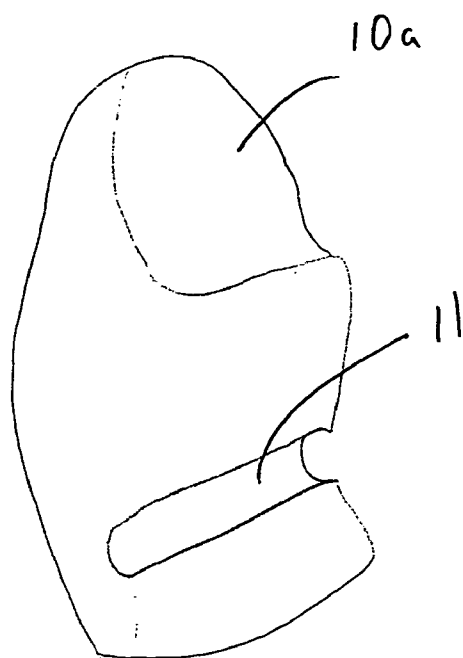


FIG 5

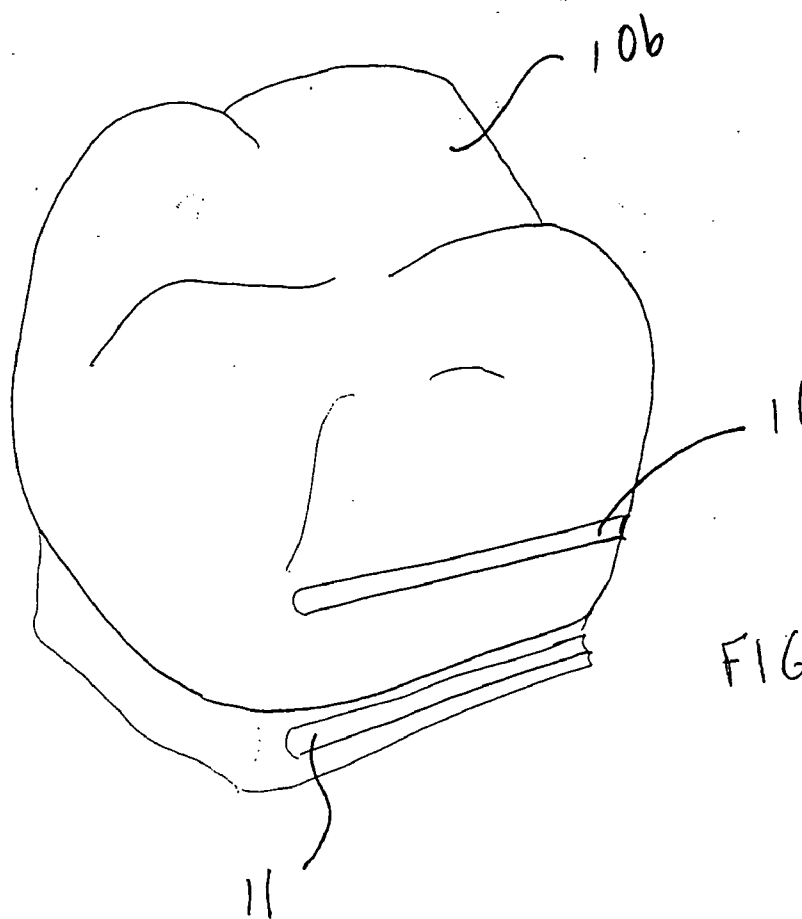


FIG 6

NOTCHED PONTIC AND SYSTEM FOR FABRICATING DENTAL APPLIANCE FOR USE THEREWITH

RELATED APPLICATIONS

[0001] This application is a U.S. non-provisional application which claims the priority benefit from U.S. Provisional Application No. 60/609,660 filed Sep. 14, 2004.

TECHNICAL BACKGROUND

[0002] The present invention is a temporary bridge as used with a dental appliance such as a retainer. More particularly, the invention relates to a pontic having a prefabricated channel or slot, such as a lingual channel therein, helping to ensure a secure mechanical lock with the dental appliance. The invention also pertains to a method of fabricating a dental appliance and a kit for facilitating the same. The invention has particular application to removable appliances.

BACKGROUND OF THE INVENTION

[0003] Dental appliances are used for a multitude of dental operative procedures. For example, a suitable plastic tray can be used in an orthodontic procedure to move teeth, and can also be used in a post-procedure to retain the teeth in the desired position. Such trays are known and are formed from plastic materials such as Essix C+ or ACE, each available from Raintree Essix of Metairie, La.

[0004] These trays are often thermoformed over a model of the patient's dentition. If the patient is missing a tooth, then the void in the resulting dental model will cause problems with the subsequent thermoforming operation. Further, because dental appliances such as tooth movement trays and retainers are used with ongoing dental procedures, the patient often cannot benefit from the well established dental procedures for restoring such deficiencies. That is, until the treatment is over, the patient often cannot get a new bridge, crown or other restorative. During the treatment period then, the patient must tolerate the dental deficiency. One solution to helping alleviate the patient's problem has been to provide temporary bridges and the like using appliances known as flippers. A flipper is a temporary artificial tooth that is attached with either a wire or a plastic piece that fits in the roof of the mouth. This is uncomfortable at best although it may be aesthetically acceptable.

[0005] Another solution which is adapted for use with removable appliances such as tooth movement trays and retainers has been to affix a temporary crown into the appliance itself in the area of the patient's missing tooth. Thus when the patient wears the appliance, the temporary pontic is positioned in the missing tooth space and appears normal to a casual observer.

[0006] Further still it has been the practice to actually affix the pontic to the model of the patient's dentition, such that when the appliance is thermoformed over the model, the pontic is embedded in the resulting appliance. This also helps to overcome the problems associated with trying to thermoform an appliance over a model with a missing tooth. To help secure the pontic to the appliance, it has also been the practice to cut a channel in the pontic to help mechanically lock the pontic into the plastic during thermoforming.

Such procedures are time consuming for the dental practitioner. A need exists therefore for a preformed pontic or set of pontics for use as temporary bridges with dental appliances. It should be simple and rapid for the dental practitioner to employ such pontics in the fabrication of the dental appliance.

SUMMARY OF THE INVENTION

[0007] There is provided according to the invention, a thermoformed dental appliance constructed by making an impression of a patient's dentition, constructing a dental impression cast from said impression, providing a pontic having a notch pre-formed therein and fitting same to the edentulous area of the cast, temporarily adhering the pontic to the cast, thermoforming a plastic sheet over the cast to form the appliance, while allowing the pontic to dislodge from the cast and mechanically lock into the appliance. The pontic may be selected from a plurality of pontics having different color, hue and or brightness characteristics or combinations thereof. The plurality of pontics may also have different sizes and shapes.

[0008] There is also provided according to the invention a method of constructing a dental appliance incorporating a pontic, comprising the steps of

[0009] a) making an impression of a patient's dentition;

[0010] b) constructing a dental impression cast from said impression;

[0011] c) providing a pontic having a notch pre-formed therein and fitting same to

[0012] the edentulous area of the cast, temporarily adhering the pontic to the cast; thermoforming a plastic sheet over the cast to form the appliance, while allowing the pontic to dislodge from the cast and mechanically lock into the appliance. The pontic may be selected from a plurality of pontics having different color, hue and or brightness characteristics or combinations thereof. The plurality of pontics may also have different sizes and shapes.

[0013] Another method according to the invention for manufacturing a pontic comprises the steps of:

[0014] a) providing an injection mold having a cavity for forming said pontic;

[0015] b) providing notch forming means in associated with said injection mold; injecting thermoplastic into said mold and allowing same to cure, so as to form a pontic having a notch formed therein. A plurality of such pontics may be provided having different color, hue and or brightness characteristics or combinations thereof. The plurality of pontics may also have different sizes and shapes.

[0016] According to a still further inventive method, a method of building a dental bridge incorporating a pontic, comprises the steps of:

[0017] a) forming a plurality of pontics of various sizes, shapes and colors;

[0018] b) forming a mounting notch in each of said pontics in one or more locations on said pontic, providing a variety of pontics having mounting notches formed therein;

providing said pontics to a dental caregiver so as to provide said dental caregiver with a greater selection so that the dental caregiver has a greater statistical probability of utilizing a pontic comprising a satisfactory match to the patients teeth, with nominal customization and no notch preparation required. The pontic may be selected from a plurality of pontics having different color, hue and or brightness characteristics or combinations thereof. The plurality of pontics may also have different sizes and shapes.

[0019] There is also provided according to the present invention, a kit for fabricating a dental appliance having at least one pontic affixed thereto, comprising a plurality of pontics of various size, shape, color, hue, brightness or combinations thereof; each said pontic of said plurality having a notch in one or more locations thereon.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] **FIG. 1** is a front perspective view of a model of a patient's upper dental arch and having a missing tooth thereon.

[0021] **FIG. 2** is a front perspective view of a model as in **FIG. 1** showing a temporary pontic according to the invention affixed to the model in the area of the patient's missing tooth.

[0022] **FIG. 3** shows a rear perspective view of the model of **FIG. 2**, showing the pontic being affixed to the model.

[0023] **FIG. 4** shows the pontic of **FIGS. 2 and 3** embedded and mechanically locked into a plastic tray retainer.

[0024] **FIG. 5** is a perspective view of an exemplary pontic according to the invention.

[0025] **FIG. 6** is a perspective view of another exemplary pontic according to the invention.

PREFERRED EMBODIMENTS FOR CARRYING OUT THE INVENTION

[0026] The present invention relates to dental appliances such as temporary anterior bridges or the like, and particularly a dental appliance utilizing a modular, customizable assembly including one or more pontics, each having the mounting notch pre-formed therein during manufacture. As used herein, "notch" means any channel, cut, scrape, gouge, etch, trench, void or other indentation, whether of regular or irregular shape and size, without limitation. The pontic according to the invention may have one of more such notches placed at one or more locations thereon. As an example, the pontic as shown in **FIG. 5** is provided with a notch in the form of a lingual channel. Because other notch shapes, locations and numbers thereof on a given pontic may vary, all such variations have not been shown on the drawings and the notch as shown is considered to be representative of all such notches.

[0027] The preferred embodiment of the present invention thereby provides a temporary anterior bridge which requires less time and effort to fabricate, and is more economical in implementation. While the invention has application to any dental appliance, it is particularly suited for use with removable appliances thermoformed from plastic sheet materials. The notch **11** as described herein serves to physically engage

the appliance during for example, the thermoforming of the appliance, and helps to secure the pontic to the appliance thereby formed.

[0028] Dental care providers have long been making temporary anterior bridges to simulate missing teeth in patients, for the patient to wear until a permanent solution can be provided. For this purpose, an off-the-shelf pontic, or artificial tooth, is employed to form a fixed partial denture or thermoplastic slip over appliance to replace the lost natural tooth, restore its function, and to occupy the space previously occupied by the natural crown. In the past, the pontic had to be prepared by notching same to facilitate securing it to the appliance, which requires additional steps which had to be performed by the dental caregiver.

[0029] Unlike the prior art, the present invention provides a ready-made pontic **10** which incorporates a notch **11** (**FIGS. 5 and 6**) formed therein during manufacture, so as to dispense with the necessity of manually forming the required notches during preparation of the bridge for the patient. **FIG. 5** shows a representation of an anterior pontic **10a** while **FIG. 6** is an example of a posterior pontic **10b**. It is understood that the term pontic refers to any portion of a bridge or other dental restoration that takes the place of a missing natural tooth or portion thereof.

[0030] A selection of pontics **10**, **10a** and **10b** is thereby formed of various sizes and colors, hues, brightness or combinations thereof, already having a notch **11** or trench formed in the outer surface of the pontic. In the case of the thermoplastic slip on, that is removable appliances, the notch may preferably be formed on the lingual surface, as will be shown on the present drawings.

[0031] During manufacture, each pontic is formed by injection molding or the like, which molds may include means to form the notch or ridge to facilitate securing the pontic to the appliance. A variety of sized, shaped, and colored pontics are provided for use by the dental care provider in his/her practice to best match the missing tooth or teeth of the patient.

[0032] In practice, an impression is made of the patient, and working cast is then formed for use in fabricating the appliance.

[0033] The attached figures illustrate utilizing the pontic **10** with a pre-formed notch **11** (**FIG. 3**) on the lingual surface of said pontic, for fabricating a slip-on thermoplastic appliance.

[0034] In the example illustrated in **FIG. 1** of the drawings, a separating medium is applied to the edentulous alveolar ridge area **21** of a dental cast **20** using any conventional means such as swab **22**.

[0035] Referring to **FIG. 2**, a suitable pontic **10** is chosen by the dental care provider to provide the appropriate size and color, hue and/or brightness, and is fitted into the edentulous area **21** of the cast **20**. The base of the pontic **10** may have to be trimmed to approximate the ridge and provide a secure fitting.

[0036] **FIG. 3** illustrates a lingual view of the pontic fitted to the edentulous area **21** of the cast **20**, with the pre-formed notch **11**. The pontic **10** is then secured to the cast with quick-cured acrylic or any other conventional thermally compatible adhesive (not shown) for subsequent thermo-

forming, using any conventional means such as with swab **22**. For aesthetic purposes, pink acrylic may be used in the gingival area.

[0037] Once secured to the cast, a plastic sheet such as Essix C+, Essix A+ for children, or the like may be thermoformed over the cast utilizing an Essix brand vacuum thermoformer or the like over the thus prepared cast **20**, resulting in the formation of dental tray appliance **30**. Once thermoformed, the pontic **10** should dislodge from the cast **20** and mechanically lock into the appliance **30** as is depicted in **FIG. 4**. The appliance **30** may then be conventionally trimmed for a secure and comfortable fit.

[0038] By “mechanically lock” and such terms it is considered that the preformed notch serves to physically engage material from the plastic appliance in a manner that the physical interaction therebetween holds, grabs or otherwise secures the pontic to the appliance.

[0039] In order to facilitate the fabrication of a dental appliance such as tray **30** having a pontic **10** according to the present invention, the invention also provides a kit for fabricating the dental appliance. The kit includes a plurality of pontics as above of various size, shape, color, hue, brightness or combinations thereof as discussed hereinabove. Each pontic of the inventive plurality has a notch in one or more locations thereon, as also described hereinabove.

[0040] The inventive kit may also include a dental compound for temporarily affixing at least one of the pontics to the dental model. An example of such an affixing compound is a blackout compound such as Triad Gel available from DENTSPLY International of York, Pa. The material used to affix the pontic to the model should not be a permanent adhesive, but may be a reversible adhesive. The material preferably is able to withstand melting at the subsequent thermoforming temperature, has suitable strength to hold the pontic in place during such procedures but is easily removable such that once the tray is removed from the model the bond between the compound and the pontic is readily and easily broken. The kit may include for example, at least one pontic having a notch that is a lingual channel or any such shape, location or number of notches. The kit also preferably includes pontics in the shapes of upper and lower anterior and posterior teeth or combinations thereof.

[0041] It is reiterated that the pontic and its use in the above illustration is for exemplary purposes, and the notch location and configuration can vary depending upon the application and appliance used.

[0042] The invention embodiments herein described are done so in detail for exemplary purposes only, and may be subject to many different variations in design, structure, application and operation methodology. Thus, the detailed disclosures therein should be interpreted in an illustrative, exemplary manner, and not in a limited sense.

1. A thermoformed dental appliance constructed by making an impression of a patient's dentition, constructing a dental impression cast from said impression, providing a pontic having a notch pre-formed therein and fitting same to the edentulous area of the cast, temporarily adhering the

pontic to the cast, thermoforming a plastic sheet over the cast to form the appliance, while allowing the pontic to dislodge from the cast and mechanically lock into the appliance.

2. The method of constructing a dental appliance incorporating a pontic, comprising the steps of:

- a) making an impression of a patient's dentition;
- b) constructing a dental impression cast from said impression;
- c) providing a pontic having a notch pre-formed therein and fitting same to the edentulous area of the cast, temporarily adhering the pontic to the cast;
- d) thermoforming a plastic sheet over the cast to form the appliance, while allowing the pontic to dislodge from the cast and mechanically lock into the appliance.

3. A pontic having a notch formed therein during manufacture.

4. The method of manufacturing a pontic comprising the steps of:

- a) providing an injection mold having a cavity for forming said pontic;
- b) providing notch forming means in associated with said injection mold;
- c) injecting thermoplastic into said mold and allowing same to cure, so as to form a pontic having a notch formed therein.

5. The method of building a dental bridge incorporating a pontic, comprising the steps of:

- a) forming a plurality of pontics of various sizes, shapes and colors;
- b) forming a mounting notch in each of said pontics in one or more locations on said pontic, providing a variety of pontics having mounting notches formed therein;
- c) providing said pontics to a dental caregiver so as to provide said dental caregiver with a greater selection so that the dental caregiver has a greater statistical probability of utilizing a pontic comprising a satisfactory match to the patients teeth, with nominal customization and no notch preparation required.

6. A kit for fabricating a dental appliance having at least one pontic affixed thereto, comprising a plurality of pontics of various size, shape, color, hue, brightness or combinations thereof; each said pontic of said plurality having a notch in one or more locations thereon.

7. A kit as in claim 6, further comprising a dental compound for temporarily affixing at least one of said pontics to a dental model.

8. A kit as in claim 7, wherein said dental compound is blackout compound.

9. A kit as in claim 6, wherein at least one of said pontics has a notch that is a lingual channel.

10. A kit as in claim 6 wherein said plurality includes pontics in the shapes of upper and lower anterior and posterior teeth or combinations thereof.

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