

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
4 December 2008 (04.12.2008)

PCT

(10) International Publication Number  
**WO 2008/147507 A1**

(51) International Patent Classification:  
*A61C 7/08* (2006.01)

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(21) International Application Number:  
PCT/US2008/006491

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(22) International Filing Date: 21 May 2008 (21.05.2008)

(81) Designated States (*unless otherwise indicated, for every  
kind of national protection available*): AE, AG, AL, AM,  
AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA,  
CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE,  
EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID,  
IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC,  
LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN,  
MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH,  
PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV,  
SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN,  
ZA, ZM, ZW.

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
11/807,367 25 May 2007 (25.05.2007) US

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(84) Designated States (*unless otherwise indicated, for every  
kind of regional protection available*): ARIPO (BW, GH,  
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,

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[Continued on next page]

(54) Title: TABBED DENTAL APPLIANCE

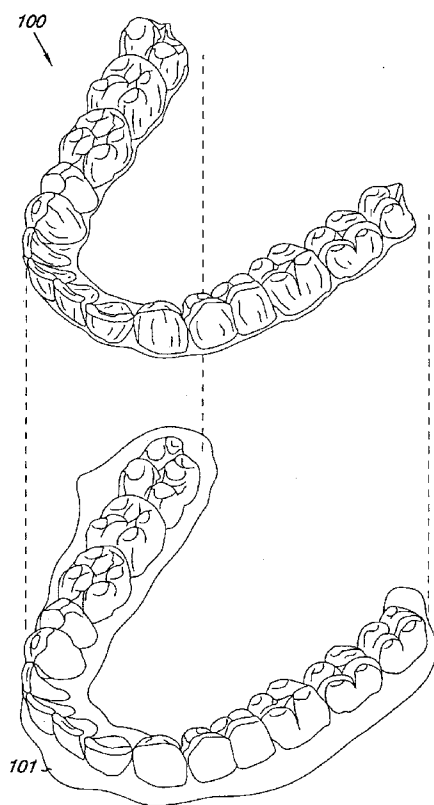


Fig. 1

(57) Abstract: Embodiments include dental appliances, dental appliance systems, and methods of making and using such appliances. In one embodiment, a dental appliance includes a number of tooth apertures for the placement of teeth therein and a tab representing a position of a tooth that has not fully erupted and oriented to be received over the position of the tooth that has not fully erupted.



ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,  
FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL,  
NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG,  
CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

## TABBED DENTAL APPLIANCE

### Background

The present disclosure is related generally to the field of  
5 orthodontics. More particularly, the present disclosure is related to the  
field of dental alignment which can be utilized where teeth have not fully  
erupted.

Many orthodontic treatments involve repositioning misaligned  
teeth and changing bite configurations for improved cosmetic appearance  
10 and dental function. Repositioning can be accomplished, for example, by  
applying controlled forces to one or more teeth over a period of time.

Some orthodontic processes use dental positioning appliances for  
realigning teeth. Such appliances may utilize a thin shell of material  
having resilient properties, referred to as an "aligner" that generally  
15 conforms to a patient's teeth but is slightly out of alignment with the initial  
tooth configuration.

Placement of such an appliance over the teeth provides controlled  
forces in specific locations to gradually move the teeth into a new  
configuration. Repetition of this process with successive appliances that  
20 provide progressive configurations eventually move the teeth through a  
series of intermediate arrangements to a final desired arrangement. An  
example of such a system is described in U.S. Patent No. 5,975,893.

Such systems generally rely on designing and fabricating some,  
most, or all of the appliances, to be worn by the patient, at the outset of  
25 treatment. In some processes the design of the appliances relies on  
computer modeling of a series of successive tooth arrangements and the  
individual appliances are designed to be worn over the teeth and to  
reposition the teeth by using the appliances in a serial order, progressing  
from a first appliance, through each of the intermediate appliances, to the  
30 last appliance.

However, in some instances, the patient has teeth that are not fully  
erupted (i.e. vertically positioned). In such instances, these teeth can

supra-erupt creating interferences with the opposite arch or suffer other alignment problems since they are not included in the treatment plan. Since the teeth are at the commencement of treatment, in many cases, much lower than the other teeth, the appliances are not designed to  
5 accommodate such teeth.

#### Brief Description of the Drawings

Figure 1 illustrates a jaw of a subject together with an example of a tabbed position adjustment appliance embodiment of the present  
10 disclosure.

Figure 2A illustrates an example of an appliance end having a small tab provided thereon according to an embodiment of the present disclosure.

Figure 2B illustrates an example of upper and lower appliance  
15 ends each having a small tab provided thereon according to an embodiment of the present disclosure.

Figure 3A illustrates another example of an appliance end having a small tab provided thereon according to an embodiment of the present disclosure.

Figure 3B illustrates an example of an appliance end having a medium sized tab provided thereon according to an embodiment of the present disclosure.  
20

Figure 3C illustrates an example of an appliance end having a large sized tab provided thereon according to an embodiment of the present disclosure.  
25

Figure 4 provides a computing system for use in the design of dental appliances thereof that can be used in association with the fabrication of embodiments of the present disclosure.

#### Detailed Description

Embodiments include dental appliances, dental appliance  
30 systems, and methods of making and using such appliances and

systems. In some embodiments, for example, a dental appliance can include one or more tooth apertures for the placement of teeth therein and a tab representing a position of a tooth that has not fully erupted.

Such a tab can, for instance, be oriented to be received over the  
5 position of the tooth that has not fully erupted. In this way, the tab can provide force and/or support to one or more other teeth being adjusted, even though the tooth is not fully in position, among other benefits. This can be particularly useful in adjusting teeth that are adjacent to (e.g., above or next to the not fully erupted tooth). Another benefit of such an  
10 appliance is that force can be applied to one or more teeth that are erupting in order to keep the teeth from over erupting (e.g., supra-eruption).

In some embodiments, the tab can be of a length to span (i.e., extend) across a portion of a horizontal position (e.g., in the middle of a  
15 number of teeth or at the end of a number of teeth) to be occupied by the tooth when fully erupted. Embodiments of such configurations are illustrated in Figures 3A-3C, among others. For instance, as illustrated in Figure 3B, the tab can be of a length to span across half of the horizontal position to be occupied by the tooth when fully erupted.

20 Embodiments of the present disclosure also include a number of method embodiments. For example, in some embodiments, a method can include applying a first dental appliance of a number of appliances shaped to move teeth by inserting the first appliance into a mouth of a patient, where the first dental appliance has a tab of a first length  
25 representing a position of a tooth that has not fully erupted and applying a second dental appliance of the number of appliances, where the second dental appliance has a tab of a second length representing a position of a tooth that has not fully erupted and where the tab of a second length is longer than the tab of the first length.

30 In some embodiments, a first aligner can include a small sized tab and a subsequent aligner can include a larger sized tab. The use of different aligner sizes can be utilized for a number of different reasons.

Such embodiments can be beneficial, for example, to provide better patient comfort than a full sized aligner.

For example, if a molar has not fully erupted, it may be uncomfortable to wear a full sized aligner with a molar aligner portion provided thereon since the portion protrudes past the teeth that are fully erupted. Less than full length tabbed aligners can be beneficial, in some instances, because the tab can reduce or prevent supra-eruption if a tooth erupts into contact with the tab during use of the tabbed aligner, among other benefits.

Such embodiments can also be beneficial because a longer tab length can provide more rigidity and/or can be shaped to receive one or more surfaces of an erupting tooth, among other benefits and functions. In some embodiments, the length of the tabs can remain the same from one aligner to a subsequent one or can change from a larger tab to a smaller tab from one aligner to a subsequent one.

As discussed above, embodiments can include removing the first appliance before inserting the second appliance. This can be beneficial in implementing embodiments utilizing successive stages of arrangements to adjust positions of one or more teeth.

In some such embodiments, one or more dental appliances can be applied. In such embodiments, a third dental appliance, for example, can have a tab of a length representing a position of a tooth that has not fully erupted and where the tab of such length is longer than the tabs of the first and second lengths.

Such embodiments can be beneficial, for example, as the erupting tooth continues to erupt and can, in some instances, begin to be used for support of the other portions of the appliance to which the tab is attached and/or to other appliances, the application of force, and/or can begin to be adjusted, among other benefits. For example, the aligner tab can be used to apply force to one or more teeth being moved by the aligner or an adjacent aligner.

Tabs can also be designed to provide some initial adjustment to an erupting tooth as it is erupting. Such embodiments can be beneficial

where a tooth may be erupting in an incorrect position and may be able to keep an erupting tooth from affecting the positioning of other teeth, if the erupting tooth is erupting in a manner to produce such an affect.

In some embodiments, a third dental appliance can have a tab of a  
5 length representing a position of a tooth that has fully erupted. In such embodiments, the tab of such length will likely be longer than the tabs of the first and second lengths. In this way, the tab can use one or more surfaces of the erupted tooth to aid in providing support, force, and/or its position can be adjusted.

10 In some embodiments, the first appliance can be removed when the tooth that has not fully erupted reaches a threshold of eruption. Thresholds of eruption can be any suitable threshold, and may be determined by the manufacturer or by a treatment professional.

For example, a threshold for removing a first appliance may be  
15 when the top of the tooth erupts from the surface of the gingiva. A threshold for removing a second appliance may be when the tooth has erupted past a halfway point as determined by a treatment professional, for example.

In some embodiments, a first dental appliance of a number of  
20 appliances can be designed by surveying the positioning of a patient's teeth within a mouth of a patient, where the first dental appliance has a tab of a first length representing a position of a tooth that has not fully erupted. Such an embodiment, may also include a second dental appliance of the number of appliances that is designed having a tab of a  
25 second length representing a position of a tooth that has not fully erupted and where the tab of a second length is longer than the tab of the first length.

In such embodiments, the surveying of the positioning of a  
patient's teeth within a mouth of a patient can, for example, be  
30 accomplished by taking a set of one or more data points manually by a treatment professional and entering the data points into a computing device.

The data can also be obtained through an automated or semi-automated process. Further, a size and/or shape of an erupting tooth can be estimated, for example, through use of a library of teeth sizes and/or shapes and/or information about the patient's other teeth. This  
5 information can be provided manually by a treatment professional or by an automated or semi-automated process in various embodiments.

Referring now to Figure 1, Figure 1 illustrates a jaw of a subject together with an example of a tabbed position adjustment appliance embodiment of the present disclosure. In various embodiments, such  
10 appliances can be used to affect incremental repositioning of one or more teeth, as described generally above.

The processes or systems of the present disclosure can employ any positioners, retainers, and/or other removable appliances for finishing and maintaining teeth positions in connection with orthodontic treatment.  
15 The systems for use with embodiments of the present disclosure can utilize a plurality of such appliances that can, for example, be worn by a patient successively in order to achieve the gradual tooth repositioning, as described herein.

An appliance (e.g., appliance 100) can, for example, be fabricated  
20 from a polymeric shell, or formed from other material, having a cavity shaped to receive and apply force to reposition teeth from one teeth arrangement to a successive teeth arrangement. The shell may be designed to fit over a number of, in many instances all teeth, present in the upper or lower jaw 101.

25 In some situations, certain individual or small sets of the teeth will be repositioned while others of the teeth will provide a base or anchor region for holding the repositioning appliance in place as it applies a resilient repositioning force against the tooth or teeth to be repositioned. In such cases, one or more of the teeth which are moved can also serve as a  
30 base or anchor region for holding the repositioning appliance. Additionally, the gums and/or the palette can serve as an anchor region,



thus allowing all or nearly all of the teeth to be repositioned at the same time, if desired.

Figure 2A illustrates an example of an appliance end having a small tab provided thereon according to an embodiment of the present disclosure. In Figure 2A, the appliance embodiment has been positioned  
5 over the teeth and the illustration is focused on the positioning of one end of the appliance that includes a small sized tab thereon.

For example, in the embodiment of Figure 2A, the tab 210 extends over the mesial cusps of the erupting tooth 212 which is covered by the gingiva on the jaw 201. The amount that the tab extends can be any  
10 length (i.e., a horizontal extension to cover a portion of a top or side of a tooth surface).

Additionally, tabs can also have different depths (i.e., a portion of a tab that extends vertically along one or more side surfaces of a tooth) and/or thicknesses (i.e., the thickness of the material that forms a  
15 horizontal or vertical surface of the tab). For example, the depth of the tab can be any depth, from virtually no depth (i.e., the thickness of the material forming a horizontal tab portion) to a depth of the bottom of a side tooth surface (i.e., a depth above or below the gingiva).

In some embodiments, the thickness of one or more surfaces of the tab can be increased to create contact with the erupting tooth. In some embodiments, a surface of the tab can be oriented to be placed in contact with the tooth. For example, if a bottom surface of a tab is to be positioned to contact a top surface of a tooth, the horizontal surface that  
20 forms the bottom surface of the tab can be positioned lower than those horizontal surfaces forming the other portions of the aligner that are oriented to contact top surfaces of teeth that are fully erupted (e.g., stepped down from one or more other surfaces of the aligner. In some embodiments, at least one of a depth or thickness of a surface on a first  
25 dental appliance a depth and/or thickness can be greater than a corresponding surface on the second dental appliance. Such thickened  
30

or stepped embodiments can be beneficial in instances where the aligner is used to aid in the positioning of a tooth as it is erupting.

In some embodiments, the depth or thickness of a tab can be adjusted from one aligner to a subsequent aligner. For example, an aligner may have a first thickness and/or depth that is thicker and/or deeper than a subsequent aligner. This may be due to the amount that the tooth has erupted or the positioning of the aligner with respect to the gingiva adjacent to the tooth that is erupting.

Although illustrated in Figure 2A as oriented to abut the top surface of the erupting tooth, one or more tabs may be provided on an appliance that will abut one or more side surfaces of the erupting tooth. Tabs may also be provided that are designed to abut multiple surfaces on the erupting tooth. For example, in some embodiments, a tab may have a bottom surface that will abut the top surface of a tooth and a side surface that will abut the side surface of a tooth.

As discussed herein, the one or more tabs may be designed to be positioned to abut a tooth surface as the tooth erupts further from its current position or may be designed to be positioned in a location that would abut a fully erupted tooth, but when positioned initially, may not abut any tooth surface. Further, as discussed herein a number of appliances with tabs of varying shapes and lengths can be provided to provide support, force, and/or alignment of the erupting tooth and/or other teeth, such as those abutting surfaces of the appliance to which the tab is attached or other appliances.

Figure 2B illustrates an example of upper and lower appliance ends each having a small tab provided thereon according to an embodiment of the present disclosure. In the embodiment of Figure 2B, a first appliance 200-1 and a second appliance 200-2 are designed to have a mating engagement such that proper forces are exerted for alignment of a number of teeth.

In the embodiment illustrated in Figure 2B, the second appliance has a tab with a bottom surface 214, a side surface 216, and a top

surface 218. The bottom surface 214 is shaped to accommodate the shape of the top of the erupting tooth 212 within the gingiva of the jaw 201. The side surface 216 is shaped to accommodate the shape of one side of the erupting tooth 212.

5           In some embodiments, the tab includes a surface that is shaped to mate with one or more surfaces of another appliance to be positioned adjacent to the surface of the tab. Such surfaces can be used to provide support, force, and/or adjustment to one or more teeth being adjusted by the first and/or second appliance, among other benefits.

10           For example, in various embodiments, the tab can include a surface that is shaped to mate with a surface of a second tab of a second appliance that is to be positioned adjacent to the surface of the tab. As discussed above, such surfaces can be used to provide support, force, and/or adjustment to one or more teeth being adjusted by the first and/or  
15           second appliance, among other benefits.

            For instance, in the embodiment of Figure 2B, the top surface 218 is shaped to mate with a surface of the appliance 200-2 (e.g., the tab portion thereof, for example). The terms top and bottom are used herein to aid the reader and are not to be viewed as limiting with respect to the  
20           embodiments of the present disclosure.

            Embodiments of the present disclosure also include a number of dental appliance system embodiments. For example, in some embodiments, a system can include a first dental appliance of a number of appliances shaped to move teeth.

25           The first appliance can, for instance, include a tab of a first length representing a position of a tooth that has not fully erupted. The system can also include a second dental appliance of the number of appliances, where the second dental appliance has a tab of a second length representing a position of a tooth.

30           In such embodiments, the first appliance can be an appliance for adjustment of upper teeth of a patient and the second appliance can be for the adjustment of lower teeth of the patient, in some embodiments. In

various embodiments, the appliances can be used on different teeth in the upper or lower portion of the patient's mouth.

Additionally, in some embodiments, the appliances can be used serially in the patient's mouth (i.e., one appliance is removed from a patient's mouth and another appliance is positioned therein). Such  
5      embodiments can be used sequentially, for example, as part of a system of adjustment that moves one or more teeth through a number of successive stages of arrangements, such as incrementally moving teeth from an initial position through a number of intermediate positions and  
10     then to a final position.

For instance, in the embodiments represented in Figures 3A, 3B, and 3C, the appliances can be used as a system. Figure 3A illustrates an example of an appliance end having a small tab provided thereon according to an embodiment of the present disclosure, similar to that  
15     provided in the embodiment of Figure 2A.

Figure 3B illustrates an example of an appliance end having a medium sized tab provided thereon according to an embodiment of the present disclosure. In the embodiment of Figure 3B, the tab can, for example, span midway across the area over which a tooth is erupting. A  
20     medium tab can be any size and shape between a small tab and a large tab.

For example, in some embodiments, the medium tab length can be designed to cover the mesial cusps and a portion of (e.g., half of the distal cusps. Additionally, in some embodiments, there can be several  
25     differently sized medium tab appliances between the small and large tab appliances. In some embodiments, the tab can have multiple medium sized surfaces. For example, the tab can include one or more side surfaces that are sized between the small tab and the large tab appliances.

30     In some embodiments, the tab can be of a length to span across the entire horizontal position to be occupied by the tooth when fully erupted. In some such embodiments, the tab can have a number of

surfaces constructed to interact with the surface of the tooth when partially and/or fully erupted.

For example, Figure 3C illustrates an example of an appliance end having a large sized tab provided thereon according to an embodiment of the present disclosure. For instance, in various embodiments, the tab  
5 includes a bottom surface that is shaped to mate with a top surface of the tooth. In the embodiment of Figure 3C, the tab extends over the entire occlusal surface of the erupting/erupted tooth.

In some embodiments, the tab includes a bottom surface that is  
10 shaped to mate with a top surface of the tooth when fully erupted. In such embodiments, the tooth can potentially erupt into position within the shape of the tab and, therefore, the tab can be used to provide support, force, and/or adjustment to the erupting/erupted tooth and/or other teeth that are being adjusted by the one or more appliances.

15 In various embodiments, the tab can be a side surface that is shaped to mate with a side surface of the tooth. Such a side surface can also be a part of a tab, as discussed above.

Figure 4 provides a computing system for use in the design of dental appliances thereof that can be used in association with the  
20 fabrication of embodiments of the present disclosure. In the system illustrated in Figure 4, the system includes a computing device 438 having a processor 420 and memory 422. The memory can include various types of information including data 424 and executable instructions 426 as discussed herein.

25 Additionally, as illustrated in the embodiment of Figure 4, a system can include a network interface 436. Such an interface can allow for processing on another networked computing device or such devices can be used to obtain information about the patient or executable instructions for use with various embodiments provided herein.

30 As illustrated in the embodiment of Figure 4, a system can include one or more input and/or output interfaces 428. Such interfaces can be used to connect the computing device with one or more input or output

devices. For example, in the embodiment illustrated in Figure 4, the system includes connectivity to a scanning device 430, a camera dock 432, and a keyboard.

Such connectivity allows for the input of image information (e.g., scanned images or digital pictures, etc.) or instructions (e.g., input via keyboard) among other type of information. Although some embodiments may be distributed among various computing devices within one or more networks, such systems as illustrated in Figure 4 can be beneficial in allowing for the capture, calculation, and analysis of the various information discussed herein.

Although specific embodiments have been illustrated and described herein, those of ordinary skill in the art will appreciate that any arrangement calculated to achieve the same techniques can be substituted for the specific embodiments shown. This disclosure is intended to cover any and all adaptations or variations of various embodiments of the disclosure.

It is to be understood that the use of the terms "a", "an", "one or more", "a number of", or "at least one" are all to be interpreted as meaning one or more of an item is present. Additionally, it is to be understood that the above description has been made in an illustrative fashion, and not a restrictive one. Combination of the above embodiments, and other embodiments not specifically described herein will be apparent to those of skill in the art upon reviewing the above description.

The scope of the various embodiments of the disclosure includes any other applications in which the above structures and methods are used. Therefore, the scope of various embodiments of the disclosure should be determined with reference to the appended claims, along with the full range of equivalents to which such claims are entitled.

In the foregoing Detailed Description, various features are grouped together in a single embodiment for the purpose of streamlining the disclosure. This method of disclosure is not to be interpreted as

reflecting an intention that the embodiments of the disclosure require more features than are expressly recited in each claim.

Rather, as the following claims reflect, inventive subject matter lies in less than all features of a single disclosed embodiment. Thus, the  
5 following claims are hereby incorporated into the Detailed Description, with each claim standing on its own as a separate embodiment.

### Claims

#### What is claimed:

1. A dental appliance, comprising:  
a number of tooth apertures for the placement of teeth therein; and  
a tab representing a position of a tooth that has not fully erupted  
and oriented to be received, in use, over the position of the tooth that has  
not fully erupted.
2. The dental appliance of claim 1, where the tab is of a length to  
span, in use, across a portion of a horizontal position to be occupied by  
the tooth when fully erupted.
3. The dental appliance of claim 2, where the tab is of a length to  
span, in use, across half of the horizontal position to be occupied by the  
tooth when fully erupted.
4. The dental appliance of claim 2, where the tab is of a length to  
span, in use, across the entire horizontal position to be occupied by the  
tooth when fully erupted.
5. The dental appliance of claim 1, where the tab includes a surface  
that is shaped to mate with a surface of a second appliance to be  
positioned, in use, adjacent to the surface of the tab.
6. The dental appliance of claim 5, where the surface is shaped to  
mate with a surface of a second tab of a second appliance that is to be  
positioned, in use, adjacent to the surface of the tab.
7. The dental appliance of claim 1, where the tab includes a bottom  
surface that is shaped to mate, in use, with a top surface of the tooth.



8. The dental appliance of claim 1, where the tab includes a bottom surface that is shaped to mate, in use, with a top surface of the tooth when fully erupted.
9. The dental appliance of claim 1, where the tab includes a side surface that is shaped to mate, in use, with a side surface of the tooth.
10. A dental appliance system, comprising:
  - a first dental appliance according to any one of claims 1 to 9 of a number of appliances shaped to move teeth, where the first dental appliance has a tab of a first length representing a position of a tooth that has not fully erupted; and
  - a second dental appliance according to any one of claims 1 to 9 of the number of appliances, where the second dental appliance has a tab of a second length representing a position of a tooth.
11. The dental system of claim 10, where the first length and the second length are equal.
12. The dental system of claim 10, where the first appliance is formed to be positioned, in use, onto one or more upper teeth of a patient.
13. The dental system of claim 12, where the second appliance is formed to be positioned, in use, onto one or more lower teeth of a patient.
14. The dental system of claim 10, where a thickness of one or more surfaces of a tab are sized to contact, in use, an erupting tooth.
15. The dental system of claim 10, where a bottom surface of a tab is designed to be positioned, in use, to contact a top surface of an erupting tooth, where a horizontal surface that forms a bottom surface of the tab can be positioned lower than those horizontal surfaces forming other

portions of the first dental appliance that are oriented, in use, to contact top surfaces of teeth that are fully erupted.

16. The dental system of claim 10, where at least one or a depth or thickness of a surface on a first dental appliance is greater than a corresponding surface on the second dental appliance.

17. The dental system as claimed in any one of claims 10 to 16 where the tab of a second length is longer than the tab of the first length.

18. The dental system as claimed in any one of claims 10 to 16 further comprising a third dental appliance of the number of appliances, where the third dental appliance has a tab of a third length representing a position of a tooth that has not fully erupted and where the tab of a third length is longer than the tabs of the first and second lengths.

19. The dental system as claimed in any one of claims 10 to 16 where the first appliance is formed such that, in use, it is removable when the tooth that has not fully erupted reaches a first threshold of eruption.

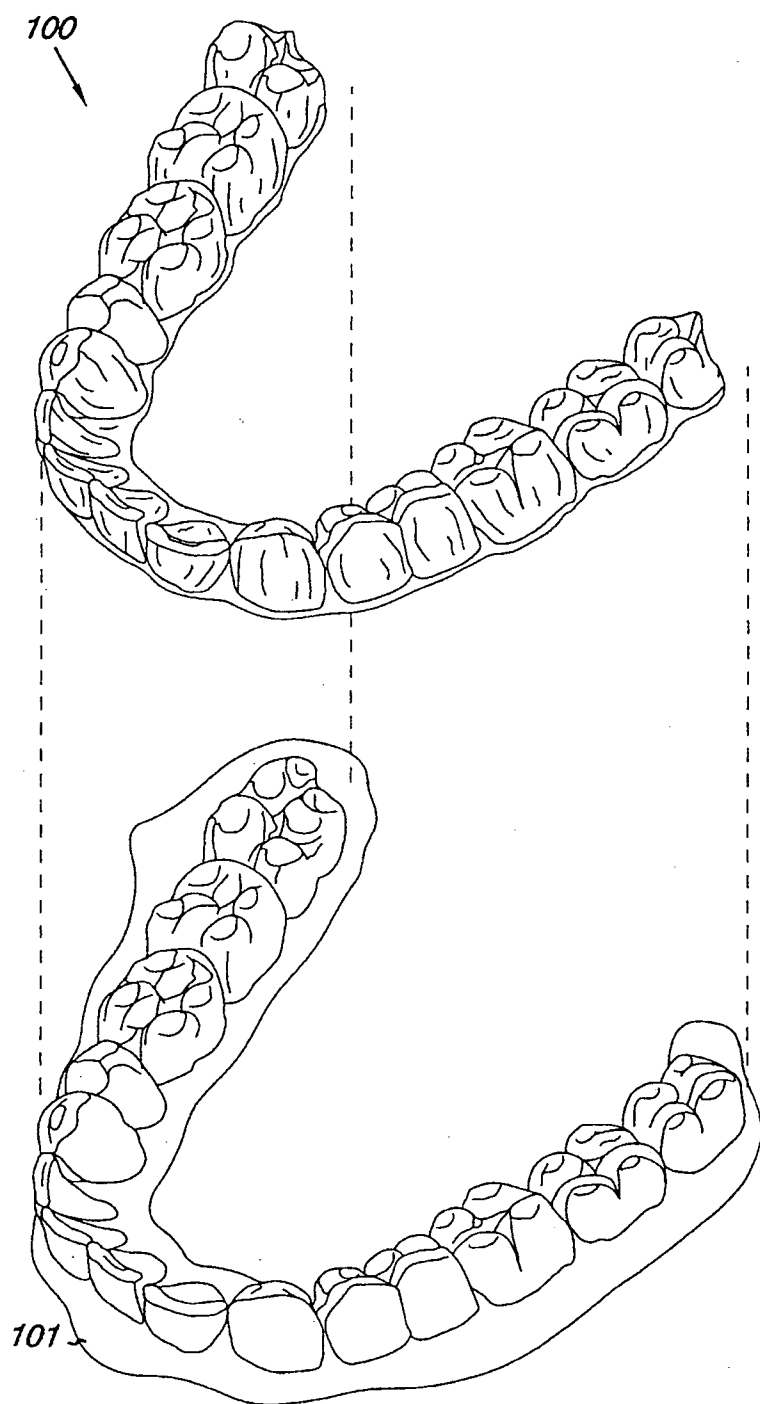
20. A computer-implemented method for generating a dental system as claimed in any one of claims 10 to 16 comprising:

designing a first dental appliance of a number of appliances shaped to move teeth by surveying the positioning of a patient's teeth within a mouth of a patient, where the first dental appliance has a tab of a first length representing a position of a tooth that has not fully erupted; and

designing a second dental appliance of the number of appliances, where the second dental appliance has a tab of a second length representing a position of a tooth that has not fully erupted.

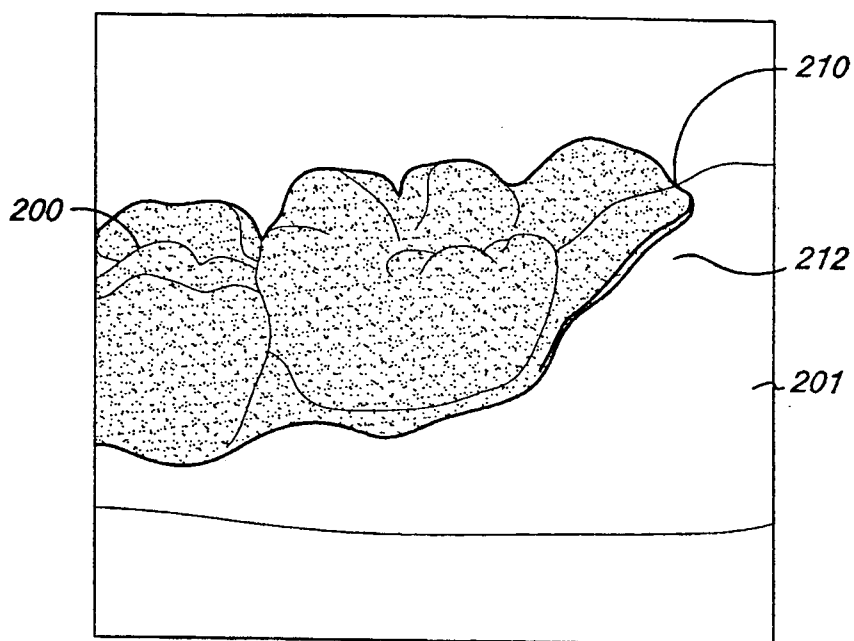
21. The method of claim 20, where surveying the positioning of a patient's teeth within a mouth of a patient is accomplished by taking a set of one or more data points manually by a treatment professional and entering the data points into a computing device.

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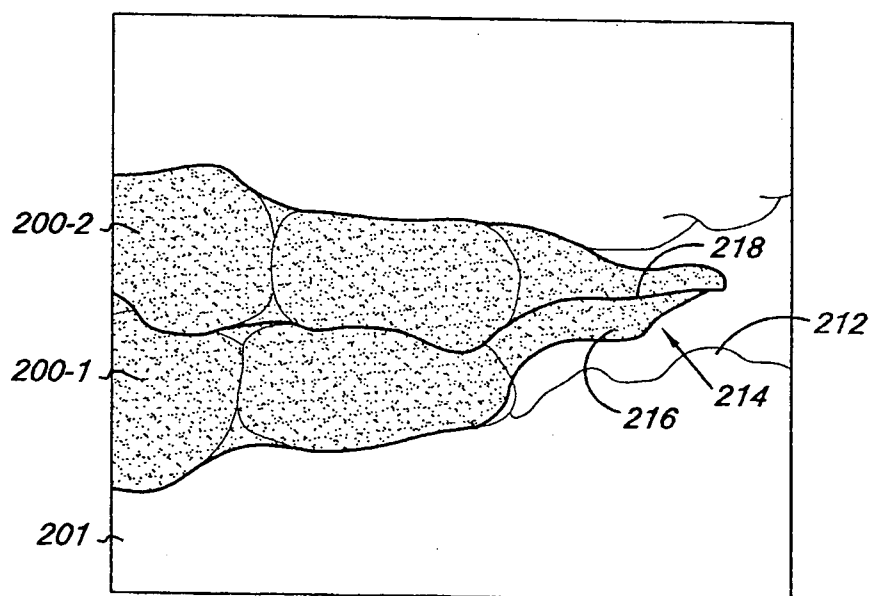


*Fig. 1*

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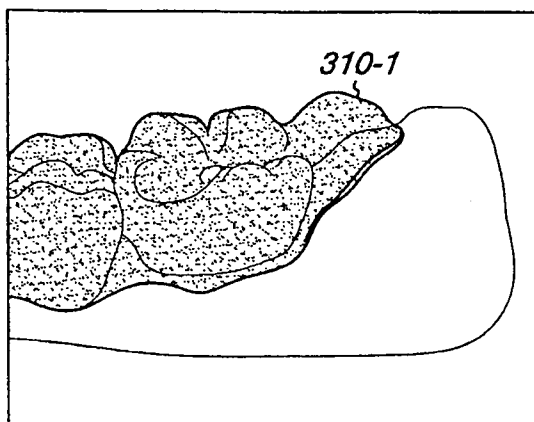


*Fig. 2A*

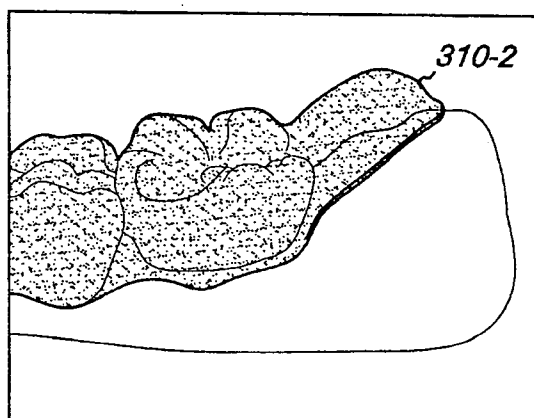


*Fig. 2B*

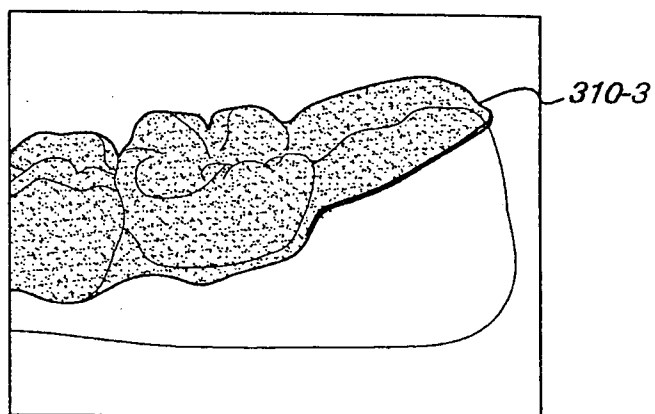
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*Fig. 3A*

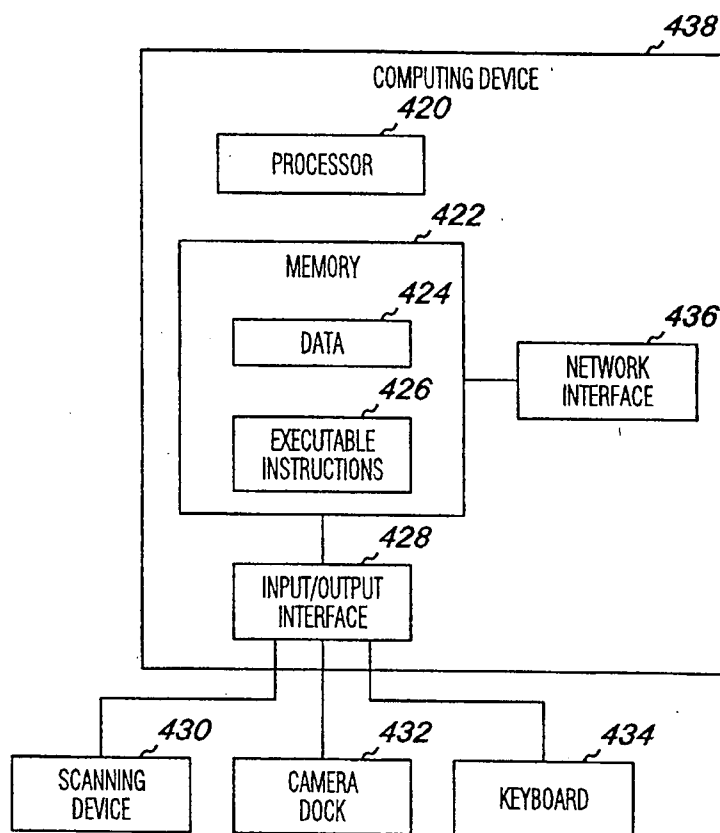


*Fig. 3B*



*Fig. 3C*

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*Fig. 4*

# INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2008/006491

## A. CLASSIFICATION OF SUBJECT MATTER

INV. A61C7/08

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/224314 A1 (BERGERSEN EARL O [US]) 4 December 2003 (2003-12-04) paragraphs [0029], [0040], [0044], [0058], [0064], [0103] - [0108], [0161], [0172] the whole document	1-21
X	US 4 139 944 A (BERGERSEN EARL O) 20 February 1979 (1979-02-20) column 3, line 13 - line 22; figures 2,6-8 the whole document	1-19
X	US 2003/224313 A1 (BERGERSEN EARL O [US]) 4 December 2003 (2003-12-04) paragraphs [0114], [0115], [0129] - [0131] the whole document	1-21
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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex

\* Special categories of cited documents:

\*A\* document defining the general state of the art which is not considered to be of particular relevance

\*E\* earlier document but published on or after the international filing date

\*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

\*O\* document referring to an oral disclosure, use, exhibition or other means

\*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\*G\* document member of the same patent family

Date of the actual completion of the international search

5 September 2008

Date of mailing of the international search report

23/09/2008

Name and mailing address of the ISA/

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International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/099545 A1 (LAI MING-LAI [US] ET AL) 11 May 2006 (2006-05-11) paragraphs [0090], [0093]; figures 1-5 the whole document -----	1-21
X	US 2004/058295 A1 (BERGERSEN EARL O [US]) 25 March 2004 (2004-03-25) paragraphs [0008], [0010], [0154], [0161], [0165]; figures 8,10,15-18 the whole document -----	1-21

## FURTHER INFORMATION CONTINUED FROM PCT/SA/ 210

Continuation of Box II.2

Claims Nos.:

Claims 1-21 have been searched incompletely because they lack clarity in the meaning of Art. 6 PCT. Contrary to the requirements of PCT GL 5.37, claims 1-21 attempt to define the subject matter claimed with respect to the use of the appliances and with respect to the human body, namely the un/erupted teeth. This method of claiming is unclear since the shape of teeth is not subject to standardization and neither are the direction and extent of eruption of them. In other words, teeth do not erupt in the same manner for everyone: they may erupt obliquely or at an angle, or may also never fully erupt.

If, on the other hand, all references to the human body and the mode of use of the appliances were disregarded from the claims, there would be very little subject matter on which to base any search. These claims were therefore searched based on the above-mentioned unclear features of the claims but, most of all, from a general understanding of the invention as understood from the application as a whole.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2)PCT declaration be overcome.

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### Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:  
**see FURTHER INFORMATION sheet PCT/ISA/210**
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

### Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search reportcovers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

#### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2008/006491

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		AU 1897676 A	04-05-1978
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		WO 2006052331 A1	18-05-2006
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		MX PA05003023 A	08-09-2005
		WO 2004026163 A1	01-04-2004