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(54) **METHOD OF DAMPING LATERAL, AXIAL AND LONGITUDINAL FORCES ON DENTAL PROSTHESES USING SYNTHETIC PERIODONTAL LIGAMENT FIBERS**

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See application file for complete search history.

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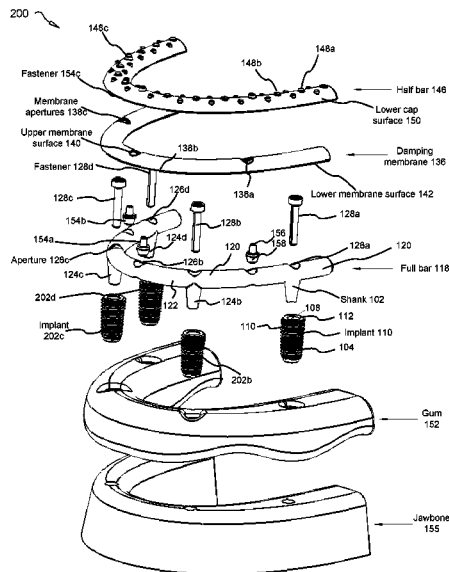
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(57) **ABSTRACT**

A method of damping compressive, tensile, and lateral compressive and tensile forces on one or more prosthetic teeth and an implant recessed into jawbone through use of synthetic periodontal ligament fibers in the form of a damping membrane within a dental bridge assembly. An arcuate damping membrane positions on a full bar and a half-bar positions over the membrane; whereby the damping membrane is sufficiently resilient to enable lateral and axial movements by the prostheses affixed to the half-bar.

10 Claims, 9 Drawing Sheets



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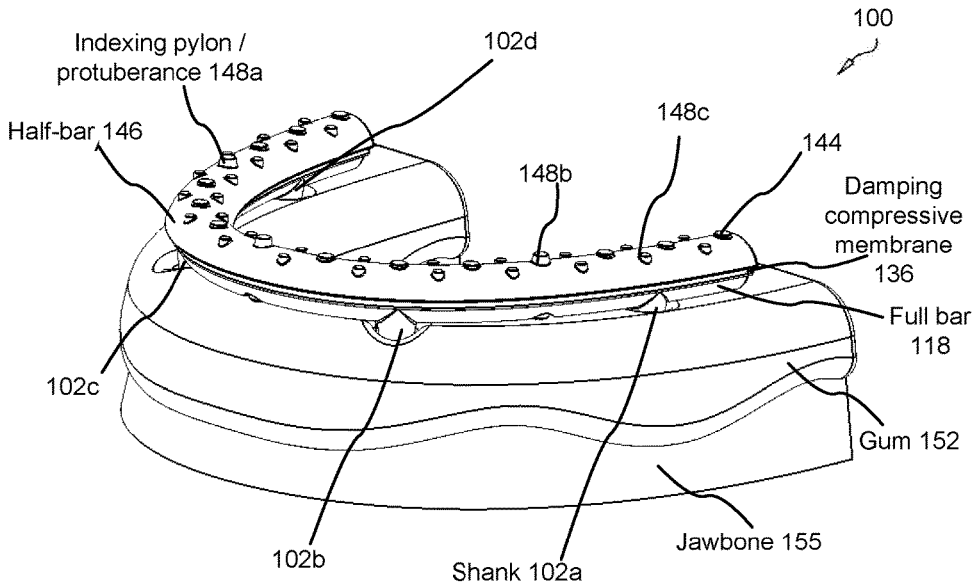


FIG. 1

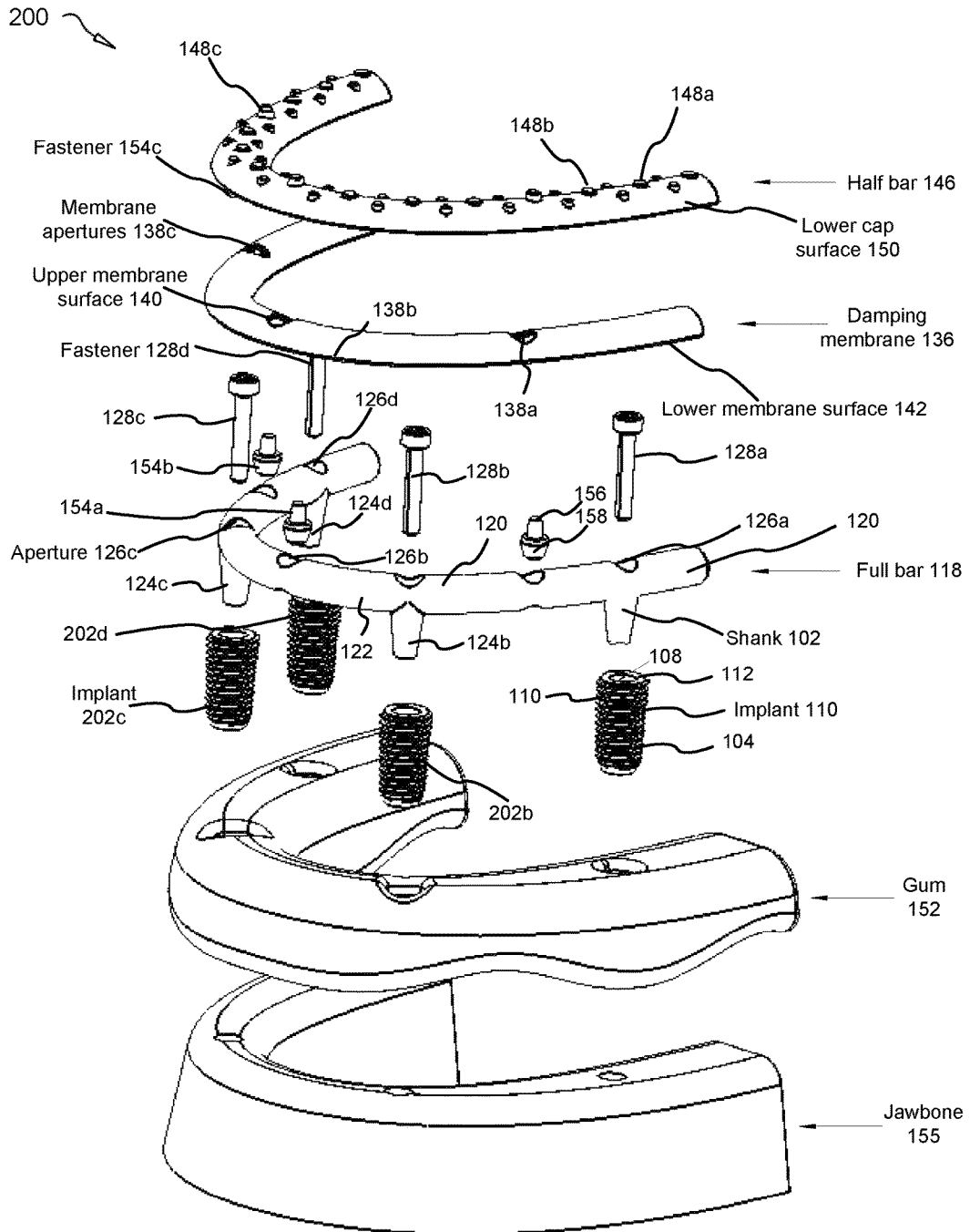


FIG. 2

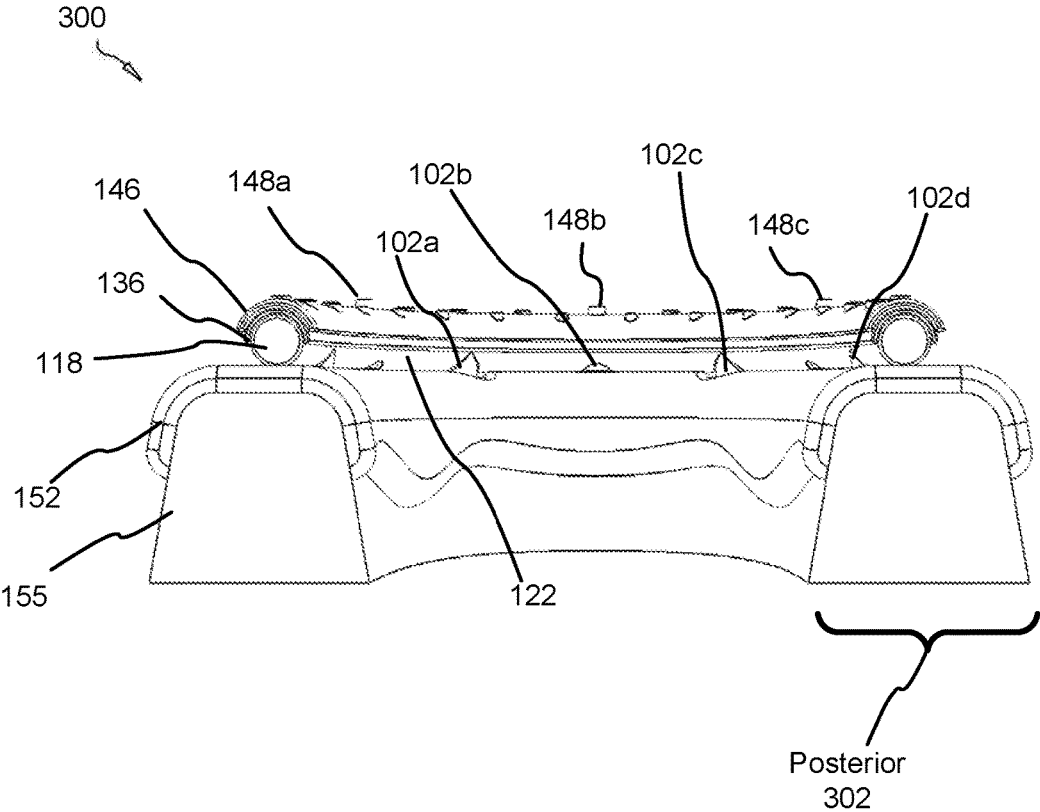


FIG. 3

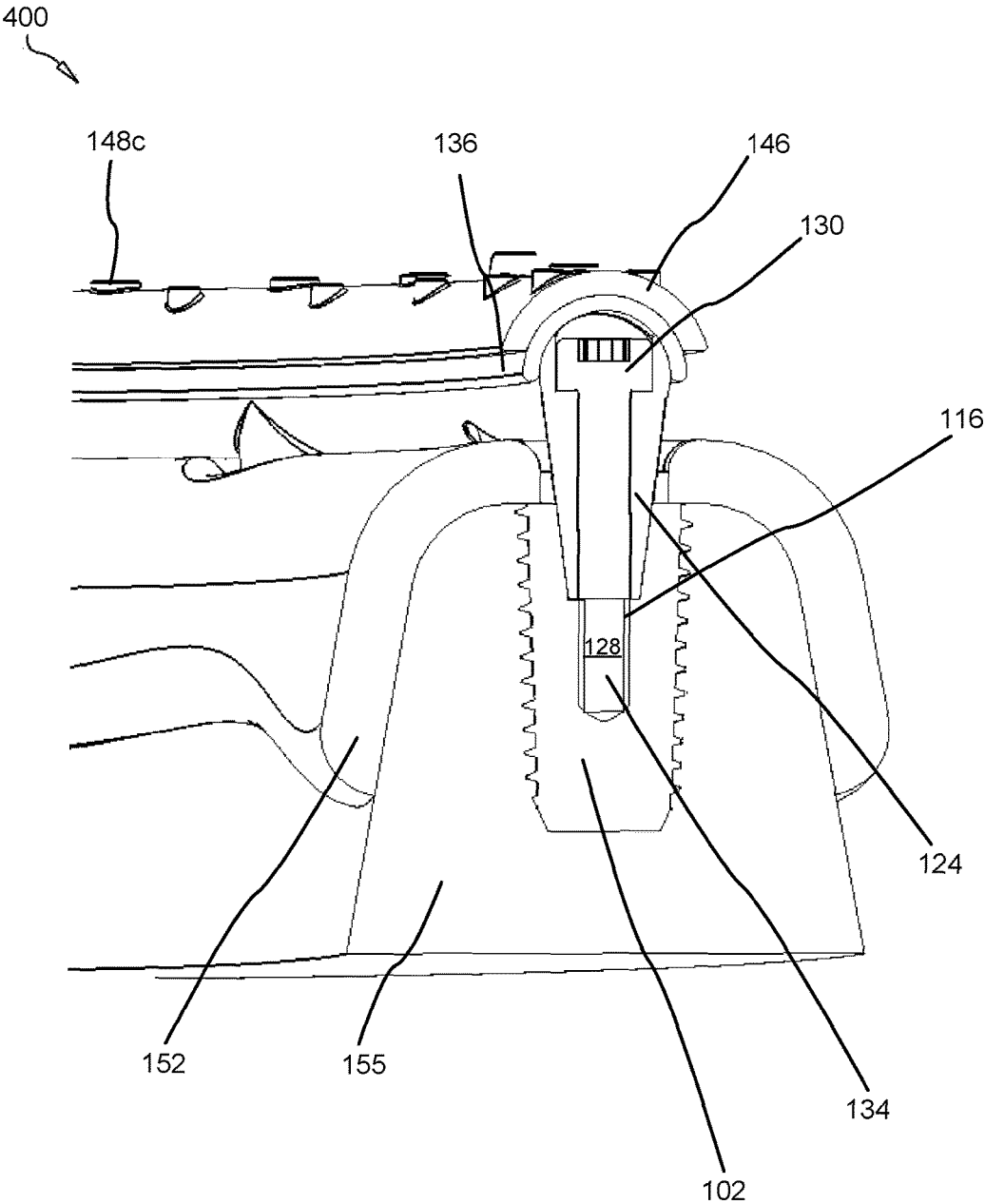


FIG. 4

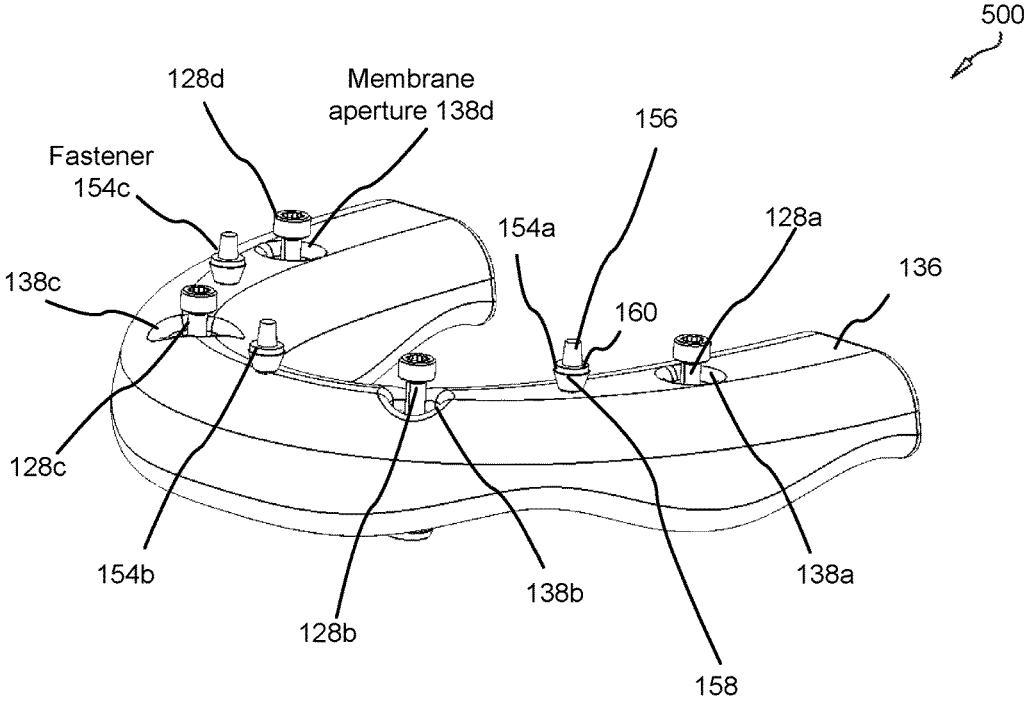


FIG. 5

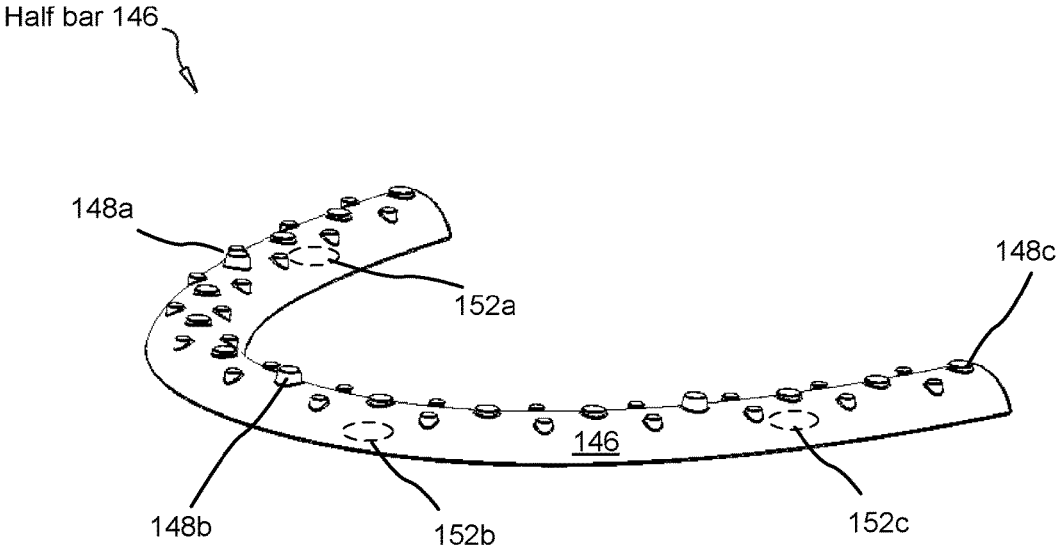


FIG. 6

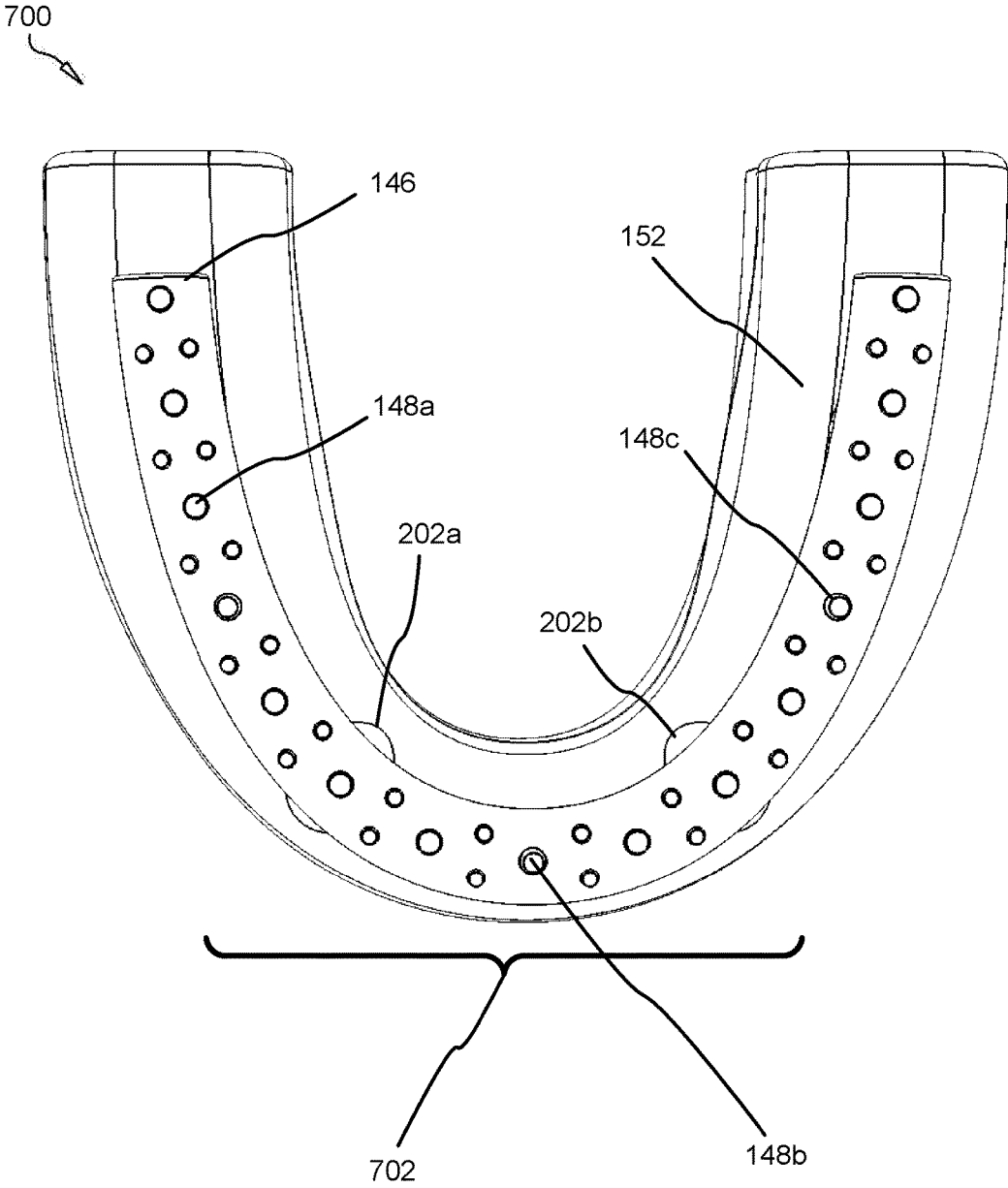


FIG. 7

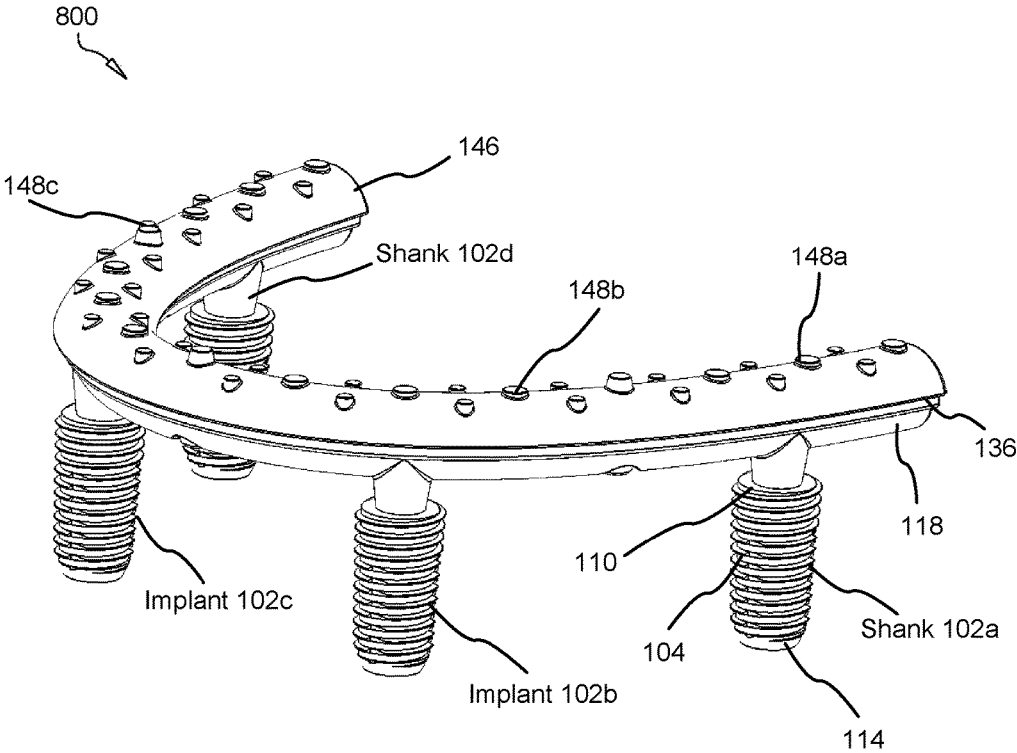


FIG. 8

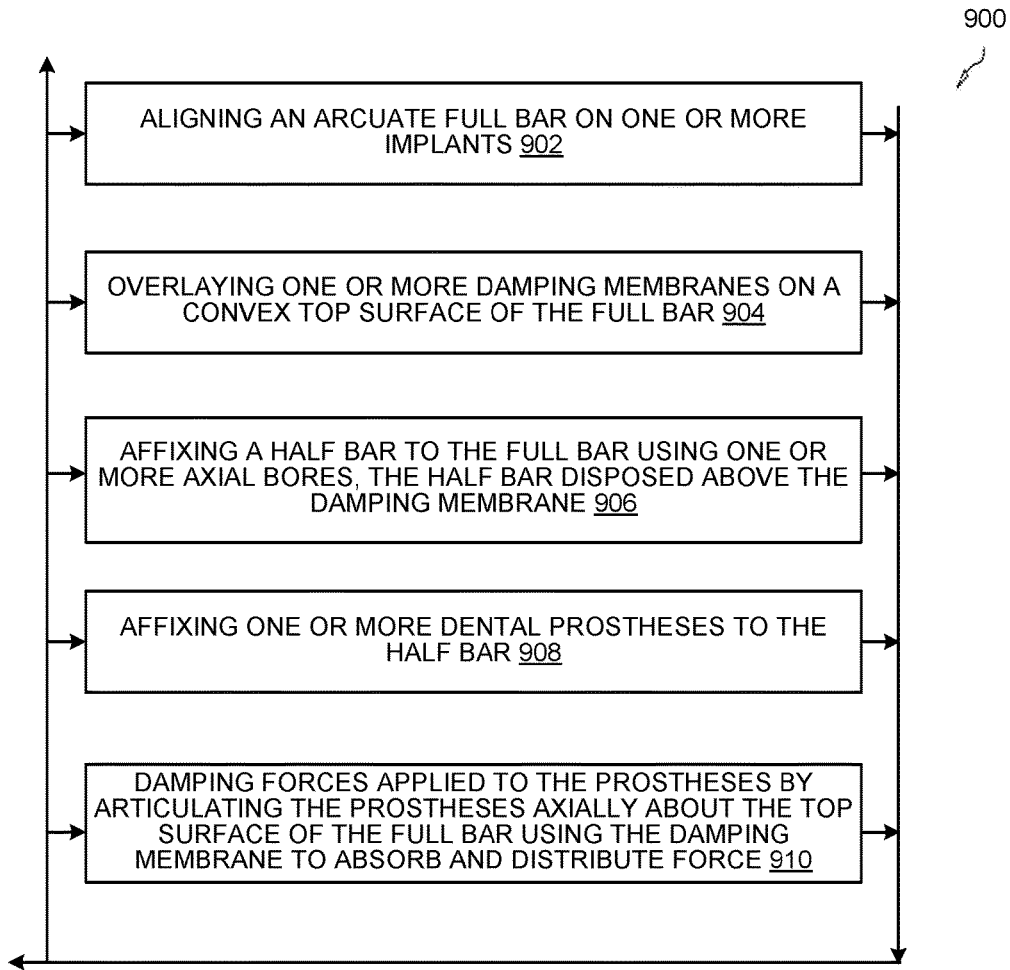


FIG. 9

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**METHOD OF DAMPING LATERAL, AXIAL
AND LONGITUDINAL FORCES ON DENTAL
PROSTHESES USING SYNTHETIC
PERIODONTAL LIGAMENT FIBERS**

FIELD OF THE INVENTION

This invention relates to a method of damping compressive, tensile, and lateral forces on dental prostheses through use of synthetic periodontal ligament fibers, and more particularly relates to damping these forces using a damping membrane positioned between rigid arcuate components of a dental bridge assembly.

BACKGROUND

Description of the Related Art

Natural teeth are connected to the jawbone by means of the parodontium. Because of the elasticity of the fibrous structure of the parodontium, natural teeth are not anchored rigidly in the jawbone, but suspended elastically. This so-called physiological movability of the teeth varies from species to species. In humans, it amounts to approximately 30 μm , that is to say under maximum chewing pressure the tooth is pressed approximately 30 μm into the socket. At the same time, because of the special arrangement of the fibers in the parodontium, most of the jawbone surrounding the tooth socket is subjected to both compressive and tensile stress. There exist no means or methods in the art of integrating synthetic periodontal ligament fibers into a dental bridge assembly to imitate and absorb and redistribute forces applied to dental prostheses.

Typically, dental bridges position in the gap created by one or more missing teeth in a patient's mouth. The dental bridge is traditionally made up of two or more crowns or prosthetic teeth which often straddle natural teeth or remnants of natural teeth. Two or more anchoring teeth may be called abutment teeth. Thus, a dental bridge replaces missing teeth with artificial teeth and literally "bridges" the gap where one or more natural teeth were formerly disposed. An implant bridge affixes artificial teeth directly to the jaw or periosteum.

In an effort to produce long lasting implants, reduce breakage and reduce prosthetic failure, the prior art contains examples of multiple implants, varying orientation of implants, varying diameter and lengths of implants, implant protected occlusion, varying surface areas, occlusal table width, varying loading schedules, varying implant locations, splinting, patient selection, soft tissue considerations, and the like.

However, a significant reason for breakage and loosening of conventional dental implants is that most prior art apparatus do not allow the implant to resiliently flex relative to the jaw bone. The prior art has therefore resulted in implants that are often directly attached to the bone and that cannot flex within the bone. Loads are, therefore, concentrated at the jaw bone. This concentration of stress on the bone results in the physiological phenomenon known as resorption and causes pathologic mobility—or mobility which is destructive the patient's mandible as well as the bridge assembly.

Furthermore, patients face the difficult prospect of cleaning dental bridge assemblies which are removable. There exists no efficient means in the art of cleaning a dental bridge assembly. The present invention provides a method of

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damping forces on a dental bridge assembly which overcomes the shortcoming in the prior art.

SUMMARY

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From the foregoing discussion, it should be apparent that a need exists for a force damping dental bridge assembly that damps compressive, tensile, and lateral forces on a tooth and jawbone through use of synthetic periodontal ligament fibers, which is replaceable and extractable by the patient for cleaning purposes.

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The present invention has been developed in response to the present state of the art, and in particular, in response to the problems and needs in the art that have not yet been fully solved by currently available dental implants. Accordingly, the present invention has been developed to provide a method of damping forces on dental prostheses, the steps of the method comprising: aligning an arcuate full bar with two or more implants recessed into bone in a patient's mouth, the full bar defining a plurality of apertures for receiving axial bores, the full bar comprising a plurality of downwardly-protruding transmucosal shanks for inserting in corresponding cavities defined by two or more implants sunk into a patient's mandible; overlaying a generally convex, arcuate damping compression membrane of flexible material on a top surface of the full bar, the arcuate damping membrane having an upper convex membrane surface, a lower concave membrane surface, and a plurality of membrane apertures, the damping membrane positioning above the full bar and below a half-bar and detachably affixed thereto; and affixing to one of the implants and the full bar an arcuate half-bar having a convex upper half-bar surface and a concave lower half-bar surface defining a plurality of cap apertures, the half-bar positioning on the upper membrane surface of the damping membrane, wherein the arcuate half-bar is detachably affixed to the full bar; wherein the damping membrane is adapted to damp lateral, longitudinal, and axial compressive and tensile forces applied to prostheses and the half-bar by enabling rotation of the prostheses around the convex upper surface of the full bar.

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The method may further comprise detachably affixing the damping membrane to half-bar using a plurality of fasteners. The method, in some embodiments, further comprises milling the full bar and shanks as a single monolithically-milled integrated piece.

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The method, in some embodiments, further comprises fabricating the damping membrane from one of medical grade silicone and polymeric materials. The method may further comprise detachably affixing the half bar to the implants with one or more axial bores comprising a socket head comprises a hex driver.

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In various embodiments, the method further comprises detachably affixing to the implants to the half-bar using a snap-fit relationship. The half-bar may affix to the full bar using two or more Morse taper friction fits.

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The method may further comprise artificially sweetening the damping membrane. The method may further comprise forming a convex top surface on the full bar.

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A second method of damping forces on dental prostheses is provided, the steps of the method comprising: aligning an arcuate full bar with two or more implants recessed into bone in a patient's mouth, the full bar defining a plurality of apertures for receiving axial bores, the full bar comprising a plurality of downwardly-protruding transmucosal shanks for inserting in corresponding cavities defined by two or more implants sunk into a patient's mandible, wherein the full bar comprises a generally convex top surface forming a semi-

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circle through a cross section; overlaying a generally convex, arcuate damping compression membrane of flexible medical grade silicone on the top surface of the full bar, the arcuate damping membrane having an upper convex membrane surface, a lower concave membrane surface, and a plurality of membrane apertures, the damping membrane positioning above the full bar and below a half-bar and detachably affixed thereto; and affixing using one or more Morse tapers to one of the implants and the full bar an arcuate half-bar having a convex upper half-bar surface and a concave lower half-bar surface defining a plurality of cap apertures, the half-bar positioning on the upper membrane surface of the damping membrane, wherein the arcuate half-bar is detachably affixed to the full bar; wherein the damping membrane is adapted to damp lateral, longitudinal, and axial compressive and tensile forces applied to prostheses and the half-bar by enabling rotation of the prostheses around the convex upper surface of the full bar.

A third method of damping forces on dental prostheses is provided, the steps of the method comprising: aligning an arcuate full bar with two or more implants recessed into bone in a patient's mouth, wherein the full bar comprises a generally convex top surface forming a semi-circle through a cross section; overlaying a generally convex, arcuate damping compression membrane of flexible medical grade silicone on the top surface of the full bar, the arcuate damping membrane having an upper convex membrane surface, a lower concave membrane surface, the damping membrane positioning above the full bar and below a half-bar; and affixing to one of the implants and the full bar an arcuate half-bar having a convex upper half-bar surface and a concave lower half-bar surface, the half-bar positioning on the upper membrane surface of the damping membrane; wherein the damping membrane is adapted to damp lateral, longitudinal, and axial compressive and tensile forces applied to prostheses and the half-bar by enabling rotation of the prostheses around the convex upper surface of the full bar.

Reference throughout this specification to features, advantages, or similar language does not imply that all of the features and advantages that may be realized with the present invention should be or are in any single embodiment of the invention. Rather, language referring to the features and advantages is understood to mean that a specific feature, advantage, or characteristic described in connection with an embodiment is included in at least one embodiment of the present invention. Thus, discussion of the features and advantages, and similar language, throughout this specification may, but do not necessarily, refer to the same embodiment.

Furthermore, the described features, advantages, and characteristics of the invention may be combined in any suitable manner in one or more embodiments. One skilled in the relevant art will recognize that the invention may be practiced without one or more of the specific features or advantages of a particular embodiment. In other instances, additional features and advantages may be recognized in certain embodiments that may not be present in all embodiments of the invention.

These features and advantages of the present invention will become more fully apparent from the following description and appended claims, or may be learned by the practice of the invention as set forth hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the advantages of the invention will be readily understood, a more particular description of the

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invention briefly described above will be rendered by reference to specific embodiments that are illustrated in the appended drawings. Understanding that these drawings depict only typical embodiments of the invention and are not therefore to be considered to be limiting of its scope, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings, in which:

FIG. 1 is a perspective view illustrating one embodiment of a force-damping dental bridge assembly, in accordance with the present invention;

FIG. 2 is a disassembled view illustrating a force-damping dental bridge assembly in accordance with the present invention;

FIG. 3 is a rear environmental perspective view illustrating a force-damping dental bridge assembly in accordance with the present invention;

FIG. 4 is a sectioned environmental view illustrating a Morse taper interconnection and a shank gap formed between a shank and a tapered connector, in accordance with the present invention;

FIG. 5 is a side top angle perspective view illustrating the fastening components of a force-damping bridge assembly in accordance with the present invention;

FIG. 6 is an upper angle perspective view illustrating an arcuate member in accordance with the present invention;

FIG. 7 is a top perspective view illustrating a force damping dental bridge assembly in accordance with the present invention;

FIG. 8 is a perspective view illustrating a force damping dental bridge assembly disengaged from the jawbone and with the implants exposed, in accordance with the present invention; and

FIG. 9 is a flow chart illustrating a method of damping lateral, axial and longitudinal forces on dental prostheses using a damping membrane in accordance with the present invention.

DETAILED DESCRIPTION

Reference throughout this specification to "one embodiment," "an embodiment," or similar language means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases "in one embodiment," "in an embodiment," and similar language throughout this specification may, but do not necessarily, all refer to the same embodiment.

Furthermore, the described features, structures, or characteristics of the invention may be combined in any suitable manner in one or more embodiments. In the following description, numerous specific details are provided to provide a thorough understanding of embodiments of the invention. One skilled in the relevant art will recognize, however, that the invention may be practiced without one or more of the specific details, or with other methods, components, materials, and so forth. In other instances, well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of the invention.

The schematic flow chart diagrams included herein are generally set forth as logical flow chart diagrams. As such, the depicted order and labeled steps are indicative of one embodiment of the presented method. Other steps and methods may be conceived that are equivalent in function, logic, or effect to one or more steps, or portions thereof, of the illustrated method. Additionally, the format and symbols

employed are provided to explain the logical steps of the method and are understood not to limit the scope of the method. Although various arrow types and line types may be employed in the flow chart diagrams, they are understood not to limit the scope of the corresponding method. Indeed, some arrows or other connectors may be used to indicate only the logical flow of the method. For instance, an arrow may indicate a waiting or monitoring period of unspecified duration between enumerated steps of the depicted method. Additionally, the order in which a particular method occurs may or may not strictly adhere to the order of the corresponding steps shown.

FIGS. 1-8 reference a force damping dental bridge assembly that damps compressive, tensile, and lateral forces on a tooth and jawbone 200 through use of a unique arc-shaped, multi-layered bridge and an optional Morse taper interconnection.

As FIG. 1 illustrates, the force damping dental bridge assembly 100, hereafter "assembly 100" is adapted to provide a complete set of prosthetic teeth. The assembly 100 enhances the structural integrity and comfort to the user through use of layered, arcuate components having unique characteristics that operate together to provide the elasticity of periodontal ligament fibers. A Morse taper may also be utilized to strengthen the bond between the assembly 100 and one or more implants or anchors in the jawbone 155.

The assembly 100 comprises a full bar 118 which may be monolithically formed using CNC to fit precisely over implants sunk into bone 155 in a patient's mouth. The full bar 118 comprises a preferably solid but alternatively tubular horseshoe-shaped framework, understructure or architecture adapted to secure the remaining components of the assembly 100. The full bar 118 works to create strong surface collisions that resist forces that degrade dental bridges, teeth, and jawbones.

Importantly, the top surface of the full bar 118 is convex and circular or semi-circular through its cross section such that a half bar 146 positioned above the full bar 118 may flex axially around the full bar 118 upon the arcuate damping membrane 136.

The arcuate damping membrane 136 is constructed from compressible, flexible, polymeric or silicone material. The compressibility of the membrane 136 allows for some flexing of the other components of the assembly 100 above the full bar 118 and also absorbs sudden compressive and tensile forces applied to the prosthetic or prostheses affixed to the half-bar 146. The membrane 136 separates the full bar 118 from the half bar 146. In various embodiments, the membrane may be infused or layered with flavorings, sweeteners and the like such as aspartame, sorbitol, saccharin or other flavorings known to those of skill in the art to create a pleasant taste within a patient's mouth. The membrane 136 is interchangeable by a patient using a specially-adapted tool for removing one or more of the full bar 118 and the half bar 146.

An arc-shaped cap or half bar 146 detachably attaches to the damping membrane 136 and provides protruberances 148 (or indexing pylons 148) that support sculpted prosthetic teeth thereon. Also, the assembly 100 employs a Morse taper interconnection between a shank 102a-c and a tapered connector 124a-d to increase the structural integrity of the interconnection between the assembly 100 and the jawbone 200.

Thus, an objective of the assembly is to provide a dental bridge that resists tensile, compressive, and lateral forces through use of a layered adaptation of arcuate dental members, including an arcuate or arc-shaped cylinder forming the

full bar 118, an concave arcuate damping membrane 136, and an arc-shaped cap 144. A further objective is to provide a dental bridge, in which bacteria causing infection are effectively prevented from penetrating into the region of the bony implant bed and of the root implant itself through use of a Morse taper interconnection.

Looking at FIG. 2 providing a disassembled view illustrating a force-damping dental bridge assembly in accordance with the present invention, the assembly 100 provides a plurality of shanks 102a-d that penetrate the jawbone 155. In one embodiment shown, four shanks may be used. Though any number and size of shanks may be used, depending on the scope of the jawbone 155 and the requirements of the dental bridge. In another embodiment, the shanks 102a-d comprise a heli-coil insert.

In some embodiments, the shank 102a-d inserts into an implant or anchor 112 comprising a threaded outer surface 104 having a threaded configuration and a tapered inner surface 106 defining an interior cavity 108 which forms a Morse taper with the shank 102. The tapered inner surface 106 of the shanks 102a-d approximately contour the interior cavity 108 or shank cavity 108. The implant 112 includes a first shank end 110 forming a shank opening 108 and a second shank end that is oriented to engage the jawbone 155 having a threaded exterior surface 104. In one embodiment, the terminus of the shank 102 is tapered, so as to enable facilitated penetration of the gum 202 and jawbone 155.

The assembly 100 may include an arc-shaped damping membrane 136 defined by a generally convex configuration. The arc-shaped damping membrane 136 is also defined by a generally resilient construction. Thus, the damping membrane 136 is sufficiently resilient to enable lateral movements by the cap and also to damp compressive and tensile forces applied to the tooth and jawbone 155.

The arcuate damping membrane 136 includes an upper membrane surface 140, a lower membrane surface 142, and a plurality of membrane apertures 138a-d that form in spaced apart intervals, and in alignment with the cylinder apertures 126a-d and a plurality of cap apertures 152a-c.

The arcuate damping membrane 136 positions on the upper cylinder surface 120 of the arc-shaped cylinder 118, as shown in FIG. 4. In one embodiment, the arcuate damping membrane 136 is fabricated from a medical grade silicone, or other similar resilient material that replicates the elasticity of the fibrous structure of the tooth-holding gums including periodontal ligament fibers.

As shown in FIG. 3, the assembly 100 may include an arcuate cylinder which forms part of the full bar 118. In one embodiment, the arcuate cylinder 118 includes an upper cylinder surface 120 and a lower cylinder surface 122. The lower cylinder surface is oriented proximally to the gum. The arcuate cylinder defines a plurality of cylinder apertures 126a-d.

The unique cylindrical configuration increases structural integrity of the assembly 300. The cylindrical shape of the arcuate cylinder helps to damp violent, lateral forces against the assembly 300 and jawbone 155. In one embodiment, the arcuate cylinder is fabricated from titanium. In other embodiments, the arcuate cylinder is fabricated from steel, aluminum, metal alloys, or polymeric materials.

In some embodiments, the assembly 300 may include a plurality of tapered connectors 124a-d extending from the lower cylinder surface 122. The tapered connectors 124a-d pass through the shank opening 112 in the first shank end 110. In one embodiment, a shank gap 116 forms between the tapered inner surface 106 of the shank 102a-d and the terminus or sides of the tapered connectors 124a-d.

The shank gap **116** creates an interference that increases the surface collision between the tapered inner surface **106** and the tapered connector **124a**. In this manner, the Morse taper configuration of the tapered inner surface **106** and the tapered connector **124a** creates a snug interlocking relationship. In one embodiment, the shank gap **116** is about $\frac{1}{4}$ of a thousandth of an inch.

Those skilled in the art will recognize that a Morse taper is formed when two substantially identical cones engage each other, one exteriorly and one interiorly. This physical phenomena creates a strong surface collision to form a snug, but detachable interconnection. Further, an interference, such as the shank gap **116** between surfaces serves to further strengthen the surface collision. It is also known in the art that a Morse taper provides a hermetic seal that bacteria cannot break through. This leads to less microbial ingress and less bone resorption and loss.

As FIG. 5 shows, the assembly **100** comprises a plurality of axial bores **128a-d** (or longitudinally-traversing male fasteners **128**) that serve as fastening mechanisms between the assembly **500** and jawbone **155**. The axial bores **128a-d** are defined by a first bore end **130** and a second bore end **134**. The first bore end **130** comprises a socket head **132** that allows for rotational screwing of the axial bore **128a** in both directions. In one embodiment, the socket head **132** is a hexagonal head. Though in other embodiments, any type of capping or socket member may be used at the first bore end **130**.

Looking back at FIG. 4, the axial bore **128** passes through the cylinder apertures **126a-d** and the shank opening **112**, positioning at least partially in the shank cavity **108** (or interior cavity). The axial bores **128a-d** provide structural integrity to the assembly **400**, while also aligning the shank **102a-d** and the half bar **146** and membrane **136**. In this manner, the full bar **118** and the half bar **146** can be secured via the shanks **102a-d** and jawbone **155**. In one embodiment, the axial bores **128a-d** are fabricated from titanium.

In one embodiment, the axial bores **128a-d** are a 1.6×10 millimeters long socket head cap screw. However in other embodiments, the axial bores **128a-d** can include a screw, a bolt, and a fastening mechanism known in the art of dental implants. Suitable materials for the axial bores **128a-d** may include, without limitation, titanium, polymers, and metal alloys.

Turning now to FIG. 7, the assembly **100** comprises an arcuate half bar **146** having a generally convex top side configuration that matches the convex shape of the underlying damping membrane **136**, and the top surface of the full bar **118**. The half bar **146** includes an upper cap surface and a lower cap surface. The lower cap surface forms a plurality of cap apertures that align with the membrane apertures **138a-d** and cylinder apertures **126a-d**. The half bar **146** positions on the upper membrane surface **140** of the arc-shaped damping membrane **136**. In one embodiment, the half bar **146** is fabricated from titanium.

The damping membrane **136** is unique in that it allows the full bar **118** and the half bar **146** layers of the assembly **700** to float in conjunction with the movement and forces encountered by the jawbone **155**, gums, and teeth. Thus, the arcuate damping membrane **136** is sufficiently resilient to enable lateral movements by the half bar **146** around the full bar **118**. Further, the damping membrane **136** damps compressive and tensile forces applied to the tooth and the jawbone as well as prostheses affixed to the half bar **146**.

As FIG. 8 illustrates, the assembly **100** may include a plurality of protuberances **148a-c** (or indexing pylons) extending from the upper cap surface of the half bar **146**.

The protuberances **148a-c** are configured to enable sculpting and affixation of one or more prosthetic teeth on the upper surface of the half bar **146**. The protuberances **148a-c** may be shapes and dimensioned by a medical provider so as to accommodate different needs and wants of the patient.

In some embodiments, the assemblies **100-700** may include a plurality of fasteners that are operable to detachably attach the arc-shaped damping membrane **136** to the arc-shaped cap **144**. The fasteners **154a-c** are defined by a narrow end **156** and a wide end **158**. This tapered configuration allows the fasteners **154a-c** to operate in a snap-fit arrangement.

For example, a wide end **158** of the fastener **154a** detachably attaches to the membrane aperture **138a** in a snap-fit relationship. In one embodiment, the wide end **158** of the fasteners **154a-c** comprises a ridge **160** that interlocks with the edge of the membrane aperture **138a**. The narrow end **156** of the fastener **154a** attaches to the cap apertures **152a** in a similar snap-fit relationship. In one embodiment, the narrow end **156** of the plurality of fasteners **154a-c** comprises a pecker head. Though other detachable fastening means known in the art may be used.

In some embodiments, a tool or implement is used to detach the half bar **146** from the damping membrane **136**. In this manner, the damping membrane **136** can be replaced, cleansed, or interchanged. Also, access to the jawbone **155** and gums is possible when the half bar **146** is easily removed in such a manner. In one possible embodiment, the tool comprises a flat surface for engaging, i.e. plying, the plurality of fasteners **154a-c**, so as to separate the half bar **146** from the arcuate damping membrane **136**.

FIG. 9 is a flow chart illustrating a method **900** of damping lateral, axial and longitudinal forces on dental prostheses using a damping membrane in accordance with the present invention.

As shown and further described above, an arcuate full bar **118** having a convex top surface is aligned **902** with and affixed to one or more implants recessed into bone. The full bar **118** is overlaid **902** with a damping membrane **136**. The half-bar **146** is positioned **906** above and in contact with the damping membrane **136**.

In various embodiments, the half bar **146** is affixed to the full bar **118** while in still further embodiments the half bar **146** is affixed **906** to the implants. This affixation may be realized using axial bores **128**, fasteners, Morse tapers, or via means known to those of skill in the art.

Dental prostheses are affixed **908** to the top surface of the half-bar and forces applied to the dental prostheses are absorbed by the damping membrane **136** when the prostheses are pushed laterally or longitudinally against the underlying damping membrane **136**. The damping membrane **136** therefore acts as a series of periodontal ligament fibers in absorbing this force. The damping membrane **136** is a synthetic periodontal ligament fiber.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed is:

1. A method of damping forces on dental prostheses, the steps of the method comprising:
 - aligning an arcuate full bar with two or more implants recessed into bone in a patient's mouth, the full bar

defining a plurality of axial bores, the full bar comprising a plurality of downwardly-protruding transmucosal shanks for inserting in corresponding cavities defined by two or more implants sunk into a patient's mandible;

overlying a generally convex, arcuate damping compression membrane of flexible material on a top surface of the full bar, the arcuate damping membrane having an upper convex membrane surface, a lower concave membrane surface, the damping membrane positioning above the full bar and below a half-bar and detachably affixed thereto; and

affixing to one of the implants and the full bar an arcuate half-bar having a convex upper half-bar surface and a concave lower half-bar surface defining a plurality of protuberances, the half-bar positioning on the upper membrane surface of the damping membrane, wherein the arcuate half-bar is detachably affixed to the full bar; wherein the damping membrane is adapted to damp lateral, longitudinal, and axial compressive and tensile forces applied to prostheses and the half-bar by enabling rotation of the prostheses around the convex upper surface of the full bar.

2. The method of claim 1, further comprising detachably affixing the damping membrane to half-bar using a plurality of fasteners.

3. The method of claim 1, further comprising milling the full bar and shanks as a single monolithically-milled integrated piece.

4. The method of claim 1, further comprising fabricating the damping membrane from one of medical grade silicone and polymeric materials.

5. The method of claim 1, further comprising detachably affixing to the implants to the half-bar using a snap-fit relationship.

6. The method of claim 1, wherein the half-bar affixes to the full bar using two or more Morse taper friction fits.

7. The method of claim 1, further comprising artificially sweetening the damping membrane.

8. The method of claim 1, further comprising forming a convex top surface on the full bar.

9. The method of claim 1, further comprising overlaying a plurality of generally convex, arcuate damping compression membrane of flexible material on a top surface of the full bar.

10. A method of damping forces on dental prostheses, the steps of the method comprising:

aligning an arcuate full bar with two or more implants recessed into bone in a patient's mouth, the full bar defining a plurality of apertures for receiving axial bores, the full bar comprising a plurality of downwardly-protruding transmucosal shanks for inserting in corresponding cavities defined by two or more implants sunk into a patient's mandible, wherein the full bar comprises a generally convex top surface forming a semi-circle through a cross section;

overlying a generally convex, arcuate damping compression membrane of flexible medical grade silicone on the top surface of the full bar, the arcuate damping membrane having an upper convex membrane surface, a lower concave membrane surface, the damping membrane positioning above the full bar and below a half-bar and detachably affixed thereto; and

affixing using one or more Morse tapers to one of the implants and the full bar an arcuate half-bar having a convex upper half-bar surface and a concave lower half-bar surface defining a plurality of protuberances, the half-bar positioning on the upper membrane surface of the damping membrane, wherein the arcuate half-bar is detachably affixed to the full bar;

wherein the damping membrane is adapted to damp lateral, longitudinal, and axial compressive and tensile forces applied to prostheses and the half-bar by enabling rotation of the prostheses around the convex upper surface of the full bar.

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