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Wilson

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[54] **TOOTHBRUSH DEVICE**

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Related U.S. Application Data

[63] Continuation-in-part of application No. 08/743,814, Nov. 6, 1996, abandoned.

[51] **Int. Cl.**[6] **A46B 9/04**

[52] **U.S. Cl.** **15/167.1**; 15/172

[58] **Field of Search** 15/167.1, 167.2, 15/172, 201

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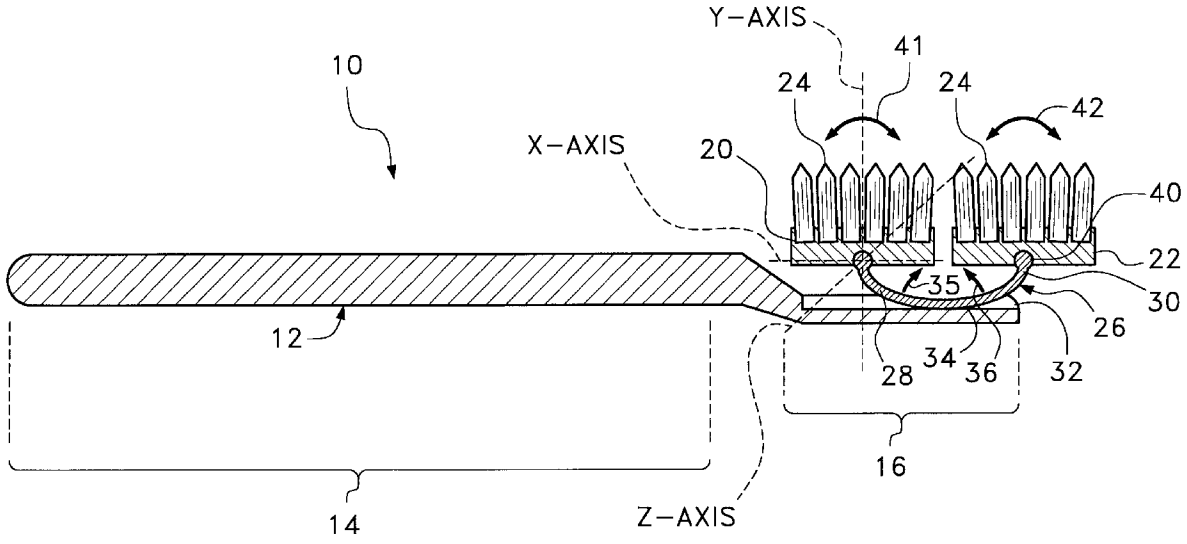
Attorney, Agent, or Firm—LaMorte & Associates

[57] **ABSTRACT**

A toothbrush device that conforms to the curvature and contours of the teeth while brushing. The toothbrush device includes a handle for gripping. At least one bristle head is disposed a predetermined distance from the handle. A support mechanism is disposed between the handle and each of the bristle heads. The support mechanism varies the predetermined distance between the bristle heads and the handle as a function of a contact force applied to each of the bristle heads. A connection is disposed between each support mechanism and each bristle head. The presence of the connection enables each bristle head to move in at least one plane in a manner independent of the support mechanism. This provides each of the bristle heads with the freedom of movement needed to properly conform to the curvature and contours of the teeth.

17 Claims, 7 Drawing Sheets



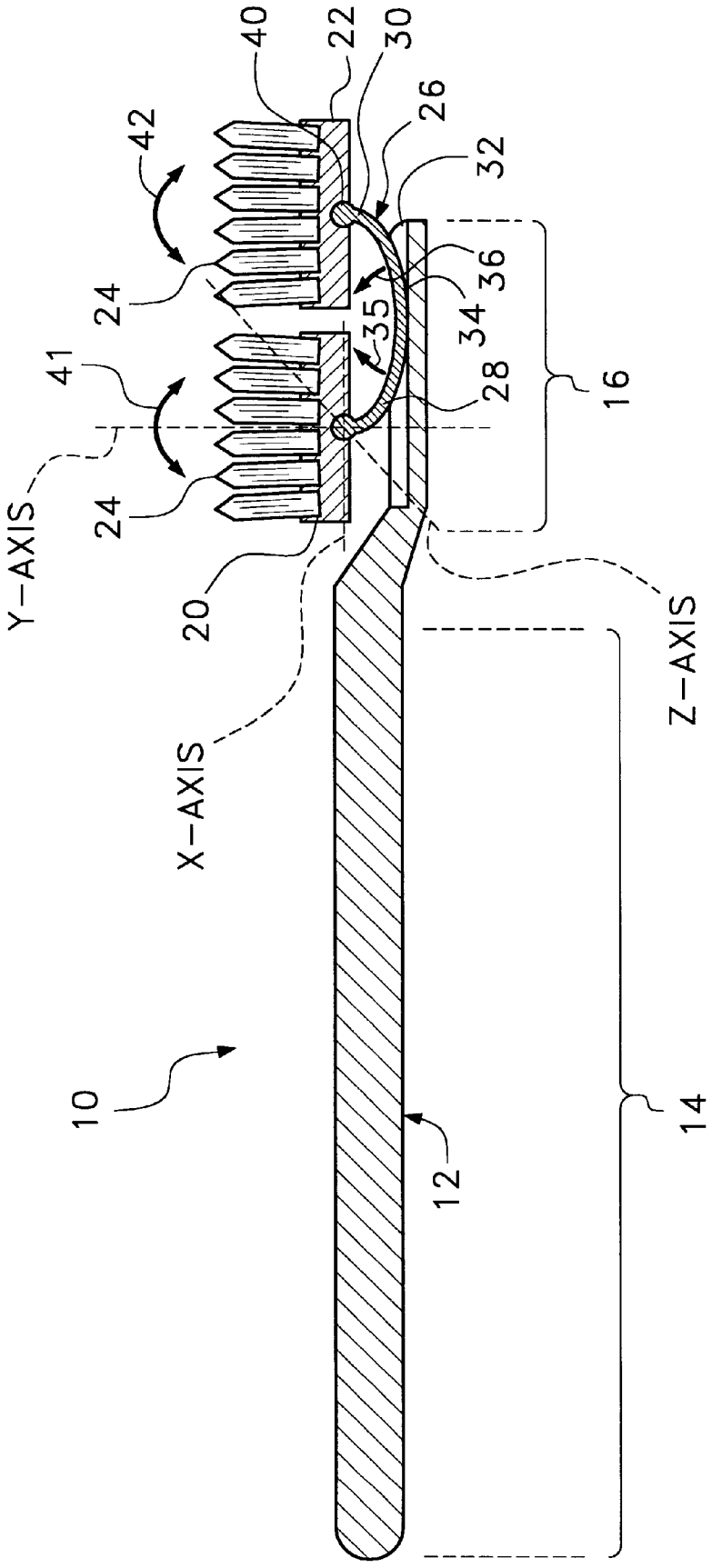

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Fig. 1

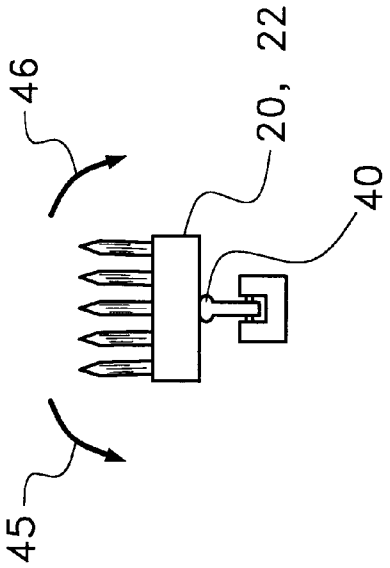


Fig. 3

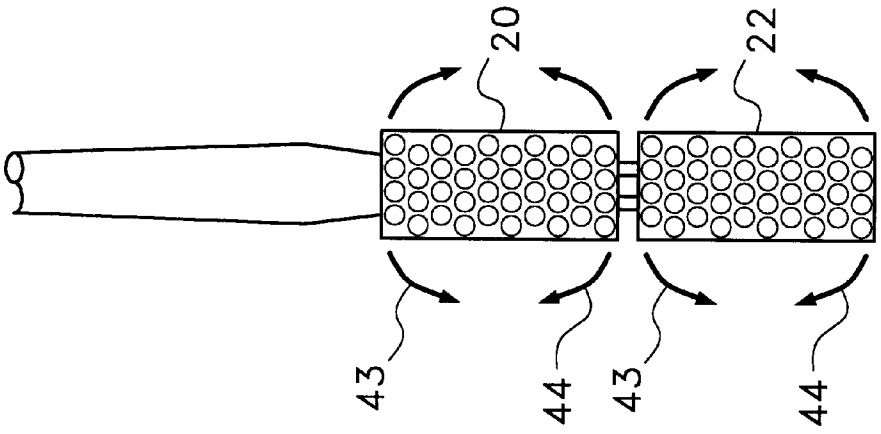


Fig. 2

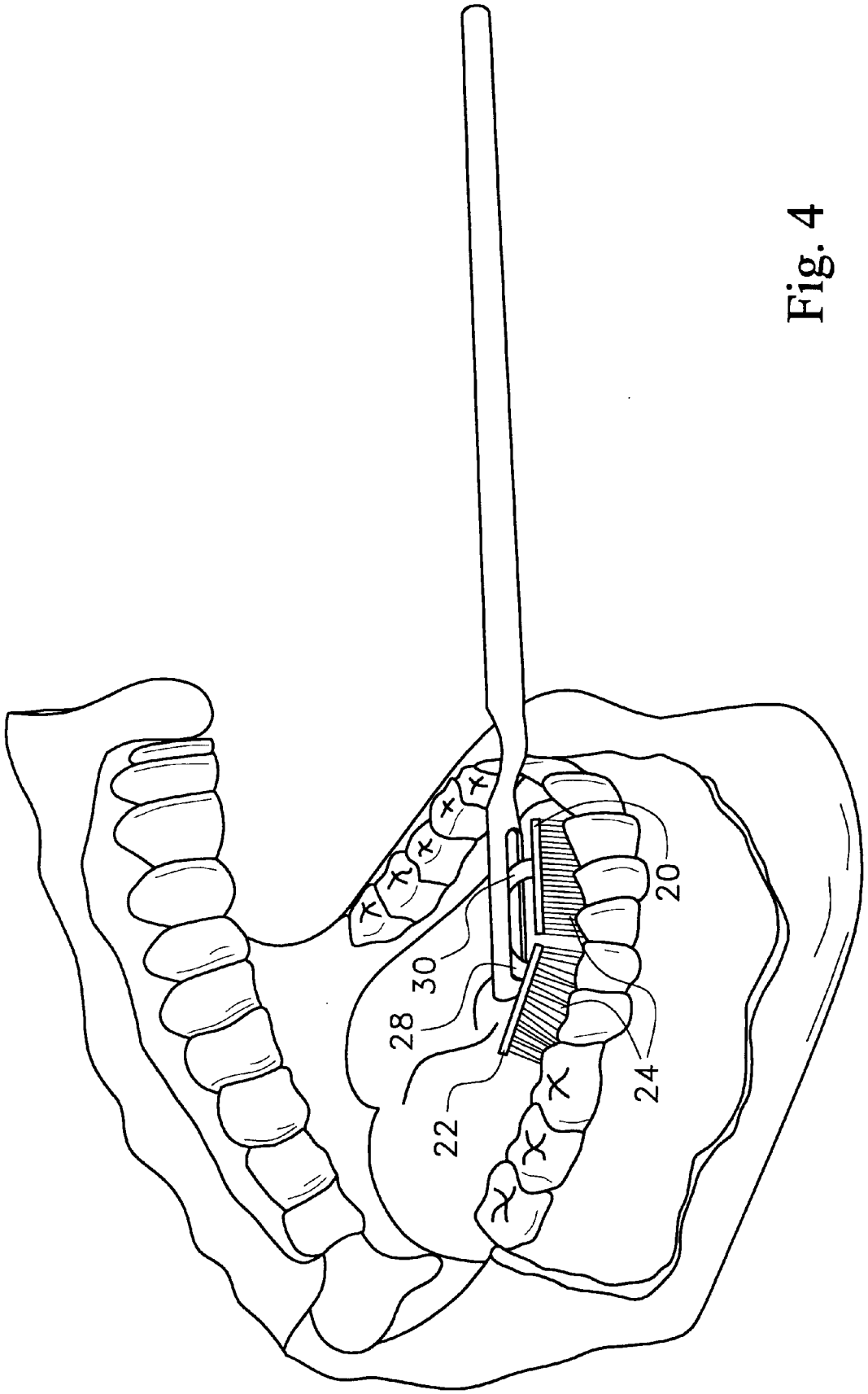


Fig. 4

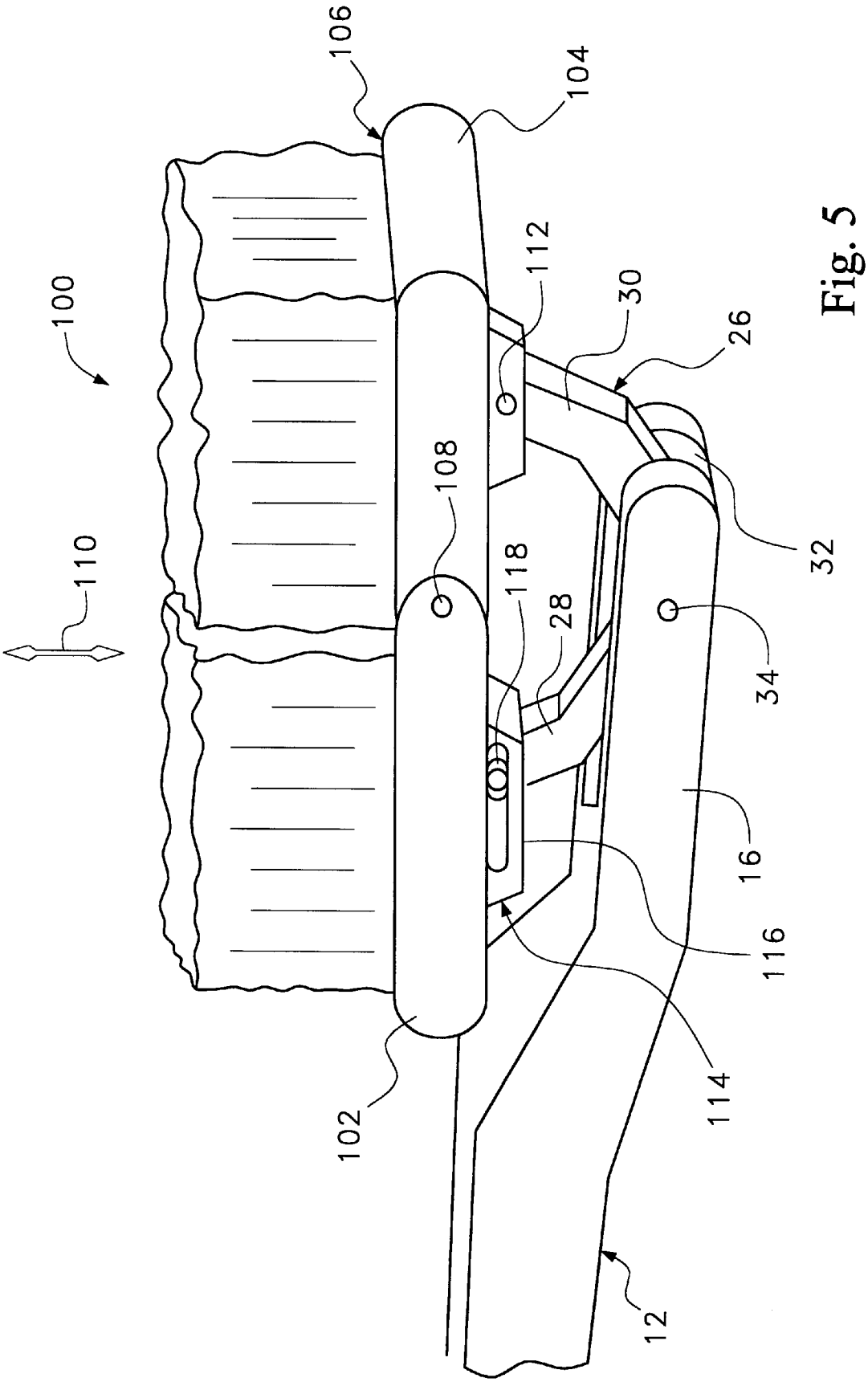
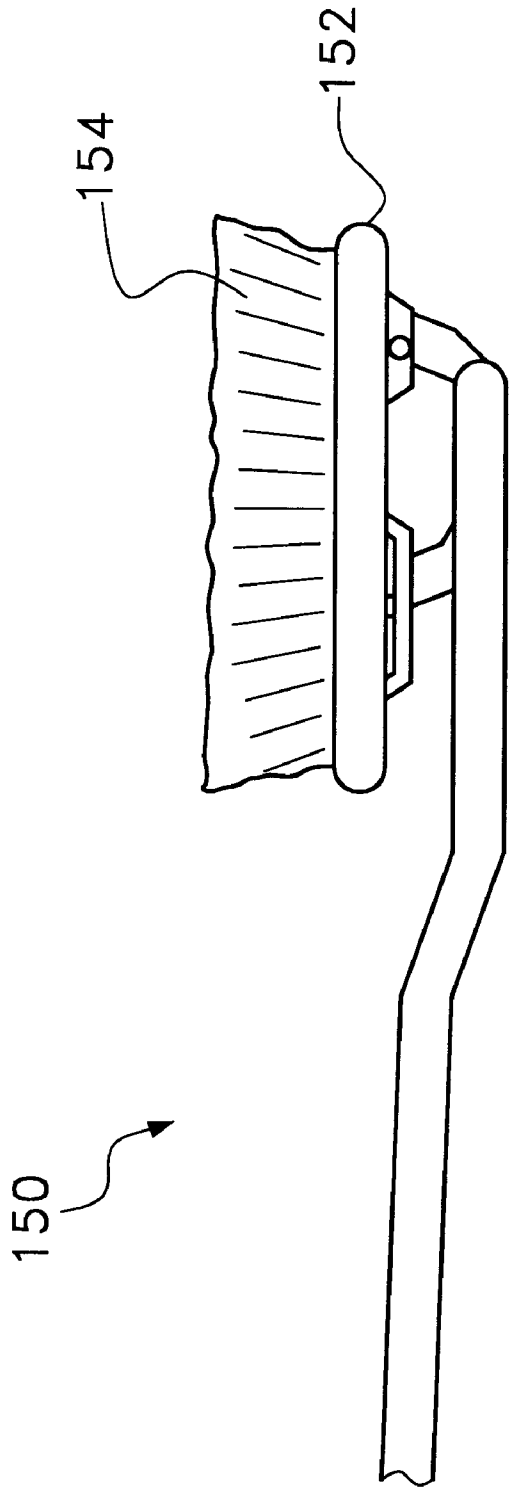


Fig. 5

Fig. 6



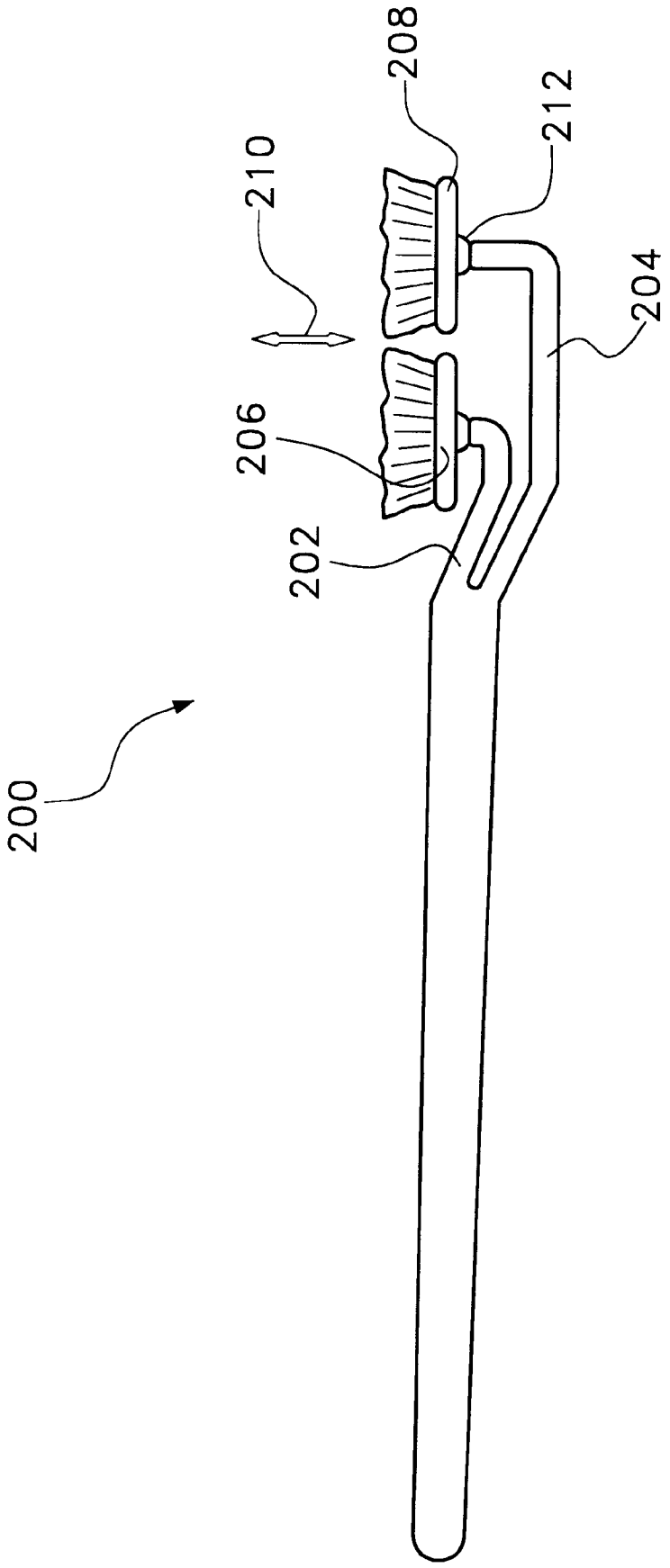


Fig. 7

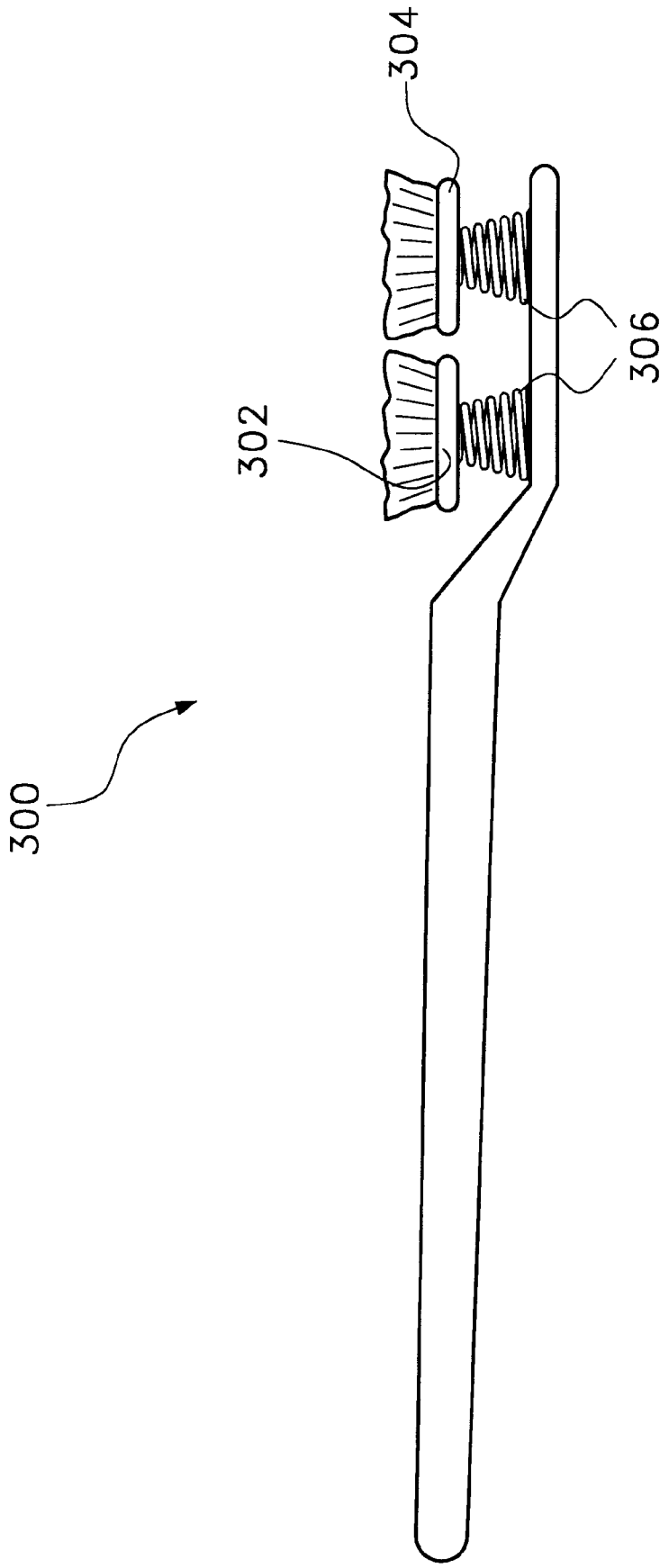


Fig. 8

TOOTHBRUSH DEVICE

RELATED APPLICATIONS

This application is a Continuation-In-Part of U.S. patent application Ser. No. 08/743,814, filed Nov. 6, 1996 and entitled Anatomically Adjustable Toothbrush System, now abandoned.

DOCUMENT DISCLOSURE DOCUMENTS

The parent application cited above claims benefit of the date of a first Document Disclosure Document No. 364815.

This application claims the benefit of the filing date of both the parent application and a second Document Disclosure Document No. 397088.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to toothbrushes that have a bristle head that is able to move independently of the toothbrush handle, thereby enabling the bristle head to better conform to the contours of the teeth during brushing.

2. Prior Art Statement

The prior art is replete with different types and styles of toothbrushes that are used to brush the teeth and maintain proper oral hygiene. One of the most common types of toothbrush designs utilizes a single head of bristles that is permanently affixed in a set orientation at the end of a handle. Although the handle may have the ability to flex slightly, the movement of the bristle head directly corresponds to the movement of the handle.

As is commonly known, most teeth are not flat, even, nor do they lay in a straight line. Rather, individual teeth are curved. Different teeth are different sizes and have different contours. Adjacent teeth do not always align. Rather, teeth are often crooked with different teeth leaning in different directions. Lastly, teeth are set into the bones of the skull and jaw along generally semicircular paths. At different points along a row of teeth, the radius of curvature changes, depending upon the size of the mouth, the number of teeth and the orientation of the teeth. The area within the mouth with the smallest radius of curvature is typically the area on the tongue side of the teeth behind the central and lateral incisors.

Utilizing a traditional toothbrush where the bristle head is set in one position, it is nearly impossible to manipulate the bristle head properly to cause the bristle head to brush against all surfaces of the teeth. Recognizing the flaws in the design of traditional toothbrushes, alternative designs have been produced. The purpose of the alternative designs is to increase contact between the bristle head and the teeth, thereby increasing the efficiency of the brushing action.

U.S. Pat. No. 5,228,166 to Gomez, entitled Removable Pivotable Head Toothbrush, exemplifies prior art toothbrush devices that have a bristle head that is pivotably connected to the toothbrush handle. In such prior art designs, the bristle head is able to pivot in line with the handle. This helps the bristle head better move across the teeth. One of the problems associated with such prior art toothbrush designs is that the single large bristle head prevents the bristles from conforming to the teeth on areas where the position of the teeth curve sharply. Furthermore, the single plane of movement provided by the pivot does not assist the bristle head in conforming to crooked teeth or teeth that do not otherwise conform to the vertical.

U.S. Pat. No. 5,398,366 to Bradley, entitled Rocker Toothbrush, exemplifies toothbrush designs where the bristle heads are pivoted to move in planes that are perpendicular to the line of the toothbrush handle. A problem associated with such tooth brush designs is that the pivoting movement of the bristle heads do not help the bristle conform to the teeth in areas having a small radius of curvature, such as behind the lateral and central incisors.

U.S. Pat. No. 5,499,421 to Brice, entitled Twin-Headed Toothbrush exemplifies prior art toothbrush designs where different bristle heads are supported by different elements that extend from the handle. In such tooth brush designs, the bristle heads are side-by-side. Accordingly, the bristle heads have the same difficulty in conforming to areas of the teeth with small radii of curvature as do tradition toothbrushes with single set bristle heads.

A need therefore exists in the prior art for a toothbrush design that is capable of having bristle heads conform to the teeth in areas where the teeth are arranged with a small radius of curvature and in situations where the teeth may be of different sizes and misaligned. This need is met by the present invention as described and claimed below.

SUMMARY OF THE INVENTION

The present invention is a toothbrush device that conforms to the curvatures and contours of the teeth while brushing. The toothbrush device includes a handle for gripping. At least one bristle head is disposed a predetermined distance from the handle. A support mechanism is disposed between the handle and each of the bristle heads. The support mechanism varies the predetermined distance between the bristle heads and the handle as a function of a contact force applied to each of the bristle heads. A connection is disposed between each support mechanism and each bristle head. The presence of the connection enables each bristle head to move in at least one plane in a manner independent of the support mechanism. This provides each of the bristle heads with the freedom of movement needed to properly conform to the curvature and contours of the teeth.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, reference is made to the following description of exemplary embodiments thereof, considered in conjunction with the accompanying drawings, in which:

FIG. **1** is a cross-sectional view of an exemplary toothbrush device in accordance with the present invention;

FIG. **2** is a top view of the bristle head section of the embodiment of the toothbrush device shown in FIG. **1**;

FIG. **3** is a end side view of the bristle head section of the embodiment of the toothbrush device shown in FIG. **1**;

FIG. **4** is a perspective view of the embodiment of the toothbrush device shown in FIG. **1**, shown in conjunction with a fragmented mouth to expose the teeth within the mouth;

FIG. **5** is a perspective view of the bristle head section of an alternate embodiment of a toothbrush device in accordance with the present invention;

FIG. **6** is a side view of a second alternative embodiment of a toothbrush device in accordance with the present invention;

FIG. **7** is a side view of a third alternative embodiment of a toothbrush device in accordance with the present invention; and

FIG. **8** is a side view of a fourth alternative embodiment of a toothbrush device in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Although the present invention device can be used in conjunction with any brush system, such as cleaning brushes and the like, the present invention device is especially suitable for use in the field of toothbrushes. As a result, the exemplary embodiments of the present invention device will all illustrate the present invention device configured as a toothbrush in order to set forth the best mode contemplated for the invention.

Referring to FIG. **1**, an exemplary embodiment of a toothbrush device **10** is shown in accordance with the present invention. The toothbrush device **10** includes a handle **12**. In the shown embodiment, the handle **12** includes an elongated gripable section **14** and a head support section **16**. Although the gripable section **14** and the head support section **16** of the handle **12** can each be linearly aligned, in the shown embodiment the head support section **16** is positioned slightly off-center from the longitudinal axis of the gripable section **14**.

The toothbrush device **10** includes a plurality of bristle heads. In FIG. **1**, two bristle heads **20, 22** are shown by way of example. Each of the bristle heads **20, 22** supports a matrix of bristles **24** that extend from each bristle head **20, 22**. The bristles **24** can have many different configurations and may terminate in a common plane or in a contoured configuration. Different bristle patterns and contours are well known in the prior art.

An arm support **26** is disposed between the head support section **16** of the handle **12** and the bristle heads **20, 22**. The arm support **26** is a generally U-shaped structure having a first arm element **28** and a second arm element **30** that extend upwardly. The first shown bristle head **20** is connected to the first arm element **28**. Similarly, the second shown bristle head **22** is connected to the second arm element **26**.

A slot **32** is disposed in the head support section **16** of the handle **12** below the bristle heads **20, 22**. The bottom center of the arm support **26** is connected to the head support section **16** of the handle **12** with a pivot **34** within the slot. Consequently, both the first arm element **28** and the second arm element **30** are free to rotate about the pivot **34** in the directions of arrows **35** and **36**, within the confines of the slot **32**. The axis of the pivot **34** is perpendicular to the longitudinal axis of the slot **32** and the head support section **16** of the handle **12**.

As the arm support **26** rotates about the pivot **34**, the height of the top end of both the first arm element **28** and the second arm element **30** changes with respect to the handle **12**. At least part of an articulated coupling **40** is disposed at the top end of each arm element **28, 30**. The articulated coupling **40** interconnects the each arm element **28, 30** to the corresponding bristle head **20, 22**. In FIG. **1**, a reference guide of an X, Y and Z axis is shown. The origin of the reference guide should be considered at the top end of each arm element **28, 30**. An articulated coupling **40** is any coupling that would enable the bristle heads **20, 22** to at least partially rotate about the X-axis, the Y-axis and the Z-axis. In the shown embodiment, the articulated coupling **40** is a ball and socket joint, wherein the ball is disposed at the top end of each arm element **28, 30** and the socket is disposed in the bottom of each bristle head **20, 22**. In alternative embodiments, hinge arrangements can be used. Similarly, a segment of elastomeric material or a spring element can also be positioned between the arm elements **28, 30** and bristle heads **20, 22**, wherein the elastomeric material or spring acts as the articulated coupling by allowing deformation in all directions.

From FIG. **1**, it is clear that the arm elements **28, 30** enable each of the bristle heads **20, 22** to move in the directions of arrows **41** and **42**, respectively. Referring now to FIG. **2**, it can be seen that the articulated coupling **40** (FIG. **1**) between each arm element **28, 30** (FIG. **1**) and each bristle head **20, 22** enables the bristle heads **20, 22** to rotate about the point of the articulated coupling on the directions of arrows **43** and **44**, respectively. Similarly, by referring to FIG. **3**, it can be seen that the articulated coupling **40** between each arm element and each bristle head **20, 22** enables the bristle heads **20, 22** to rotate about the point of the articulated coupling **40** in the directions of arrows **45** and **46**, respectively.

Returning to FIG. **1**, it should therefore be understood that the arm elements **28, 30** enable the bristle heads **20, 22** to move independently up and down in the Y-axis. Simultaneously, the articulated coupling **40** between the arm elements **28, 30** and the bristle heads **20, 22** enable the bristle heads **20, 22** to pitch, roll and yaw about the X-axis, the Y-axis and the Z-axis, respectively.

Referring to FIG. **4**, it can be seen that the multiple degrees of freedom in motion provided to the bristle heads **20, 22** by the arm elements **28, 30** and the articulated coupling **40** enable the bristle heads **20, 22** to conform to the contour of the mouth even in areas having a small radius of curvature. This enables the bristles **24** to maintain good contact with the teeth regardless to the position or orientation of the teeth in the mouth.

In the embodiment of FIGS. **1–4**, the bristle heads **20, 22** were connected to the arm elements **28, 30** by a ball and socket joint. It will be understood that such a joint can be made with a snap fit, wherein the bristle heads **20, 22** can be selectively separated from the arm elements **28, 30**. The ability to selectively connect and disconnect the bristle heads **20, 22** enable the bristle heads **20, 22** to be easily replaced when worn without having to replace the remainder of the toothbrush device **10**.

Referring to FIG. **5**, an alternate embodiment of a toothbrush device **100** is shown in accordance with the present invention. In this embodiment, the head support section of the handle **16**, the slot **32**, the arm support **26**, arm elements **28, 30** and the pivot connection **34** between the head support region **16** and the arm support **26** are the same as with the initial embodiment. For this reason, the elements are identified with the same reference numerals as were used with the initial embodiment.

In the embodiment of FIG. **5**, the two bristle heads **102, 104** are joined together at one end to create an overall bristle head assembly **106**. In the embodiment shown, a hinge connection **108** is used to join the two bristle heads **102, 104**. However, it will be understood that other connections can be used such as an elastomeric material joint or a thinned flexible plastic joint. Regardless of the connection used, it should be understood that the center of the bristle head assembly **106** is free to move up and down in the directions of arrow **110**, thereby selectively changing the slope associated with each of the bristle heads **102, 104**.

The top ends of the arm elements **28, 30** below the bristle heads **102, 104** no longer terminate with fully articulated connections. Rather, in the embodiment of FIG. **5**, less free

interconnection elements are used. As is shown, the top end of the second arm element **30** is pivotably connected to the bottom of the second bristle head **104**. This enables the second bristle head **104** to turn about the pivot connection **112** in the same plane as length of the toothbrush handle **12**. However, since the second bristle head **104** is pivotably connected to the first bristle head **102**, any movement in the second bristle head **104** will cause movement in the first bristle head **102**.

The arm elements **28**, **30** enable each of the bristle heads **102**, **104** to move up and down independently of the other. Accordingly, each side of the bristle head assembly **106** can move up and down independently. In order to allow for the two bristle heads **102**, **104** to move up and down independently and for the second bristle head **104** to pivot about the top of the second arm element **30**, the interconnection between the first arm element **28** and the first bristle head **102** can not be laterally static. Rather, in the shown embodiment, the top end of the first arm element **28** connects to the center of the first bristle head **102** with a sliding pivot arrangement **114**. The sliding pivot arrangement **114** includes a slotted track **116**. A pivot pin **118** rides within the slotted track **116**, wherein the pivot pin **118** is attached to the top of the first arm element **28**.

The use of the arm elements **28**, **30** as well as the pivot connections between the bristle head assembly **106** and the arm elements **28**, **30**, enable the bristle head assembly **106** to conform to either a concave orientation or a convex orientation. In either orientation, the radius of curvature to which the bristle heads **102**, **104** conform can be varied within a wide range. Once in a particular radius of curvature, the entire bristle head assembly **106** can rotate about the pivot **34** of the arm support **26**. Accordingly, the bristle head assembly **106** can be configured to either the outside of the teeth or the inside of the teeth and can be moved along the teeth while maintaining contact between the bristles and the teeth.

Referring to FIG. **6**. a slight modification of the toothbrush device of FIG. **5** is shown. In this embodiment, separate bristle heads are not used. Rather, the toothbrush device **150** has a single bristle head **152** fabricated from an elastomeric material. The bristles **154** are set into the material of the bristle head **152**. Since the bristle head **152** is made from elastomeric material, the bristle head **152** is free to bend across its entire length. Accordingly, the bristle head **152** can conform to curved surfaces better than can rigid bristle heads. The flexible bristle head **152** can be attached to the handle utilizing and support and connector assembly previously of subsequently described.

Referring to FIG. **7**, a third alternative embodiment of a toothbrush device **200** is shown in accordance with the present invention. In this embodiment, the two flexible arms **202**, **204** are used to support the two bristle heads **206**, **208**. The arms **202**, **204** are flexible and enable the two bristle heads **206**, **208** to move independently up and down in the directions of arrow **210** and back and forth in the plane of the paper. The flexible arms **202**, **204** can connect to the bristle heads **206**, **208** with articulated connections **212** as is shown and was previously described. Alternatively, the arms can connect to the bristle heads with the pivot connections illustrated and described in connection with FIG. **5**.

Referring to FIG. **8**, a fourth alternate embodiment of a toothbrush device **300** is shown. In this embodiment, the two bristle heads **302**, **304** are supported by spring elements **306**. The spring elements **306** allow the bristle heads to move independently up and down. Furthermore, the spring elements **306** enable each of the bristle heads **302**, **304** to independently pitch, roll and yaw in order to conform to the shape and contour of a person's teeth. Accordingly, the spring element take the place of flexible arm supports with articulated connections.

It will be understood that the embodiments of the present invention described and illustrated herein are merely exemplary and a person skilled in the art can make many variations to the embodiment shown without departing from the scope of the present invention. It should also be understood that the various elements from the different embodiments shown can be mixed together to create alternate embodiments that are not specifically described. All such variations, modifications and alternate embodiments are intended to be included within the scope of the present invention as defined by the appended claims.

What is claimed is:

1. A toothbrush device, comprising:

a handle;

a first bristle head and a second bristle head disposed a predetermined distance from said handle, wherein said first bristle head and said second bristle head each have two short sides and two long sides and said first bristle head and said second bristle head are linearly aligned with the short side of each facing the other;

a support mechanism disposed between said handle and both said first bristle head and said second bristle head for varying said predetermined distance as a function of a contact force applied to said first bristle head and said second bristle head; and

a connection disposed between said support mechanism and both said first bristle head and said second bristle head, that enables said first bristle head and said second bristle head to move in at least one plane independent of said support mechanism.

2. The device according to claim **1**, wherein said first bristle head and said second bristle head are interconnected by at least one flexible connection.

3. The device according to claim **1**, wherein said support mechanism includes at least one arm element pivotably connected to said handle.

4. The device according to claim **1**, wherein said support mechanism includes a first spring element that interconnects said first bristle head to said handle and a second spring element that interconnects said second bristle head to said handle.

5. The device according to claim **1**, wherein said connection is a pivoted connection.

6. The device according to claim **1**, wherein said connection is a ball and socket joint.

7. The device according to claim **1**, wherein said support arm includes a first arm element that supports said first bristle head and a second arm element that supports said second bristle head.

8. The device according to claim **7**, wherein said first arm element and said second arm element are interconnected and join to said handle at a common pivot point.

9. The device according to claim **7** wherein said connection between said first arm element and said first bristle head is a sliding pivot connection and said connection between said second arm element and said second bristle head is a pivot connection.

10. The device according to claim **7**, wherein said first arm element and said second arm element are flexible and extend from said handle.

11. The device according to claim **1**, wherein said at least one bristle head is flexible.

12. A toothbrush device, comprising:

a handle;

a bristle head assembly having a first bristle head coupled to second bristle head with a pivotable connection, wherein a slope associated with each said first bristle head and said second bristle head can be independently varied;

an arm support having a first end, a second end and a middle section disposed between said first end and said second end, wherein said first end is coupled to said first bristle head, said second end is coupled to said second bristle head and said middle section is pivotable connected to said handle.

13. The device according to claim 12, wherein said second end of said arm support is pivotably connected to said second bristle head.

14. The device according to claim 13, wherein said first end of said arm support is coupled to said first bristle head with sliding pivot arrangement.

15. A toothbrush device, comprising:

a handle;

a plurality of bristle heads;

a plurality of flexible arms extending from said handle, wherein each of said plurality of flexible arms supports one of said bristle heads;

a connector disposed between each of said flexible arms and each of said bristle heads that enable each of said bristle heads to move in at least one plane independently of a flexible arm in support thereof.

16. The device according to claim 15, wherein said connector includes a ball and socket joint.

17. A toothbrush device, comprising:

a handle;

at least one bristle head disposed a predetermined distance from said handle, wherein said at least one bristle head is flexible;

a support mechanism disposed between said handle and said at least one bristle head for varying said predetermined distance as a function of a contact force applied to said at least one bristle head; and

a connection disposed between said support mechanism and each said at least one bristle head that enables said at least one bristle head to move in at least one plane independent of said support mechanism.

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