United States Patent [19]

Ely

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[54] **DENTAL DEVICE**

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[52] **U.S. Cl.** **132/91**

[51] **Int. Cl.** **A61c 15/00**

[58] **Field of Search** ..... 32/40 R; 132/91, 92 R, 132/93

[56] **References Cited**

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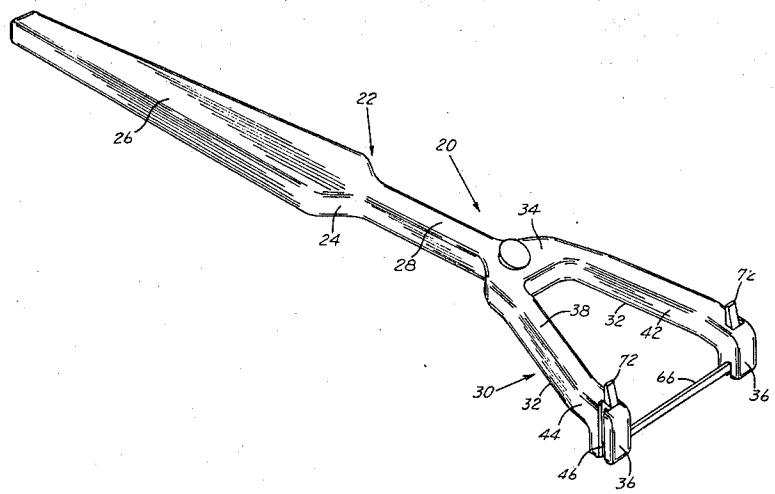
Attorney, Agent, or Firm—Burton, Crandell, Polumbus & Harris

[57] **ABSTRACT**

A hand-held device for cleaning between the teeth and in the sulcus between the gingiva and the crown of a tooth includes a handle having forwardly extending spaced arms adapted to retain an elastomeric band under tension so that the band bridges the gap between the spaced arms and can be passed between the teeth and into the sulcus to remove food particles, plaque and other like substances. The band is disclosed in two embodiments, one of which comprises a straight band having a relatively thin intermediate portion and enlarged integral heads which flare outwardly from opposite ends of the intermediate portion and are adapted to seat in notches provided in the arms of the handle. Raised ridges are provided in the intermediate portion of the band to provide an abrasion surface for facilitating removal of plaque from the teeth. An endless band embodiment is also disclosed which bridges the gap between the spaced arms and is anchored to an anchor post on the handle to establish the desired tension in the elastomeric band.

10 Claims, 10 Drawing Figures



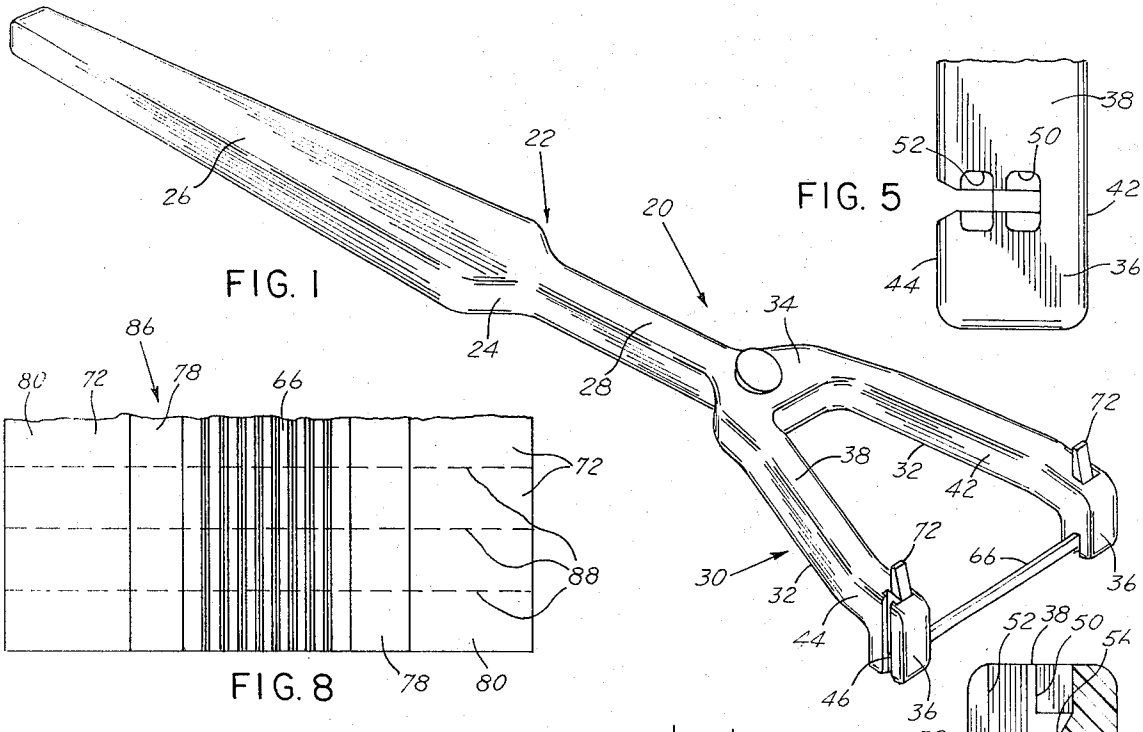


FIG. 1

FIG. 5

FIG. 8

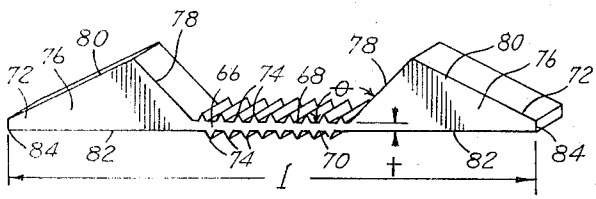


FIG. 6

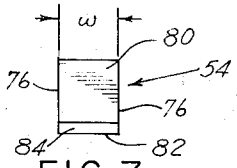


FIG. 7

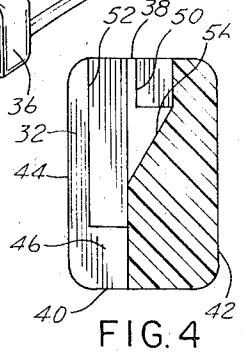


FIG. 4

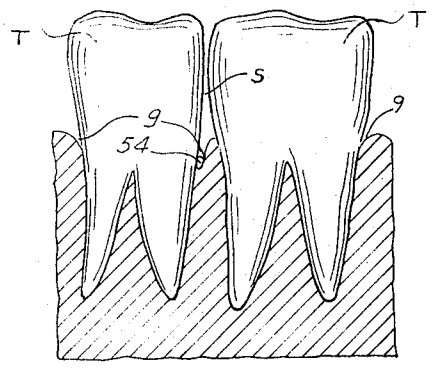


FIG. 9

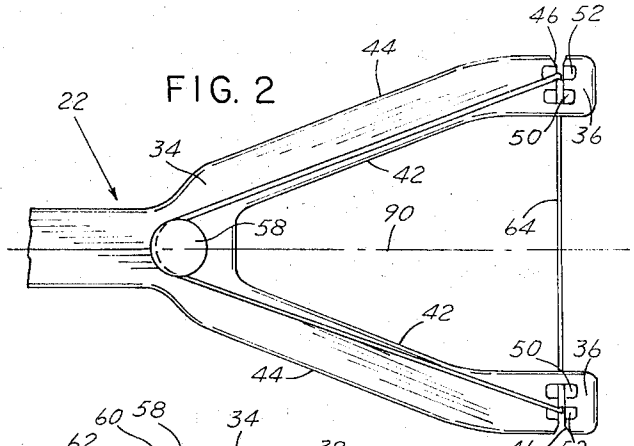


FIG. 2

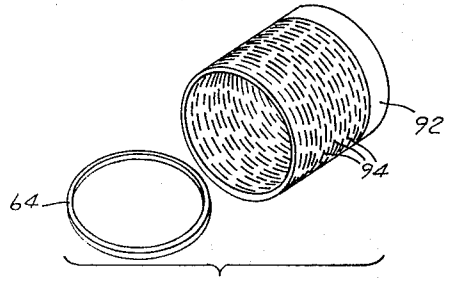


FIG. 10

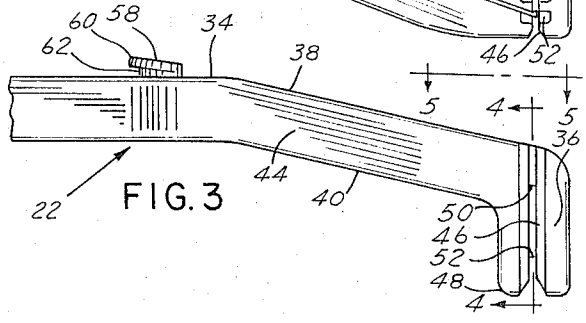


FIG. 3

DENTAL DEVICE

The present invention generally concerns dental appliances and more particularly concerns a hand-held dental device for cleaning between the teeth and in the sulcus between the gingiva and the crown of a tooth.

Peridontal diseases or diseases of the gum surrounding the teeth are normally caused by plaque building up on the surface of the teeth in the gingival crevice or sulcus between the gingiva and the crowns of the teeth, and spreading along the surface of the teeth toward the roots of the teeth destroying the connective tissue between the gingiva and the teeth. While various means have been contrived for cleaning between the teeth to prevent the formation and spread of plaque, to applicant's knowledge there are only a few dental devices available for home use in cleaning between the teeth which are also useful in cleaning plaque from the sulcus. One of these is the recently developed water-pick in which pulsed jets of water are directed into the interproximal spaces between the teeth and into the sulcus to hydraulically remove plaque deposits from the surface of the teeth. Another commonly used device is dental floss which is well suited for removing plaque in the interproximal spaces between teeth and at contact points of adjacent teeth but is not well suited for cleaning in the sulcus as it is non-elastic and tends to tear and damage the gingiva thereby lessening the effectiveness of the gingiva in preventing the buildup of plaque in the sulcus. Other devices such as the toothpick, could be used for these purposes but contain inherent limitation which make them less then entirely satisfactory.

The present invention is adapted to clean in the interproximal spaces between teeth and also in the sulcus between the gingiva and the crowns of the teeth without damaging the sulcus. In accordance with the invention, a stretched thin elastic cleaning element is utilized to abrasively scrape plaque and the like from the exposed surface of teeth, remove solid food particles from between the teeth and clean in the sulcus between the gingiva and the crowns of the teeth to prevent plaque buildup and consequent peridontal diseases.

More particularly, the invention consists of a convenient hand-held dental device including means for retaining an elastomeric band under tension such that the band can be passed across the surface of the teeth in abrasively removing plaque deposits without damaging the surface of the teeth or the gingiva surrounding the teeth. Additionally, the band may have a serrated surface to facilitate abrasive removal of plaque from the surface of the teeth.

The band is disclosed in two forms and the handle for the device is adapted to retain either form of the band under desired tension. One form of the bank comprises a straight fixed length of elastometic material having a relatively thin intermediate portion adapted to be stretched between supporting arms on the handle and enlarged integral heads at each end of the intermediate portion which flare outwardly at an obtuse angle from the intermediate portion and are adapted to be seated in appropriate notches on the spaced arms of the handle. A pair of spaced notches are provided on each arm of the handle so that the tension of the band can be selected according to the combination of notches in which the heads are seated. The heads at the ends of the intermediate portion of the band are designed to minimize the likelihood of the band breaking at the

junctions between the intermediate portion and the heads which is an important feature of the invention inasmuch as the intermediate portion of the band needs to be extremely thin in order to pass into the sulcus and is therefore susceptible to easy breakage if the heads are not properly designed. In another form of the band, it is comprised of an endless loop adapted to be anchored to an anchor post on the handle of the device so that a portion of the band is stretched under tension between the spaced arms on the handle and thereby disposed for passage between the teeth and into the sulcus for removing tartar and the like. As will be appreciated from the detailed description hereinafter, both forms of the elastomeric band can be efficiently produced on a mass production basis.

Accordingly, it is an object of the present invention to provide a dental device adapted to clean in the interproximal space between teeth and to remove plaque and the like from the sulcus surrounding the teeth without damaging the sulcus.

It is another object of the present invention to provide a hand-held device adapted to clean in the interproximal spaces between teeth, to abrasively remove plaque from the exposed surface of the teeth and to remove plaque from the sulcus surrounding the teeth.

It is another object of the present invention to provide a hand-held dental device having spaced arms adapted to seat the ends of an elastomeric band and wherein a pair of seats are provided on each arm so that the tension of the band can be selected by the combination of seats utilized.

It is another object of the present invention to provide an elastomeric band for use on a dental device having spaced arms between which the band is stretched and wherein the band has a thin serrated intermediate portion adapted to be passed into the sulcus to remove plaque in the sulcus and having enlarged integral heads at each end flaring outwardly from the ends of the intermediate portion to establish means for attaching the band to the spaced arms in a manner such that the band is not easily broken at the junctions between the intermediate portion and the heads.

It is another object of the present invention to provide an elastomeric band adapted to be stretched between the spaced arms of a dental device which can be efficiently produced on a mass-production basis.

Other objects, advantages and capabilities of the present invention will become more apparent as the description proceeds taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of the dental device of the present invention having a first embodiment of an elastic band mounted thereon;

FIG. 2 is a fragmentary top plan view of the dental device of the present invention having a second embodiment of an elastic band mounted thereon;

FIG. 3 is a fragmentary side elevation of the dental device of FIG. 1 with the elastic band removed;

FIG. 4 is an enlarged section taken along line 4—4 of FIG. 3;

FIG. 5 is an enlarged fragmentary view taken in the direction of arrows 5—5 of FIG. 3;

FIG. 6 is a perspective view of the first embodiment of an elastic band used with the dental device of FIG. 1;

FIG. 7 is an end elevation of the band of FIG. 6;

FIG. 8 is a fragmentary top plan view of a strip of material from which the band of FIG. 6 is cut;

FIG. 9 is an operational side elevation showing the band of FIG. 6 in operative engagement with the crown of a tooth in the sulcus surrounding the tooth; and

FIG. 10 is a perspective view of the second embodiment of an elastic band used with the device of the present invention and showing a tube of material from which the band is cut.

Referring first to FIGS. 1, 2 and 3, the dental device 20 of the present invention is seen to include a forked handle 22 having a shank portion 24 consisting of a grip 26 and a reduced neck 28, the forward end of the neck being integral with a bifurcated head 30 having a pair of spaced, forwardly extending, outwardly divergent arms 32. The arms 32 flare outwardly from a base portion 34 of the head and have inturned forward ends 36 extending parallel to the neck 28. The arms 32 each are of rectangular transverse cross-section having top, bottom, inner and outer faces 38, 40, 42 and 44 respectively. The edges along the intersection of adjacent faces of the arms are rounded so that the head 30 of the handle 22 is smooth and will not damage the mouth of a user when in use. As seen best in FIG. 3, the head 30 inclines downwardly from the neck 28 as this arrangement has been found best suited for properly positioning a cleaning band interconnecting the forward ends of the arms, as will be described later, between the teeth. As can also be appreciated from FIG. 3, the forward end 36 of each arm also extends downwardly from the remainder of the arm and is adapted to receive an elastomeric cleaning band to retain the band in a stretched or distended position between the forward ends 36 of the arms.

An outwardly opening vertically extending slot 46 is provided in the outer face 44 of the forward end 36 of each arm 32. As best seen in FIGS. 4 and 5, the slot 46 is continuous from the bottom end 48 of the arm to the top face 38 and interconnects upper and lower retention notches or seats 50 and 52 respectively on each arm which open through the top face 38 of the arm and are spaced transversely of the arm. As seen in FIG. 5, each of the notches or seats 50 and 52 is slightly wider than the width of the slot 46 and as shown in FIG. 4, the lower seat 52 is positioned adjacent to the outer face 44 of the arm and is deeper than the upper seat 50 which is adjacent to the inner face 42 of the arm. Each of the seats is rectangular in cross-section and is adapted to retain an enlarged end of a straight band 54 to be described in detail hereinafter. As shown in FIG. 4, the vertical slot 46 is relatively shallow at the bottom of the arm 32 and tapers inwardly along a beveled face 56 to the upper seat 50 so as to be relatively deep at the top of the arm. An upwardly projecting anchor post or nub 58 is provided on the base portion 34 of the head having a rearwardly facing overhanging lip 60 defining a notched rear face 62 of the nub. The nub 58 is provided to suitably anchor an endless band 64 which will also be described in detail hereinafter.

The straight band 54 is made of an elastomeric material and is shown in FIGS. 6 and 7 to include a thin rectangular shaped intermediate portion 66 having upper and lower surfaces 68 and 70 respectively and integral enlarged substantially triangular shaped connecting heads 72 at both ends of the intermediate portion 66. The intermediate portion 66 of the band is rectangular in shape and the width w is greater than the thickness t. In one preferred form of the straight band 54, the intermediate portion 66 is serrated on both the upper and lower surfaces 68 and 70 respectively. The serrations comprise raised transversely extending ridges or ribs 74 of triangular transverse cross-section which are effective in abrasively removing tartar and the like from the surface of teeth T, FIG. 9. As seen in FIG. 6, the substantially triangular shaped heads 72 of the straight band 54 have flattened side faces 76 and include a flat upwardly and outwardly divergent top face 78, a flat downwardly and outwardly divergent top face 80 and a flat bottom face 82 co-extensive with and defining a parallel extension from the lower surface 70 of the intermediate portion 66 of the band. A flattened outer end 84 of each head 72 interconnects the downwardly and outwardly extending top face 80 with the bottom face 82. It is important to note that the upwardly and outwardly extending top face 78 of each triangular head is inclined at an obtuse angle θ with the upper surface 68 of the intermediate portion so that the thickness of the band does not abruptly change at the junctures of the intermediate portion 66 with the heads 72 but rather gradually gets larger so as not to create weak points in the band at the junctures. This is important to the design of the the straight band 54 to prevent breakage of the band at the junctions between the intermediate portion and each head especially in view of the fact that the intermediate portion of the band of necessity is very thin as will be brought out in more detail later. The overall length l of the band 54 is less than the distance between the forward ends 36 of the arms 32 so that the band must be stretched or distended to be retained in the seats 50 and 52 on the forward end of each arm. The straight band 54 is preferably made of an elastic material having good abrasion resistance and flex-fatigue resistance. A material which has been found to be very well suited for use in the dental device is a hybrid rubber-plastic composition manufactured by E. I. Dupont De Nemours and Company, Inc. of Wilmington, Delaware, under the trademark "Hytrel." "Hytrel" incorporates the yielding nature of rubber with the rigidity of plastic and can be used in thinner sections than most other thermo-plastic elastomers to give equivalent performance. Accordingly, "Hytrel" when formed in the configuration of the straight band 54 shown in FIGS. 6 and 7 and mounted on the handle 22 is very effective in cleaning in the interproximal spaces between teeth and beneath the gum line in the sulcus g without damaging the gingiva.

A strip 86 of elastomeric material from which straight bands 54 of the type shown in FIG. 6 can be cut is shown in FIG. 8. It will be appreciated that the strip 86 can be easily molded of the desired elastomeric material in a suitable mold, not shown, and then cut into bands 54 of the desired width w along the phantom lines 88 shown in FIG. 8. Accordingly, the bands 54 can be easily and efficiently mass produced and thereby can be made in large quantities in a minimal amount of time.

The straight band 54 as mentioned previously, is adapted to be stretched or distended between the forward ends 36 of the arms 32 of the handle 22. As shown in FIG. 1, the triangular shaped heads 72 of the band are adapted to be seated in a vertical orientation in either one of the upper and lower seats 50 and 52 respectively on the forward ends 36 of the arms with the intermediate portion 66 of the band passing from the lower

end of the seat on one arm to the lower end of the seat on the opposite arm. It is important to note that the width *w*, as opposed to the thickness *t* of the intermediate portion **66** of the band is oriented vertically, or normal to the longitudinal axis **90**, FIG. **2**, of the handle **22**, so that the intermediate portion **66** can be easily inserted into the interproximal spaces between teeth and into the sulcus *g*. It should also be appreciated that if a head **72** of the straight band is seated in the lower seat **52** of an arm, the band will not be placed under as great a tension as if the head is seated in the upper seat **50** since the upper seat **50** is displaced both inwardly and upwardly from the lower seat **52.** Accordingly, three distinct tension settings of the band are available by the combination of seating arrangements available for the heads **72** at each end of the band.

The endless band **64** is shown in FIG. **10** to be substantially circular in shape with a quadralateral transverse cross-section, while of course, other oval configurations would be possible. As illustrated, the band **64** can be easily cut in a mass production manner from a hollow cylindrical or tubular body **92** of elastomeric material by cutting along the phantom lines **94** shown. Again, the band is made of an elastomeric material and "Hytrel" would be very well suited. When the endless band **64** is utilized, as shown in FIG. **2,** the band is passed through the slots **46** in the forward ends **36** of the arms **32** of the handle so that the band bridges the forward ends **36** adjacent to the lower ends **48** thereof and is extended rearwardly along the upper faces **38** of each arm and passed around the anchor post **58** on the base **34** of the head portion **30** of the handle. In this manner, the band **64** is retained under tension for suitable use in cleaning between the teeth and in the gingival cavity or sulcus between the gingiva and the crown of the tooth. It will be apparent that the tension in the band **64** can be varied by looping the band a desired number of times aroung the post **58.**

It is important to note that the dental device **20** of the present invention, regardless of which band is being used, contains no large protrusions which would hinder movement of the device in the mouth of a user. Additionally, the design of the device is such that it can be easily manipulated within the mouth to abrasively engage the elastic band with the desired surface of each tooth.

In order that the device be useful in cleaning the gingival cavity or sulcus *g* between the gingiva and the crown of the tooth, it is important that the endless band **64** and the intermediate portion **66** of the straight band **66** be of a small enough cross-sectional size so that it can be urged into the gingival cavity without damaging the gingiva. Also, it is important that the band be of an elastomeric material so that it has some give and it is thereby not damaging to the gingiva where it crosses the gingiva. In a preferred form, the elastomeric band when it is stretched between the forward ends of the band is about 0.0005 ± 0.0003 inches in thickness and 1/64th of an inch wide. Otherwise, the band will not easily fit between closely spaced teeth and will not be entirely suitable for cleaning the gingival cavity.

Accordingly, a hand-held dental device **20** has been described which is well suited for cleaning the interproximal spaces *s* between the teeth and for removing plaque and the like from the gingival cavity or sulcus g between the gingiva and the crown of the tooth. Although the present invention has been described with a certain degree of particularity, it is understood that the present disclosure has been made by way of example and that changes in details of structure may be made without departing from the spirit thereof.

What is claimed is:

1. A dental device comprising in combination,

a handle with spaced arms at one end and with retention means on said spaced arms having a retaining surface for releasably retaining a cleaning band, and

an elastomeric cleaning band adapted to be retained by said retention means on each of said spaced arms whereby said band is held in tension therebetween, said band having an intermediate portion adapted to be stretched between said arms, and an enlarged connecting head at each end, said enlarged heads each having an incline surface contiguous with one end of said intermediate portion that inclines away from said intermediate portion at an obtuse angle with the intermediate portion to strengthen the integral junctions of the intermediate portion with the enlarged heads, said retaining surfaces on the handle engaging said inclined surfaces of the cleaning band at locations beyond the juncture of the incline surfaces with the intermediate portion of the band.

2. In the dental device of claim **1,** said enlarged heads including a second surface which is parallel with said intermediate portion.

3. In the dental device of claim **2,** wherein each of said first mentioned surface and said second surface of the enlarged heads is flat.

4. In the dental device of claim **1** wherein said intermediate portion of the band has oppositely directed faces, and further including a plurality of ridges protruding away from said faces.

5. In the dental device of claim **4,** wherein said ridges are of triangular cross-sectional configuration.

6. A dental device comprising in combination an elongated handle, said handle having spaced arms at one end with retention means including a retaining surface for retaining the ends of an elastomeric band to hold the band in tension between said spaced arms, and an elastomeric band, said elastomeric band having a generally rectangular shaped intermediate portion with upper and lower surfaces, said upper and lower surfaces each having a plurality of raised ridges, an enlarged head extending outwardly from each end of the intermediate portion and adapted to be retained by said retention means, each of the enlarged heads having a first planar incline surface forming an obtuse angle with said upper surface of the intermediate portion, a second planar surface comprising an extension of said lower surface of the intermediate portion and at least a third surface interconnecting said first and second surfaces defining heads of substantially triangular configuration, said retaining surfaces on the handle engaging said incline surfaces of the cleaning band at locations beyond the juncture of the incline surfaces with the intermediate portion of the band.

7. A dental device comprising in combination:

an elongated handle having a shank portion defining a grip for the dental device, forwardly extending arms at one end of the shank portion and terminating in spaced free ends, each of said spaced free ends having an open slot, and at least two sockets with beveled surfaces, said sockets being of larger cross-sectional area

than the open slot and communicating with the open slot, and

an elastomeric strip retained by said handle having an intermediate portion with upper and lower surfaces, and enlarged heads extending outwardly from the ends of the intermediate portion adapted to be seated in one of said sockets to retain the intermediate portion of the strip in tension between the free ends of said arms, the enlarged heads each having a first planar incline surface forming an obtuse angle with said upper surface of the intermediate portion and adapted to be engaged with said beveled surface when the strip is retained by said handle, a second planar surface comprising an extension of said lower surface of the intermediate portion and at least a third surface interconnecting said first and second surfaces defining heads of substantially triangular configuration.

8. The dental device of claim **7,** wherein said sockets are spaced on the free ends of said arms such that the tension in the intermediate portion of the strip is variable according to the combination of sockets in which the enlarged heads are seated.

9. The dental device of claim **8,** wherein said upper and lower surfaces of the intermediate portion of the strip have a plurality of raised ridges.

10. The dental device of claim **7,** wherein the intermediate portion has a width dimension which is greater than a thickness dimension and wherein the width dimension extends substantially normal to the length of the handle.

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