Toothbrushing system for specialized cleaning

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Abstract

A tooth brushing system comprising a toothbrush head including a base defining a basal plane, a long axis and a short axis; and a multiplicity of bristles arranged in a plurality of bristle groups which may each have individual characteristics such as length and stiffness matching the differential anatomies of the various portions of the teeth, the base comprising a respective plurality of planar base portions, respectively supporting the plurality of bristle groups, wherein the planar base portions are configured to see-saw above and below the basal plane. Preferably, the handle is configured to retain a toothpaste-filled cartridge and the handle has at least one operative orientation in which the cartridge retained thereby is arranged to permit toothpaste to be dispensed onto the head. Optionally, a stabilizer is provided having at least one operative orientation in which it is fixedly associated with the head, the stabilizer being configured and arranged to roll along occlusal surfaces of teeth. Preferably, the head is designed to rotate about its short axis while the handle remains motionless. Preferably, the handle is designed to swivel about its long axis while the head remains motionless.
TOOTHBRUSHING SYSTEM FOR
SPECIALIZED CLEANING

CROSS-REFERENCE TO RELATED
APPLICATIONS

[0001] This application claims benefit of U.S. Provisional
Application No. 60/808,949, filed May 20, 2006 (which is
hereby incorporated by reference).

FIELD OF THE INVENTION

[0002] The present invention relates generally to tooth
brushing systems.

BACKGROUND OF THE INVENTION

describes a toothbrush comprising two spring-supported
parts carrying bristles which independently oscillate in a
plane perpendicular to the brush’s longitudinal axis. Pressure
on a blade spring causes conformation to the interior or
external curvature of the jaw.

[0004] European Patent EP1386589 describes a toothbrush
having sets of bristles movable relative to one another
such that at least one component of this relative movement
causes bristles of the first set to be raised and/or lowered
relative to bristles in the second set.

[0005] U.S. Pat. No. 5,284,168 describes a tooth cleaning
device including a cartridge unit insertable in the gap
between the jaws to serve as a tooth cleaning implement.

[0006] U.S. Pat. No. 5,351,388 describes a toothbrush
having two orthogonally disposed brush heads.

toothbrush head.

[0008] European Patent EP1486137 describes a toothbrush
having bristle groups carried by separate segments on
the brush head and a method for manufacturing this type of
brush.

[0009] The disclosures of all publications mentioned in
the specifications, and of the publications cited therein directly
or indirectly, are hereby incorporated by reference.

SUMMARY OF THE INVENTION

[0010] The present invention seeks to provide an
improved toothbrush.

[0011] There is thus provided, in accordance with a pre-
ferred embodiment of the present invention, a tooth brushing
system comprising a toothbrush head including a base
defining a basal plane, a long axis and a short axis; and a
multiplicity of bristles arranged in a plurality of bristle
groups, the base comprising a respective plurality of planar
base portions, respectively supporting the plurality of bristle
groups, wherein the planar base portions are configured to
see-saw above and below the basal plane.

[0012] Further in accordance with a preferred embodiment
of the present invention, the planar base portions include at
least one first pair of planar base portions configured to
see-saw above and below the basal plane about a first pivot
axis; and at least one second pair of planar base portions
configured to see-saw above and below the basal plane about
a second pivot axis.

[0013] Still further in accordance with a preferred em-
bodyment of the present invention, the base defines first and
second long sides which are parallel to the long axis and the
lengths of the multiplicity of bristles generally increases
from the first long side to the second long side.

[0014] Further in accordance with a preferred embodiment
of the present invention, the base defines first and second
long sides which are parallel to the long axis and wherein
the softness of the multiplicity of bristles generally increases
from the first long side to the second long side.

[0015] Additionally in accordance with a preferred em-
bodyment of the present invention, the tooth brushing
system also comprises a handle configured and arranged to
support the head in first and second selectable orientations,
wherein the first orientation is rotated 180 degrees around
the head’s short axis, relative to the second orientation.

[0016] Further in accordance with a preferred embodiment
of the present invention, the handle comprises a swivel-
mounted head support.

[0017] Still further in accordance with a preferred em-
bodyment of the present invention, the planar base portions
remain parallel to the basal plane while see-sawing above
and below the basal plane.

[0018] Also in accordance with another preferred em-
bodyment of the present invention, is a tooth brushing system
comprising a pair of friction-creating elements including a
first friction-creating element operative to apply pressure on
and receive pressure from teeth and a second friction-
creating element constructed and arranged relative to the
first friction-creating element, to engage a space between
the teeth in reaction to the pressure of the teeth on the first
friction-creating element.

[0019] Further in accordance with a preferred embodiment
of the present invention, at least one of the friction-creating
elements comprises at least one group of bristles.

[0020] Further provided, in accordance with still another
preferred embodiment of the present invention, is a toothbrush
comprising a handle configured to retain a toothpaste-
filled cartridge; and a head mounted at one end of the handle,
wherein the handle has at least one operative orientation in
which the cartridge retained thereby is arranged to permit
toothpaste to be dispensed onto the head.

[0021] Further in accordance with a preferred embodiment
of the present invention, the first pivot axis is parallel to the
short axis and the second pivot axis is parallel to the long
axis.

[0022] Also provided, in accordance with another pre-
ferred embodiment of the present invention, is a toothbrush
system comprising a handle; a head atop the handle; and a
stabilizer attached to the head and being configured and
arranged to roll along occlusal surfaces of teeth, thereby
crushing the stabilizer to move along the teeth.

[0023] Further provided, in accordance with another pre-
ferred embodiment of the present invention, is a toothbrush
system comprising a toothbrush handle, a toothbrush head
having a plurality of selectable orientations via a vis the
handle; and a stabilizer operative to selectively stabilize the
toothbrush head so as facilitate a change from a first of the
plurality of selectable orientations to a second of the plu-
rality of selectable orientations.

[0024] Further in accordance with another preferred em-
bodyment of the present invention, the stabilizer com-
prises a wheel rigidly associated with the toothbrush head
which is configured and arranged to roll along occlusal
surfaces of teeth.

[0025] Also provided, in accordance with another pre-
ferred embodiment of the present invention, is a toothbrush-
ing system comprising a handle; and a head mounted thereupon and including a multiplicity of bristles defining a teeth-contacting bristle surface, wherein the bristle surface has selectable convex and concave orientations at least one of which is adopted responsive to pressure brought to bear by the dental arch on the brush head.

Further provided, in accordance with still another preferred embodiment of the present invention is a tooth-brushing system comprising a handle; a head mounted on the handle and having a multiplicity of bristles arranged on a generally planar surface; and a bristle translator operative to translate at least a portion of said multiplicity of bristles relative to said generally planar surface.

Also provided, in accordance with a preferred embodiment of the present invention, is a toothbrush which typically comprises a three-section brush head that conforms to the shape of the jaw e.g. by means of a seesaw mechanism activated when pressure is applied to the brush head by the teeth.

Typically, when pressure is applied to a middle section of the brush head, the two lateral sections rise, thereby enabling the bristles to contact the outer surfaces of the maxilla and the mandible. When pressure is applied to one of the lateral sections of the brush head, the middle section rises, thereby to enable the bristles to contact the inner surfaces of the maxilla and the mandible.

The middle section of the brush head typically comprises at least one pair of bristle groups that is activated by a seesaw mechanism, e.g. by means of crossbars located within the base of the brush head, under each pair of bristle groups. When pressure is applied to an upper one of the bristle groups, a typically diagonally positioned lower group of bristles rises toward the teeth, whereas, when pressure is applied to the lower bristle group, the upper group rises.

The upper bristle group is preferably more rigid and tilted e.g. at a 90 degree angle relative to the tooth surface it meets, so as to allow the lower bristle group to better access spaces between the teeth.

A particular advantage of a preferred embodiment of the present invention is that the brush head conforms to the shape of the jaw and teeth thereby facilitating bristle-tooth contact during brushing, and also a better reach by the bristles into deep spaces which may be present between the teeth.

Further in accordance with another preferred embodiment of the present invention, the bristles are supported by a resilient element and at least one of the orientations of the bristle surface is adopted responsive to pressure brought to bear by the dental arch on the brush head, via the resilient element.

There is also provided, in accordance with another preferred embodiment of the present invention, a tooth-brushing system comprising a handle; and a head mounted on one end of the handle and including a multiplicity of bristles and a bristle base supporting the multiplicity of bristles, wherein the bristle base has a rest position and has at least one degree of freedom of motion responsive to pressure and includes a mechanism which restores the bristle base to the rest position, and wherein the at least one degree of freedom includes a rotational degree of freedom allowing the bristle base to rotate at least partially about an axis.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the present invention are illustrated in the following drawings:

FIGS. 1A-1C are simplified respective top-view, side view and bottom view illustrations of a tooth brushing system constructed and operative in accordance with a first preferred embodiment of the present invention.

FIGS. 2A and 2B are side view illustrations of operative orientations of the tooth brushing system of FIGS. 1A-1C.

FIG. 3A is a side view illustration of toothpaste dispensing toothbrush apparatus constructed and operative in accordance with a first alternative embodiment of the present invention.

FIGS. 3B-3C are side view illustrations of toothpaste dispensing toothbrush apparatus constructed and operative in accordance with a second preferred embodiment of the present invention in a first, toothpaste cartridge loading and toothpaste dispensing position and a second, tooth-brushing position respectively.

FIG. 4A is a cross-sectional view of a toothbrush head or of the middle section of the toothbrush head of FIG. 1A taken at a plane defined interiorly of the toothbrush head base as shown by cross-section lines I-I in FIG. 1B.

FIG. 4B is an isometric view of an individual pivotable cross-bar.

FIG. 4C is a cross-sectional side view of the toothbrush head of FIG. 4A taken along the II-II axis shown in FIG. 4A and shown in an at-rest orientation.

FIG. 4D is a cross-sectional end view of the toothbrush head of FIG. 4A taken along the III-III axis shown in FIG. 4A.

FIG. 4E is a first operative orientation of the apparatus of FIGS. 4A-4F, also taken along the III-III axis.

FIG. 4F is a second operative orientation of the apparatus of FIG. 4A-4F, also taken along the III-III axis.

FIGS. 5A-5J are semi-pictorial semi-cross-sectional drawings of a toothbrush providing pivot motion of bristle groups about the short axis of the toothbrush head in accordance with a preferred embodiment of the present invention.

FIGS. 6A-6C illustrate a preferred embodiment of the present invention providing at least two selectable head-handle orientations.

FIG. 7A is a side view illustration of a toothbrush constructed and operative in accordance with a preferred embodiment of the present invention in which a roller element constructed and arranged to contact the gingival portion of the teeth, shown in top view, stabilizes the toothbrush when it is in operation as illustrated.

FIG. 7B is an end view illustration of the toothbrush of FIG. 7A in operation.

FIG. 7C is a top view illustration of the toothbrush of FIGS. 7A-7B when at rest.

FIGS. 8A and 8B are side and top view illustrations of an optional modification of the neck portion of FIGS. 6A-6C which prevents rotation of the toothbrush head.

FIGS. 9A-9C are respective side, cross-sectional and perspective view illustrations of a toothbrush handle constructed and operative in accordance with a preferred embodiment of the present invention.
FIG. 10 is a front view illustration of the wide, open end of the handle of FIGS. 9A-9C. FIGS. 11A-11C are respective side, cross-sectional and perspective view illustrations of a removable bar holder insertable into the opening of FIG. 10 and constructed and operative in accordance with a preferred embodiment of the present invention.

FIGS. 11D-11F are end views of the apparatus of FIGS. 11A-11C.

FIGS. 12A-12C are respective side, top and perspective views of a metallic bar which is insertable, right-hand end first, into the left-hand end of the apparatus of FIGS. 11A-11C, in accordance with a preferred embodiment of the present invention.

FIGS. 13A-13C are respective side, top and perspective views of assembled handle apparatus including the components illustrated above in FIGS. 9A-12C, in accordance with a preferred embodiment of the present invention.

FIGS. 14A-14D are respective side, end, top and perspective view illustrations of a looped resilient element which may be bolted via its loop to the apertured end of the apparatus of FIGS. 13A-13C, in accordance with a preferred embodiment of the present invention.

FIGS. 15A-15B are side view illustrations of the two respective sides of a bristle supporting device mountable on the looped resilient element of FIGS. 14A-14D, in accordance with a preferred embodiment of the present invention.

FIGS. 15C-15E are respective top, perspective and end view illustrations of the bristle supporting device of FIGS. 15A-15B.

FIGS. 16A-16G are various views of a base supporting central bristles constructed and operative in accordance with a preferred embodiment of the present invention which may be mounted on a central portion of the bristle supporting device of FIGS. 15A-15E.

FIGS. 17A-17F are respective perspective, top, first end, side, second end and bottom view illustrations of a base, constructed and operative in accordance with a preferred embodiment of the present invention, wherein the base is operative to support side bristles and may be inserted into the side barrels of the bristle supporting device of FIGS. 15A-15B.

FIGS. 18A-18D are respective side, top, end and perspective views of an assembled toothbrushing system including the components illustrated in FIGS. 13A-17F and further including a rolling device and associated bolt, all constructed and operative in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference is now made to FIGS. 1A-1C which are simplified respective top view, side view and bottom view illustrations of a tooth brushing system constructed and operative in accordance with a first preferred embodiment of the present invention. Reference is also made to FIGS. 2A and 2B which are side view illustrations of operative orientations of the tooth brushing system which is shown in FIGS. 1A-1C at rest. As shown, the system of FIGS. 1A-2B includes a toothbrush handle 10 and a toothbrush head 20. The toothbrush head comprises a base 30 defining a basal plane, a long axis 40 and a short axis 50; and a multiplicity of bristles arranged in a plurality of bristle groups typically including lateral bristle groups 60 and middle bristle groups 70. The base 30 comprises a respective plurality of bristle supporting platforms typically including a middle platform array 80 and a pair of lateral platforms 90, respectively supporting the plurality of bristle groups.

In the illustrated embodiment, middle platform array 80 supports middle bristle groups 70 whereas lateral platforms 90 each support lateral bristle groups 60. The middle platform array 80 may comprise a single platform or may comprise a linear array of platforms such as several e.g. three platforms defined along the long axis 40 of the brush or such as several e.g. two platforms defined along the short axis 50 of the brush. Preferably, as shown, the middle platform array 80 comprises a two-dimensional array of platforms such as a 2x3 array of platforms 82 as shown. Each platform 82 supports one of the middle bristle groups 70.

The base 30 also typically comprises a pivot providing compartment 84 supporting the middle platform array 80. The pivot providing compartment 84 is typically snapped onto the bottom of the platform array 80. A preferred embodiment of the compartment 84 is shown in top cross sectional view in FIG. 4A, in side cross-sectional view in FIG. 4C and in end cross-sectional view in FIGS. 4D-4F.

Finally, the base 30 typically comprises a frame 86 which encases the base 30 including the pivot providing compartment 84. Frame 86 is typically pivotally mounted on one or more arms 75. Typically, the frame 86 snaps fits onto the lateral platforms 90. The frame 86 may have side walls 88 only with no walls interconnecting the side walls 88, in order to minimize the thickness of the brush head in the dimension perpendicular to the basal plane.

According to a preferred embodiment of the present invention, as shown in FIGS. 2A-2B, the lateral bristle groups 60 see-saw up and down, pivoting about the short axis 50, so as to provide a better fit with the dental arch.

The configuration shown in FIG. 2A is particularly suited for brushing the inner surface of a dental arch because the lateral bristle groups 60 are depressed relative to the middle bristle groups 70. The configuration shown in FIG. 2B is particularly suited for brushing the outer surface of a dental arch because the middle bristle groups 70 are depressed relative to the lateral bristle groups 60.

Any suitable mechanism may be employed to provide a fixed relationship between the head 20 and the handle 10 such as supporting arms 75 which have the advantage of allowing the base to be relatively slim. Alternatively, as described in detail with reference to FIGS. 6A-6C, the head may be selectively pivotable relative to the handle 10.

It is appreciated that preferably, the bristle groups 60 and 70 and their respective supporting platforms 90 and 80 are all integrally formed into a single disposable piece. Periodically, once the bristles have become worn, this single disposable piece is pulled off and discarded and replaced by a new disposable piece with its own platforms and bristle groups, e.g. by snapping the new piece onto the pivot providing compartment 84 and onto the frame 86.

Reference is now made to FIGS. 3A-3C which show optional toothpaste dispensing modifications of the toothbrush system of FIGS. 1A-2B. Alternatively, FIGS. 1A-2B may be modified by eliminating the toothpaste storing and dispensing feature. According to one embodiment of the present invention shown in FIGS. 2A-3A, the
handle 10 of the toothbrush system comprises a hollow toothpaste compartment 100 configured to receive a typically flexible toothpaste cartridge 110, formed between two toothbrush handle sections 120 and 130 which together have a first at-rest orientation as shown in FIGS. 2A and 2B and a second, toothpaste dispensing orientation e.g. as shown in FIG. 3A.

[0071] According to one embodiment of the present invention as shown in FIG. 3A, one of the toothbrush handle sections 120 includes at least one squeezable surface portion contacting the flexible toothpaste cartridge 110, e.g. side surfaces 134, which allow selectable pressure to be applied to the toothpaste in the cartridge 110 thereby facilitating dispensation of toothpaste 140 through an opening 150 in the cartridge as shown. According to a preferred embodiment of the invention as shown in FIGS. 3B-3C, a single arm 152 is provided, rather than several such arms as in FIG. 3A, which allows the toothpaste cartridge 110 when secured to handle section 120, to swing up and over the bristles 154. In this embodiment, the toothbrush handle sections need not be flexible and instead, the cartridge 110 or at least the bottom surface 156 thereof may be flexible thereby allowing the user to apply pressure so as to release toothpaste. FIG. 3B illustrates the toothpaste dispensing or carpool replenishment orientation of the toothbrush whereas FIG. 3C illustrates the tooth brushing or at-rest orientation of the toothbrush.

[0072] Reference is now made to FIGS. 4A-4F which illustrate another preferred embodiment of the present invention which may be provided in conjunction with either or both of the embodiments of FIGS. 1A-2B and FIGS. 3A-3B, or separately. FIG. 4A is a cross-sectional view of a preferred embodiment of the pivot providing compartment 84 of FIG. 2A taken at a plane defined and shown by cross-section lines 1-1 in FIG. 1B. The apparatus of FIG. 4A includes one or more pivotal cross-bars (two cross-bars 160 and 170 in the illustrated embodiment).

[0073] An isometric view of an individual pivotal cross-bar is shown in FIG. 4B. The pivot motion of the cross-bar may for example be achieved by providing a depression 180 in the center portion of the cross-bar which is fitted onto a cross bar support element 190 which is typically integrally formed with the frame 86. Preferably, a compression spring 194 is wrapped around the cross bar support element 190 so as to maintain it in its at-rest state, see FIG. 4G, after pressure on one of its ends has terminated, and to enhance the see-saw motion in response to even very slight pressure on one or two of the ends of the cross-bar.

[0074] According to a preferred embodiment of the present invention, a set of brushes constructed and operative in accordance with the embodiment of FIG. 4A may be provided, which differ in the height of the cross-bar support element 190. Typically, brushes with a relatively high cross-bar support element 190 would be suitable for individuals with deep spaces between their teeth or poorly positioned teeth which deviate markedly from the arch. Brushes with a relatively low cross-bar support element 190 would be suitable for individuals with a straighter dental arch and relatively small spaces between their teeth.

[0075] FIG. 4C is a cross-sectional side view of the toothbrush head of FIG. 4A taken along the II-II axis shown in FIG. 4A and shown in an at-rest orientation. FIG. 4D is a cross-sectional end view of the toothbrush head of FIG. 4A taken along the III-III axis shown in FIG. 4A. FIG. 4E is a first operative orientation of the apparatus of FIGS. 4A-4F, also taken along the III-III axis. FIG. 4F is a second operative orientation of the apparatus of FIG. 4A-4F, also taken along the III-III axis. In the illustrated embodiment, as best seen in FIG. 4D, the lengths of the bristles in the various bristle groups are not uniform however it is appreciated that this feature is optional. Alternatively or in addition, the stiffness (softness) of the bristles is not uniform however, again, this feature is optional. As shown, the pivotable crosbar of FIG. 4B provides see-saw motion of the various bristle groups supported by middle platforms 82.

[0076] As shown in FIGS. 4E and 4F, if pressure is applied by the teeth to one of the crossbar ends e.g. end 210 of FIG. 4B, opposite end 220 rises toward the teeth and vice versa. If pressure is applied by the teeth to two adjacent crossbar ends e.g. ends 200 and 210, both opposite ends 220 and 230 would rise toward the teeth, and vice versa. As shown in FIGS. 5A and 5B, this feature is advantageous in providing close tooth-bristle contact during brushing, including contact with unaligned teeth and embrasures. It is appreciated that preferably, pivot motion of the bristle groups supported by middle platforms 82 is provided both about the long axis of the head as shown in FIGS. 4F-4E and about the short axis of the head as shown in FIGS. 5A and 5B.

[0077] Referring again to FIG. 4D, it is seen that according to a preferred embodiment of the invention, bristles on one side of the long axis 40 of the toothbrush head 20 are preferably longer than those on the other side. For example, the bristles on one side might be 1-2 mm longer than the other side, e.g. 1.5 mm longer. Alternatively or in addition, bristles on one side of the long axis 40 of the toothbrush head 20 may be softer than stiffer bristles on the other side of the long axis 40. According to this embodiment of the present invention, two selectable head-handle orientations are provided to allow the long bristles, or soft bristles, or stiff bristles, on one side of the long axis to be consistently applied to the portion of each tooth surface adjacent to the gums and the shorter bristles, or stiffer or softer bristles on the other side of the long axis to be consistently applied to the portion of each tooth surface which is adjacent to the biting edge or chewing surface of the teeth.

[0078] Reference is now made to FIGS. 6A-6C which illustrate a preferred embodiment of the present invention providing two selectable head-handle orientations such that a first plurality of bristles 230 provided on one side of the head’s long axis 250 can be constantly applied to the gum-adjacent portion of each tooth surface whereas a second plurality 240 of bristles provided on the other side of the head’s long axis, which as shown in FIG. 4D, may be shorter than the first plurality of bristles, can be constantly applied to the portion of each tooth surface adjacent the chewing or biting end of each tooth.

[0079] The embodiment of FIGS. 6A-6C may be provided in combination with some or all of the previous embodiments or in isolation. FIGS. 6A and 6B show a toothbrush in which the head 224 is respectively oppositely oriented relative to the handle 226 such that the first plurality of bristles 230 can be maintained, by the individual brushing his teeth opposite the gum-adjacent portion of each tooth, as each surface of each quadrant of the teeth is brushed, simply by selecting the appropriate one of the two opposite orientations shown in FIGS. 6A and 6B. Conversely, the second plurality of bristles 240 can be maintained by the individual brushing his teeth opposite the chewing or biting edge.
adjacent portion of each tooth, as each surface of each quadrant of the teeth is brushed.

[0080] A third head-handle orientation is shown in FIG. 6C which is, first, a transition orientation pivotally located between the two orientations of FIGS. 6A and 6B, however, the third orientation is also useful in brushing incisors located in the front, central portion of the mouth. Suitable retainers 260 are preferably provided to respectively lock the head into either of the orientations shown in FIGS. 6A and 6B. It is appreciated that the handle 220 like any of the handles shown and described herein may be constructed to receive a toothpaste cartridge e.g. as described above with reference to FIGS. 3A and 3B, however, this need not be the case.

[0081] FIGS. 7A-7C illustrate a modification of the apparatus of FIGS. 6A-6C in which a stabilizer 500 is associated with the toothbrush apparatus. Preferably, the stabilizer is formed of a somewhat flexible material such as a flexible plastic or metal, and is preferably removable e.g. by means of a reversible snap. The stabilizer 500 is operative to stabilize the toothbrush apparatus, which other than the stabilizer may be similar to the apparatus of FIGS. 6A-6C, relative to the teeth particularly when the toothbrush handle is being manipulated by a user so as to change the head-handle orientation from one of the orientations shown in FIGS. 6A-6C to another such orientation. The stabilizer 500 can also be provided in conjunction with the embodiment of FIGS. 8A-8B, described below, in which case the stabilizer 500 is useful in stabilizing the toothbrush apparatus when the sleeve 410 is rotating about the head base 350. As shown in FIG. 7A which is a side view of the toothbrush apparatus and a top view of teeth engaging it, the stabilizing function of the stabilizer 500 is preferably achieved by the user's positioning a teeth engager portion 510 of the stabilizer 500 between the upper and lower teeth and biting down on it.

[0082] Preferably, as shown, the teeth engager portion 510 of the stabilizer comprises a roller which provides the added advantage of allowing a user who due to poor control of hand movements, is incapable of normal tooth brushing activity, to achieve an acceptable level of tooth hygiene by rolling the teeth engager portion 510 along the dental arch, thereby shifting the toothbrush along the arch.

[0083] As shown in FIGS. 7A and 7B, the teeth engager portion 510 may be configured to engage any portion of or the entirety of the top surface of the teeth.

[0084] FIG. 7C is a top view illustration of the apparatus of FIGS. 7A-7B when at rest.

[0085] Reference is now made to FIGS. 8A and 8B which are side and top view illustrations of an optional modification of the neck portion of FIGS. 6A-6C which prevents rotation of the toothbrush head.

[0086] The neck portion as illustrated in FIGS. 8A-8B is generally similar to the neck portion shown in FIG. 1C (which may be a simple one-piece neck rigidly connected to the head and to one or more head-supporting arms as shown). However, a sleeve 410 in the neck of FIGS. 8A and 8B includes a slot 420 which is configured and arranged to receive a compressible protrusion 430 in a head base 440 of FIGS. 8A-8B. The protrusion 430 when relaxed engages the slot 420 thereby to prevent rotation of the head (not shown) with respect to the handle 450.

[0087] The illustrated embodiments include, by way of example, specific mechanical means providing for translation of certain bristles toward and away from the teeth, or for creation of a general convex or concave orientation of the brush head as a whole, typically in reaction to pressure brought to bear by the dental arch, on other bristles. However, it is appreciated that alternatively, the same effect may be accomplished by electrical means or by any other suitable mechanical means.

[0088] FIGS. 9A-9C and 10, 11A-11F and 12A-12C illustrate three respective handle components shown assembled in FIGS. 13A-C.

[0089] FIGS. 9A-9C show a handle which is generally circular in cross-section and which is wider at one end than the other. FIG. 10 shows two protrusions 610, 180 degrees apart, on the inner side of the wider opening. FIGS. 11A-D depict a removable bar holder that can be inserted in the abovementioned handle and that typically can be rotated 360 degrees via an external circular groove 620 shown in FIG. 11B. Two depressions 630, typically 180 degrees apart, receive the handle protrusions at rotation and rest positions, respectively. The bar holder has two external longitudinal grooves 640 to direct the handle protrusions during insertion of the bar holder in the handle. The bar holder may have an elongated inner cavity 645 to receive one end of a metallic bar.

[0090] FIGS. 12A-C show an S-shaped bar, typically metallic, which connects to the head of the toothbrush via a resilient element described in FIGS. 14A-14D. A resilient element, via which the bar of FIGS. 12A-12C may connect to the toothbrush head, is shown in FIGS. 14A-D. A central branch 655 has a typically circular cross-section 675 in its center. Circular cross-section 675 is typically perpendicular to the two parallel sides 650. Side portion 650 typically comprises a 90 degree continuation 660 of the central branch 655, a second typically 90 degree turn 665 toward the center of the resilient element and a third typically 90 degree turn 670 toward the central branch 655.

[0091] As shown in FIGS. 15A-15E, the head of the toothbrush typically includes a supporting device including a central elongated main bar 680 having a hole 690 at each end through which the resilient element of FIGS. 14A-14D is threaded. The main bar is connected perpendicularly to the middle of two shorter bars 685. The side barrels 685 may be parallel to each other and typically comprise C-shaped protrusions 687 that engage the bases 698 of the side bristles of FIGS. 17A-17F. The main barrel 680 has one neck 695, typically perpendicular to the side barrels, that supports a typically spherical protrusion 696. The main barrel 680 can alternatively support more than one neck 695.

[0092] The spherical protrusion 696 supports the central bristle base of FIGS. 16A-16C which typically comprises two bristle supporting portions 730 and 740, the first adjacent to the gums during brushing and the second farther from the gums. The bristles on portion 730 adjacent to the gums are longer than the bristles on portion 740 farther from the gums. The two bristle supporting portions 730 and 740 are connected by a central cap 715 that has an inner cavity 720 that engages, e.g. snaps on to and/or is glued to, the spherical protrusion 696 which allows the base 698 to rotate and see-saw. Typically, underneath the cap 715 are four vertical C-shaped protrusions 725, open toward the center and seated between extensions of the neck as best seen in FIG. 15D. The base 698 for the central bristles may be formed of a bendable material.

[0093] In the embodiment of FIGS. 18A-18D, the head of the toothbrush has two bases with side bristles, one on both
sides of the base for the central bristles. FIGS. 17A-F show a preferred embodiment of the base supporting the side bristles. The bristles typically graduate from longest near the gums to shortest farthest from the gums. The base of the side bristles typically has a cylindrical appendix 755 on its longer side that is inserted in the short supporting bars 685 (FIG. 15B) and rotates within it. The bottom surface of the side bristle base typically is associated with a metal clamp 760 that can be raised to slide under and house a portion of the side bar 650 of the resilient element 660 that supports the side bristle base. This bottom surface is typically disposed at an angle, relative to the long axis of the side bristle base, to ensure that the base stays in place and does not slide back. This retention of the base position is facilitated by side bar 165.

It is appreciated that the pivot motion of a bristle base such as those shown in FIGS. 17A and 17B may be governed by a hinge system which may, for example, comprise elements 685 and 755 in FIGS. 15B and 17B, respectively.

It is appreciated that any of the toothbrush systems shown and described herein may be operable either manually or electrically.

The invention as shown and described herein includes, by way of example, specific embodiments in which certain bristles are translated, by suitable mechanical or electrical means, toward and away from the plane of the brush head responsive to pressure on other bristles. However it is appreciated that alternatively, bristles may be translated toward and away from the brush head plane generally and not merely responsive to pressure. For example, periodic translation toward and away from the plane of the brush head, and hence toward and away from the teeth, might be provided during normal brushing. The periodic translation might be provided such that at any given moment, various bristles or bristle groups on the head are at various different stages within the cycle such that at any given moment, some bristles might be at maximal elevation, some bristles might be at minimum elevation, and some bristles might be at one or more intermediate elevation levels.

Features of the present invention which are described in the context of separate embodiments may also be provided in combination in a single embodiment. Conversely, features of the invention which are described for brevity in the context of a single embodiment may be provided separately or in any suitable subcombination.

1. A tooth brushing system comprising:
   - a toothbrush head including:
     - a base defining a basal plane, a long axis and a short axis; and
     - a multiplicity of bristles arranged in a plurality of bristle groups,
   - the base comprising a respective plurality of planar base portions, respectively supporting the plurality of bristle groups, wherein the planar base portions are configured to see-saw above and below the basal plane.

2. A system according to claim 1 wherein the planar base portions include:
   - at least one first pair of planar base portions configured to see-saw above and below the basal plane about a first pivot axis; and
   - at least one second pair of planar base portions configured to see-saw above and below the basal plane about a second pivot axis.

3. A tooth brushing system according to claim 1 wherein the base defines first and second long sides which are parallel to the long axis and wherein the lengths of the multiplicity of bristles generally increases from the first long side to the second long side.

4. A tooth brushing system according to claim 1 wherein the base defines first and second long sides which are parallel to the long axis and wherein the softnesses of the multiplicity of bristles generally increases from the first long side to the second long side.

5. A system according to claim 3 and also comprising a handle configured and arranged to support the head in first and second selectable orientations, wherein the first orientation is rotated 180 degrees around the head’s short axis, relative to the second orientation.

6. A system according to claim 5 wherein the handle comprises a swivel-mounted head support.

7. A system according to claim 1 wherein said planar base portions remain parallel to the basal plane while see-sawing above and below the basal plane.

8. A tooth brushing system comprising:
   - a pair of friction-creating elements including a first friction-creating element operable to apply pressure on and receive pressure from teeth and a second friction-creating element constructed and arranged relative to the first friction-creating element, to engage a space between teeth in reaction to said pressure of the teeth on the first friction-creating element.

9. A system according to claim 8 wherein at least one of said friction-creating elements comprises at least one group of bristles.

10. A toothbrushing system comprising:
    - a handle; and
    - a head including a multiplicity of bristles defining a teeth-contacting bristle surface, wherein the bristle surface has selectable convex and concave orientations at least one of which is adopted responsive to pressure brought to bear by the dental arch on the brush head.

11. A toothbrushing system comprising:
    - a handle; and
    - a head mounted on one end of the handle and including a multiplicity of bristles and a bristle base supporting the multiplicity of bristles, wherein the bristle base has a rest position and has at least one degree of freedom of motion responsive to pressure and includes a mechanism which restores the bristle base to the rest position, and wherein said at least one degree of freedom includes a rotational degree of freedom allowing the bristle base to rotate at least partially about an axis.

12. A system according to claim 2 wherein said first pivot axis is parallel to said short axis and said second pivot axis is parallel to said long axis.

13. A toothbrush system comprising:
    - a handle;
    - a head atop the handle; and
    - a stabilizer attached to the head and being configured and arranged to roll along occlusal surfaces of teeth, thereby causing the stabilizer to move along the teeth.
14. A toothbrush system comprising:
a toothbrush handle;
a toothbrush head having a plurality of selectable orientations vis-à-vis the handle; and
a stabilizer operative to selectably stabilize the toothbrush head so as facilitate a change from a first of said plurality of selectable orientations to a second of said plurality of selectable orientations.

15. A system according to claim 14 wherein said stabilizer comprises a wheel rigidly associated with the toothbrush head which is configured and arranged to roll along occlusal surfaces of teeth.

16. A tooth-brushing system comprising:
a handle;
a head mounted on the handle and having a multiplicity of bristles arranged on a generally planar surface; and
a bristle translator operative to translate at least a portion of said multiplicity of bristles relative to said generally planar surface.

17. A system according to claim 16 wherein said bristle translator is operative to translate a first portion of said multiplicity of bristles relative to said generally planar surface, responsive to pressure on a second portion of said multiplicity of bristles.

18. A system according to claim 16 wherein said bristle translator comprises a mechanical bristle translator.

19. A system according to claim 10 and wherein the bristles are supported by a resilient element and wherein at least one of the orientations of the bristle surface is adopted responsive to pressure brought to bear by the dental arch on the brush head, via said resilient element.