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MEASUREMENT ELEMENTS FOR ORAL CARE DEVICES

Abstract

The invention discloses a measurement element (**100, 500, 600, 700**) for an oral care device. The measurement element comprises at least one elongate ridge element (**102**) for engaging an interproximal region or adjacent teeth within an oral cavity, and at least a first sensing region (**104**) for acquiring data from gingival tissue within the oral cavity. The invention also discloses an oral care device (**10**), an attachment (**1000**) for an oral care device.

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Background/Summary

CROSS-REFERENCE TO PRIOR APPLICATIONS [0001] This application is a continuation of U.S. patent application Ser. No. 16/977,646, filed on Sep. 2, 2020, which was the U.S. National Phase application under 35 U.S.C. § 371 of International Application No. PCT/EP2019/055324, filed on Mar. 4, 2019, which claimed the benefit of U.S. Provisional Application No. 62/644,860 filed Mar. 19, 2018. These applications are hereby incorporated by reference herein.

FIELD OF THE INVENTION

[0002] The invention relates generally to oral care and, in particular, to measurement elements for oral care devices.

BACKGROUND OF THE INVENTION

[0003] Within a person's oral cavity, the gingiva (i.e. the gum tissue) may hold valuable information regarding the person's health, particularly their oral health. For example, gingivitis, which manifests itself as an inflammation of the gingiva, can lead to irreversible periodontitis (also referred to as gum disease) if not treated early. Therefore, it is important to detect gingivitis as soon as possible after its onset. Gingivitis predominantly originates in the interproximal space (i.e. the space between teeth in the oral cavity) because these areas tend to be difficult to clean of oral biofilms. Therefore, examination of the gingiva to detect signs of gingivitis tends to be carried out at the interproximal gingiva (also referred to as the papilla).

[0004] Teeth range in size both within a single person's oral cavity and between people. For example, the front incisors are typically relatively long and have a relatively flat surface, while the molars are typically relatively wide, with a more rounded surface. In addition, the orientation of teeth and the spacing between adjacent teeth may vary greatly from person to person. Therefore, the gingival papilla between two adjacent teeth may also have a large range of shapes and sizes.

[0005] Devices may be used to detect gingivitis within a person's mouth. Such a device may be able to detect gingivitis if a sensing portion of the device is positioned in a particular position relative to the gingival surface, for example with a sensor of the device gently touching the gingival surface. However, contact between the device and the gingival surface can result in altered physiological parameters, for example due to the expulsion of blood from the gingival tissue. On the other hand, if a gap exists between the sensor and the gingival tissue, then a reduced sensing performance may result due to reflections, the spreading of light from the device, and so on. Thus, maintaining an optimum position and orientation of such a sensing device within an oral cavity can pose a significant challenge to a user, and incorrect positioning can lead to gingivitis going undetected.

[0006] Therefore, there is a need for a device which can be more easily positioned and oriented within the oral cavity, to allow for this accurate sensing of the gingival tissue.

SUMMARY OF THE INVENTION

[0007] In order to address at least some of the issues mentioned above, embodiments in the present disclosure provide a device which can be used to perform measurements within a person's oral cavity, and which can be positioned and oriented in an easy, intuitive manner. The structure of the devices disclosed herein is such that a user can position the sensing portion of the device appropriately relative to the gingiva within their oral cavity so that a measurement can be made at an intended location, without the need for the user to see the exact position of the measurement

device in their mouth.
[0008] According to a first aspect, the invention provides a measurement element for an oral care device, the measurement element comprising an elongate ridge element for engaging an interproximal region within an oral cavity; and a first sensing region located in a first end portion of the elongate ridge element for acquiring data from gingival tissue within the oral cavity.
[0009] The inclusion of an elongate ridge element as part of the measurement element allows the measurement element to “slot” into an intended position for taking a measurement (e.g. acquiring data) from the gingival tissue between two adjacent teeth in the oral cavity. If the elongate ridge element is aligned with the interproximal region between the adjacent teeth (the interproximal region is also generally elongate in shape), then the ridge element will fall into place, and a user positioning the measurement element within the oral cavity may be able to determine when the measurement element is in the appropriate position for taking measurements (e.g. by the sound of the ridge element lodging into position, or by the restriction of further lateral movement of the measurement element once the ridge element has engaged the interproximal region).
[0010] In some embodiments, the measurement element may comprise a first protrusion extending from the first end portion of the elongate ridge element. The first sensing region may be located in a wall of the first protrusion.
[0011] The measurement element may, in some embodiments, comprise a second sensing region located in a second end portion of the elongate ridge element for acquiring data from gingival tissue within the oral cavity.
[0012] In some embodiments, the measurement element may comprise a second protrusion extending from a second end portion of the elongate ridge element. The second sensing region may be located in a wall of the second protrusion.
[0013] Each sensing region may comprise a plurality of sensor windows. In some embodiments, the plurality of sensor windows may be positioned at different heights from a base of the elongate ridge element. In some embodiments, the plurality of sensor windows may be directed at different angles from one another with respect to a base of the elongate ridge element.
[0014] In some embodiments, the elongate ridge element may comprise a substantially triangular prism-shaped element.
[0015] The elongate ridge element may, in some embodiments, comprise a central recessed portion, such that a height of the elongate ridge element at its center is smaller than a height of the elongate ridge element at its ends.
[0016] In some embodiments, the measurement element may further comprise a cleaning element located within the elongate ridge element.
[0017] The measurement element may further comprise a surface from which the elongate ridge element extends.
[0018] In some embodiments, the first sensing region may be configured to receive radiation to be delivered to an optical sensor.
[0019] The measurement element may, in some embodiments, comprise, or form part of at least one of: a toothbrush head, an interproximal irrigation attachment, and a tongue cleaning attachment.
[0020] According to a second aspect, the invention provides an oral care device comprising a handle portion, and a measurement element as disclosed herein.
[0021] According to a third aspect, the invention provides an attachment for an oral care device, the attachment comprising a measurement element as disclosed herein, and a connection portion for connecting the attachment to a body portion of the oral care device.
[0022] According to a fourth aspect, the invention provides an oral care device comprising a handle portion and an attachment as disclosed herein.
[0023] According to a fifth aspect, the invention provides a mouthpiece comprising an arch-shaped body for fitting at least partially over a dental arch of a subject, and a measurement element as

disclosed herein, the measurement element located on a surface of the arch-shaped body for engaging an interproximal region of the dental arch of the subject.
[0024] These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0025] For a better understanding of the invention, and to show more clearly how it may be carried into effect, reference will now be made, by way of example only, to the accompanying drawings, in which:
[0026] FIG. **1** is a schematic perspective view of an example of a measurement element according to various embodiments;
[0027] FIG. **2** is a schematic plan view of the measurement element of FIG. **1**;
[0028] FIG. **3** is a schematic perspective view of a further example of a measurement element according to various embodiments;
[0029] FIG. **4** is a schematic plan view of the measurement element of FIG. **3**;
[0030] FIG. **5** is a schematic perspective view of a further example of a measurement element according to various embodiments;
[0031] FIG. **6** is a schematic plan view of a further example of a measurement element according to various embodiments;
[0032] FIG. **7** is a schematic perspective of a further example of a measurement element according to various embodiments;
[0033] FIG. **8** is a schematic side view of the measurement element of FIG. **7**;
[0034] FIG. **9** is a schematic illustration of an example of an oral care device according to various embodiments;
[0035] FIG. **10** is a perspective view of an example of an attachment for an oral care device, according to various embodiments;
[0036] FIG. **11** is a schematic illustration of a further example of an oral care device according to various embodiments; and
[0037] FIG. **12** is a perspective view of an example of a mouthpiece according to various embodiments.
DETAILED DESCRIPTION OF EMBODIMENTS
[0038] Embodiments disclosed herein relate to apparatus that can be used to perform measurements on gingival tissue within the oral cavity of a subject. Examples herein refer to use by a person (i.e. a human user). However, such apparatus may alternatively be used to perform measurements on gingival tissue within the oral cavity of a different subject, such as an animal. Gingival tissue, which is also referred to as gum tissue, or gums, is the tissue found in the area around the root of teeth that helps keep the tooth in place. Gum tissue is also found between teeth.
[0039] The measurement element disclosed herein is indicated as being suitable for an oral care device. It is envisaged that such a measurement element may be incorporated into an existing oral care device, such as a power toothbrush, an oral irrigation device, or a tongue cleaning device. Equally, however, it is envisaged that such a measurement element may be incorporated into a device whose primary purpose is to perform measurements of gingival tissue within the oral cavity. As will become apparent, is also envisaged that such a measurement element may be supplemented with additional oral care means, so that a measurement device incorporating such a measurement element may additionally be used to perform oral care tasks, such as interproximal cleaning.
[0040] The inventors of the presently-disclosed embodiments have identified that, in order to take accurate measurements of gingival tissue within an oral cavity, a measurement device should be

positioned and oriented in a particular manner, and that such positioning an orientation may be difficult for a user to achieve, even if a mirror is used. Therefore, the embodiments presented herein provide a measurement element having a structure that allows for easy and intuitive positioning of the measurement element relative to the gingival tissue from which data is to be acquired.

[0041] Referring to the drawings, FIGS. **1** and **2** show, respectively, a simplified perspective illustration and a simplified plan view illustration of an example of a measurement element **100** for an oral care device. The measurement element **100** comprises at least one elongate ridge element **102** for engaging an interproximal region within an oral cavity. An interproximal region (also referred to as an interproximal space) is the volume or space between adjacent teeth in a person's oral cavity. The elongate ridge element **102** is shaped such that a portion of the ridge element is able to enter the interproximal region when the measurement element **100** is positioned appropriately (e.g. with the longitudinal axis of the ridge element aligned with the interproximal space, or interface between two adjacent teeth, and with the elongate ridge element touching the two adjacent teeth). The measurement element **100** also comprises at least a first sensing region **104**. In the arrangement shown in FIG. **1**, the first sensing region **104** is located in a first end portion of the elongate ridge element **102** for acquiring data from gingival tissue within the oral cavity.

[0042] The elongate ridge element **102** allows the measurement element **100** to remain in a stable orientation between two adjacent teeth (i.e. in the interproximal region) while a measurement is made. According to embodiments disclosed herein, the elongate ridge element **102** may comprise a substantially triangular prism-shaped element, as shown in the drawings. In some embodiments, the ends of the triangular prism-shaped element may be inclined relative to its base, as shown, for example, in FIG. **1**. A triangular prism-shaped element has a ridge at its apex which may be at least partially received in an interproximal space between adjacent teeth. In other embodiments, the elongate ridge element **102** may be shaped differently. For example, the ridge element **102** may have some other prismatic structure. In some embodiments, the edges of the elongate ridge element **102** may be curved or chamfered so as to improve the comfort of a user when the measurement element **100** is pressed against a surface in the oral cavity. Moreover, curved edges may help to prevent injury to oral tissue.

[0043] By having a first sensing region **104** located in a first end portion **102***a* of the ridge element **102**, when the ridge element is in the intended position, the sensing region will be positioned appropriately to acquire data from the gingival tissue. Thus, a user of the measurement element **100** does not need to be too concerned with the position of the sensing region **104** because, once the ridge element **102** is lodged between two teeth, the sensing region **104** will be positioned appropriately, facing the gingiva in the interproximal region.

[0044] The first sensing region **104** may comprise a sensor **105** positioned on a surface of, or at least partially within, the elongate ridge element **102**. In some embodiments, a sensor **105** may be located on or in an end wall **102***a* or face of the ridge element **102**, for example. In other embodiments, the sensing region **104** may comprise a window or aperture through which sensing may be performed. For example, the first sensing region **104** shown in FIG. **1** may comprise a sensor window. A sensor **105** which is configured to receive a signal (e.g. a reflected optical signal) from the target gingiva may be located within the elongate ridge element **102**, or elsewhere within the measurement element **100** or within an associated oral care device. In such examples, a conduit, such as an optical waveguide (e.g. an optical fiber) may deliver an acquired signal from the sensing region **104** (e.g. a sensor window) to the sensor.

[0045] Thus, in some embodiments, the first sensing region **104** may be configured to receive radiation to be delivered to an optical sensor **105**. The optical sensor may, for example, be located within the measurement element **100** or elsewhere, such as within a body of an associated oral cleaning device **10**, such as shown in FIG. **9**. In other embodiments, other types of sensors may be used. For example, the first sensing region **104** may comprise one or more of the following types of

sensors: a proximity sensor, an electrical impedance sensor, a radiofrequency (RF) sensor, a terahertz sensor, an ultrasound sensor, or a microphone.

[0046] FIGS. **1** and **2** also show a portion of a neck **106**, which may be provided to enable the measurement element **100** to be mounted to a body of an oral care device **10**, for example, such as shown in FIG. **9**.

[0047] FIGS. **3** and **4** show, respectively, a simplified perspective illustration and a simplified plan view illustration of a further example of a measurement element **100** for an oral care device. The measurement element **100** shown in FIGS. **3** and **4** includes the elongate ridge element **102** and the first sensing region **104**, and further comprises a second sensing region **204** located in a second end portion **102***b* of the elongate ridge element **102** for acquiring data from gingival tissue within the oral cavity. The second sensing region **204** may be the same as, or similar to, the first sensing region **104** and, as discussed above with reference to the first sensing region, may comprise a window or aperture through which sensing may be performed. A signal received through such a window may be delivered (e.g. via an optical waveguide) to a sensor **105** located within the ridge element **102** or elsewhere within the measurement element or an associated oral care device **10**, such as shown in FIG. **9**. In some embodiments, signals received via the first and second sensing regions **104**, **204** may be delivered to the same sensor.

[0048] By providing a second sensing region **204** in the measurement element **100**, a user is able to use the same measurement element for performing measurements in respect of (i.e. capturing data from) the gingiva at the top of the oral cavity and at the bottom of the oral cavity. For example, in the orientation shown in FIG. **3**, the measurement element **100** may be used to capture data from gingiva in interproximal regions between teeth in an upper set of a person's teeth (i.e. in an upper dental arch) using the first sensing region **104**, and used to capture data from gingiva in interproximal regions between teeth in a lower set of a person's teeth (i.e. in a lower dental arch) using the second sensing region **204**.

[0049] FIG. **5** shows a further example of a measurement element **500** for an oral care device. The measurement element **500** shown in FIG. **5** includes the elongate ridge element **102**. In some embodiments, such as that shown in FIG. **5**, the measurement element **500** may further comprise a first protrusion **502** extending from the first end portion of the elongate ridge element **102**. The first sensing region **104** may be located in a wall of the first protrusion **502**. In some embodiments, such as that shown in FIG. **5**, the measurement element **500** may further comprise a second protrusion **504** extending from a second end portion of the elongate ridge element **102**. The second sensing region **204** may be located in a wall of the second protrusion **504**. The protrusions **502**, **504** may be considered to be part of the elongate ridge element **102**. For example, the protrusions **502**, **504** themselves may be considered to comprise the end portions of the elongate ridge element **102**.

[0050] While the measurement element **500** shown in FIG. **5** is shown to include two protrusions (i.e. the first protrusion **502** and the second protrusion **504**) a measurement element may, in other embodiments, include just one protrusion (e.g. the first protrusion **502**). Since most teeth in a person's oral cavity are curved, a straight elongate ridge element **102** without a protrusion **502**, **504** (e.g. the ridge element of the measurement element **100** shown in FIGS. **1** to **4**) may rock or pivot when positioned in the interproximal region between two teeth, especially if the teeth are particularly curved. By including a protrusion **502**, **504** at both ends of the ridge element **102**, a more secure positioning of the measurement element within the interproximal region can be achieved. A single protrusion may improve the stability of the measurement element when held against the teeth, while two protrusions may improve the stability to an even greater extent.

[0051] The protrusions **502**, **504** may take any form suitable for housing a sensing region. In some embodiments, one or more of the protrusions **502**, **504** may comprise a partial pyramidal protrusion or a partial conical protrusion. An example of protrusions having a partial pyramidal shape is shown in FIG. **5**. In other embodiments, protrusions may have a different shape or configuration. For example, a pyramid-shaped protrusion or conical protrusion may be used. In general, a

protrusion having a substantially pointed apex may allow the measurement element **100**, **500** to be positioned more stably within an interproximal region. Edges of the protrusions may be rounded or chamfered to avoid damaging tissue within the oral cavity and to improve the user's comfort. Similarly, the apex and/or edges of the protrusions may be rounded in a similar way.

[0052] In the embodiments shown in FIGS. **1** to **4**, each sensing region **104**, **204** comprises a single sensor **105** or sensor window located within an end portion of the elongate ridge element **102**. In other embodiments, each sensing region **104**, **204** may comprise multiple sensors, sensing elements or sensor windows. In the measurement elements **500** shown in FIG. **5**, each sensing region **104**, **204** comprises three sensor windows (i.e. a first sensor window **506**, a second sensor window **508** and a third sensor window **510**) arranged at different heights up the side of an end wall of the protrusions **502**, **504**. More generally, each sensing region **104**, **204** may comprise a plurality of sensor windows. The plurality of sensor windows may be positioned at different heights from a base of the elongate ridge element **102**. An advantage of arranging a plurality of sensor windows **506**, **508**, **510** at a plurality of different heights with respect to the base of the elongate ridge element **102** is that, when the measurement element **500** is positioned appropriately within the oral cavity (e.g. with the apex of the ridge element and/or the apex of each protrusion **502**, **504** engaged in an interproximal region), at least one of the sensor windows is likely to be in a suitable position for receiving a signal (e.g. a reflected optical signal) from the gingiva.

[0053] In embodiments in which multiple sensor windows are included at each sensing region **104**, **204** (e.g. the embodiment shown in FIG. **5**) one or more of the sensor windows **506**, **508**, **510** may be aimed in a different direction to the other sensor windows. For example, one or more of the sensor windows **506**, **508**, **510** may be directed at an angle with respect to the base of the elongate ridge element **102** which is different to the angle at which another of the sensor windows is directed. More generally, each sensing region **104**, **204** may comprise a plurality of sensor windows. The plurality of sensor windows may be directed at different angles from one another with respect to a base of the elongate ridge element **102**. In the example shown in FIG. **5**, the difference in the directional angles is shown by arrows labelled A, B and C. For example, the first sensor window **506** is aimed or directed in a direction indicated by arrow A, the second sensor window **508** is aimed or directed in a direction indicated by arrow B and the third sensor window **510** is aimed or directed in a direction indicated by arrow C. By arranging the sensor windows in this way, there is an increased likelihood that at least one of the sensor windows will be appropriately oriented and/or aligned with respect to the gingiva, when the measurement element **500** is positioned in the oral cavity.

[0054] In some embodiments, each sensor window **506**, **508**, **510** may serve to direct a signal (e.g. an optical signal) out from the measurement element **500**, and receive a reflected signal through the same sensor window. In other embodiments, a signal may be directed out of one of the sensor windows, and a reflected signal may be received through another of the sensor windows. In some embodiments, signals may be directed out of all of the sensor windows in a sensing region, and each of the sensor windows may also receive a reflected signal.

[0055] It will be appreciated that each sensor window **506**, **508**, **510** may have a different size and/or shape. In some embodiments, however, all of sensor windows may have the same size and/or shape.

[0056] In some embodiments, the measurement element may function in conjunction with a cleaning element, such as an oral cleaning element. For example, in some embodiments, the measurement element may include a cleaning element while, in other embodiments, a cleaning element (e.g. a cleaning element of an oral cleaning device) may incorporate a measurement element as disclosed herein. In some examples, the measurement element may comprise a cleaning element located within the elongate ridge element **102**. An example of such a cleaning element incorporated into the elongate ridge element **102** is shown in the embodiments shown in FIG. **5**. In FIG. **5**, a cleaning element **512** includes an aperture or opening in the elongate ridge element **102**.

In these embodiments, the aperture is formed in the apex of the ridge element; however, it will be appreciated that such a cleaning element may be positioned in the measurement element and/or elsewhere in the ridge element. In this example, the cleaning element aperture **512** is configured to direct gas (e.g. air), liquid (e.g. water), or a combination of gas and liquid from a source located within the ridge element, the measurement element, or an associated oral cleaning device, towards a target in the user's oral cavity. For example, a combination of water and air may be ejected through the aperture **512** (e.g. as shown by the dashed lines in FIG. **5**) into an interproximal region to provide a cleaning effect between the teeth. In other embodiments, the cleaning element **512** may comprise a bristle or tuft of bristles, for example, to engage with and clean the interproximal region while the measurement element **500** is in position in the oral cavity. In other embodiments, another type of cleaning element may be incorporated into the measurement element **500**.

[0057] While the cleaning element **512** is shown only in the measurement elements **500**, it will be appreciated that such a cleaning element may be incorporated into any of the embodiments discussed herein.

[0058] FIG. **6** shows another arrangement of a measurement device **600** which has ridge elements **102** at the outer ends, with a sensing region **104** located between the ridge elements that projects out beyond the ridge elements. This arrangement enables the ridge elements **102** to be positioned on adjacent teeth such that the sensing region **104** projects into the interproximal region between the two teeth. The sensing region **104** shown in FIG. **6** comprises a single sensor **105** or sensor window and the sensing region **104** is located between the two or more elongate ridge elements **102**. However, the sensing region **104** may comprise multiple sensors, sensing elements or sensor windows. An advantage of arranging the sensing region **104** at a different height with respect to the base of the elongate ridge element **102** is that, when the sensing region **104** is positioned appropriately within the oral cavity (e.g. with the sensor **105** engaged in an interproximal region), it is likely to be in a suitable position for receiving a signal (e.g. a reflected optical signal) from the gingiva.

[0059] FIG. **7** is a schematic perspective view of a further example of a measurement element **700** for an oral care device. The measurement element **700** is similar to the measurement element **500** shown in FIG. **5**. However, the measurement element **700** includes a number of additional features.

[0060] In the embodiments discussed above, the elongate ridge element comprises a linear ridge (i.e. the apex of the ridge element **102**). In other words, in the embodiments discussed above, the height of the ridge of the ridge element **102** above its base is approximately constant along its length. However, in some embodiments, the elongate ridge element may comprise a central recessed portion, such that a height of the elongate ridge element at its centre is smaller than a height of the elongate ridge element at its ends. Such an arrangement is shown in the example embodiment of the measurement element **700** in FIG. **7**. The measurement element **700** includes an elongate ridge element **702** which has, at its ends, the first protrusion **502** and a second protrusion **504**. In this arrangement, however, the ridge of elongate ridge element **702** dips (e.g. reduces in height) between the first and second protrusions, thereby forming a central recessed portion **704**.

[0061] FIG. **8** is a schematic side view of the measurement element **700** shown in FIG. **7**. From the side view, the central recessed portion **704** can be seen clearly between the first and second protrusions **502**, **504**. While, in the embodiment shown, the central recessed portion **704** is curved, in other embodiments, the elongate ridge element may include a stepped portion in which the height of the elongate ridge element is reduced in a central region. An advantage of including the central recessed portion **704** in the elongate ridge element **702**, particularly one formed with a curved ridge (e.g. as shown in FIGS. **7** and **8**), is that the measurement element is able to move more easily over relatively short teeth (e.g. the lower incisors) and is able to move more easily over bumps in the oral cavity and on the teeth. It will be appreciated that the central recessed portion **704** may be incorporated into any of the measurement elements discussed herein.

[0062] In some embodiments, the measurement element may comprise a surface from which the

elongate ridge element **702** extends. For example, the measurement element **700** includes a surround **706**, which provides a surface from which the elongate ridge element and the protrusions of the measurement element may be formed or mounted. In some embodiments, the elongate ridge element **702**, the protrusions **502**, **504** and the surround **706** may be formed as a single, integral unit while, in other embodiments, the elongate ridge element and the protrusions may form a separate component to be mounted onto the surround. In some embodiments, the surround **706** may be substantially circular in shape while, in other embodiments, the surround may be shaped differently, for example as an oval. The surround **706** may aid the user in positioning and orienting the measurement element appropriately within the oral cavity, as the surround may prevent or restrict rotation of the measurement element when the surround engages a tooth. A smaller surround **706** (e.g. an oval-shaped surround) may assist the user in positioning the measurement element appropriately in particularly curved regions of the oral cavity (e.g. near the canine teeth). It will be appreciated that any of the measurement elements disclosed herein may include a surround, such as the surround **706**, such that the elongate ridge element extends from a surface of the surround. Moreover, it will be appreciated that any of the features or combination of the features disclosed herein may be incorporated into any of the disclosed embodiments.

[0063] In some embodiments, the surround **706** may include other components, such as oral cleaning elements **512**, such as shown in FIG. **5**. For example, the surround **706** may include one or more bristles or tuft of bristles, one or more interproximal irrigation elements (not shown in FIGS. **7** and **8**) for directing gas and/or water into an interproximal region, and/or one or more tongue cleaning elements. In this way, the measurement element may be considered to include an oral cleaning element.

[0064] Thus, the measurement element may, in some embodiments, comprise, or form part of at least one of a toothbrush head, an interproximal irrigation head or attachment, and a tongue cleaning head or attachment. As used herein, the term “attachment” is considered to refer to a part of an oral cleaning device which, for example, can be removed from and reattached to a body of the oral cleaning device.

[0065] According to a second aspect, the invention provides an oral care device **10**. FIG. **9** is a schematic illustration of an example of an oral care device **10** according to various embodiments. The oral care device **10** comprises a handle portion **12** and a measurement element **100**, **500**, **700**, as described herein. In some embodiments, the oral care device **10** may be considered to be an oral measurement device having at least one sensing region **104**, **204**, such that its primary function is to perform measurements on gingiva within the oral cavity. In the embodiment shown in FIG. **9**, the oral care device **10** includes a handle portion **12**, the measurement element **100**, **500**, **700**, and a neck portion **106** connecting the measurement element to the handle portion. In the arrangement shown in FIG. **9**, the sensor **105** for the measurement element **100**, **500**, **700** is shown in the handle portion **12**. It can be appreciated that the sensor **105** can be located in the measurement element **100**, **500**, **700**, in the handle **12**, or elsewhere. It will also be appreciated that, in other embodiments, the measurement element **100**, **500**, **700** may form part of the handle portion **12**, or may be connected directly to it (i.e. without a neck portion). The oral care device **10** may include other features, such as electrical components, a power button, and the like, but these are omitted from FIG. **9** for clarity.

[0066] According to a third aspect, the invention provides an attachment for an oral care device **10**. FIG. **10** is a perspective view of an example of an attachment **1000** for an oral care device **10**, according to various embodiments. The attachment **1000** comprises a measurement element **100**, **500**, **700** and a connection portion **1004** for connecting the attachment to a handle portion **12** of the oral care device, as shown in FIG. **11**. The connection portion **1004** may include any suitable connection mechanism for attaching the attachment **1000** to a handle **12** of an oral care device **10**. Such connection mechanisms will be the known to those skilled in the field.

[0067] FIG. **11** is a schematic illustration of a further example of an oral care device **10** according

to various embodiments. The oral care device **10** comprises a handle portion **12** and an attachment **1000**. The attachment may comprise the attachment **1000** discussed above. The attachment **1000** may connect or attach to the handle portion **12** using the connection portion **1004** which may, for example, interact with a complementary connection mechanism of the handle portion **12**.
[0068] According to another aspect, the invention provides a mouthpiece. FIG. **12** is a perspective view of an example of a mouthpiece **1200** according to various embodiments. The mouthpiece **1200** comprises an arch-shaped body **1210** for fitting at least partially over a dental arch of a subject, and a measurement element **1202**. The measurement element **1202** is located on an interior surface of the arch-shaped body **1210** for engaging an interproximal region of the dental arch of the subject. The measurement element **1202** may comprise a measurement element as described herein (e.g. measurement elements **100**, **500**, **700**). In some embodiments, the mouthpiece **1200** may comprise a single measurement element **1202**. In another embodiment, however, the mouthpiece **1200** may comprise multiple measurement elements **1202** spaced around the arch-shaped body **1210**. Each measurement element **1202** may be arranged to engage an interproximal region between a different adjacent pair of teeth. In the embodiment shown in FIG. **12**, the mouthpiece **1200** includes three measurement elements **1202**. However, it will be appreciated that more or fewer measurement elements may be included. The mouthpiece may be worn by a user and, when the measurement elements are positioned appropriately, data relating to the gingiva may be acquired by each measurement element.
[0069] Variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure and the appended claims. In the claims, the word “comprising” does not exclude other elements or steps, and the indefinite article “a” or “an” does not exclude a plurality. A single processor or other unit may fulfil the functions of several items recited in the claims. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage. A computer program may be stored/distributed on a suitable medium, such as an optical storage medium or a solid-state medium supplied together with or as part of other hardware, but may also be distributed in other forms, such as via the Internet or other wired or wireless telecommunication systems. Any reference signs in the claims should not be construed as limiting the scope.

Claims

1. A measurement element for an oral care device, the measurement element comprising: at least one elongate ridge element, configured to fit within an interproximal region within an oral cavity by aligning a longitudinal axis of the ridge element with the interproximal region; and a first sensing region located in a first chamfered longitudinal end portion of the at least one elongate ridge element, configured to face a gingival tissue within the interproximal region when the longitudinal axis of the ridge element is aligned with the interproximal region, and further configured to acquire data from the gingival tissue.
2. The measurement element according to claim 1, further comprising: a first protrusion extending from the first end portion of the at least one elongate ridge element; wherein the first sensing region is located in a wall of the first protrusion.
3. The measurement element according to claim 1, further comprising: a second sensing region located in a second chamfered longitudinal end portion of at least one elongate ridge element for acquiring data from gingival tissue within the oral cavity.
4. The measurement element according to claim 3, further comprising: a second protrusion extending from a second end portion of the at least one elongate ridge element; wherein the second sensing region is located in a wall of the second protrusion.
5. The measurement element according to claim 1, wherein the first sensing region comprises a

plurality of sensor windows; and wherein the plurality of sensor windows are at least one of: a) positioned at different heights from a base of the at least one elongate ridge element; and b) directed at different angles from one another with respect to a base of the at least one elongate ridge element.

6. The measurement element according to claim 1, wherein the at least one elongate ridge element comprises a substantially triangular prism-shaped element.

7. The measurement element according to claim 1, wherein the at least one elongate ridge element comprises a central recessed portion, such that a height of the at least one elongate ridge element at its center is smaller than a height of the at least one elongate ridge element.

8. The measurement element according to claim 1, further comprising: a cleaning element located within the at least one elongate ridge element.

9. The measurement element according to claim 1, further comprising a surface from which the at least one elongate ridge element extends.

10. The measurement element according to claim 1, wherein the first sensing region is configured to receive radiation to be delivered to an optical sensor.

11. A measurement element for an oral care device comprising: at least two elongate ridge elements configured to fit within adjacent teeth within an oral cavity; and a first sensing region having at least one sensor located on a central portion that projects out between the at least two elongate ridge elements, configured to acquire data from gingival tissue within the oral cavity.

12. An oral care device comprising: a handle portion; and the measurement element according to claim 1.

13. A mouthpiece comprising: an arch-shaped body for fitting at least partially over a dental arch of a subject; and the measurement element according to claim 1, the measurement element located on a surface of the arch-shaped body configured to fit within an interproximal region of the dental arch of the subject.