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OPTICAL ORAL DIAGNOSIS – LOT 76

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OPTICAL ORAL DIAGNOSIS

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PREAMBLE

These broad-ranging patents describe a variety of optical delivery systems and methods for determining the health of teeth and other oral objects within the mouth. The invention may, for example, help provide practical objective measurements of oral health derived from measurements of e.g. laser Doppler flowmetry, absorption or transmission light spectroscopy, hyperspectral spectroscopy, florescence spectroscopy, Raman spectroscopy etc. A variety of other oral object health characteristic measurements might also benefit from these improved (and often more objective) techniques. Oral objects for evaluation might include teeth, gums, the tongue, and/or the like. Along with oxygenation and/or other characteristics of blood and its flow within an oral object, desirable characteristics to be measured may include the presence or absence of materials, chemicals, biomaterials, bacteria, materials absorbed or secreted by bacteria, and the like.

For example, in one embodiment, the patents describe a non-invasive, tooth pulp vitality tester:

Dental pulp tests are essential to perform a differential diagnosis; to identify the correct tooth, and to assess condition after trauma to the tooth. Presently, dentists have no way of reliably measuring the health of a tooth with devices that are suitable for routine dental practice. To date, the most accurate way to determine pulp health is by histological examination of the pulp tissue, but this requires that the tooth be extracted, and is therefore impractical. Other pulp tests such as the application of a cold solution or electric current on a patient's tooth rely on the subjective sensory response of the patient. These methods are both unreliable and painful, and are useless if the patient is numb or anaesthetized.

The pulp viability tester would essentially comprise a re-chargeable, battery powered, hand-held stylus containing electronics, light sources, filters and detectors with a detachable, sterile, single use, optical fiber based tooth interface mechanism. In a painless, diagnostic procedure the tooth pulp is subjected to multiple wavelengths of light from which the presence of e.g. blood flow, oxygenation and pulsatility within the tooth pulp tissue can be accurately detected and measured using established methods of e.g. laser Doppler flowmetry and oximetry spectroscopy. The results from which would accurately determine the health of the tooth. Dentists would purchase relatively few hand-held stylus units but many disposable optical fiber tooth interface mechanisms; thereby creating a continuous revenue stream for the device manufacturer.

US 7,440,788 B2 MEANING

US 7,440,788 B2 uniquely describes a detachable (and e.g. pre-sterilized,
single-use, disposable) probe body or tip for interfacing an optical instrument to a tooth or other oral object in the mouth. This patent covers all detachable, single use, disposable (e.g. fiber-optic) probe tips or optical windows in the oral cavity for any type of diagnostic light measurement at any wavelength be
it laser Doppler flowmetry, absorption or transmission light spectroscopy, hyperspectral spectroscopy, florescence spectroscopy, Raman spectroscopy etc. Powerfully and importantly, the 'window' aspect means that US 7,440,788 B2 could equally apply to an imaging measurement system (e.g. laser Doppler flowmetry imaging, spectral imaging, fluorescence imaging etc.) in where the e.g. pre-sterilized, detachable, disposable, single-use, optical window comprises e.g. a coherent optical fiber bundle.

SIGNIFICANCE AND VALUE

US 7,440,788 B2 effectively provides a continuous revenue stream, for any disposable, single use pre-sterilized optical probe tip for e.g. diagnostic application on oral objects in the mouth. The patent covers both 'single-point' and 'imaging' type measurements where the disposable optical window in this imaging example could be a coherent optical fiber bundle. Since the patent essentially describes single-use probes for use in the mouth, one can envisage many licensing options for such this technology across a plethora of different applications.

US 8,442,609 B2 MEANING

US 8,442,609 B2 uniquely describes a splint type mechanism for fixing,
clamping,attaching or otherwise stabilizing a sensor tip/probe (e.g. as described in US 8,442,609 B2) to a tooth. The vital importance of this invention is to ensure mechanical and therefore optical stability between the optical window of the probe tip and the tooth under examination – thereby eliminating motion artefacts and enabling reliable and consistent optical measurements to be obtained. This fixture additionally isolates the optical measurement from extraneous sources of lighting (e.g. the dentist's lamp) which may interfere with the optical measurement. Finally, this stabilizing fixture enables the dentist to obtain diagnostic measurements (e.g. in the tooth) at known, repeatable fixed distances away from the gum line thereby avoiding potential interfering effects of e.g. gingival blood flow.

SIGNIFICANCE AND VALUE

A means of stabilizing a signal probe to a tooth is vitally important in order to obtain consistent and reliable measurements – especially when that sensor signal probe is optical-based. This invention is valuable in its own right as it applicable to any signal probe that needs to be held in a fixed geometry relative to the tooth in the oral cavity in order to make a successful measurement. Again, one can envisage many licensing options for such this technology across different applications

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