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Instrument for cleaning and polishing the surface of teeth in the form of a stick

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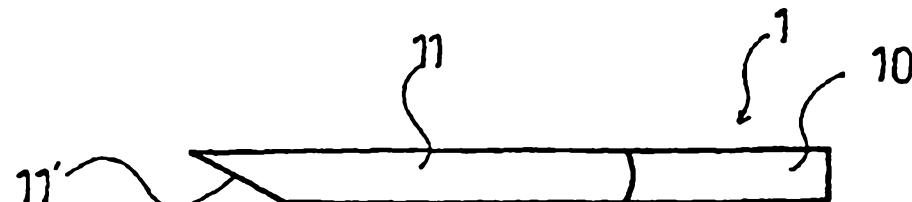


(54) Title: INSTRUMENT FOR CLEANING AND POLISHING THE SURFACE OF TEETH IN THE FORM OF A STICK

(54) Titre: INSTRUMENT POUR LE NETTOYAGE ET LE POLISSAGE DE LA SURFACE DES DENTS SE PRÉSENTANT SOUS LA FORME D'UN BATONNET

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(57) Abstract: The invention concerns a personal hygiene instrument for cleaning and polishing the surface of teeth and composite materials filling interdental spaces, having the form of a stick (1). The structure (2) of the stick (1) is produced from fibres (20) and/or a load of particles coated in a resinous matrix (21), providing the working surface of said stick (1) with continuous abrasive properties.

(57) Abrégé: Instrument d'hygiène pour le nettoyage et le polissage de la surface des dents et des matériaux composites d'obturation dentaire du type se présentant sous la forme d'un bâtonnet (1). La structure (2) du bâtonnet (1) est réalisée à partir de fibres (20) et/ou d'une charge de particules enrobées dans une matrice résineuse (21), conférant à la surface de travail dudit bâtonnet (1) un pouvoir abrasif continu.

A B S T R A C T

5 A HYGIENE INSTRUMENT FOR CLEANING AND POLISHING THE SURFACE OF THE TEETH AND OF COMPOSITE MATERIALS FOR DENTAL FILLING, THE INSTRUMENT BEING OF THE STICK-SHAPED TYPE

10 The hygiene instrument for cleaning and polishing the surface of the teeth and composite materials for dental filling is of the type that is in the form of a stick (1). The structure (2) of the stick (1) is made of fibers (20) and/or a filler of particles embedded in a resin matrix (21) imparting continuous abrasive power to the working surface of said stick (1).

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35 Translation of the title and the abstract as they were when originally filed by the Applicant. No account has been taken of any changes that may have been made subsequently by the PCT Authorities acting ex officio, e.g. under PCT Rules 37.2, 38.2, and/or 48.3.

Instrument for cleaning and polishing the surface of
teeth in the form of a stick

The present invention relates to a hygiene
5 instrument, also referred to as a "polisher", for
cleaning and polishing the surface of the teeth and of
composite dental filling materials, intended for use both
by individuals and by dental practitioners.

Proper care of the teeth consists in daily removal
10 of dental plaque and food debris from the surface of the
teeth and from the gaps between them by careful brushing,
and also by using disposable instruments such as
toothpicks made of wood, of plastics material, or of
feather, small single-tufted brushes, bottle brushes, or
15 dental floss.

Nevertheless, those instruments are not
satisfactory:

· sticks, commonly referred to as toothpicks,
whether made of wood or of feather are not hygienic, they
20 break easily, and they injure the gums; when made of
plastics they are both too thick and too flexible and
they do not pass easily between the teeth;

· dental floss, whether made of silk or of nylon, is
effective but has difficulty in going past the point
25 where teeth touch each other if they are too close
together, and it shreds and remains stuck between the
teeth, provoking immediate discomfort; and

· the various kinds of brush cannot be used when the
gaps between the teeth are narrow, and their high cost is
30 an obstacle to regular use.

Dental professionals, dentists and hygienists, need
to eliminate deposits, stains, and discolorations from
the surface of the teeth, and they have a wide range of
instruments and devices available to them for cleaning
35 and polishing teeth and their fillings, such as rotary
brushes, scale-removing instruments, ultrasound

instruments, air polishers, and also abrasive strips and disks.

However, those instruments present the following drawbacks:

- 5 · rotary brushes used with a cleaning powder possess very significant abrasive power which leads to excessive abrasion of projecting tooth surfaces;
- 10 · stainless steel de-scaling instruments act only at the points of contact between their sharp edges and teeth, and they demand time and attention in use which means that well-done work is expensive;
- 15 · ultrasound instruments have an end that is too thick to be able to penetrate into anfractuosities;
- 20 · air polishers which act like micro-sandblasters by blowing powder at supersonic speed, thereby unpolishing enamel, require the teeth to be carefully re-polished with an appropriate powder, since otherwise the entire surface of the teeth becomes stained again very quickly;
- 25 · abrasive strips of cloth or plastics material covered in a stuck-on abrasive material, inserted between the teeth and moved back and forth are supposed to polish the proximal faces of the teeth, thereby requiring the practitioner to hold each end of the strip between two fingers inside the oral cavity: this awkward situation does not enable the strip to be guided properly and made to fit closely to the proximal surface; in addition, during this motion, if the extremely fine strip should come into contact with the gum, then it can cut the gum like a razor blade; and finally it loses its abrasive layer very quickly, said layer already coming unstuck merely by going through the point of contact between the teeth if they are very close together; and
- 30 · abrasive disks, mounted on rotary instruments, are small-diameter disks of plastics material covered in an abrasive material which cuts the gum and cannot penetrate into the gaps between teeth.

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Finally, in a dental office, while finishing and polishing fillings made of composite materials, a difficulty lies in making a tooth-composite seal without excess and that is well polished. In that case also, there is a 5 problem of access and of instruments that are more or less unsuitable and that do not give full satisfaction.

The present invention seeks to remedy the drawbacks of existing instruments by proposing an instrument or polisher of low cost that enables tooth surfaces to be cleaned and 10 polished, and that can be used equally well by professionals and by individuals.

Accordingly, the present invention provides a hygiene instrument for cleaning and polishing the surface of teeth and of composite materials for dental filling, the 15 instrument being in the form of a stick and being characterized in that the stick is made from fibers embedded in a resin matrix, the fibers are made of a glass containing zirconium oxide.

The stick may include a filler of abrasive particles, 20 the abrasive functions provided by the fibers or by the particles either being similar or different depending on how said fibers and said particles are selected.

The structure of the stick can also include a core of metal, of resin, or of composite material, that is the same or different in kind to the fibers and/or the abrasive particles and/or the resin matrix forming said stick, and having a color that is the same or different.

Depending on their nature, their shape, their size, and/or their quantity, the particles of the filler make it possible to vary the abrasive effect of the instrument or polisher, said particles preferably having hardness lying in the range 3 to 10 on the Mohs scale and a size lying in the range 2 microns (μm) to 25 μm . They can have the same size or they can be of different sizes in order to reduce the interstitial gaps between them and to promote a uniform abrasive effect. Said filler particles can represent in the range 10% to 70% by weight in the resin.

The filler particles incorporated in the resin during the process of fabricating the instrument or polisher by extrusion, coextrusion, or molding by compression, compression-transfer, injection, or pultrusion, enable the desired viscosity to be obtained to promote sliding of the resin during polymerization in the dies or the molds. The particles of filler can be made depending on the embodiment of the instrument or polisher of the invention that is to be obtained:

· firstly out of materials having abrasive power such as calcium carbonate, calcinated clay, silica, microspheres of glass or of ceramic, aluminum oxide such as alumina or corundum, tin oxide, cerium oxide, and mixtures and analogues thereof;

· secondly out of materials that do not possess abrasive power but which have the function of softening the abrasive effect produced by the fibers, such as clay or kaolin in hydrated form, talc, or Teflon powder; or

· a mixture of the two above types of material.

In accordance with the invention, the fibers may be continuous or discontinuous, parallel or non-parallel, or

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assembled together, e.g. in the form of coils, braids, or meshes.

Still in accordance with the invention, the proportion by volume of fibers preferably lies in the range 45% to 65%,
5 said fibers are fibers of glass enriched with zirconium oxide, and have a diameter that lies preferably in the range 2 μm to 25 μm .

Glass fibers enriched with zirconium oxide confer very good resistance to acid and alkaline agents on the
10 instrument or polisher of the invention and they make said instrument or polisher detectable by electromagnetic radiation, and in particular by X-rays, i.e. merely by conventional medical radiography.

The resin matrix is usually made from thermosetting or
15 thermoplastic polymer resins and preferably from epoxy resins or polyester resins.

The instrument of the invention can also include surface treatment agents such as titanates,

zirconates, or preferably silanes, so as to promote adhesion of the particles to the resin.

The structure of the instrument or polisher of the present invention thus enables it to have the necessary fineness to access the narrowest of gaps between teeth, without any risk of breaking and without danger for the teeth or the periodontal area, and can also have any desired shape to fit as closely as possible to dental surfaces.

In addition, the structure of the instrument or polisher of the invention gives it continuous abrasive power, since the abrasive agents form an integral part of its structure and as the instrument or polisher wears away, its working surface always has new sections of fiber and/or new particles to perform the abrasive function.

Finally, its structure allows it to be washed, decontaminated, or sterilized, thereby making it an instrument that is well adapted to the hygiene and biocompatibility requirements for use in the oral cavity.

The instrument or polisher of the present invention thus provides individuals with means for care and hygiene of their teeth that are effective, easy to use, without danger, and of low cost, enabling users to eliminate stains and discolorations, even in locations that are difficult of access, in a way that has no equivalent in the past.

The instrument or polisher of the present invention enables dental practitioners to achieve considerable savings in time and gains in effectiveness, and gives patients greater comfort for good results without harming the teeth and at lower cost.

The advantages and characteristics of the present invention appear more clearly from the following description which refers to the accompanying drawing which shows a non-limiting preferred embodiment.

- Figure 1A is a profile view of one particular form of a tooth cleaning or polishing instrument of the invention having a particular shape,

5 - Figure 1B is a profile view of another particular form of a tooth cleaning or polishing instrument of the invention,

- Figure 1C is a profile view of another particular form of a tooth cleaning or polishing instrument of the invention,

10 - Figure 1D is a cross-sectional view of the working end of the instrument of Figure 1C, and

- Figure 2 is a cross-section view of the tooth cleaning or polishing instrument of the present invention in a preferred embodiment for its internal structure which is 15 shown in part only.

With reference to Figures 1A, 1B, 1C and 1D, there can be seen a tooth cleaning or polishing instrument of the present invention in the form of a stick 1 having a handle 10 for grasping and a portion 11 with a working end 11' 20 serving in particular to polish the surface of the teeth. The handle 10 and the portion 11 are preferably made as a single piece as shown in the figures, alternatively the handle 10 can be an added part.

The portion 11 is cylindrical in shape and its working 25 end 11' is chamfered, either obliquely (Figure 1A) or is more or less rounded (Figure 1B and Figure 1C), or straight. In Figures 1C and 1D, it can also be seen that the portion 11 can be chamfered longitudinally so as to form two adjacent faces 13, 13' that form a certain angle between 30 each other and that are slightly curved.

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The working portion 11 can thus present a variety of shapes so as to be able to penetrate into different gaps between teeth, and in particular very narrow gaps, and also so as to be capable of cleaning and polishing teeth by 5 moving the stick back and forth and up and down in contact with the surfaces to be cleaned.

The particular structure 2 of the stick 11 makes it possible to polish teeth since throughout polishing operations that structure provides abrasive power that is continuously renewed. As can be seen in Figure 2, the 5 structure 2 is constituted by abrasive fibers 20, each forming a file, the fibers being embedded in a resin matrix 21 that is preferably based on an epoxy resin.

The instrument or polisher is constituted by fibers 20 of instrument or polisher is constituted by fibers 20 of 10 glass enriched with zirconium oxide, and embedded in a resin matrix. The fibers 20 of glass enriched in zirconium oxide are fibers made from a glass which is itself manufactured by melting raw material powders including zirconium oxide or a precursor of zirconium 15 oxide which replaces and takes the place of a fraction of the other, usual components of the glass both before and after melting. For use in the invention, the glass from which the fibers 20 are made preferably contains 15% to 20% by weight of zirconium oxide, relative to the total 20 weight of the components of the glass, and more particularly in the range 16.8% to 17.1% by weight of zirconium oxide relative to the total weight of the components of the glass. Using this glass, glass fibers are spun and then embedded in a resin matrix. The 25 instrument or polisher of the invention may then be shaped and, as described above, its working end 11' is chamfered either obliquely or in a more or less rounded manner or longitudinally so as to form two adjacent faces 13, 13' that are at a certain angle to each other and slightly 30 curved.

This polisher containing fibers of glass enriched with zirconium oxide possesses numerous advantages.

Firstly, the fibers 20 of glass enriched with zirconium oxide withstand acid and alkaline agents. The 35 mouth is a medium that can alternate between being acidic and alkaline. Thus, unlike fibers of conventional glass that is not enriched with zirconium oxide, the fibers 20

of a glass that is enriched with zirconium oxide are not attached while in use in the mouth and they do not give rise to residues that could be harmful.

5 In addition, the fibers 20 of glass enriched in zirconium oxide are radio-opaque which makes the instrument or polisher of the invention detectable using X-rays, thus enabling it to be located, should it be swallowed accidentally.

10 However, above all and unlike fibers made of conventional glass which take up the form of small fibrils while being used as a polisher and thus invade the mouth, fibers made of glass that is enriched with zirconium oxide do not become deformed into such fibrils.

15 A dental instrument or polisher made of conventional glass fibers, i.e. not enriched with zirconium oxide, crumble into small fibrils which are irritating and therefore dangerous for the mucous membranes and the soft parts of the user, particularly if they are swallowed. By using a polisher made of such conventional glass 20 fibers, the user will have the mouth filled with such fibrils which is particularly dangerous and disagreeable in use. In contrast, the polisher made from fibers of glass enriched with zirconium oxide do not present these drawbacks.

25 When making the chamfered working end 11' of the polisher of the invention, this behavior makes it possible to provide a working end surface 11' having a

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felted texture, which is particularly advantageous for use as a polisher.

The polisher of the invention in which the fibers 20 are fibers of a glass enriched with zirconium oxide is 5 intended more particularly for domestic use, by individuals.

In all cases, the concentration of fibers 20 advantageously lies in the range 45% to 65% by volume, so as to obtain good polishing power, and the diameter of the fibers preferably lies in the range 2 μm to 25 μm , and is 10 preferably 2 μm .

The fibers 20 are continuous fibers embedded in a resin material which does not produce particles that might become disseminated within the oral cavity.

Another advantage common to the polishers of the 15 invention is that they can be used not only for polishing natural teeth but also for polishing composite materials used for filling teeth, whether as a filling proper or as dental prosthesis material.

In particular, the polisher of the invention can be 20 used for forming and obtaining a smooth and appropriate surface on a dental composite material. After being polished with such a polisher, a dental composite is nevertheless still matched in appearance and must therefore subsequently be made to shine by finer polishing.

25 It should be observed that when the polisher of the invention is used on a natural tooth, the tooth retains its shiny appearance.

Thus, the instrument or polisher of the present invention makes it possible to clean and polish dental tissue, without harming the tooth, and to clean and polish portions made of composite materials for dental restoration, 5 and because of its biocompatible nature, it is particularly adapted to the conditions required for use in the oral cavity.

Finally, its abrasive power can be selected and determined in accordance with needs by adjusting the nature 10 of each of its components, specifically the fibers and/or the particles contained in the resin matrix.

The abrasive action is imparted by the working end 11' of the fibers 20 and it is therefore renewed as the instrument or polisher becomes worn.

15 The reference to any prior art in this specification is not, and should not be taken as, an acknowledgement or any form of suggestion that that prior art forms part of the common general knowledge in Australia.

Throughout this specification and the claims which 20 follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of 25 integers or steps.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A hygiene instrument for cleaning and polishing the surface of teeth and of composite materials for dental filling, the instrument being in the form of a stick and being characterized in that the stick is made from fibers embedded in a resin matrix, and in that the fibers are made of a glass containing zirconium oxide.
2. The hygiene instrument according to claim 1, characterized in that the fibers are made of a glass which contains between 15 and 20 weight % of zirconium oxide, based on the total weight of the glass.
3. The hygiene instrument according to claim 2, characterized in that the fibers are made of a glass which contains between 16.8 and 17.1 weight % of zirconium oxide, based on the total weight of the glass.
4. The hygiene instrument according to any one of the preceding claims, characterized in that the resin matrix is made from a thermosetting or thermoplastic polymer resin.
5. The hygiene instrument according to any one of the preceding claims, characterized in that the stick is cylindrical in shape, an end of which is chamfered.
- 25 6. The hygiene instrument according to any one of the preceding claims, characterized in that it is chamfered longitudinally so as to present two adjacent longitudinal faces at a certain angle to each other.
7. The hygiene instrument according to any one of the preceding claims, characterized in that it has a handle fitted thereto or formed integrally with the stick.

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8. A hygiene instrument substantially as hereinbefore described with reference to the accompanying Figures.

DATED this 11th day of May, 2004.

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