ELASTOMERIC DENTAL FLOSS

BACKGROUND

[0001] The use of dental floss and other interdental cleaners are an important part of dental hygiene, and are used to remove plaque and other particulate from between the teeth and under the gum line, e.g., areas in the mouth where a toothbrush cannot reach. Frequently, these are the initiation sites of tooth decay, especially if not cleaned regularly. However, even with routine maintenance, caries and gingivitis still develop in these areas. Thus, there is a continuing need to develop more effective dental flosses.

[0002] Dental flosses are generally linear strips of a material having a fixed diameter and fixed dimensions. However, teeth are not all equally spaced apart. Thus, use of a dental floss that has a diameter less than the distance between the teeth results in inefficient or ineffective cleaning between the teeth. In addition, a space usually resides between the gum and two adjacent teeth that is usually larger than the diameter of dental floss, and efficient cleaning of such area is difficult. Dental floss users occasionally use dental floss to massage the gums, but dental flosses generally are hard when pulled taut, resulting in potential damage to the gum.

[0003] Solutions to overcome such problems include manufacturing dental flosses having a wider diameter. This may pose problems insofar as it may be difficult to pass larger diameter flosses, or even normal diameter flosses, between the teeth without a substantial increase of force. The force exerted to pass the floss between the teeth is immediately released once the floss passes between the teeth, usually resulting in a painful collision with the gums, and resulting in possible lacerations and bleeding. Also this "extra" force exerted to pass the floss between the teeth can cause the floss to shred and fray. Thus, small children may even be discouraged from flossing due to possible self-inflicted injuries.

[0004] Gelatinous elastomeric articles are known in the art, and often are used as handles for umbrellas, brushes, or for toys, dental floss, hand exercising grips, cushions, and the like. U.S. Patent Nos. 5,334,646, and 5,508,334~~, the disclosures of which are incorporated by reference herein in their entirety~~, discloses a gelatinous composition comprised of an intimate blend admixture of poly(styrene-ethylene-butylene-styrene) triblock copolymer with a high level of a plasticizing oil. These gelatinous polymers usually are too jelly-like and lack sufficient rigidity to be used in dental floss applications, because, inter alia, they tend to break

too easily upon elongation (i.e., the tensile strength at break is too high, and the elongation at break is too low for practical use). U.S. Patent No. 5,962,572, the disclosure of which is incorporated by reference herein in its entirety, discloses oriented gels useful in a variety of applications such as low frequency vibration applications, damping of mechanical structures, and the like.

[0005] U.S. Patent No. 5,755,243~~, the disclosure of which is incorporated by reference herein, in its entirety,~~ discloses a dental floss comprised of a fiber core, surrounded by an elastomeric outer layer. The outer layer provides a softer coating on a thicker floss used as a brush portion of a floss, but the floss itself is not stretchable due to the inner fiber core. A similar floss is disclosed in U.S. Patent No. 5,875,797~~, the disclosure of which is incorporated by reference herein in its entirety~~. U.S. Patent No. 5,918,609~~, the disclosure of which is incorporated by reference herein in its entirety~~ discloses particulate modified elastomeric flosses in which particulate modification agents are either adsorbed to the surface of the floss or embedded in the surface of the floss.

[0006] U.S. Patent No. 5,941,256~~, the disclosure of which is incorporated by reference herein in its entirety,~~ discloses a dental floss having microcapsules associated with a portion of the floss that will burst and release a color to indicate use of the floss. U.S. Patent No. 6,029,678, ~~the disclosure of which is incorporated by reference herein in its entirety,~~ discloses a "gel" dental floss that comprises a core material and a gel material in which the core material provides for sufficient tensile strength and the gel component provides for softness of the floss. U.S. Patent No. 6,161,555~~, the disclosure of which is incorporated by reference herein in its entirety,~~ discloses a dental floss in the form of a strand or tape made from gels having improved high tear strength and improved high tensile strength.

[0007] Despite the foregoing developments, there remains a need to develop dental floss compositions that solve such problems.

SUMMARY

[0008] Accordingly, some embodiments of the present invention provide a dental floss comprising an elastomeric matrix containing one or more particles, wherein the dental floss is adapted such that at least one of said one or more particles protrude from the matrix in increasing amounts as increasing tensile stress is applied to the dental floss.

[0022] In certain embodiments, the one or more particles are present in an amount greater than 2% by weight based on a weight of the dental floss.

[0023] In certain embodiments, the one or more particles have an average diameter of greater than 300 microns. In some embodiments, the one or more particles have an average diameter of about 350 microns.

[0024] In certain embodiments, the floss has a particle density of 0.1-100 particles/mm^3.

[0025] In certain embodiments, at least one of the one or more particles is an abrasive particle selected from the group consisting of silica, precipitated calcium carbonate, di-calcium phosphate, mica, crystalline alumino-silicate, precipitated silica, glass beads, glass bubbles, glass microspheres, ceramic microspheres and polymers having a melting point above 200°C.

[0026] In certain embodiments, a stretched nodule density for the dental floss stretched to twice a relaxed length is 0.1-100 particles/mm^3.

[0027] In certain embodiments, a stretched nodule density for the dental floss stretched to twice a relaxed length is at least 1.1x greater than a relaxed nodule density for the dental floss at the relaxed length.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] A more complete understanding of the present invention and the advantages thereof may be acquired by referring to the following description in consideration of the accompanying drawings, in which like reference numbers indicate like features.

[0029] FIG. 1 depicts an embodiment of the inventive floss containing amorphous silica particles, wherein the floss is in a relaxed state.

[0030] FIG. 2 depicts an embodiment of the inventive floss containing amorphous silica particles.

DETAILED DESCRIPTION

[0031] As used throughout, ranges are used as shorthand for describing each and every value that is within the range. Any value within the range can be selected as the terminus of the range. ~~In addition, all references cited herein are hereby incorporated by reference in their entireties.~~ In the event of a conflict in a definition in the present disclosure and that of a cited