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(54) Title: ENVIRONMENTALLY FRIENDLY TOOTHBRUSH

(57) Abstract: This invention provides a non-disposable, environmentally friendly toothbrush comprising a solid handle and bristled filaments operably affixed thereto, wherein the solid handle is made of an environmentally friendly composition of matter comprising an admixture of cornstarch (PSM) and recycled polypropylene, the weight ratio of biodegradable cornstarch (PSM) to recycled polypropylene being from 50:50 to 80:20.

ENVIRONMENTALLY FRIENDLY TOOTHBRUSH

This application claims the benefit of U.S. Provisional Application No. 61/237,075, filed August 26, 2009, and U.S. Provisional Application No. 61/263,189, filed November 20, 2009, the contents of both of these applications being incorporated herein by reference.

Throughout this application, various publications are cited. The disclosure of these publications is hereby incorporated by reference into this application to describe more fully the state of the art to which this invention pertains.

Background of the Invention

Conventional toothbrushes have a negative impact on the environment. For example, more than 50,000,000 pounds of toothbrushes pile up in landfills in this country annually. On an individual basis, a person who lives to be 80 years of age and follows his dentist's advice to change toothbrushes every three months, which is also the interval recommended by the American Dental Association, will use more than 300 brushes in his lifetime.

In addition to excessive landfill use, the use of conventional toothbrushes can lead to (i) damage to the atmosphere upon burning, and (ii) destruction of trees, a

significant factor in that a mature tree removes approximately 48 pounds of CO_2 from the atmosphere per year.

Plant-derived biodegradable polymers are a renewable resource and an environmentally friendly alternative to traditional plastic.

Our use of recycled materials helps to protect our natural resources, such as oil, water, coal, and natural gas. Using recycled polypropylene also means a reduction in the emission of greenhouse gasses.

The combined ingredients used in the making of the Ecosafe Toothbrush contribute to the zero waste movement by reducing the quantity of material in our landfills.

Summary of the Invention

This invention provides a toothbrush comprising a solid handle and bristled filaments operably affixed thereto, wherein the solid handle is made of a composition of matter comprising an admixture of biodegradable cornstarch (PSM) and recycled polypropylene, the weight ratio of cornstarch (PSM) to recycled polypropylene being from 50:50 to 80:20.

This invention also provides a method for making a solid, environmentally friendly composition of matter suitable for use as a toothbrush handle comprising the step of admixing biodegradable cornstarch (PSM) and recycled polypropylene under suitable conditions, wherein the weight ratio of cornstarch (PSM) to polypropylene is from 50:50 to 80:20.

Detailed Description of the Invention

In the present invention, it has now been found that a non-disposable toothbrush can be constructed using environmentally friendly material such that the handle retains the physical features desirable in a toothbrush.

The growing environmental burden caused by conventional toothbrush use is directly addressed by the subject invention, namely, an "Eco Safe" environmentally friendly toothbrush. These toothbrushes are made entirely of recycled material and/or material from a renewable source that can be completely recycled. When the toothbrush has completed its usable lifecycle, it can be returned to the manufacturer or seller, where the components can then be separated and recycled.

These toothbrushes made from biodegradable and recycled materials have numerous advantages, such as the following: (i) the toothbrushes are made with biodegradable materials, and thus use less landfill space than conventional toothbrushes; (ii) toothbrushes made with recycled materials reuse resources, and thereby limit the need to use virgin raw materials; (iii) the plants from which the toothbrushes are derived actually absorb harmful gases from the atmosphere, and thus act as a positive influence on the environment, and (iv) these toothbrushes are more than six-times less damaging to the atmosphere when burned than conventional polypropylene-based plastic brushes.

Specifically, this invention provides a toothbrush comprising a solid handle and bristled filaments (also referred to simply as "bristles") operably affixed thereto, wherein the solid handle is made of an environmentally friendly composition of matter comprising an admixture of biodegradable cornstarch (PSM) (available, for example, from PSM North America) and recycled polypropylene, the weight ratio of cornstarch (PSM) to recycled polypropylene being from 50:50 to 80:20. Although some percentage of the polypropylene used can be non-recycled, it is preferred that the "recycled polypropylene" be 100% recycled. The solid handle may optionally contain additional components such as coloring agents (ideally added at the mixing stage) and texture-enhancing agents. Preferably all coloring and other agents are biodegradable. This handle made from the cornstarch (PSM)/recycled polypropylene composition biodegrades to a more thorough extent than would a handle made only from polypropylene.

In the preferred embodiment, the bristles are affixed so that there are eight pounds of pull per bristle.
In one embodiment of the subject toothbrush, the weight ratio of cornstarch (PSM) to recycled polypropylene is from 50:50 to 75:25. Preferably, the weight ratio of cornstarch (PSM) to recycled polypropylene is 65:35.

In another embodiment, the solid handle is made of an environmentally friendly composition of matter consisting

of an admixture of biodegradable cornstarch (PSM) and recycled polypropylene (and optionally a coloring agent), the weight ratio of cornstarch (PSM) to polypropylene being from 50:50 to 80:20. In a further embodiment, the weight ratio of cornstarch (PSM) to recycled polypropylene is from 50:50 to 75:25, and preferably is 65:35.

This invention also provides a method for making a solid, environmentally friendly composition of matter suitable for use as a toothbrush handle comprising the step of admixing biodegradable cornstarch (PSM) and recycled polypropylene under suitable conditions, wherein the weight ratio of cornstarch (PSM) to polypropylene is from 50:50 to 80:20. In one embodiment, the weight ratio of cornstarch (PSM) to recycled polypropylene is from 50:50 to 75:25, and preferably is 65:35.

In this method, the cornstarch and polypropylene are preferably solid before mixing, and no solvents are required for mixing. It is not necessary for either of the cornstarch and polypropylene to exist at a specified particle size prior to mixing. The mixing apparatus preferably is capable of weighing each component precisely and consistently to ensure product uniformity.

For a short period of time prior to injecting the resulting mixture into a toothbrush handle mold, the mixing occurs at a temperature of between 350°F and

400°F. The mixture is molded in a press that exerts between 200 and 300 tons of pressure.

Although the primary commercial embodiment of this invention is an environmentally friendly toothbrush, this invention also provides a solid, environmentally friendly composition of matter comprising an admixture of biodegradable cornstarch (PSM) and polypropylene (preferably recycled), wherein the weight ratio of cornstarch (PSM) to polypropylene is from 50:50 to 80:20. In one embodiment of this composition, the weight ratio of cornstarch (PSM) to polypropylene is from 50:50 to 75:25, and the polypropylene is recycled polypropylene. Preferably, the weight ratio of cornstarch (PSM) to recycled polypropylene is 65:35. This composition may optionally contain additional components such as coloring agents and texture-enhancing agents (preferably all biodegradable).

Alternatively, in another embodiment, this composition consists of an admixture of polypropylene (preferably recycled) and cornstarch (PSM) (and optionally a coloring agent), and the weight ratio of cornstarch (PSM) to polypropylene is preferably 65:35.

This invention further provides articles of manufacture (such as consumer products) comprising a solid component, wherein the solid component is an environmentally friendly composition of matter comprising an admixture of biodegradable cornstarch (PSM) and recycled

polypropylene, the weight ratio of cornstarch (PSM) to recycled polypropylene being from 50:50 to 80:20, preferably from 50:50 to 75:25, and most preferably 65:35.

What is claimed is:

1. A toothbrush comprising a solid handle and bristled filaments operably affixed thereto, wherein the solid handle is made of a composition of matter comprising an admixture of biodegradable cornstarch (PSM) and recycled polypropylene, the weight ratio of cornstarch (PSM) to recycled polypropylene being from 50:50 to 80:20.

2. The toothbrush of claim 1, wherein the weight ratio of cornstarch (PSM) to recycled polypropylene is from 50:50 to 75:25.

3. The toothbrush of claim 1, wherein the weight ratio of cornstarch (PSM) to recycled polypropylene is 65:35.

4. The toothbrush of claim 1, wherein the solid handle is made of a composition of matter consisting of an admixture of biodegradable cornstarch (PSM) and recycled polypropylene, the weight ratio of cornstarch (PSM) to polypropylene being from 50:50 to 80:20.

5. The toothbrush of claim 4, wherein the weight ratio of cornstarch (PSM) to recycled polypropylene is from 50:50 to 75:25.

6. The toothbrush of claim 4, wherein the weight ratio of cornstarch (PSM) to recycled polypropylene is 65:35.

7. A method for making a solid composition of matter suitable for use as a toothbrush handle comprising the step of admixing biodegradable cornstarch (PSM) and recycled polypropylene under suitable conditions, wherein the weight ratio of cornstarch (PSM) to polypropylene is from 50:50 to 80:20.

8. The method of claim 7, wherein the weight ratio of cornstarch (PSM) to recycled polypropylene is from 50:50 to 75:25.

9. The method of claim 7, wherein the weight ratio of cornstarch (PSM) to recycled polypropylene is 65:35.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 10/46602

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A46B 9/04 (2010.01)
USPC - 15/167.2
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8): A46B 9/04 (2010.01)
USPC: 15/167.2

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 15/167.1, 159.1; 300/21

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
USPTO PubWEST (PGPB, USPT, USOC, EPAB, JPAB); Google (Scholar, Web);
Search terms used: (toothbrush OR tooth brush), (psm OR plastarch OR cornstarch OR corn starch) (polypropylene OR polypropene OR PP), (percent$ OR "%" OR "wt" OR weight OR concentration OR ratio), (recycl$ OR post-consumer) (tooth OR teeth OR dental OR oral)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2008/0014010 A1 (BARTSCHI, et al.) 17 January 2008 (17.01.2008), [Abstract]; para [0017], [0067]	1-9
Y	US 5,881,425 A (HUDSON, et al.) 16 March 1999 (16.03.1999), col 2, ln 40-45	1-9
Y	SHEN, et al. Product Overview and Market Projection Of Emerging Bio-Based Plastics. Group Science Technology and Society (STS), Utrecht University. June 2009, pp 1-245, especially, pg 16, Table 2-2; pg 31, para 5; pg 32, para 1; pg 38, para 2.	1-9

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
04 October 2010 (04.10.2010)	27 OCT 2010
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

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