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(72) Inventor; and

(71) Applicant : JENSEN, Steven, D. [US/US]; 8471 South 2385 West, West Jordan, UT 84088 (US).

(74) Agent: JONES, Terry, S.; 4628 West Skyhawk Drive, West Jordan, UT 84084 (US).

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(54) Title: TEETH WHITENING FILM UTILIZING TRIPOLYPHOSPHATE SALTS

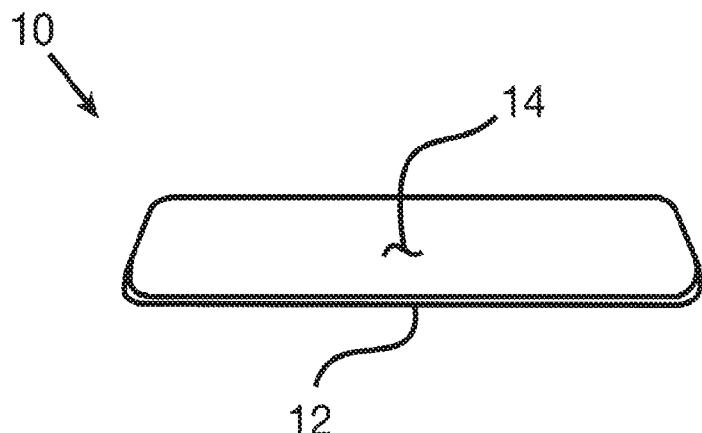


FIG. 1

(57) Abstract: A teeth whitening film may include a water insoluble polymeric sheet. A gelatinous active layer may be located on a surface of the water insoluble polymeric sheet. The gelatinous active layer may include a tripolyphosphate salt. Teeth whitening devices, methods of making such teeth whitening devices, and methods of using such teeth whitening devices are described herein.

## TEETH WHITENING FILM UTILIZING TRIPOLYPHOSPHATE SALTS

### TECHNICAL FIELD OF THE INVENTION

**[0001]** The present invention relates to the field of dentistry and, more particularly, devices useful for cleaning and whitening teeth.

### CROSS-REFERENCES TO RELATED APPLICATIONS

**[0002]** This application claims the benefit of U.S. Provisional Application No. 62/093,085 filed on December 17, 2014, which is hereby incorporated by reference in its entirety.

### SUMMARY OF THE INVENTION

**[0003]** Teeth whitening devices, methods of making such teeth whitening devices, and methods of using such teeth whitening devices are described herein.

**[0004]** In one embodiment, a teeth whitening film may include a water insoluble polymeric sheet. A gelatinous active layer may be located on a surface of the water insoluble polymeric sheet. The gelatinous active layer may include a tripolyphosphate salt.

**[0005]** Additional features and advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by the practice of the invention. The features and advantages of the invention may be realized and obtained by means of the instruments and combinations particularly pointed out in the appended claims. These and other features of the present invention will become more fully apparent from the following description and appended claims, or may be learned by the practice of the invention as set forth hereinafter.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0006]** In order to describe the manner in which the above-recited and other advantages and features of the invention can be obtained, a more particular description of the invention briefly described above will be rendered by reference to specific example embodiments thereof which are illustrated in the appended drawings. Understanding that these drawings depict only typical embodiments of the invention and are not therefore to be considered to be limiting of its scope, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings.

**[0007]** Figure 1 depicts a perspective view of a whitening film according to an embodiment of the present invention.

**[0008]** Figure 2 depicts a side view detail of the whitening film of Figure 1.

### DETAILED DESCRIPTION

**[0009]** Aqueous tripolyphosphate salts whiten teeth by dissolving susceptible stains into solution. The average person brushes their teeth for less than 60 seconds; therefore the contact time of a tripolyphosphate salt delivered via a toothpaste is limited on the teeth. Embodiments of the present invention provide delivery methods that allow greater contact time for a greater stain dissolution effect upon the teeth.

**[0010]** As shown in Figures 1 and 2, a whitening film 10 according to an embodiment of the present invention utilizes a thin water insoluble polymeric or plastic flexible backing material 12 to which is applied a water soluble gelatinous layer 14 that contains the active ingredient tripolyphosphate salts. The finished whitening film 10 is applied to the teeth such that the water soluble gelatinous layer 14 including the active ingredient comes into contact with the tooth surface. The

water insoluble backing material 12 faces away from the teeth and functions to protect the gelatinous layer 14 from the dilution effects of saliva. The finished whitening film 10 is designed to be worn for more than one minute; other embodiments call for treatment times comprising: 15, 30, 60, 120, 180, 240, 360 minutes and any other suitable application time. An overnight whitening film also comprises an embodiment of the invention, wherein the user wears the whitening film while they sleep. The user can create a stain removal regime lasting from days to weeks to achieve a desired whiteness; the film is disposable and can be replaced multiple times per day if desired.

**[0011]** Embodiments of the thin polymeric or plastic backing material 12 include but are not limited to: polyethylene sheet, polypropylene sheet, polyurethane sheet, nylon sheet, wax sheet, parafilm sheet, PVC sheet, and any other useful water insoluble sheet material.

**[0012]** The gelatinous composition 14 that contains the active ingredient may include a liquid component, a polymeric thickener, and a component that adjusts pH. The gelatinous composition that contains the active ingredient may also include additional components such as a sweetener, flavoring agent, fluoride, anti-tartar agent, anti-microbial, and any other useful ingredient.

**[0013]** Embodiments of thickening agents include but are not limited to: PVP, polyethyl oxazoline, carboxypolymethylene, guar gum, xanthum gum, silica powder, fumed silica, polyethylene glycol, polypropylene glycol, and any other useful thickening agent.

**[0014]** Embodiments of liquid components include but are not limited to: water, ethanol, propylene glycol, glycerin, propanol, and any other useful liquid component.

**[0015]** Embodiments of pH adjustment compound include but are not limited to: potassium hydroxide, sodium hydroxide, hydrochloric acid, sulfuric acid, phosphoric acid and any other pH adjustment medium.

**[0016]** The salts of tripolyphosphate include but are not limited to: sodium tripolyphosphate and potassium tripolyphosphate.

**[0017]** The components are blended together until a homogenous gel is created usually by mixing with a mechanical mixer. The gel is spread as a thin layer over the water-insoluble polymeric backing material 12 and is allowed to dry into a gelatinous state, forming the gelatinous composition 14. The final whitening film 10 is cut into a size to fit at least some portion of the teeth and packaged in airtight containers.

**[0018]** A “gelatinous” material as used herein has physical properties somewhat similar to the confection known as gummy worms (*i.e.*, flexible and soft enough to conform to a tooth surface without cracking or fracturing, yet firm enough that it will not coalesce with a separate gelatinous material when placed into mutual contact).

**[0019]** Another embodiment of the invention combines the stain removing ability of tripolyphosphate with the whitening/oxidation ability of peroxide into the gelatinous composition 14. To our surprise we have found the sodium tripolyphosphate to be compatible with peroxide and the two can remain soluble together in solution. Therefore any combination of peroxide and sodium/potassium tripolyphosphate is within the scope of this patent. The ideal combination would maximize the concentration of both ingredients with respect to their solubility within the polymeric thickener matrix.

**[0020]** Example #1

10% - sodium tripolyphosphate

30% - poly 2-ethyl oxazoline

10% - ethanol

0.3% - peppermint oil

0.2% - sucralose

49.5% - water

**[0021]** The components are blended together until homogenous in a mechanical mixer. The resulting gel is then spread as a thin layer over a water-insoluble polymeric backing material, such as parafilm, and dried until gelatinous.

**[0022]** Example #2

10% - potassium tripolyphosphate

30% - PVP

5% - polyethylene glycol 35,000 m.w.

0.3% - peppermint oil

0.2% - sucralose

54.5% - water

**[0023]** The components are blended together until homogenous in a mechanical mixer. The resulting gel is then spread as a thin layer over a water-insoluble polymeric backing material such as polypropylene sheet and dried until gelatinous.

**[0024]** Example #3

5% - potassium tripolyphosphate

28% - PVP

5% - polyethylene glycol 35,000 m.w.

0.3% - peppermint oil

0.2% - sucralose

36.5% - water

10% - carbamide peroxide

15% - ethanol

**[0025]** The components are blended together until homogenous in a mechanical mixer. The resulting gel is then spread as a thin layer over a water-insoluble polymeric backing material such as polypropylene sheet and dried until gelatinous.

**[0026]** While certain embodiments and details have been included herein and in the attached invention disclosure for purposes of illustrating the invention, it will be apparent to those skilled in the art that various changes in the methods and apparatuses disclosed herein may be made without departing from the scope of the invention, which is defined in the appended claims.

## CLAIMS

What is claimed is:

1. A teeth whitening film comprising:  
a water insoluble polymeric sheet; and  
a gelatinous active layer located on a surface of the water insoluble polymeric sheet,  
the gelatinous active layer comprising a tripolyphosphate salt.
2. The teeth whitening film of claim 1, wherein the gelatinous active layer  
further comprises a peroxide.
3. A method of making a teeth whitening film, the method comprising:  
positioning a water soluble gel that comprises a tripolyphosphate salt on a water  
insoluble polymeric sheet; and  
drying the water soluble gel to a gelatinous state.

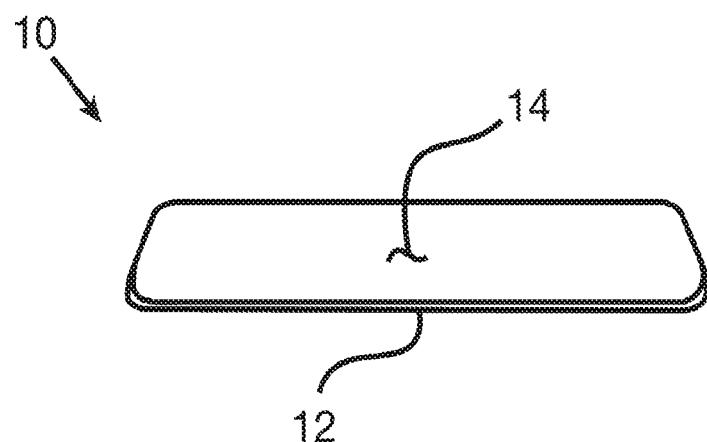


FIG. 1

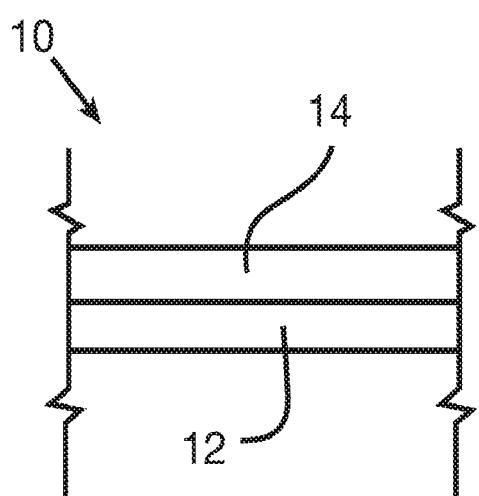


FIG. 2

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2015/065982

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A61Q 11/02 (2016.01)

CPC - A61Q 11/02 (2016.02)

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) - A61K 8/00, 8/22, 8/24; A61Q 11/00, 11/02 (2016.01)

CPC - A61K 8/00, 8/22, 8/24; A61Q 11/00, 11/02 (2016.02)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

USPC - 424/49, 53, 57; IPC(8) - A61K 8/00, 8/22, 8/24; A61Q 11/00, 11/02; CPC - A61K 8/00, 8/22, 8/24; A61Q 11/00, 11/02 (keyword delimited)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Orbit, Google Patents, Google.

Search terms used: water, insoluble, polymer, increase, contact, time, teeth, tooth, whitener, saliva, spit, tripolyphosphate, backing, protective, barrier, layer, hydrophobic, dry, dried, gelatinous.

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 8,802,062 B2 (KIM et al) 12 August 2014 (12.08.2014) entire document	1, 2
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Y	US 2009/0087393 A1 (JENSEN et al) 02 April 2009 (02.04.2009) entire document	3
A	US 2004/0101496 A1 (CHEN) 27 May 2004 (27.05.2004) entire document	3
		1-3

Further documents are listed in the continuation of Box C.

See patent family annex.

## \* 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

"&amp;" document member of the same patent family

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Name and mailing address of the ISA/

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents  
P.O. Box 1450, Alexandria, VA 22313-1450  
Facsimile No. 571-273-8300

Authorized officer

Blaine R. Copenheaver

PCT Helpdesk: 571-272-4300  
PCT OSP: 571-272-7774