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CLEANSING OF DENTURES

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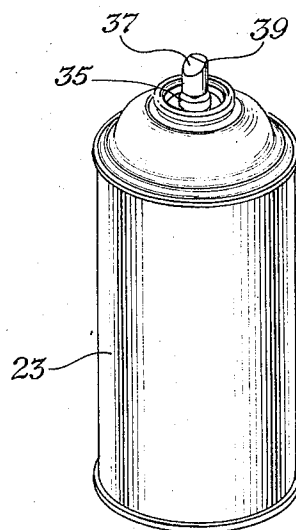
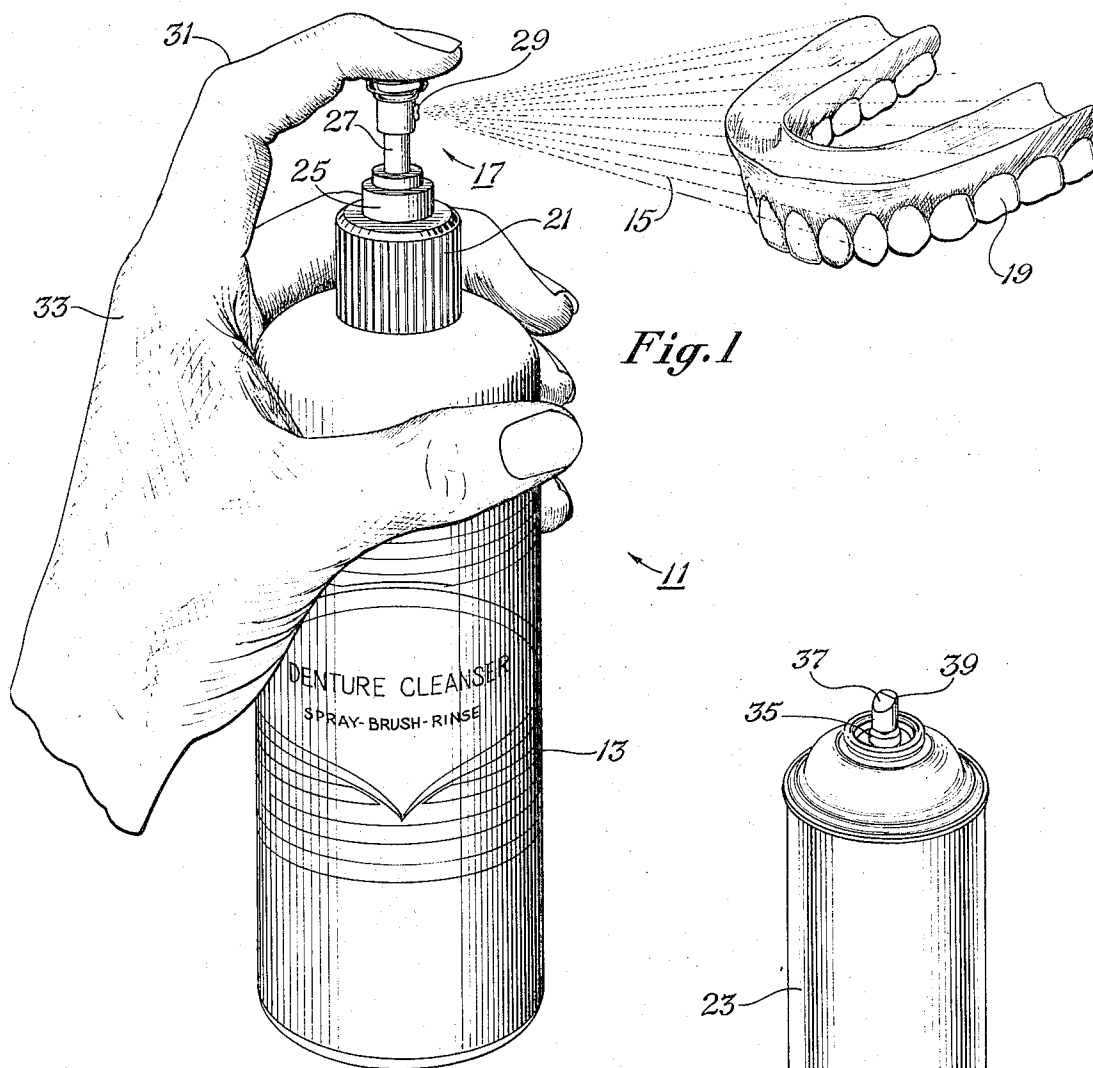


Fig. 2

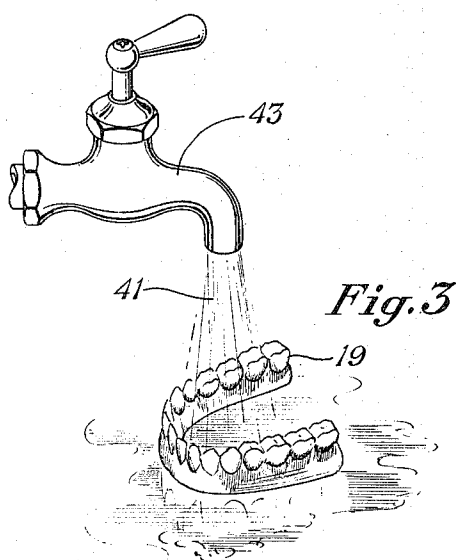


Fig. 3

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CLEANSING OF DENTURES

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7 Claims

ABSTRACT OF THE DISCLOSURE

Method and apparatus for cleaning dentures characterized by removing the dentures from the mouth, spraying a denture cleaning solution on the dentures, brushing and rinsing the dentures and returning them to the mouth of the wearer such that no time has to be lost soaking the dentures to effect cleaning thereof. Also disclosed are preferred embodiments delineating specific denture cleaning solutions and apparatus for spraying the denture cleaning solution onto the dentures.

BACKGROUND OF THE INVENTION

(1) Field of the Invention

This invention relates to cleaning of dentures. More particularly, it relates to method and apparatus facilitating rapid cleaning of dentures such that no time has to be lost in soaking the dentures before replacing them in the mouth of the wearer.

(2) Description of the Prior Art

A wide variety of dentifrices have been employed in the prior art. These dentifrices have ranged the gamut from powders through pastes to the more recent and widely advertised tablets containing an effervescent and dyes that change color to indicate when cleaning has been effected. All of the prior art dentifrices of which we are aware, however, had one thing in common. They required a period of soaking of the dentures in order to ensure cleanliness thereof. Thus, a denture wearer might have to wait 15 to 20 minutes in the bathroom for the dentures to be cleaned if the wearer did not wish to be seen without the dentures in the mouth.

SUMMARY OF THE INVENTION

Accordingly, it is an object of this invention to provide method and apparatus for cleaning dentures that obviates the disadvantages of the prior art and enables the denture wearer to clean his dentures without requiring time to be lost soaking the dentures to effect cleaning thereof.

Specifically, it is an object of this invention to enable the denture wearer to clean his dentures in about the same length of time it ordinarily takes for brushing natural teeth.

These and other objects will become apparent from the detailed description hereinafter, particularly when taken in conjunction with the drawings.

In accordance with this invention, dentures are cleaned by a new method in which the dentures are removed from the mouth of the wearer, sprayed with a new and highly effective denture cleaning solution, brushed and rinsed, and returned to the mouth such that no time has to be lost soaking the dentures to effect cleaning thereof.

In another aspect of this invention, apparatus is provided for cleaning dentures comprises a container; a denture cleaning solution disposed in the container; and means for spraying the denture cleaning solution from the container onto the dentures. The denture cleaning solution is uniquely designed for cleaning removable dentures, with the thought in mind that the dentures will be replaced in the mouth immediately after cleaning.

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In a specific embodiment, the denture cleaning solution is specifically delineated.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an isometric view illustrating one embodiment of this invention being used to spray dentures.

FIG. 2 is an isometric view of another embodiment of this invention.

FIG. 3 is an isometric view illustrating schematically a step in one aspect of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, the apparatus 11 for cleaning dentures comprises a container 13 having a denture cleaning solution 15 therewithin, the denture cleaning solution 15 being illustrated in the spray form; and means 17 for effecting spraying of the denture cleaning solution 15 onto the dentures 19.

The container 13 may comprise any of the conventional containers appropriate to the denture cleaning solution and the means for effecting spraying thereof. As illustrated, the container 13 is a plastic bottle having a threaded top for engaging the cap 21. On the other hand, the container 13 may comprise an aerosol container 23, FIG. 2. Any other container that is suitable may be employed.

The means for effecting the spraying of the denture cleaning solution will be described at this point, since it is so closely related to the container. As illustrated in FIG. 1, the means 17 comprises a pump means and spray means for controllably spraying the denture cleaning solution onto the dentures. Specifically, the cap 21 houses a cylinder 25 in which is reciprocally mounted a piston (not shown), carried on the end of plunger 27. The cylinder 25 extends into communication with the denture cleaning solution 15 inside the container 13. An effluent passageway (not shown) for the denture cleaning solution is disposed axially of the plunger 27, then laterally to terminate in external spray nozzle 29 such that when the plunger 27 is depressed, the denture cleaning solution is sprayed from interiorly of container 13 outwardly and onto an object such as dentures 19. As illustrated, finger 31 of the hand 33 is manually operating the pump to effect the spraying of the denture cleaning solution 15 onto the dentures 19. On the other hand, the means 17 for effecting spraying of the denture cleaning solution 15 may comprise a motive fluid, a conventional interior conduit, and an aerosol valve means 35 associated with aerosol container 23 such that the motive fluid and the denture cleaning solution can be emitted from the aerosol container 23 responsive to operation of the aerosol valve means 35. As is known from other aerosol containers, the conventional aerosol valve means is opened by depression of an upper portion 37 having a longitudinally and laterally extending passageway terminating in an external spray nozzle 39 for directing the sprayed material.

The denture cleaning solution 15 is designed uniquely for cleaning removable dentures of a human, bearing in mind that the dentures will be replaced in the mouth after the cleaning and rinsing thereof. Since the denture cleaning solution will be employed on dentures outside of the oral cavity, the cleaning solution may be stronger than that conventionally employed in toothpastes and the like. The denture cleaning solution must, however, meet stringent demands to effect its cleaning and freshening of the dentures in order to meet the requirements of the wearer and his dentist. Any denture cleaning solution which will meet these stringent demands, or requirements, may be employed in this invention.

We have found the following denture cleaning solutions to perform satisfactorily. Our basic denture cleaning solution consists essentially of phosphoric acid, xylene

sodium sulfonate, butyl Cellosolve (commonly called ethylene glycol monobutyl ether; chemical names glycol butyl ether, 2-butoxyethanol), iso-propyl alcohol, a non-ionic surfactant, and an emulsifier; all of the constituents being present in a concentration that is sufficiently low that all of the constituents remain in solution in the denture cleaning solution. The phosphoric acid is employed for two primary reasons; firstly, to effect the desired pH for a high degree of cleaning not heretofore possible; and, secondly, to prevent dissolution of the adhesive employed in manufacturing the dentures. The prior art cleaners have been alkaline. Consequently, they did not remove tartar and the like regardless of the length of time the dentures were soaked. We have found that an acid pH, or a pH less than 7, effects better all around cleaning of the dentures, actually cleaning calcium deposits, such as tartar, and organic stains, such as tobacco stains, from the dentures. Better cleaning is effected at the lower pH's. Good cleaning is effected at a pH of about 3.5, yet the denture cleaning solution may be safely sprayed on the skin. At pH's of 2 and below the acid tingle becomes perceptible and may ultimately cause skin problems, such as dermatosis. Attempts to use other acids caused undesirable side effects such as loosening of the teeth adhesive. Frequently, oxyphosphate cements are employed as adhesive in making the dentures. It dissolves in acids such as hydrochloric, but does not dissolve in phosphoric acid. Accordingly, we have employed reagent grade phosphoric acid having an analyzable concentration of 86.1 percent ortho-phosphoric acid in making the denture cleaning solution. The xylene sodium sulfonate is the sodium salt of xylene sulfonic acid, available commercially as SXS (sodium xylene sulfonate). The xylene sodium sulfonate, the butyl Cellosolve and iso-propyl alcohol are employed to dissolve and remove the fats and hydrophobic residue from the foods that are eaten.

Any of the conventional nonionic surfactants that do not cause difficulties and yet provide the desired cleaning of food particles and the like from the dentures may be employed. Suitable nonionic surfactants include the polyethylene oxide nonionic surfactants containing an average of about 10-30 ethylene oxide groups.

The emulsifier serves as a general purpose surfactant, as a foam builder, and as a foam stabilizer to intensify the cleaning action and help to foam out food particles and the like from between the teeth of the dentures.

The emulsifiers may include any of the constituents having the delineated properties. Satisfactory emulsifiers include the coco-diethanol amides and the coco-fatty acid amides. These materials have achieved a well recognized classification in the art and do not require detailed description as to their preparation or composition. Moreover, they are commercially available.

The detergent and cleaning action of the basic denture cleaning solution is improved if trisodium phosphate is also added to the solution. The denture cleaning solution achieves better cleaning and softer water if it also contains sodium ethylenediaminetetraacetic acid (NaEDTA) in solution. In wide ranging tests, we have found that better consumer acceptance was experienced where the denture cleaning solution also contained a non-toxic dye and a flavoring material. The choice of dye and flavoring may be varied widely according to predominant consumer tastes and preferences in given locale. We have found Du Pont's acid blue dye to be widely acceptable. Other nontoxic vegetable dyes may be employed. Similarly, we have found mint, spearmint and peppermint flavoring widely acceptable.

The following concentrations of the respective ingredients have been delineated for use in the denture cleaning solution.

The phosphoric acid is employed in an amount sufficient to effect the desired acid pH; preferably, a pH within the range of 2-3.5, inclusive. Functionally, the phosphoric acid is employed in an amount sufficient to effect

softening of the calcium deposits and the organic alkaline stains such as tobacco stains and the like such that they can be readily removed from the dentures by brushing. Functionally stated also, the xylene sodium sulfonate, the butyl Cellosolve and the iso-propyl alcohol are employed in amounts sufficient to remove the fat and hydrophobic residue from the dentures; and the nonionic surfactant and emulsifier are employed in amounts sufficient to effect lower interfacial tension, foaming and all around cleaning of the dentures. These functional amounts, as best we have been able to delineate them, are given in the following paragraphs.

The phosphoric acid must be present in a concentration of at least 1 percent by volume to obtain proper cleaning. If present in a concentration of more than 5 percent by volume the denture cleaning solution becomes too acid and frequently causes skin difficulties such as dermatosis when inadvertently sprayed on the hand holding the dentures as the dentures are sprayed.

The xylene sodium sulfonate must be present in a concentration of at least 10 percent by volume in order to retain a true solution with the iso-propyl alcohol and the like contained in the solution. A concentration of xylene sodium sulfonate in the range of 10-30 percent by volume has been found to be advantageous. Even more xylene sodium sulfonate can probably be employed if desired.

The butyl Cellosolve must be employed in an amount of at least 1 percent by volume or the nonionic surfactant and the emulsifier will not go into and remain in solution. If more than 10 percent by volume butyl Cellosolve is employed, the surfactant and emulsifier are diluted too greatly to effect the desired cleaning.

The iso-propyl alcohol must be employed in a concentration of at least 1 percent by volume to maintain the surfactant and the emulsifier in the aqueous solution. Similarly as with the butyl Cellosolve, however, the iso-propyl alcohol must not be employed in a concentration greater than 10 percent by volume or the surfactant and emulsifier will be diluted too greatly to effect the desired cleaning.

The nonionic surfactant must be present in a concentration of at least 1 percent by volume to effect proper cleaning of the dentures. The cleaning improves with higher concentrations up to the concentration of about 10 percent by volume; beyond which the nonionic surfactant will not remain in solution.

The emulsifier must be present in a concentration of at least 0.1 percent by volume or else too little reduction in the interfacial tension between the aqueous cleaning solution and the contaminants on the dentures is effected. If the emulsifier is present in a concentration greater than about 2 percent by volume, too much foam is produced because of the lowered interfacial tension, resulting in smothering of the cleaning action of the surfactant and other constituents of the denture cleaning solution.

An amount of even 0.1 percent by volume of trisodium phosphate assists in obtaining improved detergency and cleaning action. Preferably, an amount of at least 1 percent by volume is employed to effect the proper detergent action. The trisodium phosphate should not be employed in a concentration greater than about 5 percent by volume, since it begins to precipitate out of solution at greater concentrations. Volume percent was employed, since most of the other components were liquid. The specific gravity of the trisodium phosphate employed was about 1.6, specifically 1.62 at 20° C. This enables converting the concentration in volume percent to a concentration in weight percent if desired.

The sodium salt of ethylenediaminetetraacetic acid was employed as a liquid having a concentration of 38 percent by weight, calculated on the weight of the EDTA anion, in aqueous solution. This liquid is commercially available as Versene 100 or Hampene 100, and is referred to as a "concentrated solution" of the NaEDTA. The concentrated solution of the NaEDTA is employed in an amount

of at least 0.1 percent by volume if appreciable softening of the water is to be accomplished. At concentrations greater than about 2 percent by volume, the sodium salt of the ethylenediaminetetraacetic acid begins to precipitate from the solution.

The amounts, or concentrations, of the dye and flavoring will depend upon individual preferences and the concentrations of the solutions being employed.

In operation, the dentures 19 are removed from the mouth of the wearer. The denture cleaning solution 15 is sprayed onto the dentures from the container 13, as by manual operation of the plunger 27 by finger 31. The dentures are brushed to effect cleaning thereof. The dentures are then rinsed, as by ordinary water 41 from a faucet 43. The dentures 19 are then returned to the mouth of the wearer without having to wait for a soaking period to effect the requisite cleanliness.

This invention is most advantageous, since it allows a denture wearer to clean his dentures in about the same time it takes to brush natural teeth. Because the denture cleaning solution is so unusually effective, however, it may be employed as a soaking solution to loosen and facilitate removal of difficultly removable material, such as tartar, from the dentures. Such soaking would, ordinarily, be employed infrequently.

Having thus described the invention, it will be understood that such description has been given by way of illustration and example and not by way of limitation, it being recognized that equivalents may be substituted for the compounds and elements recited herein.

What is claimed is:

1. A denture cleaning solution that is fast acting enough to be useful in combination with spray-on apparatus in normal usage, yet can be employed safely in soaking off tartar and the like that has accumulated on dentures; said denture cleaning solution consisting essentially of an aqueous solution containing:

(a) phosphoric acid in a concentration sufficient to effect an acid pH within the range of 2-3.5, inclusive, and sufficient to effect softening of calcium deposits and organic alkaline stains such as tobacco stains and the like; said phosphoric acid being present in a concentration within the range of 1-5 percent by volume;

(b) xylene sodium sulfonate, ethylene glycol monobutyl ether, and iso-propyl alcohol in respective concentrations sufficient to remove the fat and hydrophobic residue from foods that have been eaten with the dentures; said respective concentrations being within the respective ranges of 10-30, 1-10 and 1-10 percent by volume; and

(c) a nonionic surfactant selected from the class of polyethylene oxide nonionic surfactants containing an average of about 10-30 ethylene oxide groups and an emulsifier selected from the class of coco-dieth-

anol amide and coco fatty acid amide in respective concentrations sufficient to lower the interfacial tension, cause foaming, and effect cleaning of the dentures; said respective concentrations being within the ranges of 1-10 and 0.1-2 percents by volume,

all of said constituents being in concentrations that are sufficiently low that all of said constituents remain in solution in said denture cleaning solution.

2. The denture cleaning solution of claim 1 wherein said denture cleaning solution contains trisodium phosphate in a concentration within the range of 0.1-5 percent by volume, said concentration being low enough that said trisodium phosphate is maintained in solution.

3. The denture cleaning solution of claim 1 wherein said denture cleaning solution contains a concentrated solution of sodium ethylenediaminetetraacetic acid in a concentration within the range of 0.1-2 percent by volume, the concentration being low enough that said sodium ethylenediaminetetraacetic acid is maintained in solution.

4. The denture cleaning solution of claim 1 wherein said aqueous solution contains a dye and a flavoring.

5. The denture cleaning solution of claim 1 wherein said denture cleaning solution also contains:

(d) trisodium phosphate in a concentration within the range of 0.1-5 percent by volume;

(e) a concentrated solution of sodium ethylenediaminetetraacetic acid in a concentration within the range of 0.1-2 percent by volume; and

wherein said xylene sodium sulfonate is present in a concentration within the range of 10-30 percent.

6. The denture cleaning solution of claim 5 wherein said denture cleaning solution also contains a nontoxic dye.

7. The denture cleaning solution of claim 5 wherein said denture cleaning solution also contains a nontoxic flavoring.

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