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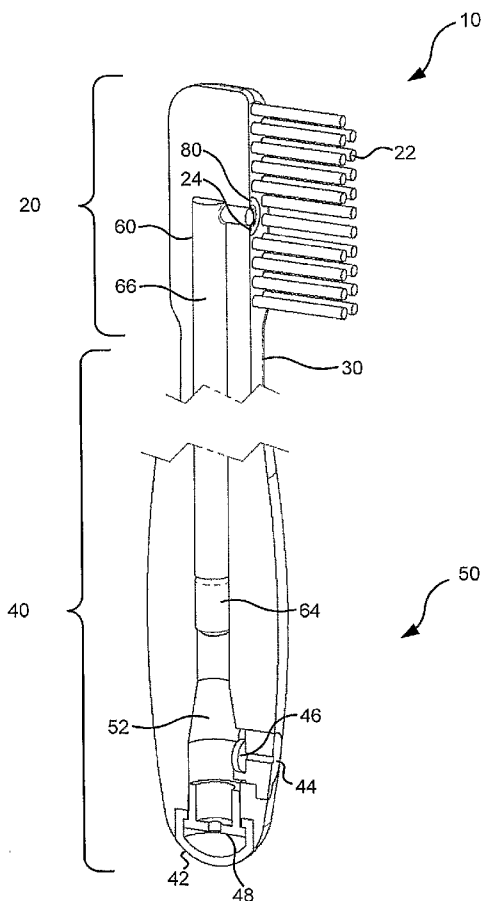
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[Continued on next page]

(54) Title: ACTIVE PUMP TOOTHBRUSH



(57) Abstract: Toothbrushes (10) are provided which incorporate in a handle portion (40) of the toothbrush (10) a volume of a beneficial agent that may be dispensed using an included manual pump mechanism (50). The volume of the beneficial agent provided in the brush and the dispense rate of the beneficial agent may be widely varied. The toothbrush (10) may be constructed to have a beneficial agent volume and dispense rate that are estimated to provide approximately three months of usage to correspond to the length of the effective life of toothbrush bristles (22), thus allowing the entire unit to be disposable upon dispensing of the last of the fluid.



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ACTIVE PUMP TOOTHBRUSH

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of and claims priority to United States Provisional Patent Application Number 60/725,528 entitled "ACTIVE PUMP TOOTHBRUSH" and filed on October 11, 2005 for Truman C. Wold, which is incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention relates generally to oral care devices, and more particularly to toothbrushes adapted to dispense a pre-measured dose of a beneficial agent for use upon actuation by the user.

BACKGROUND OF THE INVENTION

[0003] Toothbrushes have been used as a hygienic aid in a variety of cultures for many years. Increasingly, toothbrushes have been used with a variety of compositions such as dentifrices (compositions which aid in cleaning teeth) and other substances which act to improve the smell of a user's breath, remove, dislodge, or kill bacteria, or otherwise improve oral health. As their popularity has increased, so has the industry behind the production and sales of toothbrushes and associated cleaning compositions.

[0004] Most currently-produced toothbrushes are designed to be replaced after a period of time. Although this period of time varies somewhat, the American Dental Association recommends replacement of toothbrushes every three to four months, or earlier if a brush appears worn. *See generally* www.ada.org. This assures that the brush used has optimal cleaning ability. Users face some difficulty in remembering when to replace toothbrushes since their frequent use often obscures their date of purchase in memory. A variety of technologies (fading indicator strips, indicator bristles, etc.) have been used with various degrees of success to remind a user to replace their brush with a new one at the proper time.

[0005] In addition, most current toothbrushes are used with separately-provided dentifrices. Thus, travel or portable use of a toothbrush requires the user to bring their toothpaste of choice along with their toothbrush. Attention has been focused on developing

combination devices that contain a dentifrice inside of a toothbrush apparatus in a variety of forms.

[0006] Additional difficulty is faced in the industry in devising methods and means for administering a wide variety of beneficial agents to the teeth and/or mouth. Some such agents may be successfully delivered in dentifrice compositions, but others, due to their chemical properties may be unsuited for delivery in this manner.

[0007] Thus, it would be an improvement in the art to provide a disposable toothbrush device that is only usable for a specified number of uses and/or an approximate period of time. It would further be beneficial to provide a toothbrush containing its own onboard supply of a dentifrice or other beneficial agent.

[0008] Such a device and methods of its use are provided herein.

BRIEF SUMMARY OF THE INVENTION

[0009] The present invention is directed to a toothbrush capable of dispensing a beneficial agent from a handle portion of the toothbrush to the head of the toothbrush at a desired location such as, but not limited to, the back of the head or the bristles.

[0010] The toothbrushes of the present invention generally comprise a handle portion and a head portion. The handle portion is generally adapted to be grasped by the user during use. In the present invention, the handle portion is further adapted to contain a reservoir to store a volume of a beneficial agent. The handle portion further comprises a pumping mechanism for dispensing substantially-pre-measured doses of the beneficial agent to the head portion of the toothbrush.

[0011] The head portion of the toothbrushes of the present invention includes bristles for cleaning teeth and is adapted to receive a volume of the beneficial agent from the handle of the toothbrush and emit it for use. As discussed, the beneficial agent could be emitted to the bristles for direct administration to the teeth and/or gums, or to another region of the head of the toothbrush for dispensing to the mouth generally.

[0012] Other advantages and aspects of the present invention will become apparent upon reading the following description of the drawings and detailed description of the invention. These and other features and advantages of the present invention will become more fully apparent from the following figures and description, or may be learned by the practice of the invention as set forth hereinafter.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0013] In order that the manner in which the above-recited and other features and advantages of the invention are obtained will be readily understood, a more particular description of the invention briefly described above will be rendered by reference to specific embodiments thereof that 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 in which:

[0014] Figure 1 is a perspective view of the active pump toothbrush of the present invention;

[0015] Figure 2 is a partial cross-sectional view of the active pump toothbrush of the present invention;

[0016] Figure 3 is a top plan view of the active pump toothbrush of the present invention;

[0017] Figure 4 is a side plan section cross-sectional view of the active pump toothbrush of the present invention taken at line A-A of Figure 3A;

[0018] Figure 5 is a schematic diagram illustrating one embodiment of an alternate head portion in accordance with the present invention;

[0019] Figure 6 is a side cross-section view illustrating an alternative embodiment of an active pump in accordance with the present invention; and

[0020] Figure 7 is a schematic flow chart diagram illustrating one embodiment of a method of actively pumping a beneficial agent through a head portion of a toothbrush in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0021] The presently preferred embodiments of the present invention will be best understood by reference to the drawings, wherein like parts are designated by like numerals throughout. It will be readily understood that the components of the present invention, as generally described and illustrated in the figures herein, could be arranged and designed in a wide variety of different configurations. Several examples are provided below which discuss the construction, use, and testing of specific embodiments of the present invention. These embodiments are exemplary in nature and should not be construed to limit the scope of the invention in any way.

[0022] Thus, the following more detailed description of the embodiments of the active pump toothbrush device of the present invention, as represented in Figures 1-4, is not intended to limit the scope of the invention, as claimed, but is merely representative of presently preferred embodiments of the invention. As used herein, the term "active pump" refers to any mechanical, electrical, or chemical pump capable of moving material or fluid through the toothbrush. One example of an active pump suitable for use in the present invention is a diaphragm pump. The active pump of the present invention will be discussed in greater detail below with reference to Figures 1-4.

[0023] The toothbrushes provided in the present invention are designed to be inexpensively produced so as to be disposable after a provided quantity of a beneficial agent stored in a handle portion of the toothbrush has been used. Alternatively, the toothbrush may be refilled with beneficial agent. The volume of the beneficial agent provided in the brush and the dispense rate of the fluid may be widely varied within the scope of the invention. In some embodiments, the toothbrush is provided with a volume and dispense rate that are estimated to provide approximately three months of usage. In many embodiments, this corresponds to the length of the effective life of toothbrush bristles. Other quantities and dispense rates may be provided within the scope of the invention, however, as understood by one of ordinary skill in the art.

[0024] A first embodiment of the present invention is illustrated in Figure 1. Figure 1 shows a perspective view of an active pump toothbrush device 10 of the present invention. As seen in Figure 1, the toothbrush device 10 generally includes a head portion 20 and a handle portion 40. The head portion 20 comprises a number of bristles 22 that may be widely varied to correspond with various sizes and designs of toothbrushes, and an emitter 24. In Figure 1, the emitter 24 is placed to allow emission of a beneficial agent to the bristles 22 of the brush 10. One of ordinary skill in the art would understand that the emitter 24 may be placed on any other region of the head portion 20 of the brush 10, including, but not limited to, the back 26 of the head portion 20 positioned substantially opposite of the bristles 22, or on a top surface 28 or side surface 29A, 29B. All such variations are encompassed within the scope of the present invention.

[0025] The brush 10 of Figure 1 further includes a handle portion 40. The handle portion 40 may be generally configured to be grasped by a user of the brush 10 during use. Thus, the handle portion 40 may be given a wide variety of suitable shapes and dimensions to accommodate different overall brush sizes for different hand sizes and grasping orientations.

One of ordinary skill in the art would understand that such adaptations are within the scope of the present invention. The handle portion 40 also generally includes a reservoir (not shown) containing a beneficial agent such as a dentifrice or an active therapeutic composition. Such beneficial agents are dispensed from the reservoir to the head portion 20 for use. Beneficial agents may include, but are not limited to, oxidizing agents, whitening agents, therapeutic agents, breath freshening agents, gingivitis-treating compositions, pain-relieving agents, and anti-inflammatory agents.

[0026] The beneficial agents may be dispensed by depressing a flexible button 42 to activate a pump (not shown) that dispenses the agent. The handle portion 40 of the toothbrush 10 of Figure 1 includes a neck 30 that transmits the beneficial agent from the reservoir to the head portion 20. Such a neck 30 is optional, and when present, its size and dimensions may be widely varied within the scope of the invention.

[0027] Referring next to Figure 2, a partial cross-sectional view of the active pump toothbrush 10 of the present invention is shown. Portions of the handle portion 40 have been omitted to allow demonstration of sufficient structural detail of the toothbrush 10. This view of the toothbrush 10 enables the workings of the pump 50 to be viewed. More specifically, as discussed above, a beneficial agent 66 may be dispensed from a reservoir 60 by activating a pump 50 which dispenses discrete doses of the beneficial agent (hereinafter "agent") 66.

[0028] The pump 50 is activated by depression of a flexible button 42. The button 42 travels upwardly into the handle portion 40 until further motion is blocked by a button stop 48. The button 42 is in fluid connection with an air chamber 52, which is vented by a vent valve 44, which includes a flap 46. The air chamber 52 is in continuous fluid communication with a beneficial agent reservoir 60, containing a beneficial agent 66, and a plunger 64.

[0029] The pump 50 is operated by depressing the button 42 to pressurize the air chamber 52. Pressure in the air chamber 52 acts to drive the plunger 64 forward against the agent 66 present in the reservoir 60 to dispense a dose of the beneficial agent 66 to the emitter 24. In alternative embodiments of the toothbrush 10 (and, indeed, toothbrush 110 discussed below), a collapsible bag containing the beneficial agent 66 may be used instead of the plunger/follower 64. Thus, in such embodiments, pressure in the air chamber 52 would collapse the bag and dispense the beneficial agent from the brush. In other embodiments, the bag could inflate inside the reservoir chamber, displacing the beneficial agent.

[0030] The flexible button 42 may be constructed of rubber or any other suitable flexible material. A user of the toothbrush 10 may actuate the button 42 in a variety of ways,

including, but not limited to, pressing it with a finger or against another surface. The presence of the button stop 48 limits the travel of the button 42 and seals it in place within the handle portion 40 of the brush 10. The size of the dose of beneficial agent 66 dispensed is dictated by the displaced volume within the flexible button 42 and may thus be varied widely with the size and configuration of the button 42, as known to one of ordinary skill in the art.

[0031] Upon release of the flexible button 42, the button 42 will revert to its original shape, thus creating a vacuum within the air chamber 52. The vacuum may be relieved by ambient air drawn through the air vent valve 44 into the air chamber 52. The flap 46 in the vent valve 44 is forced open by the incoming air and then closes to seal the vent valve 44. The toothbrush 10 is then ready to be operated again. Alternatively the air vent valve 44 may be replaced with any one-way valve including, but not limited to, ball check valves, swing check valves, clapper valves, stop-check valves, lift-check valves, and the like.

[0032] The head portion 20 of the toothbrush 10 may optionally comprise a frangible or removable protective membrane 80 to prevent release of agent 66 prior to use during manufacture, shipping, storage, etc., of the toothbrush 10. The membrane 80 may also prevent premature drying out of any such agent 66. In some embodiments, the frangible membrane may be constructed or selected to break upon depression of the button 42 to allow release of the agent 66. In some embodiments, the membrane could be made to be easily removable such that it could be removed easily by a user prior to first use of the pump 50 of the toothbrush 10. Alternatively, the frangible or removable protective membrane 80 may be replaced with a removable plug.

[0033] The toothbrush 10 is further illustrated in Figures 3 and 4, which show a top plan view of the active pump toothbrush of the present invention and a side plan section view of the active pump toothbrush of the present invention taken at line A-A of Figure 3, respectively. It should be noted that other features such as, but not limited, to, a varying depth of the button to allow varying volumes of the beneficial agent 66 to be dispensed could be added to the toothbrushes 10 of the present invention.

[0034] Many variations on the above invention would be considered to be within the scope of the invention by one of ordinary skill in the art. In one such variation, fill windows (such as clear or at least partially transparent windows) could be added to the handle portion 40 to indicate the amount of beneficial agent remaining in the toothbrush 10. In still other embodiments, a second reservoir could be added to allow dispensing of two separate beneficial agents 66. Such a second reservoir could be controlled by the same flexible button

42, thus allowing concurrent dispensing of two discrete beneficial agents. Alternatively, the second reservoir could be controlled by use of a separate button (not illustrated) to enable separate or stepwise dispensing of the two agents. Thus, two beneficial agents could be dispensed from the toothbrush 10 concurrently or separately from each other within the scope of the invention. Other additional reservoirs are also thus within the scope of the invention.

[0035] As discussed briefly above, a wide variety of beneficial agents 66 may be dispensed from the reservoir 60 of the toothbrushes 10 of the present invention. One general family of such agents includes, but is not limited to, dentifrice compositions such as tooth pastes, gels, and creams. Other beneficial agents could include whitening agents, therapeutic compositions, oxygen-generating agents, and breath-fresheners. Some such therapeutic compositions may include, without limitation, antibacterial agents, gingivitis-treating compositions, pain-relieving agents, anti-inflammatory agents, and many other chemical entities suitable for oral administration. Suitable beneficial agents could also include agents which are not stable when mixed with a dentifrice composition for long periods of time. In such situations, the toothbrush could be used with a dose of the beneficial agent being dispensed together with a separately-provided dentifrice composition. Allowing the beneficial agent to be dispensed at the time of use could provide both the benefits of the dentifrice and the beneficial agent that would otherwise be unavailable to a user.

[0036] Figure 5 is a schematic diagram illustrating one embodiment of an alternate head portion 500 in accordance with the present invention. In one embodiment, the head portion 500 includes, as described previously, a plurality of bristles 22 embedded in the head portion 500. In one embodiment, the bristle bottoms are placed in holes formed or bored in the head portion 500. Positioned underneath the bristles 22 is one end of the reservoir 60 that extends from the handle portion (see Figures 1-4) to the head portion 500.

[0037] In one embodiment, the head portion 500 may include a plurality of emitters 24. As depicted, the emitters 24 comprise orifices or apertures that enable the flow of a beneficial agent from the reservoir 60 to the outer surface of the head portion 500 and subsequently into the bristles. Although the emitters 24 as depicted are located in between bristles, the emitters may alternatively be formed in the head portion 500 such that the flow of beneficial agent passes through one or more bristles. For example, each bristle may comprise a hollow tube configured to direct the flow of beneficial agent to the surface of the teeth.

[0038] Figure 6 is a side cross-section view illustrating an alternative embodiment of an active pump in accordance with the present invention. In one embodiment, the button 602

is formed of a rigid material and seated in the base of the handle portion 604. In the depicted embodiment, the button 602 functions to pressurize the reservoir 606. The button 602 may slideably engage interior surfaces of the handle portion 604.

[0039] In a further embodiment, a seal 608 is disposed between the button 602 and the interior surfaces 610 of the handle portion 604. One skilled in the art of forming substantially air tight seals will recognize that many substances and materials may be disposed between the button 602 and the interior surfaces 610 of the handle portion 604. Examples include, but are not limited to, rubber-based materials, petroleum-based jellies, various plastic membranes, etc.

[0040] The pump of Figure 6 may also include a biasing device in contact with the button such that a force is applied to cause the button to return to an extended or resting position. In one embodiment, the biasing device may comprise a spring 612. The spring 612, in a further embodiment, may be attached at one end with a stop 614 formed in the reservoir 606. The stop 614, as depicted does not restrict the flow of air or other fluid away from the button 602.

[0041] The schematic flow chart diagram that follows is generally set forth as a logical flow chart diagram. As such, the depicted order and labeled steps are indicative of one embodiment of the presented method. Other steps and methods may be conceived that are equivalent in function, or effect to one or more steps, or portions thereof, of the illustrated method. Additionally, the format and symbols employed are provided to explain the logical steps of the method and are understood not to limit the scope of the method. Although various arrow types and line types may be employed in the flow chart diagrams, they are understood not to limit the scope of the corresponding method. Indeed, some arrows or other connectors may be used to indicate only the logical flow of the method. For instance, an arrow may indicate a waiting or monitoring period of unspecified duration between enumerated steps of the depicted method. Additionally, the order in which a particular method occurs may or may not strictly adhere to the order of the corresponding steps shown.

[0042] Figure 7 is a schematic flow chart diagram illustrating one embodiment of a method of actively pumping a beneficial agent through a head portion of a toothbrush in accordance with the present invention. The method 700 starts and a toothbrush 10 is provided 704 having an active pump 50 integrated in the handle portion. A reservoir 60 is also provided 706 and configured to maintain a beneficial agent 66. The reservoir 60 may be defined by a void or channel extending from the handle portion into the head portion.

[0043] The method 700 continues and the active pump 50 pressurizes 708 the reservoir 60 at which point the pressurized air drives 710 the plunger. The plunger forces 712 the beneficial agent through the emitter. The method 700 then ends 714. Although the toothbrush 10 is contemplated to be a “throw-away” toothbrush, the toothbrush 10 may become reusable simply by refilling the reservoir.

[0044] The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

[0045] What is claimed is:

1. A toothbrush comprising:
 - a head portion having a plurality of bristles and at least one emitter coupled with a first end of a reservoir integrally formed in the head portion;
 - wherein the reservoir extends from inside the head portion into a handle portion, the handle portion coupled to the head portion; and
 - an active pump fluidly coupled with a second end of the reservoir such that the pump can pressurize a chamber in the reservoir and force a beneficial agent stored in the reservoir towards the head portion and for exit through the emitter.
2. The toothbrush of claim 1, further comprising a vent valve fluidly coupling the reservoir with ambient air such that a vacuum in the reservoir opens the vent valve until the pressure in the reservoir is substantially equal to the pressure of the ambient air.
3. The toothbrush of claim 1, wherein the active pump comprises a biased button fluidly coupled with the reservoir such that movement of the button pressurizes the reservoir.
4. The toothbrush of claim 4, further comprising a button stop coupled to an interior surface of the reservoir and positioned such that the movement of the button is limited to a selected distance.
5. The toothbrush of claim 1, further comprising a plunger disposed between the chamber and the reservoir, the plunger slidably engaging the reservoir such that as the chamber is pressurized the plunger travels away from the chamber and forces the beneficial agent through the emitter.
6. The toothbrush of claim 1, wherein the head portion comprises a plurality of emitters coupled with the reservoir.
7. The toothbrush of claim 1, wherein the reservoir comprises a channel extending from the head portion into the handle portion.

8. The toothbrush of claim 1, wherein the reservoir comprises a collapsible bag extending from the head portion into the handle portion.
9. The toothbrush of claim 1, further comprising a protective, removable membrane coupled with the emitter such that the membrane prevents premature drying of the beneficial agent.
10. The toothbrush of claim 1, wherein the beneficial agent is selected from a group consisting of oxidizing agents, whitening agents, therapeutic agents, breath freshening agents, gingivitis-treating compositions, pain-relieving agents, and anti-inflammatory agents.
11. A toothbrush comprising:
 - a head portion having a plurality of bristles and at least one emitter coupled with a first end of a reservoir integrally formed in the head portion;
 - wherein the reservoir extends from inside the head portion into a handle portion, the handle portion coupled to the head portion;
 - an active pump fluidly coupled with a second end of the reservoir such that the pump can pressurize a chamber in the reservoir and force a beneficial agent stored in the reservoir to travel towards the head portion and exit through the emitter; and
 - a vent valve fluidly coupling the reservoir with ambient air such that a vacuum in the reservoir opens the vent valve until the pressure in the reservoir is substantially equal to the pressure of the ambient air.
12. The toothbrush of claim 11, wherein the active pump comprises a biased button fluidly coupled with the reservoir such that movement of the button pressurizes the reservoir.
13. The toothbrush of claim 11, further comprising a button stop coupled to an interior surface of the reservoir and positioned such that the movement of the button is limited to a selected distance.

14. The toothbrush of claim 11, further comprising a plunger disposed between the chamber and the reservoir, the plunger slidably engaging the reservoir such that as the chamber is pressurized the plunger travels away from the chamber and forces the beneficial agent through the emitter.
15. The toothbrush of claim 11, wherein the head portion comprises a plurality of emitters coupled with the reservoir.
16. The toothbrush of claim 11, wherein the reservoir comprises a channel extending from the head portion into the handle portion.
17. The toothbrush of claim 11, wherein the reservoir comprises a collapsible bag extending from the head portion into the handle portion.
18. The toothbrush of claim 11, further comprising a protective, removable membrane coupled with the emitter such that the membrane prevents premature drying of the beneficial agent.
19. The toothbrush of claim 14, wherein the beneficial agent is selected from a group consisting of oxidizing agents, whitening agents, therapeutic agents, breath freshening agents, gingivitis-treating compositions, pain-relieving agents, and anti-inflammatory agents.
20. A method for delivering a beneficial agent through the head of a toothbrush using an active pump, the method comprising:
 - providing a toothbrush having:
 - a head portion having a plurality of bristles and at least one emitter coupled with a first end of a reservoir integrally formed in the head portion;
 - wherein the reservoir extends from inside the head portion into a handle portion, the handle portion coupled to the head portion;

an active pump fluidly coupled with a second end of the reservoir such that the pump can pressurize a chamber in the reservoir and force a beneficial agent stored in the reservoir to travel towards the head portion and exit through the emitter;

pressurizing the chamber;

driving a plunger disposed between the reservoir and the chamber; and

forcing the beneficial agent through the emitter.

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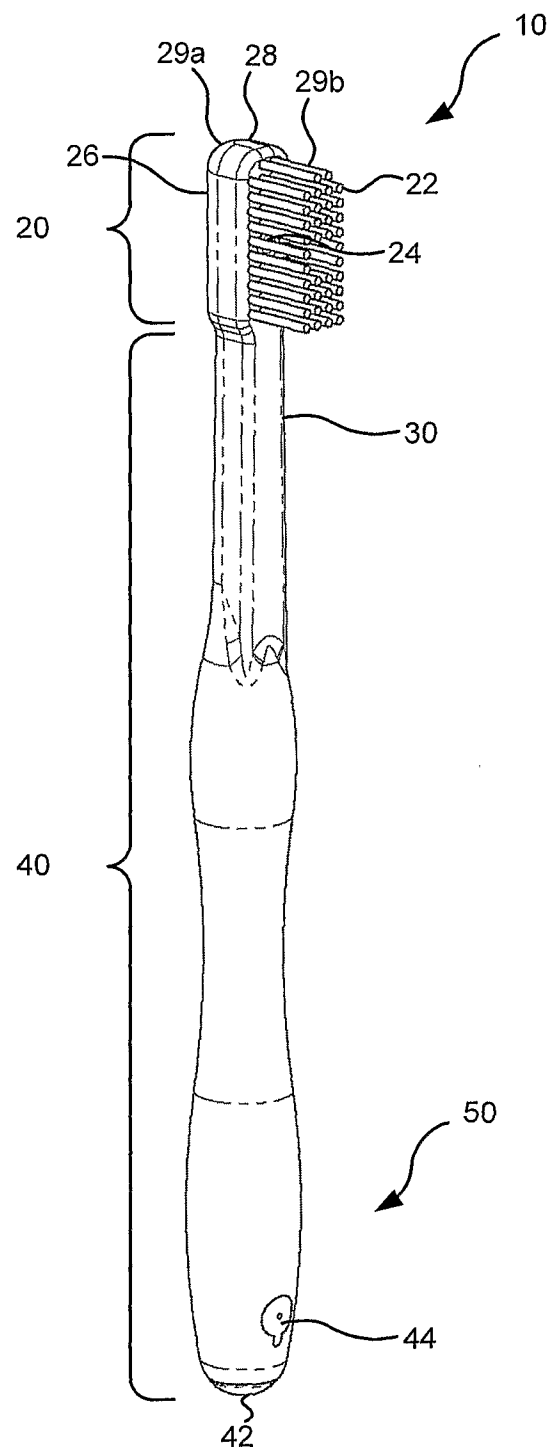


Fig. 1

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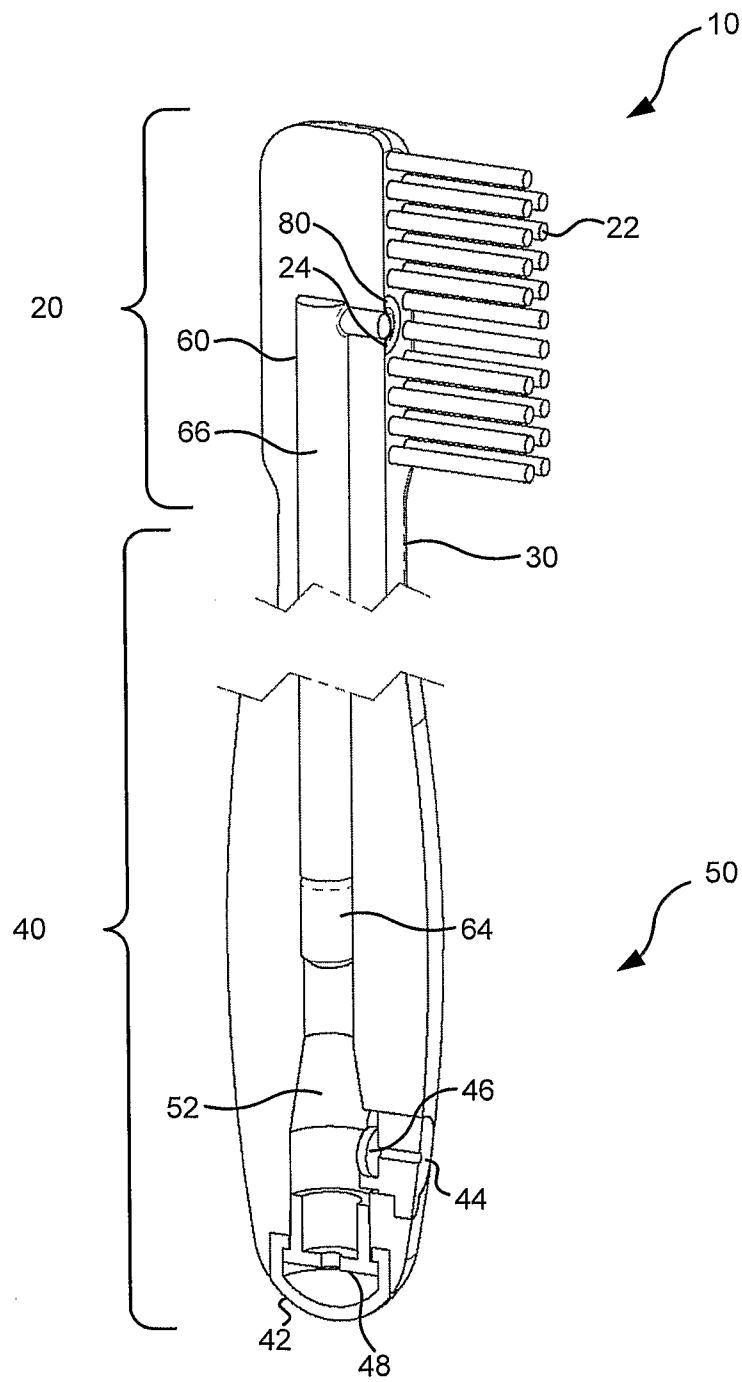


Fig. 2

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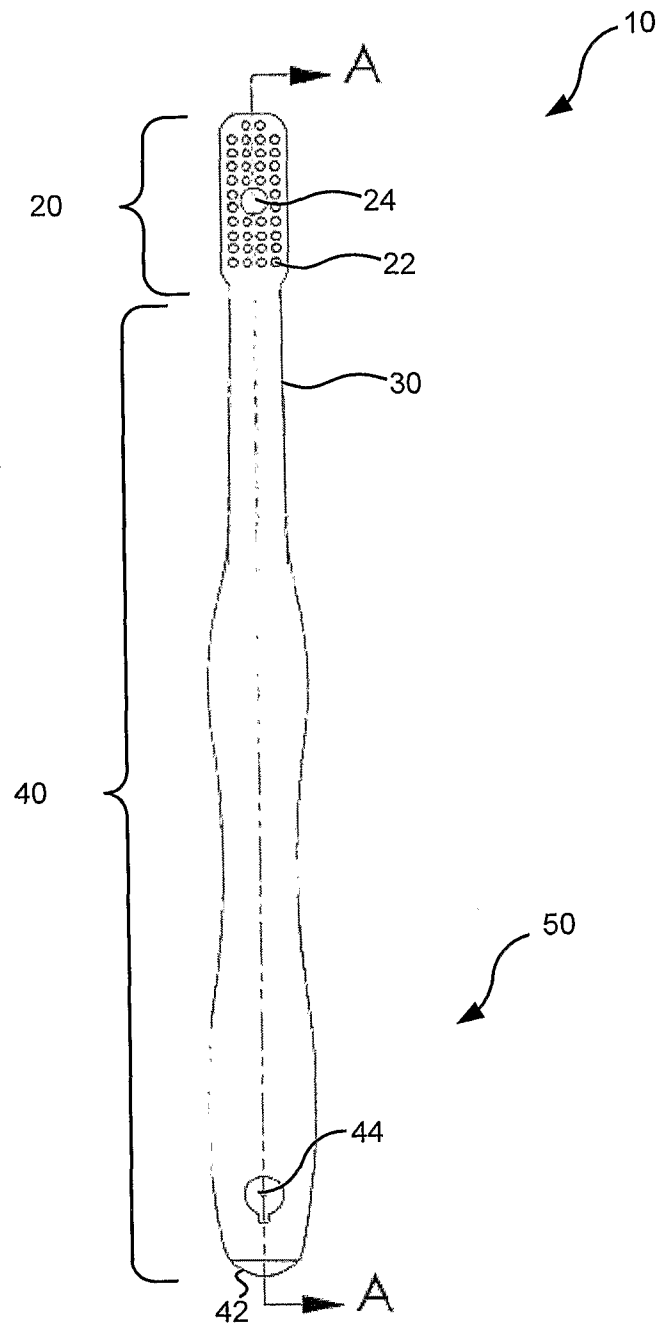


Fig. 3

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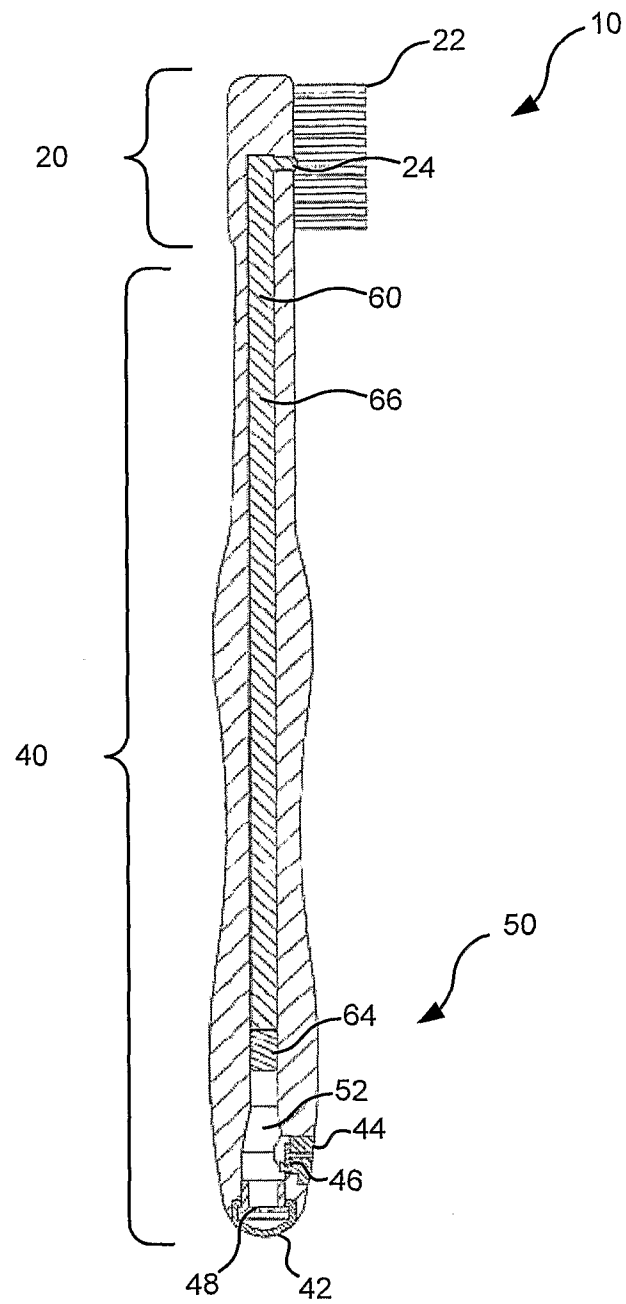


Fig. 4

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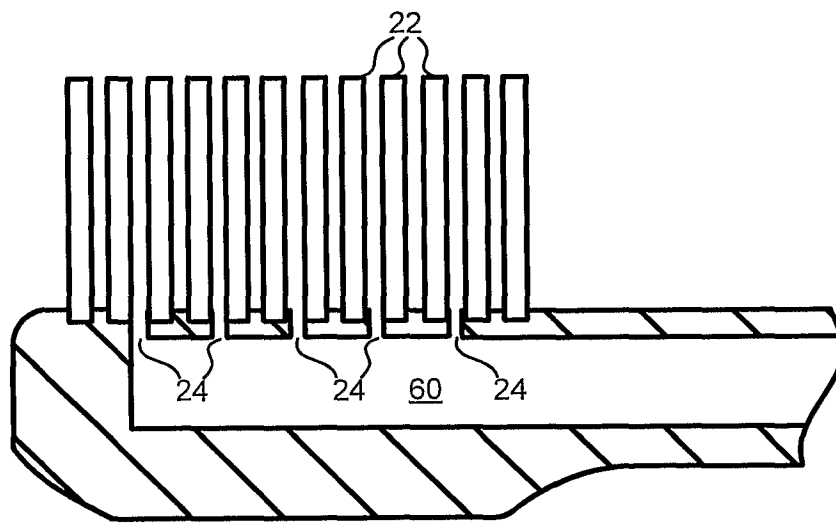


Fig. 5

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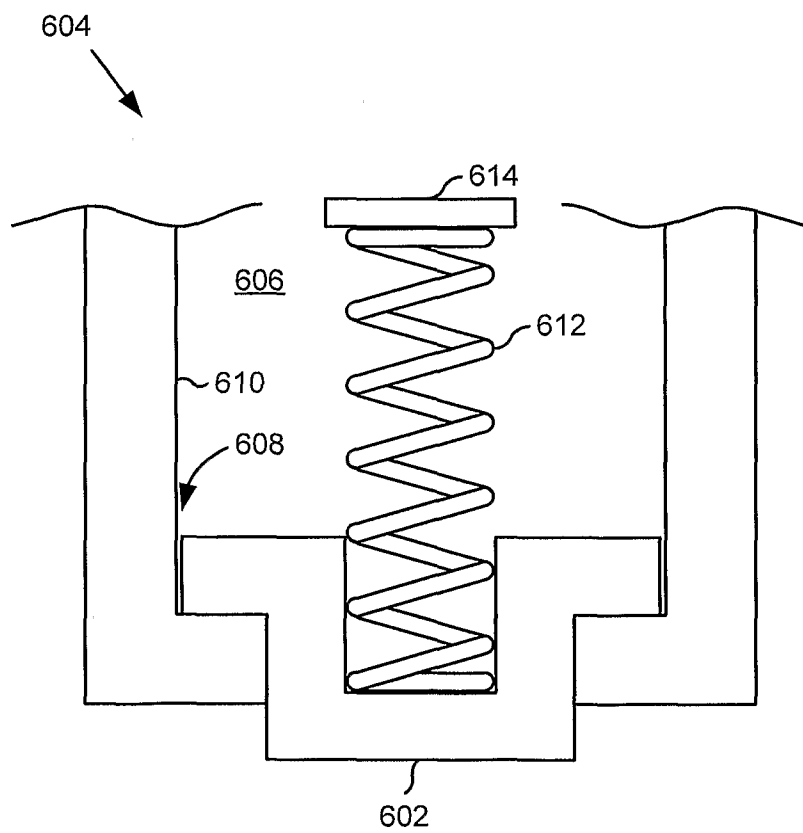


Fig. 6

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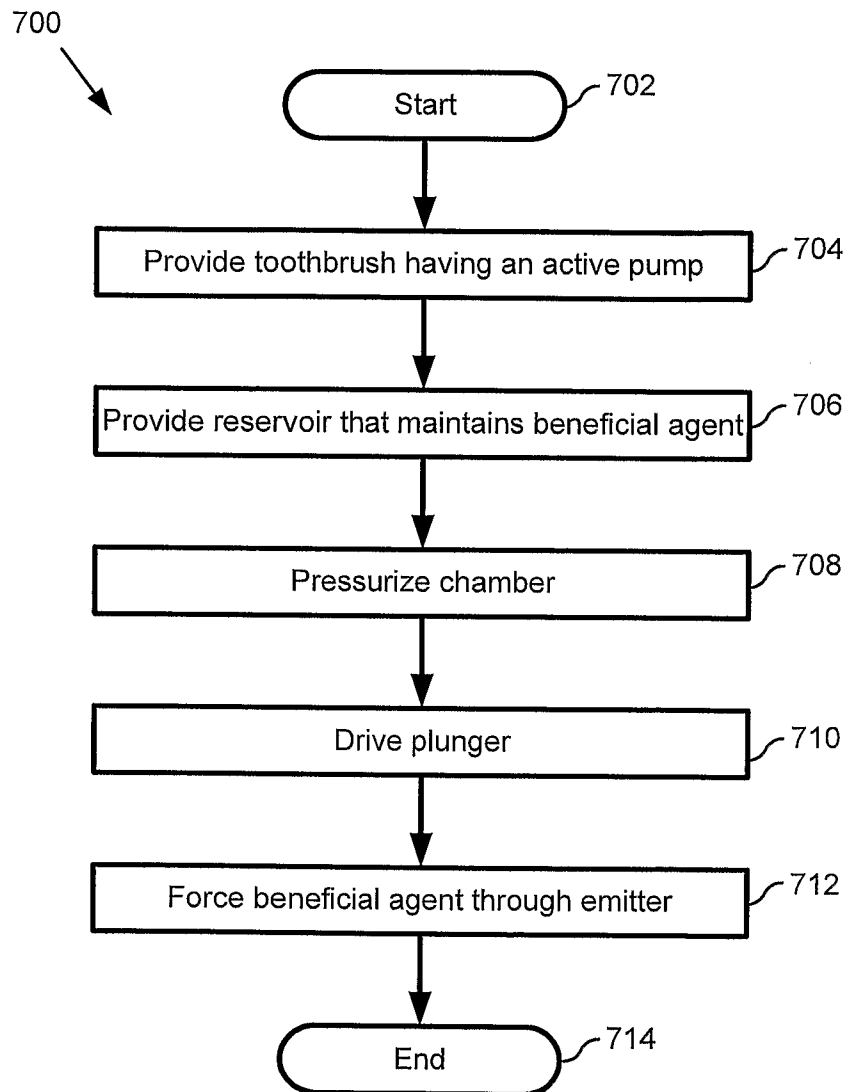


Fig. 7