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(54) **Title**: MEDICAL AND VETERINARY APPLICATIONS OF LIGHT TO THERAPEUTIC COMPOUNDS

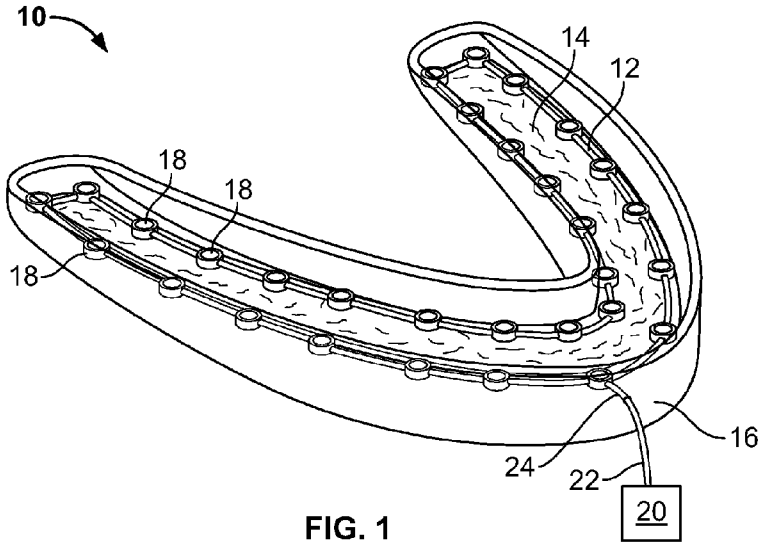

FIG. 1

(57) **Abstract**: Medical and veterinary applications of light to therapeutic compounds include a solution retainer adapted to retain a therapeutic solution against a tissue of a user; a fiber optic cable; a light source that connects with the fiber optic cable and provides a light of a predetermined wavelength to the fiber optic cable; and a light termination on the fiber optic cable that exposes the light to the therapeutic solution. A formulation includes an oxidizer; the therapeutic solution having an initial therapeutic effectiveness; and a light of a predetermined frequency that that undergoes a synergistic reaction with the oxidizer, thereby enhancing the initial therapeutic effectiveness of the solution.

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MEDICAL AND VETERINARY APPLICATIONS OF LIGHT TO THERAPEUTIC COMPOUNDS

RELATED APPLICATIONS

[00001] This application claims the benefit of the filing date of United States Patent Application Number 62/026,498, filed 7/18/2014, (P679-104) which is incorporated herein by reference in its entirety, United States Patent Application Number 14/497,269, filed 9/24/2014, (P679-104A) which is incorporated herein by reference in its entirety; United States Patent Application Number 14/536,633, filed 11/9/2014, (P679-104B) which is incorporated herein by reference in its entirety; United States Patent Application Number 14/583,580, filed 12/26/2014, (P679-104C) which is incorporated herein by reference in its entirety, United States Patent Application Number 14/630,513, filed 2/24/2015, (P679-104E) which is incorporated herein by reference in its entirety; United States Patent Application Number 14/638,902, filed 3/4/2015, (P679-104F) which is incorporated herein by reference in its entirety; and United States Patent Application Number 14/697,579, filed 4/27/2015, (P679-104D) which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

[00002] The present invention generally relates to therapy including enhancement of chemical effects with light and more specifically to medical and veterinary applications of light to antimicrobial and antineoplastic chemicals including antimicrobial and antineoplastic solutions.

[00003] Microbes exist that cause harm or disease in living tissues of humans and animals. Tumors or neoplasts such as cancer also cause harm to the tissues of humans and animals.

[00004] Light of certain wavelengths has been demonstrated to improve or "super-charge" the effects of certain pharmaceuticals or target chemicals, such as antimicrobial and antineoplastic agents, creating a synergistic effect to destroy or inhibit microbial or neoplastic growth.

[00005] It would be desirable to add light of certain wavelengths to certain antimicrobial or antineoplastic agents or both so a synergistic effect can be created to destroy or inhibit microbial growth or tumors.

SUMMARY OF THE INVENTION

[00006] In one aspect of the present invention, a device includes a solution retainer adapted to retain a therapeutic solution against a tissue of a user; a fiber optic cable; a light source that connects with the fiber optic cable and provides a light of a predetermined wavelength to the fiber optic cable; and a light termination on the fiber optic cable that exposes the light to the therapeutic solution.

[00007] In another aspect of the present invention, a formulation includes a solution that includes an oxidizer; the therapeutic solution having an initial therapeutic effectiveness; and a light of a predetermined frequency that that undergoes a synergistic reaction with the oxidizer, thereby enhancing the initial therapeutic effectiveness of the solution.

BRIEF DESCRIPTION OF THE DRAWINGS

[00008] FIG. 1 depicts an embodiment of a dental device according to the present invention;

[00009] FIG. 2 depicts an embodiment of a container according to the present invention;

[00010] FIG. 3 depicts an embodiment of a bowl according to the present invention;

[00011] FIG. 4 depicts an embodiment of a full body suit according to the present invention;

[00012] FIGs. 5A-5E depict embodiments of garments according to the present invention;

[00013] FIG. 6 depicts an embodiment of a helmet according to the present invention;

[00014] FIG. 7 depicts a catheter according to the present invention;

[00015] FIG. 8 depicts an embodiment of a horse blanket according to the present invention; and

[00016] FIGs. 9A-9C depict embodiments of animal covers according to the present invention.

DETAILED DESCRIPTION

[00017] The preferred embodiment and other embodiments, which can be used in industry and include the best mode now known of carrying out the invention, are hereby described in detail with reference to the drawings. Further embodiments, features and advantages will become apparent from the ensuing description, or may be learned without undue experimentation. The figures are not necessarily drawn to scale, except where otherwise indicated. The following description of embodiments, even if phrased in terms of "the invention" or what the embodiment "is," is not to be taken in a limiting sense, but describes the manner and process of making and using the invention. The coverage of this patent will be described in the claims. The order in which steps are listed in the claims does not necessarily indicate that the steps must be performed in that order. The phrase "and/or" between two elements means the first element alone, the second element alone, or both elements together.

[00018] Embodiments of the present invention generally provide devices and therapeutic solutions for medical and veterinary applications of light to therapeutic compounds.

[00019] Embodiments of the present invention generally provide a drug having an effectiveness that is enhanced by shining light of a predetermined frequency onto the drug.

[00020] An embodiment of the present invention may provide a device to hold solutions in contact with tissues, such as flesh, teeth, or animal's flesh, while the tissues and solutions are simultaneously being exposed to certain wavelengths of light. This device may have a component that amplifies the effect of the antimicrobial solutions by using a certain wavelength of light. The antimicrobial, antineoplastic, or other therapeutic solution may or may not be light activated at any given time. When the light is on, the therapeutic solution is "supercharged" by the light. This synergistic effect eliminates or reduces more microbes than the solution acting alone.

[00021] Embodiments of a therapeutic solution may hold oxidizers, antimicrobials or antineoplastics in contact with tissues, such as a human's or animal's flesh, while the tissues and solution are simultaneously being exposed to certain wavelengths of light. Embodiments may have a component that amplifies the effect of antimicrobial, antiviral, and antineoplastic solutions by using a certain wavelength of light. When the light is applied to the solution, the solution is "supercharged" by the light. This synergistic effect eliminates or reduces more microbes or tumors than the solution acting alone. This may be accomplished by various means including light directly from a light source, or from a light source in combination with a dental tray or other tray or container, a mask, a bandage, a horse blanket or animal covering, or a device for applying antimicrobial or antineoplastic chemicals for therapy.

[00022] Microbes exist that cause harm or disease in living tissues. By adding a light of certain wavelengths to a device that holds certain therapeutic agents in close proximity to tissues, a synergistic effect can be created to destroy or inhibit microbial or neoplastic growth. For example, in an oral cavity, this device could be a tray designed to cover the teeth and gingival. This tray would emit certain wavelengths of light that when combined with certain antimicrobial and/or antineoplastic solutions in the tray would cause a synergistic antimicrobial and/or antineoplastic effect. The light could be produced, for example, from a light emitting diode (LED) or laser. An external light source could be connected to the fiber optic cable in the solution holding apparatus with a fiber optic connection cable that may also include a fiber optic connection interface or plug.

[00023] Embodiments of the present invention may create another means to treat disease. Super charging antimicrobial or antineoplastic solutions with certain wavelengths of lights may cause the solutions to eliminate or reduce microbes and/or neoplastic tissue at a higher percentage than the solution alone. Embodiments may create a synergistic effect between certain wavelengths of light and antimicrobial and/or antineoplastic solutions that when applied to tissues eliminates or reduces disease causing microorganism sand or neoplastic tissue.

[00024] Embodiments of the present invention may consist of a solution-holding apparatus or medium that emits certain wavelengths of light into the solution. When this light and solution combination is applied to tissues, a synergistic effect is created that reduces or eliminates microorganisms and/or neoplastic tissue that cause disease. The essential components are 1. The

solution holding apparatus 2. A light source 3. An antimicrobial solution or antineoplastic solution or both.

[00025] Embodiments may utilize blue light, or another certain predetermined wavelength of light that supercharges the solution, with an exposure from a few second to minutes. Embodiments may also include an H2O2 solution, such as a gel, with concentration of 0.3 mM or any concentration of solution that is suitable such as an antimicrobial, antiviral, or antineoplastic agent or compound.

[00026] In an embodiment, for safety, a "scalding chart" might indicate that water of 130 degrees Fahrenheit is safe under an exposure of 30 seconds, but over that it causes burns. Water of 120 degrees Fahrenheit may be safe up to 5 minutes. Hydrogen peroxide (H2O2), when it is exposed to a light of 400-500 nanometers wavelength, may kill 96% of microbes in less than 20 seconds. This solution may work best at 57 degrees Celsius (134 degrees F).

[00027] Alternate embodiments may include heating elements that warm and further super-charge the therapeutic solution. In embodiments, a device may contain heating or cooling components or both. In an embodiment, an antimicrobial solution may be preheated to an ideal or optimal temperature before it is exposed to synergizing light or used at a pH that may or may not vary. For example, Hydrogen peroxide may preferably be exposed to a light of 400-500 nanometers at 57 degrees Celsius (134 degrees F) for less than 20 seconds. Other chemicals may have different preferred temperatures and pH.

[00028] Embodiments of a medical or veterinary device may include integrated or internal heating elements that run adjacent to the light emitting cable in the device. Embodiments of integrated heating elements may be located in only a portion of the device, such as at the bottom of a container, garment, or cover. Heating elements may draw power from the same source as the light source, such as batteries or wall power. Power may be supplied to the heating elements in the device through the fiber optic connection cable or through a power connection cable that runs alongside the connection cable.

[00029] Alternate embodiments of heating elements may be separate from the portion of the device that retains the therapeutic solution. Separate heating elements may warm the therapeutic solution to an optimal temperature before the solution is added to the device, such as

with a heating tray or oven, or may be used to apply heat to the antimicrobial and/or antineoplastic solution in place, such as with a hot iron or wire.

[00030] Embodiments of a device may include a light emitting fiber optic cable that may expose the therapeutic solution to a certain wavelength of light, such as a purposefully selected wavelength or frequency of light from an LED or laser. A cover may hold the antimicrobial solution. An embodiment may include a plurality of light terminations or other light emitters on the light emitting fiber optic cable. Each light termination taps into the fiber optic cable to pipe some of the light out the end of the termination, thereby emitting light into the therapeutic solution. The device may be adjustable, so that the terminations can be added or moved, or the quantity and locations of the light terminations may be measured to fit an individual user. The light terminations may be located within or on the surface of the cover so that each light termination is will be positioned in a preselected location within the retainer, such as near portions of tissue to be treated. The fiber optic cable may be opaque with light emitters spaced along its length, or may be at least partially translucent to emit light along its length. A user may be a human or an animal.

[00031] In an embodiment, a fiber optic cable may connect to a light source through a fiber optic connection cable. The connection cable may enter the retainer or cover and optically connect with the fiber optic cable through a fiber optic connection interface so that the light source can be attached and removed after use. An embodiment of the interface may include a fiber optic connection cable fixed to the fiber optic cable. Another embodiment of the interface may include a socket that mates with a plug on the connection cable so that the light source can be attached and removed after use.

[00032] An embodiment may include a device with a light source and antimicrobial and/or antimicrobial solution. Embodiments may include various human or animal body or body part coverings.

[00033] An embodiment of the present invention may include a retainer or covering that applies the therapeutic solution to a human, horse or other animal. The retainer may be connected to a light source. Embodiments may contain a multitude of fiber optic terminations. retainer may have a heating element.

[00034] Embodiments of a retainer may include: a dental tray that retains an antimicrobial, antineoplastic, or other therapeutic solution against a user's teeth; a medical solution

retainer adapted to retain an antimicrobial or antineoplastic solution against a human user's tissue; a bucket or container; a bowl; a full body suit; an arm sleeve; a glove; a leg stocking; a toe cap; a helmet; a catheter tube; a medical or therapeutic solution retainer adapted to retain an antimicrobial or antineoplastic solution against an animal's tissue; a blanket for horses or other animals; or a covering for limbs or parts of an animal.

[00035] Embodiments may include a fiber optic cable that wraps around the inside surface of the device. The fiber optic cable may have light terminations spaced along the fiber optic cable inside the device. An embodiment may include a heating element inside the device. The heating element may include heating wires inside the device that run adjacent to the fiber optic cable. The fiber optic cable may connect through a connection cable to a light source. A connection interface or plug may connect and release an external light source from the device. The heating element may receive power from the light source, through the same light source connection cable or through a separate power connection cable. A switch may allow the light source, the heating power, or both to be connected yet switched on or off.

[00036] To use an embodiment, a therapist may apply a therapeutic solution to the inside of the device, then put the device on a human or animal to receive therapy. The therapist may turn on the heater or light source or both.

[00037] Embodiments of a therapeutic solution may include an antimicrobial, antiviral, antineoplastic compound that is in contact with human or animal skin. This solution may be in a liquid, gel, mist, cream or other appropriate form. The solution may or may not be heated by the device. Embodiments may or may not includes compounds that adjust the pH of the solution.

[00038] Embodiments may contain a light source emitting a light of certain wavelengths which may be 400-500nM. This light source may be hand help. The light source may be in contact with the therapeutic solution or it may be held or placed within an effective distance. The combination of antimicrobial and/or antineoplastic solution and a certain wavelength of light may create a synergistic effect causing a reaction that is greater than the sum of the reaction of the components individually (a synergistic effect). Embodiments of this combination of light of a certain wavelength and an antimicrobial and/or antineoplastic solution may be utilized to treat acne, actinic keratosis, or any other skin or systemic condition or disease.

[00039] Once applied, the antimicrobial, antiviral, antineoplastic, or other therapeutic chemical may be exposed to a wavelength of light that creates a synergistic effect enhancing the effectiveness of the therapeutic chemical. This synergistic effect causes a greater reduction in bacteria associated with bacteria or tumors associated with cancer than the applications of the therapeutic solution alone or the light alone.

[00040] In an embodiment, a chemical may be used without a reservoir. The chemical may be inserted directly into the body cavity and exposed to light by a fiber optic wand with a plurality of light emitting fibers. Embodiments of a carrier or reservoir may be the solution itself or a gel. This gel could be inserted in a body cavity with a catheter and exposed to the synergizing light by the same catheter or a different catheter. Delivery devices may include, but are not limited to, reservoirs, bandages, gels, solutions, head coverings, animal covers, wraps, socks, stockings, hats, helmets, mists, suits, tents, probes, or catheters.

[00041] Hydrogen peroxide (H2O2) can be either an oxidizing agent or a reducing agent. When H2O2 serves as an oxidizing agent, the oxygen is reduced to H2O. When H2O2 serves as a reducing agent, the oxygen is oxidized to O2 and bubbles are noticed. Embodiments of the present invention may utilize H2O2 and formulations of H2O2 as an oxidizing agent or a reducing agent to provide an antimicrobial effect, antineoplastic effect and/or antiviral effect. A formulation or drug will include an "oxidizer" if it includes H2O2.

[00042] An embodiment of the drug consists of a number of ingredients that include light of certain wavelengths and chemicals that alone or in combinations inhibit, retard and/or stop microbial, and/or viral and/or neoplastic growth. The drug may resemble antimicrobial and/or antiviral and/or antineoplastic chemicals in terms of its chemical and functionality profiles in vivo. The drug may have light as one of its ingredients. It reliably produces antimicrobial and/or antiviral and/or antineoplastic like effects in humans and other animals at clinically prescribed doses. It is designated as light of a certain wavelength containing at least one or more of the following chemicals; H2O2, lauric acid, dodecanoic acid, topical antibiotics, topical anesthetics, nicotinic acid, nicotinamide, antimicrobials such as clindamycin phosphate, Methyl 7-chloro-6,7,8-trideoxy-6-(1-methyl-trans-4-propyl-L-2-pyrrolidinecarboxamido)-1-thio-L-threo-α-D-galacto-octopyranoside 2-(dihydrogen phosphate), salicylic acid, sulfur, retinoids such as 6-[3-(1-adamantyl)-4-methoxy-

phenyl] naphthalene-2-carboxylic acid, Alpha Hydroxy acids, tretinoin, borax, caprylic acid, capric acid, myristic acid and additional chemicals useful in said method.

[00043] The dosage forms of the present invention may comprise a compound consisting of certain wavelengths of light and one or more of the following chemicals: H2O2, lauric acid, dodecanoic acid, topical antibiotics, topical anesthetics, nicotinic acid, nicotinamide, antimicrobials such as clindamycin phosphate, Methyl 7-chloro-6,7,8-trideoxy-6-(1-methyl-trans-4-propyl-L-2-pyrrolidinecarboxamido)-1-thio-L-threo-α-D-galacto-octopyranoside 2-(dihydrogen phosphate), salicylic acid, sulfur, retinoids such as 6-[3-(1-adamantyl)-4-methoxy-phenyl] naphthalene-2-carboxylic acid, Alpha Hydroxy acids, tretinoin, borax, caprylic acid, capric acid, myristic acid and additional chemicals useful in said method including pharmaceutically acceptable carriers.

[00044] Embodiments of a target chemical may include a compound with one or more of an antimicrobial, a biocidal or a disinfectant. Embodiments of an antimicrobial may include a chlorhexidine compound. Embodiments of a target chemical may include a non-steroidal anti-inflammatory compound, such as, for example, an indene derivative. Embodiments of a target chemical may include an iodine compound. Embodiments of a target chemical may include a Tumor Necrosis Factor or a member of the TNF family of cytokines. Embodiments of a target chemical may include a metal such as silver (Ag) or a transition metal such as Cu or Fe. Embodiments of a target chemical may include an enzyme. Embodiments of an enzyme may include one or more of protease, pectinase, or elastase. Embodiments of a target chemical may include an antineoplastic. Embodiments of a target chemical may include an antibiotic, such as, for example, ciprofloxacin. Embodiments of a target chemical may include an antispasmodic, such as, for example, methylene bicloride.

[00045] In an embodiment, a first reaction may include light of a certain wavelength, such as 400-500 nanometers, combined with an oxidizer, such as hydrogen peroxide. The light plus oxidizer may be a treatment all by itself. A second reaction may include light of a certain wavelength combined with an oxidizer, further combined with a target chemical undergoing a synergistic reaction. Embodiments of a drug may include an oxidizer that has been light-enhanced, and a target chemical that has been light-enhanced, to provide a drug that has a light-enhanced therapeutic effectiveness. The drug may be a solution that is held in contact with a user while the light is

applied is applied from a light source, or the solution may be light-enhanced before application. The light may include two frequencies of light that are applied to simultaneously applied to a drug or solution, or a first frequency of light may be applied and then a second frequency of light may be applied in series.

[00046] The selected target chemical may be used in combination with surfactants, wetting agents chelating agents, or useful ingredients. Embodiments of medical drugs may be used in tablet, pill, capsule, gel, liquid, spray, mist, cream, or paste form. Embodiments may be used at varying temperatures to modulate their efficacy.

[00047] Dental. FIG. 1 depicts an embodiment of a dental device 10. A light emitting fiber optic cable 12 may expose the antimicrobial solution 14 to a certain wavelength of light, such as a purposefully selected wavelength or frequency of light from an LED or laser. A tray 16 may hold the antimicrobial solution 14. An embodiment may include a plurality of light terminations 18 or other light emitters on the light emitting fiber optic cable 12. Each light termination 18 taps into the fiber optic cable 12 to pipe some of the light out the top of the termination, thereby emitting light into the antimicrobial solution 14. The device may be adjustable, so that the terminations 18 can added or moved, or the quantity and locations of the light terminations 18 may be measured to fit an individual user. The light terminations 18 may be located within the tray 16 so that each light termination 18 is will be positioned between adjacent teeth or adjacent to a tooth of the user. The fiber optic cable may be opaque with light emitters spaced along its length, or may be at least partially translucent to emit light along its length. In an embodiment, the fiber optic cable 12 may connect to a light source 20 through a fiber optic connection cable 22. The connection cable 22 may enter the tray 16 and optically connect with the fiber optic cable 12 through a fiber optic connection interface 24 so that the light source 20 can be attached and removed after use. An embodiment of the interface 24 may include an aperture in a wall of the tray 16 with a fiber optic connection cable 22 fixed to the fiber optic cable 12. Another embodiment of the interface 24 may include a socket on the tray 16 that mates with a plug on the connection cable 22 so that the light source 20 can be attached and removed after use.

[00048] Container. As depicted in FIG. 2, an embodiment of a medical device 30 may include a container 32 having a wall 34, a bottom 36, and a carrying handle 38. Embodiments may include a fiber optic cable 40 that wraps up the inner surface of the wall 34. Light terminations 42

may be located on the fiber optic cable 40 inside the container. A heating element 44 may be located around the bottom of the container 32. The fiber optic cable 40 may connect to a light source 46 through a fiber optic connection cable 48.

[00049] Bowl. As depicted in FIG. 3, an embodiment of a medical device 50 may include a bowl 52 with a fiber optic cable 54 that wraps around an inside surface 56 of the bowl 52. The fiber optic cable 54 may have light terminations 58. Embodiments may have a base 60, which may contain a heating element 62. The fiber optic cable 54 may connect to a light source 64 through a fiber optic connection cable 66. The light source 64 may include an off/off switch 68 or a timer control 69.

[00050] Full Body Suit. As depicted in FIG. 4, an embodiment of a medical device 70 may include a full body suit 72 having an integrated torso portion 74, sleeves 76, pants 78, feet 80, and a hood 82, and removable gloves 84 or mittens 86. The sleeves 76 may have cuffs 88 to tighten against the user's wrists. The hood 82 may have elastic portions 90 to tighten against the user's face. Embodiments may include an input tube 92, such as on one shoulder of the torso portion 74, and an exhaust tube 94 on the opposite shoulder of the torso portion 74. Embodiments may include a fiber optic cable 96 spaced along the inner fabric of the suit 72. Light terminations 98 may be located on the fiber optic cable 96 inside the suit 72. A heating element may be embedded within the fabric of the suit 72. The fiber optic cable 96 or heating element or both may connect to a light source through a fiber optic connection cable.

[00051] Garments. FIGs. 5A, 5B, 5C, 5D and 5E depict embodiments of medical devices including garments to carry light-enhanced antimicrobial solution to a user wearing the garment. FIG. 5A depicts an embodiment of an arm sleeve 122. FIG. 5B depicts an embodiment of a glove 124. FIG. 5C depicts an embodiment of a toe cap 126. FIG. 5D depicts an embodiment of a thigh-high stocking with a toe covering 128 or without a toe covering 130. FIG. 5E depicts an embodiment of a one foot stocking 132 with waist band 134.

[00052] Helmet. As depicted in FIG.6, an embodiment of a medical device 140 may include a helmet 142 with a fiber optic cable 144 that wraps around an inside surface 146 of the helmet 142. The fiber optic cable 144 may have light terminations 148. Embodiments may include heating elements 150 which may include wires in a lining of the helmet. The fiber optic cable 144 may connect to a light source 152 through a fiber optic connection cable 154.

[00053] Catheter. As depicted in FIG.7, an embodiment of a medical device 160 may include a catheter 162 having a catheter tube 164, a mesh dispenser screen 166, and a fiber optic cable 168 having one or more light terminations 170. A heating element 172 may be external to the catheter tube 164, and may provide heated antimicrobial solution 174 through an input tube 176. A light source 178 may be connected through a fiber optic connection cable 180 to the fiber optic cable 168 with a fiber optic connection interface 182.

[00054] Horse blanket. As depicted in FIG. 8, an embodiment of a full horse blanket 200 may include a cover portion 202, a neck portion 204, and an upper legs portion 206. A blanket 200 may include straps 208 to hold the cover closed. The blanket 200 may be coated on the inside with an antimicrobial solution or gel. Embodiments may include a fiber optic cable 210 that wraps around the inside surface the cover portion 202. Embodiments may include a heating element 212, which may include heating wires inside the cover portion 202. Embodiments may include a connection interface 214 that connects the fiber optic cable 210 to a light source 216. Light terminations 218 may be located on the fiber optic cable 210 inside the blanket 200. The light source 216 may have an on/off switch 220 or timer control .

[00055] Animal cover. As depicted in the embodiments of FIGs. 9A, 9B, and 9C, an animal cover 230 may include a sheet 232 of soft plastic, and an attachment mechanism 234 at one end of the sheet 232. The cover 230 may be wrapped around an animal's neck and the attachment mechanism 234 on one end of the sheet 232 may attach to the other end of the sheet 232 to form a loop. Embodiments may include a soft fabric trim 46 at the top and bottom sides, where the cover 230 rubs against the animal or other objects. The cover 230 may be coated on the inside with an antimicrobial solution or gel. Embodiments may include a fiber optic cable 238 that wraps around the inside surface the sheet 232. Embodiments may include a heating element 240, which may include heating wires inside the cover. Embodiments may include a connection interface 228 that connects the fiber optic cable 238 to a light source 242. Light terminations 244 may be located on the fiber optic cable 238 inside the blanket. The light source 230 may have an on/off switch 246 or timer control.

[00056] Embodiments of a method of treating acne vulgaris ("acne") may include administering a therapeutically effective amount of a peroxide solution with light of a certain wavelength range that may be used in combination with one or more other antimicrobials or other

chemicals that may consist of topical antibiotic, topical anesthetic, nicotinic acid, nicotinamide, antimicrobials such as clindamycin phosphate, Methyl 7-chloro-6,7,8-trideoxy-6-(1-methyl-trans-4-propyl-L-2-pyrrolidinecarboxamido)-1-thio-L-threo-α-D-galacto-octopyranoside 2-(dihydrogen phosphate). Embodiments of an antimicrobial may include salicylic acid, sulfur, retinoids such as 6-[3-(1-adamantyl)-4-methoxy-phenyl] naphthalene-2-carboxylic acid, glycolic acid, tretinoin, borax, and additional chemicals useful in said method. Embodiments of topical and systemic agents may be utilized as therapeutic chemicals in embodiments of the present invention for the treatment of acne, including hydrogen peroxide, carbamide peroxide, sulfur, retinoids such as 6-[3-(1-adamantyl)-4-methoxy-phenyl] naphthalene-2-carboxylic acid, glycolic acid, borax, resorcinol, salicylic acid, benzoyl peroxide, vitamin A acid (tretinoin) and topical and systemic antibiotics. Embodiments including combinations of various peroxide compounds with certain chemical agents may be effective in treating acne, and have a synergistic effect in treating acne that is greater than the effect expected by treatment with the individual agents themselves. This synergistic effect has an even greater synergistic effect when exposed to certain wavelengths of light. The second chemical may be a therapeutic chemical or acne-therapeutic chemical because it contains elements which are helpful in reducing acne and are used in an acne treatment or acne-related therapy.

[00057] As an example, research has shown that embodiments with hydrogen peroxide may kill 30% of bacteria that are exposed to it for 20 seconds. Light of the wavelength 360nM – 500nM may kill 3% of bacteria that are exposed to it for 20 seconds. Hydrogen peroxide in combination with light of 360nM – 500nM may exhibit a synergistic reaction that kills 96% of bacteria exposed to this combination for 20 seconds. Formulations of the solutions used in embodiments of this invention may include combinations of hydrogen peroxide and/or carbamide peroxide and/or benzoyl peroxide and one or more of sulfur, retinoids such as 6-[3-(1-adamantyl)-4-methoxy-phenyl] naphthalene-2-carboxylic acid, glycolic acid, borax, resorcinol, salicylic acid, vitamin A acid (tretinoin) and topical and systemic antibiotics.

[00058] In an embodiment of this invention, topical solutions of hydrogen peroxide and/or carbamide peroxide and/or benzoyl peroxide and other chemicals deemed effective may be delivered in various organic vehicles or carriers. Embodiments of carriers may include a combination of ethyl alcohol and propylene glycol in which the active ingredient may present in the range of from about 0.001% to about 50% by volume of the carrier. The pH of the solution may be

adjusted so that tissue sensitivity is minimized while the effectiveness of the solution is not hampered. The temperature of the solution may be adjusted to optimize its effectiveness.

[00059] For safety and for optimizing effectiveness of the solution, a "scalding chart" might be provided or used. This chart may indicate that water of 130 degrees is safe under an exposure of 30 seconds, but over that it causes burns. Water of 120 10 degrees may be safe up to 5 minutes. Solutions warmer than normal body temperature will tend to open pores exposing bacteria to greater amounts of the solution. Systemic antimicrobial agents may be used as a part of an embodiment of this treatment to increase its effectiveness. The solution may be exposed to light in a wavelength of 360 nM- 600 nM or any other wavelength that proves effective for a certain time that may range from 1 second to 1 minute. Embodiments may include a solution that may be warmed, and light creates the synergistic effect that is unique to this invention. This light may be used in varying distances from the solution to modulate its synergistic effect.

[00060] In an additional embodiment, topical solutions of peroxide compounds may include hydrogen peroxide and/or carbamide peroxide and/or benzoyl peroxide in various organic carriers in concentrations that may range from 0.001 to 50% by volume of the carrier. In embodiments, the compounds may be incorporated into various vehicles or carriers including solutions, lotions, creams, gels, mists, pastes and ointments along with one or more of the following ingredients: nicotinic acid or nicotinamide that may be present in concentrations from 0.001% to 30% by volume of the carrier; erythromycin base in concentrations that may present from 0.001% to about 30% by volume of the carrier; clindamycin phosphateMethyl 7-chloro-6,7,8-trideoxy-6-(1-methyl-trans-4-propyl-L-2-pyrrolidinecarboxamido)-1-thio-L-threo-α-D-galacto-octopyranoside 2-(dihydrogen phosphate). Embodiments may have concentrations of from 0.001 to 30% by volume; tetracycline hydrochloride in concentrations of from 0.001 to 30% by volume of the carrier; retinoids such as 6-[3-(1-adamantyl)-4-methoxy-phenyl] naphthalene-2-carboxylic acid; and other ingredients deemed effective in treating acne vulgaris. In embodiments, such carriers may be useful for the incorporation of carbamide peroxide and may include combinations of ethyl alcohol and propylene glycol, surface active agents such as lauryl ethers and lauryl esters, and other carriers effective for this invention. Applications of the carrier and effective ingredients may be made to the face or other infected areas of acne patients. This treatment may be applied at varying intervals such as 1 to 4 times in a 24 hour period with the result that open and closed comedones (blackheads and

whiteheads), and inflamed lesions are greatly reduced within a period of days to weeks varying with the number of applications per day.

[00061] Embodiments of the present invention may provide an improved method for the treatment of acne vulgaris involving the periodic application of an antimicrobial solution containing an effective amount of peroxide agents alone or in combination with one or more of a topical antibiotic, topical anesthetic, nicotinic acid, nicotinamide, antimicrobials, salicylic acid, sulfur, retinoids such as 6-[3-(1-adamantyl)-4-methoxy-phenyl] naphthalene-2-carboxylic acid, glycolic acid, tretinoin, borax, and additional chemicals useful in said method. This antimicrobial solution may be applied to patients with the inflammatory disease, acne vulgaris. The antimicrobial solution may be adjusted to a temperature that is optimal for this treatment. The antimicrobial solution may be applied over the acne vulgaris lesions and associated inflamed tissue. Once applied, the antimicrobial solution may be exposed to a wavelength of light that creates a synergistic effect enhancing the effectiveness of the antimicrobial solution. This synergistic effect may cause a greater reduction in bacteria associated with acne vulgaris than the applications of the antimicrobial solution alone or the light alone.

[00062] Embodiments of a solution may contain a light activated pigment that may fluoresce when exposed to the wavelength of light used in the treatment. This pigment could indicate to the user that the synergistic effect is occurring.

[00063] The following specific examples help illustrate the present invention, which is not limited to the examples.

[00064] EXAMPLE 1. In one embodiment, a 3% solution of hydrogen peroxide in a gel carrier is prepared. Twice daily topical applications of this solution are administered to an infected area on a patient suffering from acne vulgaris. After application, the solution is exposed to a 360-500 nM wavelength of light for 20 seconds creating a synergistic effect that is greater than the application of the light or the solution alone. This light is applied by a LED device the exposes the patients entire infected area at one time. The solution is then rinsed off with clean water. After two weeks of treatment, the comedone count on the patient, and the inflamed areas that result from an acne infection will have measurably declined. This synergistic effect between the solution and the light is unique to this invention.

[00065] EXAMPLE 2. In another embodiment, a solution of containing 3% hydrogen peroxide, 3% benzoyl peroxide, and salicylic acid are combined in a carrier in cream form. This solution is buffered to a pH of 6. This cream is applied to areas infected with acne vulgaris on a patient one time per daily. Once the cream is applied, it is exposed to a 10 watt, hand help light emitting light in wave lengths from 410nM – 500nM thus creating a synergistic effect between the solution and the light causing a greater reduction in microbes then the light or the solution acting alone. The light may have a termination that radiates this light that is 15mm in diameter. This particular size would enable the patient to target small areas. The exposure time of the light is one minute. This embodiment of the invention may be used to maintain an area that once exhibited an active acne vulgaris infection. This synergistic relationship between the light and the solution is unique to this invention.

[00066] EXAMPLE 3. In yet another embodiment, a solution containing 15% carbamide peroxide, 2.5% clindamycin phosphateMethyl 7-chloro-6,7,8-trideoxy-6-(1-methyl-trans-4-propyl-L-2-pyrrolidinecarboxamido)-1-thio-L-threo-α-D-galacto-octopyranoside 2-(dihydrogen phosphate). Embodiments may include tretinoin are combined in a gel form carrier This carrier solution is heated to 105 degrees Fahrenheit. The warmed solution helps to open the patient's pores once it is applied to the infected area. This solution is applied three times per day. The infected area is exposed to a light of 410nM – 500nM by a lamp that would expose an area with a diameter of 30 centimeters. The infected area and solution are exposed to this certain wavelength of light for 30 seconds. The synergistic effect of the light and solution that may be warmed is greater than the effect of the light or the solution acting individually. This synergistic effect between the light and the solution that may be warmed is unique to this invention.

I CLAIM

1. A device comprising:

a solution retainer adapted to retain a therapeutic solution against a tissue of a user;

a fiber optic cable;

a light source that connects with the fiber optic cable and provides a light of a predetermined wavelength to the fiber optic cable; and

a light termination on the fiber optic cable that exposes the light to the therapeutic solution.

2. The device of claim 1, wherein:

the solution has an initial microbial effectiveness; and

the light undergoes a synergistic reaction with the therapeutic solution, thereby enhancing the antimicrobial effectiveness of the therapeutic solution.

3. The device of claim 1, wherein:

the solution has an initial microbial effectiveness; and

the light undergoes a synergistic reaction with the therapeutic solution, thereby enhancing the antimicrobial effectiveness of the solution.

4. The device of claim 1, wherein the therapeutic solution is hydrogen peroxide, and the light produces a synergistic reaction that enhances an antimicrobial effectiveness of the therapeutic solution.

5. The device of claim 1, wherein the therapeutic solution is an oxidizer combined with a carrier, and the light produces a synergistic reaction that enhances an effectiveness of the therapeutic solution for treating acne vulgaris.

6. The device of claim 1, wherein the therapeutic solution is an antineoplastic, and the light produces a synergistic reaction that enhances an anti-cancer effectiveness of the therapeutic solution.

7. The device of claim 1, further comprising:

a heating element that wraps around an inside of the solution retainer to warm the therapeutic solution during application.

8. The device of claim 1, further comprising:

an external light source to provide the light of a predetermined wavelength;

a fiber optic connection cable that optically connects the light source with the fiber optic cable; and

a socket on the solution retainer that mates with a plug on the fiber optic connection cable so that the light source may be attached and removed.

9. The device of claim 1, wherein the solution retainer includes a dental tray that retains the therapeutic solution in a cavity on a side of the tray;

the fiber optic cable is retained within the tray;

the tissue is a tooth of the user; and

the tray is shaped to hold the lighted therapeutic solution against the tooth;

and the device further comprises a plurality of light terminations on the fiber optic cable that emit light from the fiber optic cable into the therapeutic solution, the light terminations being positioned and of sufficient quantity so that there is at least one light termination adjacent to each of two opposite sides of each tooth.

10. The device of claim 1, wherein the fiber optic cable includes a light-emitting inner core and an outer shield that covers only a portion of the light-emitting inner core so that the light will be directed to the side of the fiber optic cable.

11. The device of claim 1, wherein the solution retainer comprises:

a full body suit for a person;

an input tube to input the therapeutic solution as a mist;

an area within the suit to circulate the mist against a user;

an exhaust tube to the exhaust the mist out of the suit; and

wherein the fiber optic cable wraps up an inner surface of the full body suit..

12. The device of claim 1, wherein the solution retainer comprises a garment selected from the group consisting of:

an arm sleeve to cover and apply the therapeutic solution to an arm of a human user;

a glove to cover and apply the therapeutic solution to a hand or a portion a hand of a human user;

a leg stocking to cover and apply the therapeutic solution to a leg or a portion of a leg of a human user;

a toe cap to cover and apply the therapeutic solution to one or more of toes of a human user;

a helmet to cover and apply the therapeutic solution to a head of a human user; and

a blanket having a cover portion shaped to cover the back, back, shoulders, sides, and rear of an animal, further having straps with fastening elements to releasably hold the blanket closed around the animal.

13. The device of claim 1, the solution retainer includes:

a catheter tube that receives the therapeutic solution at a first end of the catheter tube; and

a mesh on the catheter tube near a second catheter tube end opposite the first end, to dispense the therapeutic solution into the user;

wherein the light termination is located on the fiber optic cable near the mesh.

14. A formulation comprising:

a solution that includes an oxidizer; the therapeutic solution having an initial therapeutic effectiveness; and

a light of a predetermined frequency that that undergoes a synergistic reaction with the oxidizer, thereby enhancing the initial therapeutic effectiveness of the solution.

15. The formulation of claim 14, wherein the therapeutic solution includes a target chemical combined with an oxidizer and the combined solution undergoes a synergistic reaction with the light that enhances an antimicrobial, antiviral, or antineoplastic effectiveness of the therapeutic solution;

wherein the target chemical is selected from the group consisting of:

an antimicrobial, a biocidal, or a disinfectant compound;

an antimicrobial compound that includes chlorhexidine;

a non-steroidal anti-inflammatory compound that includes an indene derivative;

an iodine compound;

a Tumor Necrosis Factor;

a protease, pectinase, or elastase compound;

ciprofloxacin;

an antispasmodic; and

methylene bicloride.

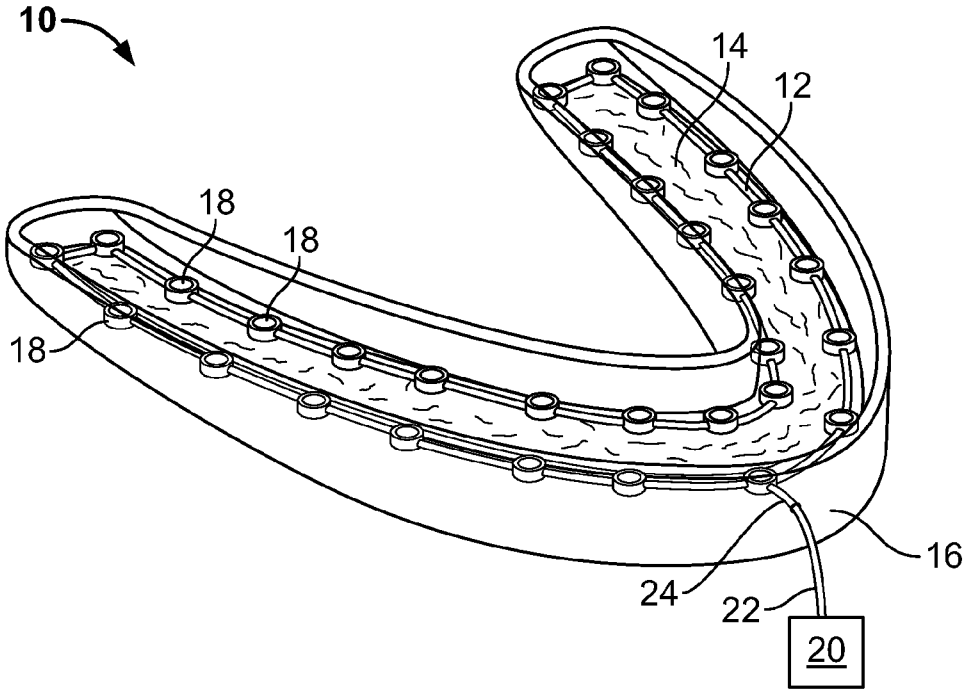

FIG. 1

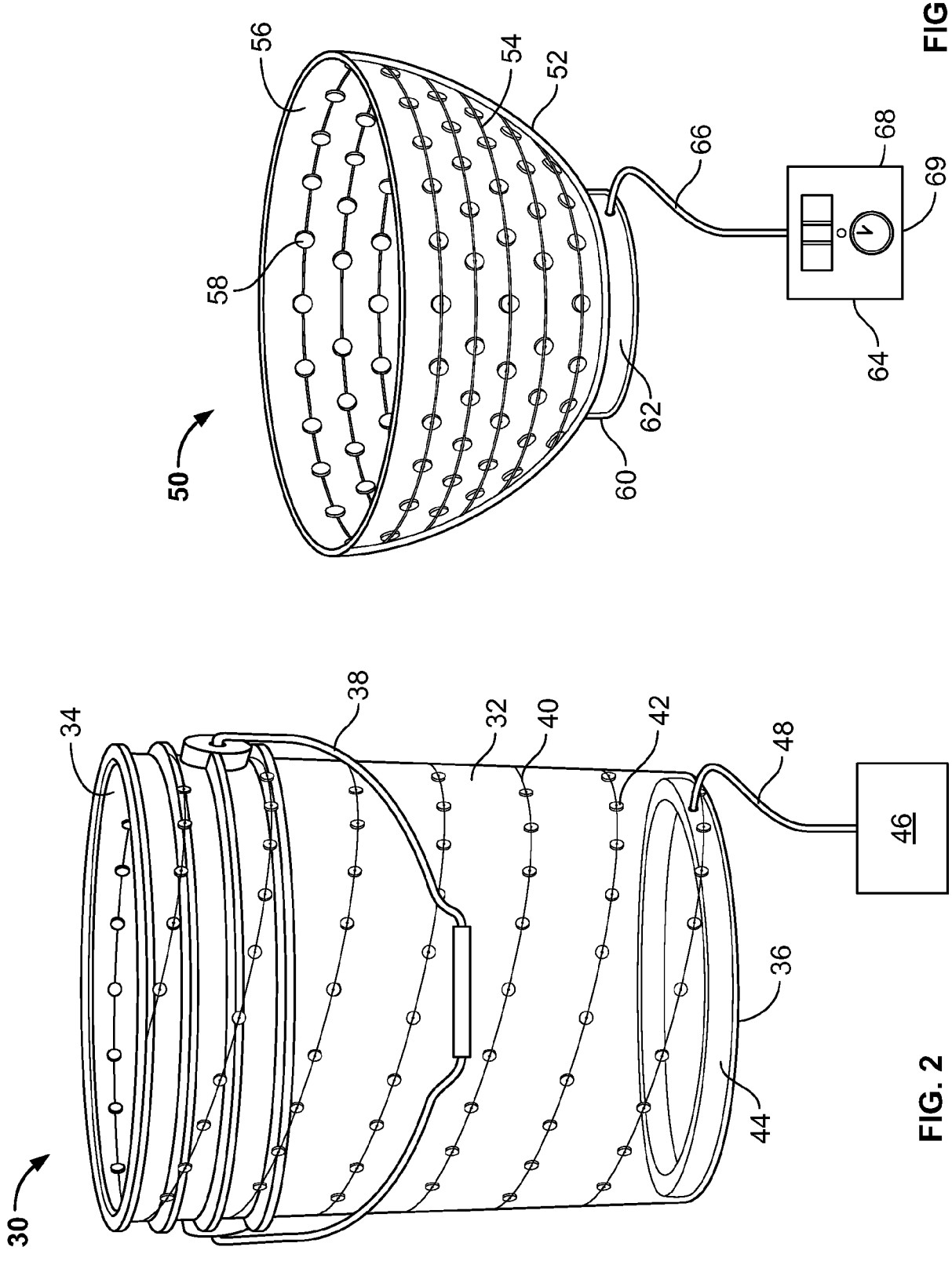

FIG. 2

FIG. 3

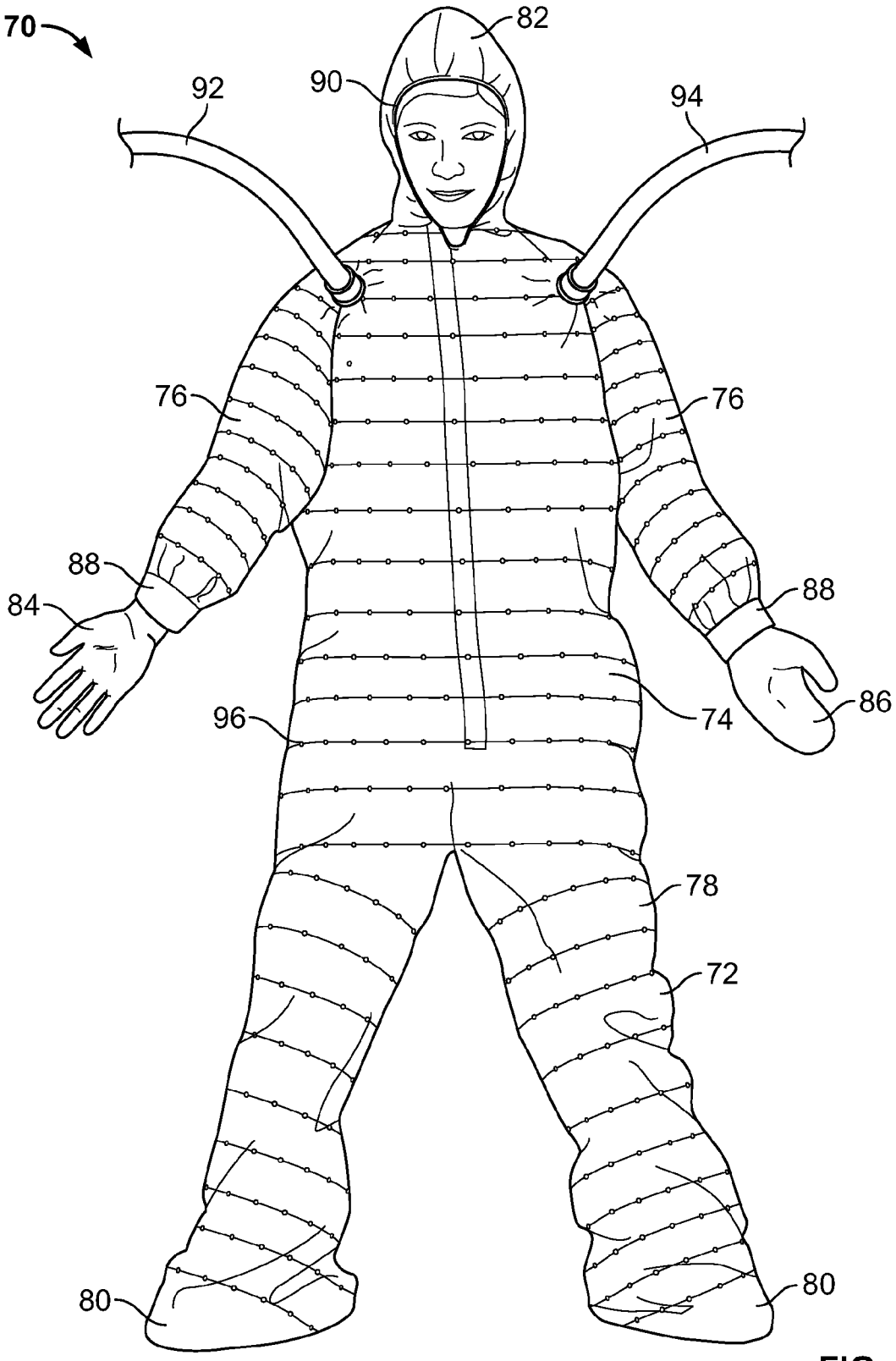

FIG. 4

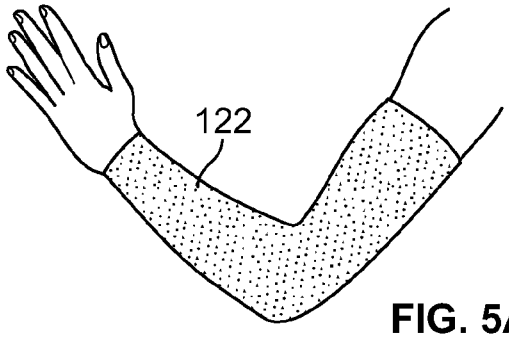

FIG. 5A

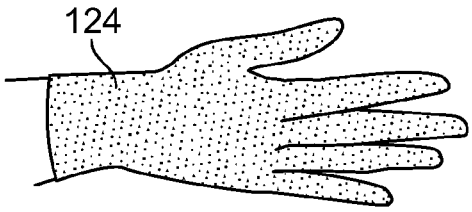

FIG. 5B

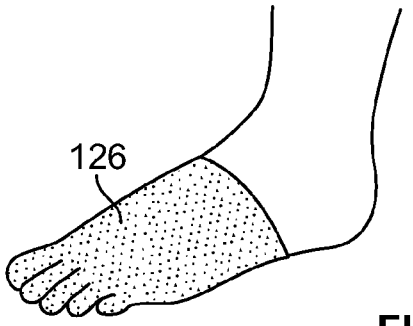

FIG. 5C

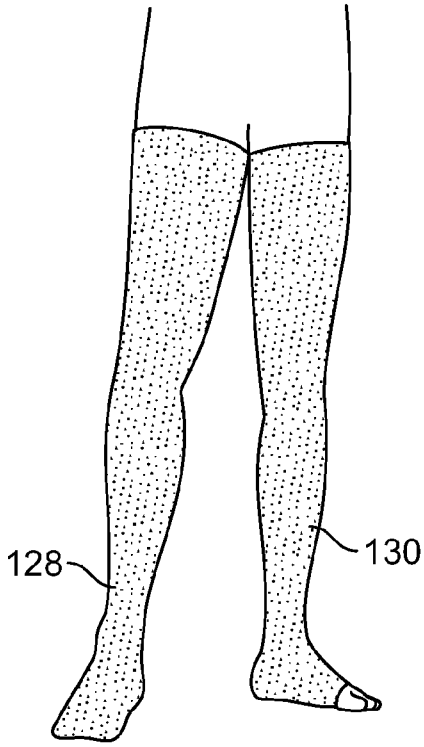

FIG. 5D

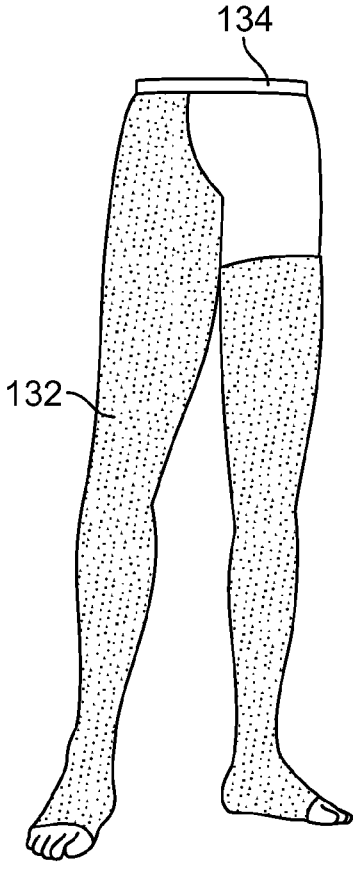

FIG. 5E

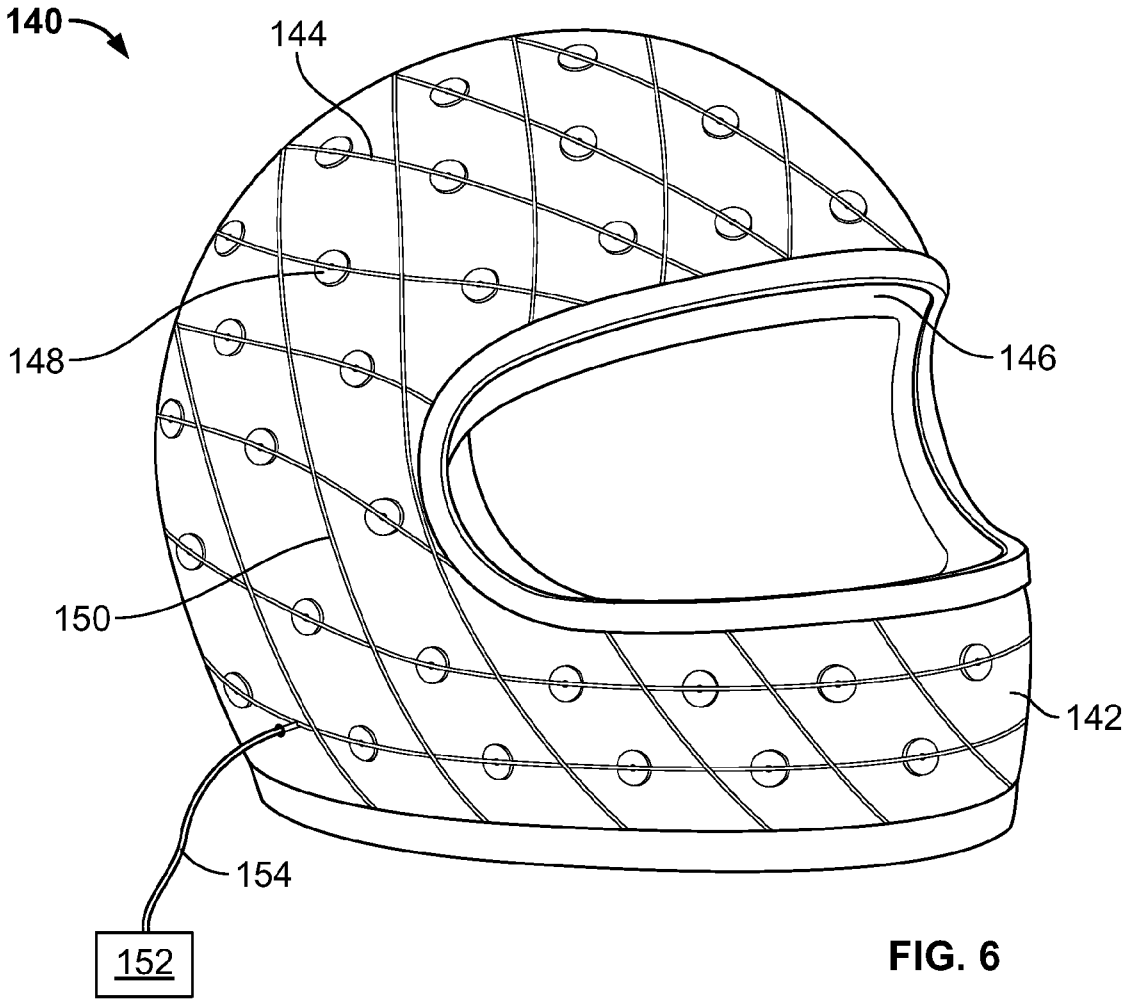
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FIG. 6

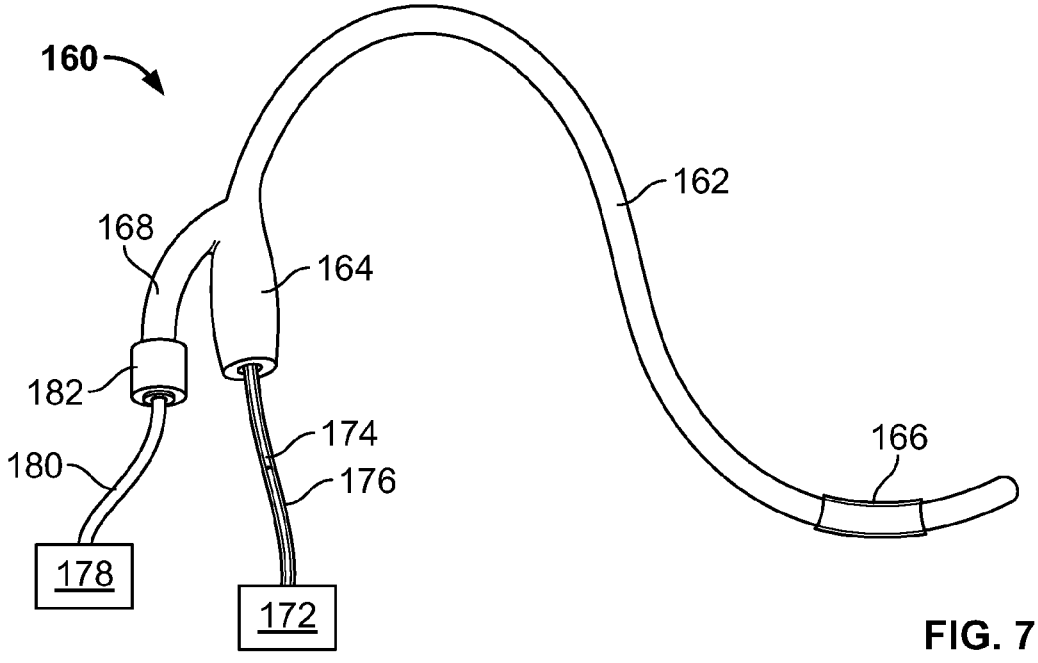
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FIG. 7

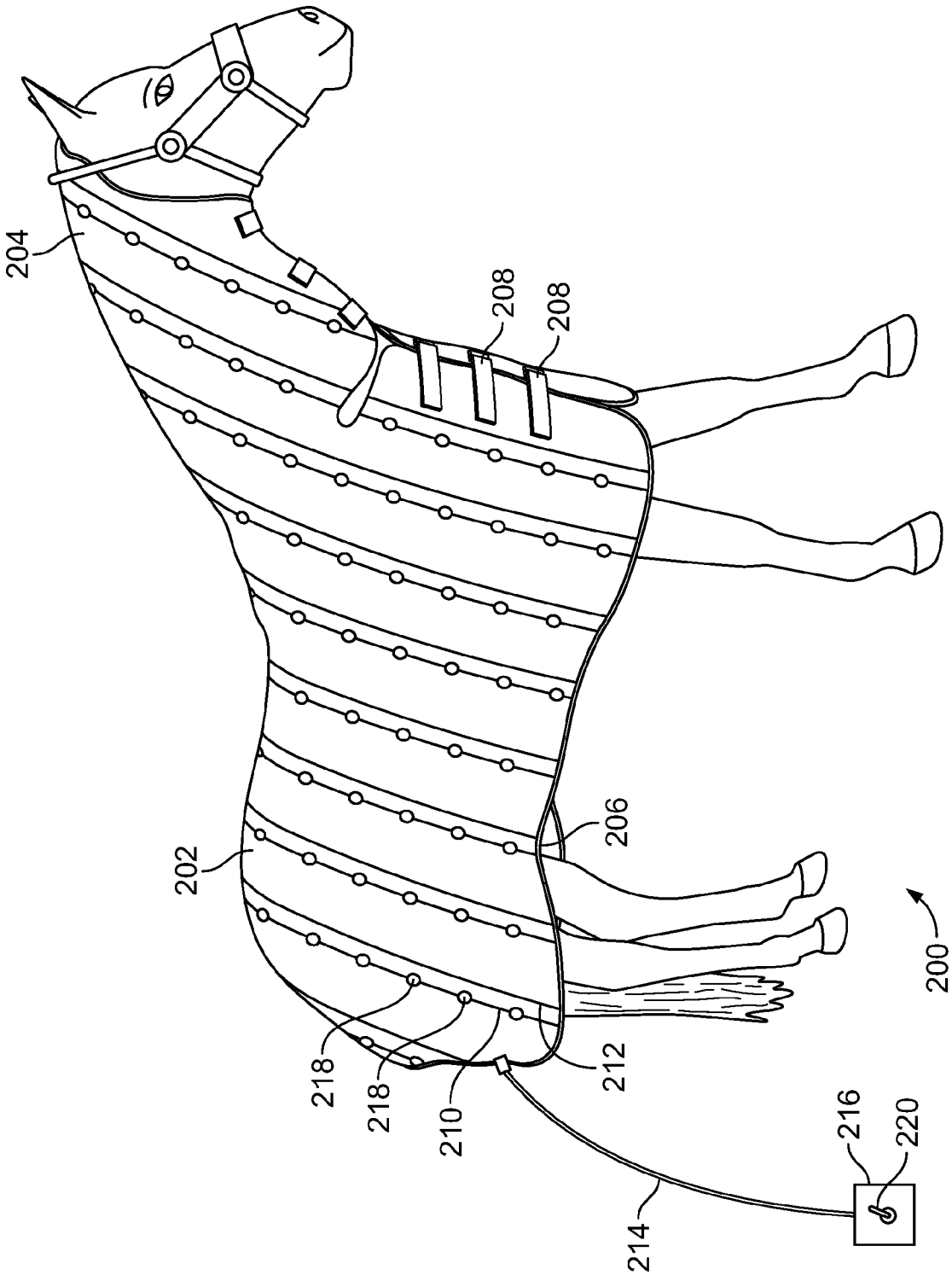

FIG. 8

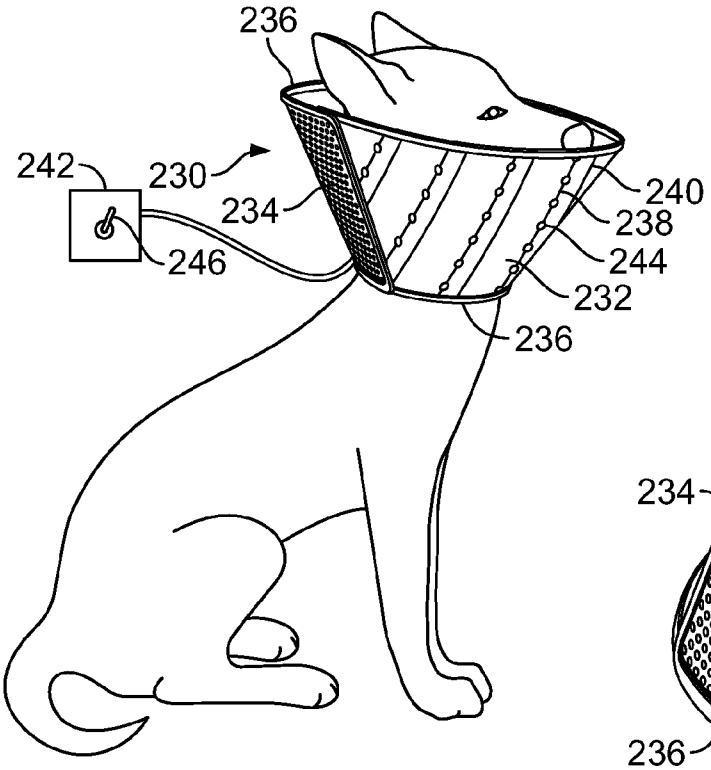

FIG. 9A

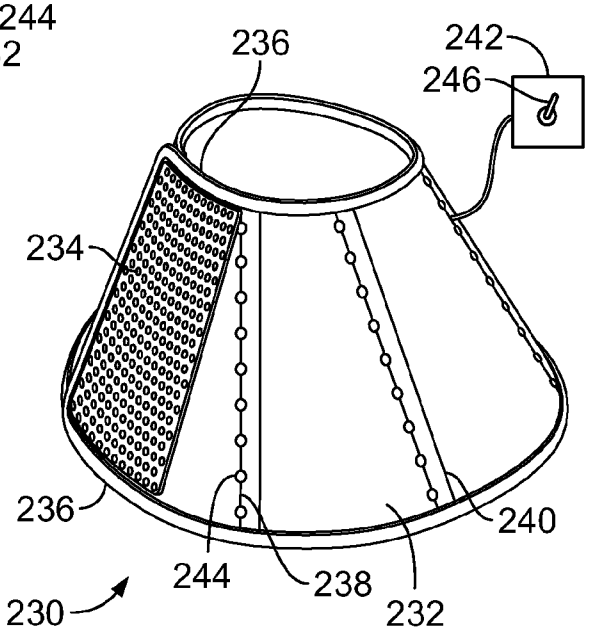

FIG. 9B

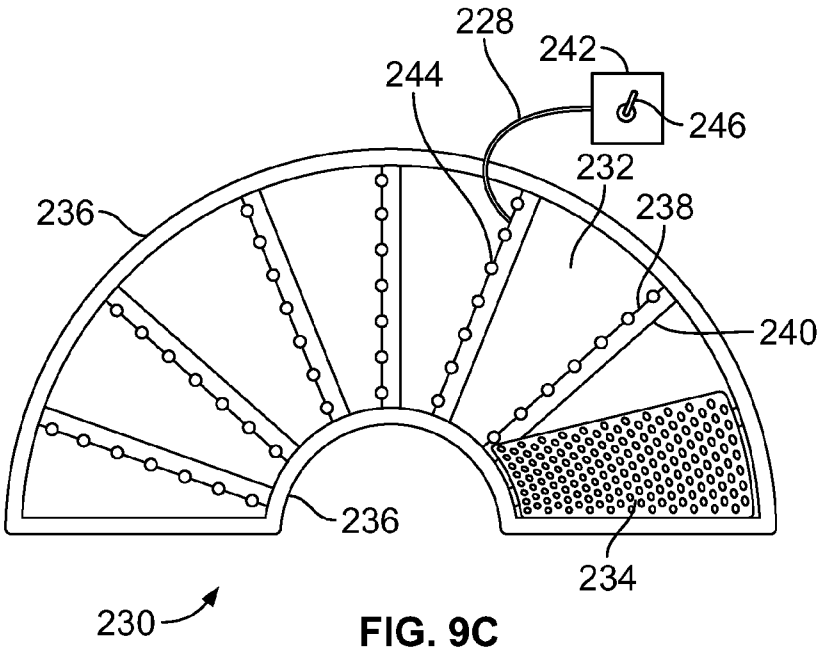

FIG. 9C

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2015/039292

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A61N 5/06 (2015.01)
CPC - A61N 5/062 (2015.09)
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) - A61B 19/00; A61C 17/00; A61L 2/08, 2/16; A61N 5/06 (2015.01)
CPC - A61C 19/066; A61L 2/08, 2/088, 15/42, 2300/404; A61N 5/0616, 5/062, 2005/0645 (2015.09)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC - 422/28; 424/404, 443; 442/123; 606/9; 607/88 (keyword delimited)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase, Google Patents, Google Scholar
Search terms used: activiating solution with light photodynamic effect phototherapy antimicrobial solution garment hydrogen peroxide dental tray bodysuit

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 6,893,259 B1 (REIZENSON) 17 May 2005 (17.05.2005) entire document	1-6,8-10,12-15 --- 7
X --- Y	US 2013/0006119 A1 (PAN et al) 03 January 2013 (03.01.2013) entire document	1-5,7-13 --- 6
Y	US 2010/0247436 A1 (ADAIR et al) 30 September 2010 (30.09.2010) entire document	6
Y	US 2001/0012608 A1 (DARNELL) 09 August 2001 (09.08.2001) entire document	7
A	US 2012/0070342 A1 (APPEANING et al) 22 March 2012 (22.03.2012) entire document	1-15
A	US 2007/0260295 A1 (CHEN et al) 08 November 2007 (08.11.2007) entire document	1-15
A	US 2003/0235605 A1 (LELAH et al) 25 December 2003 (25.12.2003) entire document	1-15

☐ 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
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 September 2015	07 OCT 2015
Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer Blaine Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

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(51)Int.Cl.
A61N 5/06(2006.01)

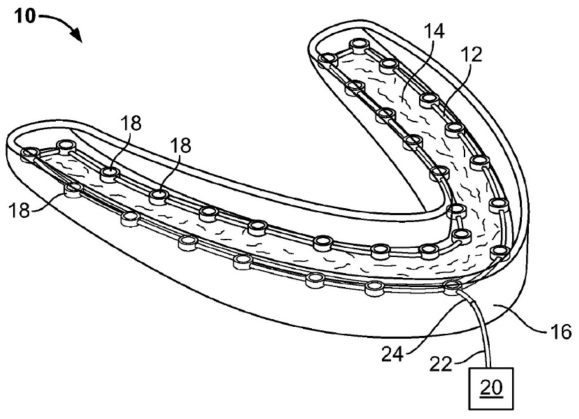
权利要求书2页 说明书9页 附图9页

(54)发明名称

对于治疗化合物的光线的人类医疗和兽医应用

(57)摘要

光线应用到治疗化合物的医疗和兽医应用包括溶液保持器-所述溶液保持器适于容纳用于使用者的组织的治疗溶液;纤维光缆;光源-所述光源与所述纤维光缆连接并且提供预定波长的光线到所述纤维光缆;以及光线终端,所述光线终端在所述纤维光缆上并且将光线暴露到治疗溶液。配方产物包括氧化剂;具有初始治疗效果的治疗溶液;和预定频率的光线,所述预定频率的光线与所述氧化物发生协合反应,从而改善了溶液的初始治疗效果。



CN 106659902 A

1.一种装置,包括:

溶液保持器,所述溶液保持器适于容纳用于使用者的组织的治疗溶液;

纤维光缆;

光源,所述光源与所述纤维光缆连接并且向所述纤维光缆提供预定波长的光线;以及

光线终端,所述光线终端在所述纤维光缆上并且将光线暴露到所述治疗溶液。

2.根据权利要求1所述的装置,其中:

所述溶液具有初始抗菌效果;并且

所述光线与所述治疗溶液发生协合反应,从而改善所述治疗溶液的抗菌效果。

3.根据权利要求1所述的装置,其中:

所述溶液具有初始抗菌效果;并且

所述光线与所述治疗溶液发生协合反应,从而改善所述溶液的抗菌效果。

4.根据权利要求1所述的装置,其中所述治疗溶液是过氧化氢,并且所述光线产生改善所述治疗溶液的抗菌效果的协合反应。

5.根据权利要求1所述的装置,其中所述治疗溶液是与载体组合的氧化剂,并且所述光线产生改善用于治疗寻常痤疮的治疗溶液的效果的协合反应。

6.根据权利要求1所述的装置,其中所述治疗溶液是抗肿瘤药剂,并且所述光线产生改善所述治疗溶液的抗癌效果的协合反应。

7.根据权利要求1所述的装置,进一步包括:

加热元件,所述加热元件围绕所述溶液保持器的内部缠绕以便在应用期间将所述治疗药剂加热至温热。

8.根据权利要求1所述的装置,进一步包括:

外部光源,所述外部光源提供预定波长的光线;

纤维光学连接线缆,所述纤维光学连接线缆通过所述纤维光缆连接所述光源;以及

在所述溶液保持器上的插座,所述插座与在所述纤维光学连接线缆上的插头匹配以便可以连接和断开所述光源。

9.根据权利要求1所述的装置,其中所述溶液保持器包括牙科盘,所述牙科盘在所述盘的侧部上的空腔中容纳所述治疗溶液;

所述纤维光缆容纳在所述盘内;

所述组织是使用者的牙齿;并且

所述盘成形为容纳用于所述牙齿的被光照射的治疗溶液;

并且所述装置进一步包括在所述纤维光缆上的多个光线终端,所述多个光线终端将光线从所述纤维光缆发射到所述治疗溶液中,所述光线终端被定位并且具有足够的数量以使得邻近每个牙齿的两个对置侧部中的每个侧部都具有至少一个光线终端。

10.根据权利要求1所述的装置,其中所述纤维光缆包括发光内芯和外保护层,所述外保护层覆盖所述发光内芯的仅一部分以使得光线被引导至所述纤维光缆的侧部。

11.根据权利要求1所述的装置,其中所述溶液保持器包括:

用于人的全身套装;

输入管道,所述输入管道输入作为合剂的所述治疗溶液;

所述套装内的区域,所述区域使所述合剂对于使用者循环;

排出管道,所述排出管道将所述合剂排出所述套装;并且

其中所述纤维光缆围绕所述全身套装的内表面缠绕。

12.根据权利要求1所述的装置,其中所述溶液保持器包括从下述群组中选定的衣物:

手臂的袖子,所述手臂的袖子覆盖人类使用者的手臂并且将所述治疗溶液应用到人类使用者的手臂;

分指手套,所述分指手套覆盖人类使用者的手或手的一部分并且将所述治疗溶液应用到人类使用者的手或手的一部分;

长袜,所述长袜覆盖人类使用者的腿或腿的一部分并且将所述治疗溶液应用到人类使用者的腿或腿的一部分;

脚趾套,所述脚趾套覆盖人类使用者的一个或多个脚趾并且将所述治疗溶液应用到人类使用者的一个或多个脚趾;

头盔,所述头盔覆盖人类使用者的头部并且将所述治疗溶液应用到人类使用者的头部;以及

盖毯,所述盖毯具有被成形为覆盖动物的后背、肩部、侧部和后部的覆盖部分,进一步具有带有固定元件的带子以可释放地保持所述盖毯围绕所述动物闭合。

13.根据权利要求1所述的装置,所述溶液保持器包括:

导管管道,所述导管管道在所述导管管道的第一端处接收所述治疗溶液;以及

在所述导管上接近于与所述第一端对置的第二导管管道端部的筛网,以便将所述治疗溶液分送到所述使用者体内;

其中所述光线终端接近于所述筛网定位在所述纤维光缆上。

14.一种配方产物,包括:

包括氧化剂的溶液;具有初始治疗效果的治疗溶液;以及

预定频率的光线,所述预定频率的光线与所述氧化剂发生协合反应,从而改善所述溶液的初始治疗效果。

15.根据权利要求14所述的配方产物,其中所述治疗溶液包括与氧化剂组合的靶向化学药剂并且组合的溶液与光线发生协合反应,改善所述治疗溶液的抗菌、抗病毒或抗肿瘤效果;

其中所述靶向化学药剂从包括下述成分的群组中选定:

抗菌、生物杀灭或消毒化合物;

包括双氯苯双胍己烷的抗菌化合物;

包括茚的衍生物的非甾体抗炎症化合物;

碘化合物;

肿瘤坏死因子;

蛋白酶、果胶酶或者弹性蛋白酶化合物;

环丙沙星;

解痉药;和

二氯甲烷。

对于治疗化合物的光线的人类医疗和兽医应用

相关申请的交叉引用

[0001] 本申请要求2014年7月18日提交的申请号为62/026,498的美国专利申请(P679-104)的申请日的权益-该美国专利申请的全部内容在此通过引用并入本申请中;还要求2014年9月24日提交的申请号为14/497,269的美国专利申请(P679-104A)的权益-该美国专利申请的全部内容在此通过引用并入本申请中;本申请要求2014年11月9日提交的申请号为14/536,633的美国专利申请(P679-104B)的权益-该美国专利申请的全部内容在此通过引用并入本申请中;本申请要求2014年12月26日提交的申请号为14/583,580的美国专利申请(P679-104C)的权益-该美国专利申请的全部内容在此通过引用并入本申请中;还要求2015年2月24日提交的申请号为14/630,513的美国专利申请(P679-104E)的权益-该美国专利申请的全部内容在此通过引用并入本申请中;本申请要求2015年3月4日提交的申请号为14/638,902的美国专利申请(P679-104F)的权益-该美国专利申请的全部内容在此通过引用并入本申请中;并且本申请要求2015年4月27日提交的申请号为14/697,579的美国专利申请(P679-104D)的权益-该美国专利申请的全部内容在此通过引用并入本申请中。

背景技术

[0002] 本发明一般地涉及包括通过光线改善化学药剂效果的疗法,并且更具体地涉及光线应用于包括抗菌和抗肿瘤溶液的抗菌和抗肿瘤化学药剂的人类医疗和兽医应用。

[0003] 在人和动物的活组织中存在引起伤害和病变的病菌。肿块或肿瘤-例如癌也导致对人和动物的组织的伤害。

[0004] 已经证明某些波长的光线与某些药物或靶向化学药剂-例如抗菌剂和抗肿瘤药剂形成协合效应来破坏或抑制病菌或肿瘤生长,从而改善或“提高”这些药物或靶向化学药剂的效果。

[0005] 希望对某些抗菌或抗肿瘤药剂或二者增加光线照射,从而能够形成协合效应来破坏或抑制病菌生长或肿块。

发明内容

[0006] 在本发明的一个方面中,一种装置包括溶液保持器、纤维光缆、光源和光线终端,其中所述溶液保持器适于容纳用于使用者的组织的治疗溶液;所述光源与所述纤维光缆相连接并且向所述纤维光缆提供预定波长的光线;所述光线终端位于所述纤维光缆上并且将光线暴露到治疗溶液。

[0007] 在本发明的另一个方面中,配方产物(也称作制剂,formulation)包括:含有氧化剂的溶液;具有初始治疗效应的治疗溶液;以及预定频率的光线,所述预定频率的光线与氧化剂发生协合反应,从而改善溶液的初始治疗效果。

附图说明

[0008] 图1描绘了根据本发明的牙科装置的实施方式;

[0009] 图2描绘了根据本发明的容器的实施方式；

[0010] 图3描绘了根据本发明的碗状物的实施方式；

[0011] 图4描绘了根据本发明的全身套装的实施方式；

[0012] 图5A-5E描绘了根据本发明的衣物的实施方式；

[0013] 图6描绘了根据本发明的头盔的实施方式；

[0014] 图7描绘了根据本发明的导管的实施方式；

[0015] 图8描绘了根据本发明的马盖毯的实施方式；以及

[0016] 图9A-9C描绘了根据本发明的动物的罩套的实施方式。

具体实施方式

[0017] 在此参照附图详细地描述了优选实施方式以及能够在工业中使用并且包括现在所知的实施本发明的最佳模式的其他实施方式。进一步的实施方式、特征和优点通过随后的描述将变得清楚或者可以在无需过多的实验的情况下就可以得知。除非另外说明，附图不一定是按比例绘制的。下面对实施方式的描述-即使措辞为“本发明”或者该实施方式是怎样的，不应理解为具有限制目的，而是描述了构成和使用本发明的方式和进程。本发明的覆盖范围将在权利要求书中说明。权利要求中所列步骤的次序不一定指示这些步骤必须以该次序执行。两个元件之间的措辞“和/或”意指仅第一元件、仅第二元件或者两者元件一起。

[0018] 本发明的实施方式一般地提供装置和治疗溶液，所述装置和治疗溶液用于以人类疾病治疗和动物疾病治疗为目的将光线应用于治疗化合物。

[0019] 本发明的实施方式一般地提供一种药物，通过将预定频率的光线照射到所述药物上，所述药物具有改善的效果。

[0020] 本发明的一个实施方式可以提供一种装置来保持溶液与组织-例如肌肤、牙齿或者动物的肌肤接触，而所述组织和溶液同时暴露到某些波长的光线。这种装置可以具有通过使用某种波长的光线来增强抗菌溶液的效应的部件。抗菌的、抗肿瘤的或者其他治疗溶液可以或者可以不是在任何给定时间由光线激活的。当光线照射时，治疗溶液通过光线“增压(supercharge)”。与仅使用溶液相比，这种协合效应消除或减少更多的病菌。

[0021] 治疗溶液的多个实施方式可以使氧化剂、抗菌剂或者抗肿瘤药剂与组织-例如人或者动物的肌肤保持接触，而所述组织和溶液同时暴露到某些波长的光线。多个实施方式可以具有通过使用某种波长的光线增强抗菌剂、抗病毒和抗肿瘤溶液效果的成分。当将光线应用到溶液上时，溶液通过光线“增压”。与仅使用溶液相比，这种协合效应消除或减少更多的病菌或肿块。这可以通过各种方式来实现，包括：直接来自光源的光线，或者来自与牙科盘或其他盘状件或容器组合的光线、面具、绷带、马盖毯或动物的罩套，或用于应用抗菌或抗肿瘤化学药剂以便治疗的装置。

[0022] 在活的组织中存在导致伤害或病变的病菌。通过向保持某些治疗药剂接近于组织的装置增加某种波长的光线照射，可以形成协合效应以便破坏或抑制病菌或肿瘤生长。例如，在口腔中，这种装置可以是被设计成覆盖牙齿和牙龈的盘状件。这种盘状件将发射某些波长的光线，所述的某些波长的光线当与某些抗菌和/或抗肿瘤溶液在所述盘状件中结合时将导致协合的抗菌和/或抗肿瘤效应。所述光线可以例如由发光二极管(LED)或激光产

生。外部光源可以在具有纤维光学连接线缆的溶液容纳设备中连接到纤维光缆，所述纤维光学连接线缆可还包括纤维光学连接接合部或插头。

[0023] 本发明的多个实施方式可以形成另外的方式来治疗疾病。与仅使用溶液相比，通过某些波长的光线增压的抗菌或抗肿瘤溶液可以导致溶液以更高的百分比消除或减少病菌和/或肿瘤组织。多个实施方式可以在某些波长的光线与抗菌和/或抗肿瘤溶液之间形成协合效应，所述抗菌和/或抗肿瘤溶液在应用到组织时消除或减少导致引起疾病的微生物和/或肿瘤组织。

[0024] 本发明的多个实施方式可以包括发射某些波长的光线进入溶液的溶液容纳设备或工具。当这种光线和溶液的结合应用于组织时，形成减少或消除导致疾病的微生物和/或肿瘤组织的协合效应。基本部件为1。溶液容纳设备为2。光源为3。具有抗菌溶液或者抗肿瘤溶液或者两者。

[0025] 多个实施方式可以采用蓝光或者通过暴露几秒到几分钟来增压的其它某种预定波长的光线。多个实施方式还可以包括H2O2溶液-例如凝胶，同时具有合适的例如抗菌、抗病毒或者抗肿瘤的药剂或化合物的0.3mM浓度或者任何浓度的溶液。

[0026] 在一个实施方式中，为了安全起见，“灼热图表”可以指示130华氏度的水暴露30秒钟是安全的，但是超过之后导致灼伤。120华氏度的水暴露高达5分钟可能是安全的。过氧化氢(H2O2)在暴露到400-500纳米波长的光线时，可以在20秒钟内杀死96％的病菌。这种溶液可以在57摄氏度(134华氏度)最好地工作。

[0027] 多个备选实施方式可以包括加热元件，所述加热元件可以将治疗溶液加热至温热并且进一步实现增压。在多个实施方式中，一种装置可以包含加热或冷却部件或者两者。在一个实施方式中，抗菌溶液可以在其暴露到协合光线之前预热到理想或者最佳温度，或者在pH值可以或者可以不改变的情况下使用。例如，过氧化氢可以优选地在57摄氏度(134华氏度)暴露到400-500纳米的光线少于20秒钟。其他化学药剂可以具有不同的优选温度和pH值。

[0028] 人类医疗和兽医装置的实施方式可以包括集成的或内部加热元件，所述集成的或内部加热元件在所述装置中邻近发光线缆布置。集成的加热元件的多个实施方式可以定位在所述装置的仅一部分中-例如在容器、衣物或者罩套的底部处。加热元件可以从与光源相同的源吸取能量，例如电池或者外接电源(wall power)。能量可以在该装置中通过纤维光学连接线缆或通过能量连接线缆供应到加热元件，所述能量连接线缆与所述连接线缆并排延伸。

[0029] 加热元件的多个备选实施方式可以与所述装置容纳治疗溶液的部分间隔开。单独的加热元件可以在溶液被添加到所述装置之前将治疗溶液-例如通过加热盘或烤箱来加热到最佳温度，或者可被用于将抗菌和/或抗肿瘤溶液在适当位置-例如通过烙铁或导线进行加热。

[0030] 装置的多个实施方式可以包括发光纤维光缆，所述发光纤维光线可以将治疗溶液暴露到某种波长的光线-例如来自LED或激光的有目的地选择的波长或频率的光线。罩套可以容纳抗菌溶液。一个实施方式可以包括在发光纤维光缆上的多个光线终端或者其他发光器件。每个光线终端都接入纤维光缆中以在该终端的端部输出某些光线，从而将光线发射到治疗溶液中。所述装置能够是可调的，以便可以添加或移动终端或者可以测量光线终端

的数量和位置来适应单个使用者。光线终端可以定位在罩套内或者罩套表面上，以使得每个光线终端都将定位在保持器内的预定位置内，例如待处理的组织的附近位置。纤维光缆可以是不透明的并且发光器件沿着它的长度间隔开，或者可以至少部分是半透明的以便沿着它的长度发射光线。使用者可以使人类或者动物。

[0031] 在一个实施方式中，纤维光缆可以通过纤维光学连接线缆来连接到光源。连接线缆可以进入保持器或罩套并且通过纤维光学连接接合部与纤维光缆光学地连接，以便可以连接光源并且在使用之后断开。接合部的一个实施方式可以包括安装到纤维光缆的纤维光学连接线缆。接合部的另一个实施方式可以包括插座，所述插座与连接线缆上的插头匹配以使得可以连接光源并且在使用之后断开。

[0032] 一个实施方式可以包括具有光源以及抗菌和/或抗肿瘤溶液的装置。多个实施方式可以包括各种人和动物的身体或身体的部分的罩套。

[0033] 本发明的一个实施方式可以包括将治疗溶液应用到人、马或者其他动物的保持器或罩套。所述保持器可以连接到光源。多个实施方式可以包含大量纤维光学终端。保持器可以具有加热元件。

[0034] 保持器的多个实施方式可以包括：容纳抗菌、抗肿瘤或者用于使用者牙齿的其他治疗溶液的牙科盘；适于容纳用于人类使用者的组织的抗菌或抗肿瘤溶液的医疗溶液保持器；桶或容器；碗状件；全身套装；手臂的袖子；分指手套；长袜；脚趾套；头盔；导管；适于容纳用于动物的组织的抗菌或抗肿瘤溶液的医疗或治疗溶液保持器；用于马或者其他动物的盖毯；或者用于动物的肢体或身体部位的罩套。

[0035] 多个实施方式可以包括纤维光缆，所述纤维光缆围绕所述装置的内表面进行缠绕。纤维光缆可以具有在所述装置内沿着纤维光缆间隔开的光线终端。一个实施方式可以包括在所述装置内的加热元件。加热元件可以包括在所述装置内邻近纤维光缆延伸的加热导线。纤维光缆可以通过连接线缆连接到光源。连接接合部或者插头可以连接外部光源或者从所述装置释放所述外部光源。加热元件可以通过相同的光源连接线缆或者通过单个能量连接线缆从光源接收能量。开关可以允许要连接的光源、加热能量或者两者开启或闭合。

[0036] 为了使用一个实施方式，治疗师可以将治疗溶液应用到所述装置的内部，那么将所述装置佩戴在人或动物身上来接受治疗。治疗师可以打开加热器或电源或者两者。

[0037] 治疗溶液的多个实施方式可以包括与人或动物皮肤接触的抗菌、抗病毒、抗肿瘤化合物。这种溶液可以是液体、凝胶、合剂、乳膏或者其他适当的形式。溶液可以或者可以不通过所述装置加热。多个实施方式可以或者可以不包括调节溶液的pH值的化合物。

[0038] 多个实施方式可以包含发射某些波长(可以为400-500nM)的光线的光源。这种光源可以是手动的。所述光源可以与治疗溶液接触或者可以保持或放置在有效距离内。抗菌和/或抗肿瘤溶液以及某种波长的光线的结合可以形成协合效应，导致大于成分单独地反应的总和的反应(协合效应)。某种波长的光线与抗菌和/或抗肿瘤溶液的这种结合的多个实施方式可被用于治疗痤疮、光化性角化症或者任何其他皮肤或全身症状或病症。

[0039] 一旦应用，抗菌、抗病毒、抗肿瘤或者其他治疗化学药剂可以暴露到形成协合效应的波长的光线，改善治疗化学药剂的效果。与仅应用治疗溶液或者仅应用光线相比，这种协合效应导致与病菌相关的细菌或者与癌症相关的肿块更多地减少。

[0040] 在一个实施方式中，化学药剂可以在没有存储器的情况下使用。化学药剂可以直

接插入到身体空腔并且通过具有多个发光纤维的纤维光学棒来暴露到光线。载体或存储器的多个实施方式可以是溶液本身或者凝胶。这种凝胶可以通过导管插入到身体空腔并且通过同一导管或不同的导管暴露到协合光线。输送装置可以包括但不限于存储器、绷带、凝胶、溶液、头部覆盖物、动物罩套、包裹物、短袜、长袜、帽子、头盔、合剂、套装、帐篷、探测器或导管。

[0041] 过氧化氢(H2O2)可以是氧化剂或还原剂。当H2O2用作氧化剂时,氧被还原成H2O。当H2O2用作还原剂时,氧被氧化成02并且可以看到气泡的产生。本发明的多个实施方式可以采用H2O2以及H2O2的配方产物来作为氧化剂或还原剂,以便提供抗菌效果、抗肿瘤效果和/或抗病毒效果。配方产物或药物将包括“氧化剂”(如果它包括H2O2)。

[0042] 药物的实施方式包括多种组分,所述多种组分包括某些波长的光线以及化学药剂,所述化学药剂单独地或者与其他手段组合来抑制、延缓和/或阻止微生物和/或细菌和/或肿瘤生长。所述药物可以与抗菌和/或抗病毒和/或抗肿瘤化学药剂就其在活的有机体中的化学和功能性剖面方面相类似。所述药物可以将光线作为它的一种组分。它以临床处方剂量在人或者其他动物体内可靠地产生类似于抗菌和/或抗病毒和/或抗肿瘤的效果。它被指定为控制下面化学药剂中的至少一种或多种的某种波长的光线:H2O2、月桂酸、十二烷酸、局部抗生素、局部麻醉剂、烟酸、烟酰胺、例如氯林可霉素磷酸酯的抗菌剂、甲基7-氯代-6,7,8-三羟基-6-(1-甲基-反-4-丙基-L-2-甲酰胺氮杂戊环)-1-硫代-L-苏式-α-D-乳-辛吡喃糖苷2-(磷酸二氢根)(Methyl7-chloro-6,7,8-trideoxy-6-(1-methyl-trans-4-propyl-L-2-pyrrolidinecarboxamido)-1-thio-L-threo-α-D-galacto-octopyranoside 2-(dihydrogen phosphate))、水杨酸、硫磺、诸如6-[3-(1-金刚烷)-4-甲氧基-苯基]萘-2-羧酸的类视黄醇、α羟酸、维生素A酸、硼砂、辛酸、癸酸、豆蔻酸以及在所述方法中有益的额外化学药剂。

[0043] 本发明的药物剂型可以包括某些波长的光线以及下面化学药剂中的一种或多种的混合物:H2O2、月桂酸、十二烷酸、局部抗生素、局部麻醉剂、烟酸、烟酰胺、例如氯林可霉素磷酸酯的抗菌剂、甲基7-氯代-6,7,8-三羟基-6-(1-甲基-反-4-丙基-L-2-甲酰胺氮杂戊环)-1-硫代-L-苏式-α-D-乳-辛吡喃糖苷2-(磷酸二氢根)、水杨酸、硫磺、诸如6-[3-(1-金刚烷)-4-甲氧基-苯基]萘-2-羧酸的类视黄醇、α羟酸、维生素A酸、硼砂、辛酸、癸酸、豆蔻酸以及包括制药方面可接受的载体的在所述方法中有益的额外化学药剂。

[0044] 靶向化学药剂的多个实施方式可以包括具有抗菌剂、生物杀灭剂或者杀菌剂中的一个或多个的化合物。抗菌剂的多个实施方式可以包括双氯苯双胍己烷化合物。靶向化学药剂的多个实施方式可以包括非甾体抗炎症化合物,例如茚的衍生物。靶向化学药剂的多个实施方式可以包括碘化合物。靶向化学药剂的多个实施方式可以包括肿瘤坏死因子,或者TNF族细胞因子的成分。靶向化学药剂的多个实施方式可以包括金属-例如银(Ag)或者诸如Cu或Fe的过渡金属。靶向化学药剂的多个实施方式可以包括酶。酶的多个实施方式可以包括蛋白酶、果胶酶或者弹性蛋白酶中的一种或几种。靶向化学药剂中的多个实施方式可以包括抗肿瘤药剂。靶向化学药剂的多个实施方式可以包括抗生素-例如环丙沙星。靶向化学药剂的多个实施方式可以包括解痉药-例如二氯甲烷(methylene bicloride)。

[0045] 在一个实施方式中,第一反应可以包括某种波长-例如400-500纳米的光线与诸如过氧化氢的氧化剂的结合。光线加上氧化剂可以是完全以自身进行治疗的。第二反应可以

包括某种波长的光线与氧化剂的结合并且进一步与发生协合反应的靶向化学药剂结合。药物的多个实施方式可以包括已经用光线改善的氧化剂以及已经用光线改善的靶向化学药剂，以便提供具有用光线改善的治疗效果的药物。药物可以是当从光源应用光线时保持与使用者接触的溶液，或者可以在应用之前用光线改善的溶液。光线可以包括两种频率的光线，这两种频率的光线同时应用到药物或溶液，或者能够以应用第一频率的光线并且随后连续应用第二频率的光线的方式进行应用。

[0046] 选定的靶向化学药剂可以与表面活性剂、湿润剂、螯合剂或者有益的组分来组合使用。医疗药物的多个实施方式能够以药片、药丸、胶囊、凝胶、液体、喷雾剂、合剂、乳膏或者糊剂方式来使用。多个实施方式能够在改变的温度使用来调节它们的功效。

[0047] 牙科器具图1描绘了牙科装置10的实施方式。发光纤维光缆12可以使抗菌溶液14暴露到某种波长的光，例如来自LED或激光的有目的地选择的波长或频率的光。盘状件16可以容纳抗菌溶液14。在一个实施方式中可包括在发光纤维光缆12上的多个光线终端18或者其他发光器件。每个光线终端18接入纤维光缆12以在该终端的顶部输出光线，从而将光线发射到抗菌溶液14中。所述装置能够是可调的，以便可以添加或移动终端18或者可以测量光线终端18的数量和位置来适应单个使用者。光线终端18可以定位在盘状件16内以使得每个光线终端18都将定位在邻近的牙齿之间或者邻近使用者的牙齿。纤维光缆可以是不透明的并且发光器件沿着它的长度间隔开，或者可以至少部分半透明的以便沿着它的长度发射光线。在一个实施方式中，纤维光缆12可以通过纤维光学连接线缆22来连接到光源20。连接线缆22可以进入盘状件16并且通过纤维光学连接接合部24与纤维光缆12光学地连接，以便可以连接光源20并且在使用之后断开。接合部24的一个实施方式可以包括在盘状件16的壁上的孔隙，其中纤维光学连接线缆22安装到纤维光缆12。接合部24的另一个实施方式可以包括在盘状件16上的插座，所述插座与连接线缆22上的插头匹配以使得可以连接光源20并且在使用之后断开。

[0048] 容器如图2描绘的，医疗装置30的实施方式可以包括容器32，所述容器32具有壁34、底部36和搬运手柄38。多个实施方式可以包括缠绕壁34的内表面的纤维光缆40。光线终端42可位于容器内部的纤维光缆40上。加热元件44可以围绕容器32的底部定位。纤维光缆40可以通过纤维光学连接线缆48连接到光源46。

[0049] 碗状件如图3中描绘的，医疗装置50的实施方式可以包括具有纤维光缆54的碗状件52，纤维光缆54围绕碗状物52的内表面56进行缠绕。纤维光缆54可具有光线终端58。多个实施方式可具有基部60，基部60可包含加热元件62。纤维光缆54可以通过纤维光学连接线缆66连接到光源64。光源64可包括开启/闭合开关68或者计时器控制件69。

[0050] 全身套装如图4中描绘的，医疗装置70的实施方式可以包括全身套装72，全身套装72具有集成的躯干部分74、袖子76、裤子78、足部部分80和兜帽82以及可移除的分指手套84或者连指手套86。袖子76可具有袖口88来裹紧使用者的手腕。兜帽82可具有弹性部分90以便裹紧使用者的脸。多个实施方式可以包括例如在躯干部分74的一个肩部上的输入管92以及在躯干部分74的对置肩部上的排出管94。多个实施方式可包括沿着套装72的内部织物间隔的纤维光缆96。光线终端98可以在套装72内定位在纤维光缆96上。加热元件可以嵌在套装72的织物内。纤维光缆96或加热元件或者两者可以通过纤维光学连接线缆连接到光源。

[0051] 衣物图5A、5B、5C、5D和5E描绘了医疗装置的实施方式，所述医疗装置包括衣物以

便将光线改善的抗菌溶液携带给穿着该衣物的使用者。图5A描绘了手臂的袖子122的实施方式。图5B描绘了分指手套124的实施方式。图5C描绘了脚趾套126的实施方式。图5D描绘了具有脚趾覆盖部分128或者没有脚趾覆盖部分130的长筒袜的实施方式。图5E描绘了具有裤带134的一个连裤袜(foot stocking)132的实施方式。

[0052] 头盔如图6中描绘的，医疗装置140的实施方式可以包括具有纤维光缆144的头盔142，纤维光缆144围绕头盔142的内表面146进行缠绕。纤维光缆144可具有光线终端148。多个实施方式可包括加热元件150，加热元件150可包括位于头盔衬里中的导线。纤维光缆144可以通过纤维连接线缆154连接到光源152。

[0053] 导管如图7中描绘的，医疗装置160的实施方式可以包括导管162，导管162具有导管管道164、分配器筛网166和纤维光缆168，纤维光缆168具有一个或多个光线终端170。加热元件172可在导管管道164外面，并且可以通过输入管道176提供加热的抗菌溶液174。光源178可以通过纤维光学连接线缆180连接到具有纤维光线连接接合部182的纤维光缆168。

[0054] 马盖毯如图8中描绘的，完整马盖毯200的实施方式可以包括覆盖部分202、颈部部分204和上腿部部分206。盖毯200可以包括带子208来使覆盖部分闭合。盖毯200可以在其内部涂覆抗菌溶液或凝胶。多个实施方式可以包括纤维光缆210，纤维光缆210围绕覆盖部分202的内部表面进行缠绕。多个实施方式可以包括加热元件212，加热元件212可以包括在覆盖部分202内部的加热导线。多个实施方式可以包括连接接合部214，连接接合部214将纤维光缆210连接到光源216。光线终端218可以在盖毯200内部定位在纤维光缆210上。光源216可以具有开启/关闭开关200或者计时器控制件。

[0055] 动物罩套如图9A、9B和9C的实施方式中描绘的，动物罩套230可以包括软塑料片232以及在所述片232的一端的附接机构234。罩套230可以围绕动物的颈部进行缠绕并且在所述片的一端上的附接机构234可以附接到所述片232的另一端以便形成环。多个实施方式可以包括在顶部和底部侧处的柔软织物饰物46，罩套230在所述饰物46处接触摩擦该动物或者其他物体。罩套230可以在内侧上涂覆抗菌溶液或凝胶。多个实施方式可以包括纤维光缆238，纤维光缆238围绕片232的内表面进行缠绕。多个实施方式可以包括加热元件240，加热元件240可以包括在所述罩套内部的加热导线。多个实施方式可以包括连接接合部228，连接接合部228将纤维光缆238连接到光源242。光线终端244可以定位在罩套内部的纤维光缆238上。光源230可以具有开启/闭合开关246或者计时器控制件。

[0056] 治疗寻常痤疮(“痤疮”)的方法的实施方式可以包括给予有效治疗量的过氧化物溶液和特定波长范围的光线，所述特定波长范围的光线可以与一种或多种其他抗菌剂或者其他化学药剂一起组合使用，所述其他抗菌剂或者其他化学药剂可以包括局部抗生素、局部麻醉剂、烟酸、烟酰胺、诸如氯林可霉素磷酸酯的抗菌剂、甲基7-氯代-6,7,8-三羟基-6-(1-甲基-反-4-丙基-L-2-甲酰胺氮杂戊环)-1-硫代-L-苏式-α-D-乳-辛吡喃糖苷2-(磷酸二氢根)。抗菌剂的多个实施方式可以包括水杨酸、硫磺、例如6-[3-(1-金刚烷)-4-甲氧基-苯基]萘-2-羧酸的类视黄醇、羟基乙酸、维生素A酸、硼砂和在所述方法中有用的化学药剂。局部和全身性药剂的多个实施方式在本发明的用于治疗痤疮的实施方式中可以用作治疗化学药剂，包括过氧化氢、过氧化脲、硫磺、诸如6-[3-(1-金刚烷)-4-甲氧基-苯基]萘-2-羧酸的类视黄醇、羟基乙酸、硼砂、间苯二酚、水杨酸、过氧化苯甲酰、维甲酸(维生素A酸)以及局部和全身性抗生素。包括各种过氧化化合物与某些化学药剂的组合的多个实施方式可以

有效地治疗痤疮，并且在治疗痤疮方面具有协合效应，所述协合效应大于通过这些单个药剂本身治疗所预期的效应。这种协合效应在暴露到某些波长的光时具有甚至更大的协合效应。第二种化学药剂可以是治疗化学药剂或痤疮治疗化学药剂，因为它包含有助于缓解痤疮并且用于痤疮治疗或痤疮相关的疗法的成分。

[0057] 作为示例，研究显示具有过氧化氢的实施方式可以杀死被暴露于过氧化氢20秒钟的细菌的30％。波长360nM-500nM的光线可以杀死被暴露于该光线20秒钟的细菌的3％。过氧化氢与360nM-500nM的光线的组合可以具有杀死被暴露这个组合20秒钟的细菌的96％的协合效应。在该发明的实施方式中使用的溶液的配方产物可以包括过氧化氢和/或过氧化脲和/或过氧化苯甲酰以及选自硫磺、诸如6-[3-(1-金刚烷)-4-甲氧基-苯基]萘-2-羧酸的类视黄醇、羟基乙酸、硼砂、间苯二酚、水杨酸、维甲酸(维生素A酸)及局部和全身抗生素中的一种或多种。

[0058] 在该发明的实施方式中，过氧化氢和/或过氧化脲和/或过氧化苯甲酰以及被认为是有效的其他化学药剂的局部用溶液能够以各种有机媒介物或载体进行传输。载体的实施方式可以包括乙醇和丙二醇的组合，其中存在的活性组分就载体的体积而言在从大约0.001％到大约50％的范围内。溶液的pH值可以被调整，以使得组织敏感性最小化同时溶液的效果不受影响。溶液的温度可以被调整以使得其效果优化。

[0059] 为了安全起见并且为了使溶液的效果优化，可以提供或者使用“灼热图表”。该图表可以指示130度的水暴露30秒钟是安全的，但是超过之后导致灼伤。120度的水暴露高达5分钟是安全的。高于正常体温的溶液将趋向于打开毛孔将细菌暴露到较大量的溶液。全身性抗菌剂可被用作这种治疗的实施方式的一部分以便增强其效果。溶液可以暴露到波长360nM-600nM或者证明是有效的其他波长的光线从1秒钟到1分钟的范围的某个时间段。实施方式可以包括可能是温热的溶液，并且光线可以形成该发明独有的协合效应。这种光线可以在改变距离溶液的距离处使用，以便调整其协合效应。

[0060] 在额外的实施方式中，过氧化化合物的局部用溶液可以包括在各种有机载体中的就载体的体积而言在从大约0.001到50％的范围内的过氧化氢和/或过氧化脲和/或过氧化苯甲酰。在多个实施方式中，化合物可以包含在各种媒介物或载体中-包括溶液、洗液、乳膏、凝胶、糊剂和软膏以及下面组分中的一种或多种：能够就载体的体积而言浓度从0.001％到30％的烟酸或烟酰胺；就载体的体积而言浓度在从0.001％到大约30％的红霉素、氯林可霉素磷酸酯、甲基7-氯代-6,7,8-三羟基-6-(1-甲基-反-4-丙基-L-2-甲酰胺氮杂戊环)-1-硫代-L-苏式-α-D-乳-辛吡喃糖苷2-(磷酸二氢根)。多个实施方式可具有就体积而言从0.001到30％的浓度；就载体的体积而言从0.001到30％浓度的盐酸四环素；诸如6-[3-(1-金刚烷)-4-甲氧基-苯基]萘-2-羧酸的类视黄醇；以及被认为在治疗寻常痤疮方面有效的其他组分。在多个实施方试中，这些载体在掺合过氧化脲方面可以是有益的并且可以包括乙醇和丙二醇、诸如月桂基醚和月桂脂的表面活性剂以及对于本发明有效果的其他载体。可以将载体和有效成分应用到痤疮患者的脸部或其他受感染区域。能够以变化的间隔例如在24小时时间段中1到4次来实施该疗法，因此根据每天实施该疗法的次数，开放性和闭合性粉刺(黑头和白头)和发炎性病变在几天到几星期的时间段内极大地减少。

[0061] 本发明的实施方式可以提供一种用于治疗寻常痤疮的改进方法，所述改进方法涉及周期性地使用抗菌溶液，所述抗菌溶液包含有效量的仅过氧化物药剂或者其与局部抗生

素、局部麻醉剂、烟酸、烟酰胺、抗菌剂、水杨酸、硫磺、诸如6-[3-(1-金刚烷)-4-甲氧基-苯基]萘-2-羧酸的类视黄醇、羟基乙酸、维甲酸(维生素A酸)、硼砂和在所述方法中有益的额外化学药剂中的一种或多种的组合。这种抗菌溶液可施用到具有发炎性疾病、寻常痤疮的患者。抗菌溶液可以被调整到对该治疗来说最佳的温度。抗菌溶液可以应用到寻常痤疮病区和相关的发炎组织。一旦应用,抗菌溶液可以暴露到形成协合效应从而改善抗菌溶液的效果的一定波长的光线。与仅应用抗菌溶液或者仅应用光线相比,这种协合效应可以导致与寻常痤疮相关的细菌更明显地减少。

[0062] 溶液的实施方式可以包含光线激活的颜料,所述颜料可以在暴露到所述疗法中应用的某波长的光线时发荧光。这种颜料可以指示使用者发生了协合效应。

[0063] 下面的具体示例帮助举例说明本发明,但本发明不限于所述示例。

[0064] 示例1。在一个实施方式中,制备了位于凝胶中的3%过氧化氢溶液。将这种溶液每天两次以局部应用方式给药到受到寻常痤疮困扰的患者的感染区域。在应用之后,溶液暴露到360nM-500nM波长的光线20秒钟,形成比仅应用光线或者仅应用溶液更好的协合效应。将患者的整个感染区域一次暴露到由LED装置施加的这种光线。随后将该溶液用清水进行漂洗。在治疗两周之后,患者的粉刺数量以及由寻常痤疮导致的发炎区域将明显地减少。溶液与光线之间的这种协合效应是本发明独有的。

[0065] 示例2。在另一个实施方式中,包含3%过氧化氢的溶液、3%的过氧化苯甲酰和水杨酸在载体中以乳膏方式组合。这种溶液的pH值被缓冲到6。将这种乳膏每天一次应用于患者的感染了寻常痤疮的区域。一旦应用了乳膏,暴露到发射波长从410nM-500nM的光线的10瓦的手动式灯,因此在溶液与光线之间形成协合效应,所述协合效应导致比仅使用光线或仅使用溶液时病菌减少的更多。所述灯可具有发射这种光线的直径15mm的终端。这个特定尺寸能够瞄准患者的较小的区域。光线的暴露时间为一分钟。本发明的这种实施方式可被用于护理曾经被寻常痤疮感染的区域。光线与溶液之间的这种协合关系是本发明独有的。

[0066] 示例3。在又一个实施方式中,溶液含有15%的过氧化脲、2.5%的氯林可霉素磷酸酯甲基7-氯代-6,7,8-三羟基-6-(1-甲基-反-4-丙基-L-2-甲酰胺氮杂戊环)-1-硫代-L-苏式-α-D-乳-辛吡喃糖苷2-(磷酸二氢根)。多个实施方式可包括被组合在凝胶形式的载体中的维生素A酸。这种载体溶液被加热到105华氏度。一旦应用到感染区域,这种温热的溶液帮助打开患者的毛孔。每天三次应用这种溶液。感染区域暴露到由灯提供的410nM-500nM的光线,所述灯将对直径30厘米的区域进行暴露。感染区域和溶液暴露到这种特定波长的光线30秒钟。光线和可能已被加热至温热的溶液的协合效应大于光线或溶液单独使用的效应。光线与可能已被加热至温热的溶液之间的这种协合效应是该发明独有的。

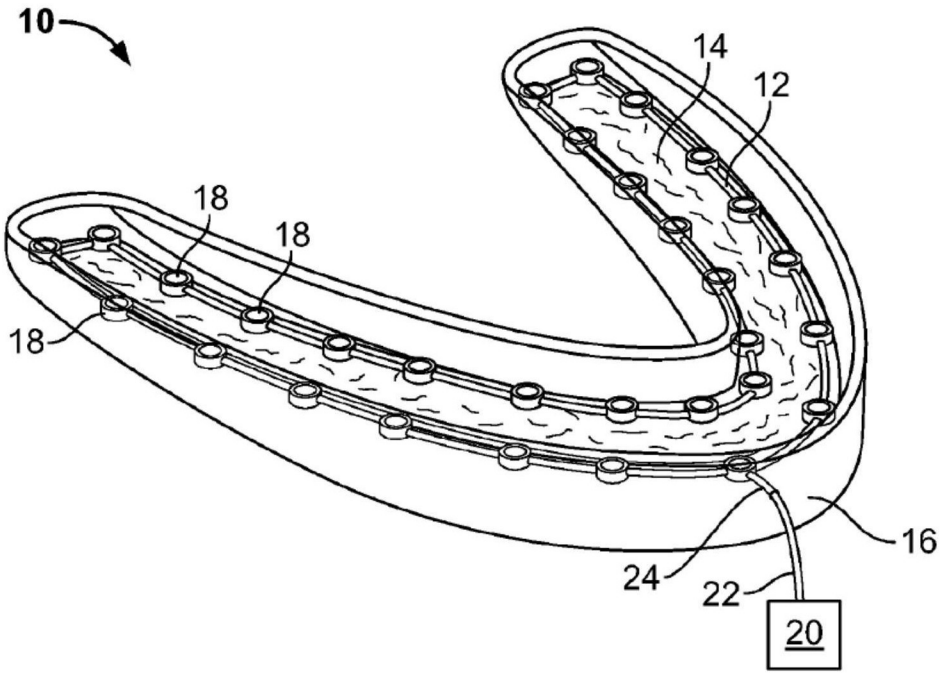


图1

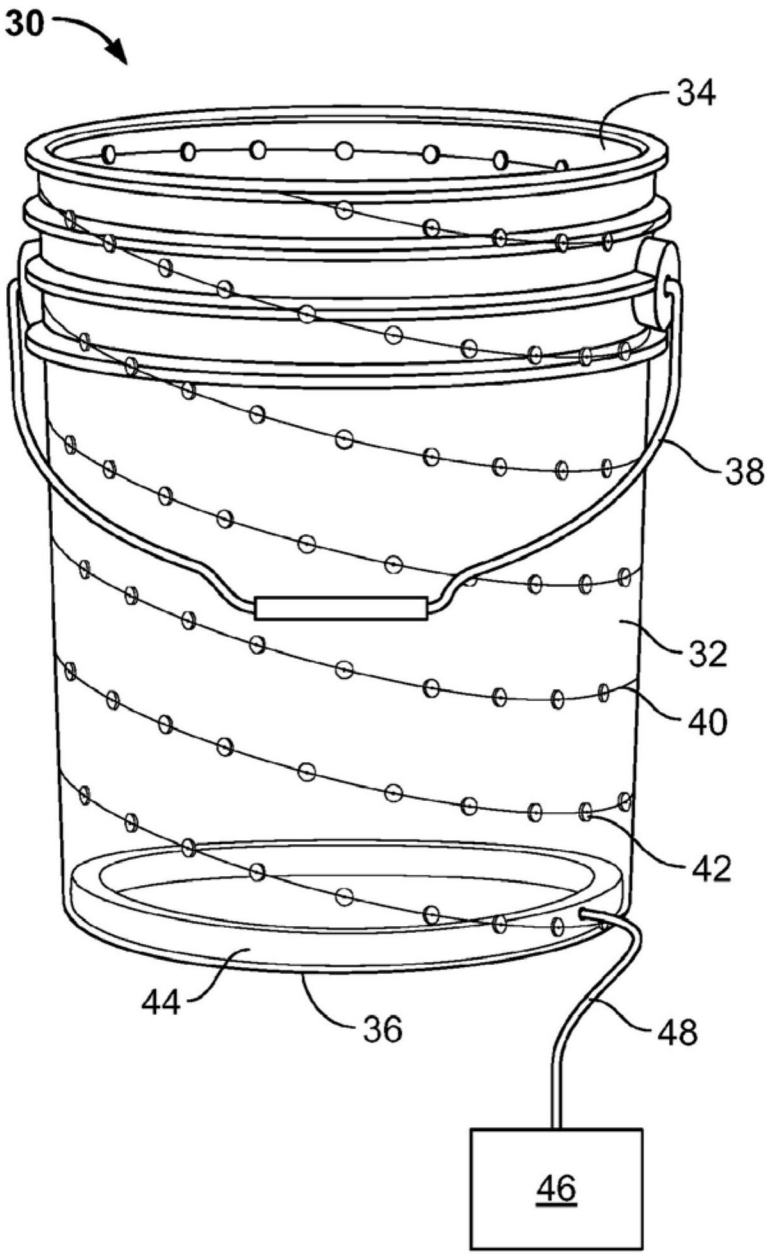
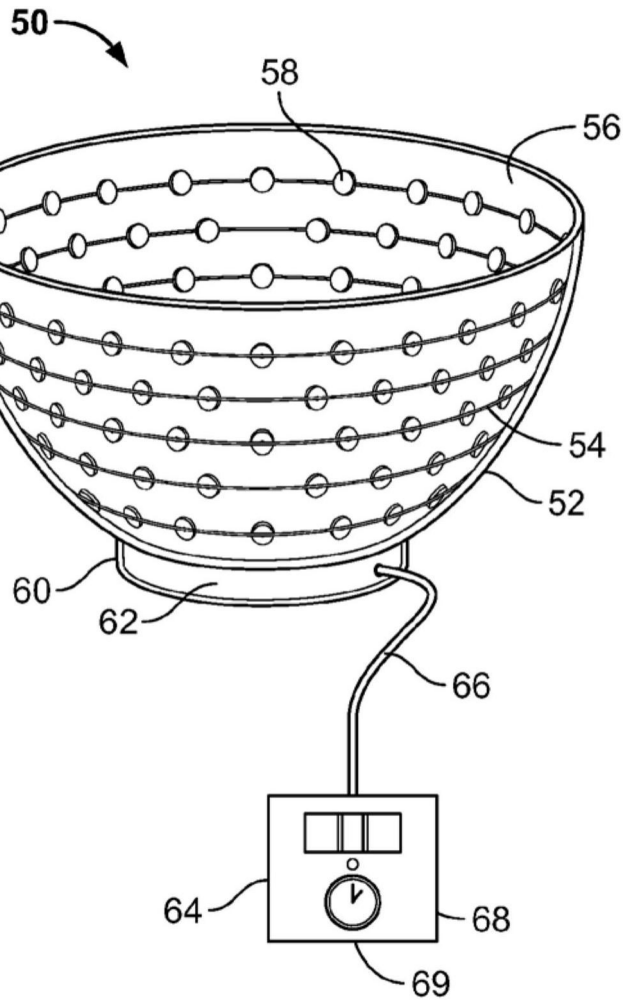


图2



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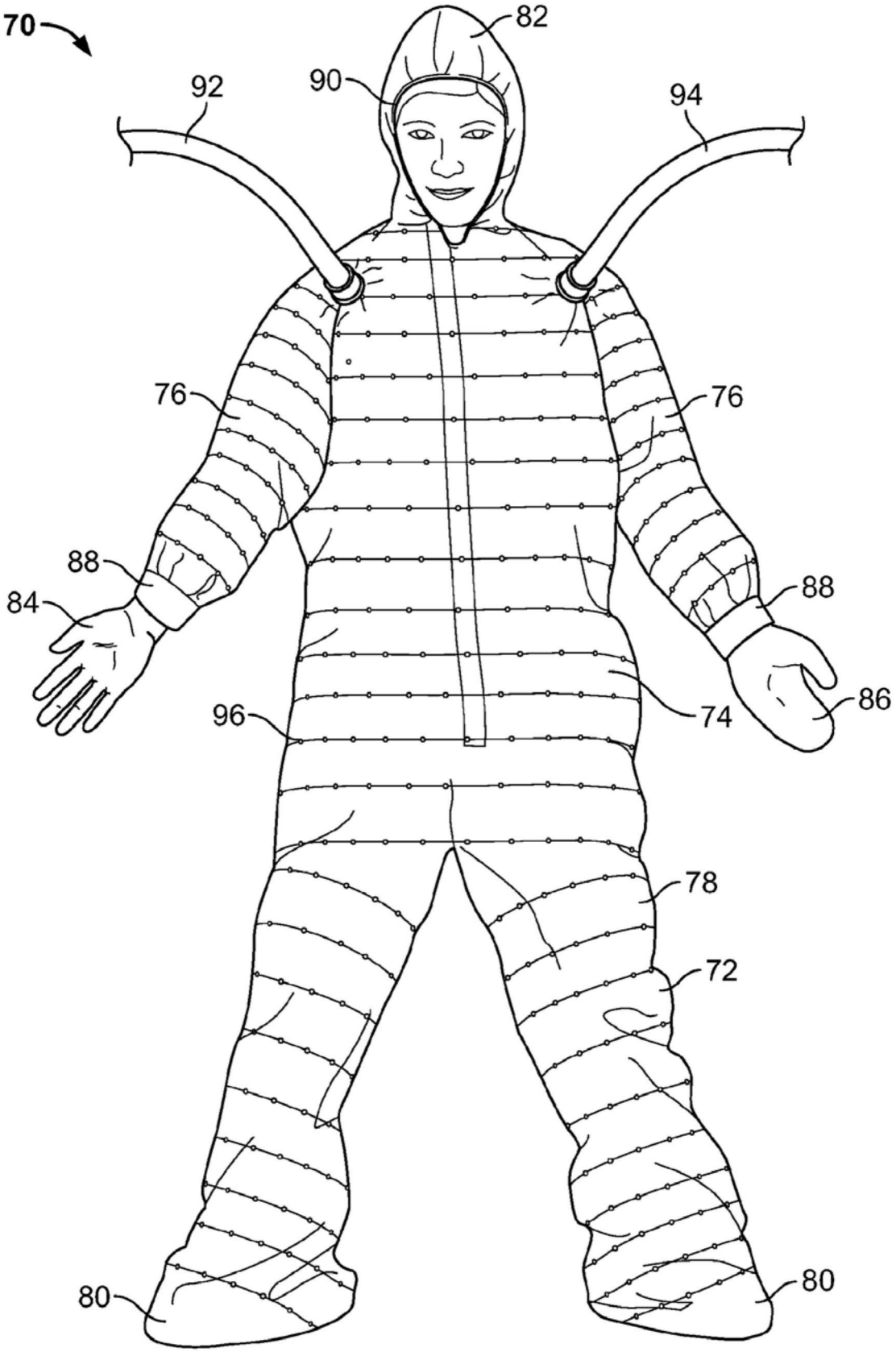

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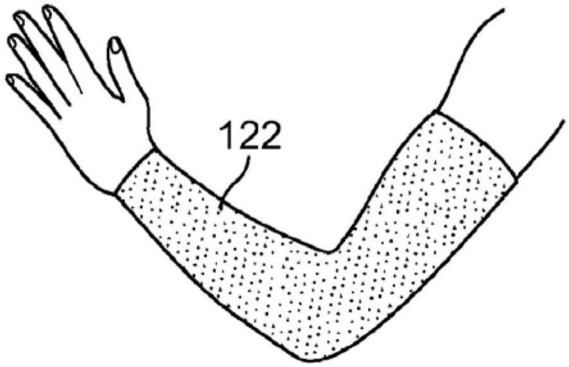


图5A

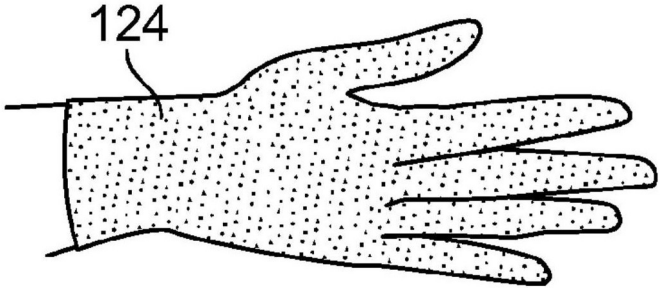


图5B

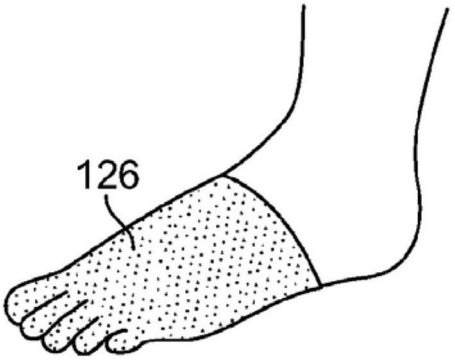


图5C

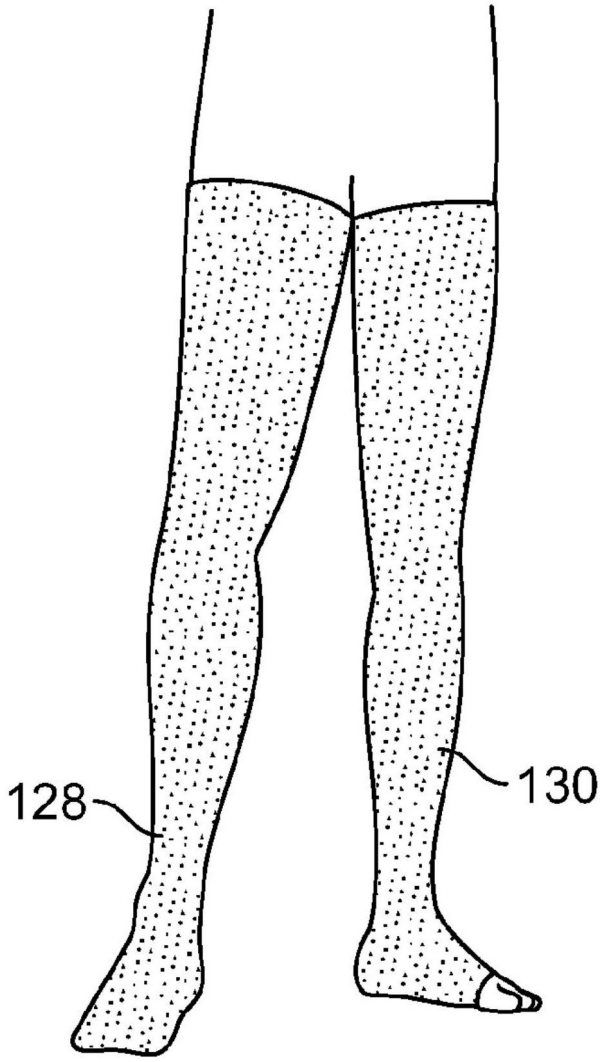
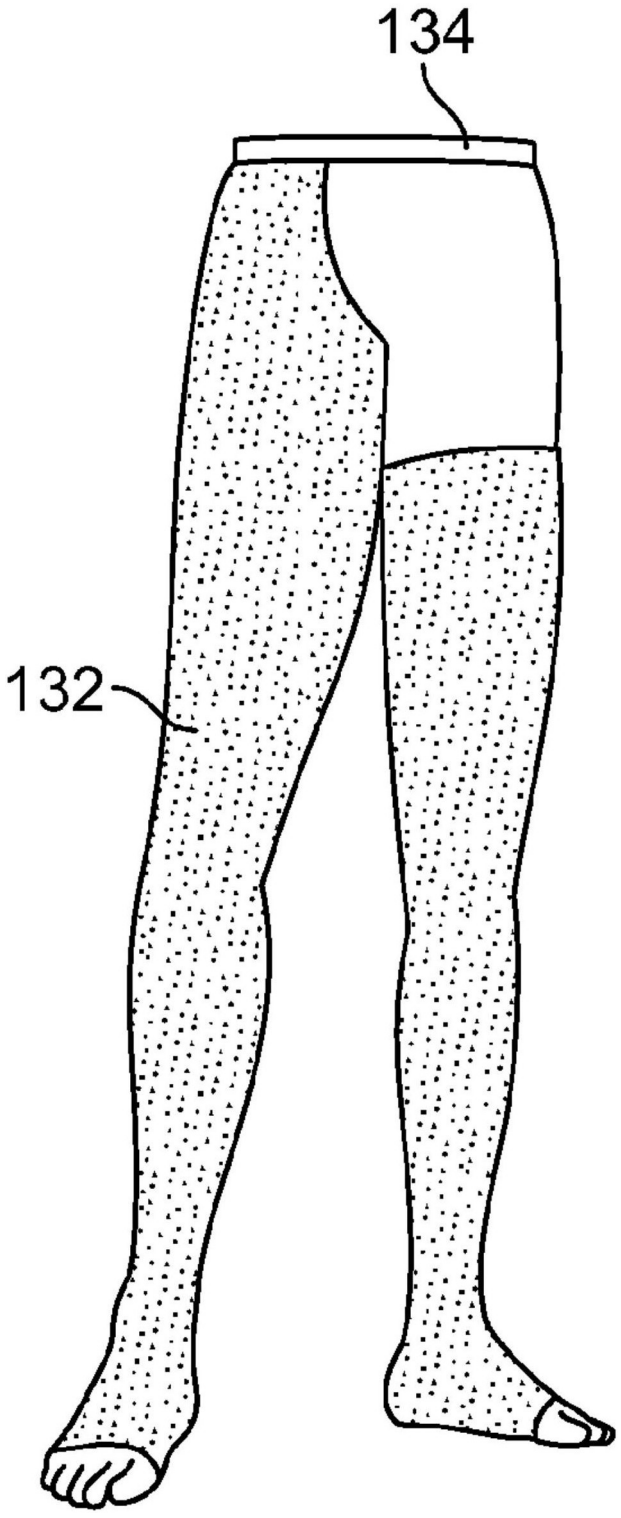


图5D



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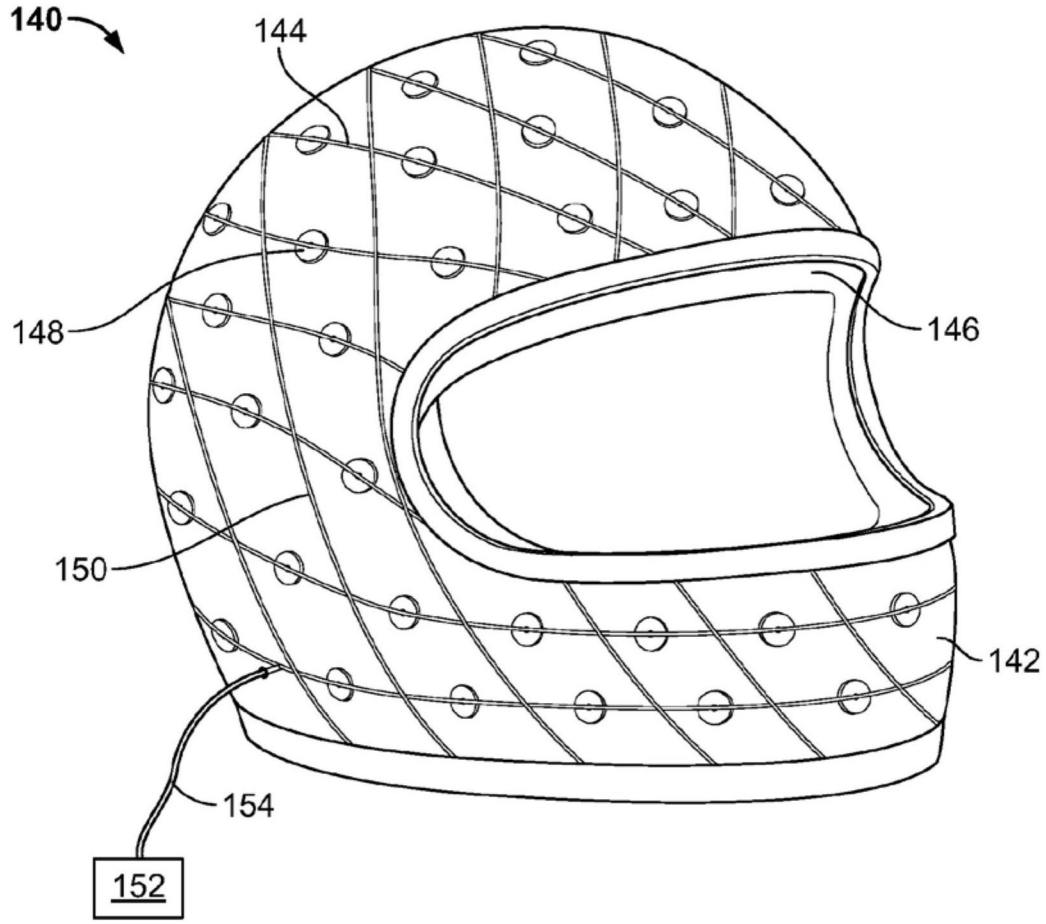
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图6

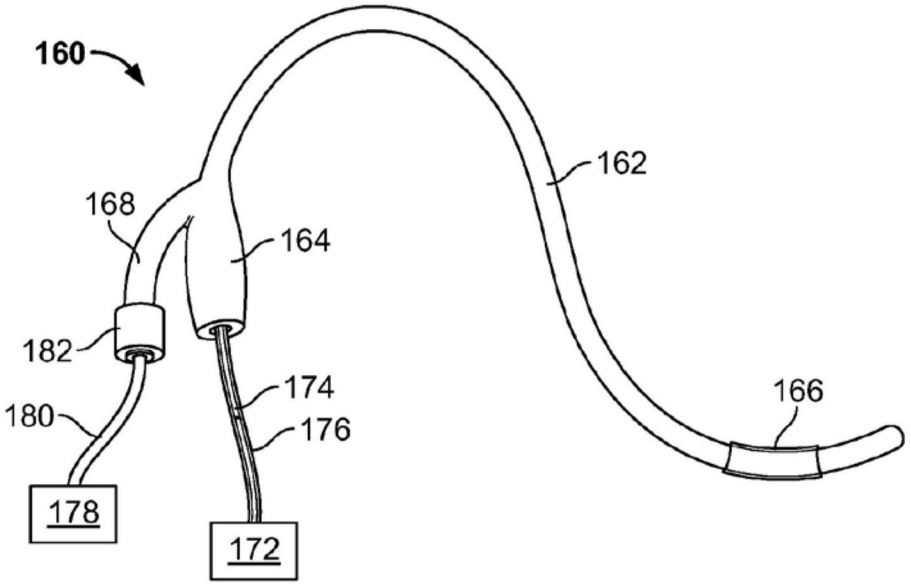
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图7

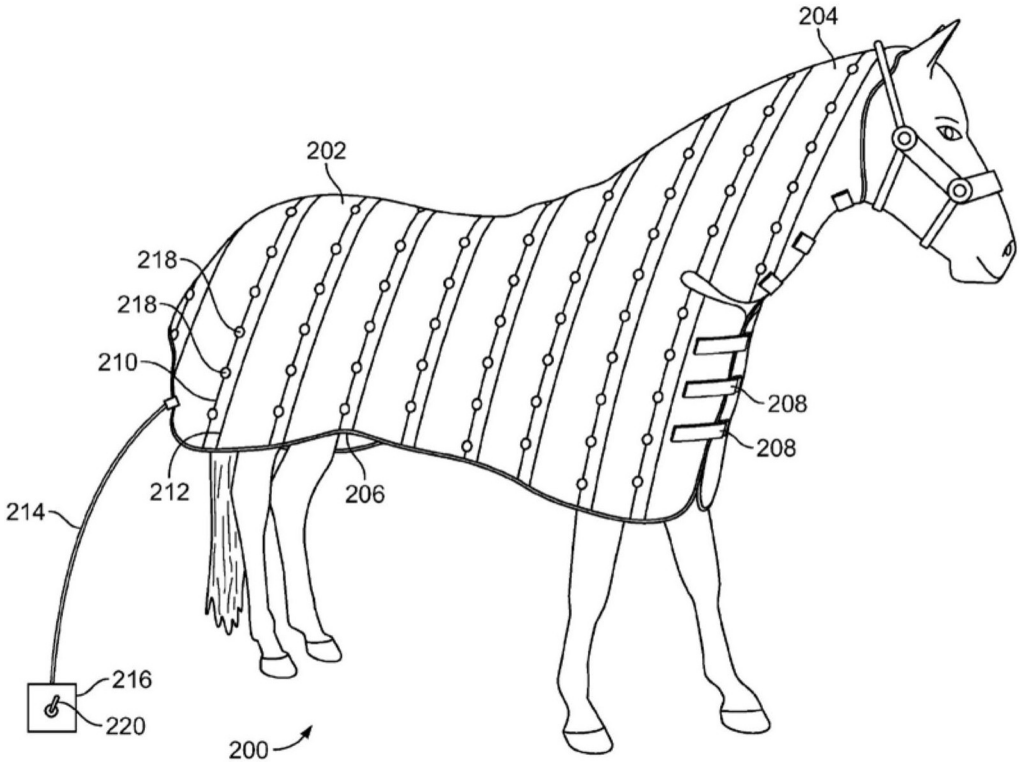
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图8

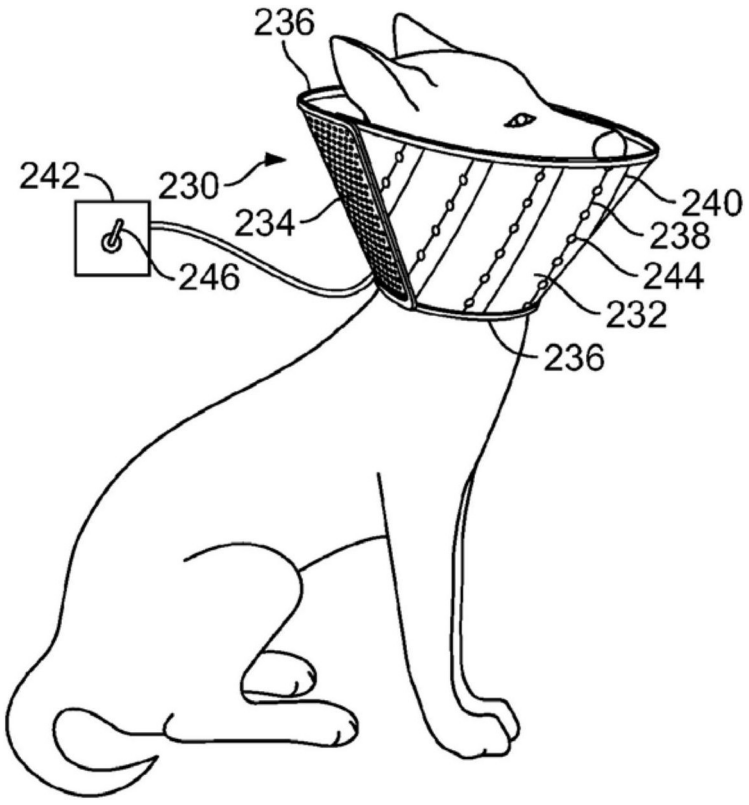
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图9A

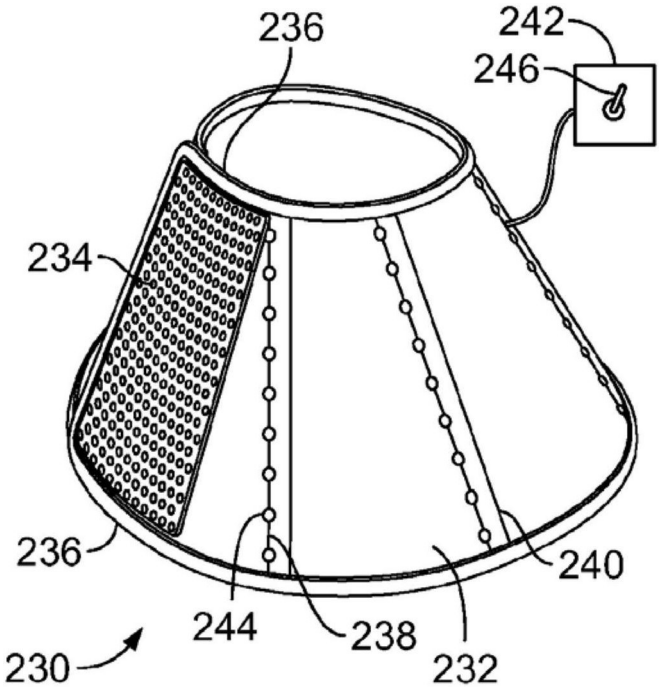
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图9B

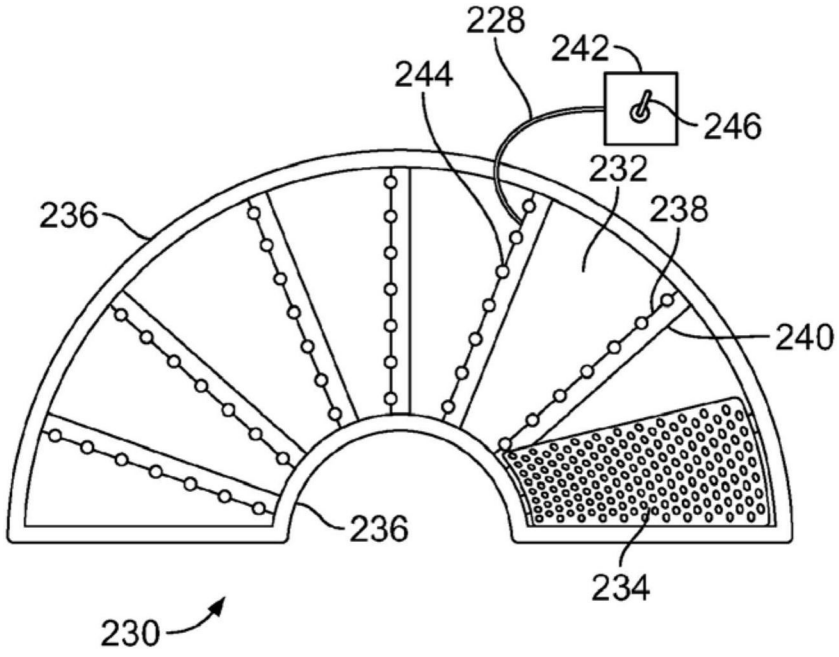
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图9C