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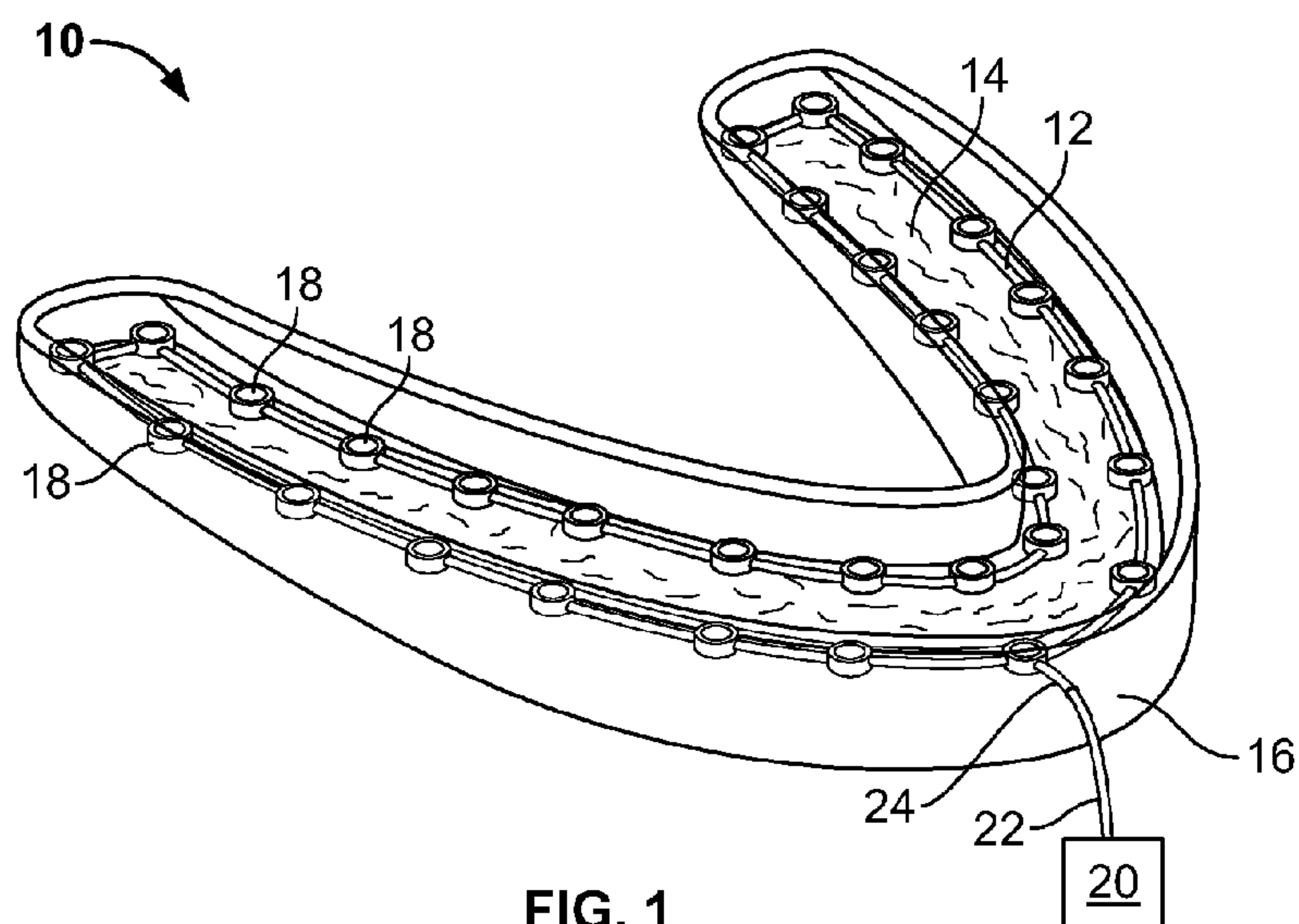


FIG. 1

(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

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[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
10 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,
15 (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

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[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
25 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.

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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.

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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
10 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
15 “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
20 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
25 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.

5 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
10 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
15 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.

20 [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
25 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
5 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
10 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.

15 [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
20 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 held. The light source may be in contact with the therapeutic solution or it may be held or placed within an effective distance.
25 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 (H_2O_2) can be either an oxidizing agent or a reducing agent. When H_2O_2 serves as an oxidizing agent, the oxygen is reduced to H_2O . When H_2O_2 serves as a reducing agent, the oxygen is oxidized to O_2 and bubbles are noticed. Embodiments of the present invention may utilize H_2O_2 and formulations of H_2O_2 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 H_2O_2 .

[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; H_2O_2 , 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-adamanty1)-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.

5 [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.

10 [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
15 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
20 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
25 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.

30 [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
5 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
10 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
15 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
20 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
25 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
30 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 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 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
5 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
10 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
15 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
20 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
25 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 held 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 than 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 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 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;

5 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:

10 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:

15 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

20 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

25 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.

5 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

10 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;

15 the tissue is a tooth of the user; and

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

20 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.

25

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;

30 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:

- 5 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;
- 10 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.

15

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;

20

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
- 25 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
30 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;
5 an iodine compound;
a Tumor Necrosis Factor;
a protease, pectinase, or elastase compound;
ciprofloxacin;
an antispasmodic; and
10 methylene bicloride.

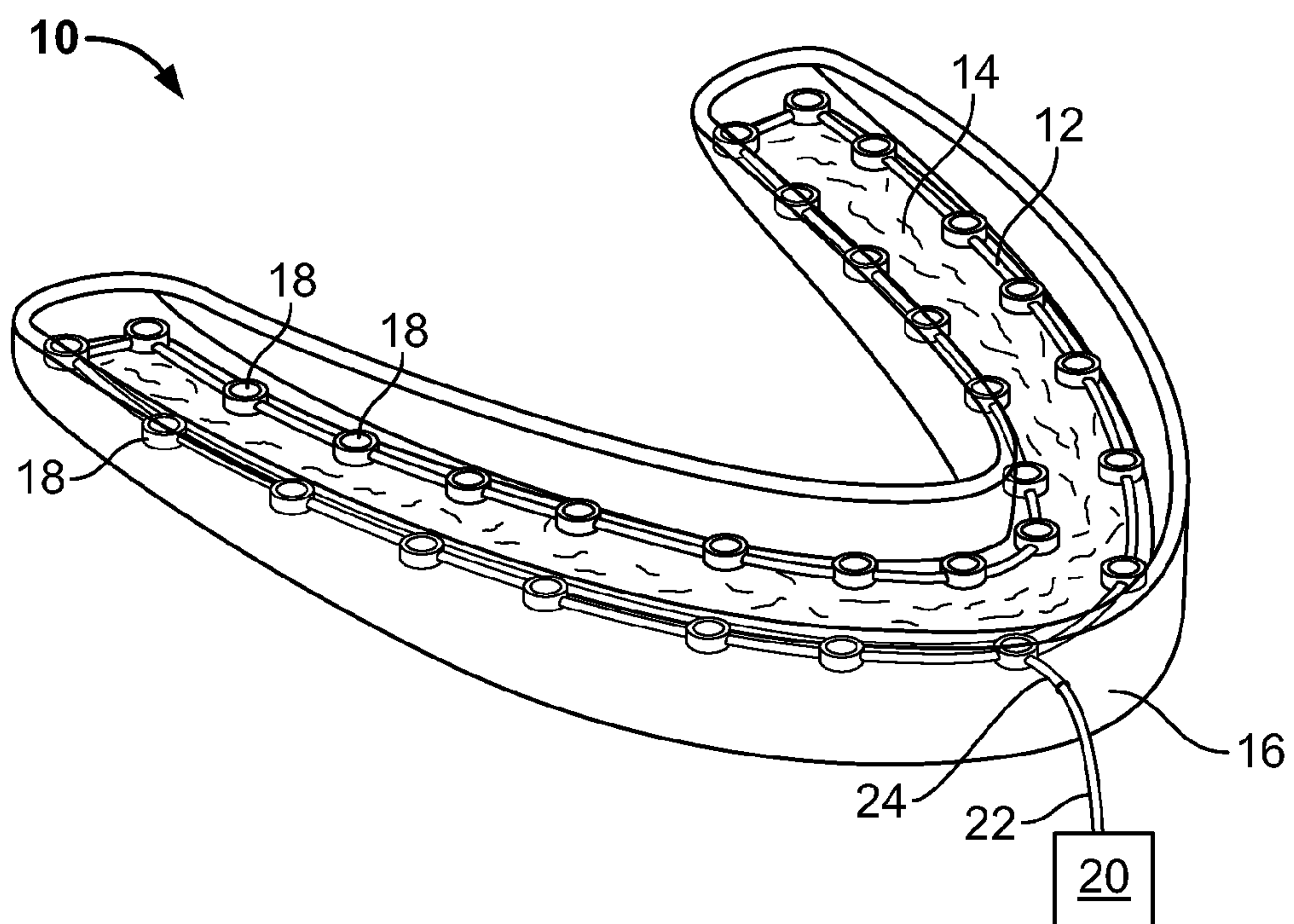


FIG. 1

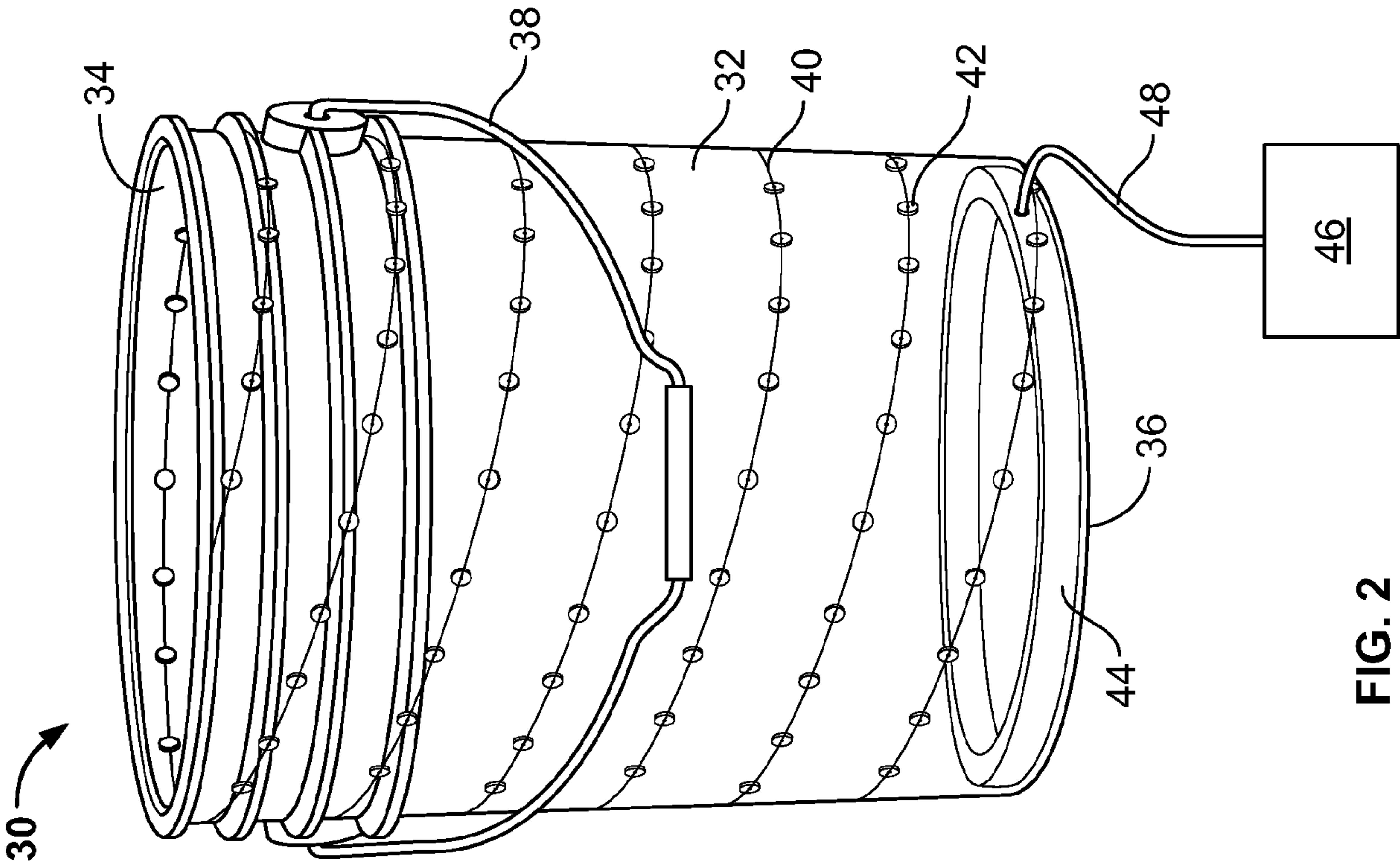


FIG. 2

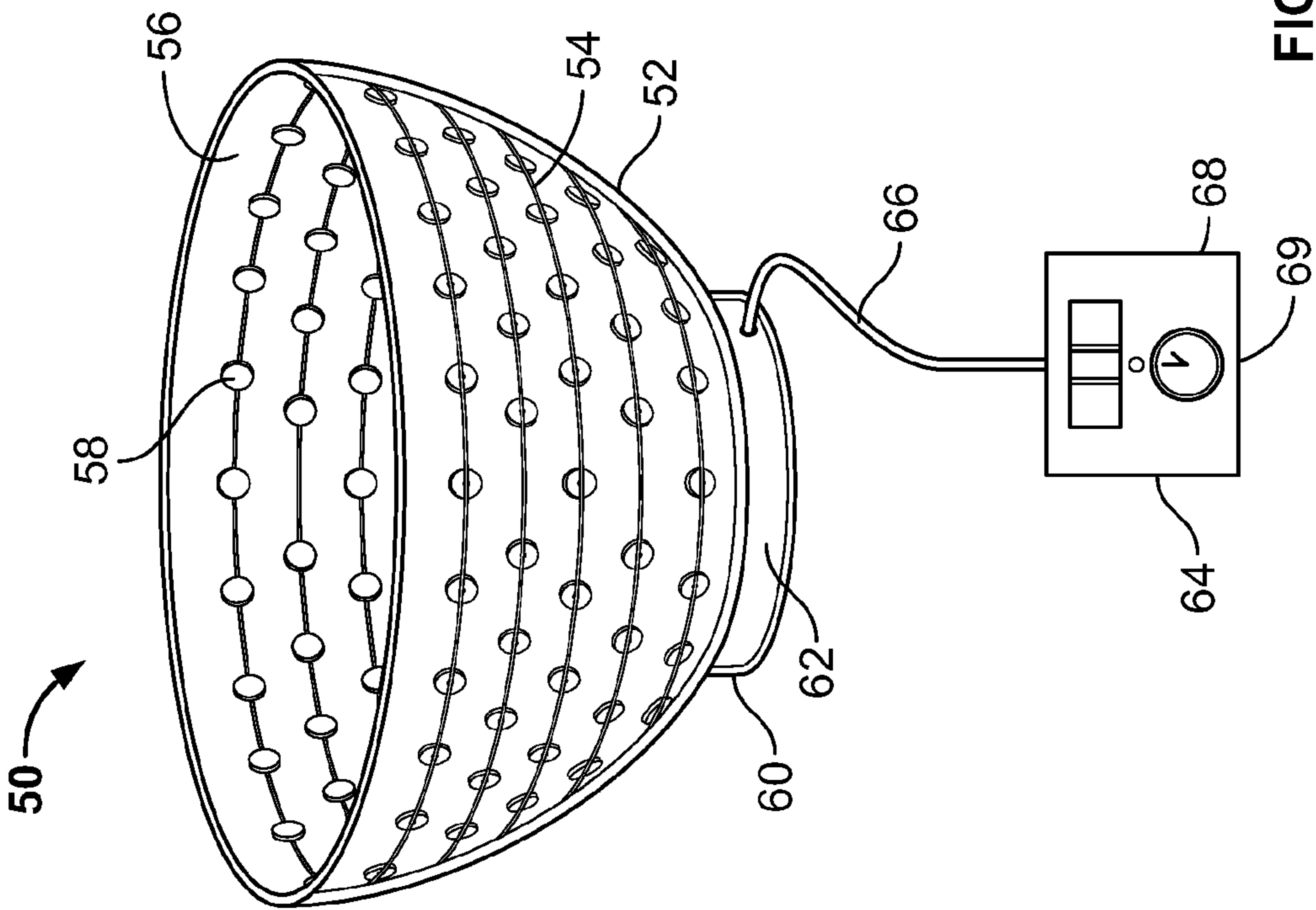


FIG. 3

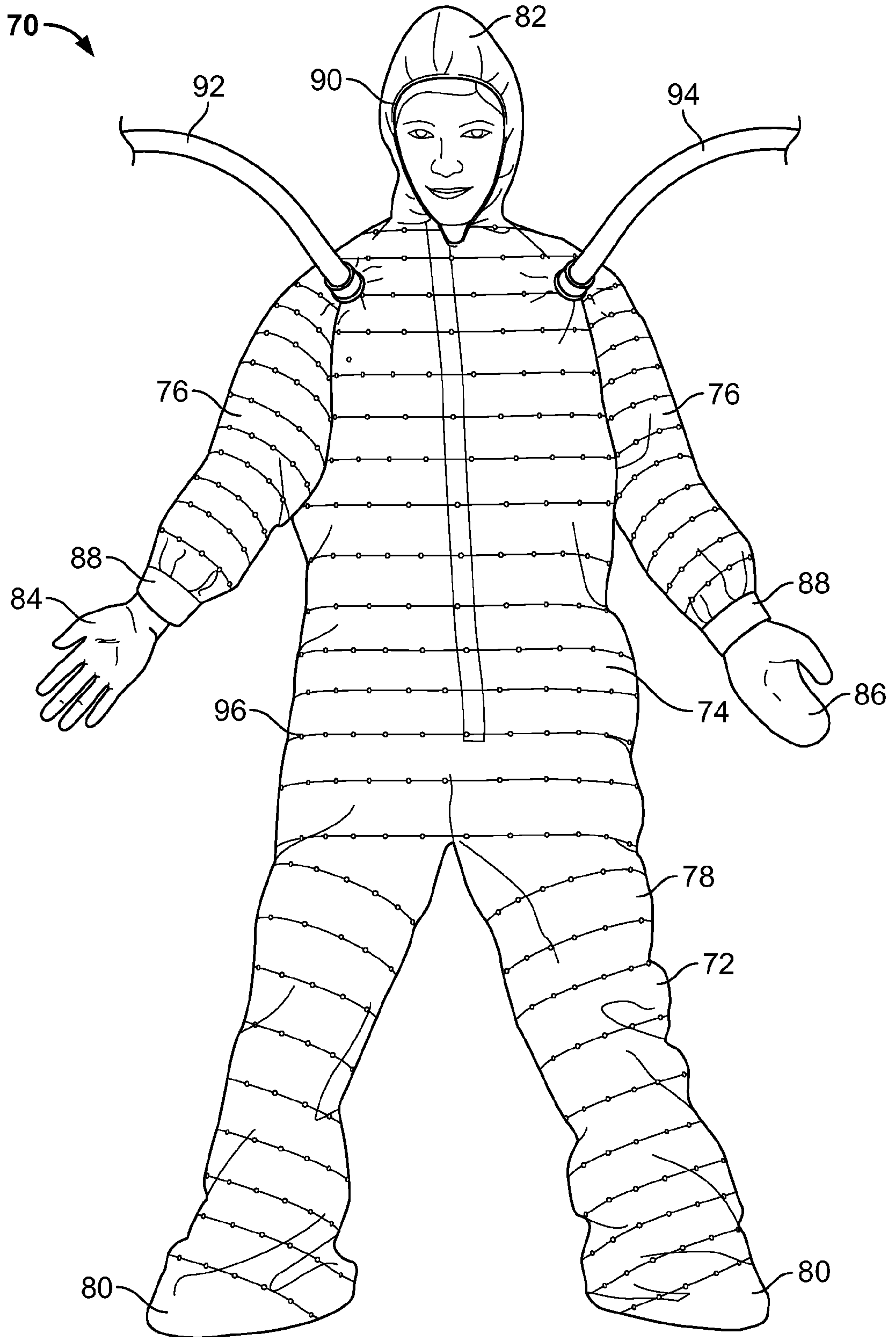
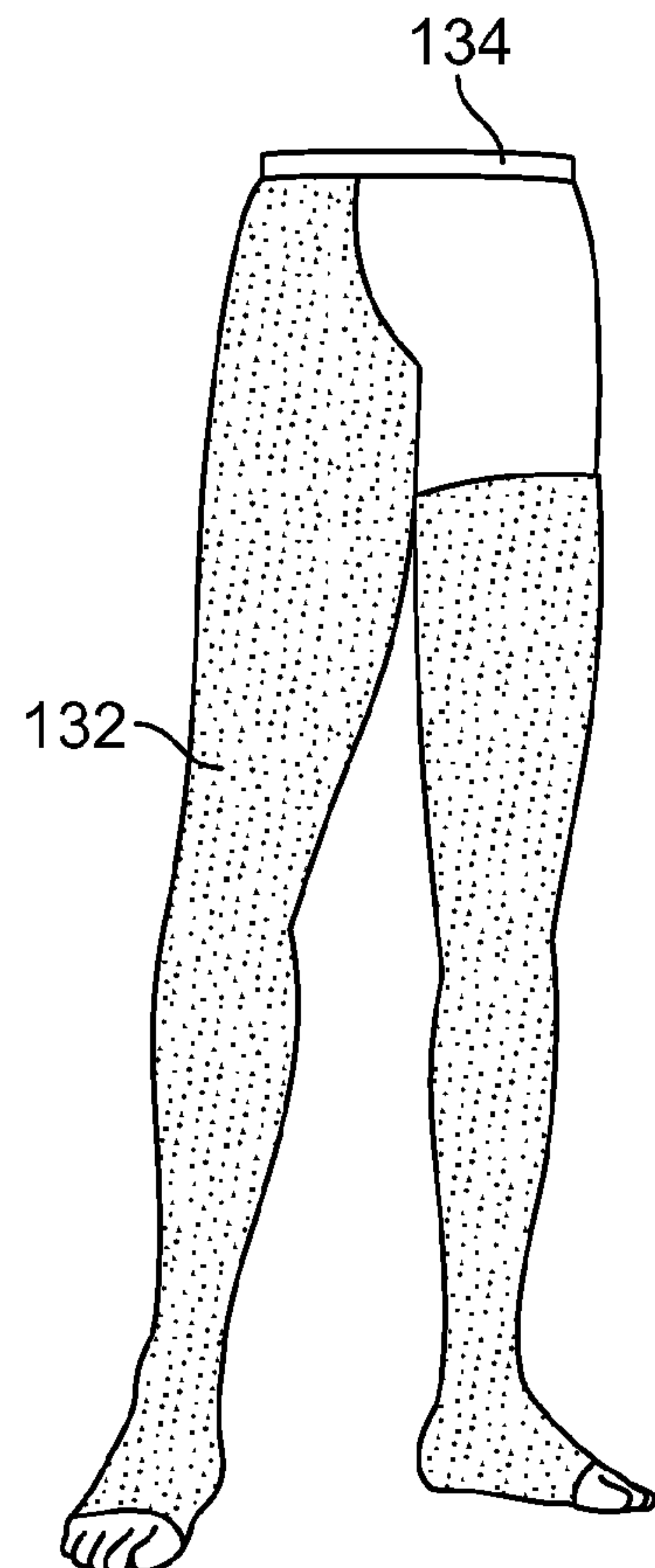
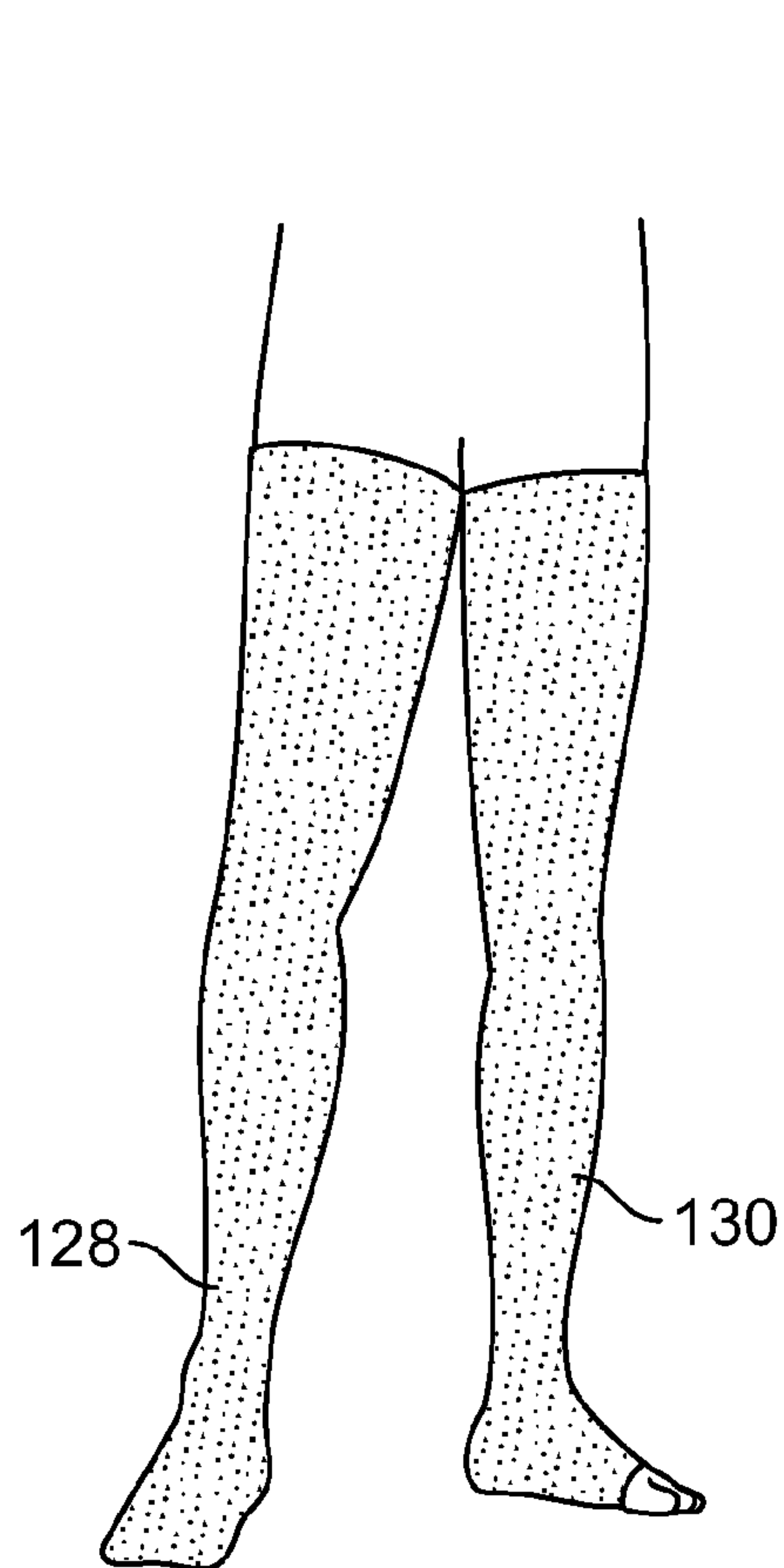
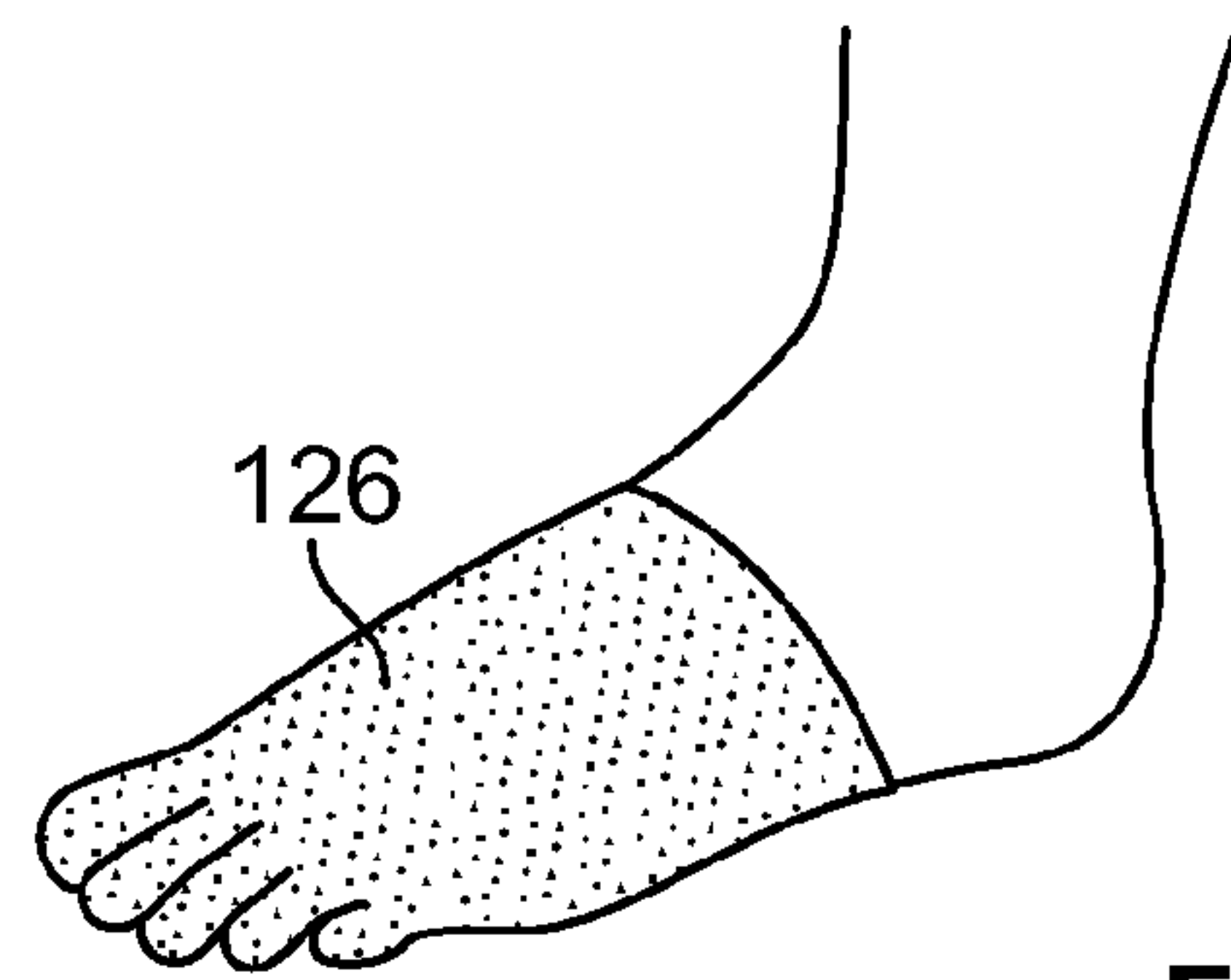
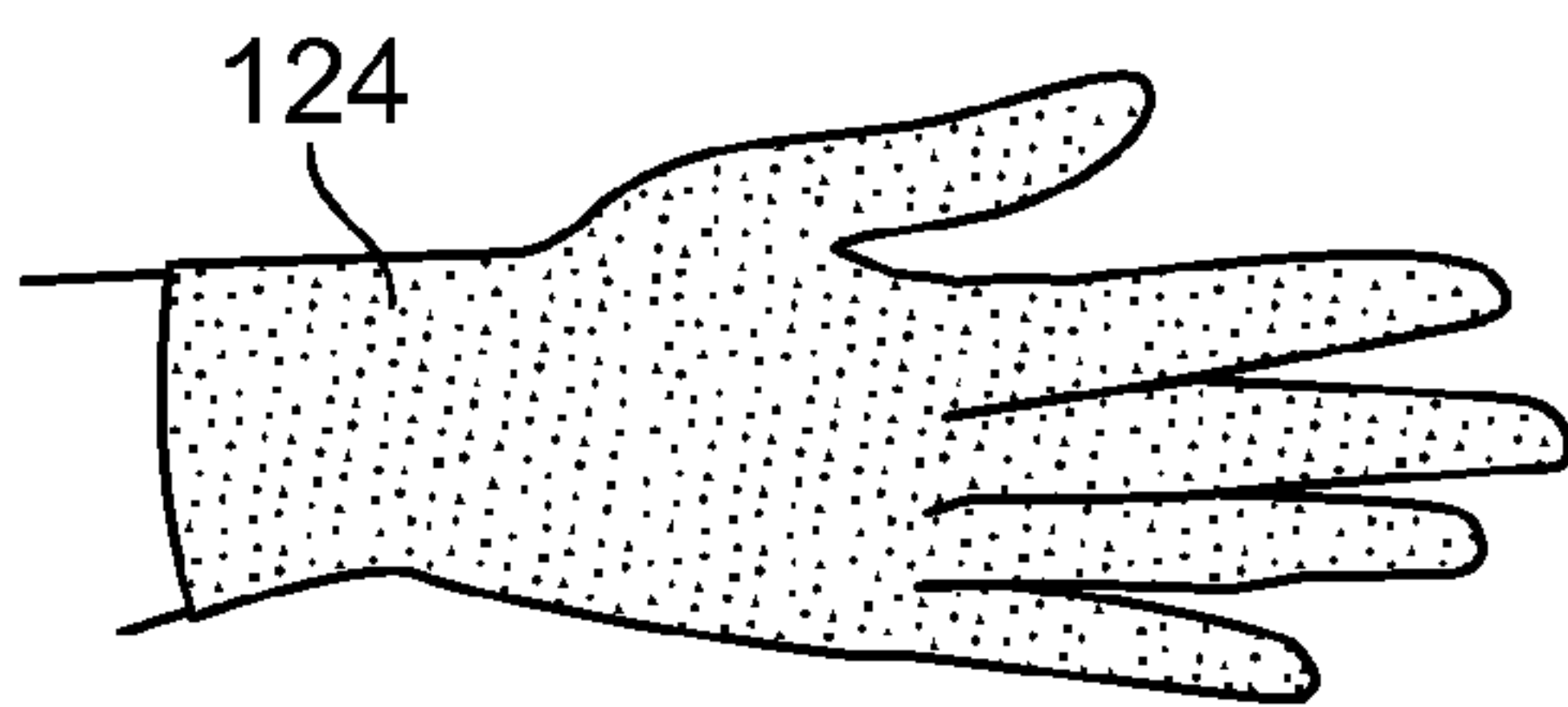
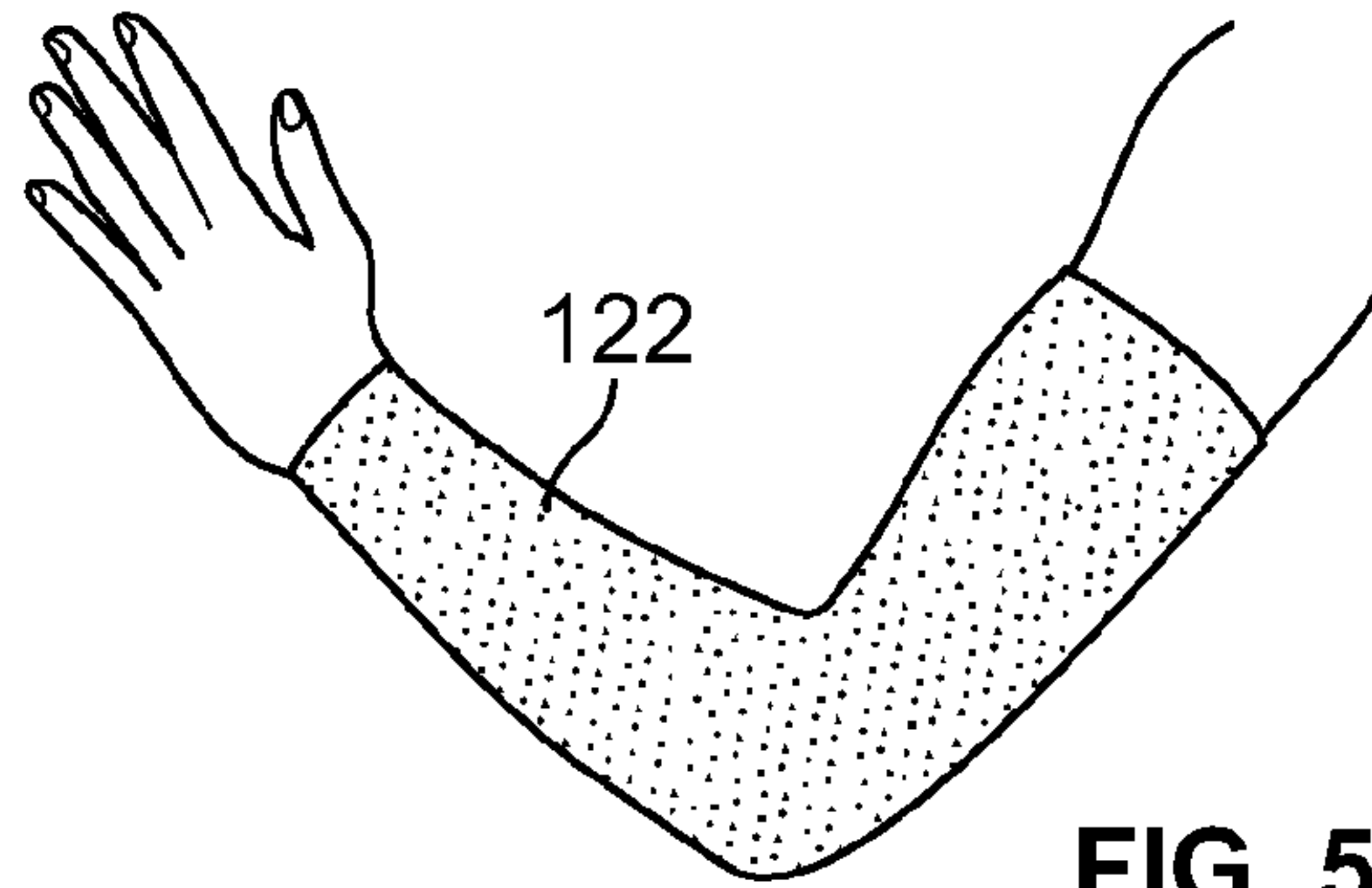
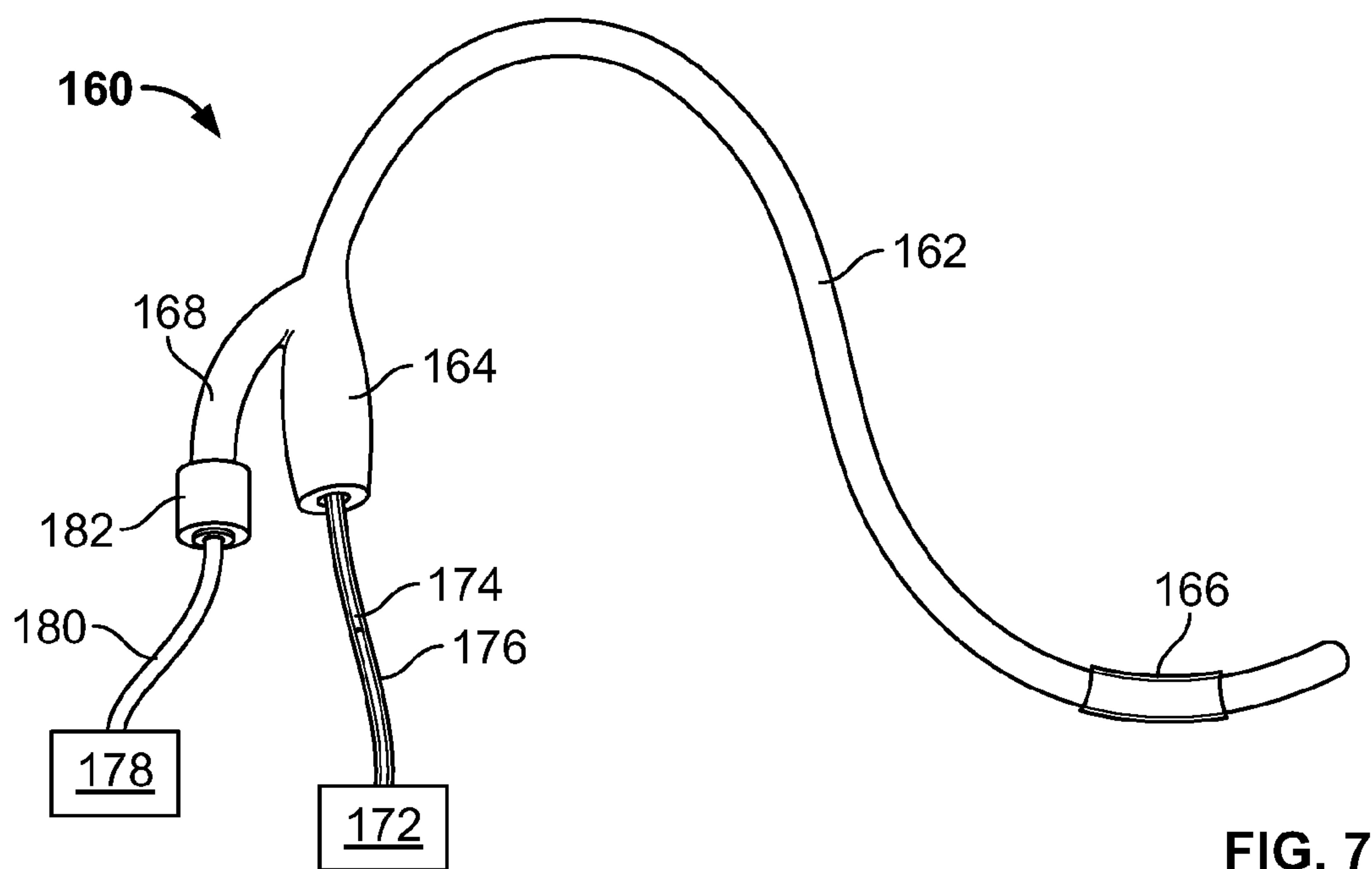
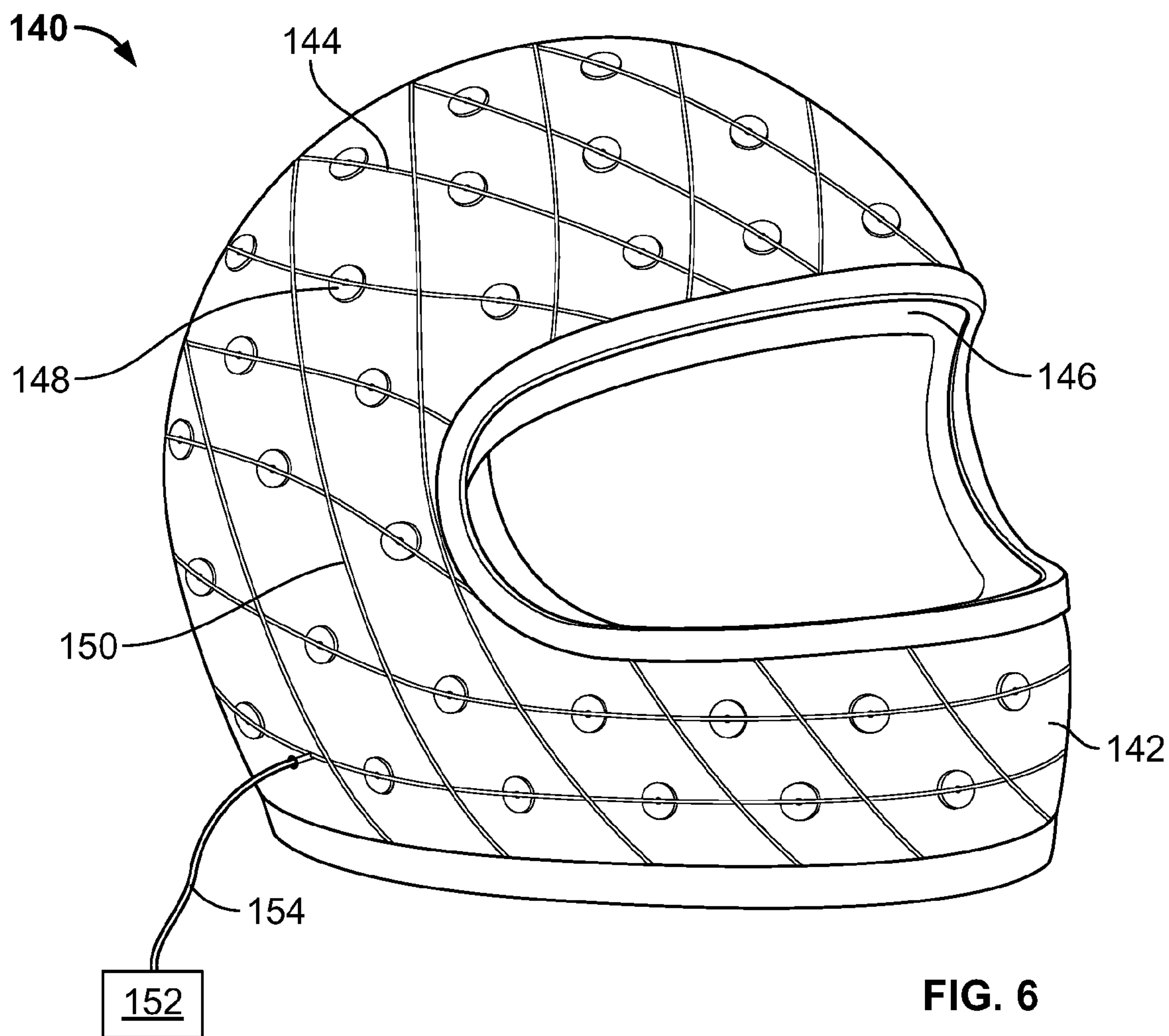


FIG. 4





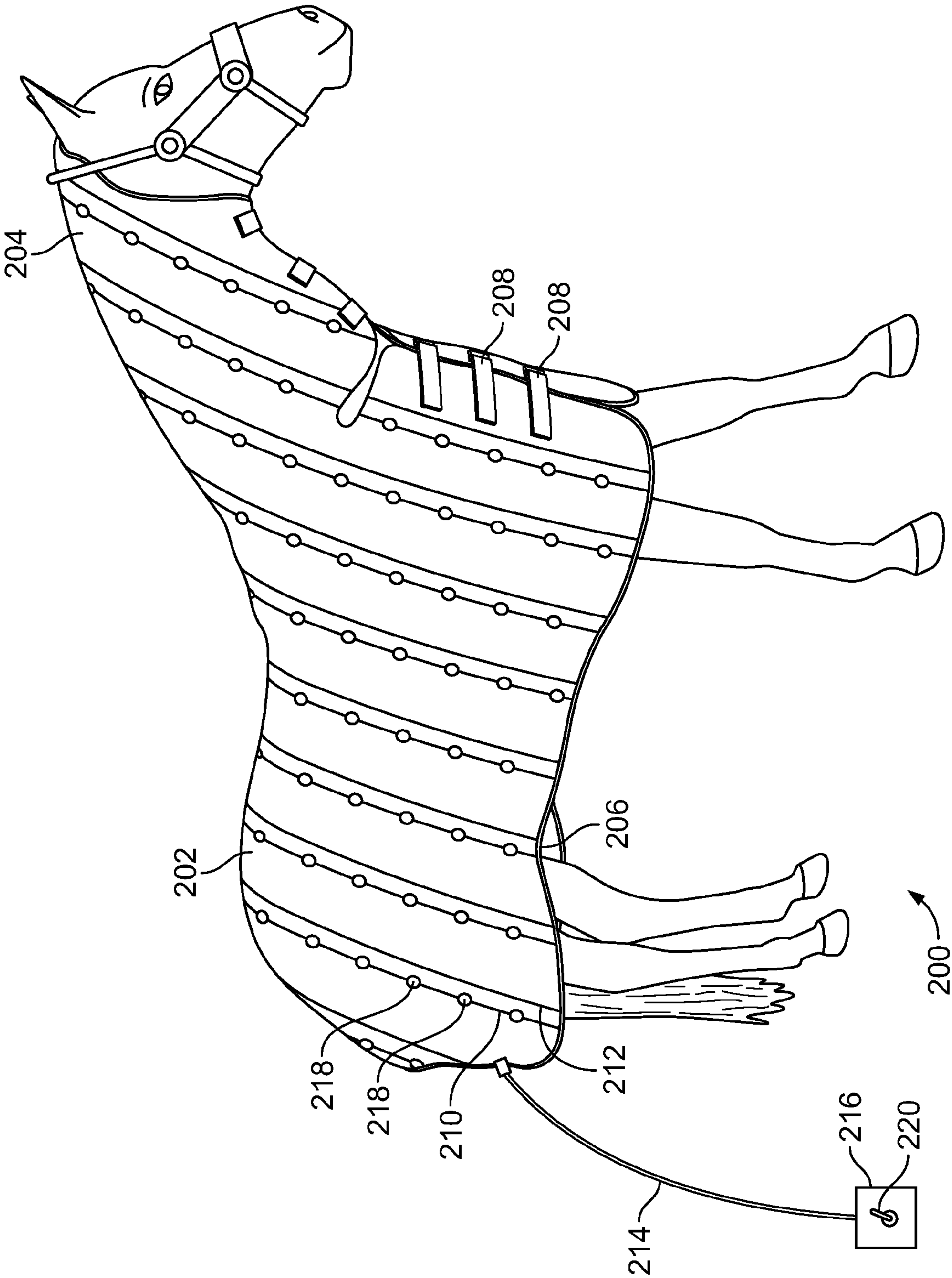
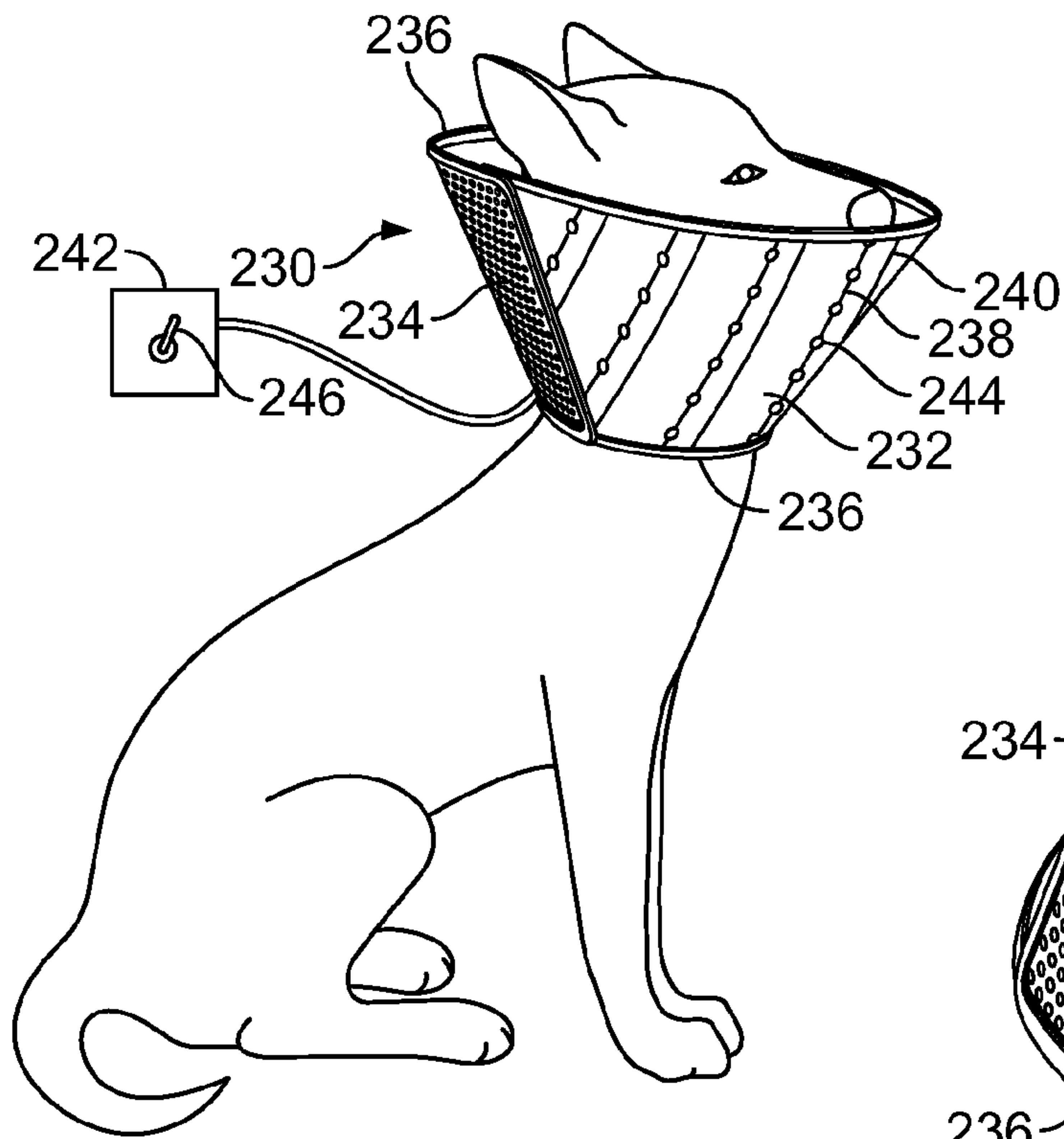
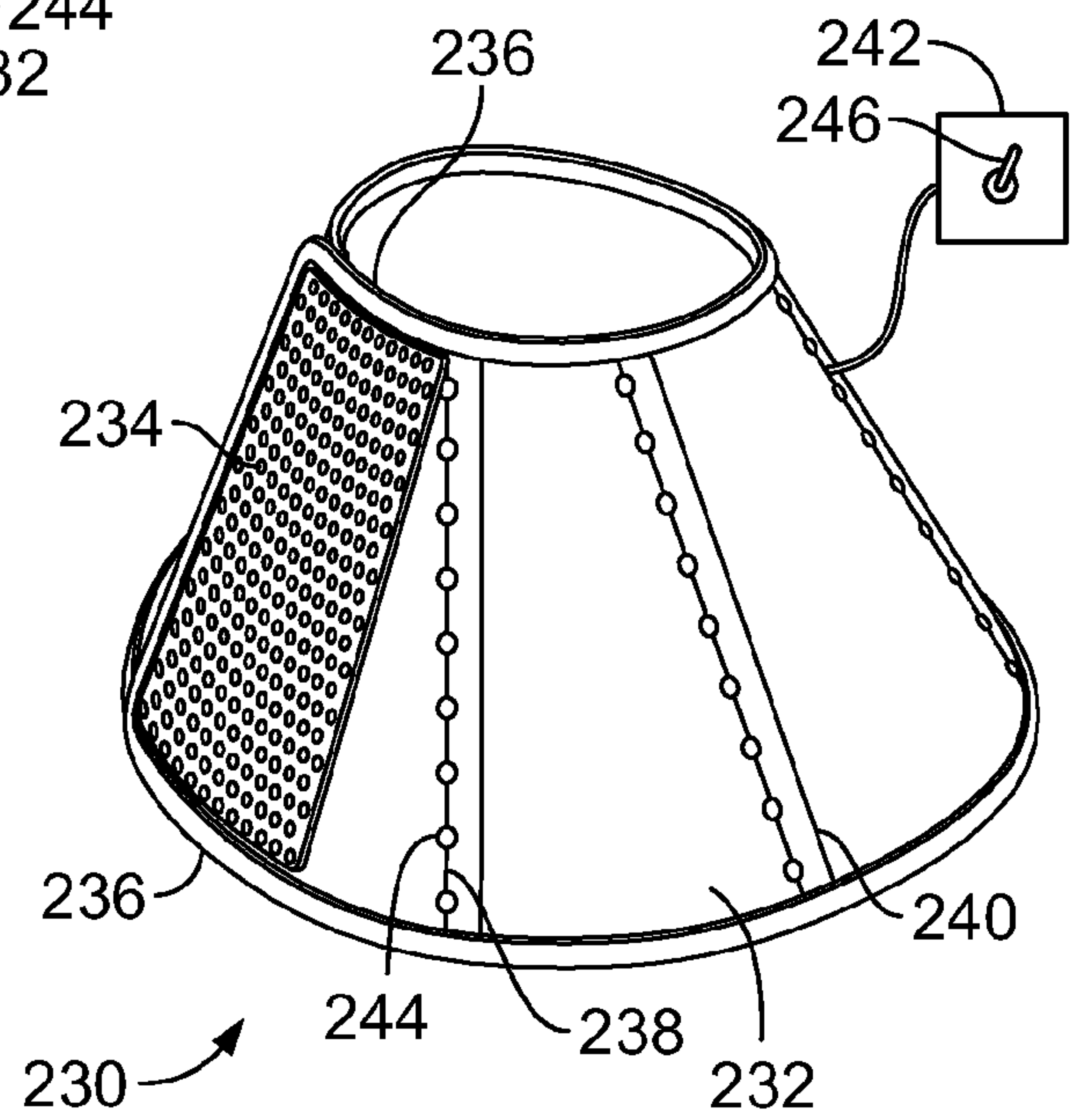
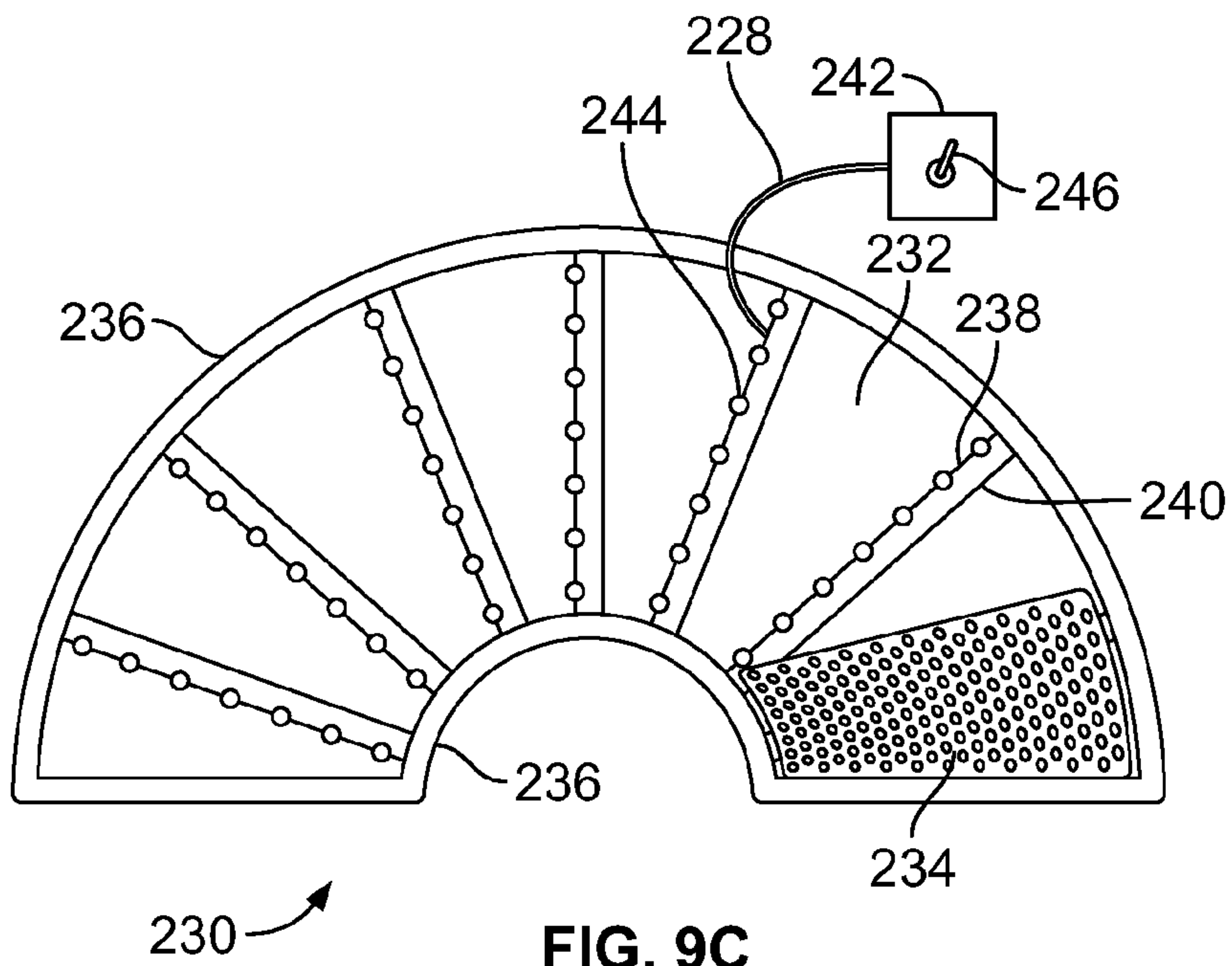


FIG. 8

**FIG. 9A****FIG. 9B****FIG. 9C**

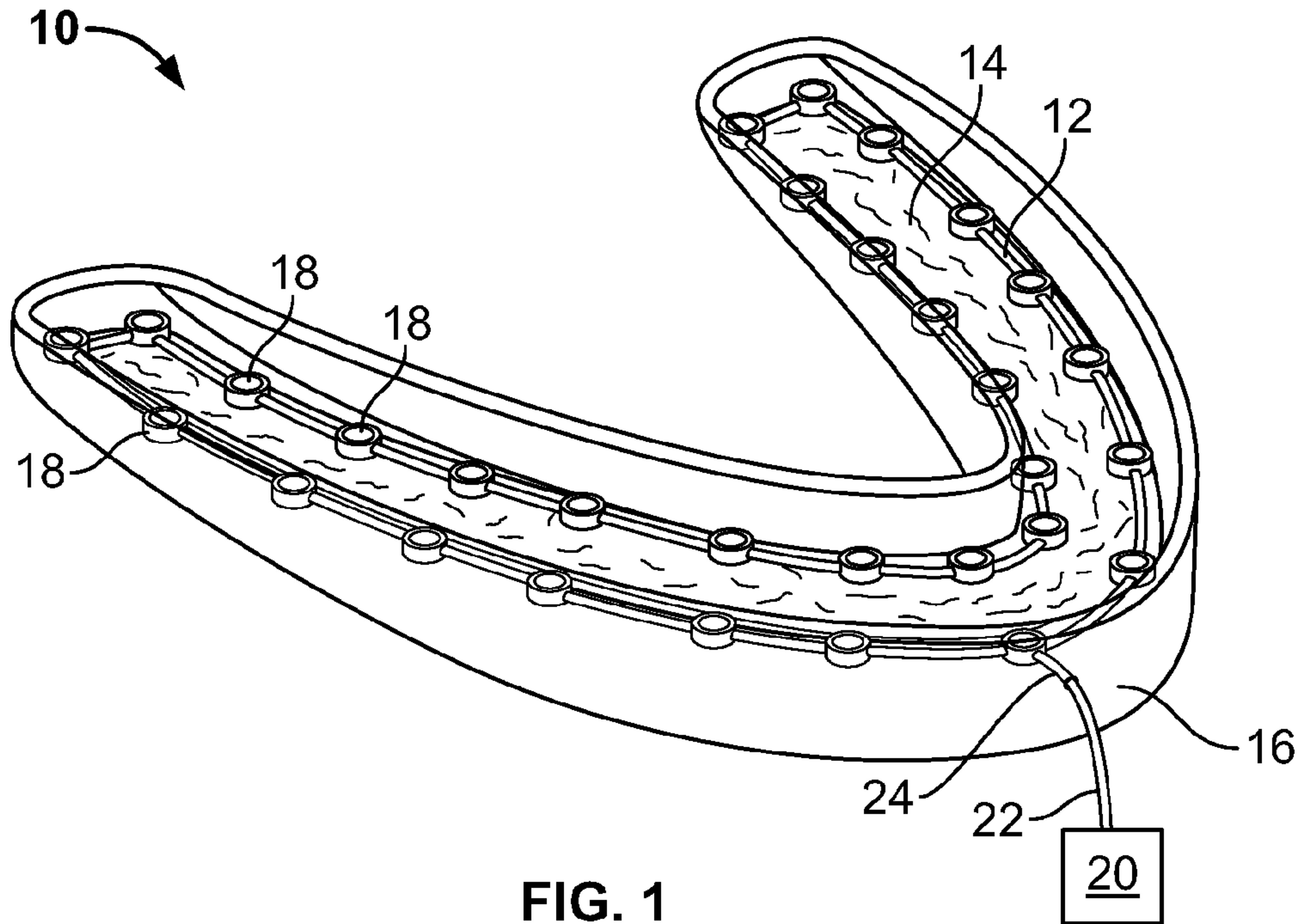


FIG. 1