



(51) International Patent Classification:

A61N 1/36 (2006.01)

A61N 1/05 (2006.01)

A61N 1/372 (2006.01)

H04R 25/00 (2006.01)

(21) International Application Number:

PCT/IB2024/055602

(22) International Filing Date:

07 June 2024 (07.06.2024)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

63/472,070

09 June 2023 (09.06.2023)

US

(71) Applicant: COCHLEAR LIMITED [AU/AU]; 1 University Avenue, Macquarie University, New South Wales 2109 (AU).

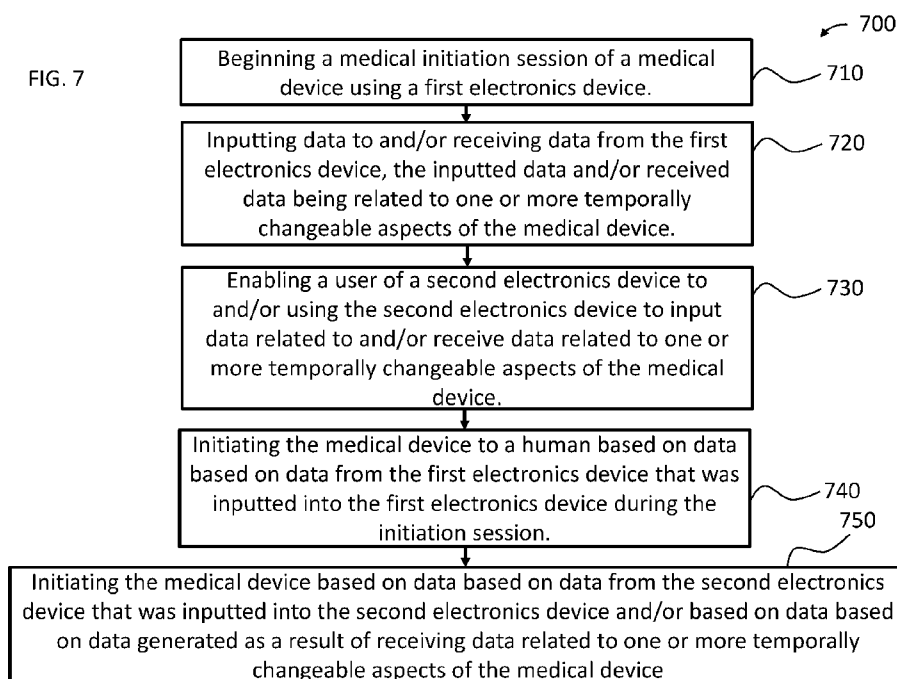
(72) Inventor: ANDERSSON, Erik; c/o Cochlear Limited, 1 University Avenue, Macquarie University, New South Wales 2109 (AU).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, CV,

(54) Title: MULTI PARTY TECHNIQUES

FIG. 7



(57) Abstract: A method, including inputting data to and/or receiving data from a first electronics device, the inputted data and/or received data being related to one or more temporally changeable aspects of the medical device, enabling a user of a second electronics device to and/or using the second electronics device to input data related to and/or receive data related to one or more temporally changeable aspects of the medical device, the second electronics device being a separate device from the first electronics device, initiating the medical device to a human based on data based on data from the first electronics device that was inputted into the first electronics device during the initiation session and initiating the medical device based on data based on data from the second electronics device that was inputted into the second electronics device and/or based on data based on data generated as a result of the receiving data related to one or more temporally changeable aspects of the medical device.

GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST,
SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ,
RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ,
DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT,
LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE,
SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN,
GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

MULTI PARTY TECHNIQUES

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Application No. 63/472,070, entitled MULTI PARTY TECHNIQUES, filed on June 9, 2023, naming Erik ANDERSSON as an inventor, the entire contents of that application being incorporated herein by reference in its entirety.

BACKGROUND

[0002] Medical devices have provided a wide range of therapeutic benefits to recipients over recent decades. Medical devices can include internal or implantable components/devices, external or wearable components/devices, or combinations thereof (e.g., a device having an external component communicating with an implantable component). Medical devices, such as traditional hearing aids, partially or fully-implantable hearing prostheses (e.g., bone conduction devices, mechanical stimulators, cochlear implants, etc.), pacemakers, defibrillators, functional electrical stimulation devices, and other medical devices, have been successful in performing lifesaving and/or lifestyle enhancement functions and/or recipient monitoring for a number of years.

[0003] The types of medical devices and the ranges of functions performed thereby have increased over the years. For example, many medical devices, sometimes referred to as “implantable medical devices,” now often include one or more instruments, apparatus, sensors, processors, controllers or other functional mechanical or electrical components that are permanently or temporarily implanted in a recipient. These functional devices are typically used to diagnose, prevent, monitor, treat, or manage a disease/injury or symptom thereof, or to investigate, replace or modify the anatomy or a physiological process. Many of these functional devices utilize power and/or data received from external devices that are part of, or operate in conjunction with, implantable components.

SUMMARY

[0004] In an exemplary embodiment, there is a method, comprising:

inputting data to and/or receiving data from a first electronics device, the inputted data and/or received data being related to one or more temporally changeable aspects of the medical device;

enabling a user of a second electronics device to and/or using the second electronics device to input data related to and/or receive data related to one or more temporally changeable aspects of the medical device, the second electronics device being a separate device from the first electronics device;

initiating the medical device to a human based on data based on data from the first electronics device that was inputted into the first electronics device during the initiation session; and

initiating the medical device based on data based on data from the second electronics device that was inputted into the second electronics device and/or based on data based on data generated as a result of the receiving data related to one or more temporally changeable aspects of the medical device, wherein

the first electronics device and/or a third electronics device that is in signal communication with the first electronics device provides a common medical device initiation session service and is directly in signal communication with the medical device and is in signal communication with the second electronics device, and

the action of initiating the medical device based on data based on data from the second electronics device that was inputted into the second electronics device and/or based on data based on data generated as a result of the receiving data related to one or more temporally changeable aspects of the medical device is executed using the first electronics device and/or the third electronics device.

[0005] In an exemplary embodiment, there is a fitting system, comprising:

a communications subsystem including at least one of (i) a first input subsystem and a first output subsystem or (ii) a first input/output subsystem; and

a processing subsystem, wherein

the communications subsystem is configured to enable a first user of the fitting system to enter data via the first input subsystem and/or the first input/output subsystem while physically present in a same location as a physical output of the first output subsystem and/or first input/output subsystem, and

least one of:

the communications subsystem is configured to enable a second user to enter and/or be entered into a fitting session in which the fitting system is

being used, wherein the second user is at a location away from the same location; or

the system includes a second input subsystem and/or a second input/output subsystem, and wherein the system is configured to enable the first user to transition from using the first input subsystem and/or the first input/output subsystem to using the second input subsystem and/or the second input/output subsystem.

[0006] In an exemplary embodiment, there is a method, comprising:

entering, via a telecommunications link, into an ongoing fitting session;

obtaining information relating to the fitting session after the action of entering;

evaluating the information; and

based on the evaluation, over the telecommunications link, providing second information to a participant in the fitting session and/or making an adjustment, over the telecommunications link to a medical device that is a subject of the fitting session and/or creating or adding or modifying in whole or in part to a data set to be used by the medical device based on the evaluation that is a subject of the fitting session and/or bringing in another party into the ongoing fitting session.

[0007] In an exemplary embodiment, there is a non-transitory computer-readable media having recorded thereon, a computer program for executing at least a portion of a medical device fitting method, the computer program including:

code for receiving input from a first participant through a first portal;

code for receiving input and/or providing output to a second participant through a second portal separate from the first portal;

code for fitting the medical device based on input from at least the first participant;

and

code for controlling at least one of:

input received from the first participant;

input received from the second participant;

output provided to the second participant.

In an exemplary embodiment, there is a fitting system, comprising:

a first keyboard / computer monitor / CPU unit assembly; and

a computer processor;

the first assembly is configured to enable a first user of the fitting system to enter data via the first assembly while physically present in a same location as the first assembly, and

least one of:

the first assembly is configured to enable a second user to enter and/or be entered into a fitting session in which the fitting system is being used, wherein the second user is at a location away from the same location; or

the system includes a second keyboard / computer monitor / CPU unit assembly, and wherein the system is configured to enable the first user to transition from using the first assembly to the second assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Embodiments are described below with reference to the attached drawings, in which:

[0009] FIG. 1 is a perspective view of an exemplary hearing prosthesis;

[0010] FIG. 2 presents a functional block diagram of an exemplary cochlear implant;

[0011] FIG. 3A and FIG. 3B and 3C present exemplary systems of communication between devices;

[0012] FIG. 4 presents an exemplary retinal prosthesis;

[0013] FIG. 5 presents an exemplary vestibular implant;

[0014] FIGs. 6-8 present exemplar flowcharts for exemplary methods;

[0015] FIG. 9 presents an exemplary functional block diagram for an exemplary embodiment;

[0016] FIGs. 10 and 11 present exemplary representations of exemplary methods; and

[0017] FIG. 12 is a schematic representation depicting communication between various components of an exemplary system.

DETAILED DESCRIPTION

[0018] Merely for ease of description, the techniques presented herein are described herein with reference by way of background to an illustrative medical device, namely a cochlear implant. However, it is to be appreciated that the techniques presented herein may also be used with a variety of other medical devices that, while providing a wide range of therapeutic benefits to recipients, patients, or other users, may benefit from setting changes based on the location of the medical device. For example, the techniques presented herein may be used to determine the viability of various types of prostheses, such as, for example, a vestibular implant and/or a retinal implant, with respect to a particular human being. And with regard to the latter, the techniques presented herein are also described with reference by way of background to another illustrative medical device, namely a retinal implant. The techniques presented herein are also applicable to the technology of vestibular devices (e.g., vestibular implants), visual devices (i.e., bionic eyes), sensors, pacemakers, drug delivery systems, defibrillators, functional electrical stimulation devices, catheters, seizure devices (e.g., devices for monitoring and/or treating epileptic events), sleep apnea devices, electroporation, etc.

[0019] Also, embodiments are directed to application to other types of hearing prostheses, such as middle ear implants, bone conduction devices (active transcutaneous, passive transcutaneous, percutaneous), and conventional hearing aids. Thus, embodiments are directed to devices that include implantable portions and embodiments that do not include implantable portions.

[0020] Any reference to one of the above-noted sensory prostheses corresponds to an alternate disclosure using one of the other above-noted sensory prostheses unless otherwise noted, providing that the art enables such.

[0021] FIG. 1 is a perspective view of a cochlear implant, referred to as cochlear implant 100, implanted in a recipient, to which some embodiments detailed herein and/or variations thereof are applicable. Particularly, as will be detailed below, there are aspects of a cochlear implant that are utilized with respect to a vestibular implant, and thus there is utility in describing features of the cochlear implant for purposes of understanding a vestibular implant. The cochlear implant 100 is part of a system 10 that can include external components in some embodiments, as will be detailed below. Additionally, it is noted that the teachings detailed herein are also applicable to other types of hearing prostheses, such as,

by way of example only and not by way of limitation, bone conduction devices (percutaneous, active transcutaneous and/or passive transcutaneous), direct acoustic cochlear stimulators, middle ear implants, and conventional hearing aids, etc. Indeed, it is noted that the teachings detailed herein are also applicable to so-called multi-mode devices. In an exemplary embodiment, these multi-mode devices apply both electrical stimulation and acoustic stimulation to the recipient. In an exemplary embodiment, these multi-mode devices evoke a hearing percept via electrical hearing and bone conduction hearing.

[0022] In view of the above, it is to be understood that at least some embodiments detailed herein and/or variations thereof are directed towards a body-worn sensory supplement medical device (e.g., the hearing prosthesis of FIG. 1, which supplements the hearing sense, even in instances when there are no natural hearing capabilities, for example, due to degeneration of previous natural hearing capability or to the lack of any natural hearing capability, for example, from birth). Again, it is noted that at least some exemplary embodiments of some sensory supplement medical devices are directed towards devices such as conventional hearing aids, which supplement the hearing sense in instances where some natural hearing capabilities have been retained, and visual prostheses (both those that are applicable to recipients having some natural vision capabilities and to recipients having no natural vision capabilities). Accordingly, the teachings detailed herein are applicable to any type of sensory supplement medical device to which the teachings detailed herein are enabled for use therein in a utilitarian manner. In this regard, the phrase sensory supplement medical device refers to any device that functions to provide sensation to a recipient irrespective of whether the applicable natural sense is only partially impaired or completely impaired, or indeed never existed.

[0023] The recipient has an outer ear 101, a middle ear 105, and an inner ear 107. Components of outer ear 101, middle ear 105, and inner ear 107 are described below, followed by a description of cochlear implant 100.

[0024] In a fully functional ear, outer ear 101 comprises an auricle 110 and an ear canal 102. An acoustic pressure or sound wave 103 is collected by auricle 110 and channeled into and through ear canal 102. Disposed across the distal end of ear channel 102 is a tympanic membrane 104 which vibrates in response to sound wave 103. This vibration is coupled to oval window or fenestra ovalis 112 through three bones of middle ear 105, collectively referred to as the ossicles 106 and comprising the malleus 108, the incus 109, and the stapes 111. Bones 108, 109, and 111 of middle ear 105 serve to filter and amplify sound wave 103,

causing oval window 112 to articulate, or vibrate in response to vibration of tympanic membrane 104. This vibration sets up waves of fluid motion of the perilymph within cochlea 140. Such fluid motion, in turn, activates tiny hair cells (not shown) inside of cochlea 140. Activation of the hair cells causes appropriate nerve impulses to be generated and transferred through the spiral ganglion cells (not shown) and auditory nerve 114 to the brain (also not shown) where they are perceived as sound.

[0025] As shown, cochlear implant 100 comprises one or more components which are temporarily or permanently implanted in the recipient. Cochlear implant 100 is shown in FIG. 1 with an external device 142, that is part of system 10 (along with cochlear implant 100), which, as described below, is configured to provide power to the cochlear implant, where the implanted cochlear implant includes a battery that is recharged by the power provided from the external device 142.

[0026] In the illustrative arrangement of FIG. 1, external device 142 can comprise a power source (not shown) disposed in a Behind-The-Ear (BTE) unit 126. External device 142 also includes components of a transcutaneous energy transfer link, referred to as an external energy transfer assembly. The transcutaneous energy transfer link is used to transfer power and/or data to cochlear implant 100. Various types of energy transfer, such as infrared (IR), electromagnetic, capacitive and inductive transfer, may be used to transfer the power and/or data from external device 142 to cochlear implant 100. In the illustrative embodiments of FIG. 1, the external energy transfer assembly comprises an external coil 130 that forms part of an inductive radio frequency (RF) communication link. External coil 130 is typically a wire antenna coil comprised of multiple turns of electrically insulated single-strand or multi-strand platinum or gold wire. External device 142 also includes a magnet (not shown) positioned within the turns of wire of external coil 130. It should be appreciated that the external device shown in FIG. 1 is merely illustrative, and other external devices may be used with embodiments.

[0027] Cochlear implant 100 comprises an internal energy transfer assembly 132 which can be positioned in a recess of the temporal bone adjacent auricle 110 of the recipient. As detailed below, internal energy transfer assembly 132 is a component of the transcutaneous energy transfer link and receives power and/or data from external device 142. In the illustrative embodiment, the energy transfer link comprises an inductive RF link, and internal energy transfer assembly 132 comprises a primary internal coil 136. Internal coil 136 is

typically a wire antenna coil comprised of multiple turns of electrically insulated single-strand or multi-strand platinum or gold wire.

[0028] Cochlear implant 100 further comprises a main implantable component 120 and an elongate electrode assembly 118. In some embodiments, internal energy transfer assembly 132 and main implantable component 120 are hermetically sealed within a biocompatible housing. In some embodiments, main implantable component 120 includes an implantable microphone assembly (not shown) and a sound processing unit (not shown) to convert the sound signals received by the implantable microphone in internal energy transfer assembly 132 to data signals. That said, in some alternative embodiments, the implantable microphone assembly can be located in a separate implantable component (e.g., that has its own housing assembly, etc.) that is in signal communication with the main implantable component 120 (e.g., via leads or the like between the separate implantable component and the main implantable component 120). In at least some embodiments, the teachings detailed herein and/or variations thereof can be utilized with any type of implantable microphone arrangement.

[0029] Main implantable component 120 further includes a stimulator unit (also not shown) which generates electrical stimulation signals based on the data signals. The electrical stimulation signals are delivered to the recipient via elongate electrode assembly 118.

[0030] Elongate electrode assembly 118 has a proximal end connected to main implantable component 120, and a distal end implanted in cochlea 140. Electrode assembly 118 extends from main implantable component 120 to cochlea 140 through mastoid bone 119. In some embodiments electrode assembly 118 may be implanted at least in basal region 116, and sometimes further. For example, electrode assembly 118 may extend towards apical end of cochlea 140, referred to as cochlea apex 134. In certain circumstances, electrode assembly 118 may be inserted into cochlea 140 via a cochleostomy 122. In other circumstances, a cochleostomy may be formed through round window 121, oval window 112, the promontory 123 or through an apical turn 147 of cochlea 140.

[0031] Electrode assembly 118 comprises a longitudinally aligned and distally extending array 146 of electrodes 148, disposed along a length thereof. As noted, a stimulator unit generates stimulation signals which are applied by electrodes 148 to cochlea 140, thereby stimulating auditory nerve 114.

[0032] Thus, as seen above, one variety of implanted devices depends on an external component to provide certain functionality and/or power. For example, the recipient of the implanted device can wear an external component that provides power and/or data (e.g., a signal representative of sound) to the implanted portion that allow the implanted device to function. In particular, the implanted device can lack a battery and can instead be totally dependent on an external power source providing continuous power for the implanted device to function. Although the external power source can continuously provide power, characteristics of the provided power need not be constant and may fluctuate. Additionally, where the implanted device is an auditory prosthesis such as a cochlear implant, the implanted device can lack its own sound input device (e.g., a microphone). It is sometimes utilitarian to remove the external component. For example, it is common for a recipient of an auditory prosthesis to remove an external portion of the prosthesis while sleeping. Doing so can result in loss of function of the implanted portion of the prosthesis, which can make it impossible for recipient to hear ambient sound. This can be less than utilitarian and can result in the recipient being unable to hear while sleeping. Loss of function would also prevent the implanted portion from responding to signals representative of streamed content (e.g., music streamed from a phone) or providing other functionality, such as providing tinnitus suppression noise.

[0033] The external component that provides power and/or data can be worn by the recipient, as detailed above. While a wearable external device is worn by a recipient, the external device is typically in very close proximity and tightly aligned with an implanted component. The wearable external device can be configured to operate in these conditions. Conversely, in some instances, an unworn device can generally be further away and less tightly aligned with the implanted component. This can create difficulties where the implanted device depends on an external device for power and data (e.g., where the implanted device lacks its own battery and microphone), and the external device can need to continuously and consistently provide power and data in order to allow for continuous and consistent functionality of the implanted device.

[0034] FIG. 2 is a functional block diagram of a cochlear implant system 200 to which the teaching herein can be applicable. The cochlear implant system 200 includes an implantable component 201 (e.g., implantable component 100 of FIG. 1) configured to be implanted beneath a recipient's skin or other tissue 249, and an external device 240 (e.g., the external device 142 of FIG. 1).

[0035] The external device 240 can be configured as a wearable external device, such that the external device 240 is worn by a recipient in close proximity to the implantable component, which can enable the implantable component 201 to receive power and stimulation data from the external device 240. As described in FIG. 1, magnets can be used to facilitate an operational alignment of the external device 240 with the implantable component 201. With the external device 240 and implantable component 201 in close proximity, the transfer of power and data can be accomplished through the use of near-field electromagnetic radiation, and the components of the external device 240 can be configured for use with near-field electromagnetic radiation.

[0036] Implantable component 201 can include a transceiver unit 208, electronics module 213, which module can be a stimulator assembly of a cochlear implant, and an electrode assembly 254 (which can include an array of electrode contacts disposed on lead 118 of FIG. 1). The transceiver unit 208 is configured to transcutaneously receive power and/or data from external device 240. As used herein, transceiver unit 208 refers to any collection of one or more components which form part of a transcutaneous energy transfer system. Further, transceiver unit 208 can include or be coupled to one or more components that receive and/or transmit data or power. For example, the example includes a coil for a magnetic inductive arrangement coupled to the transceiver unit 208. Other arrangements are also possible, including an antenna for an alternative RF system, capacitive plates, or any other utilitarian arrangement. In an example, the data modulates the RF carrier or signal containing power. The transcutaneous communication link established by the transceiver unit 208 can use time interleaving of power and data on a single RF channel or band to transmit the power and data to the implantable component 201. In some examples, the processor 244 is configured to cause the transceiver unit 246 to interleave power and data signals, such as is described in U.S. Patent Publication Number 2009/0216296 to Meskens. In this manner, the data signal is modulated with the power signal, and a single coil can be used to transmit power and data to the implanted component 201. Various types of energy transfer, such as infrared (IR), electromagnetic, capacitive and inductive transfer, can be used to transfer the power and/or data from the external device 240 to the implantable component 201.

[0037] Aspects of the implantable component 201 can require a source of power to provide functionality, such as receive signals, process data, or deliver electrical stimulation. The source of power that directly powers the operation of the aspects of the implantable component 201 can be described as operational power. There are two exemplary ways that

the implantable component 201 can receive operational power: a power source internal to the implantable component 201 (e.g., a battery) or a power source external to the implantable component. However, other approaches or combinations of approaches are possible. For example, the implantable component may have a battery but nonetheless receive operational power from the external component (e.g., to preserve internal battery life when the battery is sufficiently charged).

[0038] The internal power source can be a power storage element (not pictured). The power storage element can be configured for the long-term storage of power, and can include, for example, one or more rechargeable batteries. Power can be received from an external source, such as the external device 240, and stored in the power storage element for long-term use (e.g., charge a battery of the power storage element). The power storage element can then provide power to the other components of the implantable component 201 over time as needed for operation without needing an external power source. In this manner, the power from the external source may be considered charging power rather than operational power, because the power from the external power source is for charging the battery (which in turn provides operational power) rather than for directly powering aspects of the implantable component 201 that require power to operate. The power storage element can be a long-term power storage element configured to be a primary power source for the implantable component 201.

[0039] In some embodiments, the implantable component 201 receives operational power from the external device 240 and the implantable component 201 does not include an internal power source (e.g., a battery) / internal power storage device. In other words, the implantable component 201 is powered solely by the external device 240 or another external device, which provides enough power to the implantable component 201 to allow the implantable component to operate (e.g., receive data signals and take an action in response). The operational power can directly power functionality of the device rather than charging a power storage element of the external device implantable component 201. In these examples, the implantable component 201 can include incidental components that can store a charge (e.g., capacitors) or small amounts of power, such as a small battery for keeping volatile memory powered or powering a clock (e.g., motherboard CMOS batteries). But such incidental components would not have enough power on their own to allow the implantable component to provide primary functionality of the implantable component 201 (e.g., receiving data signals and taking an action in response thereto, such as providing stimulation) and therefore

cannot be said to provide operational power even if they are integral to the operation of the implantable component 201.

[0040] As shown, electronics module 213 includes a stimulator unit 214 (e.g., which can correspond to the stimulator of FIG. 1). Electronics module 213 can also include one or more other components used to generate or control delivery of electrical stimulation signals 215 to the recipient. As described above with respect to FIG. 1, a lead (e.g., elongate lead 118 of FIG. 1) can be inserted into the recipient's cochlea. The lead can include an electrode assembly 254 configured to deliver electrical stimulation signals 215 generated by the stimulator unit 214 to the cochlea.

[0041] In the example system 200 depicted in FIG. 2, the external device 240 includes a sound input unit 242, a sound processor 244, a transceiver unit 246, a coil 247, and a power source 248. The sound input unit 242 is a unit configured to receive sound input. The sound input unit 242 can be configured as a microphone (e.g., arranged to output audio data that is representative of a surrounding sound environment), an electrical input (e.g., a receiver for a frequency modulation (FM) hearing system), and/or another component for receiving sound input. The sound input unit 242 can be or include a mixer for mixing multiple sound inputs together.

[0042] The processor 244 is a processor configured to control one or more aspects of the system 200, including converting sound signals received from sound input unit 242 into data signals and causing the transceiver unit 246 to transmit power and/or data signals. The transceiver unit 246 can be configured to send or receive power and/or data 251. For example, the transceiver unit 246 can include circuit components that send power and data (e.g., inductively) via the coil 247. The data signals from the sound processor 244 can be transmitted, using the transceiver unit 246, to the implantable component 201 for use in providing stimulation or other medical functionality.

[0043] The transceiver unit 246 can include one or more antennas or coils for transmitting the power or data signal, such as coil 247. The coil 247 can be a wire antenna coil having of multiple turns of electrically insulated single-strand or multi-strand wire. The electrical insulation of the coil 247 can be provided by a flexible silicone molding. Various types of energy transfer, such as infrared (IR), radiofrequency (RF), electromagnetic, capacitive and inductive transfer, can be used to transfer the power and/or data from external device 240 to implantable component 201.

[0044] FIG. 3A depicts an exemplary system 210 according to an exemplary embodiment, including hearing prosthesis 100, which, in an exemplary embodiment, corresponds to cochlear implant 100 detailed above, and a portable body carried device (e.g., a portable handheld device as seen in FIG. 2A, a watch, a pocket device, etc.) 2401 in the form of a mobile computer having a display 2421. The system includes a wireless link 230 between the portable handheld device 2401 and the hearing prosthesis 100. In an embodiment, the prosthesis 100 is an implant implanted in recipient 99 (represented functionally by the dashed lines of box 100 in FIG. 3A).

[0045] In an exemplary embodiment, the system 210 is configured such that the hearing prosthesis 100 and the portable handheld device 2401 have a symbiotic relationship. In an exemplary embodiment, the symbiotic relationship is the ability to display data relating to, and, in at least some instances, the ability to control, one or more functionalities of the hearing prosthesis 100. In an exemplary embodiment, this can be achieved via the ability of the handheld device 2401 to receive data from the hearing prosthesis 100 via the wireless link 230 (although in other exemplary embodiments, other types of links, such as by way of example, a wired link, can be utilized). As will also be detailed below, this can be achieved via communication with a geographically remote device in communication with the hearing prosthesis 100 and/or the portable handheld device 2401 via link, such as by way of example only and not by way of limitation, an Internet connection or a cell phone connection. In some such exemplary embodiments, the system 210 can further include the geographically remote apparatus as well. Again, additional examples of this will be described in greater detail below.

[0046] As noted above, in an exemplary embodiment, the portable handheld device 2401 comprises a mobile computer and a display 2421. In an exemplary embodiment, the display 2421 is a touchscreen display. In an exemplary embodiment, the portable handheld device 2401 also has the functionality of a portable cellular telephone. In this regard, device 2401 can be, by way of example only and not by way of limitation, a smart phone, as that phrase is utilized generically. That is, in an exemplary embodiment, portable handheld device 2401 comprises a smart phone, again as that term is utilized generically.

[0047] It is noted that in some other embodiments, the device 2401 need not be a computer device, etc. It can be a lower tech recorder, or any device that can enable the teachings herein.

[0048] The phrase “mobile computer” entails a device configured to enable human-computer interaction, where the computer is expected to be transported away from a stationary location during normal use. Again, in an exemplary embodiment, the portable handheld device 2401 is a smart phone as that term is generically utilized. However, in other embodiments, less sophisticated (or more sophisticated) mobile computing devices can be utilized to implement the teachings detailed herein and/or variations thereof. Any device, system, and/or method that can enable the teachings detailed herein and/or variations thereof to be practiced can be utilized in at least some embodiments. (As will be detailed below, in some instances, device 2401 is not a mobile computer, but instead a remote device (remote from the hearing prosthesis 100. Some of these embodiments will be described below).)

[0049] In an exemplary embodiment, the portable handheld device 2401 is configured to receive data from a hearing prosthesis and present an interface display on the display from among a plurality of different interface displays based on the received data. Exemplary embodiments will sometimes be described in terms of data received from the hearing prosthesis 100. However, it is noted that any disclosure that is also applicable to data sent to the hearing prosthesis from the handheld device 2401 is also encompassed by such disclosure, unless otherwise specified or otherwise incompatible with the pertinent technology (and *vice versa*).

[0050] It is noted that in some embodiments, the system 210 is configured such that cochlear implant 100 and the portable device 2401 have a relationship. By way of example only and not by way of limitation, in an exemplary embodiment, the relationship is the ability of the device 2401 to serve as a remote microphone for the prosthesis 100 via the wireless link 230. Thus, device 2401 can be a remote mic. That said, in an alternate embodiment, the device 2401 is a stand-alone recording / sound capture device.

[0051] It is noted that in at least some exemplary embodiments, the device 2401 corresponds to an Apple Watch™ Series 1 or Series 2, as is available in the United States of America for commercial purchase as of January 10, 2021. In an exemplary embodiment, the device 2401 corresponds to a Samsung Galaxy Gear™ Gear 2, as is available in the United States of America for commercial purchase as of January 10, 2021. The device is programmed and configured to communicate with the prosthesis and/or to function to enable the teachings detailed herein.

[0052] In an exemplary embodiment, a telecommunication infrastructure can be in communication with the hearing prosthesis 100 and/or the device 2401. By way of example only and not by way of limitation, a telecoil 2491 or some other communication system (Bluetooth, etc.) is used to communicate with the prosthesis and/or the remote device. FIG. 3B depicts an exemplary quasi-functional schematic depicting communication between an external communication system 2491 (e.g., a telecoil, or Bluetooth transceiver), and the hearing prosthesis 100 and/or the handheld device 2401 by way of links 277 and 279, respectively (note that FIG. 3B depicts two-way communication between the hearing prosthesis 100 and the external audio source 2491, and between the handheld device and the external audio source 2491 – in alternate embodiments, the communication is only one way (e.g., from the external audio source 2491 to the respective device)). It is noted that unless otherwise noted, the embodiment of FIG. 3B is applicable to any body worn medical device / implanted device disclosed herein in some embodiments.

[0053] FIG. 3C depicts an exemplary external component 1440. External component 1440 can correspond to external component 142 of the system 10 (it can also represent other body worn devices herein / devices that are used with implanted portions). As can be seen, external component 1440 includes a behind-the-ear (BTE) device 1426 which is connected via cable 1472 to an exemplary headpiece 1478 including an external inductance coil 1458EX, corresponding to the external coil of figure 1. As illustrated, the external component 1440 comprises the headpiece 1478 that includes the coil 1458EX and a magnet 1442. This magnet 1442 interacts with the implanted magnet (or implanted magnetic material) of the implantable component to hold the headpiece 1478 against the skin of the recipient. In an exemplary embodiment, the external component 1440 is configured to transmit and/or receive magnetic data and/or transmit power transcutaneously via coil 1458EX to the implantable component, which includes an inductance coil. The coil 1458X is electrically coupled to BTE device 1426 via cable 1472. BTE device 1426 may include, for example, at least some of the components of the external devices / components described herein.

[0054] FIG. 4 presents an exemplary embodiment of a neural prosthesis in general, and a retinal prosthesis and an environment of use thereof, in particular, the components of which can be used in whole or in part, in some of the teachings herein. In some embodiments of a retinal prosthesis, a retinal prosthesis sensor-stimulator 10801 is positioned proximate the retina 11001. In an exemplary embodiment, photons entering the eye are absorbed by a

microelectronic array of the sensor-stimulator 10801 that is hybridized to a glass piece 11201 containing, for example, an embedded array of microwires. The glass can have a curved surface that conforms to the inner radius of the retina. The sensor-stimulator 108 can include a microelectronic imaging device that can be made of thin silicon containing integrated circuitry that convert the incident photons to an electronic charge.

[0055] An image processor 10201 is in signal communication with the sensor-stimulator 10801 via cable 10401 which extends through surgical incision 00601 through the eye wall (although in other embodiments, the image processor 10201 is in wireless communication with the sensor-stimulator 10801). The image processor 10201 processes the input into the sensor-stimulator 10801 and provides control signals back to the sensor-stimulator 10801 so the device can provide processed output to the optic nerve. That said, in an alternate embodiment, the processing is executed by a component proximate with or integrated with the sensor-stimulator 10801. The electric charge resulting from the conversion of the incident photons is converted to a proportional amount of electronic current which is input to a nearby retinal cell layer. The cells fire and a signal is sent to the optic nerve, thus inducing a sight perception.

[0056] The retinal prosthesis can include an external device disposed in a Behind-The-Ear (BTE) unit or in a pair of eyeglasses, or any other type of component that can have utilitarian value. The retinal prosthesis can include an external light / image capture device (e.g., located in / on a BTE device or a pair of glasses, etc.), while, as noted above, in some embodiments, the sensor-stimulator 10801 captures light / images, which sensor-stimulator is implanted in the recipient.

[0057] In the interests of compact disclosure, any disclosure herein of a microphone or sound capture device corresponds to an analogous disclosure of a light / image capture device, such as a charge-coupled device. Corollary to this is that any disclosure herein of a stimulator unit which generates electrical stimulation signals or otherwise imparts energy to tissue to evoke a hearing percept corresponds to an analogous disclosure of a stimulator device for a retinal prosthesis. Any disclosure herein of a sound processor or processing of captured sounds or the like corresponds to an analogous disclosure of a light processor / image processor that has analogous functionality for a retinal prosthesis, and the processing of captured images in an analogous manner. Indeed, any disclosure herein of a device for a hearing prosthesis corresponds to a disclosure of a device for a retinal prosthesis having analogous functionality for a retinal prosthesis. Any disclosure herein of fitting a hearing prosthesis corresponds to a

disclosure of fitting a retinal prosthesis using analogous actions. Any disclosure herein of a method of using or operating or otherwise working with a hearing prosthesis herein corresponds to a disclosure of using or operating or otherwise working with a retinal prosthesis in an analogous manner.

[0058] Figure 5 depicts an exemplary vestibular implant 500 according to one example. Some specific features are described utilizing the above-noted cochlear implant of figure 1 in the context of a vestibular implant. In this regard, some features of a cochlear implant are utilized with vestibular implants. In the interest of textual and pictorial economy, various elements of the vestibular implant that generally correspond to the elements of the cochlear implant above are referenced utilizing the same numerals. Still, it is noted that some features of the vestibular implant 500 will be different from that of the cochlear implant above. By way of example only and not by way of limitation, there may not be a microphone on the behind-the-ear device 126. Alternatively, sensors that have utilitarian value in the vestibular implant can be contained in the BTE device 126. By way of example only and not by way of limitation, motion sensors can be located in BTE device 126. There also may not be a sound processor in the BTE device. Conversely, other types of processors, such as those that process data obtained from the sensors, will be present in the BTE device 126. Power sources, such as a battery, will also be included in the BTE device 126. Consistent with the BTE device of the cochlear implant of figure 1, a transmitter / transceiver will be located in the BTE device or otherwise in signal communication therewith.

[0059] The implantable component includes a receiver stimulator in a manner concomitant with the above cochlear implant. Here, vestibular stimulator comprises a main implantable component 120 and an elongate electrode assembly 1188 (where the elongate electrode assembly 1188 has some different features from the elongate electrode assembly 118 of the cochlear implant, some of which will be described shortly). In some embodiments, internal energy transfer assembly 132 and main implantable component 120 are hermetically sealed within a biocompatible housing. In some embodiments, main implantable component 120 includes a processing unit (not shown) to convert data obtained by sensors, which could be on board sensors implanted in the recipient, into data signals.

[0060] Main implantable component 120 further includes a stimulator unit (also not shown) which generates electrical stimulation signals based on the data signals. The electrical stimulation signals are delivered to the recipient via elongate electrode assembly 1188.

[0061] It is briefly noted that while the embodiment shown in figure 5 represents a partially implantable vestibular implant, embodiments can include a totally implantable vestibular implant, such as, where, for example, the motion sensors are located in the implantable portion, in a manner analogous to a cochlear implant.

[0062] Elongate electrode assembly 1188 has a proximal end connected to main implantable component 120, and extends through a hole in the mastoid 119, in a manner analogous to the elongate electrode assembly 118 of the cochlear implant, and includes a distal end that extends to the inner ear. In some embodiments, the distal portion of the electrode assembly 1188 includes a plurality of leads 510 that branch out away from the main body of the electrode assembly 118 to electrodes 520. Electrodes 520 can be placed at the base of the semicircular ducts as shown in figure 5. In an exemplary embodiment, one or more of these electrodes are placed in the vicinity of the vestibular nerve branches innervating the semicircular canals. In some embodiments, the electrodes are located external to the inner ear, while in other embodiments, the electrodes are inserted into the inner ear. Note also while this embodiment does not include an electrode array located in the cochlea, in other embodiments, one or more electrodes are located in the cochlea in a manner analogous to that of a cochlear implant.

[0063] Briefly, it is noted that in an exemplary embodiment, any one or more of the components disclose herein and/or any one or more of the functionalities herein can be part of / can be executed by a single processor and/or part of a single computer chip and/or part of electronics located in a single casing, providing that the art enables such, while in other embodiments, the components herein are separate processors / parts of separate processors and/or separate chips / parts of separate chips and/or separate electronics / parts of separate electronics, such separate electronics located separate cases in wired or wireless communications with one another. Thus, in an exemplary embodiment, there is a device and/or a plurality of devices as just noted that are programmed or otherwise configured or otherwise contains code or otherwise have access to code (e.g., a memory storing such code, or some firmware or software or hardware, etc.), to execute one or more of the functionalities detailed herein and/or to execute one or more of the method actions detailed herein. Further, in an exemplary embodiment, this processor(s) can include or otherwise be configured to execute the functions / actions herein.

[0064] Any device, system, and/or method that can enable the teachings detailed herein can be utilized in at least some exemplary embodiments. In an exemplary embodiment, a personal computer or a smart device is programmed to execute the teachings herein.

[0065] Some examples of configuring a hearing prosthesis, such as a cochlear implant, include doing so for a recipient relying on a clinician to measure the comfort levels (C-levels), and threshold levels (T-levels) across the electrode array. One or more or all electrodes are mapped to a certain frequency range, and the output, along with other variables that affect the output delivered by the implant (e.g., rate, pulse width, maxima, gains, etc.), is referred to as the patient's 'MAP'.

[0066] Some examples of fitting a hearing prosthesis to a recipient can include measuring C and T levels for each of the electrodes of the array. For example, a 10-electrode array would have 20 measurements, a 16-electrode array would have 32 measurements, an N electrode array would have $N \times 2$ measurements (e.g., if $N = 22$ (22 electrodes), there would be 44 measurements). Some examples also include executing objective measures (for example, obtaining Neural Response Telemetry (NRT) levels) and / or interpolation, where a smaller number of T or C levels are measured (for example, 5 threshold levels for the streamlined method). Levels for the intermediate electrodes are calculated or otherwise identified using an algorithm, such as that based in software and loaded onto a computer, such as those available from common fitting devices / systems.

[0067] Informal techniques can be executed, such as, for example, executing a sound check. Also, for example, outcome questions can be used (e.g., asking the recipient to rate his or her ability to perform certain tasks). Also, for example, performance tests can be used. For example, aided audiograms can be used or otherwise developed, which include detecting the level where the recipient can hear the very softest sound with the aid of the device (in this case a Cochlear Implant). Also, for example, word testing can be executed, where, for example, a set of words can be played or otherwise provided to the recipient and the recipient is then queried (e.g., asked) or instructed to repeat the words. The clinician or other professional then scores which words (or phonemes) the patient has heard correctly.

[0068] Further by example, sentence testing can be executed. In an example, recordings of whole sentences are played or otherwise presented to the patient and the recipient is asked or otherwise instructed to repeat the sentences. These sentences may be played or otherwise

provided in quiet (with no background noise), or in a non-quiet environment (e.g., with background noise).

[0069] Also, in some examples, fitting is a subjective task, and thus one patient visiting a plurality of different clinicians may end up with respective different maps, which in some examples, are very different from each other.

[0070] It is noted that some examples exist where if a recipient of a hearing prosthesis is with a clinician or other professional with understanding of the recipient-prostheses interaction relationship, for a utilitarian amount of time, or otherwise for a significant amount of time, the clinician or the professional may, in some instances, notice some issues just by observation (as opposed to testing). To varying extents this information could be used to inform the clinician's approach to mapping. By way of example only, the clinician may notice the recipient has trouble distinguishing between ss and sh sounds, and may choose to focus on high-frequency sounds in the next MAPing session. For example, by perhaps boosting thresholds in this area.

[0071] Accordingly, in an exemplary embodiment, there are methods where a fitting session is used to detect issues and identify or otherwise develop or recommend corrective adjustments to the recipient's map. In an exemplary embodiment, the clinician listens to the conversations of the recipient and/or makes judgements as to the issues associated with the recipient and his or her hearing prostheses and identifies or otherwise recommends adjustments accordingly and makes such adjustments.

[0072] FIG. 3D is a schematic diagram illustrating one exemplary arrangement 300 in which a hearing implant fitting system 306 may be used to fit a cochlear implant, in accordance with an embodiment. In an embodiment, this system is used during the execution of one or more of the actions above and/or below. As shown in FIG. 3, an audiologist or clinician 304 may use a hearing implant fitting system 306 ("fitting system" herein) comprising interactive software and computer hardware to create individualized recipient map data 322 that are digitally stored on system 306, and ultimately downloaded to the memory of the sound processing unit 126 for recipient 302. System 306 may be programmed and/or implement software programmed to carry out one or more of the functions of mapping, neural response measuring, acoustic stimulating, and recording of neural response measurements and other stimuli.

[0073] In the embodiment illustrated in FIG. 3, sound processing unit 126 of cochlear implant 100 may be connected directly to fitting system 306 to establish a data communication link 308 between the sound processing unit 126 and fitting system 306. System 306 is thereafter bi-directionally coupled by a data communication link 308 with sound processing unit 126. It should be appreciated that although sound processing unit 126 and fitting system 306 are connected via a cable in FIG. 3, any communications link now or later developed may be utilized to communicably couple the implant and fitting system.

[0074] Some exemplary embodiments will now be described in terms of utilizing the aforementioned fitting system 306 to fit the aforementioned cochlear implant 100 to achieve the aforementioned normalization convergence. It is noted that the following is but exemplary, and that alternative methods can be practiced utilizing other devices other than the fitting system 306 and/or alternative methods can be practiced to fit a prosthesis that is different than cochlear implant 100.

[0075] Briefly, at least some teachings detailed herein and/or variations thereof are applicable to the development of a map for a unilateral cochlear implant user that restores the loudness percept or otherwise adjust the loudness percept of a hearing percept evoked by the cochlear implant towards a value that is closer to that of a normal hearing person. That said, embodiments can be directed to more simple versions of map development (e.g., developing map that is utilitarian and achieves basic verbal communication goals, even though it is not as developed as it otherwise could be, developing a map that is more conducive to the recipient wanting to use the cochlear implant, as opposed to it being the optimized map (which may be taxing for the recipient to use), etc.). The teachings detailed herein and/or variations thereof can be applicable to other types of hearing prostheses other than a cochlear implant, such as a middle ear implant and/or a bone conduction device (active transcutaneous, passive transcutaneous or percutaneous), etc. The teachings herein are also applicable to the use of a conventional hearing aid. Still further, the teachings detailed herein and/or variations thereof can be applicable in at least some embodiments to hybrid devices and bimodal devices that utilize the cochlear implant along with another type of hearing device (e.g., a traditional hearing aid). Also, the teachings herein are applicable to other types of medical devices, such as the vestibular implant and the retinal implant. Any reference to teachings herein applicable to a cochlear implant herein corresponds to an alternate disclosure of using such teachings with any one or more of the other medical devices detailed herein, unless otherwise noted, providing that the art enables such.

[0076] In an exemplary embodiment, a recipient of the cochlear implant is subjected to a threshold and/or comfort level fitting procedure to develop a current level regime for a map. During fitting, the cochlear implant 100 evokes respective hearing percepts (or attempts to evoke such - sometimes a hearing percept cannot be evoked because the given sound stimuli is below a threshold level) utilizing the initial electrode charge level regime/embryonic map thereof. The recipient indicates his or her perception. By way of example only and not by way of limitation, in an exemplary embodiment, a plurality of noise bands are presented to the recipient of the hearing prosthesis at multiple presentation levels, ranging from 30 to 80 dBSPL, in steps of 5 dB, although the range can be different than this (e.g., 20 to 100 dBSPL, 25 to 75 dBSPL, any value or range of values that can enable the teachings detailed herein and/or variations thereof) and/or the increments can be different than this (e.g., increments of 2.5 dB, 7.5 dB, 10 dB, etc.). Any value or range of values in any increment that can enable the teachings detailed herein and/or variations thereof can be utilized in at least some embodiments.

[0077] In an exemplary embodiment, each stimuli is presented twice or three or four or five or more times (i.e., each presentation level is presented twice), and the most desirable level at a given frequency is used to set the map. That said, in an alternative embodiment, each stimulus is only presented once. The results of the various presentations are, in some embodiments, compiled into a loudness growth function, in at least some exemplary embodiments, the scaling test is repeated for 2 or more frequency regions (e.g., for every octave, for 250 Hz, 1000 Hz and 4000 Hz, etc.).

[0078] In at least some instances, during a fitting session, an audiologist adjusts complex stimulation channel electrode weights of the cochlear implant. More specifically, in at least some embodiments, complex stimulation channel weights are adjusted by an audiologist to reduce and/or eliminate simultaneous channel interactions, at least for channels that are more than one base electrode apart from each other. Such exemplary methods of doing so are detailed in U.S. Patent Application Publication No. 2010/0198301 (hereinafter, the “ ‘301 publication”). Accordingly, in an exemplary embodiment, the teachings of the ‘301 publication and/or variations thereof are executed to assign and adjust complex stimulation channel electrode weights of the cochlear implant. That is, the teachings of that publication can be used, at least in part, to fit the hearing prosthesis. Then, in at least some embodiments, the cochlear implant 100 is configured such that respective stimulation channels of the cochlear implant 100 have those respective weights. This can be done, for example, by

programming the cochlear implant 100 or by any other process that sets the channels of the cochlear implant 100 to have those weights, such as by using the fitting system above. This is followed by a fitting process to determine threshold and comfort levels for the stimulation channels as will now be detailed. That said, in an alternate embodiment, the cochlear implant 100 is not programmed or otherwise configured such that the channels of the cochlear implant 100 have those weights before implementing the fitting process. Instead, the weights of the respective stimulation channels are stored in the fitting system (discussed below) used to fit the cochlear implant 100 and the fitting process is then performed, and the cochlear implant 100 is configured such that the respective stimulation channels have the respective weights at some point after the beginning of the fitting method. Any arrangement of the cochlear implant 100 and/or other equipment / devices that will enable the teachings detailed herein and/or variations thereof to be practiced can be used in at least some embodiments.

[0079] In an exemplary embodiment, subsequent implantation of the cochlear implant into the recipient, embodiments include setting (or at least assigning and adjusting) utilitarian weights of the stimulation channels. The cochlear implant is fitted or customized to conform to the specific recipient desires. This procedure can entail collecting information and determine patient specific parameters such as threshold levels (T levels) and maximum comfort levels (C levels) for one or more or all stimulation channels of the cochlear implant developed according to the exemplary method(s) detailed above or by other methods, which, in at least some instances results in residual interactions between neighboring electrode channels. That is, the following fitting methods can be applied to an implanted cochlear implant utilizing focused multipolar stimulation where simultaneous channel interactions occur for neighboring electrode channels (i.e., electrode channels that are immediately adjacent to one another / there are no electrodes in between the interacting electrode channels).

[0080] Referring now to FIG. 6, there is an exemplary flowchart 400 for a method including method actions 410-450. This is an exemplary fitting method, and some embodiments can include or not include one or more of these actions. Method action 410 entails obtaining access to a recipient having a plurality of electrodes of an electrical stimulating device implanted in the recipient. In an exemplary embodiment, the recipient can correspond to a recipient having the anatomical structure present in FIG. 1 above who also has the cochlear implant 100 implanted therein, where the cochlear implant 100 is configured to apply electrical stimulation to the recipient via the plurality of electrodes by activating a plurality of

stimulation channels. In an exemplary embodiment, an audiologist or the like executes method action 410 using the arrangement of FIG. 3.

[0081] After method action 410, method action 420 is executed, which entails creating a fitting channel. After method action 420 is executed, method action 440 is executed, which entails activating the fitting channel created in method action 430. In an exemplary embodiment, the activation of the fitting channel evokes a stimulation induced percept, which, in embodiments where method 400 is executed for a cochlear implant 100, corresponds to a stimulation induced hearing percept (in embodiments where the electrical stimulation device is, for example, an retinal stimulation device, the percept would be a visual percept, etc.).

[0082] Method action 400 further includes method action 450, which entails setting at least one of a threshold level or a comfort level for the target stimulation channel based on the activation of the fitting channel as activated in method action 440. Thus, in an exemplary embodiment, during normal autonomous operation of the cochlear implant 100, the threshold level and/or comfort level of a given channel is developed based on a stimulation regime that is different from the stimulation regime that results from activation of that channel. Additional details of this method action will be described below.

[0083] In an exemplary embodiment of method action 420, the stimulation channels have respective weights for respective electrodes of the plurality of electrodes, and the action of creating the fitting channel includes summing respective electrode weights for the at least one interacting stimulation channel and respective electrode weights for the target stimulation channel. In at least some embodiments, the weights correspond to weights of respective currents (whether positive (source currents) or negative (sink currents)) of respective electrodes for each channel.

[0084] It is noted that in some alternate embodiments, the fitting channel can be created by other methods than summing the respective electrode weights. Any method of fitting that will enable the teachings detailed herein and/or variations thereof to be practiced can be utilized in at least some embodiments.

[0085] In an exemplary fitting session (which can be a first session where the recipient can be switched on utilizing conventional methods), the clinician can run impedance measurements, and/or can run an autoNRT to create or otherwise obtain baseline information and/or can raise the C and T levels to an audible level. In an exemplary embodiment, the

results of this first session are that the recipient has access to sound. In an exemplary embodiment, this first fitting session can occur days or weeks or longer after completion of the surgery in which the prosthesis was implanted in the person. In an exemplary embodiment, this first session can occur a few days after the surgery, one week, two weeks, three weeks, four weeks, five weeks, six weeks, seven weeks, eight weeks, nine weeks, or 10 weeks, or later after the implantation surgery is completed. Times could be shorter or longer.

[0086] Exemplary embodiments also include utilizing a trained artificial intelligence system and/or training in artificial intelligence system. In an exemplary embodiment, the results of an NRT test or any other such testing can be utilized for demographic purposes and/or physiological purposes. In an exemplary embodiment, a trained system could have utilitarian value or otherwise have more utilitarian value with respect to recipients that have NRT results than those that are similarly situated, whereas another trained system can have utilitarian value or otherwise have more utilitarian value with respect to recipients having different NRT results than those of the former.

[0087] In an exemplary embodiment, artificial intelligence is also utilized to develop the map optimization/map development section. In an exemplary embodiment, lookup tables or the like are utilized. In an exemplary embodiment, there is an algorithm located on computer code that can take the output from the error detection/determination section of the system, and evaluate that output to develop the map.

[0088] Embodiments include multi-user interactive participation in a single fitting session. This can allow participants to move in and out of a fitting session, without requiring a disconnect from the current session and connecting to a new session. This is different from remote care in that it is not (exclusively) intended to be used remotely. It can be used within a clinic/hospital, without the network traffic ever leaving the company network, by way of example. By way of exemplary descriptive scenario, during a fitting session, an expert consultant can be requested by the audiologist who is conducting the fitting session. The consultant can join the ongoing session, either remotely or the recipient relocating to another room, without the need to save and end the current session and the restoring it with the consultant. Another scenario is that an experienced healthcare professional can be brought in to assist newly trained staff. One example of that is assisting a hearing aid/acoustic specialist moving into cochlear implant fitting, or *vice versa*. All without “breaking” or interrupting the fitting session.

[0089] In this regard, “breaking” and “interrupting” as used herein with respect to a fitting session refers to the concept making an affirmative stop or otherwise halting a procedure for a period of time. This as opposed to simply taking a brief timeout or a pause. By way of example, having to save work that has been done during the fitting process, and closing the fitting application until another participant can join in the fitting effort is breaking and interrupting the fitting session. Conversely, by way of example, declaring to the recipient (or not even declaring to the recipient for that matter – it could be that the extra participant’s effort will be hidden or otherwise transparent from the recipient; the interactive and sophisticated nature of the teachings detailed herein can make that possible) that there will be a brief pause or the recipient can take a timeout for a little bit is not breaking or interrupting the fitting session, because the fitting session is ongoing. If the application remains open or otherwise the “work area” is continuous for that recipient, there is no breaking and there is no interrupting the fitting session.

[0090] And it is briefly noted that while embodiments are focused upon fitting, the teachings herein are also applicable to any type of medical initiation session to which the teachings herein can have utilitarian value. Embodiments include applications of the teachings herein to such actions as implantation surgeries of the medical device. Briefly, for example, during surgery a connection to the system embodying the teachings herein can be established. It would then be possible for a remote expert to join that session to provide input on how the system is performing. It could also be used for robotic surgery, where the system can be analyzed by the remote surgeon simultaneously with other medical experts and automated systems.

[0091] Accordingly, embodiments are directed towards the concept of a medical initiation session of the medical device, which entails actions associated with getting a medical device into a state in which it can be used. This covers the initial surgery for example and also covers the settings and/or adjustments to the medical device that is utilized or otherwise needed to operate the medical device. With respect to hearing prostheses, this can entail both developing the initial map and adjusting the map, as that new map is an initiation of a new regime of operation for that device, because the device will operate differently than that which was previously the case.

[0092] Some exemplary surgical implementations will be described below, but for the most part, the descriptions herein will be described in terms of initiating a hearing prosthesis for textual simplicity. But any disclosure herein of fitting or initiating a hearing prosthesis

corresponds to an alternate disclosure of doing so of another type of medical device and/or broader applications of the teachings to a surgical implantation procedure.

[0093] Embodiments implement a variation thereof. Briefly by way of exemplary use case, using the teachings below by way of example to frame the following scenario, say for example a pediatric recipient and their guardians enter a hearing clinic, and then a healthcare professional starts up / initiates clinician fitting software as modified per the teachings herein, and connects the computing device running the software to the sound processor(s) of the hearing device (e.g., the BTE or the OTE of a cochlear implant). After discussions, the healthcare professional wants to improve user settings of the prosthesis. To allow closer and more natural interaction the healthcare professional grabs a tablet and starts the tablet app and gets down on the floor with the child. After tuning while playing around with the child the healthcare professional decides that he or she wants to consult an expert colleague from another clinic about some possible setting changes.

[0094] The healthcare professional contacts the consultant who joins the active session using their software. After making the appropriate changes to the settings, the consultant hands control of the session back to the healthcare professional who finalizes the session.

[0095] With this in mind, figure 7 provides an exemplary flowchart for an exemplary method, method 700, according to an exemplary embodiment. Method 700 includes method action 710, which includes the action of beginning a medical initiation session of a medical device using a first electronics device. In an exemplary embodiment, the first electronics device can be the user interface 314 of figure 3. Here, this user interface is co-located with the audiologist or clinician 304. In an exemplary embodiment, the user interface is an input/output subsystem of the overall fitting system (but that is not to be confused with the input/output subsystem that interfaces with the prosthesis – more on this below). In an exemplary embodiment, instead of an integrated user interface, there can be a separate input subsystem and a separate output subsystem. By way of example only and not by way of limitation, in an exemplary embodiment, the user interface could be a laptop or a desktop computer system, which can be commercially available, which includes keyboards and speakers and microphones and computer screens. Conversely, this could be a more “dumb” computer screen with touch capability. The input/output subsystem that makes up the user interface can be a smart phone for example or a work pad. These would be an example of an input/output subsystem of the user interface 314. In an exemplary embodiment, the input subsystem could be a keyboard and the output subsystem (of the interface) could be a

computer screen. In an exemplary embodiment the input subsystem could be a microphone and the output subsystem could be a speaker. In these things can be mixed and matched. For example, the output could be a computer screen, and the input could be a speaker. All of these things could be present in the communication subsystem.

[0096] With respect to a surgical procedure, the first electronics device can be an electronics device that is co-located with the surgeon in an operating room. Here, the medical initiation session can be the implantation of, for example, cochlear implant, or a pacemaker, or some other form of medical device. And note that embodiments of a medical initiation session do not require a surgical procedure. This could be the fitting of an orthopedic prostheses by way of example.

[0097] In an exemplary embodiment, method action 710 includes the actions of having the recipient enter a “fitting room” at a healthcare facility, such as an audiologist center, where the recipient is made comfortable or otherwise provided in a chair and sitting arrangement for the fitting session by way of example. The audiologist or the recipient himself or herself attaches the fitting system to the hearing prosthesis. This could be done by attaching fitting cable 308 to the behind-the-ear device 126 of the cochlear implant recipient 302, or to the over the ear (OTE) device of the recipient, etc., in an exemplary embodiment, fitting cable 308 (an electrical cable) includes a jacket that fits into a receptacle of the behind-the-ear device 126. This places the hearing implant fitting system 308 into signal communication with the prostheses, which signal communication to be one or two way communication. This arrangement can correspond to any traditional fitting system in the art that can enable the teachings detailed herein, where the management thereof is modified or otherwise adapted to the teachings detailed herein. Indeed, the innovative and new teachings detailed herein can be an “add on” to an existing fitting system, and could be a software update for that matter. Any device, system, and/or method that can enable method action 710 to be executed can be utilized in at least some exemplary embodiments.

[0098] In an exemplary embodiment, method 710 includes the action of powering up or otherwise initiating the hearing implant fitting system 306, and thus initiating the fitting session. The action of powering up or initiating the system can be executed utilizing user interface 314. Any device, system, and/or method of initiating a fitting session that can enable the teachings detailed herein, including those known in the art, can be utilized in at least some exemplary embodiments. And in this regard, with respect to method 700 being applied to a hearing prosthesis, method action 710 is directed towards beginning a fitting

session of a medical device utilizing the first electronics device, where the fitting session is the medical initiation session of the medical device. The ramifications of this broader application will be described below.

[0099] Still, with respect to embodiments directed to a hearing prosthesis, in an exemplary embodiment, method action 710 entails beginning a fitting session of a medical device using a first electronics device, where the medical device can be a cochlear implant for example.

[0100] Method 700 further includes method action 720, which includes the action of inputting data to and/or receiving data from the first electronics device, the inputted data and/or received data being related to one or more temporally changeable aspects of the medical device. In an exemplary embodiment, the temporally changeable aspects of the medical device are one or more settings of the medical device, such as, for example, the threshold level and/or comfort level for one or more frequencies and/or one or more channels of the cochlear implant. In an exemplary embodiment, the method actions 710 and 720 are executed by the audiologist 304. In an exemplary embodiment, these two method actions are concomitant with normal operation of a fitting system or otherwise a method of fitting a cochlear implant.

[0101] Consistent with the embodiments where the teachings herein are applicable to the surgical procedure, in an exemplary embodiment, method action 720 can entail setting up a robotic operation or otherwise providing data associated with a given surgery or a surgical procedure to the first electronics device. The temporally changeable aspects of the medical device can be position relative to the body or placements within the body or how the medical device is inserted into the body or how the medical device is In this exemplary embodiment, the user of the first electronics device or otherwise the surgeons at the location of the first electronics device could do the setup for example, and then could turn control of the operation over to the expert who can control a robot (in the next method action discussed below).

[0102] Still, with respect to embodiments directed towards fitting a prostheses, method action 720 entails inputting data to and/or receiving data from the first electronics device, the inputted data and/or received data being related to one or more settings of the medical device, which could be settings of the map of a hearing prosthesis by way of example (which are temporally changeable aspects of the medical device)

[00103] Method 700 further includes method action 730, which includes the action of enabling a use of a second electronics device to and/or using the second electronics device to input data related to and/or receive data related to one or more temporally changeable aspects of the medical device. In an exemplary embodiment, this action of enabling the second electronics device is executed by the audiologist 304. That said, in an exemplary embodiment, the action of using the second electronics device can also be executed by the audiologist 304. With respect to the former, by way of example, referring to the above scenario, during the fitting process, the audiologist 304 utilizing the first electronics device reaches an impasse or otherwise experiences difficulty fitting the prostheses at a particular point during the fitting process, such as with respect to fitting channel 12 of the 22 channels of a cochlear implant. The audiologist 304 seeks to bring in a consultant or otherwise an expert that is not physically present and not currently participating in the fitting process. Hence, the audiologist 304 enables a user of the second electronics device to input data and/or receive data. In an exemplary embodiment, the fitting system that is being utilized as the ability to reach out via the Internet or via a telephone system or the like and begin an interactive session with another person (or another device – this could be an artificial intelligence (AI) based system that is brought into the session), in this exemplary scenario, the technical expert. And note that the action of enabling the second electronics device need not be done utilizing the fitting system. By way of example only and not by way of limitation, a code unique to the current fitting session could be transmitted to the participant utilizing an email or a text message or some other system completely separate from the fitting system, and when the second participant utilizes the code/inputs the code into the second electronics device, the second electronics device can be used accordingly. The action of transferring the code enables the user of a second electronics device, providing that that code is the correct code for the particular method. In this regard, the second electronics device could be a device that is specially configured to jump in and out of fitting sessions, and thus could have a portal in a GUI whereupon typing the code and hitting enter, the second electronics device is brought into the fitting session or otherwise placed into signal communication with the fitting system that is being utilized to execute the method. That said, enabling the device could be providing a recipient an email with a hyperlink therein, wherein the action of clicking the hyperlink opens a second portal into the cyberspace associated with the ongoing fitting session. If the hyperlink is provided to a person who has access to the second device, that enables the user of the second electronics device to use that device according to method action 730, irrespective of whether or not the second user utilizes such.

That said, in an embodiment, method action 730 can be executed by affirmatively opening a portal in the second device, which can be done via remote access in a manner concomitant with providing access to one's computer/obtaining access to another party's computer through the Microsoft system by way of example, such as the utilization of a proxy, or otherwise "proxying in" to another party's computer. Indeed, in an exemplary embodiment, the second electronics device is a device of an expert who is "on call" to assist in ongoing fitting sessions in real time. It can be that, for example, the second device is provided with a "on deck listing" where the professional at the second device works through each job that is provided / each job that results from method action 730. In an exemplary embodiment, the jobs presented on the second device, which could be a general purpose computer or a laptop device or a smart phone (this can be done while the expert at the location of the second electronics device is working from home or is commuting, etc., so as to facilitate the real time implementation of method action 730), could be provided with an important syndicator or criticality indicator for example. Note further that the overall system to execute method 700 (more on this below) could prioritize the individual jobs that are presented to the expert. This can utilize artificial intelligence or a lookup table regime that evaluates the "problems" faced by the user of the first electronics device (which problems could be that the recipient must attend to another matter and thus has limited time to complete the fitting session relative to other recipients who are also being fitted at the same time, or could be that the recipient is having a really bad time and is getting frustrated to the point where he or she may quit utilizing the prosthesis, thus elevating the importance of remedying the problem as quickly as possible, etc.). This could be a "super administrator" that triages the workflows.

[00104] Still, in an embodiment, it can be that the second device is part of an overall fitting system, where the first device is the mere input/output device of the system for the audiologist. More on this below.

[00105] Method 730 includes an alternate implementation where the method is executed by using the second electronics device to input data related to and/or receive data related to one or more temporally changeable aspects of the medical device. That is, method action 730 can be executed without enabling the user of the second electronics device. Here, it could be that the second device is already enabled and ready to go. Again, method 700 can be executed utilizing an integrated system and can be executed under the authority of a single entity, such as a hospital or a single healthcare provider. Corollary to this is that the user of the first electronics device need not be the "administrator." It could be that the user of the second

device is the administrator. More on this below. Also, it can be that the user of the second device is the same person that is utilizing the first device. This can be a method that is implemented to enable movement from one device to another device. By way of example only and not by way of limitation, in pediatric situations, the added mobility can be used to adapt the fitting process to the child. Joining the session from a tablet or mobile device (the second device) and sitting down on the floor etc., can have utilitarian value with respect to calming the child, wherein the initial session began with the audiologist utilizing the first electronics device, which electronics device was located having the interface thereof on a table in a traditional manner. It could also be that there is a simplified application that is utilized on the second electronics device that allows the recipient to interact directly with the second device. Indeed, in an exemplary embodiment, it can be that the audiologist utilizing the first device in a traditional manner, and then, owing to circumstances during the fitting session, the audiologist transitions to the second device which is a device that is configured to allow the recipient to interact with the audiologist together, which can be useful for children and/or adults or older people for that matter. Corollary to this is that there could be instances from time to time where the recipient might want to try his or her hand at adjusting one or more parameters during the fitting session. The second device can be provided to the recipient so that the recipient could make certain adjustments.

[00106] By way of example only and not by way of limitation, in an exemplary scenario, during a fitting session, it is found that the recipient needs to move to another environment, e.g., a sound proofed room or an outside environment, to perform certain tests. With respect to the former, it could be that the ambient environment is simply too noisy for the recipient to participate in the fitting session, or, for example, a map to be used when the recipient is in total silence or effectively total silence (where the map that is being developed in the “noisy” environment is a map to be used by the recipient in a “noisy” environment) and with respect to the latter, it could be that the map to be fitted is a map that is to be used by the recipient when the recipient is outside. Here, the recipient can move to and from the new environment, without having to end the session. The audiologist could transition from the first device to the second device, which second device can be a tablet. Accordingly, in an exemplary embodiment, a person utilizing the first electronics device transitions to utilizing the second electronics device after enabling the second electronics device. That said, in an exemplary embodiment, the second device could be a fixed device located in the soundproof room. The user thus can utilize the first device to create the first map and utilize the second device to

create the second map. That said, embodiments can include creating a single map utilizing the two devices, such as in the scenario where it is determined that the environment is simply too noisy for the particular recipient to effectively participate in the fitting session. It could be that for higher frequencies, the recipient had little difficulty participating in the fitting session, but at the lower frequencies, the recipient needed a more quiet environment. Thus, part of the map is made utilizing the first device and part of the map is made utilizing the second device.

[00107] Note that while the embodiments described above have focused on the concept of the audiologist utilizing the first electronics device and the second electronics device, in an alternate embodiment, it can be the recipient that utilizes these devices. This can be a self fitting method. In an embodiment, there could be a simplified application that enables the recipient to transition from his or her personal laptop or desktop computer to his smart phone or smart device that has an application on his smart phone by way of example, the first device being the personal computer and the second device being the smart phone or smart device. Note also that while method 700 begins with method action 710, it can be that the medical initiation session of the medical device is not begun utilizing the first electronics device. Method action 710 might not be present at all in an exemplary method.

[00108] Consistent with the embodiments where the teachings herein are applicable to the surgical procedure, in an exemplary embodiment, method action 730 can entail bringing in an expert who is remotely located from the surgery to opine or otherwise provide input or otherwise provide instructions to the surgeon who is with the patient, which surgeon is conducting the operation or overseeing the operation or is a part of the operation at the location of the patient. The temporally changeable aspects of the medical device can be position relative to the body or placements within the body or how the medical device is inserted into the body or how the medical device is attached to the body, etc., as all of these are temporally changeable aspects of the medical device. This second electronics device can be utilized by the consultant or the expert in a manner comparable to that detailed above with respect to the hearing prosthesis. With respect to robotic surgery for example, the user of the second electronics device could control or guide the robotic device to implant or otherwise operate on the recipient. In this exemplary embodiment, the user of the first electronics device or otherwise the surgeons at the location of the first electronics device could do the setup for example, and then could turn control of the operation over to the expert who can control a robot.

[00109] Method 700 further includes method action 740, which includes the action of initiating the medical device to a human based on data based on data from the first electronics device that was inputted into the first electronics device during the initiation session. In an embodiment with respect to a method associated with a medical device, this corresponds to fitting the medical device based on data based on data from the first electronics device that was so inputted. By “data based on data,” it is meant that the data can be the actual data that was inputted or can be data that is manipulated somehow or otherwise transposed from that data.

[00110] In an exemplary embodiment, method action 740 is executed utilizing a traditional fitting system GUI, where the comfort and/or threshold levels for given frequencies are adjusted on a screen, and a map is created and the map is stored in the hearing prosthesis.

[00111] In the context of the surgery, this can correspond to the surgeon taking some action associated with the medical device based on data based on data from the first electronics device for example. In a robotic surgery situation, this could be the surgeon controlling the robot locally. Still, in the context of a hearing prosthesis, method action 740 could entail fitting the medical device based on data based on data from the first electronics device that was inputted into the first electronics device during the fitting session.

[00112] As seen, method 700 further includes method action 750, which includes the action of initiating the medical device based on data based on data from the second electronics device that was inputted into the second electronics device and/or based on data based on data generated as a result of the second electronics device receiving data related to one or more temporally changeable aspects of the medical device. With respect to the former, this can be a scenario where the user of the second device inputs a setting for the map under development for the hearing prosthesis. For example, the consultant or advisor expert that was brought in to the fitting session that is utilizing the second electronics device can make adjustments to the map in a manner akin to how the audiologist was making adjustments to the map utilizing the first electronics device. That said, in an embodiment, it could be that the expert or consultant utilizing the second electronics device does not make any changes or otherwise does not provide input to the second electronics device, but instead provides advice or recommendations via another device, such as by the phone. For example, the second electronics device could be a portal on a computer showing the current settings, which would correspond to the action of receiving data related to one or more settings of the medical device, and optionally, data indicative of the difficulties that the recipient is having or that the

audiologist is having during the fitting session (but note that these difficulties could be presented over the phone for example, and thus presented or provided to the user of the second device utilizing another device), and the user of the second device could provide input to the user of the first device or otherwise provide a recommendation that the user of the first device adjust the setting for example, where here, the user of the second device is not providing input through the first device and is certainly not “controlling” the data changes to the electronic map that is being created during the fitting process. Still, it is noted that in an exemplary embodiment, the second electronics device is a device that enables input as well as the reception of data related to one or more settings of the medical device. In an exemplary embodiment, the second electronics device can be an input output device of the fitting system.

[00113] In the context of the surgical procedure, this can entail the remote doctor or the remote expert controlling the robot by way of example.

[00114] Note that method actions 740 and 750 can be executed as part of the same fitting effort. In this regard, consider a map where the comfort and threshold levels for 15 of the 22 channels were set based on input into the first electronics device, and threshold but not comfort levels were set for three of the 22 channels based on input into the first electronics device, and three of the 22 channels had the comfort levels set based on input into the second electronics device, and the remaining four channels were set entirely based on input into the second electronics device. The resulting map, when loaded into the medical device, would initiate the medical device based on data based on data from the first electronics device and from the second electronics device. Thus, this would meet method actions 740 and 750.

[00115] In an embodiment, method action 740 and/or method action 750, in the context of a hearing prosthesis fitting, can include executing one or more of the actions detailed above and/or below disclosed with respect to fitting a hearing prosthesis (e.g., those associated with method 600 of FIG. 6). That said, any one or more of those actions could take place before method action 740 and/or method action 750, and embodiments include having the actor associated with action 740 and/or 750 or a third or fourth participant do so before or in conjunction with and/or after executing these actions (an expanded method 700), which actions are not detailed herein the interests of textual economy.

[00116] In an embodiment of method 700, the first electronics device and/or a third electronics device that is in signal communication with the first electronics device provides a common

medical device initiation session service and is directly in signal communication with the medical device. Here, the first electronics device could be the fitting system which could be a dedicated system that has an input/output subsystem that is physically part of the overall system. That said, in an exemplary embodiment, there could be a third electronics device which could be remote from the first electronics device (and/or the second electronics device), which third electronics device is the fitting system or otherwise is a subsystem that has the fitting software, here, in an exemplary embodiment, the hearing implant fitting system 306 with respect to figure 3. In an exemplary embodiment, the common medical device initiation session service is a common fitting session service. In an exemplary embodiment, this common medical device initiation service is kept in a single process, and as noted above, connects directly to the medical device, such as the sound processor of the hearing prosthesis / external component of the hearing prostheses or, can wirelessly connect with the implantable portion with respect to an implanted sound processor of a totally implantable hearing prostheses. As seen, this service can enable participants to join the session by communicating with that service. This as opposed to a medical device initiation session service for the user of the first electronics device and a separate service for the user of the second electronics device. The session and connection can be established using the clinician fitting software (e.g., this can be initiated by the first electronics device / the user thereof). After that, other parties can join that same session getting information about all settings and actively control the device or some of them. Not all parties will have the same access and/or will have the same ability as others. For example, it could be that one participant has total authority over everything, while all the other participants can only provide advice or recommendations. It could be that only some participants can see the threshold levels for example, but cannot see the comfort levels, or *vice versa*. It could be that say, for example, there is a problem with fitting only some channels of the cochlear implant. It could be that only those channels are accessible by some participants. One or more participants could control what one or more other participants can see or otherwise have access to or otherwise what they can input or change. Embodiments include having one or more of the participants or the users or the electronic devices identified herein being able to do all or some of the things detailed herein and/or not being able to do one or more of the things detailed herein and one or more of the participants or users or the electronic devices identified herein being able to control or limit the abilities of the others.

[00117] In an exemplary embodiment, the action of initiating the medical device based on data based on data from the second electronics device that was inputted into the second electronics device and/or based on data based on the data generated as a result of receiving data related to one or more temporally changeable aspects of the medical device is executed using the first electronics device and/or the third electronics device. In this regard, for example, this is not “remote fitting” per se utilizing for example the second electronics device. This is the utilization of the second electronics device as detailed above data to another user so as to generate data that will be used in the overall fitting. In the case of the third electronics device, where, for example, the first electronics device and the second electronics device are simply user interface devices in signal communication with the fitting system (or more accurately, fitting subsystem of the overall system), it could be the third system that initiates the medical device or otherwise fits the medical device based on the data associated with the second electronics device, whether that is inputted into the second electronics device or generated as a result of data received by the second electronics device.

[00118] In an exemplary embodiment, the first electronics device and/or the third electronics device is co-located with the medical device. By way of example only and not by way of limitation, the first electronics device can be located in the same room with the medical device. In an exemplary embodiment, the first electronics device and/or the third electronics device is not co-located with the medical device. By way of example only and not by way of limitation, in an exemplary embodiment, the first electronics device could be located in one room, and the medical device can be located in another room all in a given hospital or healthcare facility. That said, in an exemplary embodiment, the second electronics device could be co-located with the medical device in some instances, and in other instances, the second electronics device is not co-located with the medical device.

[00119] The method 700 can be practiced by enabling a user of a second electronics device to input data as noted above. In an exemplary embodiment of this, the action of enabling the second device hands over control of the initiation session, such as the fitting session, to a user of the second electronics device. Here, the user of the second electronics device is free to make changes to the map that is under development for example, or otherwise to the settings of the medical device. In an exemplary embodiment, there can be a method action of taking back control, using the first device, from the second device. In an exemplary embodiment, changes can be overridden utilizing the first device. Conversely, in an exemplary embodiment, the user of the first device can always remain in control of the fitting session,

and the input or otherwise data obtained from the second device is optional or otherwise corresponds to a recommendation, where the user of the first device utilizes the first device to accept and/or reject the proffered changes received from the second device.

[00120] In an exemplary embodiment, the first electronics device and/or the third electronics device and/or the second electronics device is located less than, greater than and/or about equal to 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000, 1250, 1500, 1750, 2000, 2500, 3000, 3500, 4000, or 5000 feet or any value or range of values therebetween in 1 foot increments (e.g., 111, 932, 22 to 94 feet, etc.) from the medical device. In an exemplary embodiment, the first electronics device and/or the third electronics device and/or the second electronics device is located less than, greater than and/or about equal to 1, 3, 5, 8, 10, 13, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000, 1250, 1500, 1750 or 2000 meters or any value or range of values therebetween in 1 meter increments (e.g., 111, 932, 22 to 94 meters, etc.) from the medical device. In an exemplary embodiment, the first electronics device and/or the third electronics device and/or the second electronics device is located less than, greater than and/or about equal to 2, 3, 4, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000, 1250, 1500, 1750, 2000, 2500, or 3000 miles or any value or range of values therebetween in 1 mile increments (e.g., 193, 472, 84 to 1777 miles, etc.) from the medical device. In an exemplary embodiment, the first electronics device and/or the third electronics device and/or the second electronics device is located less than, greater than and/or about equal to 3, 4, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000, 1250, 1500, 1750, 2000, 2500, 3000, 3500, or 4000 kilometers or any value or range of values therebetween in 1 kilometer increments (e.g., 193, 472, 84 to 1777 kilometers, etc.) from the medical device.

[00121] With respect to the spatial features, it is noted that in an embodiment, the actual fitting system could be located remotely from all the parties, and could be located at a server at a single remote location. This can be the third electronics device, where the first electronics device and the second electronics device access the third electronics device via the Internet or via a telephone link, or some other communication system. The first electronics device can be utilized to control the fitting system or as will be detailed below, the second electronics device can be utilized to control the fitting system. It is just that the software for the fitting

system is located remotely. That said, the fitting system could be located in the same room as the medical device and as the first electronics device. Indeed, the first electronics device can be the fitting system. In the second electronics device can also be located in the same room, such as for example with respect to the scenario of the tablet. However, embodiments can also include methods where the second electronics device is located remotely and accessed only on an as-needed basis, such as when there is utilitarian value with respect to bringing in an expert consultant.

[00122] To be clear, method 700 is not telemedicine per se. Method 700 is a method where multiple parties come in and out of a single session, each providing their own unique contributions, without interrupting the session.

[00123] In an exemplary embodiment, the first electronics device and the second electronics device has a graphical user interface that provides data in a format that is unique to the initiation of the medical device. That is, these devices are not merely cameras or video screens or speakers or microphones of the like.

[00124] Consistent with the theme of the invention, method actions 740 and 750 are executed during a single uninterrupted fitting session. In an exemplary embodiment, any one or more or all of the method actions of method 700 are executed within 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 120, 150, 180, or 250 minutes, or any value or range of values therebetween in one minute increments of each other.

[00125] In an exemplary embodiment, the fitting session can be not unlike a video conferencing application with respect to determining whether or not the meeting took place during a single uninterrupted session. In an exemplary embodiment, if there is no save and close action for example, that is a continuous session. In an embodiment, the computer software used for a video conferencing system commercially available on December 21, 2022, is inventively adapted to implement the teachings herein.

[00126] An embodiment can include method 700 further including the action of enabling a user of a fourth electronics device and/or using a fourth electronics device to enter the initiation session, the fourth electronics device being a separate device from the first electronics device and the second electronics device, the fourth electronics device. This can be, for example, done in a situation where both the user of the first electronics device and the user of the second electronics device have not been able to resolve a problem, and it is desired to bring in another consultant. This could also be done where, for example, there is

an internal mandate that if the fitting session is difficult enough to require that a second participant aid in the fitting, a third participant review the resulting work. This could also be standard practice where this third participant review the work even if there was no utilization of the second device, in which case the third participant would only be the second participant but this would not meet the method 700 (this is explained only with respect to explaining the concept why this third participant might always be required if there is a second participant). Indeed, the user of the second device could be the person reviewing the work for that matter.

[00127] In an exemplary embodiment, the fourth electronics device can be located relative to the first, second and/or third electronics device at spatial locations according to any of the spatial locations detailed herein for the other devices relative to one another.

[00128] The above method 700 has been presented as an example of where the audiologist working directly with the recipient deems that there exists a need for technical expertise to investigate issues or to get the optimal fitting. Assistance from experts, such as Cochlear Limited representatives, is requested. The expert can join the session and get detailed information about the current status of the fitting session/features of the results of the fitting session so far, etc. The expert can either provide recommendations or actively change properties in an exemplary embodiment according to the above. In this expert can be located in the next room, or could be located thousands of miles away.

[00129] In an alternate embodiment, there is a method where the expert or otherwise an administrator can proxy in and out of the fitting session at will. An example of this is method 800. Method 800 includes method action 810, which includes the action of entering, via telecommunications link into an ongoing fitting session. Here, this could be by invitation according to the above, but this could also be by an action that is uninvited or otherwise occurring without the request or even knowledge prior to happening of the audiologist. In an exemplary embodiment, the fitting system or otherwise the software or hardware or firmware that is utilized to implement the fitting session is configured to enable a party to proxy in, which party is designated, on the party's own volition. This can be implemented utilizing known text techniques for administrators of computer networks. In an exemplary embodiment, there is a system where the ongoing fitting sessions and/or schedule fitting sessions can be displayed on a schedule or otherwise in a graphical user interface, such as, for example, a shared Outlook calendar or a shared web-based calendar or cloud-based calendar for example, or there can be a network where all the ongoing fitting sessions and/or the scheduled fitting sessions are displayed or otherwise can be viewed. The system can be

configured so that the party, here, sometimes referred to as the administrator, can proxy and by clicking an icon displayed on the GUI for example, or can answer in a manner analogous to Teams. In a more pedestrian based system, the system could email the party at the beginning and/or before the beginning of the fitting session, and the email could include a link that permits the party to click the link to enter the fitting session or otherwise view the data associated with the fitting session. In an embodiment, the data associated with the fitting session could be logged in real time to the cloud, and the administrator or otherwise the party entering the ongoing fitting session could enter into such by accessing the data that is accruing in real time (or in an alternate embodiment, in near real time).

[00130] And this action of obtaining information can correspond to method action 820, which includes the action of obtaining information relating to the fitting session after the action of entering. This can be done by entering the session as detailed above, or by reviewing the data that is being catalogued and otherwise logged in real time or near real time. In an exemplary embodiment, the action of obtaining the information includes opening a GUI or otherwise accessing such and reviewing the settings of the hearing prosthesis, or otherwise the planned settings of the hearing prosthesis, or otherwise reviewing the map or the fitting map that is being used to fit the prostheses. In an embodiment, this can include listening in on the ongoing session. In this regard, there can be microphones and/or cameras in the location where the recipient is being fitted, which microphones and cameras could be based on a PC or the like or could be more extensive cameras and microphones, such as microphones that connect to a computer system via a USB port and/or cameras that connect to such, where the system includes software and/or firmware and/or hardware that can enable the sound and/or light that is captured by these components to be converted into digital data and/or analog data for that matter, and then reproduced in a graphical image and/or sound based medium. Technologies such as those found in existing PCs can be utilized. Listening in to an ongoing fitting session corresponds to the action of obtaining information in an exemplary embodiment.

[00131] Method 800 further includes method action 830, which includes the action of evaluating the information. Here, this could correspond to any of the actions that might be taken by an audiologist or otherwise a hearing prosthesis expert or even a novice for that matter (this can be used for training purposes). In an exemplary embodiment, the evaluation could be that a comfort level and/or a threshold level for one or more frequencies should be changed from that which is currently the case. The evaluation could be simply a review of

the threshold and/or comfort levels obtained from the system or otherwise obtained during the fitting process, or obtained before for that matter which are relied upon during the fitting session, and thus corresponds to information relating to the fitting session, although in other embodiments, the information that is evaluated is dated that did not exist in whole or in part prior to the commencement of the fitting session.

[00132] Still, an embodiment can include evaluating the information that corresponds to ratifying that the current process is being conducted in a manner that is acceptable or otherwise utilitarian or otherwise needs no improvement, or evaluating the information to identify an improvement or otherwise a change.

[00133] Method 800 further includes method action 840, which includes the action of, based on the evaluation, over the telecommunications link, providing second information to a participant in the fitting session and/or making an adjustment, over the telecommunications link to a medical device that is a subject of the fitting session and/or creating or adding or modifying in whole or in part to a data set to be used by the medical device based on the evaluation that is a subject of the fitting session and/or bringing in another party into the ongoing fitting session. With respect to the first optional action, this could be a verbal instruction to the audiologist to make an adjustment. This could be an indication to the audiologist that the settings are fine. This can be a recommendation to try a different fitting method or otherwise utilize a different regime. This could be instructing the audiologist or recommending to the audiologist that the audiologist moved to a different environment. This can be done verbally or by text display, etc.

[00134] And note that this need not necessarily include another audiologist. This could be a so-called self fitting method that is taking place, where the party that enters the fitting session is brought in to give advice or otherwise provide an evaluation. Indeed, the action of providing information to the participant in the fitting session could be the action of providing information to the recipient.

[00135] With respect to the optional action of making an adjustment, here, this can be adjusting a threshold level right comfort level or any of the other settings to the medical device that can be adjusted during a fitting process, such as, for example, adjusting the current pulse rate, pulse width, maxima, gains, etc.). With respect to the action of adding or modifying or creating in whole or in part a data set to be used by the medical device, this

could entail creating the map from scratch by way of example. This could entail completing the map such as addressing the comfort levels for five of the 22 channels.

[00136] In an exemplary embodiment, in view of the above, the ongoing fitting session is a fitting session of the medical device to a person, such as a hearing prosthesis, such as a cochlear implant. The information obtained can be a current set of settings for the medical device which are or will be stored in the medical device (the map or the fitting map for example). Further, the second information is a ratification of the settings and/or an indication that the settings should be changed and/or the adjustment is an adjustment to the settings.

[00137] In an exemplary embodiment, the ongoing fitting session is taking place with a healthcare professional (e.g., an audiologist) and a recipient of the medical device at one location (a clinic, for example). Further, the actor providing the second information is located at another location, for example, at least 200 feet from the one location. In an exemplary embodiment the actor providing the second information could be also located at that location. In an exemplary embodiment, the actor providing the second information is located less than 50 feet from the healthcare professional. In an exemplary embodiment, any of the above-noted distances associated with the first electronics device and the second electronics device and/or the other electronics devices relative to one another can be applicable to the spatial locations associated with the actor providing the second information and/or the another location and the healthcare professional and/or recipient and/or the one location in the interest of textual economy.

[00138] Note also that in an exemplary embodiment, any one or more of the method actions associated with method 800 and variations thereof detailed herein can be executed within the temporal periods detailed above with respect to method 700 and the variations thereof detailed herein in the interest of textual economy.

[00139] In an embodiment, method action 830 and/or method action 840, in the context of a hearing prosthesis fitting, can include executing one or more of the actions detailed above and/or below disclosed with respect to fitting a hearing prosthesis (e.g., those associated with method 600 of FIG. 6). That said, any one or more of those actions could take place before method action 830 and/or method action 840, and embodiments include having the actor associated with action 830 and/or 840 or another participant do so before or in conjunction with and/or after executing these actions (an expanded method 800), which actions are not detailed herein the interests of textual economy.

[00140] In an exemplary embodiment, method 800 further includes the action of receiving an invitation to enter the ongoing fitting session prior to the action of entering. Accordingly, such an exemplary method can be indicative of an invite only method, where the actor providing the second information can only join if invited or otherwise affirmatively provided access to the fitting session. That said, it could be that the actor providing the second information could enter at any time, but chose not to and this invitation is simply a request or otherwise an indication that his or her input or otherwise review is desired at this time.

[00141] In an exemplary embodiment, the ongoing fitting session is a fitting session of the medical device to a person and a healthcare professional working to fit the medical device to the person has declared to the actor evaluating the information that he/she is having difficulty optimizing one or more settings of the medical device to the person. This can be done via any digital means for example, such as communications over the Internet or messaging within a common interactive software session of which the actor has access to, or could be by a more pedestrian manner such as a telephone call. But in this exemplary embodiment, the actor evaluating the information takes over the fitting session by the telecommunications link. (Note that this can happen before the actor evaluates the information. The phrase “actor evaluating the information” simply refers to the actor that acts accordingly in the overall method. It is simply an indicator and does not require that the action be taking before any other action.) That is, the actor becomes the audiologist fitting the hearing prosthesis for example, and otherwise replaces, if only temporarily, the audiologist who is working to fit the prosthesis prior to the action of taking over. Here, the actor can change the map or make adjustments or do any of the actions that the audiologist could do or was doing or would do, providing that the art enables such (for example, if the actor was remote, the actor could not attach the fitting system to the hearing prostheses for example). In this embodiment, it could be that the healthcare professional could take back control. It also could be that the healthcare professional cannot take back control from the actor.

[00142] Accordingly, in an exemplary embodiment, the ongoing fitting session is a fitting session of the medical device to a person, wherein a healthcare professional working to fit the medical device to the person is remote from the actor evaluating the information. For example, the two parties are not in the same room. In an exemplary embodiment, the two parties are miles away from each other. In this exemplary embodiment, by way of example, the actor evaluating the information enters the ongoing fitting session without being invited by the healthcare professional. In an alternate exemplary embodiment, the actor evaluating

the information enters the ongoing fitting session with the invitation of the healthcare professional. In an embodiment, this is the only way that the actor evaluating information can do so, while in other embodiments, the actor evaluating the information can enter it will with or without the permission of the healthcare professional.

[00143] With respect to a scenario where the actor evaluating the information takes over the fitting session by the telecommunications link from the healthcare professional, the healthcare professional can take back control of the fitting session without the permission of the actor evaluating the information in some embodiments, and the healthcare professional cannot take back control of the fitting session without the permission of the actor evaluating the information in some other embodiments.

[00144] It is noted that an administrator can control the ability to control and take back control amongst the various parties. And note that the administrator need not be the actor or the healthcare professional. It could be a third party. Indeed, concomitant with the above teachings, there could be a third or fourth or fifth or sixth party that enters into the fitting session. In these various parties could all be on it once or there could be two or more or three or more or four or more or five or more parties that are on at one location. Two parties could join at the same time or more than two parties could join at the same time. The parties can come in and out of the session serially, and parties could join and then leave and then join again.

[00145] In this regard, returning back to method action 840, recall that one of the options is bringing in another party into the ongoing fitting session. Here, this could be a determination by the actor who evaluates the information that another expert is needed or otherwise another professional or a consultant is needed. The actor can expand the participants of the fitting session to this new party. This can be done in accordance with any of the method actions and/or technologies or otherwise devices and systems detailed herein. This another party could be co-located with the actor or could be located remotely. Any of the distances detailed herein with respect to the various electronics devices detailed above can be applicable to the various parties.

[00146] In an embodiment, the system or the session service (that provides the platform for the methods herein for example) etc., is configured to keep the state of the fitting session. This can entail keeping track of connection status, current settings, current controlling user and currently connected user(s). When a new party wants to join the session, or if another

party is invited, the service / system can inform automatically the other parties. In an exemplary embodiment, an administrator role can accept the new party. The administrator role(s) can hand over control to other parties. As noted herein, in some embodiments, only one party can control the session at any given point, to avoid multiple interactions to occur simultaneously. Control can be handed back to the administrator by the other controlling participants, or taken back by the administrator.

[00147] Embodiments include a fitting system. The system can include a communications subsystem including at least one of (i) a first input subsystem and a first output subsystem or (ii) a first input/output subsystem where, with respect to the latter, input and output subsystems are combined. In an exemplary embodiment, the output subsystem corresponds to the device that provides the output of figure 3 (to the hearing prosthesis). In an exemplary embodiment, the output subsystem corresponds to the device that enables the execution of the remapping of the prosthesis. In an exemplary embodiment, the output subsystem can correspond to a device that includes a jack that can be placed into wired communication with the hearing prostheses so as to transfer the map to the prostheses. In an exemplary embodiment, the output subsystem can be a Wi-Fi system. In an exemplary embodiment, the output subsystem can be a USB port or the like that enables transfer of data to the prosthesis.

[00148] Any device, system, and/or method that will enable the output subsystem to output data having utilitarian value with respect to implementing the teachings detailed herein or otherwise that can enable the teachings detailed herein can be utilized in at least some exemplary embodiments. Note that the output subsystem could be a subsystem that enables the hearing prosthesis to be fitted remotely, such as a system that utilizes the Internet, where the hearing prosthesis is located any of the distances detailed herein with respect to the first electronics device and the second electronics device in the interest of textual economy.

[00149] As noted, the system can include an input subsystem, which can be any device or system that can enable the input of data that is used by the system to be inputted into the system. In this regard, in an exemplary embodiment, the input subsystem can be a keyboard and/or mouse and/or touch screen.

[00150] The input subsystem can instead be a component that receives a signal from a microphone and need not necessarily include the microphone. In this regard, in an exemplary embodiment, the input subsystem could include a jack or the like that is configured to receive a comparable jack from a microphone. The input subsystem can be, for example, a Wi-Fi

based system that is configured to receive RF frequency transmissions from a remote device, such as the smart phone. Any device or system that can enable the input of data so that the system can perform its functions can be utilized in at least some exemplary embodiments.

[00151] Note that the input subsystem can also communicate over the Internet, where a user or all of the users of the fitting system are located away from the input subsystem, such as, for example, any of the distances detailed herein with respect to the first and second electronics device by way of textual economy.

[00152] In an embodiment, the system includes a processing subsystem. In view of the above, it can be seen that in an exemplary embodiment, there is a fitting system, where the system can be for any type of sensory prosthesis, such as, for example, a cochlear implant, a retinal implant, etc. The system includes a communications subsystem including at least one of an input subsystem and an output subsystem or an input/output subsystem. The communications subsystem can be that of a smart phone or a personal computer, or a hearing prosthesis, etc. In an exemplary embodiment, the communication subsystem is split between the hearing prosthesis and the smart phone. In this regard, in an exemplary embodiment, the microphone of the hearing prosthesis is used as the input subsystem, and the output componentry of the smart phone is utilized as the output subsystem.

[00153] With respect to the processing subsystem, the processing subsystem can be configured to automatically develop fitting data for a hearing prosthesis at least partially based on data inputted via the communications subsystem. This processing subsystem can correspond to any existing processing subsystem of a fitting system that is commercially available. The subsystem can correspond to any such processing subsystem that is obtainable from any of the cochlear implant manufacturing corporations that provide such. In an exemplary embodiment, the communications subsystem is configured to enable a first user of the fitting system to enter data via the first input subsystem and/or the first input/output subsystem while physically present in a same location as a physical output of the first output subsystem and/or first input/output subsystem. This is, for example, the embodiment of FIG. 3. Further in an exemplary embodiment, and not by way of limitation, the communications subsystem is configured to enable a second user to enter and/or be entered into a fitting session in which the fitting system is being used, wherein the second user is at a location away from the same location. This is concomitant with the teachings detailed above. Indeed, in an exemplary embodiment, the communication subsystem is configured to enable a third user and/or a fourth user and/or a fifth user and/or a sixth user and/or a seventh user, etc. to enter.

[00154] In an embodiment, the system can be used to / enable the execution of one or more of the actions detailed above and/or below disclosed with respect to fitting a hearing prosthesis (e.g., those associated with method 600 of FIG. 6), concomitant with a traditional fitting system, which actions are not detailed here in the interests of textual economy.

[00155] In an exemplary embodiment, by way of example only and not by way of limitation, instead of this ability to enable the second user to enter and/or be entered, and/or in addition to this, the system can include a second input subsystem and/or a second input/output subsystem, and wherein the system is configured to enable the first user to transition from using the first input subsystem and/or the first input/output subsystem to using the second input subsystem and/or the second input/output subsystem. This can correspond to the example detailed above where the audiologist transitions from the more formal laptop based input subsystem to the mobile pad (or smart phone for that matter) that permits the audiologist to sit on the floor with the child recipient by way of example. This second input subsystem or input/output subsystem can have any one or more of the features detailed above with respect to the first input subsystem and/or first input output subsystem.

[00156] In an embodiment, the communications subsystem is configured to enable the second user to enter and/or be entered into the fitting session in which the fitting system is being used, wherein the second user is at the location away from the same location. Again, any of the temporal and/or spatial teachings above with respect to the first and second electronics devices can be utilized in some embodiments in the interest of textual economy.

[00157] In an exemplary embodiment, the communications subsystem is configured to enable the second user to enter into the fitting session in which the fitting system is being used, wherein the second user is at the location away from the same location, the entering of the second user being under the total control of the second user. This can be implemented by, for example, a password algorithm and/or a user ID algorithm. This can be implemented via dial-up modem and/or by an Internet connection with security measures, and/or security measures that are utilized with cloud-based systems and/or network-based systems available as of December 21, 2021, by way of example. With respect to the control, the algorithm can indicate administrator status by way of example and/or can provide levels of primacy. Indeed, the second user could be the equivalent of administrator entering the network, and the technologies associated there with for implementing such on the after mentioned a can be utilized in at least some exemplary embodiments.

[00158] In an exemplary embodiment, the communications subsystem is configured to enable the second user to be entered into the fitting session in which the fitting system is being used, wherein the second user is at the location away from the same location, the first user being able to bar the entrance of the second user. Again, this can be implemented utilizing any of the detailed technologies above. The first user could have the equivalent of or have actual administrator powers.

[00159] In an exemplary embodiment, the system includes the second input subsystem and/or the second input/output subsystem, and the system is configured to enable the first user to transition from using the first input subsystem and/or the first input/output subsystem to using the second input subsystem and/or the second input/output subsystem as noted above by way of example. And by way of example, with respect to the example of a work tablet or a smart phone, the second input subsystem and/or the second input/output subsystem is part of a mobile device mobile from a device of which the first input subsystem and/or the first input/output subsystem is a part.

[00160] To be clear, the various input and/or output subsystems detailed herein can operate in a manner consistent with how a smart phone accesses emails and/or how a person accesses emails on the smart phone, etc., where the smart phone accesses emails from a remote server or over the cloud or via a cellular phone based network or via a Bluetooth link or via a Wi-Fi link. The associated access permissions and controls etc. that are utilized with a smart phone or a network computer can be utilized here. With respect to the ability to control, system such as a parental control regime can be utilized or otherwise adapted for use with the fitting system under description.

[00161] While embodiments have focused on the ability for the various users to be remote from the processing system, in some exemplary embodiments, the fitting system requires the first user to be present at the same location in order for the fitting system to begin operation. That said, in some embodiments, the fitting system does not require the first user to be present at the same location in order for the fitting system to begin operation. In this regard, the physical output of the first output subsystem and/or the first input output subsystem could be the location of the Bluetooth antenna for example, as an example of how to define the location for example. The location of the output subsystem and/or the input subsystem could be a USB port. Could be a monitor or computer screen etc. It is some physical component that is part of the system that corresponds to the input and/or output subsystem. Any of the locational features detailed above with respect to the first and second electronics devices

relative to one another can correspond to any of the components and/or the users of the system by way of example only and not by way of limitation. For example, the first user or second user and/or recipient can be located within any of the distances associated with the distance between the first and second electronics device, again all for purposes of textual economy.

[00162] In an embodiment, the fitting system does not require the first user to be present at the same location in order for the fitting system to begin operation. In an exemplary embodiment, the first user is the audiologist and in an exemplary embodiment, the system cannot be used unless the audiologist is at the same location as the recipient.

[00163] In an embodiment, where the communications subsystem includes a second output subsystem and/or the second input/output subsystem, the second output subsystem and/or the second input/output subsystem being configured to communicate with the prosthesis that is being fitted by the fitting system, the first output subsystem and/or the first input/output subsystem is configured to communicate with the prosthesis that is being fitted by the fitting system, and this can be directly (e.g., by wired communication with a jack and/or wireless communication by Bluetooth (internet connection would not be direct communication)). In this embodiment, the communications subsystem can be configured to enable the prosthesis to be moved from the same location to another location away from the same location while remaining in communication (including direct communication) with the fitting system by the first output subsystem and/or first input/output subsystem and/or the second output subsystem and/or the second input/output subsystem.

[00164] In an embodiment, the first input subsystem and/or the first output subsystem and/or the first input/output subsystem is and/or can be placed in or cannot be placed in and/or is not in direct communication with the medical device and/or the processing subsystem. In an embodiment, the second input subsystem and/or the second output subsystem and/or the second input/output subsystem is and/or can be or cannot be placed in and/or is not in direct communication with the medical device and/or the processing subsystem.

[00165] In an embodiment, the first input subsystem and/or the first output subsystem and/or the first input/output subsystem is and/or can be placed in or cannot be placed in and/or is not in direct communication with the medical device and/or the processing subsystem. In an embodiment, the second input subsystem and/or the second output subsystem and/or the second input/output subsystem is and/or can be or cannot be placed in and/or is not in direct

communication with the medical device and/or the processing subsystem, where the electronics device(s) are used in a system that includes the processing subsystem. In an embodiment, the first electronics device is and/or can be placed in or cannot be placed in and/or is not in direct communication with the medical device and/or the processing subsystem. In an embodiment, the second electronics device is and/or can be or cannot be placed in and/or is not in direct communication with the medical device and/or the processing subsystem.

[00166] In an embodiment, the first output subsystem and/or the first input/output subsystem is configured to communicate with the prosthesis that is being fitted by the fitting system, directly or indirectly, and the communications subsystem is configured to enable the prosthesis to be moved from the same location to another location away from the same location while remaining in communication with the fitting system by the first output subsystem and/or first input/output subsystem.

[00167] In view of the above, it can be seen that in an exemplary embodiment, there is a fitting system. The fitting system can be for any type of sensory prostheses, such as, for example, a cochlear implant, a retinal implant, etc. The system includes a communications subsystem including at least one of an input subsystem and an output subsystem or an input/output subsystem. The communications subsystem can be that of a smart phone or a personal computer, or a hearing prosthesis, etc. In an exemplary embodiment, the communication subsystem is split between the hearing prosthesis and the smart phone. In this regard, in an exemplary embodiment, the microphone of the hearing prostheses is used as the input subsystem, and the output componentry of the smart phone is utilized as the output subsystem.

[00168] In an exemplary embodiment of the fitting system, the system includes the processing subsystem, wherein the processing subsystem is configured to automatically develop fitting data for a hearing prosthesis at least partially based on data inputted via the communications subsystem.

[00169] In an embodiment, the various portals are part of and/or the various users work from a common network. This network could be distributed in a single facility by way of example, or across multiple facilities. In an embodiment, this can be implemented in the cloud utilizing cloud computing. Figure 9 provides a high-level exemplary functional block diagram of an exemplary system. As seen, the clinician fitting software (software that is

utilized by the clinician or audiologist or otherwise the person directly working with the recipient by way of example) can be segmented from the consultant fitting software (software that is utilized by the consultant that is brought in as needed for example) and the clinician mobile/tablet app is also segmented from the other software. Also, there exists the manufacturer software, which can also be segmented from the other software. In an embodiment, a hearing device manufacturer personnel for example could join the session, and use software specifically designed to support troublesome fitting sessions. This software would not be part of the system in some embodiments and/or would not be accessible outside of the manufacturer, for example. The software could be software that is specialized to find issues with the implant or sound processor and/or could be software that analyses the map settings (or pre-settings that are being used for the fitting session) to find issues that could result in a sub optimal fitting. The software could be trouble-shooting software. The software could be sufficiently sophisticated so that only a trained expert can use the software effectively or otherwise safely. The software could be such that it provides a more aggressive fitting regime, which aggression should be controlled by a more skilled technician / should be more tightly controlled because it can cause distress to the recipient if not used properly.

[00170] In an exemplary embodiment, the manufacturer service software can be the software that is actually utilized to fit the hearing prostheses. This can be the software that does the math so to speak and otherwise implements changes input into the overall system by one or more participants into the data that is loaded into the prostheses or otherwise the settings that will be used by the prostheses. In an exemplary embodiment, the manufacturer service software block can be representative of the processing subsystem of the system detailed above. And it is noted that the phrase processing subsystem does not require a processor per se. Instead, a computer chip or a series of computer chips can be used which in the technical strict sense are not processors. Firmware and/or hardware can be utilized as well. Dedicated electronics can be utilized.

[00171] In any event, the blocks at the top of figure 9 can represent separate devices that are in signal communication with a session service as shown. This session service can be a system that coordinates between the various parties (also represented by the respective software blocks in an exemplary embodiment). The session service may not necessarily have any true fitting software per se, but instead is a service that provides for the interaction between the various parties and/or the various electronics components etc. the session service can provide for the coordination or otherwise provide for the ability to manage the fitting session in

accordance with the teachings detailed herein or otherwise to achieve the teachings detailed herein. In this regard, the clinician fitting software is shown as the software that is utilized to control the session service. In this exemplary embodiment, the clinician would be the administrator. In other embodiments, this is not necessarily the case. The session service can be a standalone computer having the ability to receive input and output in accordance with a traditional computer, or can be a server for example. An algorithm can be present that times the inputs and outputs and otherwise routes the inputs and outputs accordingly according to known techniques. The clinician can control how this is routed or otherwise can control whether or not certain information will or will not be routed etc. in accordance with the teachings above. As seen, there can be a link between the session service and the hardware connecting interface, which can be a wired or a wireless link is disclosed above, where the hardware connection interface is in signal communication during a fitting session with the so-called sound processor or otherwise the external component of the cochlear implant as shown (or a middle-ear implant or a transcutaneous bone conduction device – element 9999 can represent any one of the external components of such).

[00172] Concomitant with the teachings above, the session service could be located remotely or could be located or co-located with the clinic device. In this regard, the session service could be accessed via the Internet. That said, in an embodiment, the session service could be the fitting system.

[00173] Briefly, it is noted that any disclosure of any method action herein or any functionality of a device and/or system corresponds to a disclosure of a non-transitory computer-readable medium having recorded thereon, a computer program for executing that method action were that functionality, etc. Accordingly, an exemplary embodiment includes a non-transitory computer-readable media having recorded thereon, a computer program for executing at least a portion of a hearing-prosthesis fitting method, the computer program including code for implementing one or more of the method actions herein.

[00174] Corollary to this is that any disclosure herein of an action associated with code or a computer medium corresponds to an alternate disclosure of a method action without the code providing that the art enables such unless otherwise noted.

[00175] In an exemplary embodiment there is a non-transitory computer-readable media having recorded thereon, a computer program for executing at least a portion of a medical device, such as a sensory prosthesis (e.g., a cochlear implant, or a retinal implant, or a bone

conduction device) fitting method, the computer program including code for receiving input from a first participant through a first portal, code for receiving input and/or providing output to a second participant through a second portal separate from the first portal and code for fitting the medical device based on input from at least the first participant. In an exemplary embodiment, the media has code for controlling at least one of input received from the first participant, input received from the second participant or output provided to the second participant.

[00176] In an exemplary embodiment, the aforementioned portals can be portals that receive input that originates from remote locations over the internet. By way of example only and not by way of limitation, the input can be received by the first and second electronics devices detailed above. In an exemplary embodiment, the media allows a plurality of participants, including the first participant and the second participant to move in and out of a fitting session fitting the medical device without requiring a medical device disconnect from the session and without requiring a new session, where this disconnect can be a physical disconnect or a virtual disconnect depending on the connection.

[00177] In an embodiment, there is computer media including code recorded thereon, for executing any one or more of the fitting actions detailed herein, such as those detailed above with regard to fitting a hearing prosthesis, at least for using a machine to do so or otherwise providing an interactive GUI to do so, which actions are not repeated here in the interests of textual economy.

[00178] In an embodiment, the media allows the second participant to move in and out of a fitting session fitting the medical device without requiring saving and/or ending of the session and restoring the session when the second participant joins the session and/or leaves the session.

[00179] With respect to the alternate code capabilities noted above, in some embodiments, the media includes code for allowing the first participant to control the input received from the second participant and/or output provided to the second participant. This can correspond to the first participant permitting the second participant to see data and then not see data depending on what the first participant once. In this regard, the first participant is in control. With respect to the input being controlled, in an embodiment, first it for the creation of the map. By way of example, the code could permit the first participant to accept or decline a change to the map made by the second participant.

[00180] In an embodiment, the media includes code for allowing the second participant to control the input received from the first participant and the code for receiving input from the first participant through the first portal is located in a device co-located with the medical device. Again, any of the spatial distances associated with the electronics devices above can be used to determine distances from a user or a participant or a component or a medical device relative to each other.

[00181] Further, in some instances, the media comprises code for receiving input from the second participant and code for fitting the medical device based on input from the second participant. The media can include code for limiting control of adjustments to the medical device during the fitting session to only one participant at a time.

[00182] It is also noted that in the interest of textual economy, any of the actions or capabilities associated with the first participant and/or first user and/or first electronics device can correspond to the second participant and/or second user and/or second electronics device and vice versa unless otherwise noted providing that the art enables such.

[00183] It is noted that while many of the embodiments above have been directed towards the concept of a human being one of the participants and otherwise utilizing one of the electronic devices, etc., in an alternate embodiment, the participant and/or one of the electronic devices etc. could be a trained neural network or an artificial intelligence system, etc. it could be that access or control of the fitting system is handed over to an AI or an expert system, which can help in the transition.

[00184] Figures 10 and 11 present an exemplary quasi-flowchart representing how and exemplary session utilizing the teachings detailed herein might be played out utilizing the teachings detailed herein. In figure 10, the clinic device is in control, such as, for example, the first electronics device noted above. In figure 11, the consultant is in control, such as through the consultant's electronic device, which could be the second electronics device detailed above. The numerals of each action indicate the sequence of an unfolding method by way of example. The control arrows do not represent a signal communications path, but instead simply are present to represent when the various parties are in control of the fitting session or otherwise in control of the settings or the ability to set the settings of the prostheses device 9999.

[00185] In an embodiment, the system provides a controlling service, which can be a service used to control the session to maintain the connection to the hearing device or other medical

device. In an embodiment, initially, an HCP device is used to initialize the service and the connection. From then on (by way of example), all communication to and from the system is routed through the session controlling service. In an embodiment, the controlling healthcare professional can choose to invite additional parties, e.g. a consultant, to the ongoing session. This can be done by sending an invite to the consultant. If the consultant accepts, he or she will join the active session and the controlling healthcare professional will be notified. The controlling healthcare professional can communicate with the consultant and share information about the session. The controlling healthcare professional can also hand over full or partial control of the session to the consultant. The controlling healthcare professional can at any time retake full control of the session, all by way of example.

[00186] It is also noted that at least some exemplary embodiments utilize so-called expert systems as the artificial intelligence system. Any disclosure herein of a neural network or of a DNN and/or of an artificial intelligence system corresponds to a disclosure in an exemplary embodiment that utilizes an expert system providing that the art enables such, unless otherwise noted.

[00187] Some of the specifics of the DNN utilized in some embodiments will be described below, including some exemplary processes to train such DNN. First, however, some of the exemplary methods of utilizing such a DNN (or any other algorithm that can have utilitarian value) will be described.

[00188] As noted above, some methods entail processing the data utilizing a product of machine learning, such as the results of the utilization of a DNN, a machine learning algorithm or system, or any artificial intelligence system that can be utilized to enable the teachings detailed herein. This as contrasted from, for example, processing the data utilizing general code or utilizing code that not from a machine learning algorithm or utilizing a non AI based / resulting chip, etc.

[00189] Again, in an exemplary embodiment, the machine learning can be a DNN, and the product can correspond to a trained DNN and/or can be a product based on or from the DNN. It is noted that in at least some exemplary embodiments, the DNN or the code from a machine learning algorithm, etc., is utilized to achieve a given functionality as detailed herein. In some instances, for purposes of linguistic economy, there will be disclosure of a device and/or a system that executes an action or the like, and in some instances structure that results in that action or enables the action to be executed. Any method action detailed herein

or any functionality detailed herein or any structure that has functionality as disclosed herein corresponds to a disclosure in an alternate embodiment of a DNN or code from a machine learning algorithm, or an artificial intelligence system etc., that when used, results in that functionality, unless otherwise noted or unless the art does not enable such.

[00190] Any learning model that is available and can enable the teachings detailed herein can be utilized in at least some exemplary embodiments.

[00191] FIG. 12 depicts an exemplary functional schematic, where the fitting system 240 is in communication with a geographically remote device / facility 10001 via link 2230, which can be an internet link. The geographically remote device / facility 10001 can have a first electronics device for example. Also, as can be seen, there can be a direct link 2999 with the prosthesis 100 and the remote facility 10001. The fitting system 240 can be in direct communication with the prosthesis 100 via link 230.

[00192] Accordingly, an exemplary embodiment entails executing some or all of the method actions detailed herein where the recipient of the hearing prosthesis, the hearing prosthesis 100 and/or the fitting system is located remotely (e.g., geographically distant) from where at least some of the method actions detailed herein are executed.

[00193] Embodiments can include a system and/or simply an embodiment that includes a non-transitory computer readable medium having recorded thereon, a computer program for executing at least a portion of a method, the computer program including code for executing any one or more of the method actions and/or functionalities detailed herein. Thus, any disclosure herein of a method action or functionality corresponds to a disclosure of a non-transitory computer readable medium having programed thereon code to execute one or more of those actions and also a product to execute one or more of those actions.

[00194] Embodiments include any functionality disclosed herein and/or method action disclosed herein being executed by a computer chip, a processor, software, logic circuitry and/or electronics, and all are not mutually exclusive. Any circuit that can enable the teachings herein can be used providing that the art enables such. Thus, in the interests of textual economy, and disclosure herein of a functionality of an article of manufacture corresponds to any one or more of the aforementioned structures being configured to execute such and otherwise for such, and the same is for any method action disclosed herein, where any such action corresponds to a disclosure of any one or more of the aforementioned structures being configured to execute such and otherwise for such.

[00195] In some embodiments, a neural network, such as a DNN, is used to directly interface to the input into the systems / devices detailed above, and process this input via its neural net, and determine the information detailed above. The network can be, in some embodiments, either a standard pre-trained network where weights have been previously determined (e.g., optimized) and loaded onto the network, or alternatively, the network can be initially a standard network, but is then trained to improve specific recipient results based on outcome oriented reinforcement learning techniques.

[00196] Any disclosure herein of a processor corresponds to a disclosure in an embodiment of a non-processor device or a combined processor-non-processor device where the non-processor is a result of machine learning. Embodiments can include a link from the cloud to a clinic to pass information back and forth, enabling the remote processing noted above and/or enabling the obtaining of additional data for retraining purposes. Information can be uploaded to the cloud to the clinic, where the information can be analyzed. Another exemplary system includes a smart device, such as a smart phone or tablet, etc., that is running a purpose built application to implement some of the teachings detailed herein. This can be used by the clinician, and can contain at least the front end portions of the systems and devices detailed herein, or otherwise provide the interface portal to the back end. Any disclosure herein of a processor corresponds to a disclosure of a non-processing device, or includes non-processing devices, such as a chip or the like that is a result of a machine learning algorithm or machine learning system, etc.

[00197] In an exemplary embodiment, devices herein can be configured to present the windows for the interface that will be used by the user.

[00198] Reference herein is frequently made to the recipient of a hearing prosthesis. It is noted that in at least some exemplary embodiments, the teachings detailed herein can be applicable to a person who is not the recipient of a hearing prosthesis. Accordingly, for purposes of shorthand, at least some exemplary embodiments include embodiments where the disclosures herein directed to a recipient correspond to a disclosure directed towards a person who is not a recipient but instead is only hard of hearing or otherwise has a hearing ailment and is contemplating obtaining a hearing assistance device.

[00199] Any method action and/or functionality disclosed herein where the art enables such corresponds to a disclosure of a code from a machine learning algorithm and/or a code of a machine learning algorithm and/or a product of machine learning for execution of such. Still

as noted above, in an exemplary embodiment, the code need not necessarily be from a machine learning algorithm, and in some embodiments, the code is not from a machine learning algorithm or the like. That is, in some embodiments, the code results from traditional programming. Still, in this regard, the code can correspond to a trained neural network. In an embodiment, the trained neural network can be utilized to provide (or extract therefrom) an algorithm that can be utilized separately from the trainable neural network. In one embodiment, there is a path of training that constitutes a machine learning algorithm starting off untrained, and then the machine learning algorithm is trained and “graduates,” or matures into a usable code – code of trained machine learning algorithm. With respect to another path, the code from a trained machine learning algorithm is the “offspring” of the trained machine learning algorithm (or some variant thereof, or predecessor thereof), which could be considered a mutant offspring or a clone thereof. That is, with respect to this second path, in at least some exemplary embodiments, the features of the machine learning algorithm that enabled the machine learning algorithm to learn may not be utilized in the practice some of the method actions, and thus are not present the ultimate system. Instead, only the resulting product of the learning is used.

[00200] And to be clear, in an exemplary embodiment, there are products of machine learning algorithms (e.g., the code from the trained machine learning algorithm) that are included in any one or more of the systems / subsystems detailed herein, that can be utilized to analyze any of the data obtained or otherwise available disclosed above that can be utilized or otherwise is utilized to evaluate the data obtained herein. This can be embodied in software code and/or in computer chip(s) that are included in the system(s).

[00201] An exemplary system includes an exemplary device / devices that can enable the teachings detailed herein, which in at least some embodiments can utilize automation. That is, an exemplary embodiment includes executing one or more or all of the methods and/or functionalities detailed herein and variations thereof, at least in part, in an automated or semiautomated manner using any of the teachings herein. Conversely, embodiments include devices and/or systems and/or methods where automation is specifically prohibited, either by lack of enablement of an automated feature or the complete absence of such capability in the first instance.

[00202] An exemplary embodiment of the fitting system or processing system includes a computer chip and/or a computer circuit configured to execute a given functionality thereof. The systems can be electronics. In an exemplary embodiment, the processes herein can be

represented by an algorithm where circuitry receives the input (embodied in an analogue or a digital signal), where the input suite converts the “physical” input into electronic signals using analog to digital converters for example, or in the case of the input subsystem corresponding to an Internet server, receives the digital signal from a remote location, and the digital data is stored in a memory and/or received by the electronics. The electronics takes the digital data and “looks” for certain strings of zeros and ones that correspond to a match with signatures / identifiers linked to prestored data regarding performance capabilities. The data linked to the signatures / identifiers is the result.

[00203] It is further noted that any disclosure of a device and/or system detailed herein also corresponds to a disclosure of otherwise providing that device and/or system and/or utilizing that device and/or system. Any functionality disclosed herein corresponds to a corresponding method of executing that functionality in any method herein corresponds to a disclosure of a device and/or system and/or an apparatus that has such functionality or otherwise is configured to have such functionality.

[00204] It is also noted that any disclosure herein of any process of manufacturing or providing a device corresponds to a disclosure of a device and/or system that results therefrom. Is also noted that any disclosure herein of any device and/or system corresponds to a disclosure of a method of producing or otherwise providing or otherwise making such.

[00205] Any function or method action detailed herein corresponds to a disclosure of doing so in an automated or semi-automated manner.

[00206] It is noted that any method detailed herein also corresponds to a disclosure of a device and/or system configured to execute one or more or all of the method actions associated there with detailed herein. In an exemplary embodiment, this device and/or system is configured to execute one or more or all of the method actions in an automated fashion.

[00207] It is further noted that any disclosure of a device and/or system detailed herein also corresponds to a disclosure of otherwise providing that device and/or system. It is also noted that any disclosure herein of any process of manufacturing other providing a device corresponds to a device and/or system that results there from. Is also noted that any disclosure herein of any device and/or system corresponds to a disclosure of a method of producing or otherwise providing or otherwise making such. Any embodiment or any feature disclosed herein can be combined with any one or more or other embodiments and/or other features disclosed herein, unless explicitly indicated and/or unless the art does not enable

such. Any embodiment or any feature disclosed herein can be explicitly excluded from use with any one or more other embodiments and/or other features disclosed herein, unless explicitly indicated that such is combined and/or unless the art does not enable such exclusion.

[00208] While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only, and not limitation. It will be apparent to persons skilled in the relevant art that various changes in form and detail can be made therein without departing from the spirit and scope of the invention.

CLAIMS

What is claimed is:

1. A method, comprising:

inputting data to and/or receiving data from a first electronics device, the inputted data and/or received data being related to one or more temporally changeable aspects of the medical device;

enabling a user of a second electronics device to and/or using the second electronics device to input data related to and/or receive data related to one or more temporally changeable aspects of the medical device, the second electronics device being a separate device from the first electronics device;

initiating the medical device to a human based on data based on data from the first electronics device that was inputted into the first electronics device during the initiation session; and

initiating the medical device based on data based on data from the second electronics device that was inputted into the second electronics device and/or based on data based on data generated as a result of the receiving data related to one or more temporally changeable aspects of the medical device, wherein

the first electronics device and/or a third electronics device that is in signal communication with the first electronics device provides a common medical device initiation session service and is directly in signal communication with the medical device and is in signal communication with the second electronics device, and

the action of initiating the medical device based on data based on data from the second electronics device that was inputted into the second electronics device and/or based on data based on data generated as a result of the receiving data related to one or more temporally changeable aspects of the medical device is executed using the first electronics device and/or the third electronics device.

2. The method of claim 1, further comprising:

prior to the action of inputting data to and/or receiving data from the first electronics device, beginning a medical initiation session of a medical device using the first electronics device.

3. The method of claims 1 or 2, wherein:
the first electronics device is co-located with the medical device.
4. The method of claims 1 or 2, wherein:
the first electronics device is co-located with the medical device; and
the third electronics device is co-located with the medical device.
5. The method of claims 1, 2, 3 or 4, wherein:
the initiation session is a fitting session.
6. The method of claim 5, wherein:
the actions of fitting with the first device and the second device are executed during a
single uninterrupted fitting session.
7. The method of claim 6, wherein:
the method includes the action of enabling the second electronics device; and
the action of enabling the second electronics device hands over control of the fitting
session to the user of the second electronics device.
8. The method of claim 6, further comprising:
taking back control, using the first device, from the second device.
9. The method of claims 1, 2, 3, 4, 5, 6, 7 or 8, wherein:
a person using the first electronics device transitions to using the second electronics
device after enabling the second electronics device.
10. The method of claims 1, 2, 3, 4, 5, 6, 7, 8 or 9, further comprising:
enabling a user of a fourth electronics device and/or using a fourth electronics device
to enter the initiation session, the fourth electronics device being a separate device from the
first electronics device and the second electronics device, the fourth electronics device being
located at least 100 feet from the first and third electronics device.
11. A fitting system, comprising:

a communications subsystem including at least one of (i) a first input subsystem and a first output subsystem or (ii) a first input/output subsystem; and

a processing subsystem, wherein

the communications subsystem is configured to enable a first user of the fitting system to enter data via the first input subsystem and/or the first input/output subsystem while physically present in a same location as a physical output of the first output subsystem and/or first input/output subsystem, and

least one of:

the communications subsystem is configured to enable a second user to enter and/or be entered into a fitting session in which the fitting system is being used, wherein the second user is at a location away from the same location; or

the system includes a second input subsystem and/or a second input/output subsystem, and wherein the system is configured to enable the first user to transition from using the first input subsystem and/or the first input/output subsystem to using the second input subsystem and/or the second input/output subsystem.

12. The fitting system of claim 11, wherein:

the communications subsystem is configured to enable the second user to enter and/or be entered into the fitting session in which the fitting system is being used, wherein the second user is at the location away from the same location.

13. The fitting system of claims 11 or 12, wherein:

the communications subsystem is configured to enable the second user to enter into the fitting session in which the fitting system is being used, wherein the second user is at the location away from the same location, the entering of the second user being under the total control of the second user.

14. The fitting system of claims 11, 12, or 13, wherein:

the communications subsystem is configured to enable the second user to be entered into the fitting session in which the fitting system is being used, wherein the second user is at the location away from the same location, the first user being able to bar the entrance of the second user.

15. The fitting system of claims 11, 12, 13 or 14, wherein:
the system includes the second input subsystem and/or the second input/output subsystem, and wherein the system is configured to enable the first user to transition from using the first input subsystem and/or the first input/output subsystem to using the second input subsystem and/or the second input/output subsystem.
16. The fitting system of claim 15, wherein:
the second input subsystem and/or the second input/output subsystem is part of a mobile device mobile from a device of which the first input subsystem and/or the first input/output subsystem is a part.
17. The fitting system of claims 11, 12, 13, 14, 15, or 16, wherein:
the fitting system requires the first user to be present at the same location in order for the fitting system to begin operation.
18. The fitting system of claim 15, wherein:
the communications subsystem includes a second output subsystem and/or the second input/output subsystem, the second output subsystem and/or the second input/output subsystem being configured to communicate with the prosthesis that is being fitted by the fitting system;
the first output subsystem and/or the first input/output subsystem is configured to communicate with the prosthesis that is being fitted by the fitting system; and
the communications subsystem is configured to enable the prosthesis to be moved from the same location to another location away from the same location while remaining in communication with the fitting system by the first output subsystem and/or first input/output subsystem and/or the second output subsystem and/or the second input/output subsystem.
19. The fitting system of claim 15, wherein:
the first output subsystem and/or the first input/output subsystem is configured to communicate with the prosthesis that is being fitted by the fitting system; and
the communications subsystem is configured to enable the prosthesis to be moved from the same location to another location away from the same location while remaining in

communication with the fitting system by the first output subsystem and/or first input/output subsystem.

20. The fitting system of claims 11, 12, 13, 14, 15, 16, 17, 18 or 19, wherein:

the communications subsystem is configured to enable a second user to enter and/or be entered into a fitting session in which the fitting system is being used, wherein the second user is at a location away from the same location; and

the system includes a second input subsystem and/or a second input/output subsystem, and wherein the system is configured to enable the first user to transition from using the first input subsystem and/or the first input/output subsystem to using the second input subsystem and/or the second input/output subsystem.

21. A method, comprising:

entering, via a telecommunications link, into an ongoing fitting session;
obtaining information relating to the fitting session after the action of entering;
evaluating the information; and

based on the evaluation, over the telecommunications link, providing second information to a participant in the fitting session and/or making an adjustment, over the telecommunications link to a medical device that is a subject of the fitting session and/or creating or adding or modifying in whole or in part to a data set to be used by the medical device based on the evaluation that is a subject of the fitting session and/or bringing in another party into the ongoing fitting session.

22. The method of claim 21, wherein:

the ongoing fitting session is a fitting session of the medical device to a person;
the information obtained is a current set of settings for the medical device which are or will be stored in the medical device; and

the second information is a ratification of the settings and/or an indication that the settings should be changed and/or the adjustment is an adjustment to the settings.

23. The method of claims 21 or 22, wherein:

the ongoing fitting session is taking place with a healthcare professional and a recipient of the medical device at one location; and

the actor providing the second information is located at another location at least 200 feet from the one location.

24. The method of claims 21, 22 or 23, further comprising:

receiving an invitation to enter the ongoing fitting session prior to the action of entering.

25. The method of claims 21, 22, 23 or 24, wherein:

the ongoing fitting session is a fitting session of the medical device to a person; a healthcare professional working to fit the medical device to the person has declared to the actor evaluating the information that he/she is having difficulty optimizing one or more settings of the medical device to the person; and

the actor evaluating the information takes over the fitting session by the telecommunications link.

26. The method of claims 21, 22, 23 or 24, wherein:

the ongoing fitting session is a fitting session of the medical device to a person, wherein a healthcare professional working to fit the medical device to the person is remote from the actor evaluating the information;

the actor evaluating the information takes over the fitting session by the telecommunications link from the healthcare professional; and

the healthcare professional cannot take back control of the fitting session unless the actor evaluating the information permits such.

27. The method of claims 21, 22, 23 or 24, wherein:

the ongoing fitting session is a fitting session of the medical device to a person, wherein a healthcare professional working to fit the medical device to the person is remote from the actor evaluating the information;

the actor evaluating the information enters the ongoing fitting session without being invited by the healthcare professional.

28. The method of claims 21, 22, 23 or 24, wherein:

the ongoing fitting session is a fitting session of the medical device to a person, wherein a healthcare professional working to fit the medical device to the person is remote from the actor evaluating the information;

the actor evaluating the information takes over the fitting session by the telecommunications link from the healthcare professional; and

the healthcare professional can take back control of the fitting session without the permission of the actor evaluating the information.

29. The method of claims 21, 22, 23 or 24, wherein:

the fitting session is a fitting session where a hearing prosthesis is fitted to a person; and

the method includes making the adjustment to the medical device, wherein the medical device is the hearing prosthesis.

30. The method of claims 21, 22, 23, 24, 25, 26, 27, 28 or 29, wherein:

the ongoing fitting session is taking place with a healthcare professional and a recipient of the medical device at one location; and

the actor providing the second information is located at another location less than 50 feet from the one location.

31. A non-transitory computer-readable media having recorded thereon, a computer program for executing at least a portion of a medical device fitting method, the computer program including:

code for receiving input from a first participant through a first portal;

code for receiving input and/or providing output to a second participant through a second portal separate from the first portal;

code for fitting the medical device based on input from at least the first participant;

and

code for controlling at least one of:

input received from the first participant;

input received from the second participant;

output provided to the second participant.

32. The media of claim 31, wherein:

the media allows a plurality of participants, including the first participant and the second participant to move in and out of a fitting session fitting the medical device without requiring a disconnect of the medical device from the session and without requiring a new session.

33. The media of claims 31 or 32, wherein:

the media allows the second participant to move in and out of a fitting session fitting the medical device without requiring saving and/or ending of the session and restoring the session when the second participant joins the session and/or leaves the session.

34. The media of claims 31, 32 or 33, wherein:

the media includes code for allowing the first participant to control the input received from the second participant and/or output provided to the second participant.

35. The media of claims 31, 32, 33 or 34, wherein:

the media includes code for allowing the second participant to control the input received from the first participant; and

the code for receiving input from the first participant through the first portal is located in a device co-located with the medical device.

36. The media of claims 31, 32, 33, 34 or 35, wherein the media comprises:

code for receiving input from the second participant; and

code for fitting the medical device based on input from the second participant.

37. The media of claims 31, 32, 33, 34, 35 or 36, wherein the media comprises:

code for limiting control of adjustments to the medical device during the fitting session to only one participant at a time.

38. A fitting system, comprising:

a first keyboard / computer monitor / CPU unit assembly; and

a computer processor;

the first assembly is configured to enable a first user of the fitting system to enter data via the first assembly while physically present in a same location as the first assembly, and

least one of:

the first assembly is configured to enable a second user to enter and/or be entered into a fitting session in which the fitting system is being used, wherein the second user is at a location away from the same location; or

the system includes a second keyboard / computer monitor / CPU unit assembly, and wherein the system is configured to enable the first user to transition from using the first assembly to the second assembly.

39. A system, method and/or A non-transitory computer-readable media, wherein one or more of:

the method includes inputting data to and/or receiving data from a first electronics device, the inputted data and/or received data being related to one or more temporally changeable aspects of the medical device;

the method includes enabling a user of a second electronics device to and/or using the second electronics device to input data related to and/or receive data related to one or more temporally changeable aspects of the medical device, the second electronics device being a separate device from the first electronics device;

the method includes initiating the medical device to a human based on data based on data from the first electronics device that was inputted into the first electronics device during the initiation session;

the method includes initiating the medical device based on data based on data from the second electronics device that was inputted into the second electronics device and/or based on data based on data generated as a result of the receiving data related to one or more temporally changeable aspects of the medical device;

the first electronics device and/or a third electronics device that is in signal communication with the first electronics device provides a common medical device initiation session service and is directly in signal communication with the medical device and is in signal communication with the second electronics device;

the action of initiating the medical device based on data based on data from the second electronics device that was inputted into the second electronics device and/or based on data based on data generated as a result of the receiving data related to one or more temporally changeable aspects of the medical device is executed using the first electronics device and/or the third electronics device;

the method includes prior to the action of inputting data to and/or receiving data from the first electronics device, beginning a medical initiation session of a medical device using the first electronics device;

the first electronics device is co-located with the medical device;

the first electronics device is co-located with the medical device;

the third electronics device is co-located with the medical device;

the initiation session is a fitting session;

the actions of fitting with the first device and the second device are executed during a single uninterrupted fitting session;

the method includes the action of enabling the second electronics device;

the action of enabling the second electronics device hands over control of the fitting session to the user of the second electronics device;

the method includes taking back control, using the first device, from the second device;

a person using the first electronics device transitions to using the second electronics device after enabling the second electronics device;

the method includes enabling a user of a fourth electronics device and/or using a fourth electronics device to enter the initiation session, the fourth electronics device being a separate device from the first electronics device and the second electronics device, the fourth electronics device being located at least 100 feet from the first and third electronics device;

the system includes a communications subsystem including at least one of (i) a first input subsystem and a first output subsystem or (ii) a first input/output subsystem;

the system includes communications subsystem is configured to enable a first user of the fitting system to enter data via the first input subsystem and/or the first input/output subsystem while physically present in a same location as a physical output of the first output subsystem and/or first input/output subsystem;

the communications subsystem is configured to enable a second user to enter and/or be entered into a fitting session in which the fitting system is being used, wherein the second user is at a location away from the same location;

the system includes a second input subsystem and/or a second input/output subsystem, and wherein the system is configured to enable the first user to transition from using the first input subsystem and/or the first input/output subsystem to using the second input subsystem and/or the second input/output subsystem;

the communications subsystem is configured to enable the second user to enter and/or be entered into the fitting session in which the fitting system is being used, wherein the second user is at the location away from the same location;

the communications subsystem is configured to enable the second user to enter into the fitting session in which the fitting system is being used, wherein the second user is at the location away from the same location, the entering of the second user being under the total control of the second user;

the communications subsystem is configured to enable the second user to be entered into the fitting session in which the fitting system is being used, wherein the second user is at the location away from the same location, the first user being able to bar the entrance of the second user;

the system includes the second input subsystem and/or the second input/output subsystem, and wherein the system is configured to enable the first user to transition from using the first input subsystem and/or the first input/output subsystem to using the second input subsystem and/or the second input/output subsystem;

the second input subsystem and/or the second input/output subsystem is part of a mobile device mobile from a device of which the first input subsystem and/or the first input/output subsystem is a part;

the fitting system requires the first user to be present at the same location in order for the fitting system to begin operation;

the communications subsystem includes a second output subsystem and/or the second input/output subsystem, the second output subsystem and/or the second input/output subsystem being configured to communicate with the prosthesis that is being fitted by the fitting system;

the first output subsystem and/or the first input/output subsystem is configured to communicate with the prosthesis that is being fitted by the fitting system;

the communications subsystem is configured to enable the prosthesis to be moved from the same location to another location away from the same location while remaining in communication with the fitting system by the first output subsystem and/or first input/output subsystem and/or the second output subsystem and/or the second input/output subsystem;

the first output subsystem and/or the first input/output subsystem is configured to communicate with the prosthesis that is being fitted by the fitting system;

the communications subsystem is configured to enable the prosthesis to be moved from the same location to another location away from the same location while remaining in

communication with the fitting system by the first output subsystem and/or first input/output subsystem;

the communications subsystem is configured to enable a second user to enter and/or be entered into a fitting session in which the fitting system is being used, wherein the second user is at a location away from the same location;

the system includes a second input subsystem and/or a second input/output subsystem, and wherein the system is configured to enable the first user to transition from using the first input subsystem and/or the first input/output subsystem to using the second input subsystem and/or the second input/output subsystem;

the method includes entering, via a telecommunications link, into an ongoing fitting session;

obtaining information relating to the fitting session after the action of entering;

the method includes evaluating the information;

the method includes on the evaluation, over the telecommunications link, providing second information to a participant in the fitting session and/or making an adjustment, over the telecommunications link to a medical device that is a subject of the fitting session and/or creating or adding or modifying in whole or in part to a data set to be used by the medical device based on the evaluation that is a subject of the fitting session and/or bringing in another party into the ongoing fitting session;

the ongoing fitting session is a fitting session of the medical device to a person;

the information obtained is a current set of settings for the medical device which are or will be stored in the medical device;

the second information is a ratification of the settings and/or an indication that the settings should be changed and/or the adjustment is an adjustment to the settings;

the ongoing fitting session is taking place with a healthcare professional and a recipient of the medical device at one location;

the actor providing the second information is located at another location at least 200 feet from the one location;

receiving an invitation to enter the ongoing fitting session prior to the action of entering;

the ongoing fitting session is a fitting session of the medical device to a person;

a healthcare professional working to fit the medical device to the person has declared to the actor evaluating the information that he/she is having difficulty optimizing one or more settings of the medical device to the person;

the actor evaluating the information takes over the fitting session by the telecommunications link;

the ongoing fitting session is a fitting session of the medical device to a person, wherein a healthcare professional working to fit the medical device to the person is remote from the actor evaluating the information;

the actor evaluating the information takes over the fitting session by the telecommunications link from the healthcare professional;

the healthcare professional cannot take back control of the fitting session unless the actor evaluating the information permits such;

the ongoing fitting session is a fitting session of the medical device to a person, wherein a healthcare professional working to fit the medical device to the person is remote from the actor evaluating the information;

the actor evaluating the information enters the ongoing fitting session without being invited by the healthcare professional;

the ongoing fitting session is a fitting session of the medical device to a person, wherein a healthcare professional working to fit the medical device to the person is remote from the actor evaluating the information;

the actor evaluating the information takes over the fitting session by the telecommunications link from the healthcare professional;

the healthcare professional can take back control of the fitting session without the permission of the actor evaluating the information;

the fitting session is a fitting session where a hearing prosthesis is fitted to a person; and

the method includes making the adjustment to the medical device, wherein the medical device is the hearing prosthesis;

the ongoing fitting session is taking place with a healthcare professional and a recipient of the medical device at one location;

the actor providing the second information is located at another location less than 50 feet from the one location;

the media includes code for receiving input from a first participant through a first portal;

the media includes code for receiving input and/or providing output to a second participant through a second portal separate from the first portal;

the media includes code for fitting the medical device based on input from at least the first participant;

the media includes for controlling at least one of:

input received from the first participant;

input received from the second participant;

output provided to the second participant;

the media allows a plurality of participants, including the first participant and the second participant to move in and out of a fitting session fitting the medical device without requiring a disconnect of the medical device from the session and without requiring a new session;

the media allows the second participant to move in and out of a fitting session fitting the medical device without requiring saving and/or ending of the session and restoring the session when the second participant joins the session and/or leaves the session;

the media includes code for allowing the first participant to control the input received from the second participant and/or output provided to the second participant;

the media includes code for allowing the second participant to control the input received from the first participant;

the code for receiving input from the first participant through the first portal is located in a device co-located with the medical device;

the media includes code for receiving input from the second participant;

the media includes code for fitting the medical device based on input from the second participant;

the media includes code for limiting control of adjustments to the medical device during the fitting session to only one participant at a time;

a device, system and/or method that allows for that is a multi-user interactive participation in a single fitting session;

a device, system and/or method that allows participants to move in and out of a fitting session, without requiring a disconnect from the current session and connecting to a new session;

a device, system and/or method that is not remote care;

the method includes assisting newly trained staff;

the method includes a hearing aid/acoustic specialist moving into cochlear implant fitting, or *vice versa* without breaking or interrupting the fitting session;

the method is executed during a surgery;

the system is a robotic medical device insertion system;
 the method is a medical initiation session;
 the method is for developing an initial map of a hearing device;
 the method is for modifying an existing map of a hearing device;
 the method actions are executed under a single authority;
 the system is an integrated system;
 the entire system is present in a single building;
 the entire system is present in a single floor of a building;
 the recipient is located remotely from all other parties;
 all entities in the method are located remotely from each other;
 the method is executed during a surgery of implanting and/or adjusting the medical device, and one of the users entering into the method is located remote from the surgical location;
 the method actions are executed using a traditional fitting system;
 one of the users is an audiologist at a clinic;
 one of the users is an expert at a cochlear implant manufacturing company;
 all method actions are executed as part of the same fitting effort;
 one of the users adjusts some of the threshold and/or comfort levels and another of the users adjusts others of the threshold and/or comfort levels;
 the system and code are part of a common medical device initiation session service;
 only one of the electronics devices are a full fledged fitting system;
 the system and code are part of a common hearing prosthesis session service;
 the common medical device initiation service is kept in a single process;
 the session and the connections are established using clinician fitting software;
 all users have different levels of access and different abilities from one another;
 only one user can initiate a session, after which one or more other users can join, but only after the one user initiates the session;
 the method is not a remote fitting method;
 the method includes automatically contacting a user;
 the first electronics device and/or the third electronics device and/or the second electronics device is located less than, greater than and/or about equal to 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000, 1250, 1500, 1750, 2000, 2500, 3000, 3500, 4000, or 5000 feet or any value or range of values therebetween in 1 foot increments from the medical device;

the first electronics device and/or the third electronics device and/or the second electronics device is located less than, greater than and/or about equal to 2, 3, 4, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000, 1250, 1500, 1750, 2000, 2500, or 3000 miles or any value or range of values therebetween in 1 mile increments from the medical device;

the first electronics device and/or the third electronics device and/or the second electronics device is located less than, greater than and/or about equal to 1, 3, 5, 8, 10, 13, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000, 1250, 1500, 1750 or 2000 meters or any value or range of values therebetween in 1 meter increments from the medical device;

the first electronics device and/or the third electronics device and/or the second electronics device is located less than, greater than and/or about equal to 3, 4, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000, 1250, 1500, 1750, 2000, 2500, 3000, 3500, or 4000 kilometers or any value or range of values therebetween in 1 kilometer increments from the medical device;

the actual fitting system is located remotely from all the parties, and/or is located at a server at a single remote location; which server could be a third electronics device, where the first electronics device and the second electronics device access the third electronics device via the Internet or via a telephone link, or some other communication system;

all fitting software is located remotely from the recipient and/or at least one of the users;

any one or more or all of the method actions of method 700 are executed within 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 120, 150, 180, or 250 minutes, or any value or range of values therebetween in one minute increments of each other;

the session is an ongoing fitting session of the medical device to a person and a healthcare professional working to fit the medical device to the person has declared to the actor evaluating the information that he/she is having difficulty optimizing one or more settings of the medical device to the person;

the actor evaluating the information takes over the fitting session by the telecommunications link;

actor becomes the audiologist fitting the hearing prosthesis for example, and otherwise replaces, if only temporarily, the audiologist who is working to fit the prosthesis prior to the action of taking over;

the healthcare professional cannot take back control from the actor;

a hearing device manufacturer personnel joins the session, and use software specifically designed to support troublesome fitting sessions, which software is not part of the system and/or would not be accessible outside of the manufacturer;

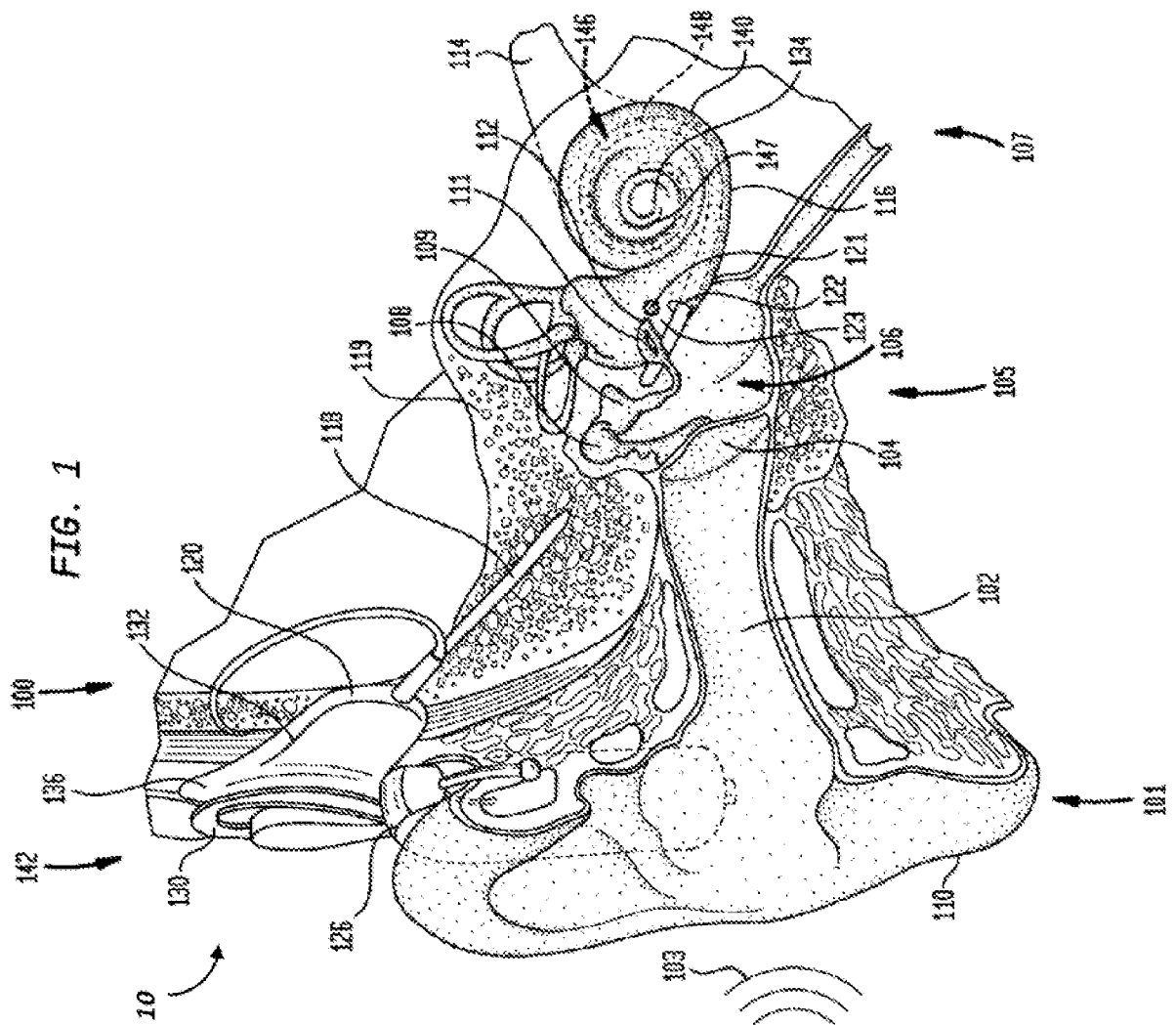
software is software that is specialized to find issues with the implant or sound processor and/or could be software that analyses the map settings and/or or pre-settings that are being used for the fitting session to find issues that could result in a sub optimal fitting;

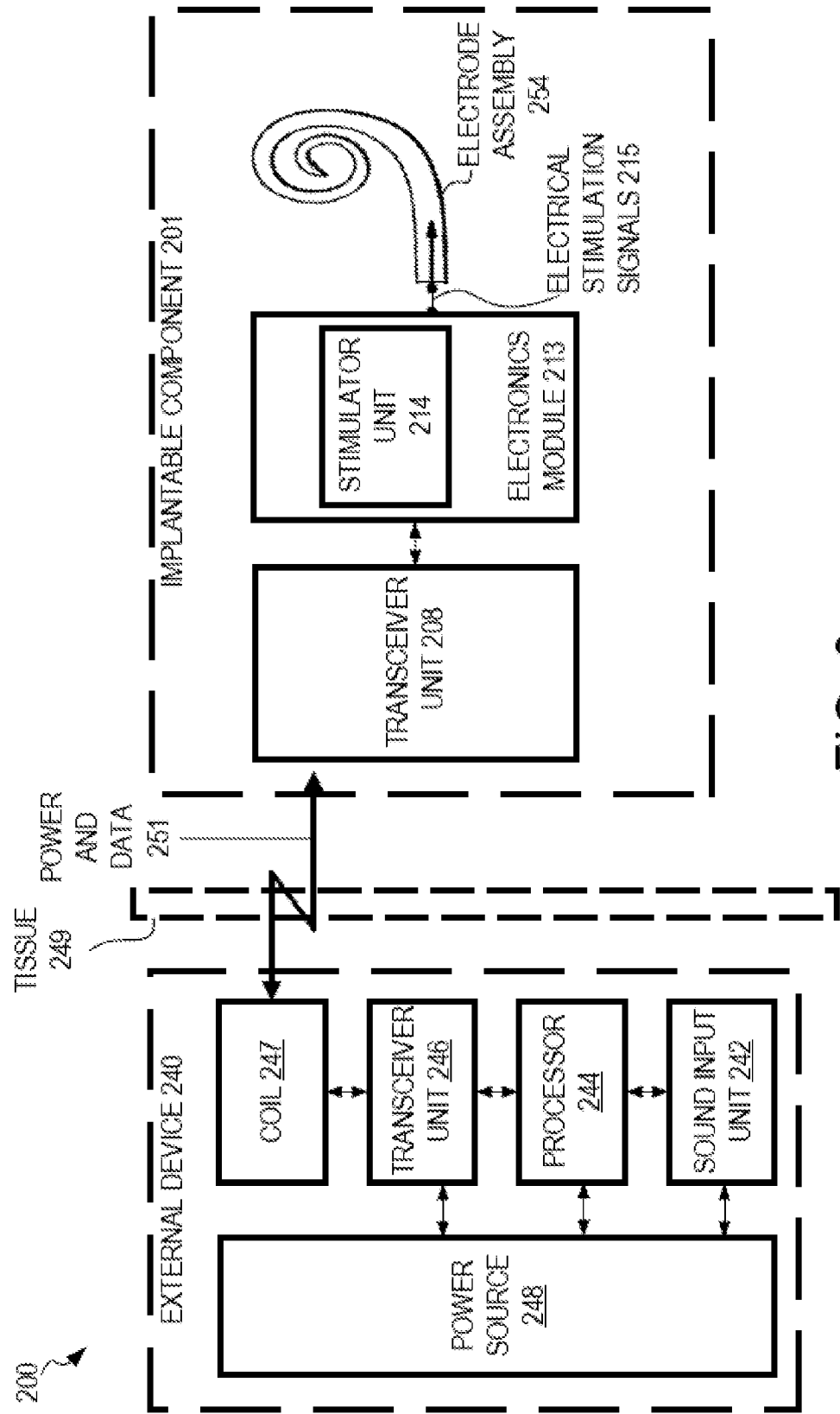
the software is troubleshooting software;

the software is limited to trained experts more highly trained than the audiologist;

the system is a compilation of separate devices that are in signal communication with each other; or

the system is a compilation of separate devices that are in signal communication with each other only via the internet.





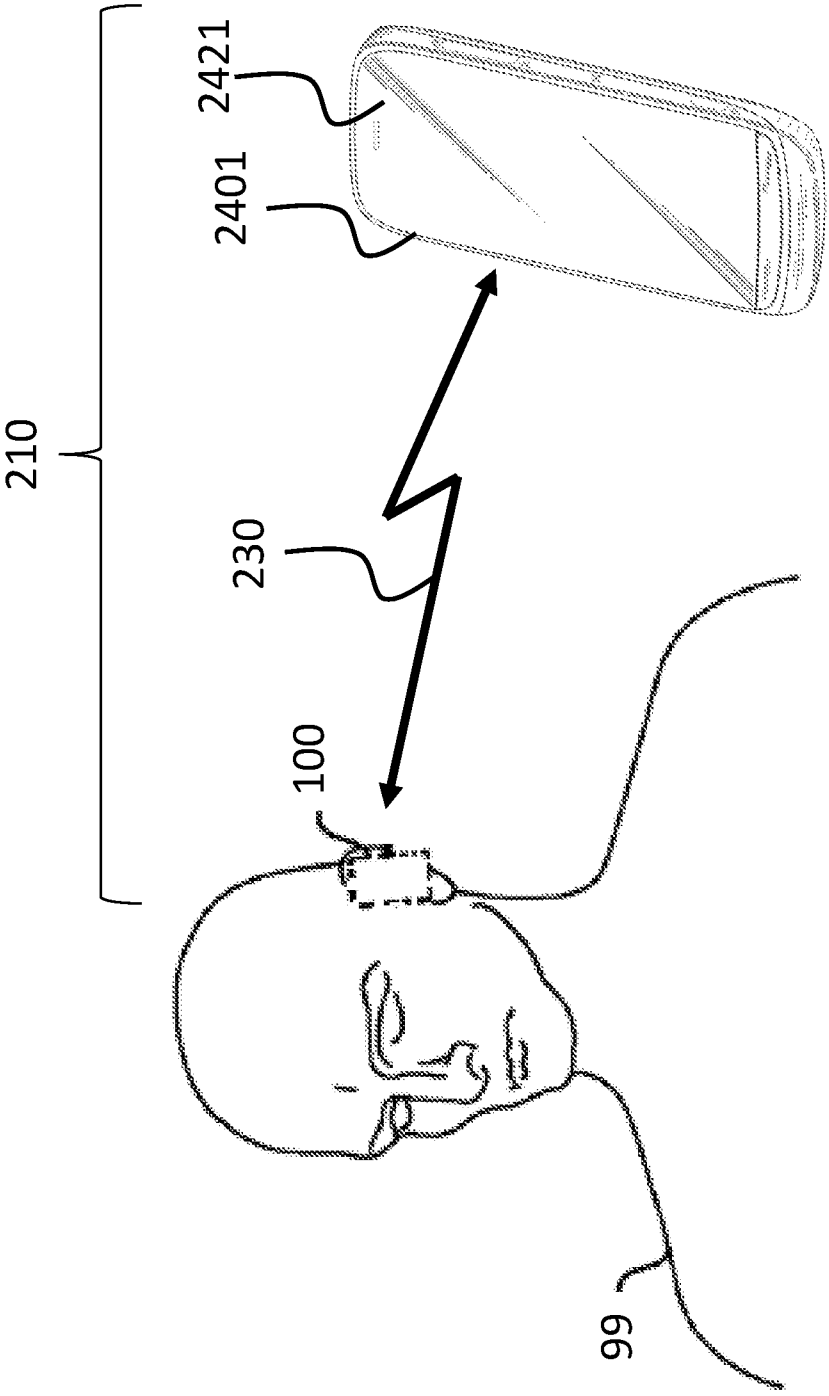


FIG. 3A

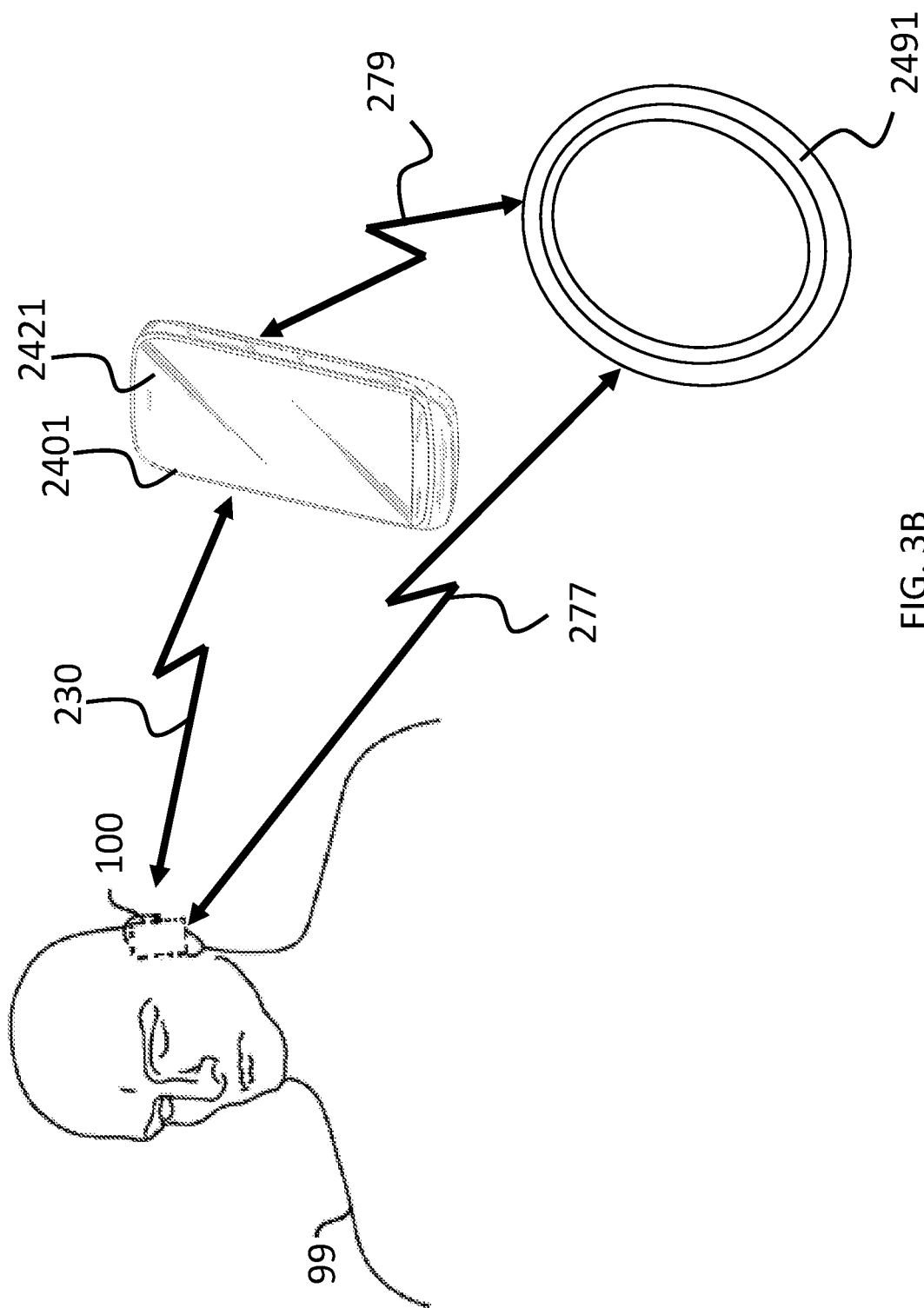


FIG. 3B

FIG. 3C

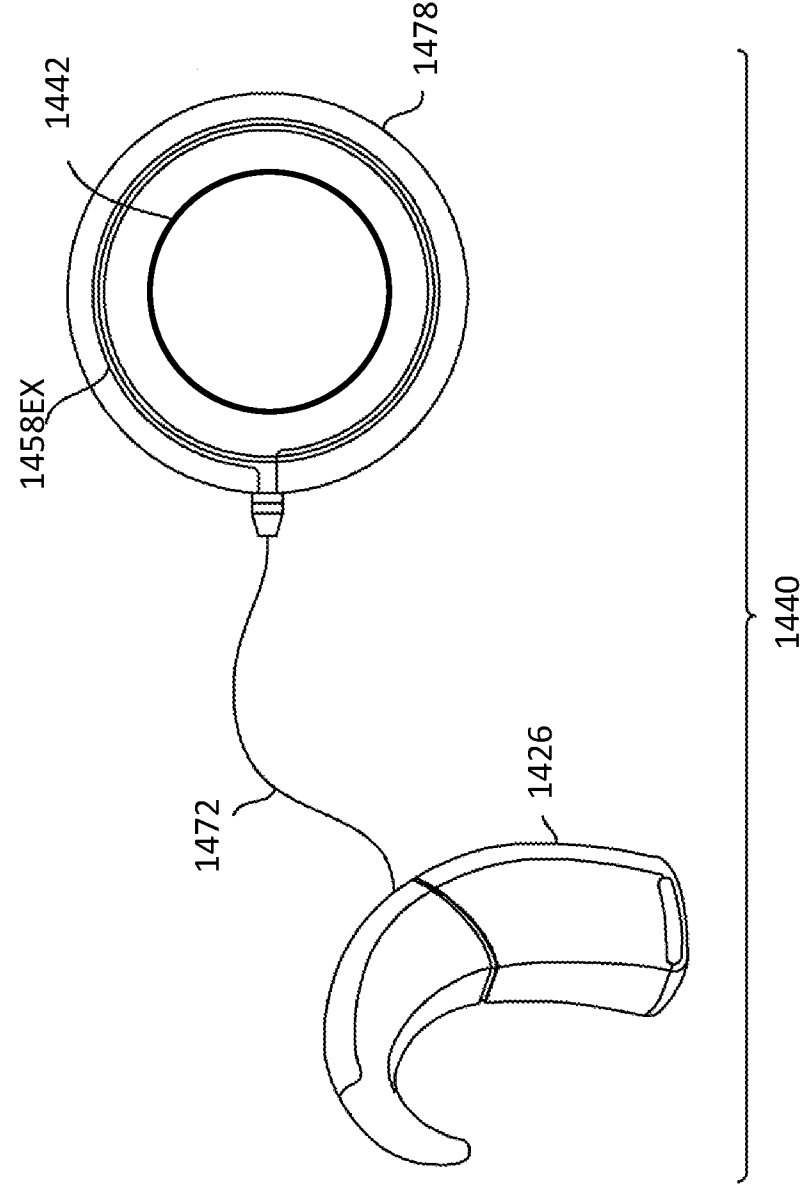


FIG. 3D

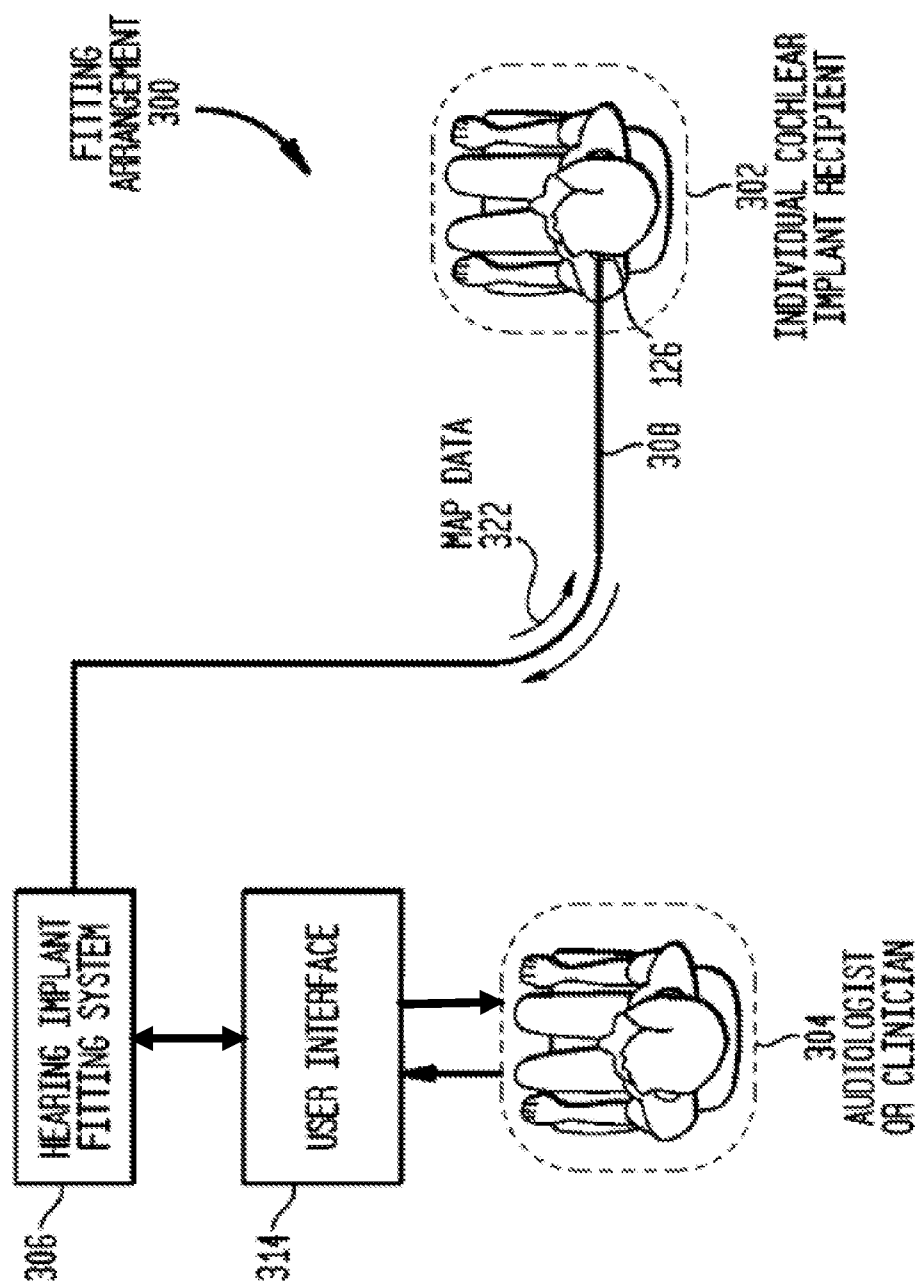


FIG. 4

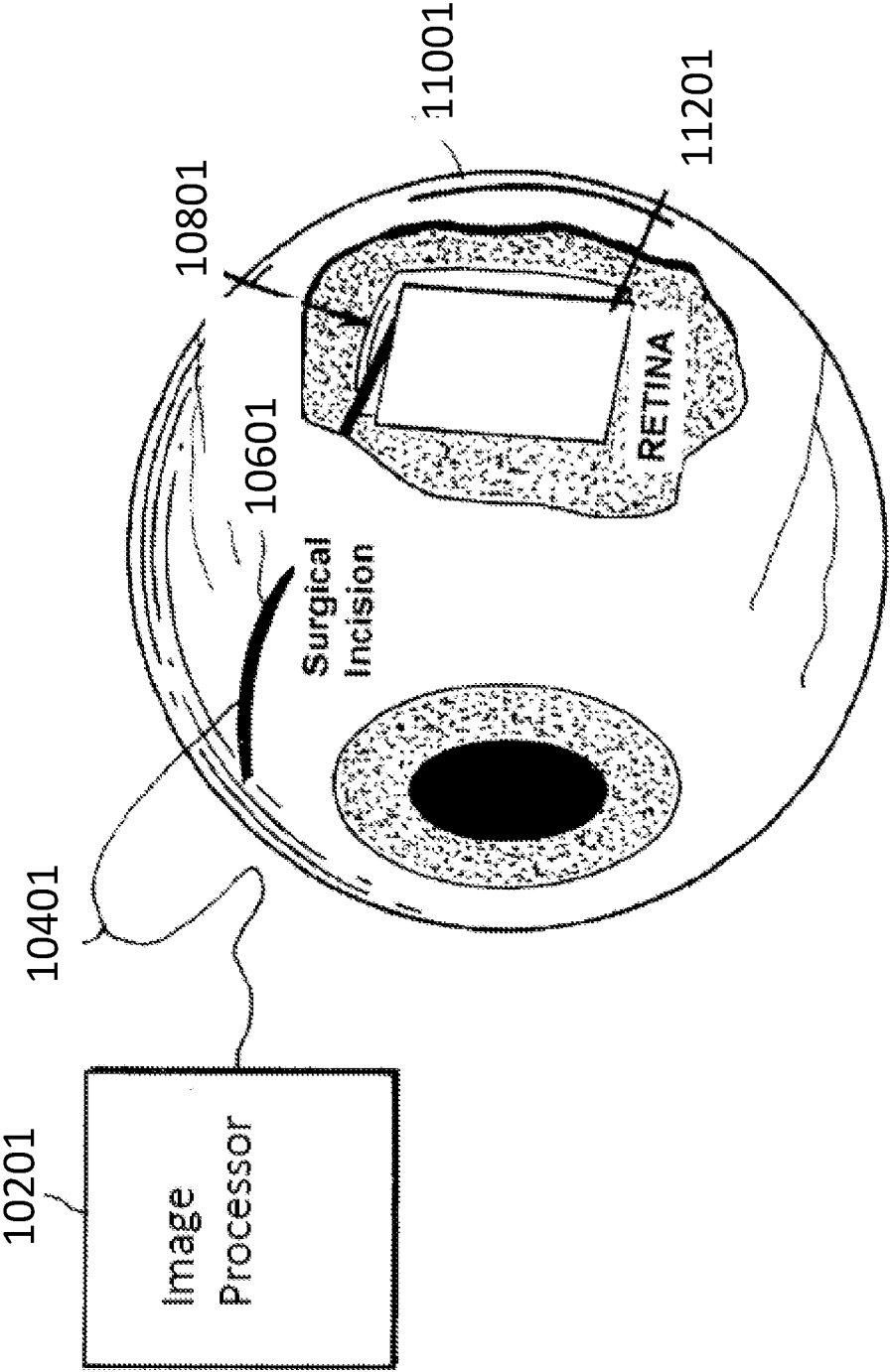
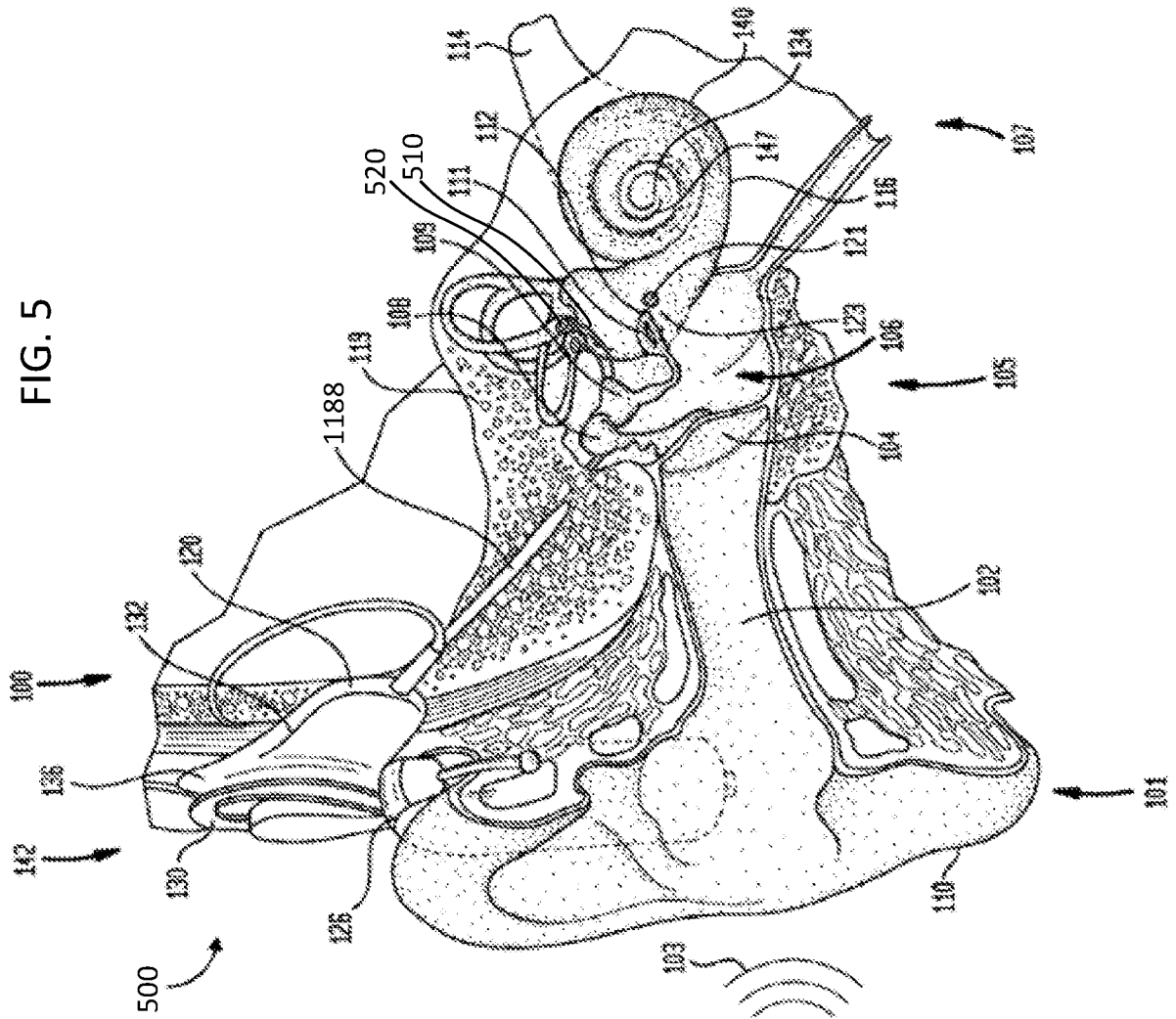


FIG. 5



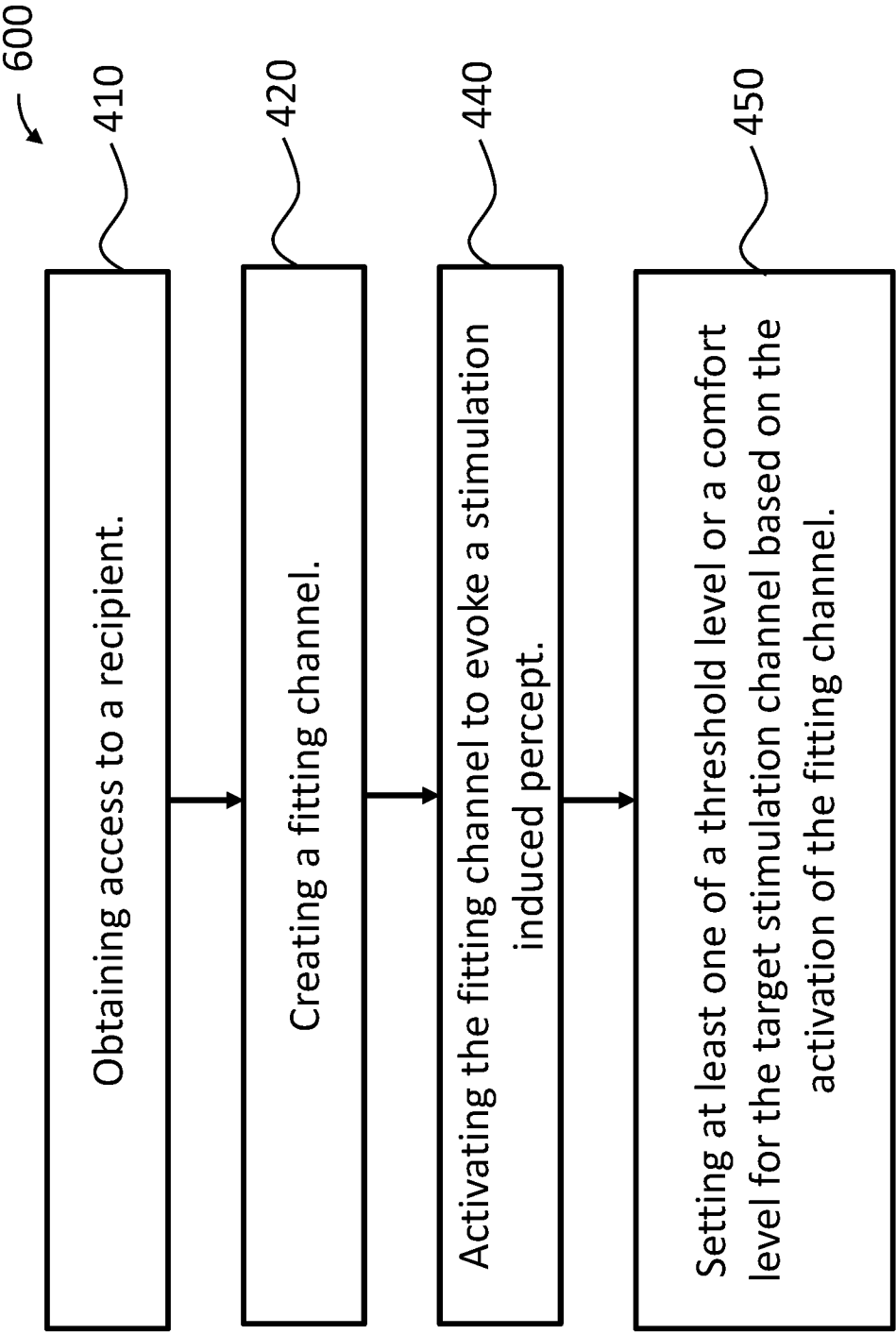
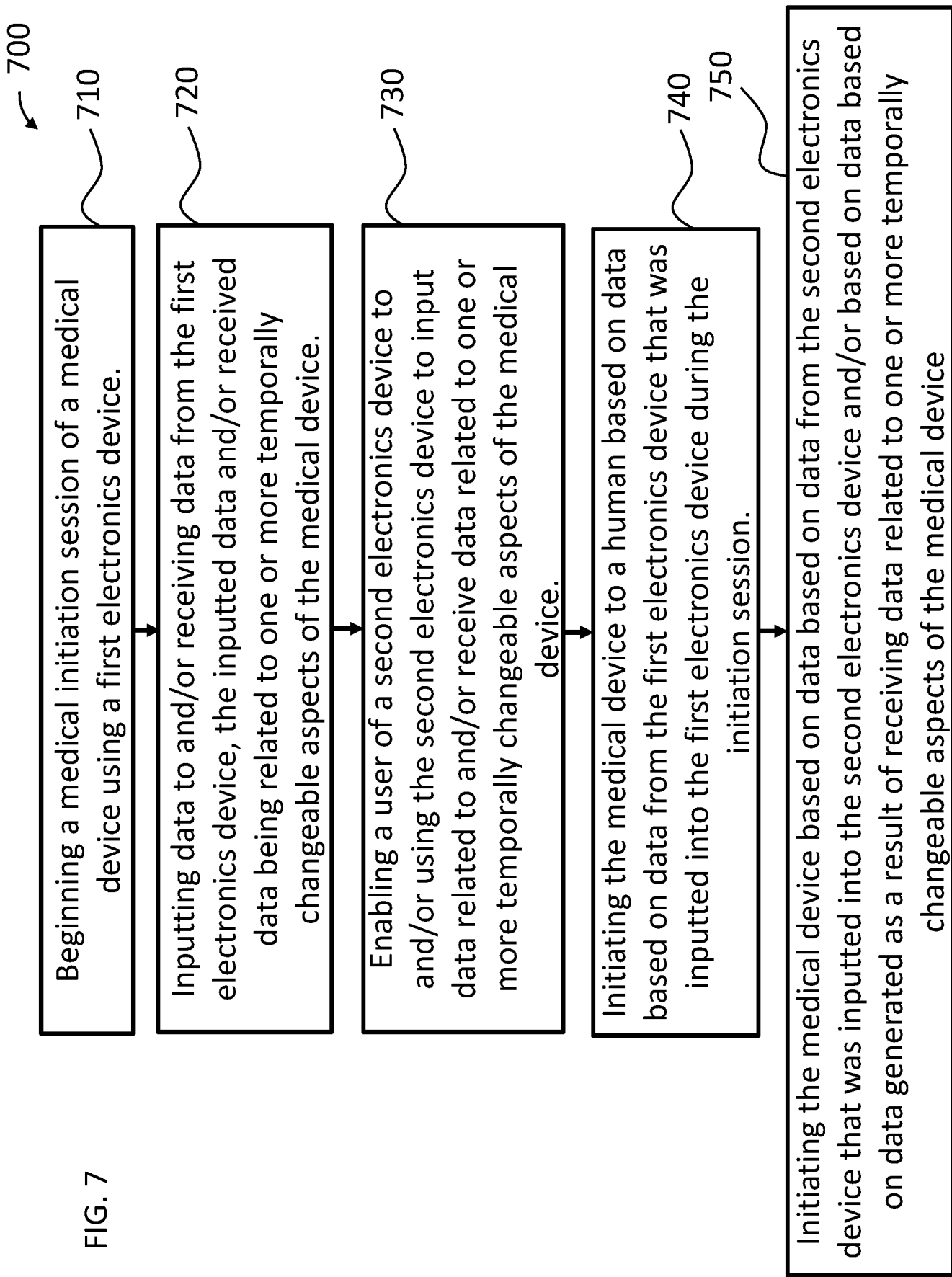


FIG. 7



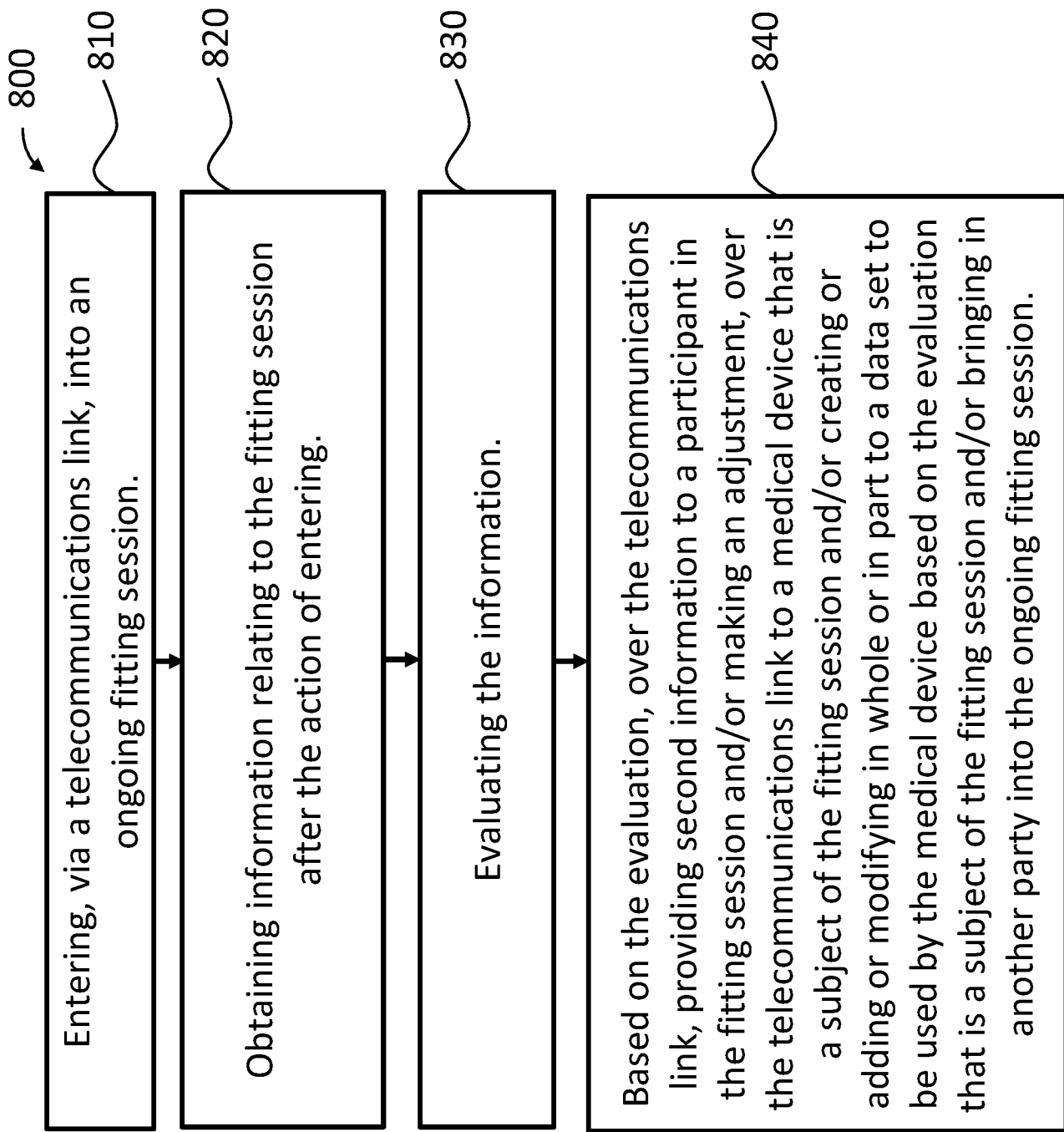


FIG. 9

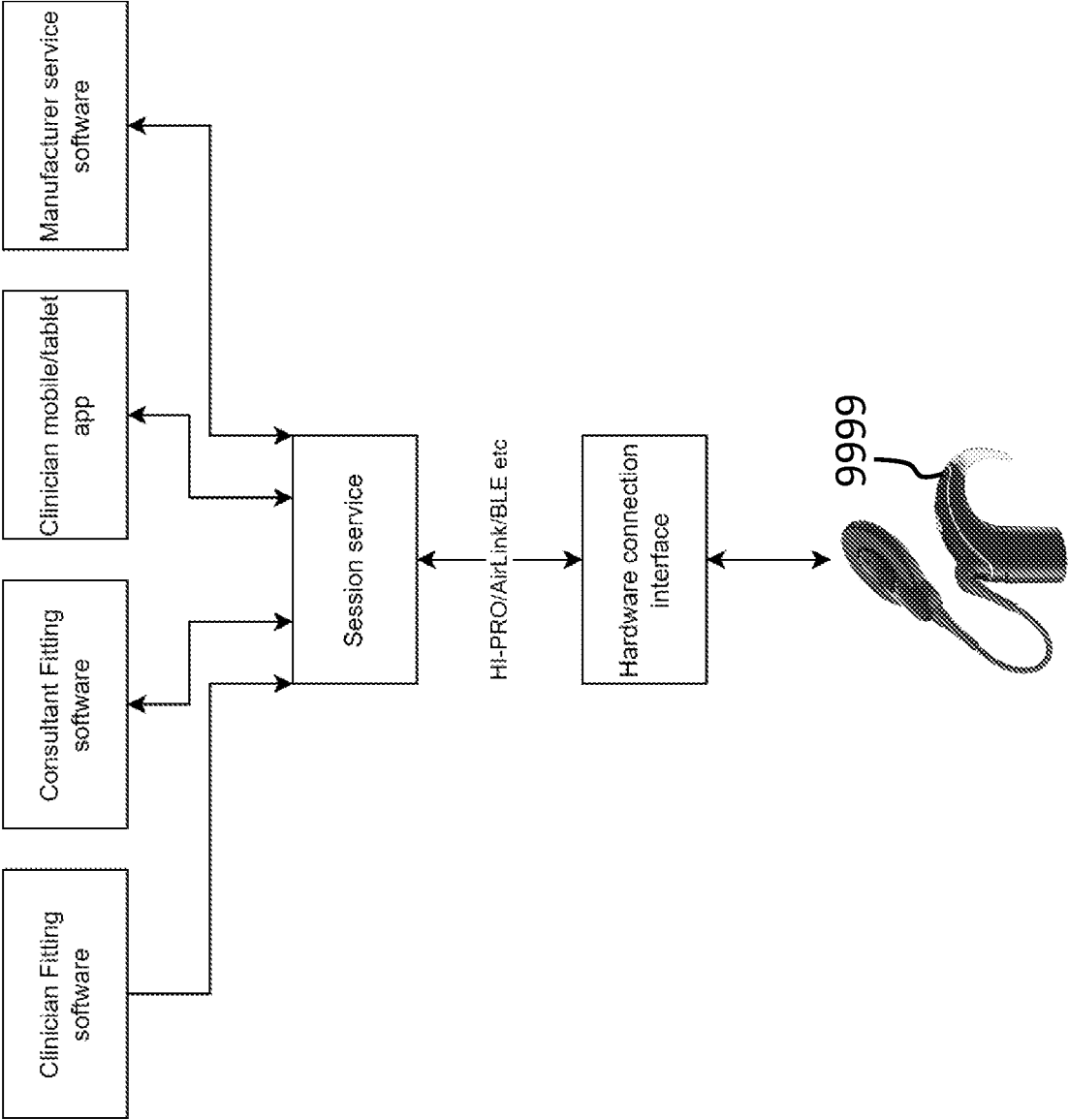
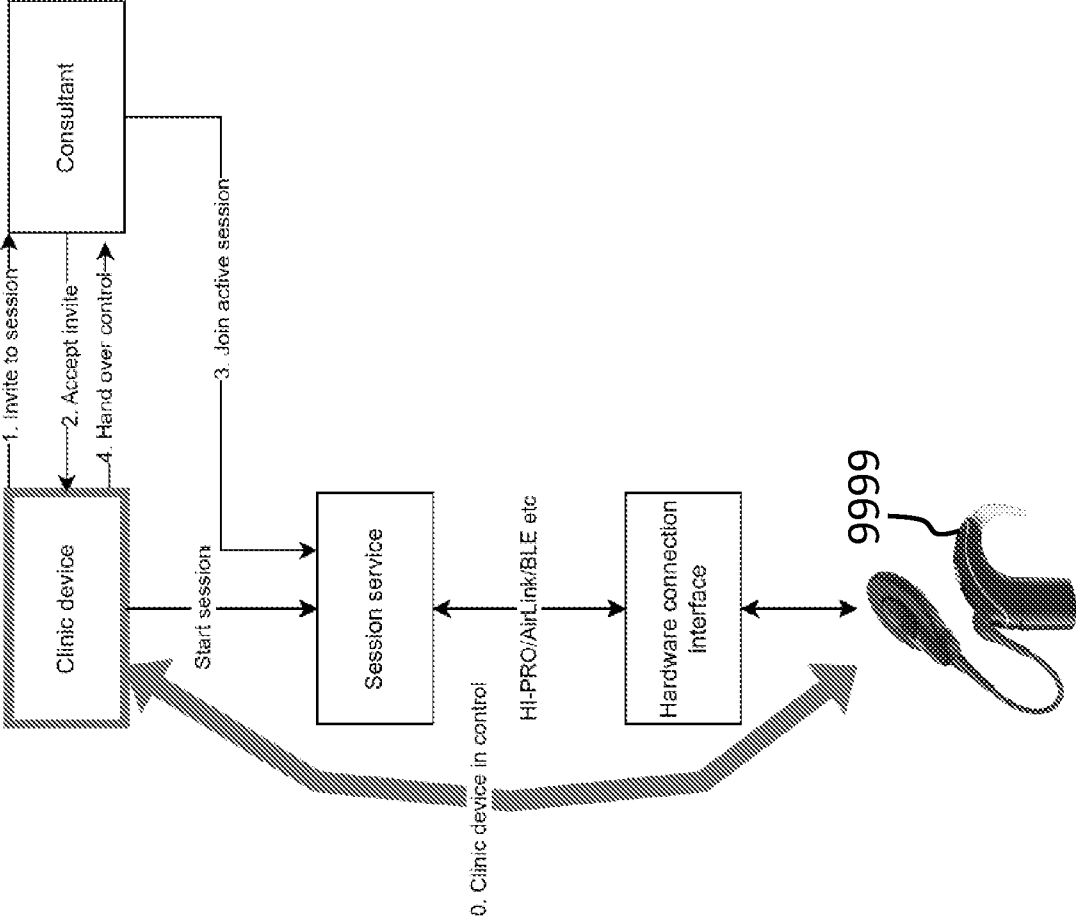


FIG. 10



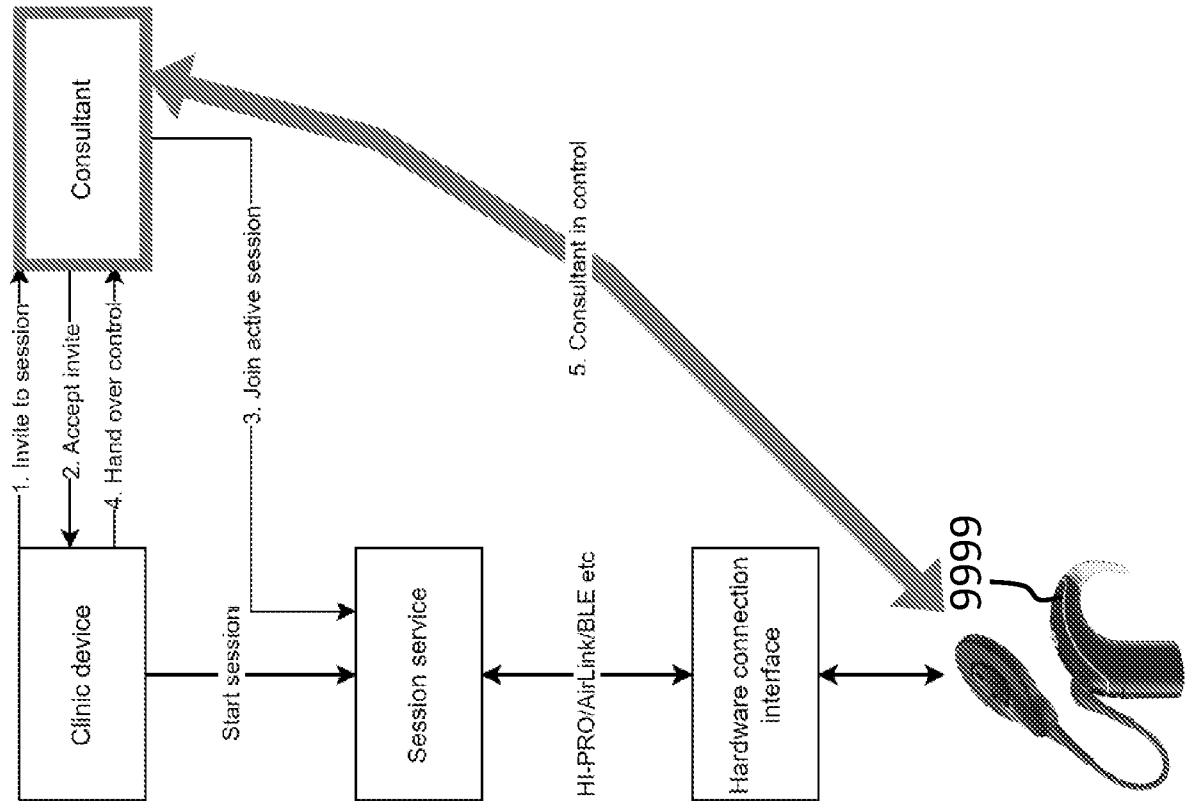


FIG. 11

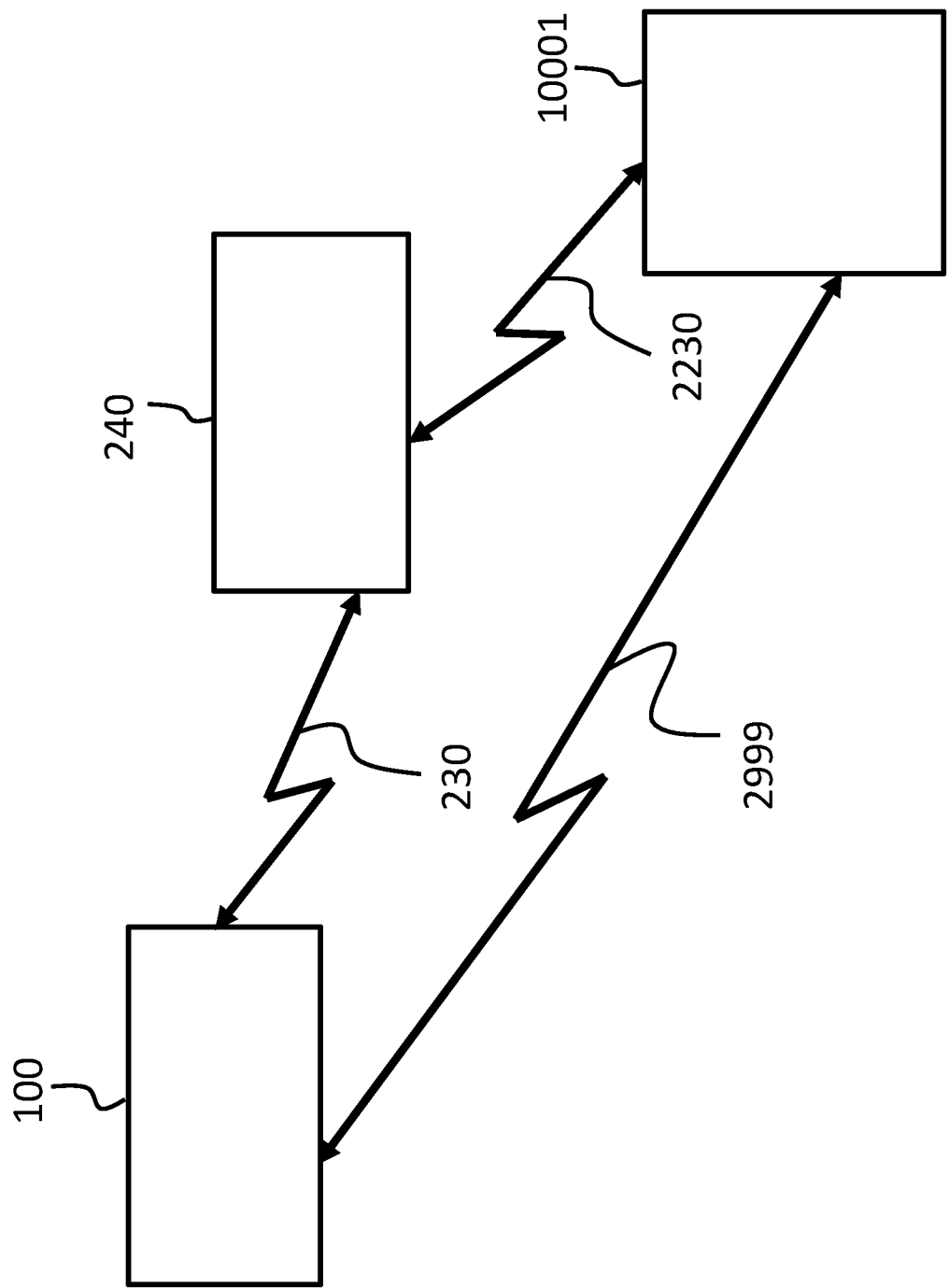


FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB2024/055602

A. CLASSIFICATION OF SUBJECT MATTER A61N 1/36(2006.01)i; A61N 1/372(2006.01)i; A61N 1/05(2006.01)i; H04R 25/00(2006.01)i 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) A61N 1/36(2006.01); A61H 23/00(2006.01); A61M 5/142(2006.01); A61N 1/18(2006.01); A61N 2/00(2006.01); H04B 7/00(2006.01); H04R 25/00(2006.01) Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Korean utility models and applications for utility models Japanese utility models and applications for utility models Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) eKOMPASS(KIPO internal) & Keywords: implant, cochlear, data, communication, electronic, input, output, evaluation, control, processor		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2022-208439 A1 (COCHLEAR LIMITED et al.) 06 October 2022 (2022-10-06) claim 11; paragraphs [0044]-[0057], [00152]-[00181], [00222]-[00243]; figures 2, 16, 22	1-4,11-13,21-23,31-33,38,39
A	US 2013-0142367 A1 (BERRY, M. M. et al.) 06 June 2013 (2013-06-06) claims 1-7	1-4,11-13,21-23,31-33,38,39
A	US 2017-0113057 A1 (ELWHA LLC) 27 April 2017 (2017-04-27) claims 1, 2, 15, 16	1-4,11-13,21-23,31-33,38,39
A	US 2006-0178711 A1 (PATRICK, J. F. et al.) 10 August 2006 (2006-08-10) claims 1, 7	1-4,11-13,21-23,31-33,38,39
☒ 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 “D” document cited by the applicant in the international application “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 11 September 2024		Date of mailing of the international search report 11 September 2024
Name and mailing address of the ISA/KR Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon 35208, Republic of Korea Facsimile No. +82-42-481-8578		Authorized officer HEO, Joo Hyung Telephone No. +82-42-481-5373

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB2024/055602

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2021-0260378 A1 (COCHLEAR LIMITED) 26 August 2021 (2021-08-26) claims 11-13	1-4, 11-13, 21-23, 31-33, 38, 39

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB2024/055602

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: **6-8, 16, 18, 19**
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

Claims 6-8, 16, 18, and 19 are regarded to be unclear because they refer to claims which do not comply with PCT Rule 6.4(a).
3. ☒ Claims Nos.: **5, 9, 10, 14, 15, 17, 20, 24-30, 34-37**
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB2024/055602

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
WO	2022-208439	A1	06 October 2022	CN	117043873	A	10 November 2023
				US	2024-0194335	A1	13 June 2024
US	2013-0142367	A1	06 June 2013	US	9323893	B2	26 April 2016
US	2017-0113057	A1	27 April 2017	US	10406376	B2	10 September 2019
US	2006-0178711	A1	10 August 2006	US	2009-0076569	A1	19 March 2009
US	2021-0260378	A1	26 August 2021	CN	112470495	A	09 March 2021
				CN	112470495	B	09 September 2022
				CN	115414593	A	02 December 2022
				WO	2020-044307	A1	05 March 2020