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FIG. 1
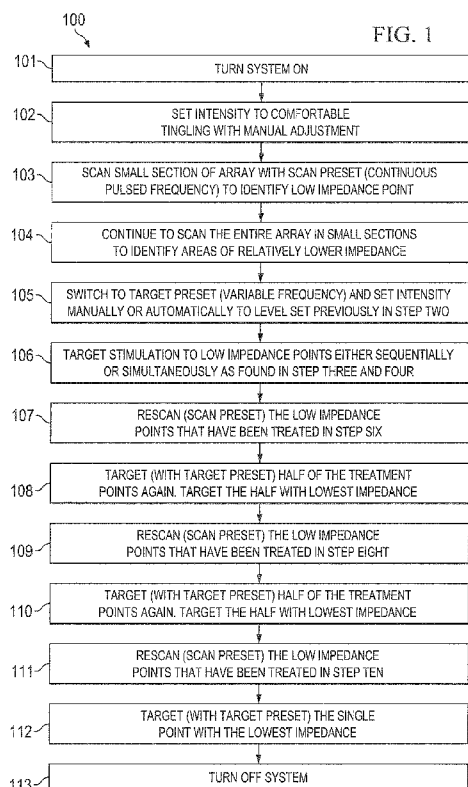
(57) Abstract: A method and system provide an automated protocol for assessing and treating a neurostimulation treatment area. The assessment involves identifying a number of relative low impedance points among an array of points of a treatment area array associated with a physiological region. A certain number of the identified points are treated. The array area is reassessed. Then, a certain number of the previously treated points are treated again. These steps are repeated a predetermined number of times and/or until a predetermined number of treatment points remains.

Declarations under Rule 4.17:

— *as to the identity of the inventor (Rule 4.17(i))*

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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

AUTOMATED ELECTRODE ARRAY TREATMENT PROTOCOL

RELATED APPLICTIONS AND CLAIM FOR PRIORITY

[0001] This application claims the benefit of earlier filed provisional patent application Ser. No. 61/627,867 filed October 19, 2011.

TECHNICAL FIELD

[0002] The disclosure relates generally to a method of treating a patient with an electrode array and, more particularly, to an automated protocol for treating a patient with the electrode array.

BACKGROUND

[0003] An objective of transcutaneous neurostimulation is to focus an adequate electrical energy concentration at a relatively small, preferred treatment location on the skin. The preferred treatment locations are typically locations such as nerve branches, trigger points, and acupuncture points, and are evidenced as points of lower relative impedance.

[0004] One approach to determine the location of low relative impedance points is to use an array of electrodes where the pairs of alternating polarity are individually

addressable. This method is employed by Bijelic in U.S. Patent Application Serial No. 2008/0027507. An operator can then step through the combinations of electrodes, scanning for low relative impedance values. After the low impedance points are identified, the operator must use another device to treat the identified areas. The process of scanning and treating must be repeated to accomplish the desired results. Performing this approach, either manually or in an automated fashion, is time-consuming and costly.

[0005] Other prior devices and methods do not address the problem. For example, in U.S. Patent No. 4,238,726, Ichijo discusses a method of determining points of low impedance electrically without mentioning using an electrode configuration as a means. Molina-Negro et al., in U.S. Patent No. 4,541,432, discuss using a waveform to treat pain without regard to the electrode configuration. Matos, in U.S. Patent Application Serial No. 2003/0233129, discusses a method of scanning and stimulating without regard to relative electrode size and spacing.

[0006] Another common method of locating low impedance points is to use a configuration of concentric electrodes. An outer electrode has a substantially larger area than a smaller, inner "treatment" electrode. The area ratio of the outer electrode to the inner electrode is typically

between 1.2/1 and 5.0/1, and the spacing between the electrodes is controlled at a small dimension, which is typically less than .40 inches.

[0007] By measuring and noting the impedance measurements between the inner and outer electrodes, as the electrode pair is moved over the body, one can locate points of low impedance and, thus, preferred treatment locations. This is discussed generally by Colthurst in U.S. Patent No. 7,483,734.

[0008] Axelgaard, in U.S. Patent No. 6,038,485, discusses controlling current distribution and directing electrical pulses via rows and columns of electrodes. Axelgaard addresses spacing and area of individual electrodes but does not disclose anything but equal spacing and equal electrode areas. Schumann, in U.S. Patent Application Serial No. 2007/0106342, discusses a means of scanning and locating trigger points and mentions a relationship between spacing and skin conductance. However, Schumann does not teach anything about having different areas of electrodes in combination with particular spacing between the electrodes. Schumann also discusses "chasing the pain" via multiple cycles of scanning and treating. Also worth noting is that Bijelic, in U.S. Patent Application Serial No. 2008/0027507,

discusses arrays of electrodes with a single spacing and single dimension.

[0009] Once a treatment point is located, electrical energy may be applied to that point for treatment purposes. However, this is normally a manual process. If the optimal treatment point changes, one must manually identify a new treatment point and apply treatment energy to the new point.

SUMMARY

[0010] A treatment protocol is provided for use in conjunction with neurostimulation devices. Preferably, the treatment protocol provides unattended treatment. However, it should be understood that steps in the treatment process may be conducted manually.

[0011] It has been discovered that applying treatment energy to a treatment point changes the relative impedance reading of that point compared to surrounding points. This results in a user manually "chasing" a treatment point on a patient. It has also been discovered that pain or other ailments in one general location on a patient are not necessarily best treated by applying treatment energy to points within that general area. Rather, a better result is sometimes achieved by treating points in a different

area than the area in which pain is being perceived by the patient. For example, back pain may sometimes be relieved by treating points in the facial area. For example, a first physiological region has a first set of relative impedance points, wherein stimulation of impedance in one of the points affects a relative impedance value of at least one of the other points in the regions. A second physiological region has a second set of relative impedance points. Stimulation of a point in the first region does not affect relative impedance of points in the second region. However, treatment of a point in the first region does impact the impedance value of at least one point in the second region. Thus, part of at least one protocol is to treat one region to impact another region. Other examples might include, without limitation, treating the left leg to reduce phantom pain associated with a missing right leg, or treating the back to relieve pain in lower extremities. In at least some example protocols, the link between two physiological regions is through the central nervous system rather than through a direct impact of changing an impedance value of one site to affect a relative impedance value of an adjacent site.

[0012] In accordance with at least certain example embodiments, treatment sites on the skin are identified

automatically. An appropriate amount of treatment energy is focused at the site(s) to treat the sites effectively without over-treating.

[0013] In certain embodiments, the treatment protocol incorporates the use of an array of physical electrodes with alternating polarity electrodes, and whose spacing is held at a uniform distance. The distance is preferably less than .40 inches and the relative area of a treating electrode and the surrounding opposite polarity electrodes is preferably at least a ratio of 1.2/1. In some embodiments, the range of relative area is from about 1.2/1 to about 5.0/1. Stated another way, the relative area of a higher-voltage electrode (or electrode portion that is part of a virtual electrode pair) compared to a lower-voltage electrode (or electrode portion that is part of a virtual electrode pair) is preferably in the range of from about 1.2/1 to about 5.0/1. However, it should be understood that the polarity of the electrodes, virtual electrode pairs, and/or electrode nodes, as well as the relative area, may be reversed depending on the treatment objectives.

[0014] Such an array of electrodes then "self-selects" the optimal treatment electrodes at the preferred treatment location via Ohm's law since the greatest energy is

delivered by the electrode located on the lowest impedance points. Moreover, the array "self-directs" treatment energy to the appropriate site within the array. Therefore, both scanning and treatment is performed automatically and concurrently. It should be understood that this is only an example of the device that may be employed in the treatment protocol and other neurostimulation devices may be used.

[0015]   The electrode array device is used in the context of the treatment protocol, which preferably automates what would otherwise be a manual process. In one example embodiment, a method of neurostimulation is provided. The method includes establishing a first treatment area array having a plurality of sites. The method also includes scanning a plurality of sites of a treatment area array to determine an activity reading value for each of the plurality of sites. The method also includes determining a first subset of the plurality of sites of the treatment area array based on the activity reading value. The method also includes stimulating each site within the first subset of sites.

[0016]   In another example embodiment, a system is provided. The system includes an assessment apparatus operable to measure a first activity reading value of a

plurality of sites within a treatment area array. The system also includes a computer operable to receive the first activity readings from the device, and to determine a first subset of the plurality of sites for stimulation.

[0017] In another example embodiment, a non-transitory computer-readable medium is provided that includes software executable by a processor. The software is operable to receive first activity reading values for a plurality of sites of a treatment area array. The software is also operable to determine a first subset of sites for stimulation from the plurality of sites of the treatment area array based on the first activity reading values. The software is also operable to receive second activity reading values for at least one site of the first subset after at least one site of the first subset has received electrical stimulation. The software is also operable to determine a second subset of sites for stimulation from the first subset of sites.

[0018] One or more of the embodiments may provide some, none, or all of certain of the following advantages. One advantage is that at least some manual assessment and treatment steps are automated. Another advantage is that at least some assessment and treatment steps may be achieved without at least some of the feedback from an

- 9 -

electrode to a user or additional system component, which would be needed in typical systems.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]   For   a   more   complete   understanding   of   this disclosure and its features, reference is now made to the following   description,   taken   in   conjunction   with   the accompanying drawings, in which:

[0020]   FIGURE 1 is a flow chart illustrating an example protocol according to an example embodiment;

[0021]   FIGURE   2   is   a   screen   shot   illustrating   an assessment of relative impedance values for a treatment area array associated with a physiological region according to an example embodiment;

[0022]   FIGURE   3   is   a   screen   shot   illustrating   a treatment area array associated with a physiological region according to an example embodiment;

[0023]   FIGURE 4 is a screen shot illustrating assessment of a first segment associated with a treatment area array according to an example embodiment;

[0024]   FIGURE 5 is a screen shot illustrating assessment of a second segment associated with a treatment area array according to an example embodiment;

[0025]   FIGURE   6   is   a   screen   shot   illustrating   an assessment of sites within a treatment area array at a step in a treatment protocol according to an example embodiment;

[0026]   FIGURE 7 is a screen shot illustrating the identification of certain sites within a treatment area array according to an example embodiment;

[0027]   FIGURE 8 is a screen shot illustrating re-assessment of certain sites within a treatment area array according to an example embodiment;

[0028]   FIGURE 9 is a screen shot illustrating identification and treatment of a primary active site within a treatment area array according to an example embodiment;

[0029]   FIGURE 10 is a screen shot illustrating a chart that may be used as part of at least one protocol according to an example embodiment;

[0030]   FIGURE 11 is a screen shot of a treatment area array associated with a facial region according to an example embodiment;

[0031]   FIGURE 12 is a screen shot illustrating assessment of a segment of a treatment area array associated with a facial region according to an example embodiment;

[0032]   FIGURE 13 is a screen shot illustrating assessment of all sites within a treatment area array associated with a facial region according to an example embodiment;

[0033]   FIGURE 14 is a screen shot illustrating treatment of active sites within segments of a treatment area array according to an example embodiment;

[0034]   FIGURE 15 is a screen shot illustrating interpreting results of at least one protocol according to an example embodiment;

[0035]   FIGURE 16 is a block diagram illustrating a system for executing at least one protocol according to an example embodiment;

[0036]   FIGURE 17 is a block diagram illustrating a computing platform for executing at least one protocol according to an example embodiment; and

[0037]   FIGURE 18 is a block diagram illustrating a network for executing at least one protocol according to an example embodiment.

DETAILED DESCRIPTION

[0038]   Certain embodiments provide treatment protocols for automating the neurostimulation treatment process. In certain examples, the protocol is an iterative process in which treatment points are first identified based on relative impedance readings, and then treated with application of treatment energy. Then the points are re-scanned and a subset of the points is re-treated. Certain

other example protocols involve identifying physiological treatment regions that are different from a physiological region experiencing pain.

[0039]   FIGURE 1 is a flow chart illustrating an example treatment protocol. It should be understood that this is an example only and certain steps may be modified, added or eliminated, and that the order of certain steps may be changed. These modifications are within the scope of this disclosure and are within the knowledge of one having ordinary skill in the art. It should also be understood that the terminology used in the flow chart, and elsewhere herein, is not intended to be limiting.

[0040]   As shown in FIGURE 1, method 100 for a neurostimulation protocol is provided. In at least one embodiment the protocol is executed in the context of treating an ailment, such as pain, associated with a physiological region on a patient. In certain examples illustrated herein, this region is the back or the face of a human. The invention is not intended to be so limited, however. The protocols described herein may be applied to other physiological regions and to other patients (e.g., animals) and in other contexts. In the case of a human patient, for example, an example protocol may be applied to a first physiological region (e.g., the back). As a

precursor to the method, or part of the method in certain embodiments, the physiological region is divided into an array of target areas or points. It should be understood that the terminology of "target areas or points" is not limiting. The divided sub-areas of the array may have any shape so long as each part of the array is a portion of the overall area covered by the array. Also, it is not required that the array encompass the entire physiological region being assessed and treated.

[0041]   Method 100 has a first step 101, which comprises turning on a system operable to execute the protocol. Such a system is described elsewhere herein. According to step 102 an intensity level of an energy source is preset to a predetermined comfort level associated with assessment and treatment of a physiological region of a patient. According to step 103, a subsection of a treatment area array is scanned. The treatment area array is a division into subcomponents of a larger area associated with a physiological region being assessed and/or treated. The scanning is executed to determine a plurality of low impedance points within the scanned subsection. It should be understood that the term "point" refers to a specific point to treat or measure, as determined by relative readings, for example. "Site" may be used interchangeably

with "point" herein. However, "site" in certain contexts refers to a sub-area within a treatment area array. Preferably, scanning is accomplished with a scan preset for which continuous pulsed frequency energy is delivered to the area, subcomponent, point, etc. being assessed or treated.

[0042] In some embodiments, the scanning is accomplished by a device operable to deliver the desired energy. This may be a hand-held device, for example, connected to an energy source. The device may also be connected to a computing device, which is operable to receive information from the device, store the information, manipulate the information, and automatically perform at least certain steps within the protocol. The device may also be an electrode array device, for example, which may be applied to the physiological region to at least partially cover the region. In such a context, it is preferable that each electrode node, or virtual node, correspond to one of the subcomponents of the treatment area array. In other words, the array of electrodes or electrode nodes may define the treatment area array.

[0043] In at least some embodiments the treatment area array subcomponents are scanned with a delivered energy source having characteristics amenable to identifying low

impedance value areas without treating those areas. It should be recognized, however, that delivery of almost any energy amount (or type) may cause the relative impedance value of a given point to fluctuate. In at least some embodiments, scanning for low impedance points means scanning for subcomponents that have low impedance as compared to one or more adjacent or surrounding points or subcomponents.

[0044] As will be more apparent from the remaining description, in at least certain embodiments, an "activity reading" refers to an objective measurement of the effect that skin impedance has on a waveform of energy applied to that point. The activity reading may be used to provide a relative measurement of tissue impedance between distinct points on the skin. A higher activity reading may be used to indicate a low-impedance value or site, and thus where treatment is to be applied. "Point stimulation" or "point stim" refers to treatment of a specific area of pain and/or low impedance. When a point-stimulation is completed, a "point stimulation value" may be assessed. In certain cases, a site with a relatively higher activity reading indicates a relatively-lower skin impedance. Also, in certain cases, a point-stim value is indicated of a secondary activity reading. The description herein also

reflects the concept of "multi-stim," which refers to a series of point-stims delivered to one treatment point.

[0045] According to step 104, additional subsections of the array are scanned to identify points or areas having low impedance. In at least some embodiments, a predetermined number of low impedance points are established. If that number is reached prior to scanning all of the subsections, then, as additional subsections are scanned, points having lower impedance replace points with higher impedance from the already-scanned subsections. Preferably all of the subsections or subcomponents of the entire treatment area array are scanned during this part of the process.

[0046] According to step 105, a target preset is selected. The target preset is associated with a delivered energy signal having a variable frequency. Also, in step 105 it is preferable to set an intensity value that is commensurate with the comfort level established earlier in step 102.

[0047] According to step 106, target stimulation (e.g., treatment energy selected and/or established in step 105) is delivered to the low impedance points identified earlier. In some embodiments, the treatment energy is delivered sequentially according to geographical

positioning within the area, or according to the previously-determined relative impedance value, or according to some other criterion. In other embodiments, the treatment energy may be delivered to one or more first points, and then to one or more second points. The sets of points may be in order as described above, or may be in a randomly-selected order. In still other embodiments, two or more (or all) of the identified low impedance points may be treated simultaneously.

[0048] According to step 107, the low impedance points having been treated in step 106 are re-scanned (as in steps 103, 104) to determine new relative impedance values. This is done because the treatment step 107 will affect the relative impedance of the spot being treated.

[0049] In step 108, a subset of the low impedance points are treated again (as in step 106). The subset can be determined according to any number of suitable criteria. According to one aspect, a predetermined percentage is set and the number of low impedance points treated in this step is the predetermined percentage of the prior treated points. The exact points may be randomly selected until the percentage is reached. Alternatively, additional selection criteria may be incorporated. For example, if the percentage is 50%, then the 50% having the lowest

impedance values (as measured in re-scanning step 107) may be treated. Other criteria may be used including preference based on geographic positioning. For example, points adjacent to, or within a certain distance of a particular spot may receive a weighting preference. The particular spot might be, for example, the spot of perceived pain, or the spot having the highest initial activity reading. In another alternate embodiment, a certain number of most-active (higher activity reading) points are selected. In following steps, the percentage, or number, of target points may be reduced all the way to a single point.

[0050] In step 109, the thus-treated points are now re-scanned. In step 110, a subset of the points rescanned in step 109 are treated. The re-scanning and re-treating steps are repeated in steps 111 and 112 until, preferably, a single point of lowest impedance is determined. This point may be again treated (not expressly shown). It should be noted that the re-treating steps illustrated in FIGURE 1 involve re-treating half of the previously scanned (or re-scanned) points and that half represents the points having the lowest re-determined impedance values (e.g., higher re-determined activity readings). This is an example only and, as previously discussed, other criteria

may be used to determine the number of, and particular ones
of, the low impedance points that will receive treatment or
re-treatment.

[0051] In step 113, the procedure is ended and the
system is turned off.   It should be noted that other
protocols, methods, or steps described herein may, at this
point be done or re-done.   For example, a protocol which
involves assessing and treating a facial treatment array
area for perceived back pain may be executed after the
assessment and treatment (or re-treatment) of the treatment
area array associated with the back.

[0052] FIGURES 2 through 16 illustrate a treatment array
area associated with back pain.   Again, it should be noted
that this is provided for example purposes only and is no
way intended to limit the scope of the various embodiments
disclosed and described herein.   These features illustrate
certain aspects associated with the protocol described in
connection with FIGURE 1, as well as some additional and/or
modified aspects.   It should also be noted that FIGURES 2-
16 may also represent wire frames or screen shots as might
be associated with a software program and/or a graphical
user interface (GUI) as may provide the functionality
described herein in accordance with one or more additional
example embodiments.

- 20 -

[0053]   FIGURE 2 illustrates a physiological region 21, which in this example is a patient's back.   Also illustrated is a treatment area array 25.   It can be seen that the array is a 3 by 14 array, although arrays having different dimensions may be utilized.   In this example there are 14 rows and 3 columns.   Value 23 represents an example activity reading of a spot associated with the particular area on the back.   Thus, item 23 can also be viewed as representing a particular subcomponent of the array.   Dashed box 22 represents a segment or subsection of the array.   It should be understood that segments or subsections may have different configurations and may include different numbers of subcomponents.   The various values illustrated in FIGURE 2 represent activity readings. It can be seen that at some points there are two or three values.   For example, value 42 is a secondary reading after that point was initially assessed and treated.   Thus all of the points that have two values were subjected to secondary readings according to, for example, the iterative process described in connection with FIGURE 1.   Those particular points were treated and then re-assessed.   Points that have a third value were treated a second time and assessed a third time, and so on.   It should be noted that the array developed by conducting primary assessments, secondary

assessments, and so forth may be used as part of the automated protocol(s) described herein, or as an initial assessment tool to determine treatment areas, on which additional protocol arrays may be established.

[0054]   FIGURE 3 is another illustration of the physiological region being a patient's back. A treatment area array is shown as being divided into an actual grid 31. Activity readings would be measured for one or more of the blocks 32 defined by grid 31. Also illustrated are markings 33 on the physiological region. These markings represent target placement of electrodes for treatment and/or activity reading purposes. Also illustrated is a documentation grid 34 that may be used to record activity readings and/or point-stimulation values. Preferably, documentation grid 34 has data input fields that correspond, both in number and orientation, to the blocks 32 of grid 31 of the treatment area array.

[0055]   FIGURE 4 illustrates the same physiological area. Item 41 is an illustration of a first segment (or subsection) of the treatment area array. Thus, this is one of the 14 rows previously described. During the scanning step (or one of the re-scanning steps as the case may be), the three points that make up segment 41 are scanned to determine the activity readings associated with those

particular subcomponents of the array. The readings are represented by dashed box 42, where it can be seen that the activity readings for the segment are, from left to right, 24, 25, and 36. In one or more of the treatment steps, the right-most point 44 in the segment 41 (the point having a value of 36) is treated. The segment points that have been treated (point 44 in this example) are re-scanned to determine new activity readings. In this example, the new value is shown as 49, which is the secondary value associated with point 44 and shown in dashed box 43. It should be understood that the activity readings may be in any suitable units, or without units.

[0056] FIGURE 5 illustrates scanning and measuring activity reading values for three points associated with a second segment 51. Dashed box 52 illustrates the values associated with this assessment. It can be seen that the middle value is highest. Thus, a point-stimulation (i.e., treatment) is applied to that point in the segment. The new activity reading for that point is 54 and is shown in dashed box 53.

[0057] FIGURE 6 illustrates the entire treatment area array after activity readings have been measured for each point of each segment, the highest-value points in each segment have received a point-stimulation treatment, and

new activity readings have been determined for the points
that received point-stimulation.

[0058]   FIGURE 7 illustrates another aspect that may be
incorporated into one or more protocols described herein.
At this point in the process, the three most active sites
in the array are determined.   It can be seen that the
second values of sites 71, 72, and 73 are 56, 67, and 56
respectively, and that these are the three highest values
among the sites of the array. It should be understood that
the selection of three most-active sites is an example, and
a larger or smaller number of most-active sites may be
determined.   This figure also illustrates the concept of
applying a second point-stimulation to the three most-
active sites.

[0059]   FIGURE 8 illustrates the follow-on assessment of
the three sites in FIGURE 7 after the application of the
second point-stimulation. The respective values are 67, 58
and 54.   This figure also illustrates the concept of
determining the single most-active site (e.g., the site
having the highest activity reading), which is site 71.
FIGURES 8 and 9 collectively illustrate treating this site
with treatment energy. In at least one example embodiment
the treatment energy is delivered for about one minute.
Preferably, the treatment energy is at an energy level,

wave form, frequency, etc. predetermined to achieve a
desired treatment effect.

[0060] In at least certain embodiments, "activity
reading" refers to an objective measurement of the effect
that skin impedance has on a waveform of energy applied to
that point. The activity reading may be used to provide a
relative measurement of tissue impedance between distinct
points on the skin. A higher activity reading may be used
to indicate where treatment is to be applied. "Point
stimulation" or "point stim" refers to treatment of a
specific area of pain and/or low impedance. When a point-
stimulation is completed, a "point stimulation value" may
be assessed. In certain cases, a site with a relatively
higher activity reading indicates a relatively-lower skin
impedance. Also, in certain cases, a point-stim value is
indicated of a secondary activity reading. The above
description also reflects the concept of "multi-stim,"
which refers to a series of point-stims delivered to one
treatment point.

[0061] FIGURE 10 illustrates a treatment protocol
execution grid 101. Grid 101 reflects the treatment area
array assessment process of at least one example
embodiment. A first assessment reading is done for all
sites in the array. This is reflected in the upper left-

hand box.   It can be seen that a point-stimulation is applied to the most active sites (e.g., having the highest activity reading value) in each segment of the array.   Then these sites are re-assessed.   Then the three most-active sites in the entire array are determined and receive a second point-stimulation.   Then, these three points are re-assessed.   Then the most active site is determined and treated.

[0062]   FIGURE 11 illustrates assessment and treatment of a facial region.   As previously discussed, this protocol may be useful for pain perceived in the facial region. But, it may also be useful for pain perceived in other regions, such as the back (for example).   The sites 112 selected in the illustrated example may be referred to as trigeminal points.   Sites 112 make up a treatment area array 111.

[0063]   FIGURE 12 illustrates a process similar to that already described in which array segments are scanned to elicit an activity reading (AR), which is a measure of the relative impedance of the respective sites.   Thus, dashed box 123 represents activity readings for the lower segment of the array with respective values (left to right) of 24 and 36 Ohms.   The value of 59 Ohms reflects the secondary reading of the right-most site after a point-stimulation is

applied. Similar to the protocols already described, a point-stimulation was applied to the right-most site because this site had the highest activity reading of the two sites in the segment.

FIGURE 13 illustrates the results of scanning the remaining segments, and rescanning those sites within each segment after point-stimulation is delivered to the respective sites having the highest activity reading within each segment. FIGURE 14 illustrates the identification of the site within the array having the highest activity reading, as well as the treatment of that site. Treatment energy is reflected as a preset energy level delivered for two minutes. The preset amount may be any appropriate energy level suitable for the treatment objectives. The time of delivery of the treatment signal may also be varied to suit treatment objectives.

[0064] FIGURE 15 illustrates interpretation of the results of assessment, activity reading, point-stimulation, and/or treatment. In this example, a primary site has been identified in the Thoracic region of the back.

[0065] FIGURE 15 also illustrates a chart which may be used to track a treatment protocol. The chart reflects treatment of objectively identified areas and subjectively identified areas. Objectively identified areas include

those areas identified during the assessment protocols as already described. Subjectively identified areas include those areas identified by a patient's response to application of neurostimulation energy including point-stimulation and/or treatment.

[0066] FIGURE 16 illustrates an example system 160 for executing one or more of the protocols described elsewhere herein. System 160 includes a user 161, an assessment apparatus 162, and a computing platform 164 connected to each other by a network 163. Although the figure illustrates a particular arrangement of user 161, assessment apparatus 162, treatment apparatus 165, computing platform 164, and network 163, this disclosure contemplates any suitable arrangement of these elements. Moreover, although the figure illustrates a particular number of each element, this disclosure contemplates any suitable number of elements.

[0067] In particular embodiments, computing platform 164 may be a network-addressable computing system that can host various applications, such as, for example, assessment and treatment applications. Computing platform 164 may generate, store, receive, and transmit information, such as, for example, activity readings and or relative impedance measurements, treatment area array configuration

data, array site information, point-stimulation delivery, and treatment energy delivery. Computing platform 164 may be accessed by the other components of system 160 either directly or via network 163.

[0068] This disclosure contemplates any suitable network 163. As an example and not by way of limitation, one or more portions of network 163 may include an ad hoc network, an intranet, an extranet, a virtual private network (VPN), a local area network (LAN), a wireless LAN (WLAN), a wide area network (WAN), a wireless WAN (WW AN), a metropolitan area network (MAN), a portion of the Internet, a portion of the Public Switched Telephone Network (PSTN), a cellular telephone network, or a combination of two or more of these. Network 163 may include one or more networks 163.

[0069] Connections 166 may connect assessment apparatus 162, treatment apparatus 165, and computing platform 164 to network 163 and/or to each other. This disclosure contemplates any suitable connections 166. In particular embodiments, one or more connections 166 include one or more wireline (such as for example Digital Subscriber Line (DSL) or Data Over Cable Service Interface Specification (DOCSIS)), wireless (such as for example Wi-Fi or Worldwide Interoperability for Microwave Access (WiMAX)) or optical (such as for example Synchronous Optical Network (SONET) or

Synchronous Digital Hierarchy (SDH)) connections. In particular embodiments, one or more connections 166 each include an ad hoc network, an intranet, an extranet, a VPN, a LAN, a WLAN, a WAN, a WWAN, a MAN, a portion of the Internet, a portion of the PSTN, a cellular telephone network, another connection 166, or a combination of two or more such connections 166. Connections 166 need not necessarily be the same throughout system 160. One or more first connections 166 may differ in one or more respects from one or more second connections 166.

[0070] Various components such as, for example, assessment apparatus 162 and treatment apparatus 165, may include computers, printers, a displays, user interfaces, and network interfaces (not expressly shown).

[0071] Printers may include any suitable type of printer, such as, for example, a dot-matrix printer, an ink-jet printer, a solid ink printer, a dye-sublimation printer, a laser printer, a thermal printer, another suitable printer, or two or more such printers. The printer may print on any suitable media, such as, for example, sheet paper, printer paper, plotter paper, photo paper, paper rolls, printer label rolls, label sheets, boxes, parcels, another suitable media, or two or more such media. As an example and not by way of limitation, the

printer may be used to print postage indicia (e.g., postage stamps). As another example and not by way of limitation, the printer may be used as a label printer. As yet another example and not by way of limitation, the printer may be used as a standard printer. The printer may be operable to print any of the charts or other images referenced herein.

[0072] Network interface may include any suitable type of network interface, such as, for example wireless or Ethernet based. Any of the components may use the network interface to connect with other components or systems via any suitable connection, such as, for example, a connection 166.

[0073] In particular embodiments, various components of system 160 may be powered by any suitable power source. These may include, for example, an external source (such as, for example, an AC or DC power outlet) or an internal source (such as, for example, rechargeable or non-rechargeable batteries).

[0074] In particular embodiments, various system components may include one or more displays. The display may render, visualize, display, message, and publish to one or more users based on input to, or output from, any of the various components. Input and output can be transmitted to the display by any suitable connection. The display can

include any suitable I/O device that can enable
communication between a user and display. As an example
and not by way of limitation, the display can include a
video monitor, speaker, touchscreen, printer, another
suitable I/O device, or a combination of two or more of
these.

[0075] In particular embodiments, various system
components may receive user-input from one or more users
via the display. As an example and not by way of
limitation, the display may be a type of touchscreen, such
as a resistive touchscreen, a capacitive touchscreen, an
infrared touchscreen, or another suitable type of
touchscreen. The user may click, touch, or otherwise
interact with the display to select and input commands and
to perform other actions. As an example and not by way of
limitation, components may receive user-input via keyboard,
keypad, microphone, monitor, mouse, printer, scale,
scanner, speaker, still camera, stylus, tablet, trackball,
video camera, another suitable I/O device, or a combination
of two or more of these. As another example, and not by
way of limitation, components may receive user input via a
peripheral I/O device, such as a detachable keyboard,
keypad, microphone, monitor, mouse, printer, scale,
scanner, speaker, still camera, stylus, tablet, trackball,

video camera, another suitable I/O device, or a combination
of two or more of these.

[0076]   In   particular   embodiments,   various   system
components may receive user-input from one or more users
via a user interface that is displayed on a display. As an
example and not by way of limitation, the user interface
may be a graphic user interface that allows one or more
users to interact with the respective system component. A
user may click, touch, or otherwise interact with the user
interface to provide input to the respective system
component.   The user interface may be generated by any
suitable program or application. As an example and not by
way of limitation, the user interface may be provided in a
structured document and processed by a browser client of
the respective system component. A user can use the
browser client or other application to access a user
interface over a network (such as, for example, network
163). The user interface may be automatically generated
and presented to the user in response to the user accessing
one of the system components, a third-party website, or
executing an application on one of the system components.
As another example, and not by way of limitation, the user
interface may be provided by a dedicated client application
hosted on the respective system component.

[0077]   FIGURE 17 illustrates an example computer system 170.   In particular embodiments, one or more computer systems 170 perform one or more steps of one or more methods described or illustrated herein.   In particular embodiments, one or more computer systems 170 provide functionality described or illustrated herein.   In particular embodiments, software running on one or more computer systems 170 performs one or more steps of one or more methods described or illustrated herein or provides functionality described or illustrated herein.   Particular embodiments include one or more portions of one or more computer systems 170.

[0078]   This disclosure contemplates any suitable number of computer systems 170.   This disclosure contemplates computer system 170 taking any suitable physical form.   As example, and not by way of limitation, computer system 170 may be an embedded computer system, a system-on-chip (SOC), a single-board computer system (SBC) (such as, for example, a computer-on-module (COM) or system-on-module (SOM)), a desktop computer system, a laptop or notebook computer system, an interactive kiosk, a mainframe, a mesh of computer systems, a mobile telephone, a personal digital assistant (PDA), a server, a tablet computer system, or a combination of two or more of these.   Where appropriate,

computer system 170 may include one or more computer systems 170; be unitary or distributed; span multiple locations; span multiple machines; span multiple data centers; or reside in a cloud, which may include one or more cloud components in one or more networks. Where appropriate, one or more computer systems 170 may perform without substantial spatial or temporal limitation one or more steps of one or more methods described or illustrated herein. As an example, and not by way of limitation, one or more computer systems 170 may perform in real time or in batch mode one or more steps of one or more methods described or illustrated herein. One or more computer systems 170 may perform at different times or at different locations one or more steps of one or more methods described or illustrated herein, where appropriate.

[0079] In particular embodiments, computer system 170 includes a processor 171, memory 172, storage 173, an input/output (I/O) interface 174, a communication interface 175, and a bus 176. Although this disclosure describes and illustrates a particular computer system having a particular number of particular components in a particular arrangement, this disclosure contemplates any suitable computer system having any suitable number of any suitable components in any suitable arrangement.

[0080] In particular embodiments, processor 171 includes hardware for executing instructions, such as those making up a computer program. As an example and not by way of limitation, to execute instructions, processor 171 may retrieve (or fetch) the instructions from an internal register, an internal cache, memory 172, or storage 173; decode and execute them; and then write one or more results to an internal register, an internal cache, memory 172, or storage 173. In particular embodiments, processor 171 may include one or more internal caches for data, instructions, or addresses. This disclosure contemplates processor 171 including any suitable number of any suitable internal caches, where appropriate. As an example, and not by way of limitation, processor 171 may include one or more instruction caches, one or more data caches, and one or more translation lookaside buffers (TLBs). Instructions in the instruction caches may be copies of instructions in memory 172 or storage 173, and the instruction caches may speed up retrieval of those instructions by processor 171. Data in the data caches may be copies of data in memory 172 or storage 173 for instructions executing at processor 171 to operate on the results of previous instructions executed at processor 171 for access by subsequent instructions executing at processor 171 or for writing to memory 172 or

- 37 -

storage 173; or other suitable data.   The data caches may speed up read or write operations by processor 171.   The TLBs may speed up virtual-address translation for processor 171.   In particular embodiments, processor 171 may include one or more internal registers for data, instructions, or addresses.   This disclosure contemplates processor 171 including any suitable number of any suitable internal registers, where appropriate.   Where appropriate, processor 171 may include one or more arithmetic logic units (ALUs); be a multi-core processor; or include one or more processors 171.   Although this disclosure describes and illustrates a particular processor, this disclosure contemplates any suitable processor.

[0081]   In particular embodiments, memory 172 includes memory for storing instructions for processor 171 to execute or data for processor 171 to operate on.   As an example, and not by way of limitation, computer system 170 may load instructions from storage 173 or another source (such as, for example, another computer system 170) to memory 172.   Processor 171 may then load the instructions from memory 172 to an internal register or internal cache. To execute the instructions, processor 171 may retrieve the instructions from the internal register or internal cache and decode them.   During or after execution of the

instructions, processor 171 may write one or more results
(which may be intermediate or final results) to the
internal register or internal cache. Processor 171 may
then write one or more of those results to memory 172. In
particular embodiments, processor 171 executes only
instructions in one or more internal registers or internal
caches or in memory 172 (as opposed to storage 173 or
elsewhere) and operates only on data in one or more
internal registers or internal caches or in memory 172 (as
opposed to storage 173 or elsewhere). One or more memory
buses (which may each include an address bus and a data
bus) may couple processor 171 to memory 172. Bus 176 may
include one or more memory buses, as described below. In
particular embodiments, one or more memory management units
(MMUs) reside between processor 171 and memory 172 and
facilitate accesses to memory 172 requested by processor
171. In particular embodiments, memory 172 includes random
access memory (RAM). This RAM may be volatile memory,
where appropriate. Where appropriate, this RAM may be
dynamic RAM (DRAM) or static RAM (SRAM). Moreover, where
appropriate, this RAM may be single-ported or multi-ported
RAM. This disclosure contemplates any suitable RAM.
Memory 172 may include one or more memories 172, where
appropriate. Although this disclosure describes and

illustrates particular memory, this disclosure contemplates any suitable memory.

[0082] In particular embodiments, storage 173 includes mass storage for data or instructions. As an example and not by way of limitation, storage 173 may include an HDD, a floppy disk drive, flash memory, an optical disc, a magneto-optical disc, magnetic tape, or a Universal Serial Bus (USB) drive or a combination of two or more of these. Storage 173 may include removable or non-removable (or fixed) media, where appropriate. Storage 173 may be internal or external to computer system 170, where appropriate. In particular embodiments, storage 173 is non-volatile, solid-state memory. In particular embodiments, storage 173 includes read-only memory (ROM). Where appropriate, this ROM may be mask-programmed ROM, programmable ROM (PROM), erasable PROM (EPROM), electrically erasable PROM (EEPROM), electrically alterable ROM (EAROM), or flash memory or a combination of two or more of these. This disclosure contemplates mass storage 173 taking any suitable physical form. Storage 173 may include one or more storage control units facilitating communication between processor 171 and storage 173, where appropriate. Where appropriate, storage 173 may include one or more storages 173. Although this disclosure

describes   and   illustrates   particular   storage,   this
disclosure contemplates any suitable storage.

[0083]   In   particular   embodiments,   I/O   interface   174
includes hardware, software, or both providing one or more
interfaces for communication between computer system 170
and one or more I/O devices.   Computer system 170 may
include   one   or   more   of   these   I/O   devices,   where
appropriate.   One or more of these I/O devices may enable
communication between a person and computer system 170. As
an example, and not by way of limitation, an I/O device may
include a keyboard, keypad, microphone, monitor, mouse,
printer, scanner, speaker, still camera, stylus, tablet,
touch screen, trackball, video camera, another suitable I/O
device or a combination of two or more of these.   An I/O
device may include one or more sensors.   This disclosure
contemplates any suitable I/O devices and any suitable I/O
interfaces 908 for them.   Where appropriate, I/O interface
174 may include one or more device or software drivers
enabling processor 171 to drive one or more of these I/O
devices.   I/O interface 174 may include one or more I/O
interfaces   174,   where   appropriate.   Although   this
disclosure describes and illustrates a particular I/O
interface, this disclosure contemplates any suitable I/O
interface.

[0084] In   particular   embodiments,   communication
interface 175 includes hardware, software, or both
providing one or more interfaces for communication (such
as, for example, packet-based communication) between
computer system 170 and one or more other computer systems
170 or one or more networks.   As an example and not by way
of limitation, communication interface 175 may include a
network interface controller (NIC) or network adapter for
communicating with an Ethernet or other wire-based network
or a wireless NIC (WNIC) or wireless adapter for
communicating with a wireless network, such as a WI-FI
network.   This disclosure contemplates any suitable network
and any suitable communication interface 175 for it.   As an
example and not by way of limitation, computer system 170
may communicate with an ad hoc network, a personal area
network (PAN), a local area network (LAN), a wide area
network (WAN), a metropolitan area network (MAN), or one or
more portions of the Internet or a combination of two or
more of these.   One or more portions of one or more of
these networks may be wired or wireless.   As an example,
computer system 170 may communicate with a wireless PAN
(WPAN) (such as, for example, a BLUETOOTH WPAN), a WI-FI
network, a WI-MAX network, a cellular telephone network
(such as, for example, a Global System for Mobile

Communications (GSM) network), or other suitable wireless
network or a combination of two or more of these. Computer
system 170 may include any suitable communication interface
175 for any of these networks, where appropriate.
Communication interface 175 may include one or more
communication interfaces 175, where appropriate. Although
this disclosure describes and illustrates a particular
communication interface, this disclosure contemplates any
suitable communication interface.

[0085] In particular embodiments, bus 176 includes
hardware, software, or both coupling components of computer
system 170 to each other. As an example, and not by way of
limitation, bus 176 may include an Accelerated Graphics
Port (AGP) or other graphics bus, an Enhanced Industry
Standard Architecture (EISA) bus, a front-side bus (FSB), a
HYPERTRANSPORT (HT) interconnect, an Industry Standard
Architecture (ISA) bus, an INFINIBAND interconnect, a low-
pin-count (LPC) bus, a memory bus, a Micro Channel
Architecture (MCA) bus, a Peripheral Component Interconnect
(PCI) bus, a PCI-Express (PCI-X) bus, a serial advanced
technology attachment (SATA) bus, a Video Electronics
Standards Association local (VLB) bus, or another suitable
bus or a combination of two or more of these. Bus 176 may
include one or more buses 176, where appropriate. Although

this disclosure describes and illustrates a particular bus, this disclosure contemplates any suitable bus or interconnect.

[0086] Herein, reference to a computer-readable storage medium encompasses one or more non-transitory, tangible computer-readable storage media possessing structure. As an example and not by way of limitation, a computer-readable storage medium may include a semiconductor-based or other integrated circuit (IC) (such, as for example, a field-programmable gate array (FPGA) or an application-specific IC (ASIC)), a hard disk, an HDD, a hybrid hard drive (HHD), an optical disc, an optical disc drive (ODD), a magneto-optical disc, a magneto-optical drive, a floppy disk, a floppy disk drive (FDD), magnetic tape, a holographic storage medium, a solid-state drive (SSD), a RAM-drive, a SECURE DIGITAL card, a SECURE DIGITAL drive, or another suitable computer-readable storage medium or a combination of two or more of these, where appropriate. Herein, reference to a computer-readable storage medium excludes any medium that is not eligible for patent protection under 35 U.S.C. § 101. Herein, reference to a computer-readable storage medium excludes transitory forms of signal transmission (such as a propagating electrical or electromagnetic signal per se) to the extent that they are

not eligible for patent protection under 35 U.S.C. § 101. A computer-readable non-transitory storage medium may be volatile, non-volatile, or a combination of volatile and non-volatile, where appropriate.

[0087] This disclosure contemplates one or more computer-readable storage media implementing any suitable storage. In particular embodiments, a computer-readable storage medium implements one or more portions of processor 171 (such as, for example, one or more internal registers or caches), one or more portions of memory 172, one or more portions of storage 173, or a combination of these, where appropriate. In particular embodiments, a computer-readable storage medium implements RAM or ROM. In particular embodiments, a computer-readable storage medium implements volatile or persistent memory. In particular embodiments, one or more computer-readable storage media embody software. Herein, reference to software may encompass one or more applications, bytecode, one or more computer programs, one or more executables, one or more instructions, logic, machine code, one or more scripts, or source code, and vice versa, where appropriate. In particular embodiments, software includes one or more application programming interfaces (APIs). This disclosure contemplates any suitable software written or otherwise

expressed in any suitable programming language or combination of programming languages. In particular embodiments, software is expressed as source code or object code. In particular embodiments, software is expressed in a higher-level programming language, such as, for example, C, Perl, or a suitable extension thereof. In particular embodiments, software is expressed in a lower-level programming language, such as assembly language (or machine code). In particular embodiments, software is expressed in JA VA. In particular embodiments, software is expressed in Hyper Text Markup Language (HTML), Extensible Markup Language (XML), or other suitable markup language.

[0088] FIG. 18 illustrates an example network environment 180. This disclosure contemplates any suitable network environment 180. As an example, and not by way of limitation, although this disclosure describes and illustrates a network environment 180 that implements a client-server model, this disclosure contemplates one or more portions of a network environment 180 being peer-to-peer, where appropriate. Particular embodiments may operate in whole or in part in one or more network environments 180. In particular embodiments, one or more elements of network environment 180 provide functionality described or illustrated herein. Particular embodiments

include one or more portions of network environment 180. Network environment 180 includes a network 181 coupling one or more servers 182 and one or more clients 183 to each other. This disclosure contemplates any suitable network 1010. As an example, and not by way of limitation, one or more portions of network 181 may include an ad hoc network, an intranet, an extranet, a virtual private network (VPN), a local area network (LAN), a wireless LAN (WLAN), a wide area network (WAN), a wireless WAN (WW AN), a metropolitan area network (MAN), a portion of the Internet, a portion of the Public Switched Telephone Network (PSTN), a cellular telephone network, or a combination of two or more of these. Network 181 may include one or more networks 181.

[0089] Links 184 couple servers 182 and clients 183 to network 181 or to each other. This disclosure contemplates any suitable links 184. As an example, and not by way of limitation, one or more links 184 each include one or more wireline (such as, for example, Digital Subscriber Line (DSL) or Data Over Cable Service Interface Specification (DOCSIS»), wireless (such as, for example, Wi-Fi or Worldwide Interoperability for Microwave Access (WiMAX) or optical (such as, for example, Synchronous Optical Network (SONET) or Synchronous Digital Hierarchy (SDH)) links 184. In particular embodiments, one or more links 184 each

includes an intranet, an extranet, a VPN, a LAN, a WLAN, a

WAN, a MAN, a communications network, a satellite network,

a portion of the Internet, or another link 184 or a

combination of two or more such links 184. Links 184 need

not necessarily be the same throughout network environment

180. One or more first links 184 may differ in one or more

respects from one or more second links 184.

[0090] This disclosure contemplates any suitable servers

182. As an example, and not by way of limitation, one or

more servers 182 may each include one or more applications

servers, catalog servers, communications servers, database

servers, exchange servers, fax servers, file servers, home

servers, mail servers, message servers, name or DNS

servers, print servers, proxy servers, sound servers,

standalone servers, web servers, or web-feed servers. In

particular embodiments, a server 182 includes hardware,

software, or both for providing the functionality of server

182. As an example, and not by way of limitation, a server

182 that operates as a web server may be capable of hosting

websites containing web pages or elements of web pages and

include appropriate hardware, software, or both for doing

so. In particular embodiments, a web server may host HTML

or other suitable files or dynamically create or constitute

files for web pages on request. In response to a Hyper

Text Transfer Protocol (HTTP) or other request from a client 183, the web server may communicate one or more such files to client 183. As another example, a server 18 that operates as a database server may be capable of providing an interface for interacting with one or more data stores (such as, for example, data stores 185 described below). Where appropriate, a server 182 may include one or more servers 182; be unitary or distributed; span multiple locations; span multiple machines; span multiple datacenters; or reside in a cloud, which may include one or more cloud components in one or more networks.

[0091] In particular embodiments, one or more links 184 may couple a server 182 to one or more data stores 185. A data store 185 may store any suitable information, and the contents of a data store 185 may be organized in any suitable manner. As an example, and not by way or limitation, the contents of a data store 185 may be stored as a dimensional, flat, hierarchical, network, object-oriented, relational, XML, or other suitable database or a combination or two or more of these. A data store 185 (or a server 182 coupled to it) may include a database-management system or other hardware or software for managing the contents of data store 185. The database-management system may perform read and write operations,

delete or erase data, perform data de-duplication, query or search the contents of data store 185, or provide other access to data store 185.

[0092] In particular embodiments, one or more servers 182 may each include one or more data monitors/collectors 186. A data monitor/collection 186 may include hardware, software, or both for providing the functionality of data collector/collector 186. As an example, and not by way of limitation, a data monitor/collector 186 at a server 182 may monitor and collect network-traffic data at server 182 and store the network-traffic data in one or more data stores 185. In particular embodiments, server 182 or another device may extract pairs of search queries and selected URLs from the network-traffic data, where appropriate. In at least one embodiment, a data monitor/collector receives data from an assessment apparatus. The data may include any of the assessment/treatment information described herein or any derivations or modifications of such data. Such data may include, for example, activity readings and/or relative impedance measurements.

[0093] One or more servers 182 may include, or otherwise function as, one or more computing platforms 187. In at least one embodiment, at least one computing platform 187

receives date from data monitor/collector 186. Platform 187 includes a number of modules, which collectively provide the functionality described herein, such as determining site values for point-stimulation and treatment, as well as determining and executing the steps of the various protocols.

[0094] This disclosure contemplates any suitable clients 183. A client 183 may enable a user at client 183 to access or otherwise communicate with network 181, servers 182, or other clients 183. As an example, and not by way of limitation, a client 183 may have a web browser, such as MICROSOFT INTERNET EXPLORER or MOZILLA FIREFOX, and may have one or more add-ons, plug-ins, or other extensions, such as GOOGLE TOOLBAR or YAHOO TOOLBAR. A client 183 may be an electronic device including hardware, software, or both for providing the functionality of client 183. As an example, and not by way of limitation, a client 183 may, where appropriate, be an embedded computer system, an SOC, an SBC (such as, for example, a COM or SOM), a desktop computer system, a laptop or notebook computer system, an interactive kiosk, a mainframe, a mesh of computer systems, a mobile telephone, a PDA, a netbook computer system, a server, a tablet computer system, or a combination of two or more of these. Where appropriate, a client 183 may

include one or more clients 183; be unitary or distributed; span multiple locations; span multiple machines; span multiple datacenters; or reside in a cloud, which may include one or more cloud components in one or more networks.

[0095]   It should be understood that the various figures and their description illustrate example embodiments of the apparatus and various aspects of the apparatus may be added, eliminated, and/or substituted for those shown. Such modifications may be made as is desired, suitable, and/or advantageous for performing the functionality described herein.   Such modifications are within the scope of the invention.

[0096]   Numerous   other   changes,   substitutions, variations,   alterations,   and   modifications   may   be ascertained by those skilled in the art and it is intended that the present invention encompass all such changes, substitutions, variations, alterations and modifications as falling within the spirit and scope of this description.

[0097]   While   this   disclosure   has   described   certain embodiments and generally associated methods, alterations and permutations of these embodiments and methods will be apparent to those skilled in the art.   Accordingly, the above description of example embodiments does not define or

- 52 -

constrain this disclosure. Other changes, substitutions, and alterations are also possible without departing from the spirit and scope of this disclosure, as defined by the following claims.

CLAIMS

WHAT IS CLAIMED IS:

1.   A   method   of   providing   neurostimulation,
comprising:

establishing   a   first   treatment   area   array   having   a
plurality of sites;

scanning   a   plurality   of   sites   of   a   treatment   area
array to determine an activity reading value for each of
the plurality of sites;

determining   a   first   subset   of   the   plurality   of   sites
of   the   treatment   area   array   based   on   the   activity   reading
value; and

stimulating   each   site   within   the   first   subset   of
sites;

re-scanning   at   least   a   plurality   of   the   stimulated
sites   to   determine   a   new   activity   reading   value   for   at
least a plurality of sites of the first subset of sites.

2.   The method of Claim 1, further comprising:

repeating   at   least   one   of   the   determining,
stimulating,   and   re-scanning   steps   to   identify   a   primary
subset of sites for treatment.

3.   The method of Claim 2, wherein the primary subset comprises only one site.

4.   The method of Claim 2, further comprising treating the primary subset of sites.

5.   The method of Claim 1, wherein the determining step comprises determining the subset as a pre-established percentage of the plurality of sites.

6.   The method of Claim 5, wherein the subset comprises a pre-established percentage of the plurality of sites having the highest activity readings.

7.   The method of Claim 1, wherein the determining step comprises determining the subset as a predetermined number of the plurality of sites.

8.   The method of Claim 1, wherein the determining step is accomplished, at least partially, by selecting sites from the plurality of sites according to the position within the treatment area array.

9.   The method of Claim 1, wherein the determining step comprises assigning a weighting value to at least one of the plurality of sites prior to determining the subset.

10.   The method of Claim 1, wherein the stimulating step comprises stimulating one or more of the sites of the subset sequentially according to a position within the treatment area array.

11.   The method of Claim 1, wherein the stimulating step comprises stimulating one or more of the sites of the subset sequentially according to an activity reading value.

12.   The method of Claim 1, wherein the stimulating step comprises stimulating two or more of the sites of the subset simultaneously.

13.   The method of Claim 1, further comprising dividing the treatment area array into one or more segments, and wherein the determining steps comprises determining at least one site within the segment to be included in the subset.

14.   A system comprising:

an assessment apparatus operable to measure a first activity reading value of a plurality of sites within a treatment area array;

a computer operable to receive the first activity readings from the device, and to determine a first subset of the plurality of sites for stimulation.

15. The system of Claim 14, wherein the assessment apparatus is further operable to re-scan the first subset to determine a second activity reading for at least one site among the first subset of sites.

16. The system of Claim 15, wherein the computer is operable to receive the second activity readings, and to determine a second subset of the first subset for stimulation.

17. A non-transitory computer-readable medium, comprising software executable by a processor, and operable to:
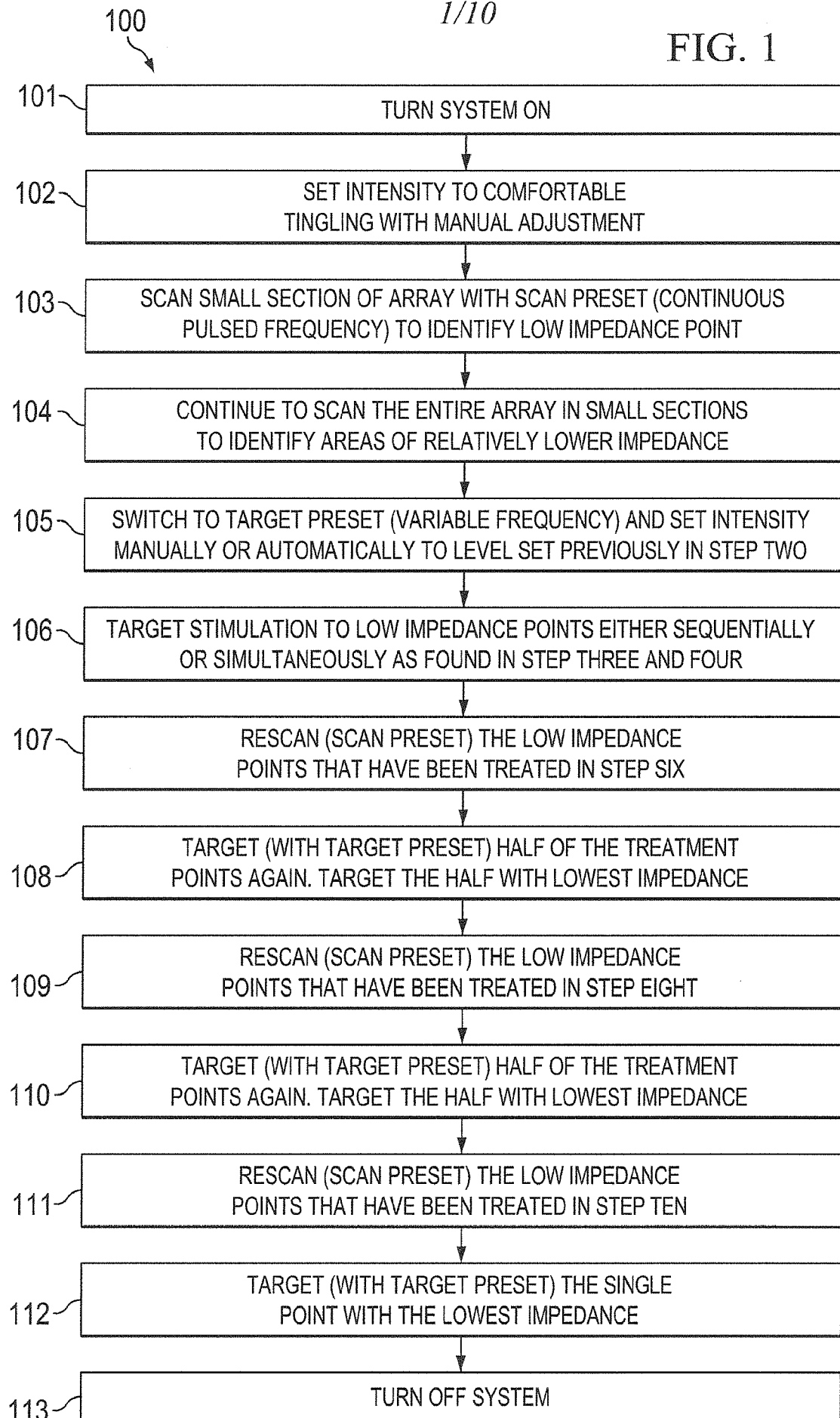
receive first activity reading values for a plurality of sites of a treatment area array;
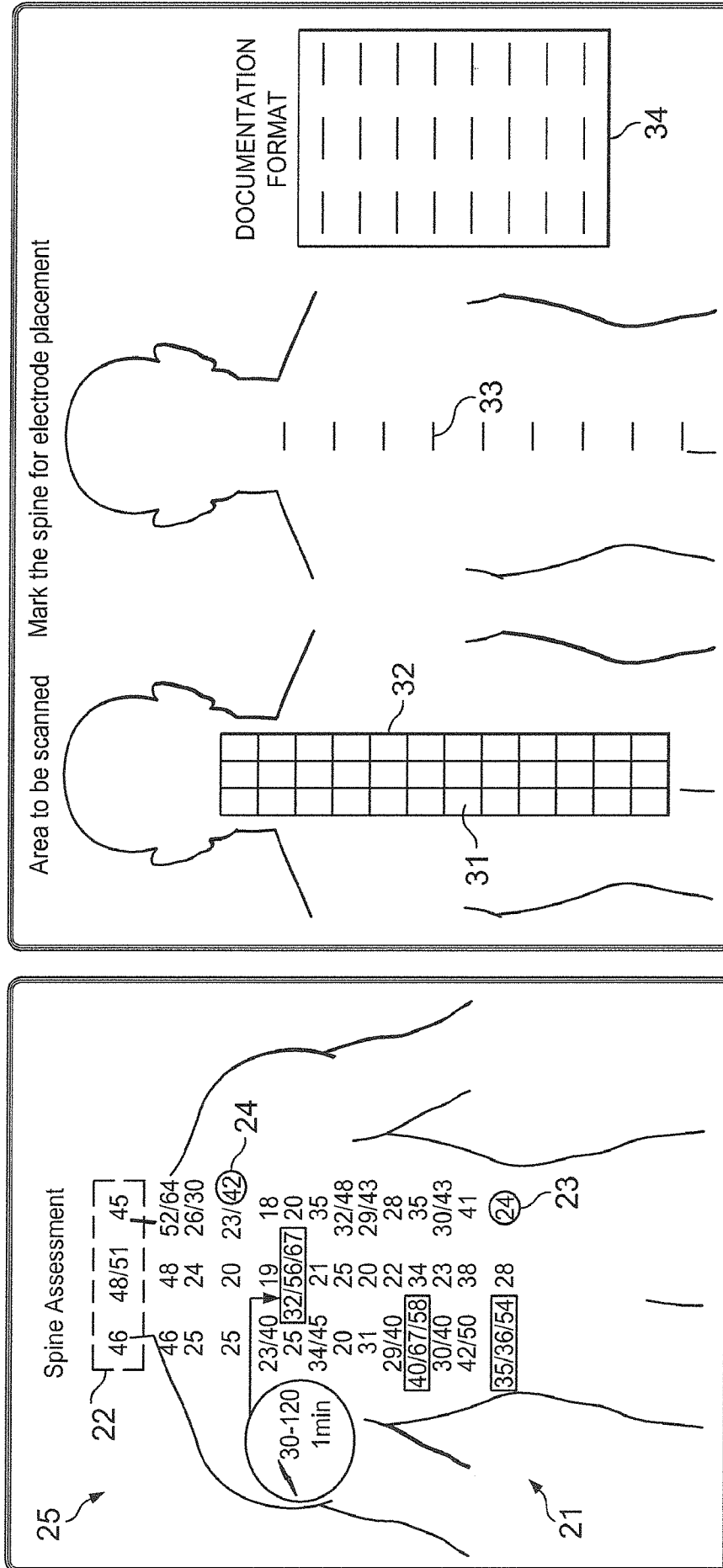
determine a first subset of sites for stimulation from the plurality of sites of the treatment area array based on the first activity reading values;

receive second activity reading values for at least one site of the first subset after at least one site of the first subset has received electrical stimulation; and

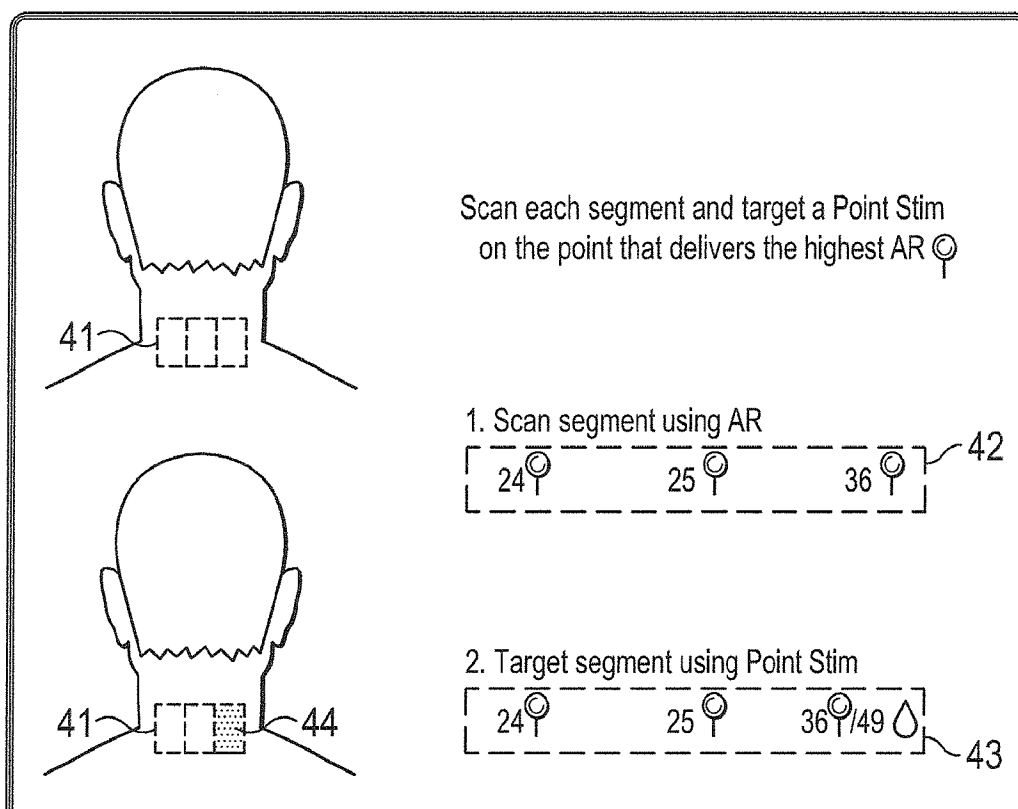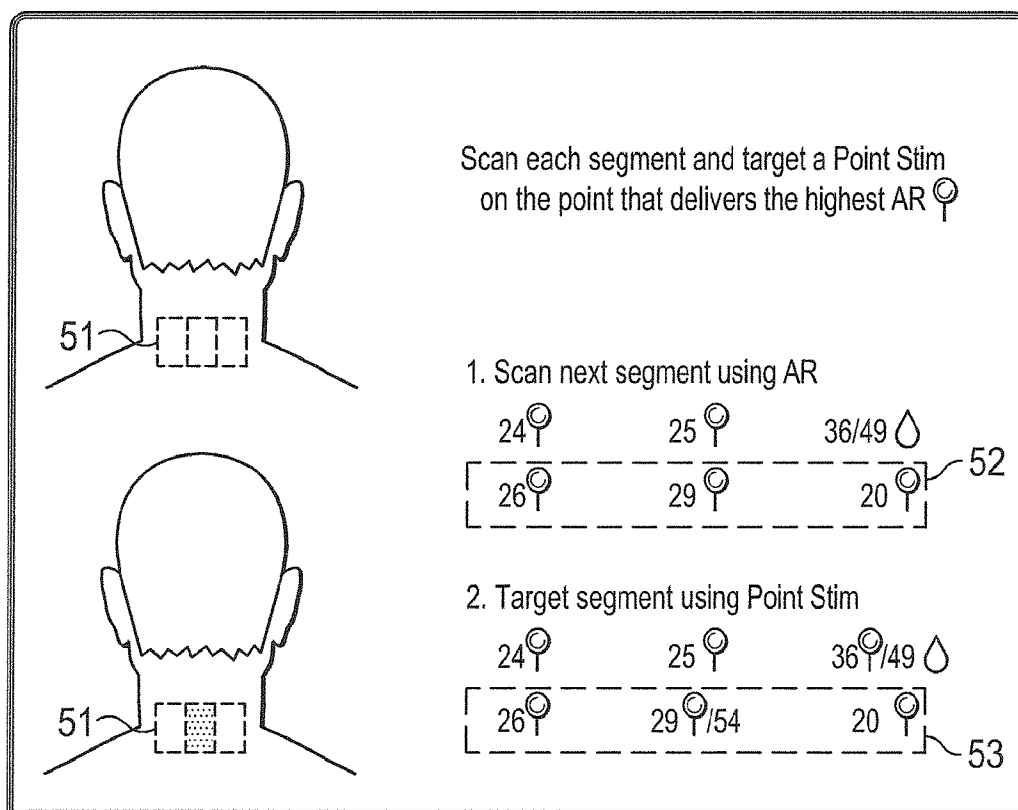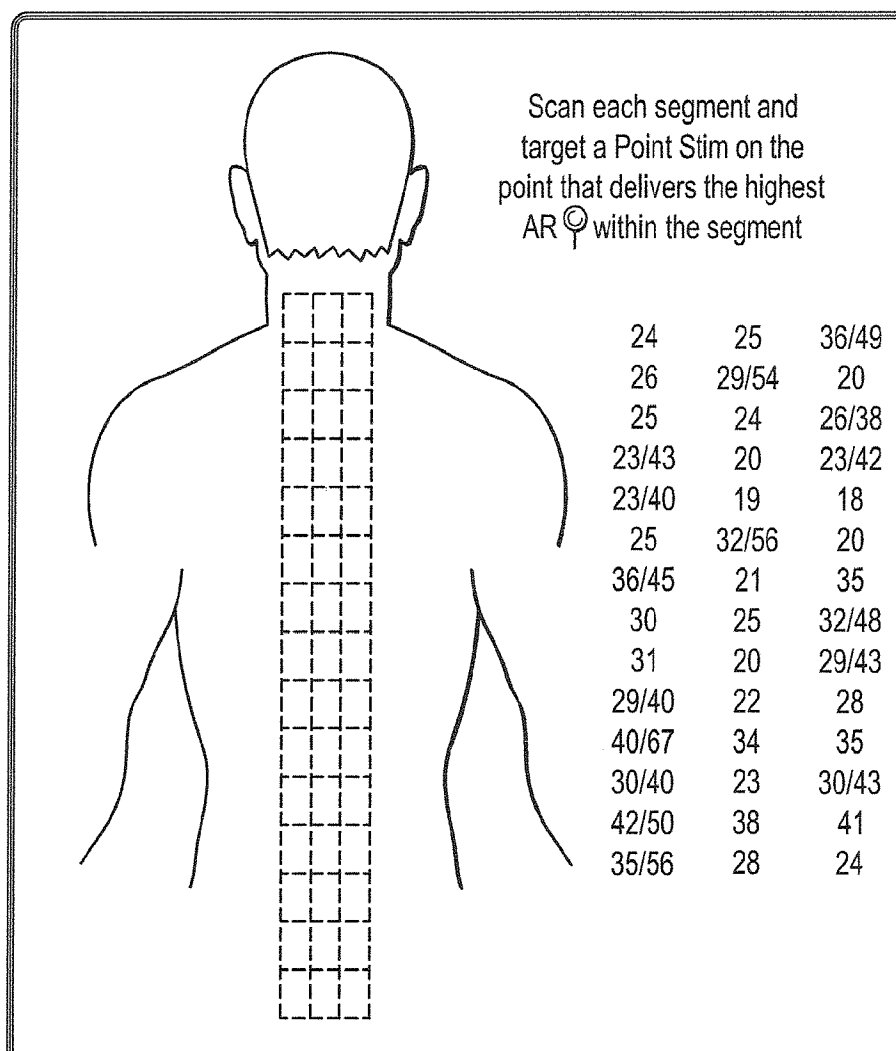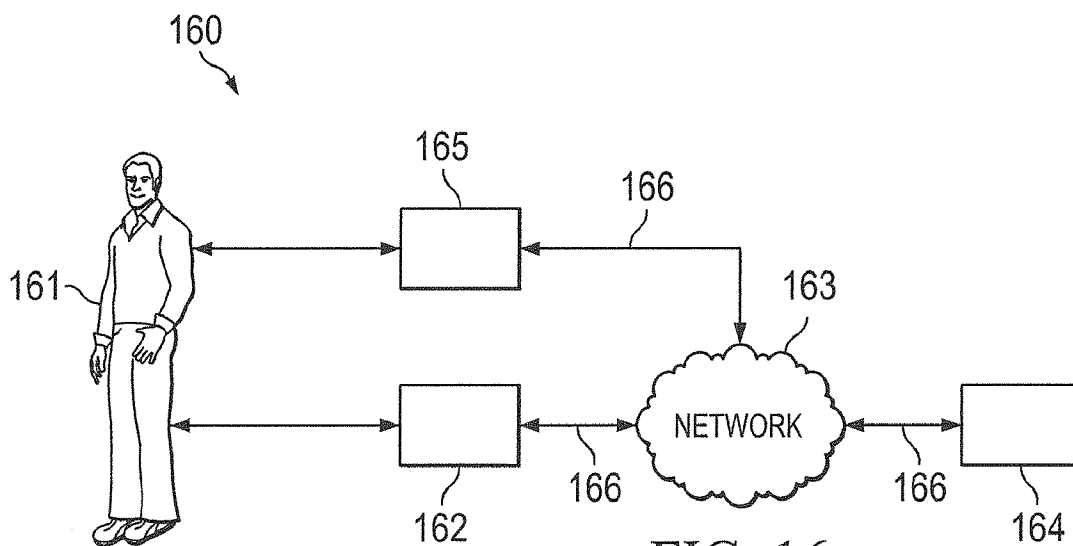determine a second subset of sites for stimulation from the first subset of sites.

100

FIG. 1

101 — | TURN SYSTEM ON |

102 — | SET INTENSITY TO COMFORTABLE TINGLING WITH MANUAL ADJUSTMENT |

103 — | SCAN SMALL SECTION OF ARRAY WITH SCAN PRESET (CONTINUOUS PULSED FREQUENCY) TO IDENTIFY LOW IMPEDANCE POINT |

104 — | CONTINUE TO SCAN THE ENTIRE ARRAY IN SMALL SECTIONS TO IDENTIFY AREAS OF RELATIVELY LOWER IMPEDANCE |

105 — | SWITCH TO TARGET PRESET (VARIABLE FREQUENCY) AND SET INTENSITY MANUALLY OR AUTOMATICALLY TO LEVEL SET PREVIOUSLY IN STEP TWO |

106 — | TARGET STIMULATION TO LOW IMPEDANCE POINTS EITHER SEQUENTIALLY OR SIMULTANEOUSLY AS FOUND IN STEP THREE AND FOUR |

107 — | RESCAN (SCAN PRESET) THE LOW IMPEDANCE POINTS THAT HAVE BEEN TREATED IN STEP SIX |

108 — | TARGET (WITH TARGET PRESET) HALF OF THE TREATMENT POINTS AGAIN. TARGET THE HALF WITH LOWEST IMPEDANCE |

109 — | RESCAN (SCAN PRESET) THE LOW IMPEDANCE POINTS THAT HAVE BEEN TREATED IN STEP EIGHT |

110 — | TARGET (WITH TARGET PRESET) HALF OF THE TREATMENT POINTS AGAIN. TARGET THE HALF WITH LOWEST IMPEDANCE |

111 — | RESCAN (SCAN PRESET) THE LOW IMPEDANCE POINTS THAT HAVE BEEN TREATED IN STEP TEN |

112 — | TARGET (WITH TARGET PRESET) THE SINGLE POINT WITH THE LOWEST IMPEDANCE |

113 — | TURN OFF SYSTEM |

FIG. 3

FIG. 2

Scan each segment and target a Point Stim
on the point that delivers the highest AR ⊚

41

1. Scan segment using AR

24 ⊚   25 ⊚   36 ⊚   42

2. Target segment using Point Stim

24 ⊚   25 ⊚   36 ⊚/49 ⬦   43

41   44

FIG. 4

Scan each segment and target a Point Stim
on the point that delivers the highest AR ⊚

51

1. Scan next segment using AR

24 ⊚   25 ⊚   36/49 ⬦

26 ⊚   29 ⊚   20 ⊚   52

2. Target segment using Point Stim

24 ⊚   25 ⊚   36 ⊚/49 ⬦

26 ⊚   29 ⊚/54   20 ⊚   53

51   51

FIG. 5

Scan each segment and target a Point Stim on the point that delivers the highest AR ☿ within the segment

24	25	36/49
26	29/54	20
25	24	26/38
23/43	20	23/42
23/40	19	18
25	32/56	20
36/45	21	35
30	25	32/48
31	20	29/43
29/40	22	28
40/67	34	35
30/40	23	30/43
42/50	38	41
35/56	28	24

FIG. 6

FIG. 16

**Apply a Secondary Point Stim to the three
most active sites.** Three most active sites =
Three highest Point Stim Values ▨

24	25	36/49
26	29/54	20
25	24	26/38
23/43	20	23/42
23/40	19	18
25	71⤸ 32/56	20
36/45	21	35
30	25	32/48
31	20	29/43
29/40	22	28
72⤸ 40/67	34	35
30/40	23	30/43
42/50	38	41
73⤸ 35/56	28	24

FIG. 7

**Apply ⟋ 30-120 on the Primary Active Site for 1
minute.** The primary active site = The highest
secondary Point Stim value

24	25	36/49
26	29/54	20
25	24	26/38
23/43	20	23/42
23/40	19	18
25	71⤸ 32/56/67	20
36/45	21	35
30	25	32/48
31	20	29/43
29/40	22	28
72⤸ 40/67/58	34	35
30/4	23	30/43
42/50	38	41
73⤸ 35/56/54	28	24

FIG. 8

Apply ✐ 30-120 on the Primary Active
Site for 1 minute. The primary active site
= highest secondary Point Stim value

24	25	36/49
26	29/54	20
25	24	26/38
23/43	20	23/42
23/40	19	18
25	32/56/67	20
36/45	21	35
30	25	32/48
31	20	29/43
29/40	22	28
40/67/58	34	35
30/40	23	30/43
42/50	38	41
35/56/54	28	24

FIG. 9

101

	Every Point	Active Sites	3 Most Active Sites	Primary Active Site
AR Stim	♀	♀	♀	♀
Point Stim		◊	◊	◊
Second Point Stim				◊
✐ 30-120				✐

FIG. 10
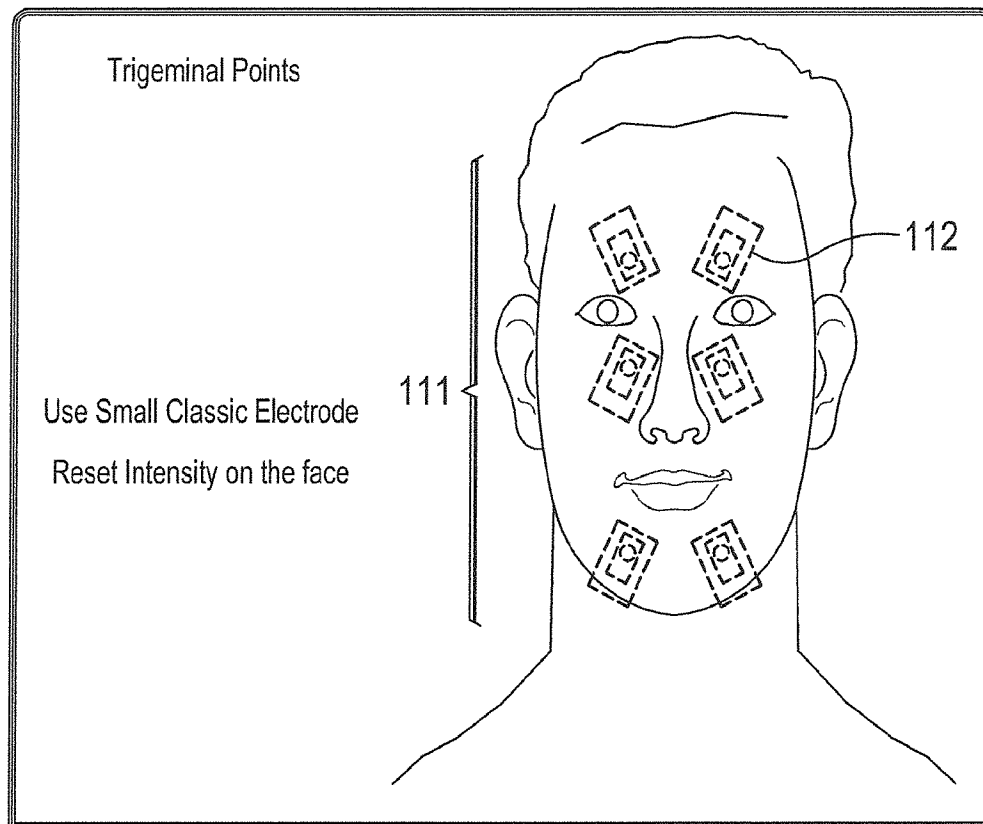
FIG. 11

FIG. 12

FIG. 13

FIG. 14

Interpretation of Results

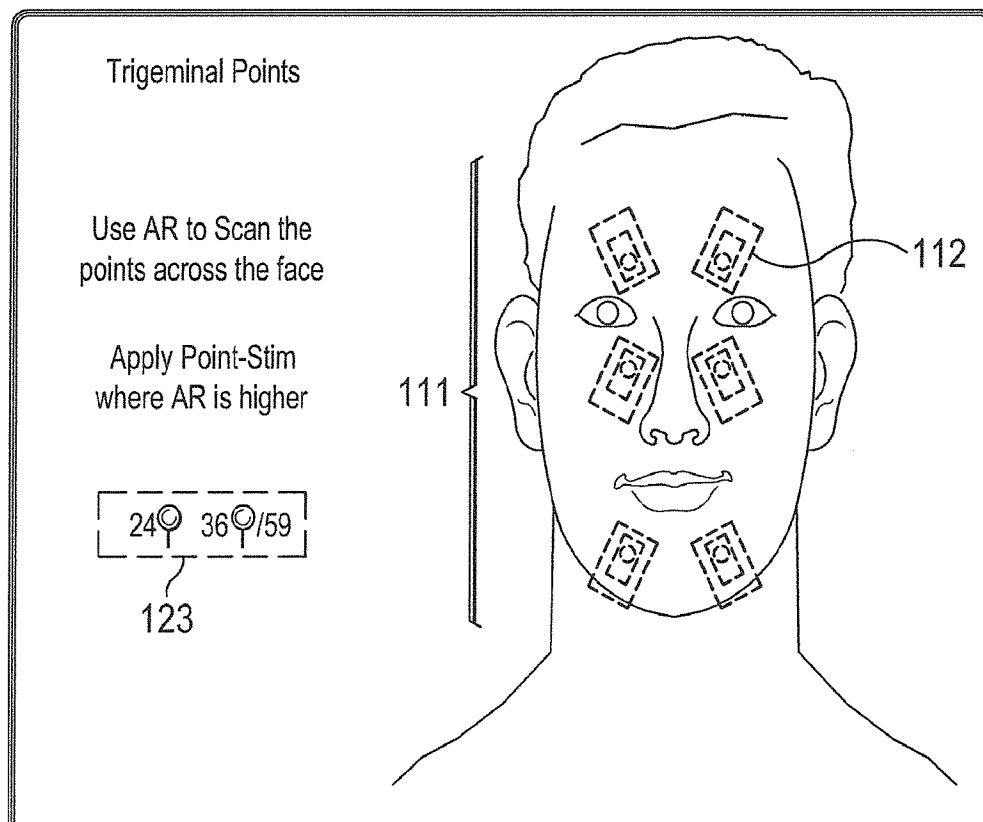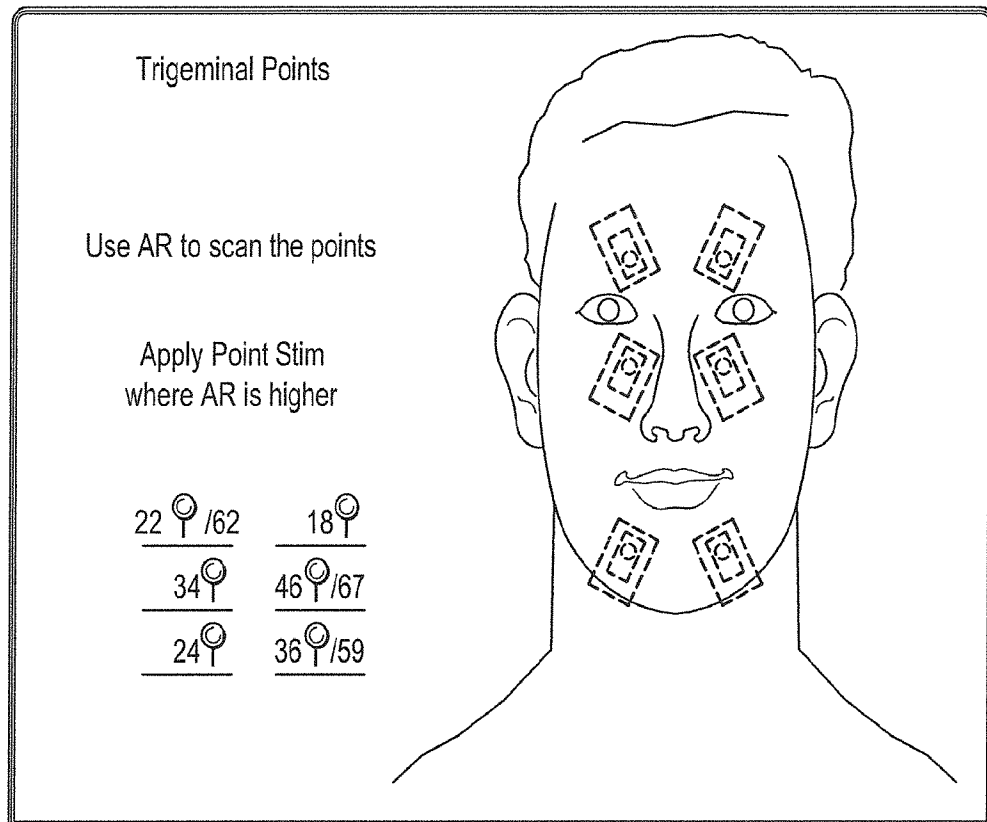Primary Active Site=

Active Region = Thoracic

Cervical

Thoracic

Lumbar/Sacral
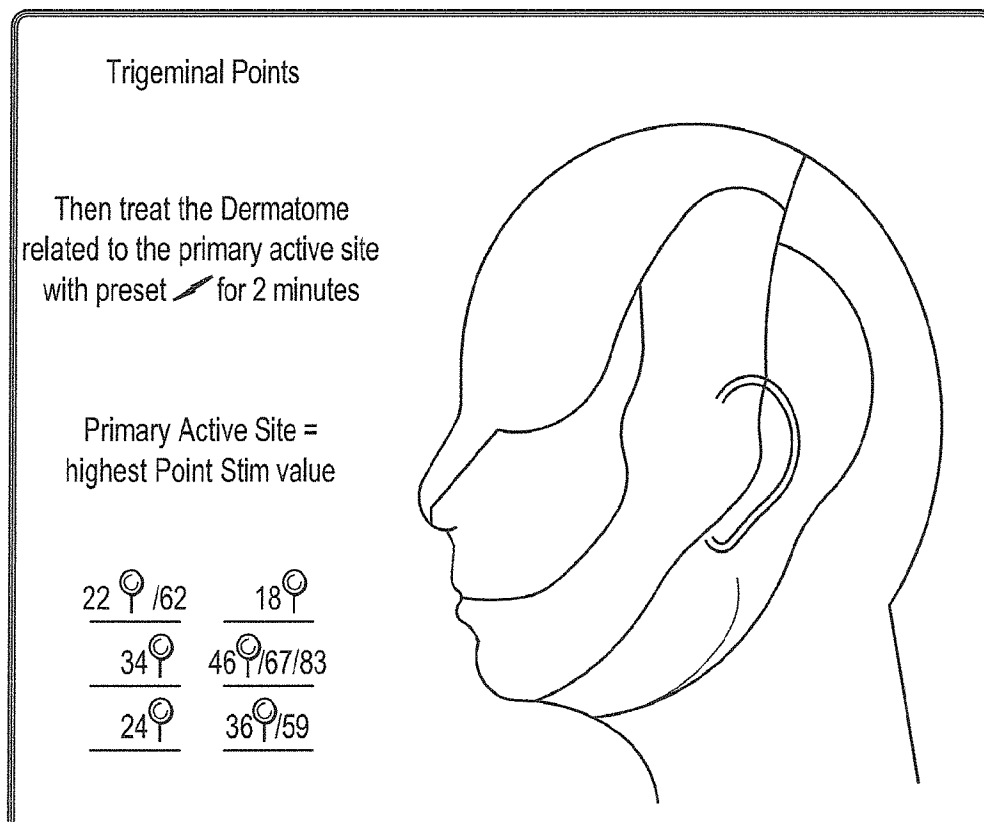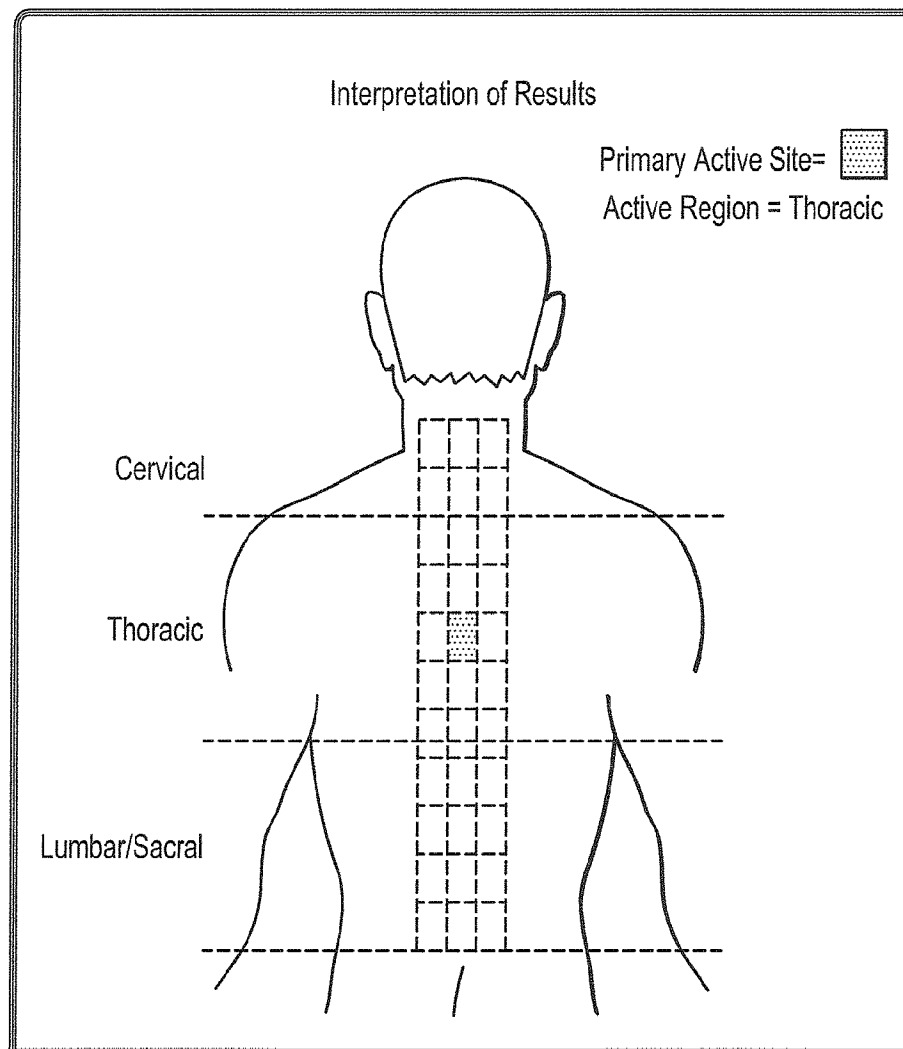
In subsequent treatments: Treat the active Region (identified *objectively* in the assessment and other areas identified *subjectively* by the patient's response.

Patient response after last treatment

Recommended Treatment Option		No change	Symptoms more localized	Increased symptoms	Decreased symptoms	Symptoms changed
	Direct Treatment				O	
	Dermatome Treatment		O			
	Homeostatic Point Treatment	O		O		O
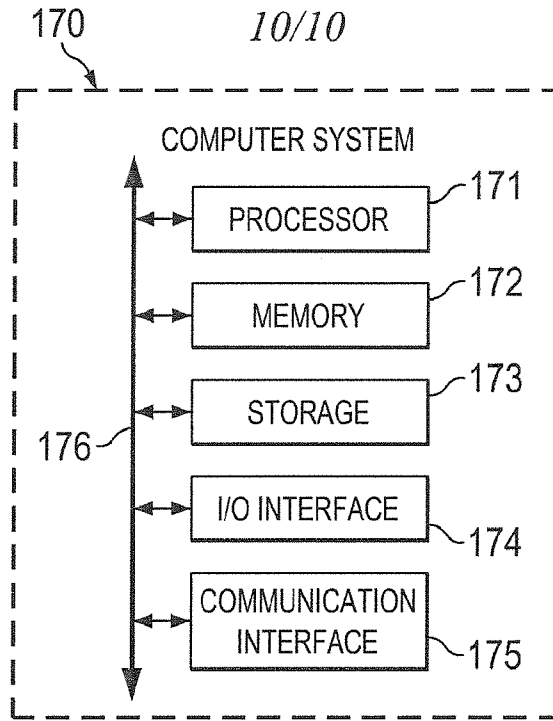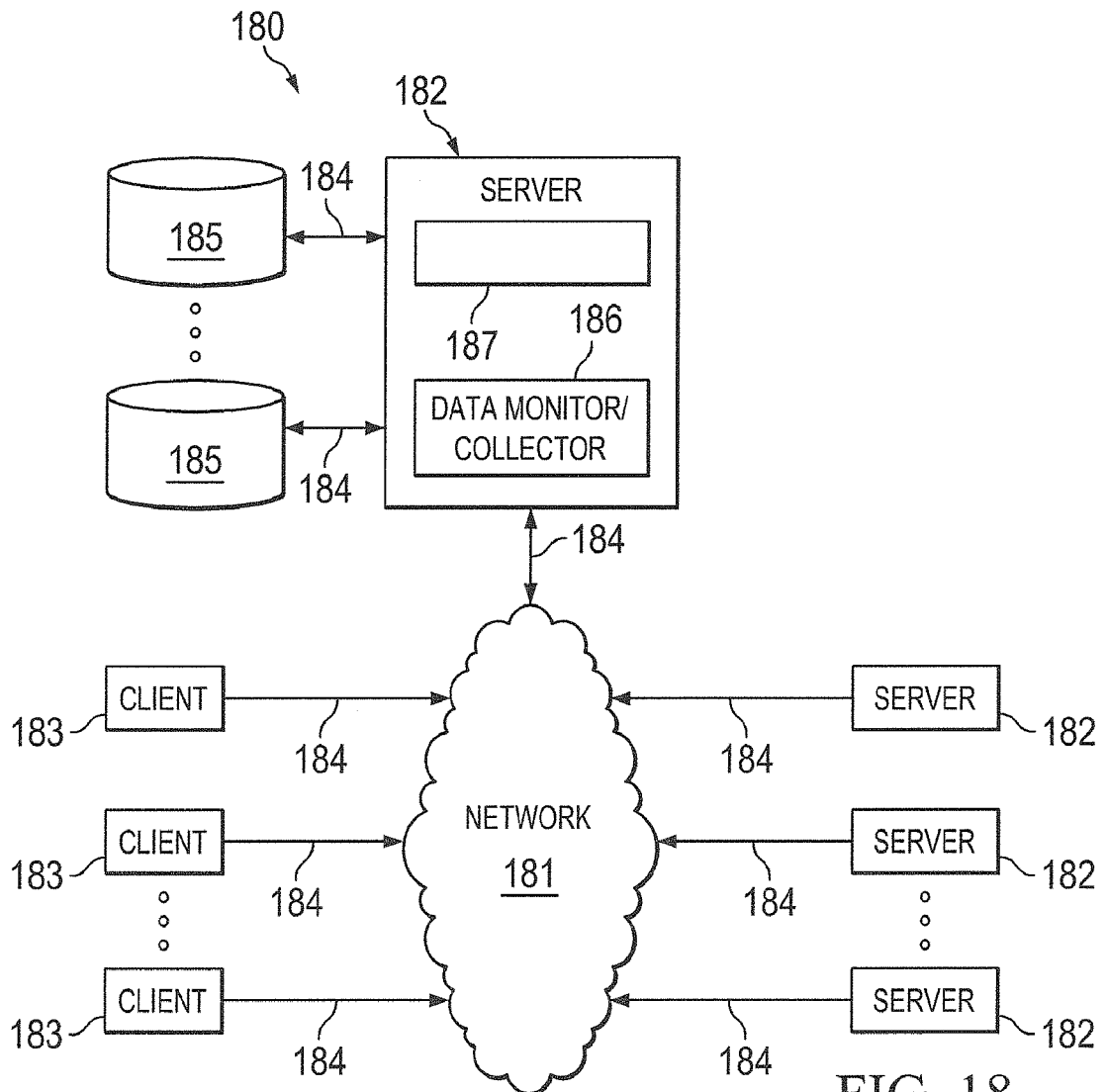
FIG. 15

10/10

170

COMPUTER SYSTEM

PROCESSOR — 171

MEMORY — 172

STORAGE — 173

I/O INTERFACE — 174

COMMUNICATION INTERFACE — 175

176

FIG. 17

180

182

SERVER

185 — 184

185 — 184

187   186

DATA MONITOR/ COLLECTOR

184

183 — CLIENT — 184

183 — CLIENT — 184

183 — CLIENT — 184

NETWORK 181

184 — SERVER — 182

184 — SERVER — 182

184 — SERVER — 182

FIG. 18

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A61N 1/00 (2012.01)
USPC - 607/2
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
IPC(8): A61N 1/00 (2012.01)
USPC: 607/2

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC - 600/547, 548; 607/62, 46, 48, 66, 73

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWEST; Google Scholar
Terms: Stimulat$; neurostimulat$, neuro$, detect$, measur$, scanning, identify$, subset, group, predetermined, pre-establish$, array$, simultaneous$, sequential$

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011/0137381 A1 (Lee et al.) 09 June 2011 (09.06.2011); Fig. 11; para[0144], [0272], [0273] [0287]-[0288]	1-17
A	US 2009/0281601 A1 (Forsberg et al.) 12 November 2009 (12.11.2009); entire document	1-17
A	US 2007/0250119 A1 (Tyler et al.) 25 October 2007 (25.10.2007); entire document	1-17

☐ Further documents are listed in the continuation of Box C.   ☐

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"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
"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	"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 December 2012 (28.12.2012)	**07 JAN 2013**

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