

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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SMART SOLUTIONS TECHNOLOGIES, S.L.  
Petitioner

v.

KONINKLIJKE PHILIPS ELECTRONICS N.V.  
Patent Owner

Patent No. 7,522,951  
Issued: April 21, 2009  
Filed: June 23, 2005  
Inventors: Paul A. Gough, *et al.*  
Title: Electrode Arrangement

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CASE IPR: Unassigned

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**DECLARATION OF ROOZBEH JAFARI  
IN SUPPORT OF PETITIONER, SMART SOLUTIONS  
TECHNOLOGIES, S.L.  
IN THE INTER PARTES REVIEW OF U.S. PATENT NO. 7,522,951**

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## **I. INTRODUCTION**

### **A. Engagement**

1. I have been retained by counsel for Smart Solutions Technologies, S.L. as an expert witness in the above-captioned proceeding. I have been asked to render an opinion regarding the validity of claims 1-4 of U.S. Patent No. 7,522,951 to Gough, *et al.* (hereinafter “the ‘951 Patent”) (Ex. SS 1001). The following is my written declaration that sets forth my opinion that claims 1-4 of the ‘951 Patent are invalid, and specifically that the prior art constitutes, discloses, teaches, or suggests the inventions of claims 1-4, which claims are thus anticipated and/or rendered obvious by the prior art, including the knowledge of those skilled in the art.

2. This declaration explains, based on facts and information available to me to date, the subject matter and opinions related to this *inter partes* review, including the particular references that invalidate at least claims 1-4 of the ‘951 Patent. As such, I am prepared to provide expert testimony regarding opinions formed resulting from my analysis of the issues considered in this declaration if asked about those issues by the Board or by the private parties’ attorneys.

### **B. Background and Qualifications**

3. I have been working in the field of wearable computers, sensors and electrodes since 2002. I received a B.S. in Electrical Engineering from Sharif

University of Technology in Tehran, Iran in 2000, an M.S. in Electrical Engineering from the State University of New York in 2002, and both an M.S. and Ph.D. in Computer Science from the University of California at Los Angeles in 2004 and 2006, respectively, followed by a Post-doctoral Fellowship in 2006-07 at the University of California at Berkeley, with a research focus on design and development of wearable computers for fall prevention in the elderly. From essentially the beginning, my research interests have generally been in embedded system design and signal processing, and specifically wearable computers and sensors and related hardware and software design – even the first funded research project I embarked upon in October 2006 was directed to “Electronic Textile Sensors for Stress Measurement in Soldiers” under a grant from the Air Force Office of Scientific Research (“AFOSR”).

4. I am presently an Associate Professor at Texas A&M University in Biomedical Engineering, Computer Science and Engineering, and Electrical and Computer Engineering. I also have since 2007 served as the Director of the Embedded Signal Processing Lab (“ESP”), a multi-million-dollar research lab funded from both the public and private sector and focused on how embedded processing and sensing systems employing advanced signal processing techniques can improve medical care and enhance lives. Multi-disciplinary research projects at the ESP under my direction as the principal investigator have included

“Wearable Dry-contact Reconfigurable Electroencephalography” and “Ultra Low Power Architectures for Wearable Computing,” such research resulting in a number of related wearable prototypes including an “EEG/ECG/EMG Acquisition System” and a “BioWatch.” The stated aim of our dry EEG electrode research is to “design a wearable dry contact EEG system that estimates and responds to variations in skin contact impedance across different electrodes as well as motion artifacts in real-time in order to improve the signal to noise ratio (SNR)/enhance signal processing accuracy.” Prior to joining the faculty at Texas A&M University and relocating the ESP there, I served as an Assistant Professor and then Associate Professor in Electrical Engineering at the University of Texas at Dallas from 2007 to 2015.

5. I have published over 140 book chapters and papers in refereed journals and conferences, most notably on such topics as “Power-Aware Activity Monitoring Using Distributed Wearable Sensors” and “Multi-Sensor Data-Driven Synchronization Using Wearable Sensors.” I have also contributed book chapters for treatises such as “Wearable Sensors: Fundamentals, Implementation and Applications” and “Wearable Monitoring Systems” and have been an invited speaker on numerous occasions. I have served as the general chair and technical program committee chair for several flagship conferences in the area of wearable computers and sensors, including the ACM Wireless Health 2012 and 2013, the

International Conference on Body Sensor Networks 2011, and the International Conference on Body Area Networks 2011. I am the recipient of the NSF CAREER award in 2012, the IEEE Real-Time & Embedded Technology & Applications Symposium (RTAS) best paper award in 2011, and the Andrew P. Sage best transactions paper award from IEEE Systems, Man and Cybernetics Society in 2014. I am also an associate editor for the IEEE Sensors Journal, the IEEE Internet of Things Journal, and the IEEE Journal of Biomedical and Health Informatics.

6. My Curriculum Vitae (Ex. SS 1013), including my publications and patents, is submitted herewith as Attachment A, which details my education, experience, and publications as briefly summarized above as an overview of some of my experience that is relevant to the matters set forth in this declaration.

**C. Compensation and Prior Testimony**

7. I am being compensated at a rate of \$400 per hour for my study and testimony in this matter. I am also being reimbursed for reasonable and customary expenses associated with my work and testimony in this matter. My compensation is not contingent on the outcome of this matter or the specifics of my testimony.

8. I have served as an expert witness prior to this matter, and specifically have provided expert testimony at trial or deposition or through other sworn

statements during the last four years in four other matters, each of which or my role therein remains confidential.

**D. Information Considered**

9. My opinions are based on my years of education, research, and experience, as well as my investigation and study of relevant materials. In forming my opinions, I have considered the materials referred to herein, including my review of the '951 Patent, its file history, and various prior art references as well as any other references referred to or cited in this declaration. I may rely upon these materials and/or additional materials to rebut arguments raised by the Patent Owner. I reserve my right to alter or supplement my analysis in response to any criticisms or alternative opinions offered by the Patent Owner or any other matter that might cause me to alter my opinion.

10. I understand that discovery may occur in this proceeding. I thus may also consider additional documents and information in forming any necessary opinions, including documents that may not yet have been provided to me, on which basis I reserve the right to modify or supplement my opinions and the bases therefor in light of any documents, testimony, or other evidence that may emerge during the course of this proceeding, including depositions that have yet to be taken.



11. Additionally, I may discuss my own work, teachings, research, experiments, and knowledge of the state of the art in the relevant time period as well as retrospectively as appropriate in forming my opinions as set forth herein. I may rely on handbooks, textbooks, technical literature, and the like to demonstrate the state of the art in the relevant time period and the evolution of relevant technologies.

12. Throughout this declaration, I refer to specific pages of patents and other technical documents. The citations are intended to be exemplary and not intended to convey that the citations are the only source of evidence to support the propositions for which they are cited.

13. All of the opinions stated in this declaration are based on my own personal knowledge and professional judgment. I am over 18 years of age, and if called as a witness during any proceeding in this matter I am prepared to testify competently about my opinions and the reasons therefor.

## **II. LEGAL STANDARDS FOR PATENTABILITY**

14. I have been informed of and understand the following legal principles, and I have applied these to my analyses herein. I am not an attorney and have not researched the law on patent invalidity. I am relying solely on instructions from Petitioner's attorneys for these legal standards.

15. It is my understanding that in the context of this proceeding, the party asserting unpatentability bears the burden to prove unpatentability by “a preponderance of the evidence.” It is my understanding that a preponderance of the evidence is evidence sufficient to show that a fact is more likely than not.

16. It is my understanding that for an invention claimed in a patent to be found patentable, it must be, among other things, new and not obvious in light of what came before it (the “prior art”).

17. It is my understanding that for purposes of this proceeding, the information that may be evaluated as prior art is limited to patents and printed publications. My analysis herein compares prior art patents and printed publications to the claims of the ‘951 Patent.

18. It is my understanding that a U.S. or foreign patent qualifies as prior art to a patent claim if the date of application and/or issuance of the prior art patent is prior to the purported date of invention of the patent claim.

19. I further understand that a U.S. or foreign patent or patent application qualifies as prior art to a patent claim if the date of issuance or publication of the prior art patent or application is more than one year before the earliest asserted priority date of the patent claim.

20. I further understand that a published U.S. patent application qualifies as prior art to a patent claim if the filing date of the prior art application is prior to

the purported date of invention of the patent claim and that in such context the requirement of a “published U.S. patent application” is met by an international patent application filed under the Patent Cooperation Treaty (“PCT”) and subsequently published by the World Intellectual Property Organization (“WIPO”) if such international application was filed after November 29, 2000, designated the United States, and was published in the English language, whereby the effective prior art date is the international filing date.

21. It is my understanding that the ‘951 Patent derived from a U.S. national stage patent application under 35 U.S.C. § 371, with the corresponding international PCT patent application itself claiming the benefit of a British patent application filed on December 27, 2002 (hereinafter “Priority Application”). Therefore, assuming adequate support in the Priority Application, the earliest effective filing date for the ‘951 Patent is December 27, 2002, and I have used that date as the earliest “date of invention” or “priority date” in my analyses.

22. It is my understanding that in the context of this proceeding, the claims of the patent, here the ‘951 Patent, must be given their broadest reasonable interpretation consistent with the specification, which is ultimately a matter of law for the arbiter of law to decide. The claims are then to be compared to the information in the prior art.

23. I understand that a patent may include two types of claims, independent claims and dependent claims. An independent claim stands on its own and includes only the limitations it recites. A dependent claim can depend from an independent claim or another dependent claim and so includes all the limitations that it recites in addition to all of the limitations recited in the claim(s) from which it depends.

24. I further understand that under a “broadest reasonable interpretation,” the words of the claim must be given their plain meaning, unless the inventor, acting as a lexicographer, has set forth special meaning to certain terms.

25. It is my understanding that one way in which prior art may render a patent claim unpatentable is when prior art can be shown to “anticipate” the claim. It is also my understanding that in addition to anticipation, the prior art can be shown to “render obvious” the claim, alone or in combination with other prior art.

26. Anticipation: It is my understanding that, for a patent claim to be “anticipated” by the prior art, each and every element or limitation recited in the claim, once properly construed, must be found, expressly or inherently (*i.e.*, necessarily present or implied), in a single prior art reference. Specifically, it is my understanding that claim limitations that are not expressly found in a prior art reference are inherent if the prior art necessarily functions in accordance with, or includes, the claim limitations. It is my understanding that extrinsic evidence, that

is, evidence outside of the anticipatory prior art reference, may be used in the analysis of whether a feature is inherently present in the prior art reference.

Additionally, the prior art reference must enable one of ordinary skill in the art to make and/or use (practice) the claimed invention without undue experimentation.

27. Obviousness: It is my understanding that a patent claim may be obvious even though it is not identically disclosed or described in a single prior art reference. An invention may be obvious “if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains.”

28. I understand that a person of ordinary skill in the art provides a reference point from which the prior art and claimed invention should be viewed. It is my further understanding that the obviousness inquiry should not be done in hindsight, but should be done through the eyes of one of ordinary skill in the relevant art at the time the subject patent was filed, such that this reference point prevents one from using his or her own insight or improper hindsight in deciding or determining whether a claim is obvious. For purposes here, I have applied my analyses to that understood by one of ordinary skill in the art as of December 27, 2002.

29. I understand, more generally, that a person having ordinary skill in the art is a hypothetical person who is used to analyze prior art without the benefit of hindsight. A person of ordinary skill in the art is presumed to be one who thinks along the lines of conventional wisdom in the art and is not one who undertakes to innovate, whether by extraordinary insights or by patent and often expensive systematic research.

30. I further understand that the hypothetical person of ordinary skill in the art is presumed to have knowledge of all references that are sufficiently related to one another and to the pertinent art, and to have knowledge of all arts reasonably pertinent to the particular problem that the claimed invention addresses.

31. It is my understanding that obviousness may be shown by one or more items of prior art including combinations of prior art references. It is also my understanding that the relevant inquiry into obviousness requires consideration of four factors: (a) the scope and content of the prior art; (b) the differences between the prior art and the claims at issue; (c) the knowledge or level of one of ordinary skill in the pertinent art; and (d) objective factors indicating obviousness or nonobviousness.

32. It is my understanding that the objective factors indicating obviousness or nonobviousness (*i.e.*, secondary considerations or factors) may include: (a) commercial success of products covered by the patent claims; (b) the

taking of licenses under the patent by others; (c) a long-felt but unmet need for the invention; (d) failed attempts by others to make the invention; (e) praise by others (particularly following initial skepticism); (f) copying of the invention by others in the field; (g) unexpected results achieved by the claimed invention; and (h) the patentee's approach being contrary to the accepted wisdom of the prior art.

33. I understand that a proper obviousness analysis generally requires a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements of multiple items of prior art in the way the claimed invention does. I understand that the items of prior art themselves may provide teaching, suggestion, motivation or other reason to combine, but other times the nexus linking two or more prior art references is simple common sense. I further understand that an obviousness analysis recognizes that market demand, rather than scientific literature, often drives innovation, and that a motivation to combine references may be supplied by the direction of the marketplace.

34. I have been informed of and understand that in 2007 the United States Supreme Court issued its decision in *KSR Int'l Co. v. Teleflex, Inc.*, which governs many of the principles concerning obviousness, and I have set out these understandings in the following paragraphs.

35. It is my understanding that a combination of familiar elements according to known methods is likely to be obvious when it does no more than

yield predictable results. It is my understanding that when a work is available in one field of endeavor, design incentives and other market forces can prompt variations of that work, either in the same field or a different one. If one of ordinary skill in the art can implement a predictable variation, such change would have been considered obvious. For example, a predictable variation of prior art is obvious if the claimed structure in a patent only substitutes one element for another element that is known in the field, unless the result is unexpected.

36. It is my understanding that if a technique has been used to improve one device, and one of ordinary skill in the art would have recognized that it would improve similar devices in the same way, using that technique to improve the other device would have been obvious, unless its actual application presents challenges in implementation or yields unexpected results.

37. It is my understanding that the obviousness analysis does not require precise teachings directed to the specific subject matter of the claim or claims at issue, but also can take account of “ordinary innovation” that does no more than yield predictable results, which are inferences and creative steps that one of ordinary skill in the art would normally employ.

38. It is my understanding that one can consider factors such as interrelated teachings of multiple patents, the effects of demands known to the design community or present in the marketplace, and the background knowledge



possessed by one of ordinary skill in the art to determine whether there was an apparent reason to have combined the known elements in the fashion claimed by the patent at issue. It is my further understanding that a motivation that would have been known to one of ordinary skill in the art, including common sense, or derived from the nature of the problem to be solved, is sufficient to explain why prior art references would have been combined. It is my understanding that common sense teaches that familiar items may have obvious uses beyond the particular application being described in a reference. The prior art considered can be directed to any need or problem known in the field of endeavor at the time of the invention and can provide a reason for combining the elements of the prior art in the manner claimed in the patent.

39. When there is such a design need or market pressure to solve a problem, and there are a finite number of identified, predictable solutions, one of ordinary skill in the art would have had good reason to pursue the known options within their technical grasp. If this leads to the anticipated success, it is likely the product of ordinary skill and common sense. The fact that a particular combination of prior art elements was “obvious to try” may indicate that the combination was obvious even if no one attempted the combination.

40. It is my understanding that a reference may “teach away” from the claimed inventions and therefore preclude a determination that the reference

renders the claimed invention obvious. It is my understanding that for a reference to “teach away,” one of ordinary skill in the art, upon reading the reference, would be discouraged from following the path set out in the reference. Said in another way, a reference that “teaches away” would have led one of ordinary skill in the art in a direction divergent from the path that was taken by the patentee. However, it is also my understanding that the mere disclosure of alternative designs in a reference does not necessarily teach away, nor does teaching away apply simply because a combination may be inferior as compared to better alternatives in the prior art.

41. I have been informed and understand that the obviousness analysis requires a comparison of the properly construed claim language to the prior art on an element-by-element or limitation-by-limitation basis.

### **III. THE ‘951 PATENT**

#### **A. Effective Filing Date of the ‘951 Patent**

42. The ‘951 Patent was filed on June 23, 2005 and assigned application No. 10/540,594. The face of the ‘951 Patent states that it was filed under 35 U.S.C. § 371 as a U.S. national stage patent application derived from an international patent application PCT No. PCT/IB03/05963, which itself claims foreign priority to a British patent application No. 0230361.8 filed on December 27, 2002 (hereinafter “Priority Application”).

43. It is my understanding based on this chain of priority that the earliest effective filing date to which the ‘951 Patent can claim benefit is December 27, 2002. It is also my understanding that the claims of the ‘951 Patent are only entitled to this date if the Priority Application provides sufficient disclosure of the claimed invention. For purposes of my analyses herein, I have used December 27, 2002 as the effective filing date of the ‘951 Patent for determining whether a reference is prior art.

**B. Description of the Background Technology Relevant to the ‘951 Patent**

44. The ‘951 Patent is directed to “performance improvements in substantially fabric based electrodes.” Ex. SS 1001 at 1:3-4. A stated object of the invention is thus “to provide a substantially fabric based electrode arrangement with improved performance in comparison with a fabric based electrode not benefitting from the ... invention.” *Id.* at 1:35-38.

45. As the one example of such “a fabric based electrode not benefitting from the ... invention,” over which the subject matter of the ‘951 Patent is purportedly an improvement, the ‘951 Patent cites to International Patent Application No. PCT/EP00/05235 to Demeyere, *et al.* entitled “Garment Comprising Electrode”, published as Publication No. WO 01/02052 on January 11, 2001 and filed June 7, 2000 (hereinafter “Demeyere”) (Ex. SS 1009). *See, e.g., Id.* at 1:5-34.

46. The ‘951 Patent characterized Demeyere as disclosing “a garment comprising at least two zones; one being formed of electrically insulative yarns and the other being formed of one or more electrically conductive yarns,” that is, a “textile based electrode.” *Id.* at 1:5-8 and 1:20-21.

47. Shortcomings of a “textile based electrode” as taught by Demeyere were identified as employing “an electro-conductive gel ... between the zone containing the electrically conductive yarns and the skin to assist the electrical contact between yarn and skin” or potentially having to use a higher percentage of electrically conductive material or yarns in the fabric electrode, in either case the ‘951 Patent asserting that such approaches were inferior, impractical, or undesirable in solving or attempting to solve the fundamental problem “that the electrical resistance between the conductive portion of the textile based electrode and the skin of a wearer to which the electrode is applied is high enough to render detection of electrical signals corresponding to the wearer’s heartbeat very difficult.” *Id.* at 1:12-34.

48. Regarding the use of an “electro-conductive gel,” specifically, the ‘951 Patent states that “[i]t is not always desirable to introduce such gel between an electrode and the skin for a number of reasons, but in any case people are not always happy to apply a liquid or gel to a fabric based article.” *Id.* at 1:15-19.

49. And regarding the prospect of incorporating more “electrically conductive yarns” in the electrode, the ‘951 Patent states that “there is an upper limit on the percentage of electrically conductive material that can be present in the electrode conductive portion, either for reasons of limitations imposed by the manufacturing process or because the feel or other physical property of the conductive portion would be adversely affected.” *Id.* at 1:27-34.

50. In sum, the ‘951 Patent asserts that in certain uses the disclosed “electrode arrangement ... provides detection of user signals when the basic knitted electrode of the type generally described by [Demeyere] may not.” *Id.* at 2:18-21.

51. Accordingly, aspects of the invention of the ‘951 Patent are recited as:

- “a fabric electrode arrangement exhibiting a first surface for application to the skin of a mammal, wherein said fabric electrode arrangement comprises at least one portion of material being substantially impermeable to moisture, said material being located on said first surface”;
- “a substantially textile article comprising the fabric electrode arrangement”;
- “a wearable article comprising the fabric electrode arrangement”; and
- “a garment comprising a fabric electrode arrangement exhibiting a first surface for application to the skin of a mammal, wherein said fabric electrode

arrangement comprises at least one portion of material being substantially impermeable to moisture, said material being located on said first surface.”

*Id.* at 1:39-44 and 3:15-27.

52. Thus, it can be seen that the “problem” described in the ‘951 Patent is to provide a “textile based electrode” or “fabric electrode arrangement” that has improved electrical signal detection capabilities as by lowering the resistance and thereby increasing the conductivity between the electrode and the skin of a wearer without compromising wearer comfort. **The “solution” presented in the ‘951 Patent for improving fabric electrode conductivity is essentially to provide a moisture impermeable material on, adjacent to, or embedded in the skin-facing surface of the fabric electrode**, with such electrode then incorporated in “a textile article,” “a wearable article,” or “a garment.”

53. However, as of the earliest priority date for the ‘951 Patent, which I have again assumed to be December 27, 2002 for purposes of this declaration, and as set forth more fully below, **one of ordinary skill in the art would have been familiar with the problems associated with bio-potential fabric electrodes and with a variety of structures and methods relating to fabric electrodes wherein a moisture impermeable material is placed on or adjacent to or otherwise forms or is integrated in the skin-facing surface of the electrode, in whole or in part, or is otherwise incorporated within the electrode.**

54. For example, and without limitation, prior art U.S. Patent No. 4,729,377 to Granek, *et al.* issued on March 8, 1988 (hereinafter “Granek”) (Ex. SS 1002) discloses electrodes formed of conductive cloth embedded in a garment, each having a tubular cylinder or conductor made of plastic, metal, or silicone rubber passing therethrough so as to at least partially define or form the skin-facing surface of the electrode, it being known that plastic, metal, and silicone rubber are moisture impermeable. *See, e.g.*, Ex. SS 1002 at 3:31-35; 4:9-13; 5:1-9; 6:67-7:2, and 7:8-10; and Figs. 6 and 12.

55. By way of further non-limiting example, prior art International Patent Application No. PCT/FI02/00132 to Reho, *et al.* published as Publication No. WO 02/071935 on September 19, 2002 and filed February 18, 2002 (hereinafter “Reho”) (Ex. SS 1003) discloses that a textile sensor may be formed having a moisture impermeable seal layer incorporated therein made of “a waterproof or non-respiring fabric, or a film-like material, such as suitable plastic, e.g. silicone plastic or rubber or laminate layer” for the express purpose of “prevent[ing] transpiration secreted [from the skin] from escaping the [conductive] contact layer” and thereby reducing the resistance between the electrode and the skin and thus improving the electrode’s performance when worn while not requiring grease or

other wetting to achieve the required conductivity. *See, e.g.*, Ex. SS 1003 at pp. 3-4.<sup>1</sup>

56. As a further non-limiting example, prior art U.S. Patent No. 6,270,466 to Weinstein, *et al.* issued on August 7, 2001 (hereinafter “Weinstein”) (Ex. SS 1011) discloses “fabric-reinforced conductive rubber electrodes” that are incorporated within a wearable headband or neck band and are expressly described as being “made from materials which are impermeable to water” for the stated purpose or benefit that “[m]oisture naturally present in the user’s skin builds up between the electrode and the user’s skin in a short time, allowing the skin to become conductive enough for the device to work without the need for special chemicals to be applied to the electrode.” *See, e.g.*, Ex. SS 1011 at Abstract, 2:52-54, 3:5-11, 4:4-5, and 12:49 and 51; Figs. 2, 3, and 4E.

57. As a still further non-limiting example, prior art U.S. Patent No. 4,941,961 to Noguchi, *et al.* issued on July 18, 1990 (hereinafter “Noguchi”) (Ex. SS 1004) discloses an “elastomeric electrode” formed of an electrically conductive fabric base with a moisture impermeable protective layer thereover of a conductive silicone or fluorine rubber, the electrode touted as having “excellent flexibility.” *See, e.g.*, Ex. SS 1004 at 1:56-57 and 3:21-40; Fig. 1.

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<sup>1</sup> All page citations to the Reho PCT publication are counted from or include the cover page and so effectively refer to the Exhibit page numbers in the lower right rather than the page numbers provided at the top of the specification pages of the actual application as filed.



58. As a still further non-limiting example, prior art U.S. Patent No. 4,664,118 to Batters issued on May 12, 1987 (hereinafter “Batters”) (Ex. SS 1008) discloses a wearable electrode-based therapeutic assembly wherein “[t]he skin is free from any externally applied liquid medium so that there is substantially dry contact between the skin and the electrically conducting material.” *See, e.g.*, Ex. SS 1008 at 3:51-59. Batters further explains that “[o]ne of the basic problems associated with ... use of a wet lubricant [such as a gel or cream] is that the skin tissue becomes mottled or macerated when there is prolonged use of the electrode in conjunction with the gel or lubricant.” *Id.* at 2:40-47 and 2:66-67.

59. As a still further non-limiting example, prior art U.S. Patent No. 4,867,166 to Axelgaard, *et al.* issued on September 19, 1989 (hereinafter “Axelgaard”) (Ex. SS 1010) discloses an electrical stimulation electrode comprising a conductive fabric with a “conductive adhesive fill[ing the] interstitial areas of the conductive fabric,” the fabric itself being a flexible “loose knit” blend of about 20% stainless steel and 80% polyester so as to maintain the required stretch without compromising the conductivity provided by the individual conductive fibers. *See, e.g.*, Ex. 1010 at Abstract, 4:13-18, 4:35-40, 4:51-59, and 5:8-12.

60. And as a still further non-limiting example, even prior art U.S. Patent No. 3,993,049 to Kater issued on November 23, 1976 (hereinafter “Kater”), cited

in the prosecution of the ‘951 Patent as noted below, teaches a base or skirt **24** portion of a fabric-adhesive-electrolyte electrode assembly that is configured to lie on or to in part form the skin-facing surface of the electrode and is formed of either metal or metalized plastic, in either case clearly being moisture impermeable. *See, e.g.,* Kater at 4:1-7, 5:30-41, 5:51-68, and 7:23-26; Fig. 2.

### **C. The Person of Ordinary Skill in the Art**

61. A person having ordinary skill in the art (“PHOSITA”) in the field of the ‘951 Patent in or about 2002 and prior would have good knowledge of sensor and electrode design in general, including knowledge of fabrics or textiles having electrically conductive fibers or properties as might be employed in sensor or electrode designs and related garments or “wearables.” This person would have gained this knowledge through an undergraduate degree in electrical engineering or an equivalent discipline and/or two or more years of work experience in bio-potential sensor or electrode design and/or fabrication.

### **D. Technical Overview of the ‘951 Patent**

62. The ‘951 Patent generally discloses an electrode arrangement **10** comprising a knitted electrically conductive fabric electrode portion **12** and at least one portion **14** of moisture impermeable electrically conductive material attached to the electrode portion **12**. Ex. SS 1001 at Abstract. During use the electrode arrangement **10** is applied to a wearer’s skin, with the moisture impermeable

portion **14** encouraging perspiration of a user and trapping the perspiration between the skin and the moisture impermeable portion **14** to reduce skin to electrode contact resistance and thereby increase the efficiency of detection of a user's heart rate or other electrical signals generated by a user. *Id.*

63. In the '951 Patent, the "at least one portion of material [**14**] which is substantially impermeable to moisture" is disclosed as being a silicon rubber material **14** that causes "the reduction of resistance over time ... due to moisture forming between material portion **14** and the wearer's skin." *See, e.g., Id.* at 3:55-58 and 5:26-30.

64. The '951 Patent further discloses that "the attachment [of the moisture impermeable material **14** to the conductive electrode portion **12**] does not need to be direct and ... is not mandatory because mere appropriate location of [the] material **14**, such that during use [the] material **14** electrically contacts [the electrode] portion **12**, either directly or indirectly, is sufficient to allow operation in accordance with the ... invention." *Id.* at 6:13-23.

65. All embodiments described in the '951 Patent are directed to a moisture impermeable portion **14** that is "conductive" or "electrically conductive." *See, e.g., Id.* at 3:49-62, 4:38-64, 5:31-39 and 6:1-43. In the preferred embodiment, this is accomplished by loading the silicone rubber material **14** with

carbon black and attaching it to the electrode portion **12** by “suitable electrically conductive adhesive.” *Id.* at 3:57-58 and 4:38-40.

66. The ‘951 Patent further discloses that the fabric electrode arrangement **10** is located on a textile article **11** or is essentially “integral with a garment.” *Id.* at 3:10-27 and 49-50. It is specifically disclosed in the illustrated embodiment that the “garment [is] in the form of a fabric band **11**” that is to be worn around the chest. *Id.* at 4:48-49. In any such garment, the electrode arrangement **10** is positioned to face or be against the wearer’s skin. *See, e.g., Id.* at 4:46-64.

#### **E. Prosecution History of the ‘951 Patent**

67. In a first Office Action mailed on November 13, 2007, claim 1 was initially rejected under 35 U.S.C. § 102(b) “as being clearly anticipated” by both U.S. Patent No. 3,993,049 to Kater issued on November 23, 1976 (hereinafter “Kater”) and U.S. Patent No. 3,954,100 to Sem-Jacobsen issued on May 4, 1976 (hereinafter “Sem-Jacobsen”). Ex. SS 1007 at p. 82.

68. In response through an “Amendment B” filed February 4, 2008, Patent Owner distinguished Kater in that because “the skirt [or base **24**, which the Examiner took to be the “substantially impermeable member,”] is displaced from the skin by a layer of an adhesive-electrolyte material [**28**] the metal connector **12** does not lie directly on the first surface.” *Id.* at pp. 69 and 82.

69. Sem-Jacobsen was characterized by Patent Owner as a device that is “porous and breathable and includes no moisture impermeable electrode portion” and so was distinguished on that basis. *Id.* at p. 69.

70. In addressing a Section 103 rejection in the same first Office Action of then-numbered claims 10 and 13, which became claims 1 and 5 of the ‘951 Patent, based on the combination of Sem-Jacobsen with U.S. Patent Application Pub. No. US 2004/0138546 to Reho dated July 15, 2004, which is the U.S. counterpart to International PCT Patent Application No. PCT/FI02/00132, referred to herein as “Ex. SS 1002” and “Reho,” Reho was ignored or otherwise not discussed in the February 4, 2008 “Amendment B” submission. *Id.* at pp. 70 and 83.

71. With the rejection of claim 1 as being anticipated by Kater maintained in a second non-final Office Action mailed on April 22, 2008, such was ultimately traversed in a responsive “Amendment C” filed July 22, 2008 simply by adding the limitation that the electrically conductive fabric of the electrode arrangement be “integral with a garment.” Rather than adding such limitation to claim 1 and canceling then-numbered claim 10, Patent Owner elected to cancel claim 1 and add the subject matter thereof to allowable former dependent claim 10, which claim was then renumbered as claim 1 upon issuance of the ‘951 Patent. *Id.* at pp. 29, 32, 39, 46, 49 and 58.

72. In the “Reasons for Allowance” included in the Notice of Allowance mailed on December 9, 2008 relating to the ‘951 Patent, the Examiner stated: “The prior art fails to disclose an electrode arrangement including a conductive fabric on which is located a substantially impermeable material that induces perspiration to enable superior signal detection.” *Id.* at p. 21. Patent Owner entered no comments regarding the stated “Reasons for Allowance,” instead only correcting an antecedent basis issue for then-numbered claim 13, which became claim 5 in the issued ‘951 Patent, in a Rule 312 Amendment entered along with issue fee payment on March 9, 2009. *Id.* at pp. 6 and 16.

73. The ‘951 Patent then issued on April 21, 2009. *Id.* at p. 1; Ex. SS 1001 at cover page.

#### **F. Challenged Claims**

74. I have analyzed claim 1, which is an independent claim and is reproduced below.

1. An electrode arrangement comprising:  
  
an electrically conductive fabric having a first surface for application  
  
to skin of a mammal; and  
  
at least one portion of material which is substantially impermeable to  
  
moisture, said material being located on said first surface,  
  
wherein said electrically conductive fabric is integral with a garment.

Ex. SS 1001 at 7:6-13.

75. I have also analyzed claims 2-4 that depend from claim 1, which dependent claims are reproduced below.

2. The electrode arrangement in accordance with claim 1 wherein said at least one portion of material is located directly on said first surface.

3. The electrode arrangement in accordance with claim 1 wherein said material is mechanically flexible.

4. The electrode arrangement in accordance with claim 1 wherein said material is silicone rubber loaded with conductive material.

*Id.* at 7:14-21.

#### **G. Claim Construction**

76. As explained above, it is my understanding that in an *inter partes* review, a claim is given its broadest reasonable interpretation in light of the specification of the patent. I agree that Petitioner's proffered constructions of the terms set forth below are reasonable.

77. The phrase "electrically conductive fabric" appears in claim 1 of the '951 Patent. In view of the prosecution history and/or other portions of the '951 Patent, a reasonable construction of this phrase is "a fabric capable of transmitting an electrical current." *See, e.g., Id.* at 1:39-44, 3:5-53, 4:3-7, and 6:44-48. The

phrase “electrically conductive fabric” does not appear in the specification of the ‘951 Patent. In introducing the full phrase in a responsive “Amendment C” filed on July 22, 2008, Patent Owner indicated only that the “subject matter was revised to address the 35 U.S.C. § 112 rejection” that was then outstanding, the Examiner indicating that “absent such fabric being conductive, no structure is presented to effect an operable electrode.” Ex. SS 1007 at pp. 46, 49, and 58. The specification further indicates that “[w]hile the present invention has been discussed with reference to a knitted electrode structure this is not a limiting feature of the present invention which has use in textile based electrodes in general, whether the electrodes are of a knitted, woven, embroidered, or non-woven structure.” Ex. SS 1001 at 6:44-48.

78. The phrase “a first surface for application to the skin of a mammal” also appears in claim 1 of the ‘951 Patent. In view of the ‘951 Patent, a reasonable construction of this phrase is “a surface of the electrically conductive fabric capable of contacting the skin.” *See, e.g., Id.* at 1:39-44, 3:21-27, and 3:49-55. This term is consistently used in the specification to describe or refer to that surface of the “fabric electrode arrangement” that faces or is oriented toward or is “intended to contact the skin of a wearer during electrode use.” *See, e.g., Id.* at 3:54-55.



79. The phrase “at least one portion of material which is substantially impermeable to moisture” also appears in claim 1 of the ‘951 Patent. In view of the ‘951 Patent, a reasonable construction of this phrase is “a material that prevents moisture to pass or diffuse through the material to a considerable degree.” *See, e.g., Id.* at Abstract and 3:55-58. The specification describes the “portion of material” as a “moisture impermeable conductive rubber” or specifically “silicon loaded with carbon black” “positioned on the wearer’s skin [during use of the electrode arrangement] which promotes gathering of perspiration between the skin and the portion of material by virtue of restricting the degree to which that skin is able to breath[e].” *See, e.g., Id.* at Abstract, 1:48-52, 2:52-54, 3:55-58, and 5:31-35. Otherwise, the specification provides no details or standard as to the degree to which the material would be “impermeable to moisture,” again only indicating that the purpose of the material is to “promote gathering of perspiration between the skin and the portion of material by virtue of restricting the degree to which that skin is able to breath[e] ... so as to reduce the electrical resistance present between the skin and electrode arrangement.” *See, e.g., Id.* at 1:48-60.

80. The phrase “located on said first surface” also appears in claim 1 of the ‘951 Patent in connection with the “at least one portion of material which is substantially impermeable to moisture.” In view of the prosecution history and/or other portions of the ‘951 Patent, a reasonable construction of this phrase is “the

material is located directly on the first surface or is over, adjacent to, touching, in electrical communication with, or embedded in the first surface.” *See, e.g., Id.* at 2:33-36, 4:38-44, and 6:13-23. Within the specification it is disclosed that the moisture impermeable material **14** is “located directly on said first surface [**13**]” or “attached to the electrode portion [**12**]” but also that “the attachment does not need to be direct and there may be one or more layer of electrically conductive material between the material **14** and [the electrode] portion **12**.” *See, e.g., Id.* at 2:33-36, 4:38-44, and 6:13-18. It is expressly disclosed that direct attachment “is not mandatory because mere appropriate location of [the moisture impermeable] material **14**, such that during use [the] material **14** electrically contacts [the electrode] portion **12**, either directly or indirectly, is sufficient to allow operation in accordance with the ... invention.” *Id.* at 6:18-23. During prosecution of the ‘951 Patent, the Examiner maintained that the electrode disclosed in U.S. Patent No. 3,993,049 to Kater as depicted below discloses an electrically conductive fabric, patch **36**, and a “substantially impermeable member, base **24** of connector **12**, on the surface of the patch.” Ex. SS 1007 at pp. 58, 59, and 82. Patent Owner attempted to argue that since the base **24** is “displaced from the skin by a layer of an adhesive-electrolyte material [**28**] the metal connector **12** does not lie directly on the first surface.” *Id.* at p. 69. The Examiner was unconvinced and Patent Owner ultimately amended claim 1 (then-numbered claim 10) to include the

further limitation that the electrically conductive fabric is integral with a garment as discussed herein in order to distinguish over Kater, thereby effectively conceding that Kater also disclosed a moisture impermeable portion “located on said first surface” of the electrically conductive fabric. *Id.* at pp. 29, 32, 39, 46, 49 and 58. This further evidences that any such moisture impermeable material may be located directly on the first surface or there may be one or more intermediate layers of further material between the first surface and the material, or essentially that in being “located on said first surface” the moisture impermeable material may even be embedded within the first or skin-facing surface of the electrode.

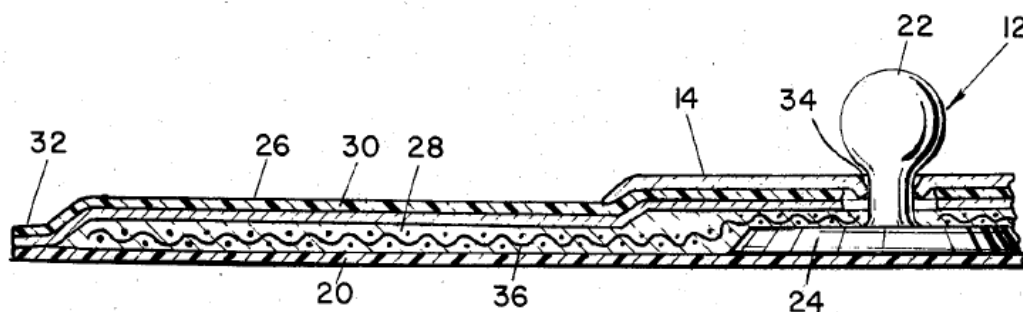


Fig. 2 of U.S. Pat. No. 3,993,049 to Kater

81. The phrase “integral with a garment” also appears in claim 1 of the ‘951 Patent in connection with the “electrically conductive fabric.” In view of the ‘951 Patent, a reasonable construction of this phrase is “attached to or integrated in a wearable textile article.” *See, e.g.*, Ex. SS 1001 at 3:18-50 and 4:27-49, and Fig. 2. The specification of the ‘951 Patent discloses that the “garment” is a “wearable article” or “textile article **11**” such as “a fabric band **11** ... worn around the chest.”

*See, e.g., Id.* at 3:18-20, 3:49-50, and 4:48-49, and Fig. 2. It is further disclosed that “[t]he electrically conductive electrode portion **12** may be sewn, glued or otherwise attached to the textile article **11** [or] may be an integral part of the textile article **11**.” *Id.* at 4:27-30.

82. With regard to the remaining terms used in the claims of the ‘951 Patent, I have applied their ordinary and customary meaning as understood by one of ordinary skill in the art using the broadest reasonable construction.

83. I have been informed and understand that the claim construction standard in this proceeding differs from that used in U.S. district court litigation. Accordingly, to the extent I provide any opinions in U.S. district court litigation, I reserve the right to provide opinions and analyses regarding different constructions for any term of the ‘951 Patent in any U.S. district court litigation.

#### **IV. PRIOR ART REFERENCES**

84. I include in this declaration five prior art references with exemplary citations identifying the relevant features related to the language of claims 1-4 of the ‘951 Patent. I have also described combinations of these prior art references that when combined render claims 1-4 of the ‘951 Patent invalid.

85. The citations presented in the body of this declaration correspond to the teachings disclosed in exemplary items of prior art that identify (a) the problem(s) confronted by one of ordinary skill in the art, (b) an express suggestion

to make one or more of the combinations, (c) an implicit suggestion to make one or more of the combinations, and/or (d) the knowledge of those skilled in the art as to the applicable field of technology.

86. It is my opinion that claims 1-4 of the '951 Patent are anticipated and/or rendered obvious in light of the prior art specifically discussed in this declaration. Below I describe five particular references related to the features recited in the challenged claims.

87. I have personally reviewed the references cited in this declaration. It is my opinion that a person of ordinary skill in the art would consider at least the five prior art references identified as follows and discussed further below:

<b>Ex.</b>	<b>Reference</b>	<b>Abbrev.</b>
SS 1002	U.S. Patent No. 4,729,377 entitled "Garment Apparatus for Delivering or Receiving Electric Impulses", issued on March 8, 1988 and filed May 22, 1984.	Granek
SS 1003	International Patent Application No. PCT/FI02/00132 entitled "A sensor arrangeable on the skin", published as Publication No. WO 02/071935 on September 19, 2002 and filed February 18, 2002.	Reho
SS 1004	U.S. Patent No. 4,941,961 entitled "Flexible Elastomer Electrode", issued July 18, 1990 and filed April 21, 1989.	Noguchi
SS 1005	U.S. Patent No. 568,095 entitled "Therapeutic Electrode", issued September 22, 1896 and filed April 17, 1896.	Muir
SS 1006	U.S. Patent No. 4,207,904 entitled "Constant Power Density Electrode Adapted To Be Useful in Bio-Medical Applications", issued June 17, 1980 and filed September 25, 1978.	Greene

88. Other references and knowledge described earlier in this declaration are relevant to show the state of the art, *i.e.*, what a person of ordinary skill in the art would have known when using the references identified above, or to use in various combinations with the references identified above to render claims 1-4 invalid and as motivation for any such combinations.

**A. U.S. Patent No. 4,729,377 entitled “Garment Apparatus for Delivering or Receiving Electric Impulses” (“Granek”) (Ex. SS 1002)**

89. Granek has a filing date of May 22, 1984 and issued on March 8, 1988. Ex. SS 1002 at cover page.

90. It is my understanding that based on at least the publication date of March 8, 1988, Granek is prior art to the ‘951 Patent under at least 35 U.S.C. § 102(b) because it was patented more than one year before the earliest priority date of the ‘951 Patent of December 27, 2002.

91. One of ordinary skill in the art would have recognized that Granek is directed to subject matter that is highly related to that of the ‘951 Patent, namely, fabric- or textile-based wearable electrode arrangements for the purpose of acquiring electrical or bio-potential signals corresponding to physiological characteristics of the wearer.

92. Granek discloses a garment **10** made of conventional woven fabric such as cotton, polyester, or nylon and having a multiplicity of insulated

conductors **12** terminating at designated points **14** defining electrodes **24** and **38** that may be made of conductive cloth attached on the inside of the garment **10** for the purpose of receiving electrical signals from various parts of the body while allowing body movement and keeping such electrodes secure. *See, e.g., Id.* at 1:55-58; 3:6-11 and 31-35; 4:9-13; 5:1-9; and 6:22-24; Figs. 6 and 12.

93. Granek further discloses that the conductive fabric electrodes **24** and **38** include a conductive or non-conductive tubular cylinder **22** made of rubber, plastic, or metal or a conductor **46**, inherently made of metal or conductive rubber, any of which is well known in the art as being impermeable to moisture, each member **22** or **46** being effectively coterminous with the electrode **24** or **38** or positioned on, over, adjacent to, touching, in electrical communication with, or embedded within the inside surface of the electrode **24** or **38** and thus collectively intended to be positioned against the skin when the garment **10** is worn. *See Id.* at 4:9-13; 5:1-9; and 6:67-7:2; and Figs. 6 and 12.

94. Alternatively, Granek discloses that “[s]elected designated points [**14** of the garment **10**] may be made of [c]onductive cloth for special purposes.” *Id.* at 3:31-33. As such, the electrically conductive fabric may be formed within the garment **10** itself, in which case the electrode **24** placed on the inside of the garment **10** at such points **14** and formed of metal or silicone rubber defines the

portion of moisture impermeable material on the inside or skin-facing surface of the electrode. *Id.* at 4:9-11 and 7:1-2; and Figs. 5 and 6.

**B. International Patent Application No. PCT/FI02/00132 entitled “A sensor arrangeable on the skin” (“Reho”) (Ex. SS 1003)**

95. Reho was filed on February 18, 2002 and claims priority to a Finnish application filed on February 19, 2001. Ex. SS 1003 at p. 1.

96. It is my understanding that based on at least the international filing date of February 18, 2002, which application was later published in the English language under Publication No. WO 02/071935 on September 19, 2002, Reho is prior art to the ‘951 Patent under at least 35 U.S.C. § 102(e)(1) because it was filed before the earliest priority date of the ‘951 Patent of December 27, 2002.

97. One of ordinary skill in the art would have recognized that Reho and the ‘951 Patent disclose very similar subject matter. Both references are directed to fabric or textile electrode or sensor arrangements for application to the skin, even such electrodes having moisture impermeable materials incorporated therein, and both further relate to the incorporation of such electrodes in wearable garments.

98. For example, Reho and the ‘951 Patent both disclose that the electrode can be of a knitted or woven construction with the conductive fibers or yarns integrated directly within the fabric of a garment or textile for the purposes of



function and wearer comfort. *See, e.g.*, Ex. SS 1001 at 3:5-14; 4:3-9; and 4:30-37; and Figs. 1 and 2; and Ex. SS 1003 at pp. 2-3 and Figs 2 and 3.

99. Reho and the '951 Patent further both disclose that the electrode may be formed having a moisture impermeable material incorporated therein for the express purpose of retaining perspiration and thereby reducing the resistance between the electrode and the skin and thus improving the electrode's performance when worn. *See, e.g.*, Ex. SS 1001 at Abstract; and Ex. SS 1003 at p. 3. Reho expressly discloses that the textile sensor may be formed having a moisture impermeable seal layer incorporated therein made of "a waterproof or non-respiring fabric, or a film-like material, such as suitable plastic, e.g. silicone plastic or rubber or laminate layer" for the express purpose of "prevent[ing] transpiration secreted [from the skin] from escaping the [conductive] contact layer," which thus "enhances the contact between the skin and the contact layer and increases the electric conductivity of the contact layer." *See, e.g.*, Ex. SS 1003 at p. 3.

**C. U.S. Patent No. 4,941,961 entitled "Flexible Elastomer Electrode" ("Noguchi") (Ex. SS 1004)**

100. Noguchi has a filing date of April 21, 1989 and issued on July 18, 1990. Ex. SS 1004 at cover page.

101. It is my understanding that based on at least the publication date of July 18, 1990, Noguchi is prior art to the '951 Patent under at least 35 U.S.C. §

102(b) because it was patented more than one year before the earliest priority date of the ‘951 Patent of December 27, 2002.

102. One of ordinary skill in the art would have recognized that Noguchi is directed to subject matter that is highly related to that of the ‘951 Patent, namely, fabric- or textile-based electrode arrangements having moisture impermeable materials incorporated therein.

103. Specifically, Noguchi discloses that an electrode “[b]ase **11** is formed of a fabric material, such as satin, twill, plain woven fabric with textile weave organic fiber yarns ... coated ... with conductive material, such as nickel, copper, zinc, etc. [or otherwise having] electrically conductive elements ... provided in the yarn.” Ex. SS 1004 at 3:21-27.

104. Further, Noguchi discloses that a protective layer **12** “of silicone or fluorine rubber provided with [highly electrically conductive] distributed carbon or oil therein” is formed over or surrounding the base **11**. *Id.* at 3:34-38; Fig. 1.

**D. U.S Patent No. 568,095 entitled “Therapeutic Electrode” (“Muir”) (Ex. SS 1005)**

105. Muir was filed on April 17, 1896 and issued on September 22, 1896. Ex. SS 1005 at cover page and p. 1.

106. It is my understanding that based on at least the publication date of September 22, 1896, Muir is prior art to the ‘951 Patent under at least 35 U.S.C. §

102(b) because it was patented more than one year before the earliest priority date of the ‘951 Patent of December 27, 2002.

107. One of ordinary skill in the art would have recognized that Muir is directed to subject matter that is highly related to that of the ‘951 Patent, namely, cloth or woven electrodes suitable for application to the skin, and particularly those that do not require wetting but may instead be used dry by employing a moisture impermeable material in the electrode, as is a stated object of the ‘951 Patent.

108. Muir specifically discloses a multi-layered electrode having “a backing **A**, which may be of ... cloth ...”, “a sheet **B** of electroconducting material of a flexible character,” for example “a partly metallic sheet, such ... as tinsel-cloth” interwoven with “metal threads”, and a “pliable layer **C**” located on top of the skin-facing surface of the sheet **B** of electroconducting material, layer **C** being made from combining primarily gelatin and glycerin as a plasticizer to form a substantially moisture impermeable layer, which would substantially prevent the escape of perspiration when placed on the skin. *Id.* at p. 1, lns. 44-70; Figs. 1-2.

**E. U.S. Patent No. 4,207,904 entitled “Constant Power Density Electrode Adapted to Be Applied in Bio-Medical Applications” (“Greene”) (Ex. SS 1006)**

109. Greene was filed on September 25, 1978 and issued on June 17, 1980. Ex. SS 1006 at cover page.

110. It is my understanding that based on at least the publication date of June 17, 1980, Greene is prior art to the '951 Patent under at least 35 U.S.C. § 102(b) because it was patented more than one year before the earliest priority date of the '951 Patent of December 27, 2002.

111. One of ordinary skill in the art would have recognized that Greene is directed to subject matter that is highly related to that of the '951 Patent, namely, electrodes suitable for application to the skin, and particularly those that include a lower or skin-contacting layer of electrically conducting rubber.

112. Greene specifically discloses that “[l]ower layer **22** comprises a relatively thin ... section of electrically conducting rubber,” rubber being well known for the inherent property of being impermeable to moisture. *Id.* at 4:28-30; Figs. 2 and 3.

## **V. ANALYSIS OF THE CHALLENGED CLAIMS AGAINST THE PRIOR ART**

### **A. Application of the Prior Art to the Claims**

113. Based on my review of the prior art, and particularly the references cited in detail in this declaration, it is my opinion that the subject matter of each of the challenged claims 1-4 of the '951 Patent is anticipated by or would have been obvious to one of ordinary skill in the art in view of the known prior art.

114. I understand that each of the prior art references analyzed in this declaration meets the legal requirements for prior art to the ‘951 Patent, and I have performed my analyses with that understanding.

115. Based on my analysis, I conclude that the challenged claims 1-4 of the ‘951 Patent are anticipated and/or rendered obvious by the following prior art:

<b>Claims</b>	<b>Proposed Statutory Rejections for the ‘951 Patent</b>
1-3	Anticipated under §102(b) by Granek
4	Obvious under §103(a) over Granek in view of Noguchi
1-4	Obvious under §103(a) over Reho in view of Muir
1-4	Obvious under §103(a) over Reho in view of Greene
1-3	Anticipated under §102(e) by Reho

116. I have analyzed each of these references on a claim element-by-claim element basis in the accompanying claim charts and analysis shown below.

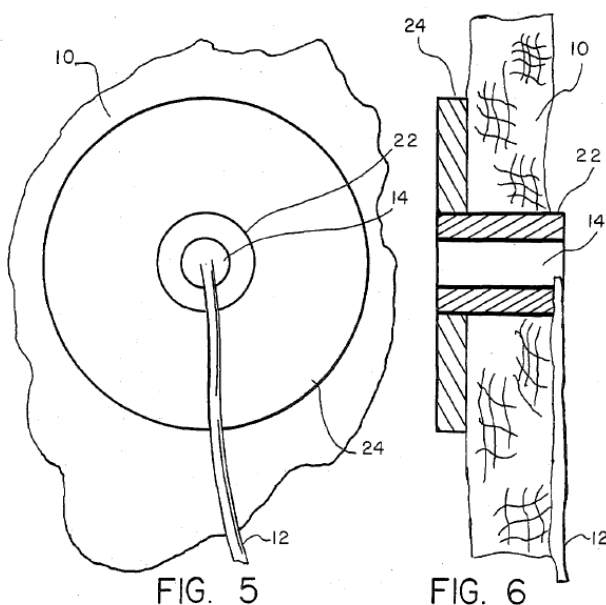
## **B. Anticipation of Claims 1-3 by Granek**

### Claim 1

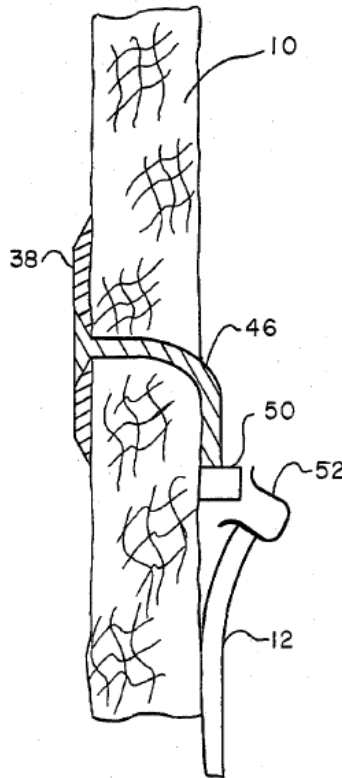
117. Granek discloses an electrode arrangement, stating that “an electrode **24** [is] placed on the inside of the garment **10** ....” Ex. SS 1002 at 4:10-11. Thus, the invention disclosed by Granek fits squarely within the “electrode arrangement” disclosure of the ‘951 Patent as evidenced by the claim 1 preamble.

118. Granek discloses “a garment **10** in the form of a covering for the human torso, having embedded in the garment a multiplicity of insulated conductors **12** ... terminat[ing] at designated points **14**.” *Id.* at 3:6-11. “Selected designated points [**14**] may be made of [c]onductive cloth for special purposes[,

which] cloth might be, for example, HI-MEG R Conductive Products” conductive fabric material. *Id.* at 3:31-35. Specifically, the “electrodes **24** and **38** [that may be selectively positioned at the designated points **14**] may be ... conductive cloth [such] as HI-MEG.” *Id.* at 4:9-13; 5:1-9; and 7:8-10; and Figs. 5, 6 and 12. A garment **10** is thus described that may cover at least a portion of the skin, wherein the garment **10** has one or more designated points **14** selectively comprising an electrode **24** or **38** on the inside or skin-facing surface of the garment **10** and made of conductive fabric, such that when worn, the garment **10** and the integral conductive fabric portion thereof will have an inner or first surface that is applied to the skin of a human or mammal. *See, Id.* at 3:4-23 and 31-35; 4:9-13; and 5:8-9; and Figs. 5 and 6. Therefore, the related limitations of claim 1 of the ‘951 Patent of “an electrically conductive fabric having a first surface for application to [the] skin of a mammal” are literally met.



119. Regarding the further limitation of “at least one portion of material which is substantially impermeable to moisture, said material being located on said first surface,” Granek again discloses that “an electrode **24** [or **38** is] placed on the inside of the garment **10** ...,” which “may be ... conductive cloth [such] as HI-MEG.” *Id.* at 4:9-13 and 5:1-9; and Figs. 6 and 12. Further, in one embodiment a tubular cylinder **22** passing through the garment **10** and the electrode **24** so as to also be at the inside or skin-facing surface of the garment **10** at the designated point **14** or of the electrode **24** “might be made of plastic or rubber ... or metal or silicone rubber.” *Id.* at 6:67-7:2; and Fig. 6. Similarly, in an alternative embodiment, a conductor **46** with a flared end on the skin-facing side of the assembly passes through the fabric electrode **38** and the garment **10**, thereby forming the skin-facing surface of the electrode **38** as having an integral conductor **46** co-located at the first or inside or skin-facing surface of the electrode assembly and partially covering the electrode **38**. *Id.* at 5:1-9; Fig. 12.



Granek Fig. 12

120. As discussed above in reference to the previous claim element, Granek thus describes embodiments wherein at least one of the designated points **14** comprises an electrode **24** or **38** made of conductive fabric located on the inside of the garment **10** and a conductive or non-conductive tubular cylinder **22** made of rubber, plastic or metal or a conductor **46**, inherently made of metal or conductive rubber, any of which is well known in the art as being impermeable to moisture, each member **22** or **46** being effectively coterminous with the electrode **24** or **38** or positioned on, over, adjacent to, touching, in electrical communication with, or embedded in the first or inside or skin-facing surface and thus collectively intended



to be positioned against the skin. *See, Id.* at 4:9-13; 5:1-9; and 6:67-7:2; and Figs. 6 and 12. Accordingly, Granek expressly discloses multiple embodiments wherein a moisture impermeable material such as the tubular cylinder **22** or the flared end of the conductor **46** is located on the first surface of the electrically conductive fabric electrode **24** or **38**, thereby literally meeting the limitation of claim 1 of “at least one portion of material which is substantially impermeable to moisture, said material being located on said first surface.”

121. Alternatively, Granek again discloses as noted above that “[s]elected designated points [**14** of the garment **10**] may be made of [c]onductive cloth for special purposes[, which] cloth might be, for example, HI-MEG R Conductive Products” conductive fabric material. *Id.* at 3:31-35. Accordingly, Granek also teaches that a portion **14** of the garment **10** itself may define the “electrically conductive fabric having a first surface for application to skin of a mammal.” Relatedly, regarding the “at least one portion of material which is substantially impermeable to moisture, said material being located on said first surface” of the electrically conductive fabric, which moisture impermeable material may be conductive according to the ‘951 Patent (*see, e.g.*, Ex. SS 1001 at Abstract, 2:52-54 and 3:55-58), Granek discloses that “an electrode **24** [is] placed on the inside of the garment **10** ...” and that “[i]n the conductive embodiment ... the electrode **24** might be made of metal or silicone rubber.” *See*, Ex. SS 1002 at 4:9-11; 7:1-2; and

Figs. 5-6. Thus, Granek describes an embodiment where one or more of the designated points **14**, where electrodes are positioned, is made of conductive fabric, which may be woven as part of the non-conductive fabric of the garment **10** or layered at the designated point **14**. The electrode **24** is located on the inside of the garment **10** at a designated point **14**, and is intended to be positioned against the skin. Accordingly, the electrode **24** is located between the inner surface of the conductive portion of the fabric and the skin. The electrode **24** may be made of silicone rubber, which is well known in the art as being impermeable to moisture. It follows that the silicone rubber electrode **24** can be considered the claimed at least one portion of moisture impermeable material, where the silicone rubber electrode **24** is located on the first or inner surface of the conductive portion **14** of the garment **10**, thereby again literally meeting all the limitations of claim 1 of the '951 Patent.

122. As noted above in connection with the first claim element, Granek describes a variety of garment configurations and uses for particular areas of the body or body parts. *See, Id.* at 3:4-23; and Figs. 1 and 2. Further, Granek describes embodiments wherein the conductive fabric electrode **24** or **38** is integral with the garment **10** as by being “sewed, glued, welded or attached by any other means” onto the non-conductive fabric which comprises the garment **10**. *See, Id.*

at 5:8-14; 6:13-15; 7:3-38; and 7:63-8:8. Thus, the limitation that the “electrically conductive fabric is integral with a garment” is also literally met.

123. Therefore, all limitations of claim 1 of the ‘951 Patent are literally met by Granek alone, even based on multiple embodiments and readings of Granek.

### Claim 2

124. Regarding dependent claim 2, which adds the further limitation that “said at least one portion of material is located directly on said first surface,” it is clear that this limitation is literally met by Granek as well.

125. With reference to Figures 5, 6 and 12 of Granek as noted above in connection with the anticipation of claim 1, the portion of moisture-impermeable material defined by the central tubular cylinder **22** or conductor **46** is located directly on the first or inner or skin-facing surface of the conductive fabric electrode **24** or **38**. Alternatively, where the designated points **14** of the garment **10** are themselves conductive fabric and the electrode **24** located at each point **14** is silicone rubber as also taught by Granek as set forth above, it is clear that such construction thus entails a moisture impermeable material located directly on the first or skin-facing surface of the electrically conductive fabric to form the electrode arrangement.

### Claim 3

126. Regarding dependent claim 3, which adds the further limitation that “said [moisture impermeable] material is mechanically flexible,” Granek once again clearly discloses such structure.

127. As discussed above, in one embodiment taught by Granek, the tubular cylinder **22** passing through the garment **10** and the electrode **24** so as to also be at the inside or skin-facing surface of the garment **10** at the designated point **14** or of the electrode **24** “might be made of plastic or rubber ... or metal or silicone rubber.” *See, Id.* at 6:67-7:2; and Fig. 6. In an alternative embodiment, “the electrode **24** might be made of ... silicone rubber.” *See, Ex. SS 1002* at 6:67-7:2. Thus, in both embodiments taught by Granek, where either the tubular cylinder **22** or the electrode **24** defines the moisture impermeable material, a mechanically flexible material such as silicone rubber may form the moisture impermeable portion of material.

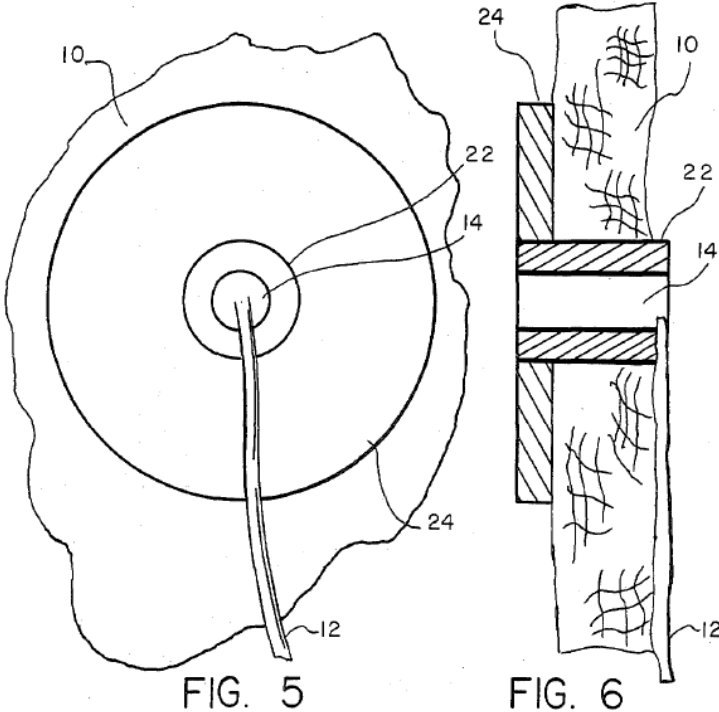
128. That silicone rubber as the moisture impermeable material is “mechanically flexible” is evidenced by statements in the ‘951 Patent indicating that the recited moisture impermeable material is “silicone rubber” just as disclosed in Granek and that such is “flexible” or “able to flex in sympathy with the first surface of the electrode arrangement.” *See, e.g., Ex. SS 1001* at 2:40-42, 52-54 and 59-64; *see also*, ¶ 125, *supra*.

129. That any such moisture impermeable material or rubber is “mechanically flexible” is further evidenced by the general prior art, wherein, for example, a fabric electrode covered in a conductive silicone rubber is described as “highly flexible.” *See, e.g.*, Ex. SS 1004 at 3:21-40 and 10:35-40.

130. Based on the foregoing, it is clear that all limitations of claims 1-3 of the ‘951 Patent are literally found in Granek.

131. The claim charts below illustrate how Granek anticipates claims 1-3:

<b>Claim 1</b>	<b>Citations from Granek and Discussion of Citations</b>
An electrode arrangement comprising:	Granek discloses an electrode arrangement, stating that “an electrode <b>24</b> [is] placed on the inside of the garment <b>10</b> ....” Ex. SS 1002 at 4:10-11.
an electrically conductive fabric having a first surface for application to skin of a mammal; and	<p>Granek discloses “a garment <b>10</b> in the form of a covering for the human torso, having embedded in the garment a multiplicity of insulated conductors <b>12</b> ... terminat[ing] at designated points <b>14</b>.” <i>Id.</i> at 3:6-11. “Selected designated points [<b>14</b>] may be made of [c]onductive cloth for special purposes[, which] cloth might be, for example, HI-MEG R Conductive Products” conductive fabric material. <i>Id.</i> at 3:31-35. Specifically, the “electrodes <b>24</b> and <b>38</b> [that may be selectively positioned at the designated points <b>14</b>] may be ... conductive cloth [such] as HI-MEG.” <i>Id.</i> at 4:9-13; 5:1-9; and 7:8-10; and Figs. 5, 6 and 12.</p> <p>A garment <b>10</b> is thus described that may cover at least a portion of the skin, wherein the garment <b>10</b> has one or more designated points <b>14</b> selectively comprising an electrode <b>24</b> or <b>38</b> on the inside or skin-facing surface of the garment <b>10</b> and made of conductive fabric, such that when worn, the garment <b>10</b> and the integral conductive fabric portion thereof will have an inner or first surface that is applied to the skin of a human or mammal. <i>See, Id.</i> at 3:4-23 and 31-35; 4:9-13; and 5:8-9; and Figs. 5 and 6.</p>

Claim 1	Citations from Granek and Discussion of Citations
	 <p style="text-align: center;">FIG. 5                      FIG. 6</p>
<p>at least one portion of material which is substantially impermeable to moisture, said material being located on said first surface,</p>	<p>In one embodiment a tubular cylinder <b>22</b> passing through the garment <b>10</b> and the electrode <b>24</b> so as to also be at the inside or skin-facing surface of the garment <b>10</b> at the designated point <b>14</b> or of the electrode <b>24</b> “might be made of plastic or rubber ... or metal or silicone rubber.” <i>Id.</i> at 6:67-7:2; and Fig. 6.</p> <p>Similarly, in an alternative embodiment, a conductor <b>46</b> with a flared end on the skin-facing side of the assembly passes through the fabric electrode <b>38</b> and the garment <b>10</b>, thereby forming the skin-facing surface of the electrode <b>38</b> as having an integral conductor <b>46</b> co-located at the first or inside or skin-facing surface of the electrode assembly and partially covering the electrode <b>38</b>. <i>Id.</i> at 5:1-9; Fig. 12.</p>

Claim 1	Citations from Granek and Discussion of Citations
	<div data-bbox="743 258 1084 1031" data-label="Image"> </div> <p data-bbox="808 1094 1036 1129">Granek Fig. 12</p> <p data-bbox="423 1224 1409 1728">Granek thus describes embodiments wherein at least one of the designated points <b>14</b> comprises an electrode <b>24</b> or <b>38</b> made of conductive fabric located on the inside of the garment <b>10</b> and a conductive or non-conductive tubular cylinder <b>22</b> made of rubber, plastic or metal or a conductor <b>46</b>, inherently made of metal or conductive rubber, any of which is well known in the art as being impermeable to moisture, each member <b>22</b> or <b>46</b> being effectively coterminous with the electrode <b>24</b> or <b>38</b> or positioned on, over, adjacent to, touching, in electrical communication with, or embedded in the first or inside or skin-facing surface and thus collectively intended to be positioned against the skin. <i>See, Id.</i> at 4:9-13; 5:1-9; and 6:67-7:2; and Figs. 6 and 12.</p> <p data-bbox="423 1776 1390 1894">Alternatively, Granek again discloses that “[s]elected designated points [<b>14</b> of the garment <b>10</b>] may be made of [c]onductive cloth for special purposes[, which] cloth might be, for example, HI-</p>

Claim 1	Citations from Granek and Discussion of Citations
<p>wherein said electrically conductive fabric is integral with a garment.</p>	<p>MEG R Conductive Products” conductive fabric material. <i>Id.</i> at 3:31-35. Granek thus also teaches that a portion <b>14</b> of the garment <b>10</b> itself may define the “electrically conductive fabric having a first surface for application to skin of a mammal.” Further, Granek discloses that “an electrode <b>24</b> [is] placed on the inside of the garment <b>10</b> ...” and that “[i]n the conductive embodiment ... the electrode <b>24</b> might be made of metal or silicone rubber.” <i>See</i>, Ex. SS 1002 at 4:9-11; 7:1-2; and Figs. 5-6. Thus, the silicone rubber electrode <b>24</b> can be considered the claimed at least one portion of moisture impermeable material, where the silicone rubber electrode <b>24</b> is located on the first or inner surface of the conductive portion <b>14</b> of the garment <b>10</b>.</p>
	<p>Granek describes a variety of garment configurations and uses for particular areas of the body or body parts. <i>See, Id.</i> at 3:4-23; and Figs. 1 and 2. Further, Granek describes embodiments wherein the conductive fabric electrode <b>24</b> or <b>38</b> is integral with the garment <b>10</b> as by being “sewed, glued, welded or attached by any other means” onto the non-conductive fabric which comprises the garment <b>10</b>. <i>See, Id.</i> at 5:8-14; 6:13-15; 7:3-38; and 7:63-8:8.</p> <div data-bbox="703 1106 1127 1688"> <p>FIG. 1</p> </div>



<b>Claim 2</b>	<b>Citations from Granek and Discussion of Citations</b>
The electrode arrangement in accordance with claim 1 wherein said at least one portion of material is located directly on said first surface.	With reference to Figures 5, 6 and 12 of Granek as noted above in connection with the anticipation of claim 1, the portion of moisture-impermeable material defined by the central tubular cylinder <b>22</b> or conductor <b>46</b> is located directly on the first or inner or skin-facing surface of the conductive fabric electrode <b>24</b> or <b>38</b> . Alternatively, where the designated points <b>14</b> of the garment <b>10</b> are themselves conductive fabric and the electrode <b>24</b> located at each point <b>14</b> is silicone rubber as also taught by Granek as set forth above, it is clear that such construction thus entails a moisture impermeable material located directly on the first or skin-facing surface of the electrically conductive fabric to form the electrode.

<b>Claim 3</b>	<b>Citations from Granek and Discussion of Citations</b>
The electrode arrangement in accordance with claim 1 wherein said material is mechanically flexible.	<p>In one embodiment taught by Granek, the tubular cylinder <b>22</b> passing through the garment <b>10</b> and the electrode <b>24</b> so as to also be at the inside or skin-facing surface of the garment <b>10</b> at the designated point <b>14</b> or of the electrode <b>24</b> “might be made of plastic or rubber ... or metal or silicone rubber.” <i>See, Id.</i> at 6:67-7:2; and Fig. 6. In an alternative embodiment, “the electrode <b>24</b> might be made of ... silicone rubber.” <i>See, Ex. SS 1002</i> at 6:67-7:2. Thus, in both embodiments taught by Granek, a mechanically flexible material such as silicone rubber may form the moisture-impermeable portion of material.</p> <p>That silicone rubber as the moisture impermeable material is “mechanically flexible” is evidenced by statements in the ‘951 Patent indicating that the recited moisture impermeable material is “silicone rubber” just as disclosed in Granek and that such is “flexible” or “able to flex in sympathy with the first surface of the electrode arrangement.” <i>See, e.g., Ex. SS 1001</i> at 2:40-42, 52-54 and 59-64; <i>see also</i>, ¶ 125, <i>supra</i>.</p> <p>That any such moisture impermeable material or rubber is “mechanically flexible” is further evidenced by the general prior art, wherein, for example, a fabric electrode covered in a conductive silicone rubber is described as “highly flexible.” <i>See, e.g., Ex. SS 1004</i> at 3:21-40 and 10:35-40.</p>

### C. Obviousness of Claim 4 Over Granek in View of Noguchi

132. As discussed above and referenced in the claim charts, I believe Granek discloses each and every limitation of claims 1-3 and so anticipates those claims. *See*, ¶ 125, *supra*.

133. Particularly, Granek discloses an electrode arrangement with an electrically conductive fabric electrode **24** having a portion of material such as a central tubular cylinder **22** that is substantially impermeable to moisture located on or above, adjacent to, touching, in electrical communication with, or embedded in the respective electrode first or skin-facing surface, even with either or both the electrode **24** and the tubular cylinder **22** being made of silicone rubber (*see*, Ex. SS 1002 at 7:1-2), or discloses that a portion **14** of the garment **10** itself on the skin-facing side may define the “electrically conductive fabric” with a moisture impermeable electrode **24** made of metal or silicone rubber also located at the conductive portion **14** (*see*, *Id.* at 3:31-35; 4:9-11; 7:1-2; and Figs. 5-6), but only fails in either case to expressly disclose that the silicone rubber forming the moisture impermeable material is loaded with conductive material.

134. However, Noguchi teaches an elastomeric electrode **10** with an electrically conductive base **11** made of fabric yarns coated with conductive material to form a conductive fabric, and a protective layer **12** on the fabric base **11**, expressly wherein the material of the protective layer is silicone rubber loaded

with conductive material. Specifically, Noguchi indicates that the “protective layer is formed of silicone ... rubber provided with the distributed carbon ... therein” and that “[t]he carbon is a “[h]ighly electrically conductive carbon.” *See*, Ex. SS 1004 at 3:10-40; and Fig. 1.

135. Furthermore, it was generally known in the art around and before 2002 to employ rubber electrodes or electrode surfaces, or surfaces that are moisture impermeable, not only for the purpose of causing perspiration to build up between the electrode and the skin on which the electrode is applied and thereby reduce resistance and improve conductivity without the need for gels, chemicals, wetting, etc. (*see, e.g.*, Reho), but also to provide electrically conductive material within the rubber for the express purpose of improving conductance. *See, e.g.*, Ex. SS 1005 at p. 1, lns. 57-60 and 70-85; and Ex. SS 1006 at 3:65-68.

136. It would have been obvious to one having ordinary skill in the art at the time of invention of the subject matter of the ‘951 Patent to add the silicone rubber loaded with conductive material as taught by Noguchi to the invention of Granek to create an electrode where all portions of the electrode in contact with the skin have conductive properties, the motivation being a general desire to increase the signal strength to and from the sensor, and Noguchi teaching that this can be accomplished by adding conductive material to the moisture-impermeable portion of the electrode (*i.e.*, the silicone rubber). Thus, it would have also been obvious

to one of ordinary skill in the art at the time the invention was made to use silicone rubber loaded with conductive material in place of the silicone rubber or metal of either or both the electrode **24** or tubular cylinder **22**, since it was within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use. In fact, since Granek teaches that “[i]n the conductive embodiment the tubular cylinder **22** and the electrode **24** might be made of ... silicone rubber,” it follows that the silicone rubber must be loaded with conductive material of some kind. *See*, Ex. SS 1002 at 7:1-2.

137. Therefore, it is clear that all limitations of claim 4 of the ‘951 Patent are rendered obvious by Granek in combination with Noguchi.

**D. Obviousness of Claims 1-4 Over Reho in View of Muir**

138. As discussed below and referenced in the claim charts, I believe Reho expressly or inherently discloses all limitations of at least claims 1-3 of the ‘951 Patent. *See*, ¶¶ 194-213, *infra*. Particularly, it is my opinion that evidence of the “state of the art” in and around 2002 as well as experimental data demonstrate that the moisture impermeable material being “located on said first surface” of the conductive fabric as recited in claim 1 of the ‘951 Patent is inherent to the disclosed electrode structure of Reho.

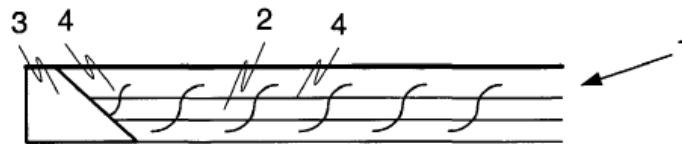
139. However, to the extent that the limitation of claim 1 regarding the at least one portion of material which is substantially impermeable to moisture “being

located on said first surface” is not explicitly disclosed in Reho, Muir discloses such structure.

### Claim 1

140. Reho is directed to “a sensor placed on the skin.” Ex. SS 1003 at p. 2. It is specifically disclosed that “the sensor of the invention can be an electrode.” *Id.* at p. 5. Thus, the invention disclosed in Reho fits squarely within the “electrode arrangement” disclosure of the ‘951 Patent as evidenced by the claim 1 preamble.

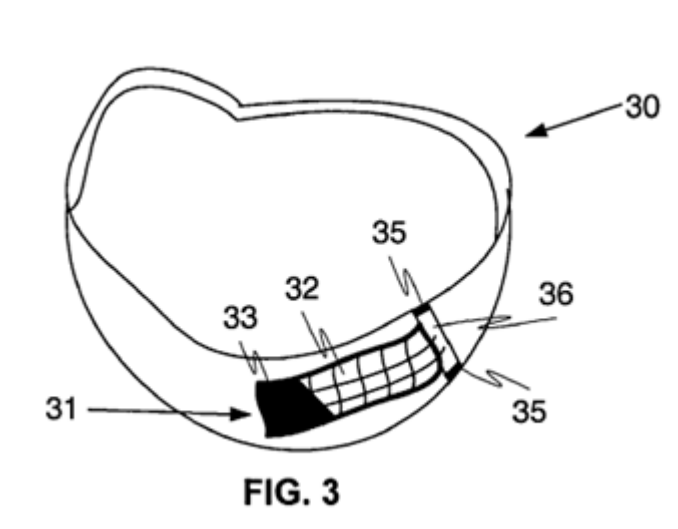
141. Reho discloses that “[t]he sensor in accordance with the invention comprises a contact layer including conductive fibres ....” *Id.* at p. 2. “The contact layer may consist e.g. of a fabric-like layer ....” *Id.* at p. 3. “The sensor 1 shown in figure 1 has a contact layer 2 made of conductive fibres 4 e.g. by weaving, knitting, twining, pressing, gluing or sewing.” *Id.* at p. 5. Thus, the related limitations of claim 1 of the ‘951 Patent are literally met.



**FIG. 1**

142. It is further disclosed that “[t]he invention relates to a sensor placed on the skin” and that there is to be “contact between the skin and the contact layer” of the sensor. *Id.* at pp. 2 and 3. Thus, it is inherent that the sensor 1 has a “first

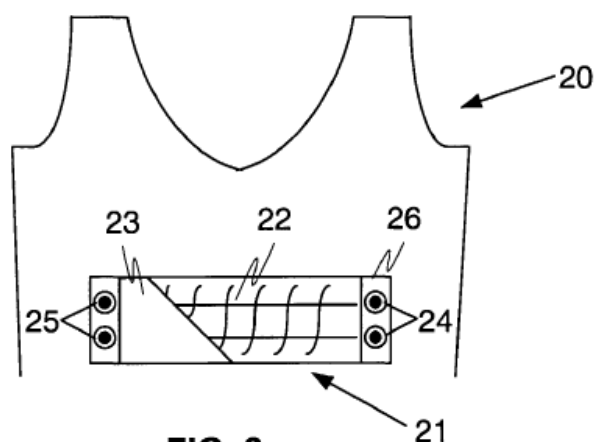
surface,” namely, the bottom side of the contact layer, that “faces or is oriented toward the skin of the wearer” as required by claim 1. Furthermore, looking at Figure 3 reproduced below, the contact layer **32** has a surface, illustrated in a grid-like cross hatch, which can be considered a first surface, where the first surface is configured to be applied directly to the skin. It is disclosed that “[d]ata to be measured are collected on the skin with the aid of the contact layer. The contact layer may consist e.g. of a fabric-like layer, which readily adapts to the skin surface.” *Id.* at p. 3. Thus, the contact layer acts as a first surface that is placed on the skin.



143. Reho states that “[b]esides humans, the sensor ... can be placed on the skin of an animal.” *Id.* at p. 5. This clearly covers mammals as also required by claim 1.

144. Reho discloses that “[t]he sensor can be integrated in a garment [with] the conductive fibres in the contact layer... sewn into the fabric surface or ...

knitted or woven directly in the fabric texture.” *Id.* at p. 3. Further, Reho states that “[k]nitted or woven conductive fibres are not necessarily distinguished at all in the garment, and in addition, they may enhance the elasticity and strength properties of the product.” *Id.* “The sensor can typically be placed in the chest area of a garment, or the measurement can also be made e.g. in the area of the neck or the wrists. The sensor can be combined with various pieces of clothing, such as an undershirt, bras, a top, a turtleneck, a headband, a wristband or any other garment.” *Id.* at p. 4. Figure 2 below provides a schematic view of “a sensor [21] connected to a fabric by sewing or weaving,” here illustrating the electrically conductive fabric integrated into a shirt **20** or the like. *Id.* at p. 5. Similarly, Figure 3 above illustrates the electrically conductive fabric sensor **31** integrated into a headband or wristband **30** or the like. *Id.* at p. 5.



**FIG. 2**

145. Reho further discloses “a moisture layer for retaining moisture on top of the contact layer” that may take the form of “an impervious, substantially

moisture proof seal layer.” *See, e.g., Id.* at pp. 2-3. It is disclosed that the function and purpose of the “moisture layer” is to “retain secretory products from the skin, [which] enhances the contact between the skin and the contact layer and increases the electrical conductivity of the contact layer.” *Id.* at p. 3. In the context of the “seal layer” version of the “moisture layer,” Reho discloses that “[t]he seal layer may be made e.g. of a waterproof or non-respiring fabric, or a film-like material, such as suitable plastic, e.g. silicone plastic or rubber or a laminate layer.” *Id.*

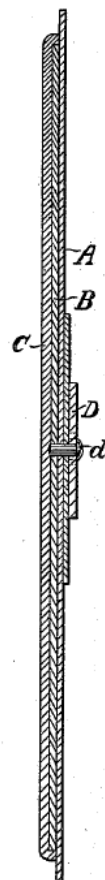
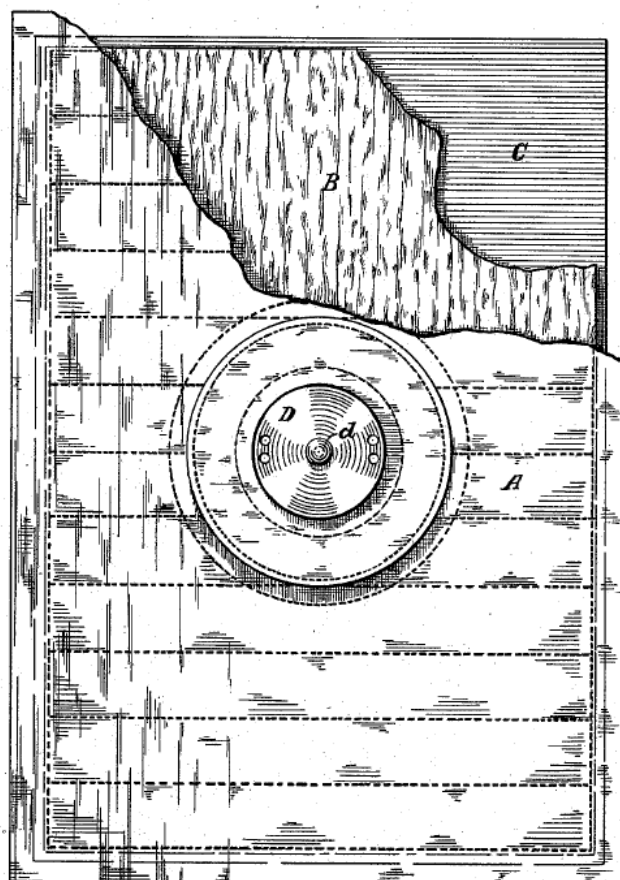
With reference to Figure 3 above, Reho states that the “seal layer **33** [is] made of a non-respiring fabric.” *Id.*

146. All that remains in finding literal basis in or anticipation by Reho of claim 1 of the ‘951 Patent is the limitation that the at least one portion of material which is substantially impermeable to moisture be “located on said first surface.”

147. Muir discloses a “pliable layer **C** of suitable electroconducting properties.” *See, Ex. SS 1005* at p. 1, lns. 57-60; and Figs. 1 and 2. Muir describes a method of manufacturing pliable layer **C** as what is known today as a bioplastic, made from combining primarily gelatin and glycerin as a plasticizer to form a substantially moisture impermeable layer, which would substantially prevent the escape of perspiration when placed on the skin. *See, Id.* at p. 1, lns. 57-70; and Figs. 1-2. Accordingly, pliable layer **C** meets the limitation of “at least one portion of material which is substantially impermeable to moisture.”



148. Muir further discloses a multi-layered electrode as shown in Figures 1 and 2 reproduced below, having “a backing **A**, which may be of ... cloth or any other suitable and flexible material ...”, “a sheet **B** of electroconducting material of a flexible character,” for example “a partly metallic sheet, such ... as tinsel-cloth” interwoven with “metal threads,” and the “pliable layer **C**” located on top of the first or skin-facing surface of the sheet **B** of electroconducting material. *See, Id.* at p. 1, lns. 44-60; Figs. 1 and 2. Thus, pliable layer **C** also meets the limitation that the moisture impermeable material be “located on said first surface” of the electrode.

*Fig. 2.**Fig. 1.*

149. It would have been obvious to one having ordinary skill in the art at the time of invention of the subject matter of the '951 Patent to position the portion of material that is impermeable to moisture on top of the first surface of the electrically conductive fabric as taught by Muir in the invention of Reho, the motivation being to create an electrode with a contact surface where both the portion of material that is impermeable to moisture and the electrically conductive fabric are configured for directly touching the skin, since Reho discloses that it is desirable that the conductivity of the conductive fabric electrode be improved by employing an impermeable material to trap moisture, including having such moisture-impermeable material also in contact with the skin of the person wearing the garment, and it involves only routine skill in the art to merely reverse the order of layering in Reho's electrode assembly as taught by Muir, as essentially requiring only "common sense" and "ordinary innovation" to arrive at a "predictable result," namely moisture retention and improved conductivity.

150. Furthermore, Muir teaches that, because the material that is impermeable to moisture (pliable layer C) is directly contacting the skin, the electrode can be applied dry "avoiding the necessity of moistening or wetting it." *See*, Ex. SS 1005 at p. 1, Ins. 27-33. Likewise, Reho teaches that "[t]he moisture layer of the sensor preferably surrounds the contact layer so as to fit against the skin around the contact area," without the need for applying moisture; and that

“[t]he moisture layer retains secretory products from the skin, such as moisture and electrolytes. This enhances the contact between the skin and the contact layer and increases the electric conductivity of the contact layer.” *See*, Ex. SS 1003 at pp. 3-4. Moreover, as noted above, Muir teaches that the electrode can be integrated into a cloth backing A and Reho teaches that the cloth backing can be expanded into a garment to create an electrode integrated into a garment. Thus, Reho in view of Muir teaches a layered electrode construction with a layer of material that is substantially impervious to moisture that is positioned on top of or over, adjacent to, touching, in electrical communication with, or embedded in the skin-facing surface of a layer of electrically conductive fabric, where either or both materials may directly touch the skin for the purpose of enhancing conductivity and user comfort.

### Claim 2

151. Regarding claim 2 and the requirement that the “at least one portion of [moisture impermeable] material is located directly on said first surface” of the electrically conductive fabric, which is again inherent in Reho as explained below (*see*, ¶¶ 208-209, *infra.*), this is further expressly taught by Muir.

152. Each of Muir and Reho also disclose that the at least one portion of moisture impermeable material is located *directly* on said first surface of the

conductive fabric, meaning there is no intermediate layer between the two and the first surface is the surface configured to face the skin.

153. Muir specifically teaches that “[u]pon this sheet of conducting material **B** is placed a pliable layer **C** of suitable electroconducting properties.” *See*, Ex. SS 1005 at p. 1, lns. 57-60; Fig. 2. Furthermore, Muir teaches that the material comprising the pliable layer **C** may be applied to the conducting material **B** while the material is hot and plastic. *See, Id.* at p. 1, lns. 85-91. Reho discloses “a moisture layer for retaining moisture on top of the contact layer” and again that “[t]he moisture layer of the sensor preferably surrounds the contact layer so as to fit against the skin around the contact area.” *See*, Ex. SS 1003 at pp. 2-4.

154. Because Muir’s pliable layer **C** is applied on the surface of the conductive sheet **B** and there is no material in between, Muir teaches that at least one portion of moisture impermeable material is located *directly* on said first surface. Reho teaches direct contact between the layers and also teaches that both the electrically conductive fabric and the portion of moisture impermeable material may contact the skin. Therefore, Reho in view of Muir teaches an electrode arrangement where said at least one portion of material is located directly on said first surface, with the motivation to combine these references as above-described (*see*, ¶ 149, *supra*).

### Claim 3

155. Regarding dependent claim 3, which adds the further limitation that “said [moisture impermeable] material is mechanically flexible,” this limitation is met by both Reho and Muir.

156. Reho discloses that “[t]he moisture layer may also be made of a fabric-like material adapting to the skin. The seal layer prevents transpiration secreted at the contact layer from escaping from the contact layer. The seal layer may be made e.g. of a waterproof or non-respiring fabric, or a film-like material, such as suitable plastic, e.g. silicone plastic or rubber or a laminate layer.” *See*, Ex. SS 1003 at p. 3.

157. Similarly, Muir teaches that “[a] therapeutic electrode thus formed is very pliable and is adapted to be easily adjusted to all parts of the body and to fit thereto throughout its entire surface, so that there is no one point of greater contact than another ...” and “[u]pon this sheet of conducting material **B** is placed a pliable layer **C** of suitable electroconducting properties.” *See*, Ex. SS 1005 at p. 1, Ins. 57-60 and 97-101.

158. All such statements are synonymous or consistent with the electrode, and particularly the moisture impermeable material, being “mechanically flexible,” which is evidenced by statements in the ‘951 Patent indicating that the recited moisture impermeable material is “silicone rubber” just as disclosed in Reho and

that such is “flexible” or “able to flex in sympathy with the first surface of the electrode arrangement.” *See, e.g.*, Ex. SS 1001 at 2:40-42 and 2:52-54; *see also*, ¶ 156, *supra*.

159. Thus, both Reho and Muir disclose that the moisture-impermeable material is mechanically flexible.

#### Claim 4

160. And regarding dependent claim 4 and the limitation that the moisture impermeable material be “silicone rubber loaded with conductive material,” this is once again disclosed by the combination of Reho and Muir.

161. Reho discloses that the “seal layer may be made e.g. of a waterproof or non-respiring fabric, or a film-like material, such as suitable plastic, e.g. silicone plastic or rubber or a laminate layer.” *See*, Ex. SS 1003 at p. 3. Reho fails to disclose that the silicone layer is loaded with conductive material.

162. However, Muir teaches that the “pliable layer C of suitable electroconducting material” may be loaded with “any material ... which is an electroconductor, such, for example, as plumbago or pulverized carbon, or any metallic substance in a fine state of division.” *See*, Ex. SS 1005 at p. 1, lns. 57-60 and 70-85.

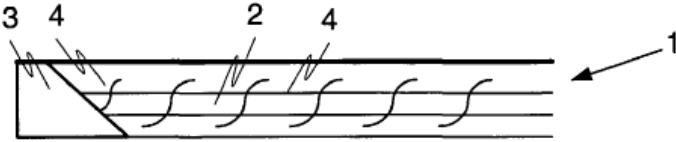
163. It would have been obvious to one having ordinary skill in the art at the time of invention of the subject matter of the ‘951 Patent to add the conductive

material to the portion of moisture-impermeable material as taught by Muir in the invention of Reho to create an electrode where all portions of the electrode in contact with the skin have conductive properties, the motivation being a general desire to increase the signal strength to and from the sensor and Muir teaching that this can be accomplished by adding conductive material to the portion of material that is substantially impermeable to moisture, or the silicone rubber moisture layer of the Reho sensor that preferably surrounds the contact layer so as to fit against the skin around the contact area.

164. Based on the foregoing, it is clear that all limitations of claims 1-4 of the '951 Patent are rendered obvious by Reho, either expressly or inherently, alone or in combination with Muir.

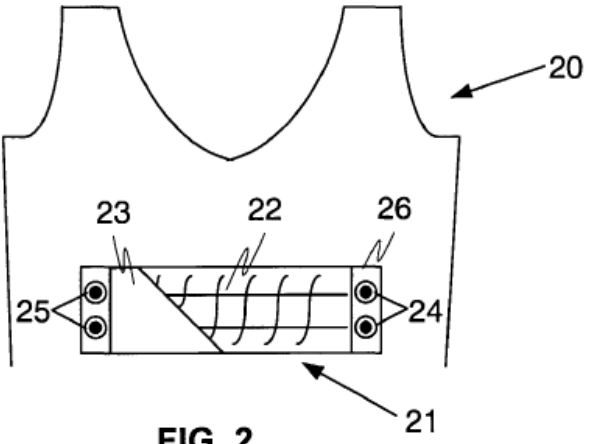
165. The claim charts below illustrate how claims 1-4 are obvious over Reho in combination with Muir:

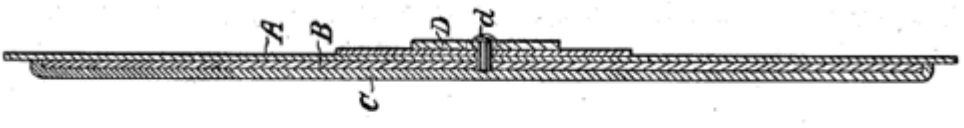
<b>Claim 1</b>	<b>Citations from Reho and Muir and Discussion of Citations</b>
An electrode arrangement comprising:	Reho is entitled "a sensor arrangeable on the skin" and is directed to "a sensor placed on the skin." Ex. SS 1003 at p. 2. It is specifically disclosed that "the sensor of the invention can be an electrode." <i>Id.</i> at p. 5.
an electrically conductive fabric having a first surface for application to skin of a	"The sensor in accordance with the invention comprises a contact layer including conductive fibres ...." <i>Id.</i> at p. 2. "The contact layer may consist e.g. of a fabric-like layer ...." <i>Id.</i> at p. 3.  "The sensor 1 shown in figure 1 has a contact layer 2 made of conductive fibres 4 e.g. by weaving, knitting, twining, pressing, gluing or sewing." <i>Id.</i> at p. 5.

Claim 1	Citations from Reho and Muir and Discussion of Citations
mammal; and	 <p style="text-align: center;"><b>FIG. 1</b></p> <p>Claim 5: “A sensor as defined in any of the preceding claims, characterized in that the contact layer (2, 22, 32) is made of fabric.” <i>Id.</i> at p. 9.</p> <p>“The invention relates to a sensor placed on the skin.” <i>Id.</i> at p. 3. There is to be “contact between the skin and the contact layer” of the sensor. <i>Id.</i> at p. 4. Thus, it is inherent that the sensor 1 has a “first surface” that “faces or is oriented toward the skin of the wearer.”</p> <p>“Besides humans, the sensor of the invention can be placed on the skin of an animal.” <i>Id.</i> at p. 5. This clearly covers mammals.</p>
at least one portion of material which is substantially impermeable to moisture, said material being located on said first surface,	<p>Reho discloses “a moisture layer for retaining moisture on top of the contact layer” that may take the form of “an impervious, substantially moisture proof seal layer.” <i>Id.</i> at p. 3. The function and purpose of the “moisture layer” is to “retain secretory products from the skin, [which] enhances the contact between the skin and the contact layer and increases the electrical conductivity of the contact layer.” <i>Id.</i> “The seal layer may be made e.g. of a waterproof or non-respiring fabric, or a film-like material, such as suitable plastic, e.g. silicone plastic or rubber or a laminate layer.” <i>Id.</i></p> <p>Regarding the basic sensor <b>1</b> as shown in Fig. 1 of Reho reproduced above, “[a]s the sensor <b>1</b> is placed on the skin, the seal layer <b>3</b> of the sensor <b>1</b> starts collecting moisture from the skin on its lower surface.” <i>Id.</i> at p. 5. As such, the seal layer <b>3</b> is adjacent the skin and the contact layer <b>2</b> of the sensor <b>1</b> so as to together function to trap moisture such that “the skin contact and the conductive properties of the contact layer are substantially improved.” <i>Id.</i></p>



Claim 1	Citations from Reho and Muir and Discussion of Citations
	<p>Muir discloses a “pliable layer <b>C</b> of suitable electroconducting properties.” <i>See</i>, Ex. SS 1005 at p. 1, lns. 57-60; and Figs. 1 and 2. Muir describes a method of manufacturing pliable layer <b>C</b> as what is known today as a bioplastic, made from combining primarily gelatin and glycerin as a plasticizer to form a substantially moisture impermeable layer, which would substantially prevent the escape of perspiration when placed on the skin. <i>See, Id.</i> at p. 1, lns. 57-70; and Figs. 1-2.</p> <div data-bbox="558 632 1292 1157" data-label="Image"> </div> <p style="text-align: center;">Muir Fig. 1</p> <p>Muir further discloses a multi-layered electrode having “a backing <b>A</b>, which may be of ... cloth or any other suitable and flexible material ...”, “a sheet <b>B</b> of electroconducting material of a flexible character,” for example “a partly metallic sheet, such ... as tinsel-cloth” interwoven with “metal threads,” and the “pliable layer <b>C</b>” located on top of the first or skin-facing surface of the sheet <b>B</b> of electroconducting material. <i>See, Id.</i> at p. 1, lns. 44-60; Figs. 1 and 2.</p> <p>It would have been obvious to one having ordinary skill in the art at the time of invention of the subject matter of the ‘951 Patent to position the portion of material that is impermeable to moisture on top of the first surface of the electrically conductive fabric as taught by Muir in the invention of Reho to create an electrode</p>

Claim 1	Citations from Reho and Muir and Discussion of Citations
	<p>with a contact surface where both the portion of material that is impermeable to moisture and the electrically conductive fabric are configured for directly touching the skin, since Reho discloses that it is desirable that the conductivity of the conductive fabric electrode be improved by employing an impermeable material to trap moisture, including having such moisture-impermeable material also in contact with the skin of the person wearing the garment, and it involves only routine skill in the art to merely reverse the order of layering in Reho's electrode assembly as taught by Muir, as essentially requiring only "common sense" and "ordinary innovation" to arrive at a "predictable result," namely moisture retention and improved conductivity.</p>
<p>wherein said electrically conductive fabric is integral with a garment.</p>	<p>"The sensor can be integrated in a garment .... The conductive fibres in the contact layer can be sewn into the fabric surface or they can be knitted or woven directly in the fabric texture." Ex. SS 1003 at p. 3.</p> <p>Figure 2 below provides a schematic view of "a sensor of the invention connected to a fabric by sewing or weaving." <i>Id.</i> at p. 5.</p>  <p>FIG. 2</p> <p>"The sensor can combined with various pieces of clothing, such as an undershirt, bras, a top, a turtleneck, a headband, a wristband or any other garment." <i>Id.</i> at p. 4.</p>

Claim 2	Citations from Reho and Muir and Discussion of Citations
<p>The electrode arrangement in accordance with claim 1 wherein said at least one portion of material is located directly on said first surface.</p>	<p>Reho discloses “a moisture layer for retaining moisture on top of the contact layer” and that “[t]he moisture layer of the sensor preferably surrounds the contact layer so as to fit against the skin around the contact area.” <i>See</i>, Ex. SS 1003 at pp. 2-4.</p> <p>Muir specifically teaches that “[u]pon this sheet of conducting material <b>B</b> is placed a pliable layer <b>C</b> of suitable electroconducting properties.” <i>See</i>, Ex. SS 1005 at p. 1, lns. 57-60; Fig. 2. Furthermore, Muir teaches that the material comprising the pliable layer <b>C</b> may be applied to the conducting material <b>B</b> while the material is hot and plastic. <i>See, Id.</i> at p. 1, lns. 85-91.</p>  <p style="text-align: center;">Muir Fig. 2</p> <p>Because Muir’s pliable layer <b>C</b> is applied on the surface of the conductive sheet <b>B</b> and there is no material in between, Muir teaches that at least one portion of moisture impermeable material is located <i>directly</i> on said first surface. Reho teaches direct contact between the layers and also teaches that both the electrically conductive fabric and the portion of moisture-impermeable material may contact the skin. Therefore, Reho in view of Muir teaches an electrode arrangement where said at least one portion of material is located directly on said first surface.</p>

Claim 3	Citations from Reho and Muir and Discussion of Citations
<p>The electrode arrangement in accordance with claim 1 wherein said material is mechanically</p>	<p>“The seal layer may be made e.g. of a waterproof or non-respiring fabric, or a film-like material, such as suitable plastic, e.g. silicone plastic or rubber or a laminate layer.” <i>See, e.g.</i>, Ex. SS 1003 at p. 3.</p> <p>The resulting sensor, and hence the components thereof, namely, the contact layer and the seal layer, “can be given a textile-like embodiment” and thereby be “soft and adaptable on the skin,” have enhanced “elasticity,” and be “pleasant to wear” and</p>

<b>Claim 3</b>	<b>Citations from Reho and Muir and Discussion of Citations</b>
flexible.	<p>provide “extremely good comfort of use.” <i>Id.</i></p> <p>Similarly, Muir teaches that “[a] therapeutic electrode thus formed is very pliable and is adapted to be easily adjusted to all parts of the body and to fit thereto throughout its entire surface, so that there is no one point of greater contact than another ...” and “[u]pon this sheet of conducting material <b>B</b> is placed a pliable layer <b>C</b> of suitable electroconducting properties.” <i>See</i>, Ex. SS 1005 at p. 1, lns. 57-60 and 97-101.</p> <p>All such statements are synonymous or consistent with the sensor being “mechanically flexible,” which is evidenced by statements in the ‘951 Patent indicating that the recited moisture impermeable material is “silicone rubber” just as disclosed in Reho and that such is “flexible” or “able to flex in sympathy with the first surface of the electrode arrangement.” <i>See, e.g.</i>, Ex. SS 1001 at 2:40-42 and 2:52-54.</p> <p>The general prior art discloses, for example, that a fabric electrode covered in a conductive silicone rubber is “highly flexible.” <i>See, e.g.</i>, Ex. SS 1004 at 3:21-40 and 10:35-40.</p>

<b>Claim 4</b>	<b>Citations from Reho and Muir and Discussion of Citations</b>
The electrode arrangement in accordance with claim 1 wherein said material is silicone rubber loaded with conductive material.	<p>Reho discloses that the “seal layer may be made e.g. of a waterproof or non-respiring fabric, or a film-like material, such as suitable plastic, e.g. silicone plastic or rubber or a laminate layer.” <i>See</i>, Ex. SS 1003 at p. 3.</p> <p>Muir teaches that the “pliable layer <b>C</b> of suitable electroconducting material” may be loaded with “any material ... which is an electroconductor, such, for example, as plumbago or pulverized carbon, or any metallic substance in a fine state of division.” <i>See</i>, Ex. SS 1005 at p. 1, lns. 57-60 and 70-85.</p> <p>It would have been obvious to one having ordinary skill in the art at the time of invention of the subject matter of the ‘951 Patent to add the conductive material to the portion of moisture-impermeable material as taught by Muir in the invention of Reho to create an electrode where all portions of the electrode in</p>

Claim 4	Citations from Reho and Muir and Discussion of Citations
	contact with the skin have conductive properties, since it is a general desire to increase the signal strength to and from the sensor and Muir teaches that this can be accomplished by adding conductive material to the portion of material that is substantially impermeable to moisture, or the silicone rubber moisture layer of the Reho sensor that preferably surrounds the contact layer so as to fit against the skin around the contact area.

### **E. Obviousness of Claims 1-4 Over Reho in View of Greene**

166. As discussed below and referenced in the claim charts, I believe Reho expressly or inherently discloses all limitations of at least claims 1-3 of the ‘951 Patent. *See*, ¶¶ 194-213, *infra*. Particularly, it is my opinion that evidence of the “state of the art” in and around 2002 as well as experimental data demonstrate that the moisture impermeable material being “located on said first surface” of the conductive fabric as recited in claim 1 of the ‘951 Patent is inherent to the disclosed electrode structure of Reho.

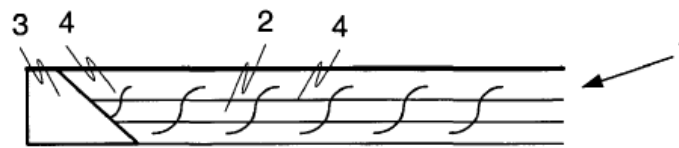
167. However, to the extent that the limitation of claim 1 regarding the at least one portion of material which is substantially impermeable to moisture “being located on said first surface” is not explicitly disclosed in Reho, Greene discloses such structure.

### Claim 1

168. Reho is directed to “a sensor placed on the skin.” Ex. SS 1003 at p. 2. It is specifically disclosed that “the sensor of the invention can be an electrode.” *Id.* at p. 5. Thus, the invention disclosed in Reho fits squarely within the

“electrode arrangement” disclosure of the ‘951 Patent as evidenced by the claim 1 preamble.

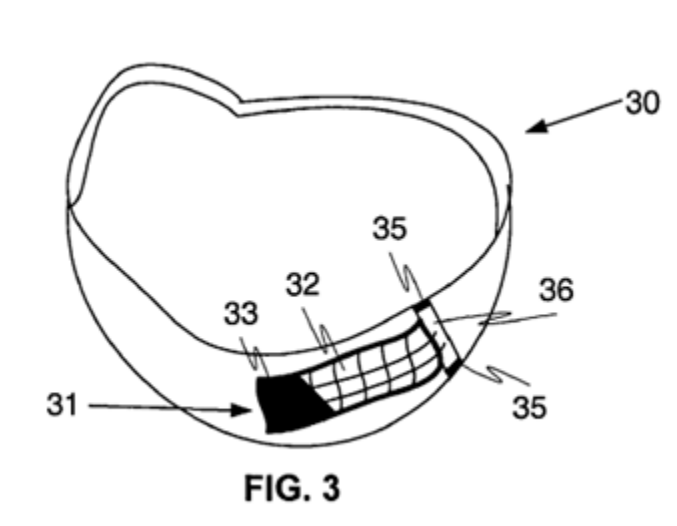
169. Reho discloses that “[t]he sensor in accordance with the invention comprises a contact layer including conductive fibres ....” *Id.* at p. 2. “The contact layer may consist e.g. of a fabric-like layer ....” *Id.* at p. 3. “The sensor 1 shown in figure 1 has a contact layer 2 made of conductive fibres 4 e.g. by weaving, knitting, twining, pressing, gluing or sewing.” *Id.* at p. 5. Thus, the related limitations of claim 1 of the ‘951 Patent are literally met.



**FIG. 1**

170. It is further disclosed that “[t]he invention relates to a sensor placed on the skin” and that there is to be “contact between the skin and the contact layer” of the sensor. *Id.* at pp. 2 and 3. Thus, it is inherent that the sensor 1 has a “first surface,” namely, the bottom side of the contact layer, that “faces or is oriented toward the skin of the wearer” as required by claim 1. Furthermore, looking at Figure 3 reproduced below, the contact layer **32** has a surface, illustrated in a grid-like cross hatch, which can be considered a first surface, where the first surface is configured to be applied directly to the skin. It is disclosed that “[d]ata to be measured are collected on the skin with the aid of the contact layer. The contact

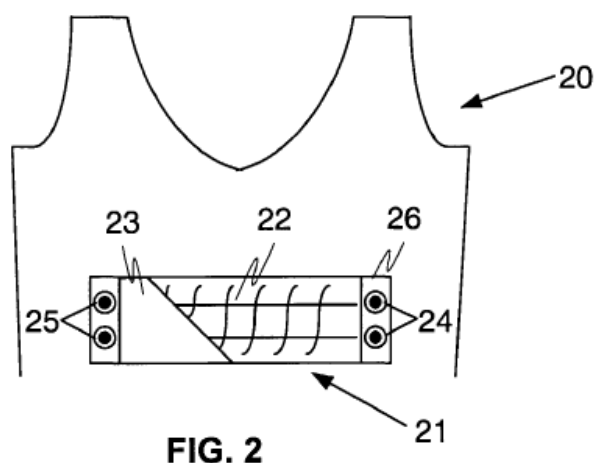
layer may consist e.g. of a fabric-like layer, which readily adapts to the skin surface.” *Id.* at p. 3. Thus, the contact layer acts as a first surface that is placed on the skin.



171. Reho states that “[b]esides humans, the sensor ... can be placed on the skin of an animal.” *Id.* at p. 5. This clearly covers mammals as also required by claim 1.

172. Reho discloses that “[t]he sensor can be integrated in a garment [with] the conductive fibres in the contact layer... sewn into the fabric surface or ... knitted or woven directly in the fabric texture.” *Id.* at p. 3. Further, Reho states that “[k]nitted or woven conductive fibres are not necessarily distinguished at all in the garment, and in addition, they may enhance the elasticity and strength properties of the product.” *Id.* “The sensor can typically be placed in the chest area of a garment, or the measurement can also be made e.g. in the area of the neck or the wrists. The sensor can be combined with various pieces of clothing, such as

an undershirt, bras, a top, a turtleneck, a headband, a wristband or any other garment.” *Id.* at p. 4. Figure 2 below provides a schematic view of “a sensor [21] connected to a fabric by sewing or weaving,” here illustrating the electrically conductive fabric integrated into a shirt 20 or the like. *Id.* at p. 5. Similarly, Figure 3 above illustrates the electrically conductive fabric sensor 31 integrated into a headband or wristband 30 or the like. *Id.* at p. 5.



173. Reho further discloses “a moisture layer for retaining moisture on top of the contact layer” that may take the form of “an impervious, substantially moisture proof seal layer.” *See, e.g., Id.* at pp. 2-3. It is disclosed that the function and purpose of the “moisture layer” is to “retain secretory products from the skin, [which] enhances the contact between the skin and the contact layer and increases the electrical conductivity of the contact layer.” *Id.* at p. 3. In the context of the “seal layer” version of the “moisture layer,” Reho discloses that “[t]he seal layer may be made e.g. of a waterproof or non-respiring fabric, or a film-like material,

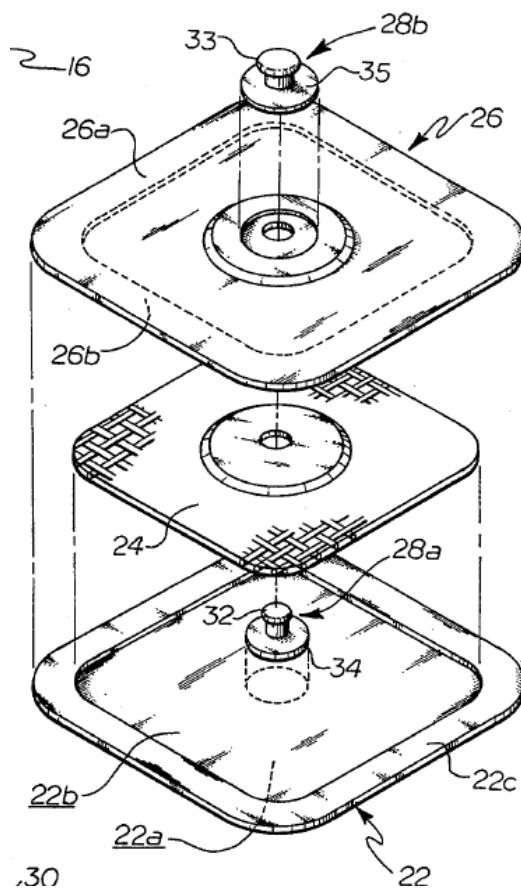


such as suitable plastic, e.g. silicone plastic or rubber or a laminate layer.” *Id.*

With reference to Figure 3 above, Reho states that the “seal layer **33** [is] made of a non-respiring fabric.” *Id.*

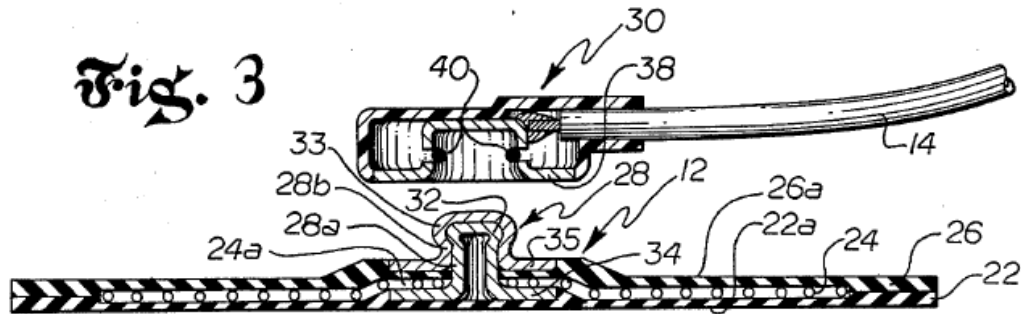
174. All that remains in finding literal basis in or anticipation by Reho of claim 1 of the ‘951 Patent is the limitation that the at least one portion of material which is substantially impermeable to moisture be “located on said first surface.”

175. Greene discloses an electrode arrangement **12** with at least one portion of material which is substantially impermeable to moisture, namely, “[l]ower layer **22** compris[ing] a relatively thin, approximately 1/64th of an inch, section of electrically conducting rubber.” Rubber is well known for the inherent property of being impermeable to moisture. *See*, Ex. SS 1006 at 3:63-65; and Fig. 2. Accordingly, lower layer **22** meets the limitation of “at least one portion of material which is substantially impermeable to moisture.”



Greene Fig. 2

176. Greene further teaches an “[i]ntermediate layer element **24** [with] a relatively thin ... electrically conducting wire mesh or screen,” which has a first surface that contacts the lower layer **22**. *See, Id.* at 4:28-30; and Figs. 2 and 3. It follows that the moisture impermeable lower layer **22** is located on the skin-facing surface of the electrode **12**. Therefore, lower layer **22** also meets the limitation that the moisture impermeable material be “located on said first surface” of the electrode.



177. It would have been obvious to one having ordinary skill in the art at the time of invention of the subject matter of the '951 Patent to position the portion of material that is impermeable to moisture on top of or over, adjacent to, touching, in electrical communication with, or embedded in the first surface of the electrically conductive mesh as taught by Greene to the invention of Reho, the motivation being to create an electrode with a contact surface where the portion of moisture impermeable material is located on said first surface of the electrically conductive fabric, since Reho discloses that it is desirable that the effectiveness of the electrode and the conductivity of the skin-electrode contact be improved by employing an impermeable material to trap moisture, including having such moisture impermeable material also in contact with the skin of the person wearing the garment, and it involves only routine skill in the art to merely reverse the order of layering in Reho's electrode assembly as taught by Greene as essentially requiring only "common sense" and "ordinary innovation" to arrive at a "predictable result," namely moisture retention and improved conductivity.

## Claim 2

178. Regarding claim 2 and the requirement that the “at least one portion of [moisture impermeable] material is located directly on said first surface” of the electrically conductive fabric, which is again inherent in Reho as explained below (*see*, ¶¶ 208-209, *infra.*), this is further expressly taught by Greene.

179. Each of Reho and Greene also disclose that said at least one portion of material is located *directly* on said first surface, meaning there is no intermediate layer between the two and the first surface is the surface configured to face the skin.

180. Greene teaches “an electrically conducting ... mesh screen [is] embedded in the lower element in said recess area thereof so that said intermediate element is in intimate electrical contact with said lower element.” *See, Id.* at 7:12-17.

181. Reho again discloses “a moisture layer for retaining moisture on top of the contact layer” and that “[t]he moisture layer of the sensor preferably surrounds the contact layer so as to fit against the skin around the contact area.” *See*, Ex. SS 1003 at pp. 2-4.

182. Because Greene’s electrically conductive fabric layer or mesh screen intermediate layer **24** is embedded in the moisture-impermeable lower element or layer **22** for “intimate electrical contact” with clearly no material in between,

Greene teaches that at least one portion of moisture impermeable material is located *directly* on said first surface or skin-facing surface of the electrode construction. Reho teaches direct contact between the layers and also teaches that both the electrically conductive fabric and the portion of moisture-impermeable material may contact the skin. Therefore, Reho in view of Greene teaches an electrode arrangement where said at least one portion of material is located directly on said first surface, with the motivation to combine these references as above-described (*see*, ¶ 177, *supra*).

### Claim 3

183. Regarding dependent claim 3, which adds the further limitation that “said [moisture impermeable] material is mechanically flexible,” this limitation is met by both Reho and Greene.

184. Reho discloses that “[t]he moisture layer may also be made of a fabric-like material adapting to the skin. The seal layer prevents transpiration secreted at the contact layer from escaping from the contact layer. The seal layer may be made e.g. of a waterproof or non-respiring fabric, or a film-like material, such as suitable plastic, e.g. silicone plastic or rubber or a laminate layer.” *See*, Ex. SS 1003 at p. 3.

185. Similarly, Greene teaches that “[t]he material comprising lower layer 22 is sufficiently flexible to make good contact with the user’s skin over its entire surface area ....” *See*, Ex. SS 1006 at 4:2-5.

186. All such statements are synonymous or consistent with the electrode, and particularly the moisture impermeable material, being “mechanically flexible,” which is evidenced by statements in the ‘951 Patent indicating that the recited moisture impermeable material is “silicone rubber” just as disclosed in Reho and that such is “flexible” or “able to flex in sympathy with the first surface of the electrode arrangement.” *See, e.g.*, Ex. SS 1001 at 2:40-42 and 2:52-54; *see also*, ¶ 184, *supra*.

187. Thus, both Reho and Greene disclose that the moisture-impermeable material is mechanically flexible.

#### Claim 4

188. And regarding dependent claim 4 and the limitation that the moisture impermeable material be “silicone rubber loaded with conductive material,” this is once again disclosed by the combination of Reho and Greene.

189. Reho discloses that the “seal layer may be made e.g. of a waterproof or non-respiring fabric, or a film-like material, such as suitable plastic, e.g. silicone plastic or rubber or a laminate layer.” *See*, Ex. SS 1003 at p. 3. Reho fails to disclose that the silicone layer is loaded with conductive material.

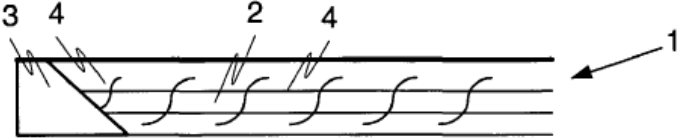
190. However, Greene teaches that the “rubber comprising lower layer **22** is made electrically conducting by embedding carbon particles therein, and is referred to as carbonized rubber.” *See*, Ex. SS 1006 at 3:65-68. Although Greene specifies a rubber material and does not specifically state that the material is silicone rubber it would have been within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use, where silicone rubber would have been a logical choice for creating a rubber-like sheet of material, as taught by Reho as noted above and others. *See, e.g.*, Ex. SS 1002 at 7:1-2; and Ex. SS 1004 at 2:12-13.

191. It would have been obvious to one having ordinary skill in the art at the time of invention of the subject matter of the ‘951 Patent to add the conductive material to the portion of moisture-impermeable material as taught by Greene in the invention of Reho, the motivation being to create an electrode where all portions of the electrode in contact with the skin have conductive properties, since it is a general desire to increase the signal strength to and from the sensor and Greene teaches that this can be accomplished by adding conductive material to the portion of material that is substantially impermeable to moisture.

192. Based on the foregoing, it is clear that all limitations of claims 1-4 of the ‘951 Patent are rendered obvious by Reho, either expressly or inherently, alone or in combination with Greene.

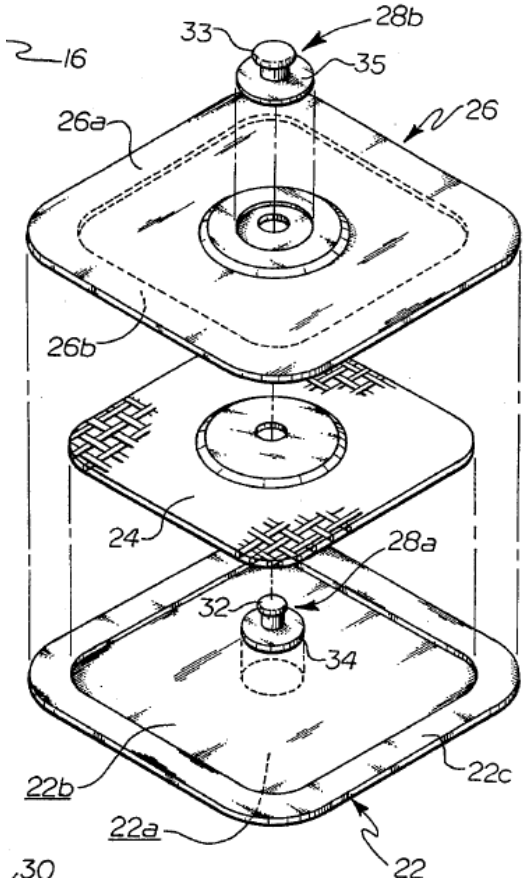
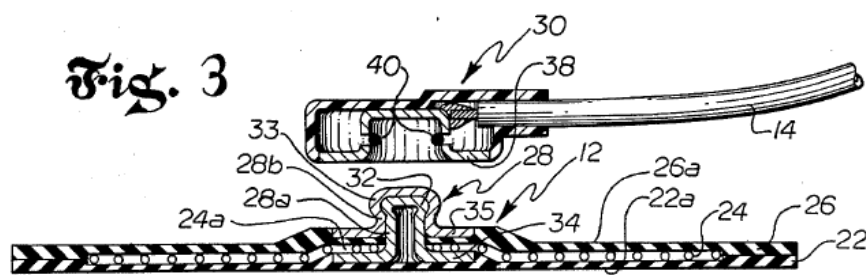
193. The claim charts below illustrate how claims 1-4 are obvious over

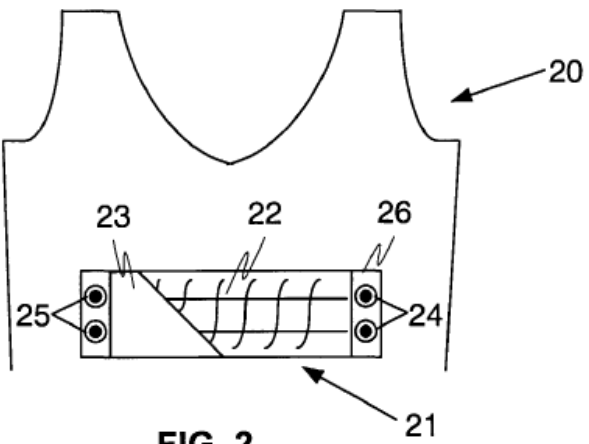
Reho in combination with Greene:

Claim 1	Citations from Reho and Greene and Discussion of Citations
An electrode arrangement comprising:	Reho is entitled “a sensor arrangeable on the skin” and is directed to “a sensor placed on the skin.” Ex. SS 1003 at p. 2. It is specifically disclosed that “the sensor of the invention can be an electrode.” <i>Id.</i> at p. 5.
an electrically conductive fabric having a first surface for application to skin of a mammal; and	<p>“The sensor in accordance with the invention comprises a contact layer including conductive fibres ....” <i>Id.</i> at p. 2. “The contact layer may consist e.g. of a fabric-like layer ....” <i>Id.</i> at p. 3.</p> <p>“The sensor 1 shown in figure 1 has a contact layer 2 made of conductive fibres 4 e.g. by weaving, knitting, twining, pressing, gluing or sewing.” <i>Id.</i> at p. 5.</p>  <p style="text-align: center;"><b>FIG. 1</b></p> <p>Claim 5: “A sensor as defined in any of the preceding claims, characterized in that the contact layer (2, 22, 32) is made of fabric.” <i>Id.</i> at p. 9.</p> <p>“The invention relates to a sensor placed on the skin.” <i>Id.</i> at p. 3. There is to be “contact between the skin and the contact layer” of the sensor. <i>Id.</i> at p. 4. Thus, it is inherent that the sensor 1 has a “first surface” that “faces or is oriented toward the skin of the wearer.”</p> <p>“Besides humans, the sensor of the invention can be placed on the skin of an animal.” <i>Id.</i> at p. 5. This clearly covers mammals.</p>
at least one portion of material which is substantially	Reho discloses “a moisture layer for retaining moisture on top of the contact layer” that may take the form of “an impervious, substantially moisture proof seal layer.” <i>Id.</i> at p. 3. The function and purpose of the “moisture layer” is to “retain secretory products from the skin, [which] enhances the contact between the



Claim 1	Citations from Reho and Greene and Discussion of Citations
impermeable to moisture, said material being located on said first surface,	<p>skin and the contact layer and increases the electrical conductivity of the contact layer.” <i>Id.</i> “The seal layer may be made e.g. of a waterproof or non-respiring fabric ... such as suitable plastic, e.g. silicone plastic or rubber or a laminate layer.” <i>Id.</i></p> <p>Regarding the basic sensor <b>1</b> as shown in Fig. 1 of Reho reproduced above, “[a]s the sensor <b>1</b> is placed on the skin, the seal layer <b>3</b> of the sensor <b>1</b> starts collecting moisture from the skin on its lower surface.” <i>Id.</i> at p. 5. As such, the seal layer <b>3</b> is adjacent the skin and the contact layer <b>2</b> of the sensor <b>1</b> so as to together function to trap moisture such that “the skin contact and the conductive properties of the contact layer are substantially improved.” <i>Id.</i></p> <p>Greene discloses an electrode arrangement <b>12</b> with at least one portion of material which is substantially impermeable to moisture, namely, “[l]ower layer <b>22</b> compris[ing] a relatively thin, approximately 1/64th of an inch, section of electrically conducting rubber.” Rubber is well known for the inherent property of being impermeable to moisture. <i>See</i>, Ex. SS 1006 at 3:63-65; and Fig. 2.</p>

Claim 1	Citations from Reho and Greene and Discussion of Citations
	 <p style="text-align: center;">Greene Fig. 2</p> <p>Greene further teaches an “[i]ntermediate layer element <b>24</b> [with] a relatively thin ... electrically conducting wire mesh or screen,” which has a first surface that contacts the lower layer <b>22</b>. <i>See, Id.</i> at 4:28-30; and Figs. 2 and 3. It follows that the moisture impermeable lower layer <b>22</b> is located on the skin-facing surface of the electrode <b>12</b>. Therefore, lower layer <b>22</b> also meets the limitation that the moisture impermeable material be “located on said first surface” of the electrode.</p> 

Claim 1	Citations from Reho and Greene and Discussion of Citations
	<p>It would have been obvious to one having ordinary skill in the art at the time of invention of the subject matter of the '951 Patent to position the portion of material that is impermeable to moisture on top of or over, adjacent to, touching, in electrical communication with, or embedded in the first surface of the electrically conductive mesh as taught by Greene to the invention of Reho to create an electrode with a contact surface where the portion of moisture-impermeable material is located on said first surface of the electrically conductive fabric, since Reho discloses that it is desirable that the conductivity of the conductive fabric electrode be improved by employing an impermeable material to trap moisture, including having such moisture-impermeable material also in contact with the skin of the person wearing the garment, and it involves only routine skill in the art to merely reverse the order of layering in Reho's electrode assembly as taught by Greene as essentially requiring only "common sense" and "ordinary innovation" to arrive at a "predictable result," namely moisture retention and improved conductivity.</p>
<p>wherein said electrically conductive fabric is integral with a garment.</p>	<p>"The sensor can be integrated in a garment .... The conductive fibres in the contact layer can be sewn into the fabric surface or they can be knitted or woven directly in the fabric texture." Ex. SS 1003 at p. 3.</p> <p>Figure 2 below provides a schematic view of "a sensor of the invention connected to a fabric by sewing or weaving." <i>Id.</i> at p. 5.</p>  <p style="text-align: center;"><b>FIG. 2</b></p>

<b>Claim 1</b>	<b>Citations from Reho and Greene and Discussion of Citations</b>
	“The sensor can combined with various pieces of clothing, such as an undershirt, bras, a top, a turtleneck, a headband, a wristband or any other garment.” <i>Id.</i> at p. 4.

<b>Claim 2</b>	<b>Citations from Reho and Greene and Discussion of Citations</b>
The electrode arrangement in accordance with claim 1 wherein said at least one portion of material is located directly on said first surface.	<p>Reho discloses “a moisture layer for retaining moisture on top of the contact layer” and that “[t]he moisture layer of the sensor preferably surrounds the contact layer so as to fit against the skin around the contact area.” <i>See</i>, Ex. SS 1003 at pp. 2-4.</p> <p>Greene teaches “an electrically conducting ... mesh screen ... [is] embedded in the lower element in said recess area thereof so that said intermediate element is in intimate electrical contact with said lower element.” <i>See</i>, Ex. SS 1006 at 7:12-17.</p> <p>Because Greene’s electrically conductive fabric layer or mesh screen intermediate layer <b>24</b> is embedded in the moisture-impermeable lower element or layer <b>22</b> for “intimate electrical contact” with clearly no material in between, Greene teaches that at least one portion of moisture impermeable material is located <i>directly</i> on said first surface or skin-facing surface of the electrode construction. Reho teaches direct contact between the layers and also teaches that both the electrically conductive fabric and the portion of moisture-impermeable material may contact the skin. Therefore, Reho in view of Greene teaches an electrode arrangement where said at least one portion of material is located directly on said first surface.</p>

<b>Claim 3</b>	<b>Citations from Reho and Greene and Discussion of Citations</b>
The electrode arrangement in accordance with claim 1 wherein said material is mechanically flexible.	<p>“The seal layer may be made e.g. of a waterproof or non-respiring fabric, or a film-like material, such as suitable plastic, e.g. silicone plastic or rubber or a laminate layer.” <i>See, e.g.</i>, Ex. SS 1003 at p. 3.</p> <p>The resulting sensor, and hence the components thereof, namely, the contact layer and the seal layer, “can be given a textile-like embodiment” and thereby be “soft and adaptable on the skin,” have enhanced “elasticity,” and be “pleasant to wear” and provide “extremely good comfort of use.” <i>Id.</i></p>

<b>Claim 3</b>	<b>Citations from Reho and Greene and Discussion of Citations</b>
	<p>Similarly, Greene teaches that “[t]he material comprising lower layer <b>22</b> is sufficiently flexible to make good contact with the user’s skin over its entire surface area ....” <i>See</i>, Ex. SS 1006 at 4:2-5.</p> <p>All such statements are synonymous or consistent with the sensor being “mechanically flexible,” which is evidenced by statements in the ‘951 Patent indicating that the recited moisture impermeable material is “silicone rubber” just as disclosed in Reho and that such is “flexible” or “able to flex in sympathy with the first surface of the electrode arrangement.” <i>See, e.g.</i>, Ex. SS 1001 at 2:40-42 and 2:52-54.</p> <p>The general prior art discloses, for example, that a fabric electrode covered in a conductive silicone rubber is “highly flexible.” <i>See, e.g.</i>, Ex. SS 1004 at 3:21-40 and 10:35-40.</p>

<b>Claim 4</b>	<b>Citations from Reho and Greene and Discussion of Citations</b>
The electrode arrangement in accordance with claim 1 wherein said material is silicone rubber loaded with conductive material.	<p>Reho discloses that the “seal layer may be made e.g. of a waterproof or non-respiring fabric, or a film-like material, such as suitable plastic, e.g. silicone plastic or rubber or a laminate layer.” <i>See</i>, Ex. SS 1003 at p. 3.</p> <p>Greene teaches that the “rubber comprising lower layer <b>22</b> is made electrically conducting by embedding carbon particles therein, and is referred to as carbonized rubber.” <i>See</i>, Ex. SS 1006 at 3:65-68. Although Greene specifies a rubber material and does not specifically state that the material is silicone rubber it would have been within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use, where silicone rubber would have been a logical choice for creating a rubber-like sheet of material, as taught by Reho as noted above and others. <i>See, e.g.</i>, Ex. SS 1002 at 7:1-2; and Ex. SS 1004 at 2:12-13.</p> <p>It would have been obvious to one having ordinary skill in the art at the time of invention of the subject matter of the ‘951 Patent to add the conductive material to the portion of moisture-impermeable material as taught by Greene in the invention of</p>

Claim 4	Citations from Reho and Greene and Discussion of Citations
	Reho to create an electrode where all portions of the electrode in contact with the skin have conductive properties, since it is a general desire to increase the signal strength to and from the sensor and Greene teaches that this can be accomplished by adding conductive material to the portion of material that is substantially impermeable to moisture.

#### **F. Anticipation of Claims 1-3 by Reho**

194. It is clear from the disclosed language cited above in connection with the obviousness of the invention claimed in the '951 Patent based on Reho in combination with either Muir or Greene that Reho teaches an electrically conductive fabric electrode arrangement that has a first surface that is applied to the skin of a mammal and contains a portion of material that is substantially impermeable to moisture, wherein the electrode is integral with a garment. And while Reho fails to expressly disclose that the portion of moisture impermeable material is located on the first surface of the electrically conductive fabric, not only is such layered construction generally taught and known in the art in a manner that renders this alternative arrangement obvious, as essentially requiring only "common sense" and "ordinary innovation" to arrive at a "predictable result" as set forth above (*see*, ¶¶ 149 and 177, *supra.*), the presence of the moisture impermeable material on or over, adjacent to, touching, in electrical communication with, or embedded in the first or skin-facing surface of the fabric electrode is inherent even in the expressly disclosed embodiments of Reho wherein

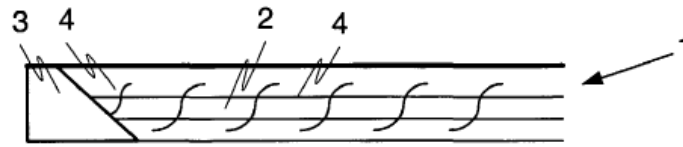
the material that is substantially impermeable to moisture is placed on top of the electrode, rather than on the side that faces the skin to which the electrode is to be applied. It is also important to note that non-conductive moisture impermeable material cannot completely cover the electrically conductive fabric or threads. The electrode configuration as disclosed in the '951 Patent will require resistive coupling with the skin, hence requiring conductive materials to reach the first surface for application to the skin. This observation extrapolates that non-conductive moisture impermeable and conductive materials must be interleaved with merely *some* of the portion of moisture impermeable substances remaining on or over the electrically conductive fabric.

### Claim 1

195. Reho is directed to “a sensor placed on the skin.” Ex. SS 1003 at p. 2. It is specifically disclosed that “the sensor of the invention can be an electrode.” *Id.* at p. 5. Thus, the invention disclosed by Reho fits squarely within the “electrode arrangement” disclosure of the '951 Patent as evidenced by the claim 1 preamble.

196. Reho discloses that “[t]he sensor in accordance with the invention comprises a contact layer including conductive fibres ....” *Id.* at p. 2. “The contact layer may consist e.g. of a fabric-like layer ....” *Id.* at p. 3. “The sensor 1 shown in figure 1 has a contact layer 2 made of conductive fibres 4 e.g. by

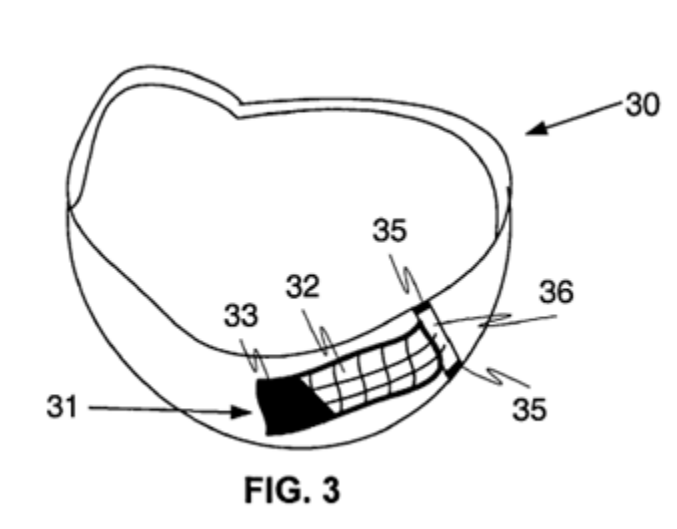
weaving, knitting, twining, pressing, gluing or sewing.” *Id.* at p. 5. Therefore, the related limitations of claim 1 of the ‘951 Patent are literally met.



**FIG. 1**

197. It is further disclosed that “[t]he invention relates to a sensor placed on the skin” and that there is to be “contact between the skin and the contact layer” of the sensor. *Id.* at pp. 2 and 3. Thus, it is inherent that the sensor 1 has a “first surface,” namely, the bottom side of the contact layer, that “faces or is oriented toward the skin of the wearer” as required by claim 1. Furthermore, looking at Figure 3 reproduced below, the contact layer **32** has a surface, illustrated in a grid-like cross hatch, which can be considered a first surface, where the first surface is configured to be applied directly to the skin. It is disclosed that “[d]ata to be measured are collected on the skin with the aid of the contact layer. The contact layer may consist e.g. of a fabric-like layer, which readily adapts to the skin surface.” *Id.* at p. 3. Thus, the contact layer acts as a first surface that is placed on the skin.

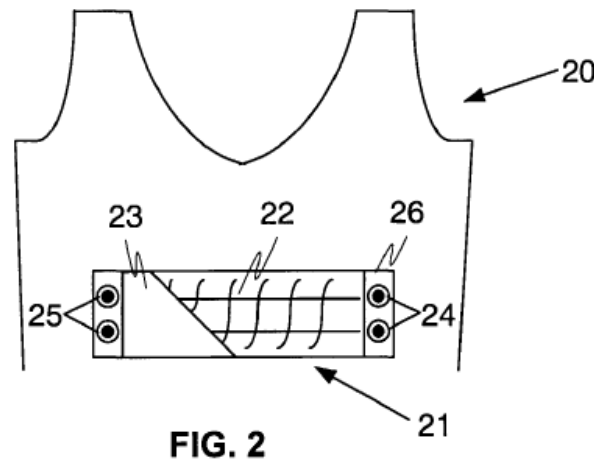




198. Reho states that “[b]esides humans, the sensor ... can be placed on the skin of an animal.” *Id.* at p. 5. This clearly covers mammals as also required by claim 1.

199. Reho discloses that “[t]he sensor can be integrated in a garment [with] the conductive fibres in the contact layer... sewn into the fabric surface or ... knitted or woven directly in the fabric texture.” *Id.* at p. 3. Further, Reho states that “[k]nitted or woven conductive fibres are not necessarily distinguished at all in the garment, and in addition, they may enhance the elasticity and strength properties of the product.” *Id.* “The sensor can typically be placed in the chest area of a garment, or the measurement can also be made e.g. in the area of the neck or the wrists. The sensor can be combined with various pieces of clothing, such as an undershirt, bras, a top, a turtleneck, a headband, a wristband or any other garment.” *Id.* at p. 4. Figure 2 below provides a schematic view of “a sensor [21] connected to a fabric by sewing or weaving,” here illustrating the electrically

conductive fabric integrated into a shirt **20** or the like. *Id.* at p. 5. Similarly, Figure 3 above illustrates the electrically conductive fabric sensor **31** integrated into a headband or wristband **30** or the like. *Id.*



200. Reho further discloses “a moisture layer for retaining moisture on top of the contact layer” that may take the form of “an impervious, substantially moisture proof seal layer.” *See, e.g., Id.* at pp. 2-3. It is disclosed that the function and purpose of the “moisture layer” is to “retain secretory products from the skin, [which] enhances the contact between the skin and the contact layer and increases the electrical conductivity of the contact layer.” *Id.* at p. 3. In the context of the “seal layer” version of the “moisture layer,” Reho discloses that “[t]he seal layer may be made e.g. of a waterproof or non-respiring fabric, or a film-like material, such as suitable plastic, e.g. silicone plastic or rubber or a laminate layer.” *Id.* With reference to Figure 3 above, Reho states that the “seal layer **33** [is] made of a non-respiring fabric.” *Id.*

201. All that remains in finding literal basis in or anticipation by Reho of claim 1 of the '951 Patent is the limitation that the at least one portion of material which is substantially impermeable to moisture be “located on said first surface.” While this feature may not find express recitation in Reho, it is my opinion as supported by “state of the art” and experimental data that such feature is inherent to the disclosed electrode structure.

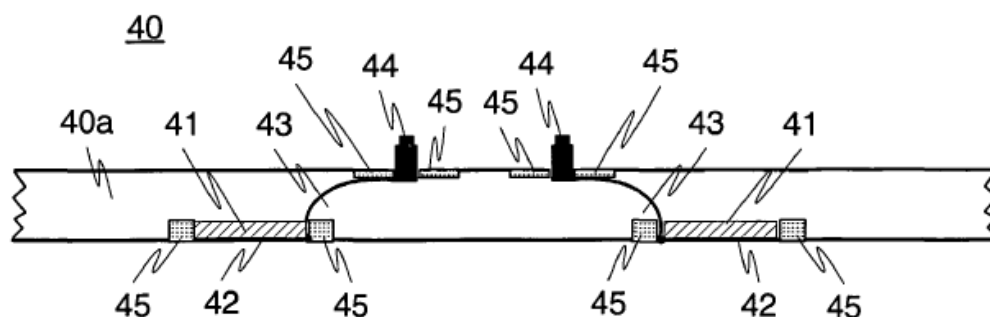
202. As set forth above, a reasonable construction of the phrase “material which is substantially impermeable to moisture” is “a material that prevents moisture to pass or diffuse through the material to a considerable degree,” such as rubber. *See, e.g.*, Ex. SS 1001 at Abstract and 2:52-54; *see also*, ¶ 79, *supra*. And a reasonable construction of the phrase “said material being located on said first surface” is “the material is located directly on the first surface or is over, adjacent to, touching, in electrical communication with, or embedded in the first surface.” *See, e.g., Id.* at 2:33-36; 4:38-44; and 6:13-23; *see also*, ¶ 80, *supra*. Read together, this limitation of claim 1 as subject to its broadest reasonable construction calls for a portion of moisture impermeable material over, adjacent to, touching, embedded in, or electrically coupled to the conductive fabric to form the electrode arrangement.

203. Regarding the basic sensor **1** as shown in Figure 1 reproduced above, Reho indicates that “[a]s the sensor **1** is placed on the skin, the seal layer **3** of the

sensor **1** starts collecting moisture from the skin on its lower surface.” *Id.* at p. 5.

As such, the seal layer **3** is adjacent the skin and the contact layer **2** of the sensor **1** so as to together function to trap moisture such that “the skin contact and the conductive properties of the contact layer are substantially improved.” *Id.*

204. Notably, Reho discloses in connection with the various cross-sectional views of the sensor arrangement of Figures 4-6 that the sensor **42**, and thus the fabric-like contact layer, is “integrated in the surface of the garment **40a** with [the] seal layer **41** provided on the side opposite to the sensor part **42** placed in contact with the skin.” *Id.* at p. 6; Fig. 4. Thus, as shown and is inherent, the sensor **42** itself is quite thin, being composed of a weave of conductive fibers backed by the seal layer **41**. In one prior art example, such a seal layer over a conductive fabric electrode is on the order of 0.1 to 5.0 mm thick. *See, e.g.,* Ex. SS 1004 at 3:18-20.



**FIG. 4**

205. As is generally known in the related art, the conductive fibers or yarns typically employed in fabric or textile electrodes are often stainless steel fibers of an alloy such as AISI 316L having a diameter preferably on the order of only six to

fifteen microns (6-15  $\mu\text{m}$ ) blended with polyester yarns or the like at a ratio of 20% steel and 80% polyester to form the completed conductive yarn. *See, e.g.*, Ex. SS 1009 at pp. 12-13<sup>2</sup>; Ex. SS 1010 at 4:51-59. Such conductive fibers or yarns are then woven together at a relatively low count of on the order of 60 tex or with a relatively “loose knit” to produce a fabric or textile electrode having the required conductivity as well as flexibility and stretch. *See, e.g.*, Ex. SS 1009 at pp. 12-14; Ex. SS 1010 at 4:35-63 and 5:8-12. It is further known in the art to use a variety of other conductive metallic fibers, to use non-conductive fibers such as polyester polyamide or aromatic polyamide “coated ... with conductive material, such as nickel, copper, zinc, etc.” or to use “electrically conductive elements” blended into the yarn. *See, e.g.*, Ex. SS 1009 at pp. 12-13; Ex. SS 1004 at 3:21-29.

Accordingly, such resulting electrically conductive fabrics inherently have openings or interstitial spaces within the weave as a byproduct of the yarns selected and the weaving or knitting process.

206. It follows in connection with the disclosed sensor arrangement of Reho, which is in one or more embodiments a fabric construction generally as described above or even a mesh, that it is inherent that portions of the seal layer formed of a material such as silicone rubber when applied to the back of the

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<sup>2</sup> All page citations to the Demeyere PCT publication are counted from or include the cover page and so effectively refer to the Exhibit page numbers in the lower right rather than the page numbers provided at the top of the specification pages of the actual application as filed.

relatively thin, woven or somewhat porous contact layer of the sensor will naturally flow into and fill at least some of the openings or interstitial spaces between the individual fibers of the fabric-like woven sensor and thus be embedded in and to some extent present on the “first surface” or front or skin-facing surface of the sensor in actual construction and use.

207. Moreover, to confirm the inherency of at least a portion of the seal layer of the sensor being embedded in or “located on said first surface” or skin-facing surface of the sensor, Agustín Maciá Barber personally conducted experiments wherein an electrode according to Reho was constructed and its skin-facing surface evaluated, which confirmed that indeed there is moisture impermeable material (silicone rubber) in and at the surface of the fabric electrode. The details of the Maciá Barber experiments are found in the separate Declaration of Agustín Maciá Barber (Ex. SS 1014). I have reviewed the experimental design and results cited in such Maciá Barber Declaration. As highlighted in several exhibits (Ex. 1-6), moisture impermeable material is found to be interleaved with the electrically conductive fabric and threads. The magnified images of the skin-facing surface of the fabric electrode clearly illustrate the presence of moisture impermeable materials located or deposited on or embedded among the electrically conductive threads. Accordingly, I find the results to be credible and so agree with the conclusions reached.

## Claim 2

208. Regarding dependent claim 2, which adds the further limitation that the “at least one portion of [moisture impermeable] material is located directly on said first surface” of the electrically conductive fabric, Reho again discloses “a moisture layer for retaining moisture on top of the contact layer” and that “[t]he moisture layer of the sensor preferably surrounds the contact layer so as to fit against the skin around the contact area.” *See*, Ex. SS 1003 at pp. 2-4. Thus, Reho discloses that the at least one portion of moisture impermeable material is located *directly* on said first surface, meaning there is no intermediate layer between the two and the first surface is the surface configured to face the skin.

209. The conclusion that Reho discloses an electrode construction wherein “at least one portion of [moisture impermeable] material is located directly on said first surface” is further supported by the above remarks concerning the inherency of this construction based on the properties of the silicone rubber that forms the seal layer and the relatively thin, woven or somewhat porous contact layer of the fabric sensor (*see*, ¶¶ 203-206, *supra*) as well as the Maciá Barber experimental results demonstrating that an electrode constructed according to Reho does have at least a portion of the substantially impermeable seal layer of the sensor, such as silicone rubber with carbon black, embedded in or “located directly on said first surface” or skin-facing surface of the sensor (*see*, ¶ 207, *supra*).

Claim 3

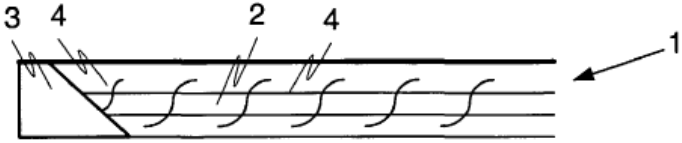
210. Regarding dependent claim 3, which adds the further limitation that “said [moisture impermeable] material is mechanically flexible,” Reho again discloses that “[t]he seal layer may be made e.g. of a waterproof or non-respiring fabric, or a film-like material, such as suitable plastic, e.g. silicone plastic or rubber or a laminate layer.” *See, e.g.*, Ex. SS 1003 at p. 3. It is further disclosed that the resulting sensor, and hence the components thereof, namely, the contact layer and the seal layer, “can be given a textile-like embodiment” and thereby be “soft and adaptable on the skin,” have enhanced “elasticity,” and be “pleasant to wear” and provide “extremely good comfort of use.” *Id.* All such statements are synonymous or consistent with the sensor being “mechanically flexible,” which is evidenced by statements in the ‘951 Patent indicating that the recited moisture impermeable material is “silicone rubber” just as disclosed in Reho and that such is “flexible” or “able to flex in sympathy with the first surface of the electrode arrangement.” *See, e.g.*, Ex. SS 1001 at 2:40-42 and 2:52-54.

211. That any such moisture impermeable material or rubber is “mechanically flexible” is further evidenced by the general prior art, wherein, for example, a fabric electrode covered in a conductive silicone rubber is described as “highly flexible.” *See, e.g.*, Ex. SS 1004 at 3:21-40 and 10:35-40.



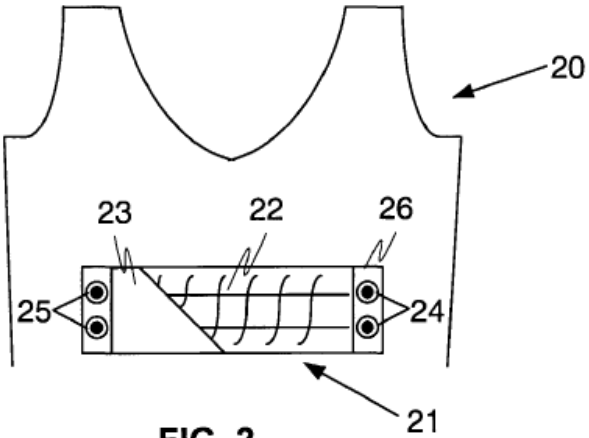
212. Based on the foregoing, it is clear that all limitations of claims 1-3 of the '951 Patent are literally found in Reho, either expressly or inherently.

213. The claim charts below illustrate how Reho anticipates claims 1-3:

Claim 1	Citations from Reho and Discussion of Citations
An electrode arrangement comprising:	Reho is entitled "a sensor arrangeable on the skin" and is directed to "a sensor placed on the skin." Ex. SS 1003 at p. 2. It is specifically disclosed that "the sensor of the invention can be an electrode." <i>Id.</i> at p. 5.
an electrically conductive fabric having a first surface for application to skin of a mammal; and	<p>"The sensor in accordance with the invention comprises a contact layer including conductive fibres ...." <i>Id.</i> at p. 2. "The contact layer may consist e.g. of a fabric-like layer ...." <i>Id.</i> at p. 3.</p> <p>"The sensor 1 shown in figure 1 has a contact layer 2 made of conductive fibres 4 e.g. by weaving, knitting, twining, pressing, gluing or sewing." <i>Id.</i> at p. 5.</p>  <p style="text-align: center;"><b>FIG. 1</b></p> <p>Claim 5: "A sensor as defined in any of the preceding claims, characterized in that the contact layer (2, 22, 32) is made of fabric." <i>Id.</i> at p. 9.</p> <p>"The invention relates to a sensor placed on the skin." <i>Id.</i> at p. 3. There is to be "contact between the skin and the contact layer" of the sensor. <i>Id.</i> at p. 4. Thus, it is inherent that the sensor 1 has a "first surface" that "faces or is oriented toward the skin of the wearer."</p> <p>"Besides humans, the sensor of the invention can be placed on the skin of an animal." <i>Id.</i> at p. 5. This clearly covers mammals.</p>
at least one portion of material	Reho discloses "a moisture layer for retaining moisture on top of the contact layer" that may take the form of "an impervious, substantially moisture proof seal layer." <i>Id.</i> at p. 3. The function

Claim 1	Citations from Reho and Discussion of Citations
<p>which is substantially impermeable to moisture, said material being located on said first surface,</p>	<p>and purpose of the “moisture layer” is to “retain secretory products from the skin, [which] enhances the contact between the skin and the contact layer and increases the electrical conductivity of the contact layer.” <i>Id.</i> “The seal layer may be made e.g. of a waterproof or non-respiring fabric, or a film-like material, such as suitable plastic, e.g. silicone plastic or rubber or a laminate layer.” <i>Id.</i></p> <p>Regarding the basic sensor <b>1</b> as shown in Fig. 1 reproduced above, “[a]s the sensor <b>1</b> is placed on the skin, the seal layer <b>3</b> of the sensor <b>1</b> starts collecting moisture from the skin on its lower surface.” <i>Id.</i> at p. 5. As such, the seal layer <b>3</b> is adjacent the skin and the contact layer <b>2</b> of the sensor <b>1</b> so as to together function to trap moisture such that “the skin contact and the conductive properties of the contact layer are substantially improved.” <i>Id.</i></p> <p>The sensor <b>42</b>, and thus the fabric-like contact layer, is “integrated in the surface of the garment <b>40a</b> with [the] seal layer <b>41</b> provided on the side opposite to the sensor part <b>42</b> placed in contact with the skin.” <i>Id.</i> at p. 6; Fig. 4. Thus, as shown and is inherent, the sensor <b>42</b> itself is quite thin, being composed of a weave of conductive fibers backed by the seal layer <b>41</b>. In one prior art example, such a seal layer over a conductive fabric electrode is on the order of 0.1 to 5.0 mm thick. <i>See, e.g.,</i> Ex. SS 1004 at 3:18-20.</p> <div data-bbox="537 1360 1284 1598" data-label="Image"> </div> <p><b>FIG. 4</b></p> <p>The conductive fibers or yarns typically employed in fabric or textile electrodes are often stainless steel fibers of an alloy such as AISI 316L having a diameter preferably on the order of only six to fifteen microns (6-15 <math>\mu\text{m}</math>), such as in a blend with polyester</p>

Claim 1	Citations from Reho and Discussion of Citations
	<p>yarns or the like at a ratio of 20% steel and 80% polyester to form the completed conductive yarn. <i>See, e.g.</i>, Ex. SS 1009 at pp. 12-13; Ex. SS 1010 at 4:51-59. Such conductive fibers or yarns are then woven together at a relatively low count of on the order of 60 tex or with a relatively “loose knit” to produce a fabric or textile electrode having the required conductivity as well as flexibility and stretch. <i>See, e.g.</i>, Ex. SS 1009 at pp. 12-14; Ex. SS 1010 at 4:35-63 and 5:8-12. It is further known in the art to use a variety of other conductive metallic fibers, to use non-conductive fibers such as polyester polyamide or aromatic polyamide “coated ... with conductive material, such as nickel, copper, zinc, etc.” or to use “electrically conductive elements” blended into the yarn. <i>See, e.g.</i>, Ex. SS 1009 at pp. 12-13; Ex. SS 1004 at 3:21-29.</p> <p>It is inherent that portions of the seal layer <b>41</b> formed of a material such as silicone rubber when applied to the back of the relatively thin, woven or somewhat porous contact layer of the sensor <b>42</b> will naturally flow into and fill at least some of the openings or interstitial spaces between the individual fibers of the fabric-like, woven sensor <b>42</b> and thus be embedded in and to some extent present on the “first surface” or front or skin-facing surface of the sensor <b>42</b> in actual construction and use.</p> <p>Moreover, to confirm the inherency of at least a portion of the seal layer of the sensor being embedded in or “located on said first surface” or skin-facing surface of the sensor, Agustín Maciá Barber personally conducted experiments wherein an electrode according to Reho was constructed and its skin-facing surface evaluated, which confirmed that indeed there is moisture impermeable material in and at the surface of the fabric electrode. <i>See, e.g.</i>, Ex. SS 1014 at ¶ 46.</p>
wherein said electrically conductive fabric is integral with a garment.	<p>“The sensor can be integrated in a garment .... The conductive fibres in the contact layer can be sewn into the fabric surface or they can be knitted or woven directly in the fabric texture.” Ex. SS 1003 at p. 3.</p> <p>Figure 2 below provides a schematic view of “a sensor of the invention connected to a fabric by sewing or weaving.” <i>Id.</i> at p. 5.</p>

Claim 1	Citations from Reho and Discussion of Citations
	 <p><b>FIG. 2</b></p> <p>“The sensor can combined with various pieces of clothing, such as an undershirt, bras, a top, a turtleneck, a headband, a wristband or any other garment.” <i>Id.</i> at p. 4.</p>

Claim 2	Citations from Reho and Discussion of Citations
<p>The electrode arrangement in accordance with claim 1 wherein said at least one portion of material is located directly on said first surface.</p>	<p>Reho discloses “a moisture layer for retaining moisture on top of the contact layer” and that “[t]he moisture layer of the sensor preferably surrounds the contact layer so as to fit against the skin around the contact area.” <i>See</i>, Ex. SS 1003 at pp. 2-4.</p> <p>“The contact layer may consist e.g. of a fabric-like layer ....” <i>Id.</i> at p. 3. “The sensor 1 shown in figure 1 has a contact layer 2 made of conductive fibres 4 e.g. by weaving, knitting, twining, pressing, gluing or sewing.” <i>Id.</i> at p. 5.</p> <p>“The seal layer may be made e.g. of a waterproof or non-respiring fabric, or a film-like material, such as suitable plastic, e.g. silicone plastic or rubber or a laminate layer.” <i>Id.</i> at p. 3.</p> <p>It is inherent that portions of the seal layer formed of a material such as silicone rubber when applied to the back of the relatively thin, woven or somewhat porous contact layer of the sensor will naturally flow into and fill at least some of the openings or interstitial spaces between the individual fibers of the fabric-like, woven sensor and thus be embedded in and to some extent</p>

<b>Claim 2</b>	<b>Citations from Reho and Discussion of Citations</b>
	<p>present on the “first surface” or front or skin-facing surface of the sensor in actual construction and use.</p> <p>“It has been confirmed through the conducted experiments based on fabric electrodes constructed according to and consistent with the teachings of Reho that at least a portion of the substantially impermeable seal layer of the sensor, here silicone rubber with carbon black, is imbedded in or ‘located directly on said first surface’ or skin-facing surface of the sensor.” Ex. SS 1014 at ¶ 46.</p>

<b>Claim 3</b>	<b>Citations from Reho and Discussion of Citations</b>
The electrode arrangement in accordance with claim 1 wherein said material is mechanically flexible.	<p>“The seal layer may be made e.g. of a waterproof or non-respiring fabric, or a film-like material, such as suitable plastic, e.g. silicone plastic or rubber or a laminate layer.” <i>See, e.g.</i>, Ex. SS 1003 at p. 3.</p> <p>The resulting sensor, and hence the components thereof, namely, the contact layer and the seal layer, “can be given a textile-like embodiment” and thereby be “soft and adaptable on the skin,” have enhanced “elasticity,” and be “pleasant to wear” and provide “extremely good comfort of use.” <i>Id.</i></p> <p>All such statements are synonymous or consistent with the sensor being “mechanically flexible,” which is evidenced by statements in the ‘951 Patent indicating that the recited moisture impermeable material is “silicone rubber” just as disclosed in Reho and that such is “flexible” or “able to flex in sympathy with the first surface of the electrode arrangement.” <i>See, e.g.</i>, Ex. SS 1001 at 2:40-42 and 2:52-54.</p> <p>The general prior art discloses, for example, that a fabric electrode covered in a conductive silicone rubber is “highly flexible.” <i>See, e.g.</i>, Ex. SS 1004 at 3:21-40 and 10:35-40.</p>

## **VI. SECONDARY CONSIDERATIONS**

214. I understand that Patent Owner has not provided any evidence regarding secondary considerations of non-obviousness. To the extent Patent Owner is permitted to provide any evidence of such secondary considerations later in this case or in any contentions expressed by Patent Owner or its experts attempting to rebut my opinions as expressed in this declaration, I reserve the right to supplement and/or amend this declaration or submit a reply declaration to consider the alleged secondary considerations of non-obviousness.

## **VII. RIGHT TO SUPPLEMENT**

215. I reserve the right to supplement this declaration, if appropriate, should additional information come to light that bears on my opinions contained in this declaration. I also reserve the right to consider and comment on additional evidence, such as objective evidence of non-obviousness, that may be presented by Patent Owner or its experts.

216. At any trial or hearing in which I testify in this matter, I may provide demonstrative aids, such as computer animations, excerpts and figures from relevant exhibits and prior art references, and physical examples to assist in explaining the subject matter discussed in this declaration.

217. I expect to continue my study and evaluation of relevant prior art as this case proceeds, at least up until the end of any period prescribed for discovery.

In the event that further issues arise that concern the subject matter of this declaration, I expressly reserve the right to supplement, modify, or amend the opinions stated in this declaration as well as the bases supporting my opinions. I further reserve the right to supplement and/or amend this declaration or submit a reply declaration based on any information or contentions expressed by Patent Owner or its experts attempting to rebut my opinions as expressed in this declaration. Additionally, I reserve the right to use demonstratives or other exhibits at trial in support of my opinions in any of my expert declarations or supplements thereto.


## **VIII. CONCLUSION**

218. For the reasons set forth above, it is my opinion that claims 1-4 of the '951 Patent are invalid.

219. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine

or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Executed on Dec 28<sup>th</sup>, 2015 in Dallas, TX

By:   
Roozbeh Jafari