

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

CASE IPR: Unassigned

**PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 7,522,951
UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. §§ 42.1-.80, 42.100-.123**

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TABLE OF EXHIBITS

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| SS 1001 | U.S. Patent No. 7,522,951 to Gough, <i>et al.</i> (the challenged patent) |
| SS 1002 | U.S. Patent No. 4,729,377 to Granek, <i>et al.</i> (invalidating prior art to the challenged claims) |
| SS 1003 | International Patent Application No. PCT/FI02/00132 to Reho, <i>et al.</i> (invalidating prior art to the challenged claims) |
| SS 1004 | U.S. Patent No. 4,941,961 to Noguchi, <i>et al.</i> (invalidating prior art to the challenged claims) |
| SS 1005 | U.S. Patent No. 568,095 to Muir (invalidating prior art to the challenged claims) |
| SS 1006 | U.S. Patent No. 4,207,904 to Greene (invalidating prior art to the challenged claims) |
| SS 1007 | Prosecution History of the ‘951 Patent |
| SS 1008 | U.S. Patent No. 4,664,118 to Batters (prior art relevant to state of the art) |
| SS 1009 | International Patent Application No. PCT/EP00/05235 to Demeyere, <i>et al.</i> (prior art relevant to state of the art) |
| SS 1010 | U.S. Patent No. 4,867,166 to Axelgaard, <i>et al.</i> (prior art relevant to state of the art) |
| SS 1011 | U.S. Patent No. 6,270,466 to Weinstein, <i>et al.</i> (prior art relevant to state of the art) |
| SS 1012 | Declaration of Roozbeh Jafari (related to unpatentability of claims 1-4 of the ‘951 Patent) |
| SS 1013 | Curriculum Vitae of Declarant Roozbeh Jafari |
| SS 1014 | Declaration of Agustín Maciá Barber (related to experiments involving prior art electrode constructions) |
| SS 1015 | Curriculum Vitae of Declarant Agustín Maciá Barber |

I. INTRODUCTION

Pursuant to 37 C.F.R. § 42.22(a)(1) and 37 C.F.R. § 42.104(b)(1)-(2), Smart Solutions Technologies, S.L. (hereinafter “Petitioner”) seeks *Inter Partes* Review (“IPR”) and cancellation of claims 1-4 of U.S. Patent No. 7,522,951 to Gough, *et al.* (hereinafter “the ‘951 Patent”) (“Ex. SS 1001”¹), which is owned by Koninklijke Philips Electronics N.V. (hereinafter “Patent Owner”).

II. OVERVIEW OF THE CHALLENGE

The ‘951 Patent is an attempt to claim exclusive right to a known and obvious skin electrode construction. The purported point of novelty in the pertinent claims and the stated reason for their allowance is the inclusion of a “portion of material which is substantially impermeable to moisture” on the front or skin-facing surface of an electrically conductive fabric electrode, when it was already known in the art to employ rubbers and other such moisture impermeable materials on either or both sides of such fabric electrodes for the common purpose of reducing resistance and improving conductivity as well as providing other mechanical benefits to the resulting electrode construction.

For the reasons discussed below, the challenged claims of the ‘951 Patent should never have issued because the prior art cited herein anticipates or renders

¹ References to Exhibits herein are in the form “Ex. SS [10--]”.

them obvious. Thus, because Petitioner is reasonably likely to prevail as to at least one of the claims challenged, this Petition should be granted and trial instituted.

III. GROUNDS FOR STANDING (37 C.F.R. § 42.104(a)) AND PROCEDURAL STATEMENTS

Petitioner certifies, pursuant to 37 C.F.R. § 42.104(a), that the ‘951 Patent is available for IPR and that Petitioner is not barred or estopped from requesting IPR of any claim of the ‘951 Patent on the grounds identified herein.

Under 35 U.S.C. § 315(b), an IPR may not be instituted based on a petition filed more than one year after the petitioner is served with a complaint alleging infringement of the patent. There being no such complaint filed, let alone filed and served more than one year prior to the filing date of this Petition, such Petition is thus not barred. Similarly, the ‘951 Patent having issued on April 21, 2009, well over nine months prior to the filing of this Petition, and itself not being subjected to reissuance or any post-grant review, the present Petition likewise is thus not barred under 35 U.S.C. § 311(c).

This Petition is filed in accordance with 37 C.F.R. § 42.106(a). A Power of Attorney pursuant to 37 C.F.R. § 42.10(b) is filed herewith, and an exhibit list in compliance with 37 C.F.R. § 42.63(e) is submitted on page iii of this Petition. The required fee is paid through online credit card payment.

As identified in the attached Certificate of Service, a copy of this Petition in its entirety is being served to the Patent Owner’s address of record as listed in the

USPTO's records associated with the challenged patent by overnight delivery pursuant to 37 C.F.R. § 42.6.

IV. MANDATORY NOTICES (37 C.F.R. § 42.8(a)(1))

A. Real Party-In-Interest (37 C.F.R. § 42.8(b)(1))

Smart Solutions Technologies, S.L., doing business as Nuubo, is the real party-in-interest for Petitioner.

B. Notice of Related Matters (37 C.F.R. § 42.8(b)(2))

Petitioner is unaware of any pending civil action asserting the '951 Patent against Petitioner or against any real party-in-interest or any privy of Petitioner. Petitioner is also unaware of any disclaimers or any reexamination certificates for or relating to the '951 Patent.

C. Designation of Counsel (37 C.F.R. § 42.8(b)(3))

| Lead Counsel | Back-Up Counsel |
|--|---|
| Peter D. Weinstein (Reg. No. 43,251) One ³ IP Management, P.C. 1560-1 Newbury Road, Suite 327 Newbury Park, CA 91320 (805) 499-7305 (telephone) (805) 322-4469 (facsimile) Peter_Weinstein@one3ip.com | Jeromye V. Sartain (Reg. No. 54,423) One ³ IP Management, P.C. 1113 Murfreesboro Road, Suite 106-160 Franklin, TN 37064 (615) 807-1963 (telephone) (805) 322-4469 (facsimile) Jeromye_Sartain@one3ip.com |

D. Notice of Service Information (37 C.F.R. § 42.8(b)(4))

Please direct all correspondence to lead counsel at the above address.

Petitioner consents to electronic service by email at

one3ipdocket@blackhillsip.com.

V. STATEMENT OF THE PRECISE RELIEF REQUESTED AND THE REASONS THEREFOR (37 C.F.R. § 42.22(a))

A. Claims for Which *Inter Partes* Review is Requested

Pursuant to 37 C.F.R. §§ 42.22(a), the precise relief requested is that *inter partes* review be granted and each of claims 1-4 of the ‘951 Patent be cancelled as invalid under 35 U.S.C. §§ 102 or 103, as forth in more detail herein.

B. Prior Art on Which Challenge is Based

The ‘951 Patent derived from a U.S. national stage 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. Petitioner requests *inter partes* review based on the following references:

| Ex. | Reference | Abbrev. |
|------------|---|----------------|
| 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 |

| Ex. | Reference | Abbrev. |
|------------|--|----------------|
| 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 |

Reho qualifies as prior art under at least 35 U.S.C. §§ 102(a) and 102(e)(1).

The other references qualify as prior art under at least 35 U.S.C. § 102(b).

C. Statutory Grounds for Challenge

The statutory grounds under 35 U.S.C. §§ 102 and 103 on which each challenge is based are set forth in summary fashion in the below table:

| Ground | Claims | Invalidity Basis |
|---------------|---------------|--|
| A | 1-3 | Anticipated under §102(b) by Granek |
| B | 4 | Obvious under §103(a) over Granek in view of Noguchi |
| C | 1-4 | Obvious under §103(a) over Reho in view of Muir |
| D | 1-4 | Obvious under §103(a) over Reho in view of Greene |
| E | 1-3 | Anticipated under §102(e) by Reho |

VI. SUMMARY OF THE ‘951 PATENT

A. Disclosure of the ‘951 Patent

The ‘951 Patent issued on April 21, 2009 from a U.S. national stage application filed under 35 U.S.C. § 371 on June 23, 2005. Once again, the corresponding international PCT patent application² claimed the benefit of a

² PCT Patent Application No. PCT/IB03/05963 filed on December 11, 2003.

Priority Application filed on December 27, 2002.³ *See*, Ex. SS 1001 at p. 1.

Therefore, the earliest effective filing date of the ‘951 Patent, assuming adequate support in the Priority Application, is December 27, 2002.

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**. *Id.* 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.*

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

³ British Patent Application No. GB 0230361.8 filed on December 27, 2002.

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.

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 one exemplary 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.

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.

B. Summary of the Prosecution History of the ‘951 Patent

Claim 1 was initially rejected⁴ under 35 U.S.C. § 102(b) “as being clearly anticipated” by both Kater⁵ and Sem-Jacobsen⁶. Ex. SS 1007 at p. 82.

⁴ First Office Action mailed on November 13, 2007.

⁵ U.S. Patent No. 3,993,049 to Kater issued on November 23, 1976.

⁶ U.S. Patent No. 3,954,100 to Sem-Jacobsen issued on May 4, 1976.

In response⁷, Kater was distinguished 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.

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. In addressing a Section 103 rejection of claims 1 and 5⁸ based on the combination of Sem-Jacobsen with Reho⁹, Reho was not discussed. *Id.* at pp. 70 and 83.

With the rejection of claim 1 as being anticipated by Kater maintained in a subsequent Office Action¹⁰, such was ultimately traversed simply by adding the limitation that the electrically conductive fabric of the electrode arrangement be “integral with a garment.”¹¹ *Id.* at pp. 29, 32, 39, 46, 49 and 58.

⁷ “Remarks” section of Patent Owner’s “Amendment B” filed February 4, 2008.

⁸ Then-numbered claim 10 became claim 1 and then-numbered claim 13 became claim 5 in the issued ‘951 Patent.

⁹ U.S. Patent Application Pub. No. US 2004/0138546 dated July 15, 2004, which issued as U.S. Patent No. 7,324,841, itself derived from PCT/FI02/00132 referred to herein as “Ex. SS 1003” and “Reho”.

¹⁰ Second non-final Office Action mailed on April 22, 2008.

¹¹ “Amendments” and “Remarks” sections of Patent Owner’s “Amendment C” filed July 22, 2008 and “After Final Amendment D” filed on November 17, 2008, as well as “Allowable Subject Matter” section of third Office Action, made “Final,” mailed on September 17, 2008. Subject matter of former claim 1 was added to allowable former dependent claim 10, which claim was then renumbered as claim 1 upon issuance of the ‘951 Patent.

In the “Reasons for Allowance” relating to the ‘951 Patent¹², it was 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. No comments regarding the stated “Reasons for Allowance” were entered.¹³ *Id.* at p. 16.

VII. PERSON OF ORDINARY SKILL IN THE ART & STATE OF THE ART

A person having ordinary skill in the art (“PHOSITA”) is presumed to be aware of all pertinent art, to think along conventional wisdom in the art, and to be a person of ordinary creativity. In the field of the ‘951 Patent in or about 2002 and prior, a PHOSITA 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. *See*, Ex. SS 1012 at ¶ 61.

Moreover, it is noted that the level of ordinary skill in the art is evidenced by the references. *See, In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995).

¹² Notice of Allowance mailed on December 9, 2008.

¹³ A Rule 312 Amendment was entered on March 9, 2009 to correct an antecedent basis issue for then-numbered claim 13 (claim 5 in the issued ‘951 Patent).

The prior art demonstrates that a PHOSITA around and before 2002 was aware of the problems that are presented in connection with fabrication and use of fabric electrodes. For example, it was known that employing water, grease, chemicals, salves, gels, or other such materials typically used to help electrodes stick to the skin and have improved conductivity with the skin is not desirable in the context of fabric or wearable electrodes, where such use may be of longer duration and such additives, versus functional “dry” electrode operation, may cause skin irritation or discomfort or generally be inconvenient or unpleasant in use. *See, e.g.*, Ex. SS 1003 at pp. 2-3¹⁴; Ex. SS 1008 at 2:40-47, 2:66-3:1, and 3:20-25; Ex. SS 1011 at Abstract and 3:5-11; and Ex. SS 1012 at ¶¶ 55, 56, and 58.

The art also makes clear that it is preferable that the challenge of improving the conductivity of a wearable fabric electrode not be met by simply increasing the number or proportion of conductive fibers in the electrode, which would adversely result in a less flexible and less comfortable fabric electrode. *See, e.g.*, Ex. SS 1009 at pp. 3-6, 8 and 12¹⁵; Ex. SS 1010 at Abstract, 4:13-18, 4:35-40, 4:51-59, and 5:8-12; and Ex. SS 1012 at ¶ 59.

¹⁴ 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.

¹⁵ All page citations to the Demeyere PCT publication are counted from or include the two-page cover page and so effectively refer to the Exhibit page numbers in the

Rather, it was known in the art that fabric-based electrodes may incorporate moisture impermeable rubber or like materials so as to not compromise electrode flexibility while improving electrode conductivity, whether through the formation of moisture between the electrode and skin due to the impermeability of the material and/or through configuring the moisture impermeable material to be electrically conductive as well. *See, e.g.*, Ex. SS 1003 at pp. 2-3; Ex. SS 1004 at 1:56-57 and 3:21-40; Ex. SS 1011 at Abstract, 2:52-54, 3:5-11, 4:4-5, and 12:49 and 51; and Ex. SS 1012 at ¶¶ 55, 56, 57, 99, and 104.

As of December 27, 2002 (the earliest possible priority date of the ‘951 Patent), the subject matter of claims 1-4 was well known to a PHOSITA.

VIII. CLAIM CONSTRUCTION

In accordance with 37 C.F.R. § 42.104(b)(3), Petitioner provides the following statement regarding construction of terms found in the ‘951 Patent claims as an aid to the Board.¹⁶ Except for the terms addressed specifically herein, the terms of the ‘951 Patent should be given their ordinary and customary meaning

lower right rather than the page numbers provided at the top of the specification pages of the actual application as filed.

¹⁶ Petitioner’s claim construction herein should not be taken to mean that Petitioner agrees or admits that any claim element of the challenged claims should receive the benefit of the doctrine of equivalents or that Petitioner is precluded from propounding alternative claim constructions or that Petitioner agrees or believes that the claims at issue are susceptible to a meaningful construction or satisfy the requirements of 35 U.S.C. § 112.

as understood by a PHOSITA using the broadest reasonable construction as required by 37 C.F.R. § 42.100(b).¹⁷

Claim 1 includes the phrase “electrically conductive fabric,” which does not appear in the specification of the ‘951 Patent. In the specification of the ‘951 Patent, there is disclosed a “fabric electrode arrangement” that “can be of a knitted construction or a woven construction” such as “a plain knit structure using yarn comprising tactelTM (a type of nylon) which is an electrical insulator and stainless steel which is an electrical conductor.” *See, e.g.*, Ex. SS 1001 at 1:39-44, 3:5-6, 3:49-53, and 4:3-7. Notably, 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 [‘951 Patent] which has use in textile based electrodes in general, whether the electrodes are of a knitted, woven, embroidered, or non-woven structure.” *Id.* at 6:44-48. Thus, Petitioner submits that the broadest reasonable construction of “electrically conductive fabric” 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; *see also*, Ex. SS 1012 at ¶ 77.

Claim 1 further includes the limitation of “a first surface for application to [the] skin of a mammal.” This term is consistently used in the specification to

¹⁷ Any interpretation or construction of the challenged claims in this Petition is made solely pursuant to the broadest reasonable construction rule applicable to this Petition and shall not be viewed as constituting, in whole or in part, Petitioner’s interpretation or construction under any other forum’s rules or standards.

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 1:39-44, 3:21-27, and 3:49-55. A first proposed construction would not give patentable weight to the portion of the limitation which states “for application to the skin of a mammal,” where the preposition “for” often indicates that the language to follow is merely functional language that is a statement of intended use. *See, C.R. Bard, Inc. v. M3 Systems, Inc.*, 157 F.3d 1340, 1348-49 (Fed. Cir. 1998). If it is determined that the preceding functional language should be given patentable weight, Petitioner submits that the broadest reasonable construction of “a first surface for application to skin of a mammal” is “a surface of the electrically conductive fabric capable of contacting the skin.” *See, e.g., SS* 1001 at 1:39-44, 3:21-27, and 3:49-55; *see also, Ex. SS* 1012 at ¶ 78.

Claim 1 further recites an “at least one portion of material which is substantially impermeable to moisture”. 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., Ex. SS* 1001 at Abstract, 1:48-52, 2:52-54, 3:55-58, and 5:31-35.

Regarding the term “substantially,” it is considered to be a broad term. *See, e.g., In re Nehrenberg*, 280 F.2d 161 (CCPA 1960). “Substantially” is also a word of degree. *See, e.g., LNP Engineering Plastics, Inc. v. Miller Waste Mills, Inc.*, 275 F.3d 1347, 1359 (Fed. Cir. 2001). “When a word of degree is used the district court must determine whether the patent’s specification provides some standard for measuring that degree.” *Seattle Box Co. v. Indus. Crating & Packing, Inc.*, 731 F.2d 818, 826 (Fed. Cir. 1984). If the specification does not provide a standard for imposing a more precise construction of the term, the Federal Circuit has ruled that imposing a more precise construction would be error. *See, e.g., Playtex Products, Inc. v. Procter & Gamble Co.*, 400 F.3d 901, 907 (Fed. Cir. 2005); *Cordis Corp. v. Medtronic AVE, Inc.*, 339 F.3d 1352, 1360 (Fed. Cir. 2003).

For example, in *Playtex*, the Federal Circuit, quoting *Liquid Dynamics Corp. v. Vaughan Co., Inc.*, 355 F.3d 1361, 1368 (Fed. Cir. 2004), stated that “substantial” implies “approximate” rather than “perfect.” 400 F.3d at 907. In *Cordis*, the Federal Circuit held that “[t]he patents do not set out any numerical standard by which to determine whether the thickness of the wall surface is ‘substantially uniform.’ The term ‘substantially,’ as used in this context, denotes approximation.” 339 F.3d at 1360. In *Liquid Dynamics Corp.*, the Federal Circuit also construed a claim term having the word “substantially,” holding that “because the plain language of the claim was clear and uncontradicted by anything in the

written description or the figures, the district court should not have relied upon the written description, the figures, or the prosecution history to add limitations to the claim.” 355 F.3d at 1368.

Here, the ‘951 Patent 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.” Ex. SS 1001 at 1:48-60; Ex. SS 1012 at ¶ 79. Petitioner thus submits that the broadest reasonable construction of the phrase “at least one portion of material which is substantially impermeable to moisture” is “a material that prevents moisture to pass or diffuse through the material to a considerable degree.” *See, e.g., Id.* at Abstract, 1:48-60, 2:52-54, 3:55-58, and 5:31-35; *see also*, Ex. SS 1012 at ¶ 79.

Claim 1 also recites that the “portion of material” is “located on said first surface” of the electrically conductive fabric. Within the specification it is disclosed that the material is “located directly on said first surface” or “attached to the electrode portion” 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.,* Ex. SS 1001 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.

Furthermore, claim 2 adds the express limitation that the “material is located *directly* on said first surface” (emphasis added), such that the conclusion that claim 1 does not require direct attachment or location of the moisture impermeable layer on the electrode portion or electrically conductive fabric is reinforced under the doctrine of claim differentiation, which holds that “the presence of a dependent claim that adds a particular limitation gives rise to a presumption that the limitation in question is not present in the independent claim.” *See, Phillips v. AWH Corp.*, 415 F.3d 1303, 1315 (Fed. Cir. 2005) (citation omitted).

Thus, Petitioner submits that the broadest reasonable construction of the limitation that the moisture impermeable portion of material be “located on said first surface” of the electrically conductive fabric 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.*, Ex. SS 1001 at 2:33-36, 4:38-44, and 6:13-23; *see also*, Ex. SS 1012 at ¶ 80.

Claim 1 also includes the limitation that the “electrically conductive fabric is integral with a garment.” 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.*, Ex. SS 1001 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. Petitioner submits that the broadest reasonable construction of the phrase “electrically conductive fabric is integral with a garment” is that the electrically conductive fabric is “attached to or integrated in a wearable textile article.” *See, e.g., Id.* at 3:18-50 and 4:27-49, and Fig. 2; *see also*, Ex. SS 1012 at ¶ 81.

IX. IDENTIFICATION OF CHALLENGE (37 C.F.R. § 42.104(b))

Pursuant to 37 C.F.R. § 42.104(b)(4)-(5), a detailed explanation of the pertinence and manner of applying the prior art references to claims 1-4 is provided herein below, demonstrating that the challenged claims are unpatentable. Because Petitioner believes these grounds are not cumulative, Petitioner respectfully requests that trial be instituted for all grounds.

A. Claims 1-3 Are Anticipated under 35 U.S.C. § 102(b) by Granek

Regarding **Claim 1**, Granek discloses an electrode arrangement (“[A]n electrode **24** [is] placed on the inside of the garment **10**” Ex. SS 1002 at 4:10-11.) comprising:

an electrically conductive fabric having a first surface for application to skin of a mammal (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; *see also*, Ex. SS 1012 at ¶ 118.); and

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.” Ex. SS 1002 at 6:67-7:2; and Fig. 6; *see also*, Ex. SS 1012 at ¶ 119. 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**. Ex. SS 1002 at 5:1-9; and Fig. 12; *see also*, Ex. SS 1012 at ¶ 119. 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*, Ex. SS 1002 at 4:9-13; 5:1-9; and 6:67-7:2; and Figs. 6 and 12; *see also*, Ex. SS 1012 at ¶ 120.);

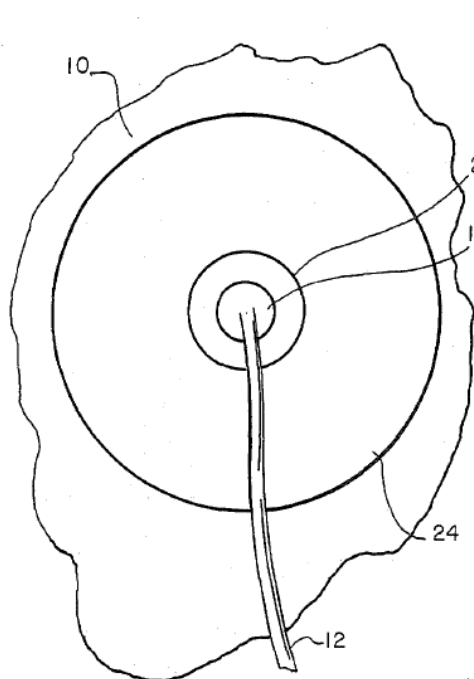


FIG. 5

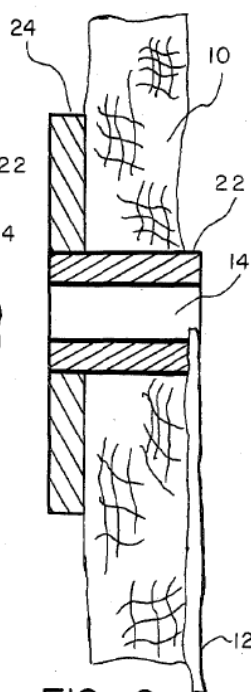
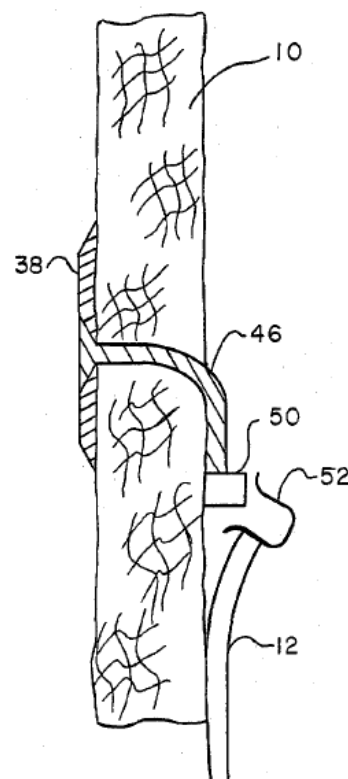


FIG. 6



Granek Fig. 12

wherein said electrically conductive fabric is integral with a garment (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, Ex. SS 1002 at 3:4-23; and Figs. 1 and 2; *see also*, Ex. SS 1012 at ¶ 122.

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*, Ex. SS 1002 at 5:8-14; 6:13-15; 7:3-38; and 7:63-8:8; *see also*, Ex. SS 1012 at ¶ 122.).

Alternatively regarding **Claim 1**, 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. Ex. SS 1002 at 3:31-35.

Accordingly, Petitioner submits that 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.” *See*, Ex. SS 1012 at ¶ 121.

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. In sum, Petitioner submits that the silicone rubber electrode **24** can be considered the claimed at least one portion of 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 meeting all the limitations of claim 1 of the ‘951 Patent. *See*, Ex. SS 1012 at ¶ 121.

Regarding **Claim 2**, Granek discloses an electrode arrangement wherein said at least one portion of material is located directly on said first surface (With reference to Figs. 5, 6 and 12 of Granek above and the proposed 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 electrode. *See*, Ex. SS 1012 at ¶¶ 124-125.).

Regarding **Claim 3**, Granek discloses an electrode arrangement wherein said material is mechanically flexible (As discussed above in one proposed anticipation of claim 1, 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,” with rubber or silicone rubber clearly known in the art as being “mechanically flexible.” *See*, Ex. SS 1002 at 6:67-7:2; and Fig. 6; *see also*, Ex. SS 1001 at 2:40-42, 52-54 and 59-64; and Ex. SS 1012 at ¶ 127. In an alternative embodiment “the electrode **24** might be made of ... silicone rubber,” which of course is also known to be flexible. *See*, Ex. SS 1002 at 6:67-7:2; *see also*, Ex. SS 1012 at ¶ 127. Thus, in both embodiments taught by Granek, a mechanically flexible material such as silicone rubber may form the moisture-impermeable portion of material. *See*, Ex. SS 1012 at ¶¶ 126-129.).

Based on the foregoing, it is clear that all limitations of claims 1-3 of the ‘951 Patent are literally found in Granek. *See*, Ex. SS 1012 at ¶¶ 130-131.

B. Claim 4 Is Obvious under 35 U.S.C. § 103(a) over Granek in View of Noguchi

Regarding **Claim 4**, as set forth above in the proposed anticipation of claim 1, 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 is loaded with conductive material. *See*, Ex. SS 1012 at ¶¶ 132-133.

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 is silicone rubber loaded with conductive material (The “protective layer is formed of silicone ... rubber provided with the distributed

carbon ... therein.” “The carbon is a “[h]ighly electrically conductive carbon.”

See, Ex. SS 1004 at 3:10-40; and Fig. 1.). *See*, Ex. SS 1012 at ¶ 134.

It would have been obvious to one having ordinary skill in the art at the time of the invention 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, since it is a general desire to increase the signal strength to and from the sensor, and Noguchi teaches 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. *See*, Ex. SS 1012 at ¶¶ 135-137.

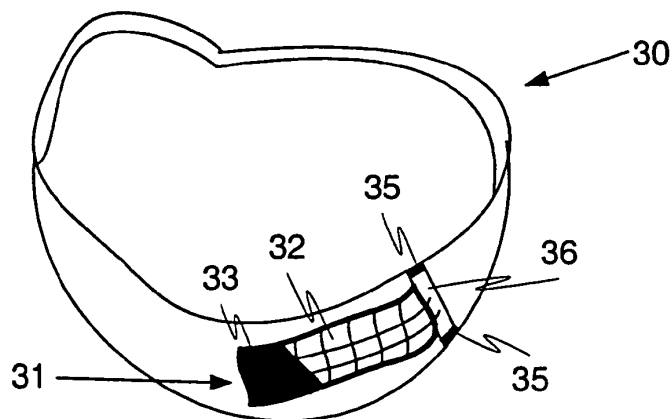
C. Claims 1-4 Are Obvious under 35 U.S.C. § 103(a) over Reho in View of Muir

Regarding **Claim 1**, Reho discloses an electrode arrangement (sensor **31**, where “the sensor of the invention can be an electrode.” *See*, Ex. SS 1003 at pp. 5-6; and Fig. 3.) comprising:

an electrically conductive fabric (contact layer **32**, where the “sensor ... comprises a contact layer including conductive fibres” and “[t]he contact layer may consist e.g. of a fabric-like layer, which readily adapts to the skin surface.” *See, Id.* at pp. 2-3; and Fig. 3) having a first surface for application to skin of a mammal (Looking at Fig. 3, 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. “Data 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.” *See, Ex. SS 1003 at pp. 2-3; see also, Ex. SS 1012 at ¶¶ 141-142.* Thus, the contact layer acts as a first surface that is placed on the skin. *See, Ex. SS 1012 at ¶ 142.* “Besides humans, the sensor of the invention can be placed on the skin of an animal.” *See, Ex. SS 1003 at p. 5.* Thus, the first or skin-facing surface of the electrically conductive fabric may be placed on the skin of a mammal, such as a human. *See, Ex. SS 1012 at ¶¶ 142-143.); and*

at least one portion of material which is substantially impermeable to moisture (Moisture or seal layer **33** is a portion of material. “The moisture layer may be an impervious, substantially moisture proof seal layer” The “seal layer **33** [is] made of a non-respiring fabric.” *See, Ex. SS 1003 at pp. 2 and 5; see also, Ex. SS 1012 at ¶ 145.),*

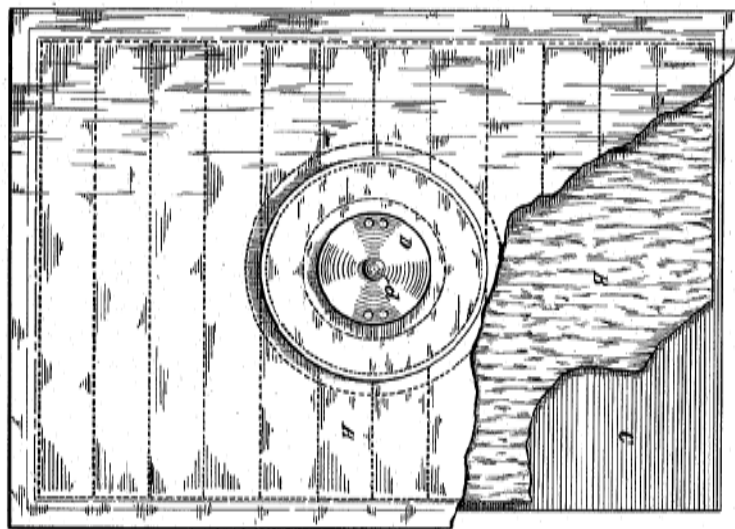
wherein said electrically conductive fabric (contact layer **32**) is integral with a garment (“The sensor can be integrated in a garment, being thus especially pleasant and practical in use. The conductive fibres in the contact layer can be sewn into the fabric surface or they can be knitted or woven directly in the fabric texture. Knitted 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.” “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.” Figures 2 and 3, in particular, illustrate the electrically conductive fabric integrated into shirt **20** and wrist band **30** garments, respectively. *See, Id.* at pp. 3-4; and Figs. 2 and 3; *see also*, Ex. SS 1012 at ¶ 144.), but fails to expressly disclose that the portion of material is located on said first surface of the electrically conductive fabric. *See*, Ex. SS 1012 at ¶ 146.



Reho Fig. 3

However, Muir teaches at least one portion of material (There is disclosed a “pliable layer **C** of suitable electroconducting properties.” *See*, Ex. SS 1005 at p. 1, lns. 57-60; and Figs. 1 and 2.) which is substantially impermeable to moisture (Muir describes a method of manufacturing 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; *see also*, Ex. SS 1012 at ¶ 147.), said material (pliable layer **C**) being located on said first surface (A multi-layered electrode is illustrated, with “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*, Ex. SS 1005 at p. 1, lns. 44-60; *see also*, Ex. SS 1012 at ¶ 148.).



Muir Fig. 1

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 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-

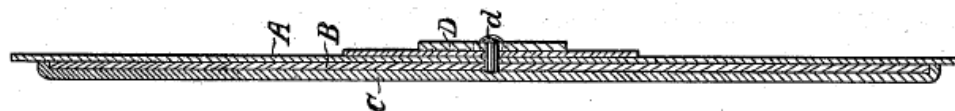
impermeable material also in contact with the skin of the person wearing the garment, and it involves only routine skill in the art to merely reverse the order of layering in Reho's electrode assembly as taught by Muir, as essentially requiring only "common sense" and "ordinary innovation" to arrive at a "predictable result," namely moisture retention and improved conductivity. *See*, Ex. SS 1012 at ¶ 149.

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, lns. 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. *See*, Ex. SS 1012 at ¶ 150.

Regarding **Claim 2**, Reho in view of Muir again teaches an electrode arrangement where said at least one portion of material is located on said first surface (see discussion of claim 1 above, describing the layered arrangement that Reho in view of Muir teaches). *See*, Ex. SS 1012 at ¶ 151.

Each of Muir and Reho also disclose that the 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. *See*, Ex. SS 1012 at ¶ 152.



Muir Fig. 2

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; and 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, *see also*, Ex. SS 1012 at ¶ 153. 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.

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. *See*, Ex. SS 1012 at ¶ 154.

Regarding **Claim 3**, Reho in view of Muir teaches an electrode arrangement where said at least one portion of material is located on said first surface (see discussion of claim 1 above), wherein said material is mechanically flexible (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. 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, lns. 57-60 and 97-101. Thus, both disclose that the moisture-impermeable material is mechanically flexible. *See*, Ex. SS 1012 at ¶¶ 155-159.).

Regarding **Claim 4**, Reho in view of Muir teaches an electrode arrangement where said at least one portion of material is located on said first surface (see discussion of claim 1 above), wherein said material is silicone rubber loaded with conductive material (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. *See*, Ex. SS 1012 at ¶ 161. 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; *see also*, Ex. SS 1012 at ¶ 162.).

It would have been obvious to one having ordinary skill in the art at the time of the invention to add the conductive material to the portion of moisture-

impermeable material as taught by Muir to the invention of 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 Muir teaches that this can be accomplished by adding conductive material to the portion of material that is substantially impermeable to moisture. *See*, Ex. SS 1012 at ¶ 163.

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. *See*, Ex. SS 1012 at ¶¶ 164-165.

D. Claims 1-4 Are Obvious under 35 U.S.C. § 103(a) over Reho in View of Greene

Regarding **Claim 1**, Reho discloses an electrode arrangement (sensor **31**, where “the sensor of the invention can be an electrode.” *See*, Ex. SS 1003 at pp. 5-6; and Fig. 3.) comprising:

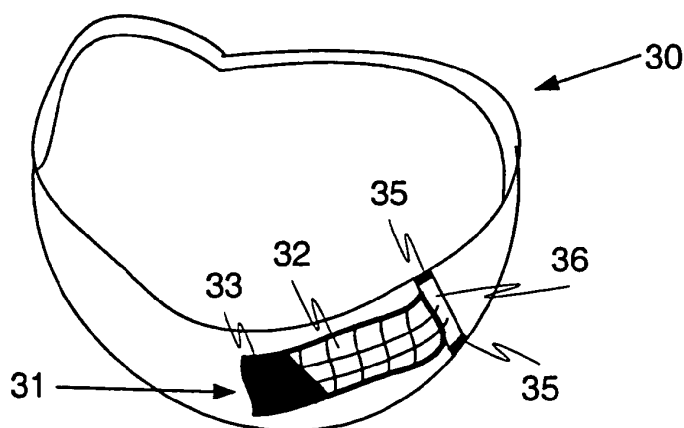
an electrically conductive fabric (contact layer **32**, where the “sensor ... comprises a contact layer including conductive fibres” and “[t]he contact layer may consist e.g. of a fabric-like layer, which readily adapts to the skin surface.” *See, Id.* at pp. 2-3; and Fig. 3) having a first surface for application to skin of a mammal (Looking at Fig. 3, 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. “Data 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.” *See*, Ex. SS 1003 at pp. 2-3; *see also*, Ex. SS 1012 at ¶¶ 169-170. The contact layer acts as a first surface that is placed on the skin. *See*, Ex. SS 1012 at ¶ 170. “Besides humans, the sensor of the invention can be placed on the skin of an animal.” *See*, Ex. SS 1003 at p. 5. Thus, the first or skin-facing surface of the electrically conductive fabric may be placed on the skin of a mammal, such as a human. *See*, Ex. SS 1012 at ¶¶ 170-171.); and

at least one portion of material which is substantially impermeable to moisture (Moisture or seal layer **33** is a portion of material. “The moisture layer may be an impervious, substantially moisture proof seal layer” The “seal layer **33** [is] made of a non-respiring fabric.” *See*, Ex. SS 1003 at pp. 2 and 5; *see also*, Ex. SS 1012 at ¶ 173.),

wherein said electrically conductive fabric (contact layer **32**) is integral with a garment (“The sensor can be integrated in a garment, being thus especially pleasant and practical in use. 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. Knitted 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.” “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

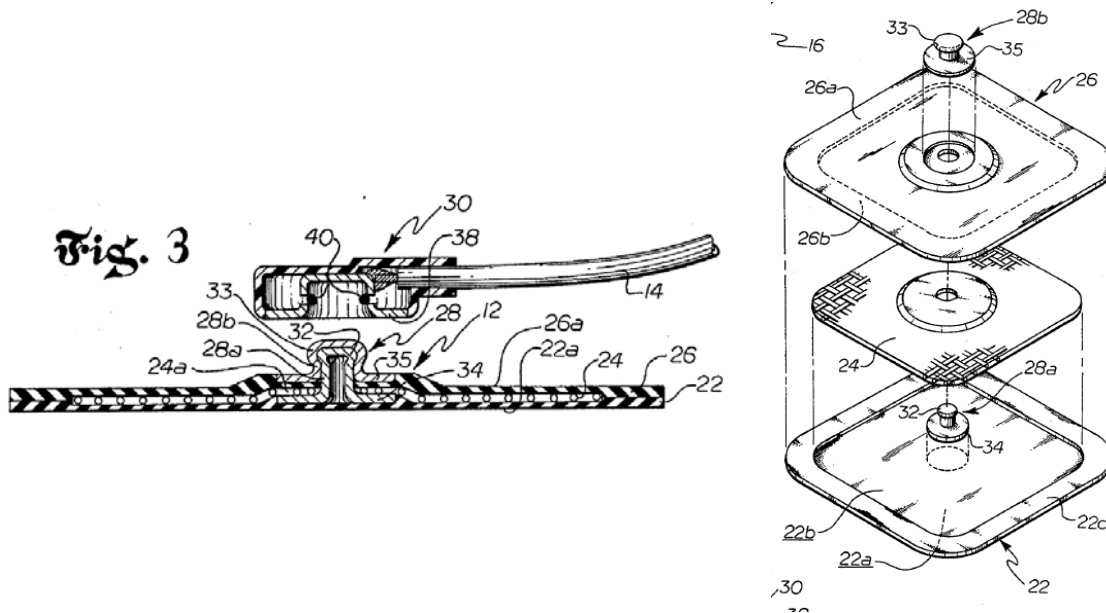
wrists. The sensor can be combined with various pieces of clothing, such as an undershirt, bras, a top, a turtleneck, a headband, a wristband or any other garment.” Figures 2 and 3, in particular, illustrate the electrically conductive fabric integrated into shirt **20** and wrist band **30** garments, respectively. *See, Id.* at pp. 3-4; and Figs. 2 and 3; *see also*, Ex. SS 1012 at ¶ 172.), but fails to expressly disclose that the portion of material is located on said first surface of the electrically conductive fabric. *See*, Ex. SS 1012 at ¶ 174.



Reho Fig. 3

However, Greene teaches an electrode arrangement (**12**) with at least one portion of material (lower layer **22**) which is substantially impermeable to moisture (“Lower layer **22** comprises 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.), said material (lower layer **22**) being

located on said first surface (Greene 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*, Ex. SS 1006 at 4:28-30; and Figs. 2 and 3; *see also*, Ex. SS 1012 at ¶¶ 175-176.).



Greene Figs. 2 and 3

It would have been obvious to one having ordinary skill in the art at the time of the invention 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. *See*, Ex. SS 1012 at ¶ 177.

Regarding **Claim 2**, Reho in view of Greene again teaches an electrode arrangement where said at least one portion of material is located on said first surface (see discussion of claim 1 above, describing the layered arrangement that Reho in view of Greene teaches). *See*, Ex. SS 1012 at ¶ 178.

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 (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*, SS 1006 at 7:12-17. 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.). *See*, Ex. SS 1012 at ¶¶ 179-181.

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. *See*, Ex. SS 1012 at ¶ 182.

Regarding **Claim 3**, Reho in view of Greene teaches an electrode arrangement where said at least one portion of material is located on said first surface (see discussion of claim 1 above), wherein said material is mechanically flexible (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. 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. Thus, both disclose that the moisture-impermeable material is mechanically flexible. *See*, Ex. SS 1012 at ¶¶ 183-187.).

Regarding **Claim 4**, Reho in view of Greene teaches an electrode arrangement where said at least one portion of material is located on said first surface (see discussion of claim 1 above), wherein said material is silicone rubber loaded with conductive material (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. *See*, Ex. SS 1012 at ¶ 189. 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. *See*, Ex. SS 1012 at ¶ 190.).

It would have been obvious to one having ordinary skill in the art at the time of the invention to add the conductive material to the portion of moisture-impermeable material as taught by Greene to the invention of 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. *See*, Ex. SS 1012 at ¶ 191.

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. *See*, Ex. SS 1012 at ¶¶ 192-193.

E. Claims 1-3 Are Anticipated under 35 U.S.C. § 102(e) by Reho

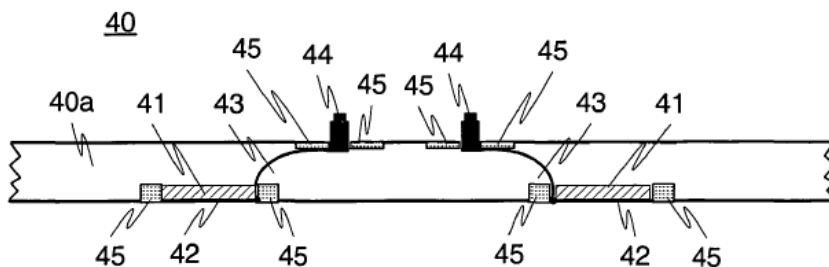
All limitations of claim 1 of the ‘951 Patent are found in Reho, either literally or inherently. *See, e.g.*, Ex. SS 1012 at ¶¶ 138 and 166. To start, Reho is entitled “a sensor arrangeable on the skin” and is directed to “a sensor placed on the skin.” *See*, Ex. SS 1003 at pp. 1-2.

Regarding **Claim 1**, Reho discloses an electrode arrangement (sensor **31**, where “the sensor of the invention can be an electrode.” *See, Id.* at pp. 4-5; and Fig. 3.) comprising:

an electrically conductive fabric (contact layer **32**, where the “sensor ... comprises a contact layer including conductive fibres” and “[t]he contact layer may consist e.g. of a fabric-like layer, which readily adapts to the skin surface.” *See, Id.* at pp. 1-2; and Fig. 3) having a first surface for application to skin of a mammal (Looking at Fig. 3, 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. “Data 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.” *See, Ex. SS 1003 at pp. 2-3; see also, Ex. SS 1012 at ¶¶ 196-197.* The contact layer acts as a first surface that is placed on the skin. *See, Ex. SS 1012 at ¶ 197.* “Besides humans, the sensor of the invention can be placed on the skin of an animal.” *See, Ex. SS 1003 at p. 5.* Thus, the first or skin-facing surface of the electrically conductive fabric may be placed on the skin of a mammal, such as a human. *See, Ex. SS 1012 at ¶¶ 197-198.); and*

at least one portion of material which is substantially impermeable to moisture (Moisture or seal layer **33** is a portion of material. “The moisture layer may be an impervious, substantially moisture proof seal layer” The “seal layer **33** [is] made of a non-respiring fabric.” *See, Ex. SS 1003 at pp. 2 and 5; see also, Ex. SS 1012 at ¶ 200.),*

wherein said electrically conductive fabric (contact layer **32**) is integral with a garment (“The invention relates to a sensor (**42**) placed on the skin, which can advantageously be integrated in a garment and has a contact layer in contact with the skin containing conductive fibres for receiving signals and a moisture retentive moisture layer (**41**) on top of the contact layer.” “The sensor can be integrated in a garment, being thus especially pleasant and practical in use. 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. Knitted 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.” “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.” Figures 2 and 3, in particular, illustrate the electrically conductive fabric integrated into shirt **20** and wrist band **30** garments, respectively. *See*, Ex. SS 1003 at pp. 3-4; and Figs. 2-4; *see also*, Ex. SS 1012 at ¶ 199.).



Reho Fig. 4

It is clear from the disclosed language cited above 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. However, again, Reho fails to expressly disclose that the portion of material is located on said first surface of the electrically conductive fabric. Yet, 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, 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. *See, e.g.*, Ex. SS 1012 at ¶¶ 138, 166, 194, and 201-206. 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. *See, Id.* at ¶ 194.

To confirm that at least a portion of the substantially impermeable seal layer of the sensor is embedded in or “located on said first surface” or skin-facing surface of the sensor, Agustín Maciá Barber personally conducted experiments using an electrode constructed according to and consistent with the teaching of Reho. *See*, Ex. SS 1014 at ¶¶ 24 and 25. Through this experiment, Maciá Barber was able to show that the substantially moisture-impermeable layer, in this case, silicone loaded with carbon black, when applied to the “top” of the electrode was able to “leach” through the pores in the electrically conductive fabric (the electrode) and was found to be present on the first or skin-facing surface as required by claim 1 of the ‘951 Patent. *See, Id.* at ¶¶ 36, 46, 47 and 51.

Therefore, even though Reho does not explicitly teach the placement of the substantially moisture-impermeable material on the surface applied to the skin of a wearer, it is clear that such material is inherently located on the first surface of the electrode due to the porosity of a fabric electrode. Reho thus discloses each and every element of Claim 1 of the '951 Patent and anticipates this claim. *See, e.g.*, Ex. SS 1012 at ¶¶ 138, 166, 194, and 201-206.

Regarding **Claim 2**, Reho discloses an electrode arrangement as in Claim 1 as set forth above, wherein said at least one portion of moisture-impermeable material is located directly on said first surface (as confirmed in the Declaration of Maciá Barber; *see, e.g.*, Ex. SS 1014 at ¶ 46). *See, e.g.*, Ex. SS 1012 at ¶¶ 208-209.

Regarding **Claim 3**, Reho discloses an electrode arrangement as in Claim 1, wherein said material is mechanically flexible (“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.” *See, e.g.*, Ex. SS 1003 at p. 3; *see also*, Ex. SS 1012 at ¶¶ 210-211.).

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. *See*, Ex. SS 1012 at ¶¶ 212-213.

X. CONCLUSION


Claims 1-3 of the '951 Patent are anticipated by both Granek and Reho and each of claims 1-4 are rendered obvious over the prior art in combinations as cited herein. Petitioner has established a reasonable likelihood of prevailing on at least one of the claims challenged, and prompt and favorable consideration of this Petition is respectfully requested.

Respectfully submitted,

ONE3 IP MANAGEMENT, P.C.

Dated: December 30, 2015

1560-1 Newbury Road, Suite 327
Newbury Park, CA 91320
(800) 478-2152



Peter D. Weinstein
Attorney for Petitioner
Registration No. 43,251

CERTIFICATE OF SERVICE


I hereby certify that a true and complete copy of the foregoing Petition for *Inter Partes* Review and all Exhibits and other documents filed together with the Petition has been served in its entirety on December 30, 2015, via United States Postal Service Express Mail delivery to the following correspondence address of record for the '951 patent:

Philips Intellectual Property & Standards
P.O. Box 3001
Briarcliff Manor, NY 10510

ONE3 IP MANAGEMENT, P.C.

Dated: December 30 2015

1560-1 Newbury Road, Suite 327
Newbury Park, CA 91320
(800) 478-2152



Peter D. Weinstein
Attorney for Petitioner
Registration No. 43,251