UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MED-EL ELEKTROMEDIZINISCHE GERÄTE GES.M.B.H.

Petitioner

v.

ADVANCED BIONICS AG

Patent Owner

U.S. Patent No. 8,155,746

"Cochlear Implant Sound Processor with
Permanently Integrated Replenishable Power Source"

Issued April 10, 2012

IPR2020-01016

PETITION FOR *INTER PARTES* REVIEW

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1003	Provisional Application No. 60/417,973
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1025	U.S. Patent 6,358,281 to Berrang et al.
1026	U.S. Patent 5,814,095 to Müller et al.
1027	Stephenson et al., Energy Transport through Tissue by Inductive Coupling, American Journal of Surgery 114, 87 (1967)
1028	U.S. Patent 6,129,753
1029	U.S. Patent No. 5,610,494 to Grosfilley
1030	U.S. Patent 6,265,100 ("Saaski Parent")

I. INTRODUCTION

In a typical cochlear implant system, an externally worn "sound processor" turns sound signals into electrical stimulation signals, which are transmitted to an implant in the user's skull and then sent to electrodes implanted in the user's inner ear (the "cochlea"). Thereby, the auditory nerve fibers are stimulated, leading to the perception of sound in the brain. *See* Ex. 1002, ¶¶ 31-32.

The patent at issue, U.S. Patent 8,155,746 to Maltan et al. ("Maltan," Ex. 1001), describes that a typical sound processor is powered by replaceable batteries, i.e., batteries that are regularly inserted and taken out by the user. Maltan describes an allegedly inventive power management system for the sound processor – the use of either (i) inductive charging or (ii) charging through direct electrical contacts on the outer surface of the device, to recharge a permanently integrated battery *in situ*.

However, there was nothing new or non-obvious about these concepts.

Both inductive charging and charging through direct electrical contacts on the device's surface were known in the field of cochlear implant systems and related hearing aid devices before the earliest critical date of October 11, 2002.

U.S. Patent Application Publication 2001/0056291 ("Zilberman," Ex. 1018), which was <u>not</u> cited during prosecution of Maltan, discloses a *cochlear implant system* using inductive charging to recharge a permanently integrated battery.

PCT Application Publication WO 97/04619 ("Petersen," Ex. 1017), also not cited during prosecution of Maltan, discloses a *hearing aid* using either inductive charging or charging through direct electrical contacts on the device's surface to recharge a permanently integrated battery.

And U.S. Patent 6,310,960 ("Saaski," Ex. 1021), cited but not considered by the Examiner during prosecution of Maltan, also describes a *hearing aid system* that uses inductive charging to recharge a permanently integrated battery.

All of the recited power management features in the claims of Maltan are described in, and taught by, Zilberman, Petersen and/or Saaski.

The claimed cochlear implant features unrelated to power management are admitted to be prior art in Maltan itself (the "Applicant Admitted Prior Art" or "AAPA"), and also described in Zilberman. In combination with the Applicant Admitted Prior Art or with each other, Zilberman, Petersen and/or Saaski render all of Maltan's claims obvious.

II. NOTICES AND STATEMENTS

A. Real Parties-in-Interest (37 C.F.R. § 42.8(b)(1))

Petitioner, MED-EL Elektromedizinische Geräte Ges.m.b.H., and its subsidiary MED-EL Corporation, USA are the real parties-in-interest.

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

On October 3, 2018, Petitioner, MED-EL Elektromedizinische Geräte Ges.m.b.H., and MED-EL Corporation, USA, filed suit against Advanced Bionics, LLC in the U.S. District Court for the District of Delaware, asserting infringement of two MED-EL patents. See *MED-EL Elektromedizinische Geräte Ges.m.b.H. et al. v. Advanced Bionics et al.*, No. 1:18-cv-01530 (D. Del.). On October 8, 2019, Advanced Bionics, LLC, Advanced Bionics AG, and Sonova AG brought a counterclaim against Petitioner and its subsidiary for infringement of Maltan.

C. Notice of Lead and Back-Up Counsel (37 C.F.R. § 42.8(b)(3))

Petitioner provides the following designation of counsel.

Lead Counsel:	Brian P. Murphy (Reg. No. 34,986)
Backup Counsel:	Georg C. Reitboeck (pro hac vice to be requested)
	Robert E. Colletti (Reg. No. 76,417)
	Christopher F. Gosselin (*pro hac vice* to be requested)
Address:	Haug Partners LLP, 745 Fifth Avenue, NY, NY 10151
	Tel. (212) 588 0800
	Fax (212) 588-0500

Pursuant to 37 C.F.R. § 42.10(b), a Power of Attorney accompanies this Petition.

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

Please address all correspondence and service to counsel at the address provided in Section II.C. Petitioner also consents to electronic service by email at medelipr@haugpartners.com.

E. Payment of Fees (37 C.F.R. § 42.103)

Petitioner provides herewith payment of the required fees in accordance with 37 C.F.R. §§ 42.103 and 42.15(a). If any additional fees are required, the USPTO is authorized to charge such fees to Deposit Account No. 50-0320.

F. Grounds for Standing (37 C.F.R. § 42.104(a))

Petitioner certifies that Maltan is eligible for IPR, and that Petitioner and its real parties-in-interest are not barred or estopped from requesting IPR.

III. CHALLENGE UNDER 37 C.F.R. § 42.104(b) AND RELIEF REQUESTED

Petitioner requests review of claims 1-24 of Maltan on the grounds set forth below and requests cancellation of all claims as unpatentable.

Ground	Claims	35 U.S.C.	Prior Art
1	1-24	103	Applicant Admitted Prior Art + Petersen
2	10-17, 24	103	Zilberman + Saaski
3	10-17, 24	103	Applicant Admitted Prior Art + Zilberman + Saaski

IV. MALTAN

Maltan asserts that the batteries in the sound processor of a typical cochlear implant system must be regularly replaced. Maltan describes several related problems, including that "[t]he small size of the batteries requires good manual dexterity for changing them, which is a problem especially for the many cochlear implant users who are elderly." *See* Ex. 1001, col. 1:29-48.

Maltan then summarizes the invention as:

> [P]roviding a cochlear implant sound processor that is powered by a rechargeable battery that is permanently integrated into the sound processor. … The sound processor contains an inductive coil that may be tuned to an external charging coil when the rechargeable battery needs to be recharged… [T]he sound processor is placed in a recharging base station in which the sound processor is positioned in a space surrounded by the inductive charging coil... The inductive charging coil sends power to the coil inside the processor and thereby recharges the battery. Alternatively, or conjunctively, the sound processor contains a connector, or contacts, that allow direct connection with an external charging source, e.g., the charging source within the base station, when the rechargeable battery needs to be recharged.

Id., col. 1:55-2:8.

In its detailed description, Maltan describes representative prior art cochlear implant systems, both with respect to (i) the power management of the sound processor, as well as (ii) typical cochlear implant system features unrelated to power management (hereinforth the “typical cochlear implant features”), such as the implantable cochlear stimulator, the electrode array, a sound processing circuit, or a microphone. *Id.*, col. 3:47-4:55, Figs.1-2; *see* VI.D.

Maltan then describes the allegedly inventive features related to the power management of the sound processor (hereinforth the “power management features”), including a replenishable power source (e.g., rechargeable battery) integral with the sound processor, and either (i) a charging coil in the sound processor and a base station with circuitry for recharging the battery through inductive power transfer (*see* Fig. 5 below), or (ii) contacts at the surface of the sound processor, which align with electrical contacts in a base station for recharging the battery through direct electrical connection (*see* Fig. 6 below). *Id.,* col. 4:56-8:18, Figs. 3–6; Ex. 1002, ¶ 49.

The claims of Maltan mix typical cochlear implant features with these allegedly novel power management features. *See* appended Claim Listing.

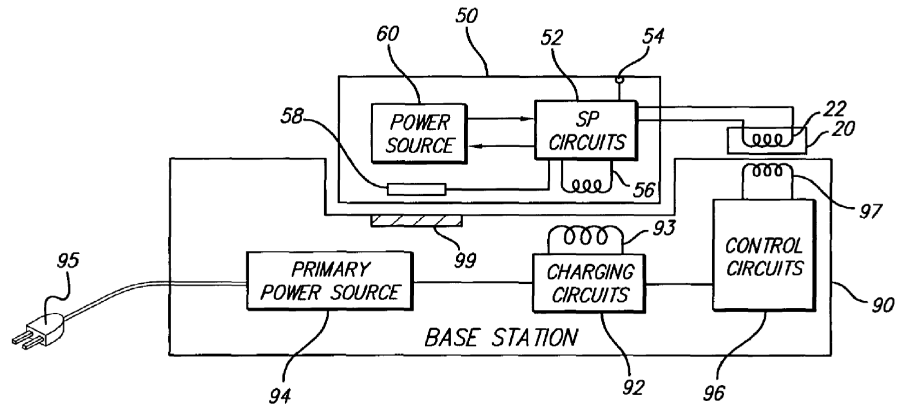


FIG. 5

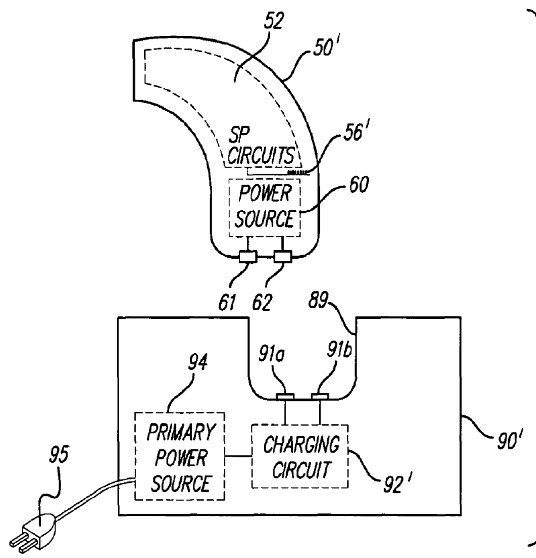


FIG. 6

V. THE PROSECUTION HISTORY OF MALTAN

Throughout the prosecution history, the power source in the sound processor was at the center of the discussions between the Examiner and the applicants.

A. The Parent Application

In Maltan's parent application (10/675,375), the claims recited "a power source integrally housed within the sound processor" (later amended to "…permanently integrated into the sound processor") and "a rechargeable battery integrally housed within a closed case." Ex. 1004, 17, 20, 56.

The Examiner relied on U.S. Patents 5,603,726 ("Schulman," Ex. 1007) and 4,532,930 ("Crosby," Ex. 1008). Ex. 1004, 43-46. Schulman describes a sound processor as "powered by a battery," and Crosby describes that its sound processor could use "a wide choice in number and style of batteries, including readily available primary cells, or rechargeable cells." *Id.*, 44-45; Ex. 1007, col. 4:42; Ex. 1008, col. 27:13-18; Ex. 1002, ¶ 52-53.

The applicants argued that Schulman "does not even remotely suggest that the battery 38 is permanently integrated into the external processor," and that in Crosby, the batteries "are not permanently integrated into the speech processor" and "not 'integrally housed within a closed case.'" Ex. 1004, 64, 68.

The Examiner then relied on U.S. Patent 6,272,382 ("Faltys," Ex. 1009). Ex. 1004, 173-75. The applicants responded that the power source in Faltys's external speech processor is described as "readily replaced when needed" (*see* Ex. 1009, col. 9:19-21) and therefore "not ***'permanently*** integrated into' the wearable unit." Faltys would otherwise describe a "fully implantable system." Ex. 1004, 195-96, 199; *see* Ex. 1002, ¶ 54. After the applicants later essentially repeated these arguments (Ex. 1004, 313, 318-19), U.S. Patent 7,349,741 issued (Ex. 1005).

B. The Application Leading to Maltan

In the continuation application leading to Maltan (12/040,888), the claims included "an external sound processor including a closed case and a sound processor circuit, a coil and a rechargeable power source integrally housed within the closed case." Ex. 1006, 139.

The Examiner relied on U.S. Patent 6,190,305 ("Ball," Ex. 1010), stating that Ball's "sound processor includes a rechargeable battery that is recharged with a pickup coil." The Examiner further relied on Faltys, pointing to its "external module," which would be described as powered by "any available power source…" Ex. 1006, 213-15.

The applicants amended the above-mentioned feature to read "…power source <u>permanently and</u> integrally housed…" *Id.*, 233. They stressed that the sound processor was "external," *i.e.*, "not implanted" and "located on the outer side of the skin," and argued that in contrast, "the Ball sound processor 960 is part of a **'fully internal'** hearing aid…" *Id.*, 236-39; *see* Ex. 1010, col. 18:55-19:14; Ex. 1002, ¶ 53. Regarding Faltys, they argued that "even assuming for the sake of argument that the coil 52, external unit 54 and power source 56 are in the same case, nothing in Faltys even remotely suggests that they are **'permanently and integrally** housed within [a] **closed** case.'" Ex. 1006, 241-42.

The Examiner then relied on U.S. Patent 5,571,148 ("Loeb," Ex. 1011). *See* Ex. 1006, 252. The applicants responded that Loeb describes the power source of the external sound processor as "a rechargeable or replaceable battery," and argued that "Loeb does not even remotely suggest that the case is a 'closed case' or that [the] battery is 'permanently and integrally housed within the closed case,'" and that "Loeb does not disclose *in situ* charging of the power source." Ex. 1006, 266, 298-300; *see* Ex. 1011, col. 4:29-31, 11:39-42; Ex. 1002, ¶ 54.

The Examiner then relied on Loeb in view of U.S. Patent 5,303,305 ("Raimo," Ex. 1012). Raimo describes a hearing aid employing "a permanent built-in rechargeable storage cell or battery," which is solar-powered. *See* Ex. 1012, Abstract; Ex. 1002, ¶ 55.

The applicants responded that "Raimo discloses a solar powered hearing aid," with the goal of "eliminating the need for a recharger." The "Loeb/Raimo device," they argued, would neither include "at least one contact [that] is electrically connected to the rechargeable power source and ... exposed outside the closed case," nor "a power coil... that selectively receives power from an external charging source and recharges the rechargeable power source,'" nor "'a base station that charges the rechargeable power source.'" *See* Ex. 1006, 382-85.

The Examiner allowed application claim 31 (issued claim 1), which included the "electrical contact" limitation, but relied on PCT Application Publication WO 02/41666A1 ("Gibson," Ex. 1013) to reject others. Ex. 1006, 396-97. Gibson describes that "[t]he power supply [of an external controller] can comprise one or more rechargeable batteries." Ex. 1013, page 13:35-14:2; Ex. 1002, ¶ 58.

In response, the applicants argued, regarding application claim 33 (issued claim 10), that "Gibson does not even remotely suggest that the case is a 'closed case' or that the rechargeable batteries are 'permanently and integrally housed within the closed case,'" and that "Gibson also fails to disclose … ***'an external sound processor*** including ... ***a power coil*** ... that selectively receives power from an external charging source and ***recharges the rechargeable power source*** when the sound processor is in proximity to the external charging source.'" Regarding application claim 54 (issued claim 24), the applicants argued that "nothing [in] Gibson even remotely suggests" that any of its external cases "lacks a battery removal door." The applicants further amended application claim 38 (issued claim 18) to include the "electrical contact" limitation. Ex. 1006, 435-36, 442-44.

Maltan issued on April 10, 2012.

In summary, the prior art references the Examiner relied on disclose

(i) an external sound processor with replaceable batteries (Schulman, Crosby, Faltys, Loeb, Gibson),

(ii) an implanted sound processor with integrated batteries (Faltys, Ball), or

(iii) an external hearing aid system with integrated, rechargeable batteries that are not recharged through electrical contacts or by inductive charging, but by solar energy (Raimo),

all of which the applicants distinguished by claiming an external sound processor with a permanently integrated battery that can be recharged through electrical contacts on the device's surface or by inductive charging. *See* Ex. 1002, ¶ 59.

VI. THE PRIOR ART RELIED UPON

A. Petersen

Petersen was published on February 6, 1997 and is prior art under pre-AIA 35 U.S.C. 102(b). *See* Ex. 1017.

Petersen discloses hearing aids and describes that batteries in hearing aids need to be replaced frequently, and "this is not made easier by their small size, giving many users problems in handling them." Ex. 1017, page 1:17-21.

Petersen discloses the very power management features the Maltan applicants alleged to be missing in the prior art: It describes a rechargeable battery that "cannot readily be exchanged" and is "intended to be placed more or less permanently in the housing" *Id.*, page 4:26-31, 5:8-12. Petersen describes recharging that battery either (i) through direct electrical contacts on the outside of the device's housing or (ii) by inductive charging – using a charging device for both alternatives:

> Since the battery 7 is of the **rechargeable** type, there is, of course, a need for being able to connect it to a suitable charging device. Such a connection can preferably be achieved by means of **contact members… on the outside of the housing or - better still - the cover 2**, adapted to be connected releasably with corresponding contact members connected to or placed on a suitable **charging device**… when the hearing aid is placed in or on the charging device in a predetermined position…, connections between the **current-supplying** means in the charging device and the battery 7 will be established.
>
> …
>
> [I]t is also possible to transfer electrical energy for charging the battery by means of an **alternating electromagnetic field** produced by the charging device and intercepted in the hearing aid by a **coil** with an associated rectifier.

Id., page 5:14-29, 6:34-7:7 (emphasis added).

Like Petersen, Maltan "relates to hearing aid prosthesis devices." Ex. 1001 at col.1:14-15, 1:49-51. Petersen and Maltan are therefore in "the same field of endeavor." Furthermore, Petersen is "reasonably pertinent to the particular problem" with which the Maltan inventors were involved, since it expressly addresses problems of replacing batteries of an external hearing aid component, and suggests solutions. Petersen is therefore analogous prior art. *See* Ex. 1002, ¶ 62; *Intri-Plex Techs., Inc. v. Saint-Gobain Performance Plastics Rencol Ltd.*, IPR2014-00309, Paper 83 at 30 (PTAB March 23, 2014).

Petersen was not cited during prosecution of Maltan. *See* Exs. 1001, 1004, 1006. In contrast to the various prior art references the Examiner relied on, *see in detail supra* V., Petersen discloses an external hearing aid with a permanently integrated battery that can be recharged *in situ* either through electrical contacts on the device's surface or by inductive charging. *See* Ex. 1002, ¶ 63*; in detail* IX.A.

Beckton Dickinson factors (a) ("the similarities and material differences between the asserted art and the prior art involved during examination"), (b) ("the cumulative nature of the asserted art and the prior art evaluated during examination"), and (d) ("the extent of the overlap between the arguments made during examination and the manner in which petitioner relies on the prior art") all lead to the conclusion that it is not the case that "the same or substantially the same prior art or arguments previously were presented to the Office," and the Director should not deny institution under 35 U.S.C. § 325(d). *See Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 at 17-18 (PTAB Dec. 15, 2017); *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 9-10 (PTAB Feb. 6, 2020).

B. Zilberman

Zilberman was filed on June 15, 2001, published on December 27, 2001, and claims priority to Provisional Application No. 60/212,517 ("Zilberman Provisional," Ex. 1019), filed on June 19, 2000. *See* Ex. 1018.

Zilberman is therefore, at least, prior art under (a) pre-AIA 35 U.S.C. § 102(e) as of June 15, 2001, (b) pre-AIA 35 U.S.C. § 102(e) as of June 19, 2000 with respect to subject matter disclosed in the Zilberman Provisional, and (c) pre-AIA 35 U.S.C. § 102(a) as of December 27, 2001. If Maltan is not entitled to the October 11, 2002 filing date of Provisional Application 60/417,973, Zilberman is prior art under pre-AIA 35 U.S.C. 102(b).

Zilberman was assigned to the Alfred E. Mann Foundation for Scientific Research. *See* Ex. 1020.

Zilberman pertains to "the same field of endeavor" as Maltan, cochlear implant systems. It is thus analogous prior art. *See* Ex. 1002, ¶ 64; *Intri-Plex* at 30.

Zilberman describes a system for enhancing hearing comprised of both a middle ear implant and a cochlear implant. *See* Ex. 1018, [0006]. Aside from typical cochlear implant features, such as microphone and sound processing circuit (called "microphone module"), RF link to the implant, and stimulating electrodes (*see id.*, [0011]-[0015]), Zilberman describes the very power management features the applicants of Maltan alleged to be missing in the prior art:

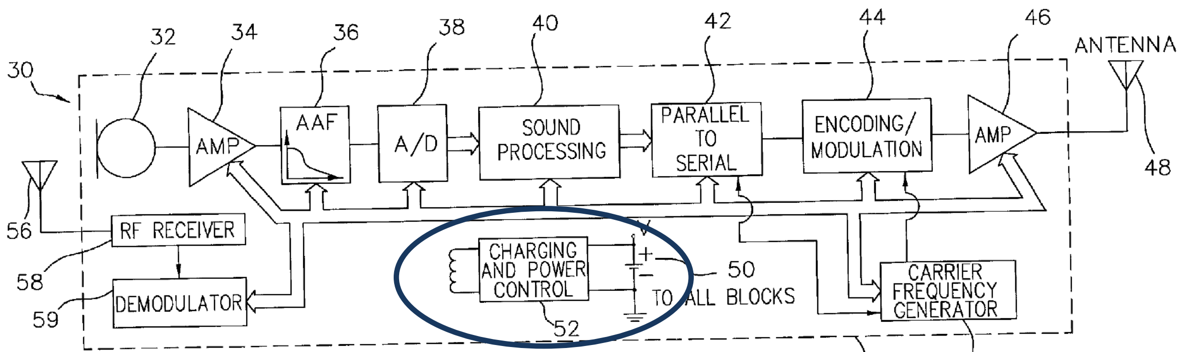


FIG. 1: MICROPHONE MODULE

> The blocks of the microphone module 30 depicted in FIG. 1 are all powered by a battery 50. The battery is preferably of the **rechargeable** type, e.g., a lithium ion battery, **which can be charged by charging and power control circuit 52 from, for example, energy extracted from an alternating magnetic field provided by an external source** (not shown). All of the elements of FIG. 1 are preferably contained in a **housing 54 which is hermetically sealed** and suitable for implanting in a patient's body near to the middle ear and inner ear. Alternatively, the housing 54 can be worn **externally**, as on a patient's belt or behind the patient's ear.

Ex. 1018 at Fig. 1, para. [0011]; Ex. 1002, ¶ 66.

Zilberman was <u>not</u> cited during prosecution of Maltan. *See* Exs. 1001, 1004, 1006. In contrast to the various prior art references the Examiner relied on, *see in detail supra* V., Zilberman describes an <u>external</u> sound processor with a permanently integrated battery in a "hermetically sealed" housing, which is recharged *in situ* by inductive charging. *See* Ex. 1002, ¶ 67.

Furthermore, Zilberman discloses the typical cochlear implant features of the claims. *See* IX.B. It is materially different, and closer, than any of the prior art considered by the Examiner. *See* Ex. 1002, ¶ 68.

Beckton Dickinson factors (a), (b), and (d) (quoted above) all lead to the conclusion that it is not the case that "the same or substantially the same prior art or arguments previously were presented to the Office," and the Director should not deny institution under 35 U.S.C. § 325(d). *See Becton, Dickinson* at 17-18; *Advanced Bionics* at 9-10.

C. Saaski

Saaski was filed on October 7, 1999, as a division of Application No. 08/942,963, which in turn was filed on February 23, 1998 and resulted in U.S. Patent 6,265,100 ("Saaski Parent," Ex. 1030); Saaski issued on October 30, 2001. *See* Ex. 1021. The specifications of Saaski and Saaski Parent are substantively identical. Ex. 1002, ¶ 69 n.1.

Saaski is therefore, at least, prior art under (a) pre-AIA 35 U.S.C. § 102(e) as of February 23, 1998 and October 7, 1999, and (b) pre-AIA 35 U.S.C. § 102(a) as of October 30, 2001. If Maltan is not entitled to the October 11, 2002 filing date of

Provisional Application 60/417,973, Saaski is prior art under pre-AIA 35 U.S.C. 102(b).

Saaski was assigned to Research International, Inc., and later to Varta Micro Innovation GmbH. *See* Exs. 1021, 1022.

Saaski describes problems arising from the use of disposable batteries, such as potential damage to a battery compartment door and "difficulty and stress to the elderly, who … may lack the manual dexterity… to easily replace the hearing aid batteries on their own." *See id.*, col. 1:63-2:35; Ex. 1002, ¶ 69.

Saaski then describes a hearing aid system comprising a charger and a hearing aid that can be optically or inductively recharged. *See* Ex. 1021, col. 1:7-10. Saaski describes the very power management features the Maltan applicants alleged to be missing in the prior art:

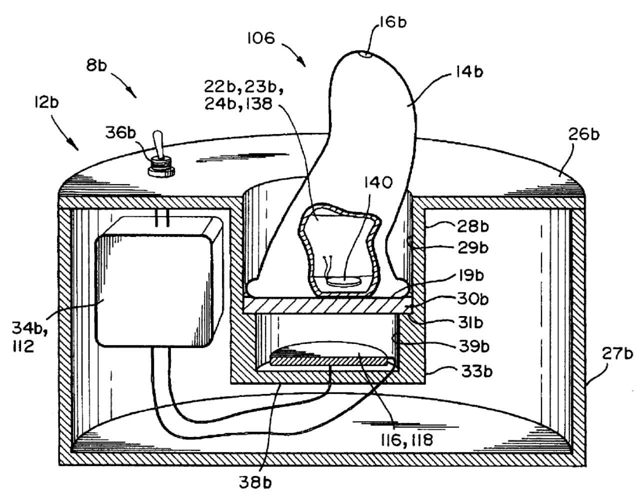


FIG. 5

Accordingly, the rechargeable hearing aid system of the present invention may comprise an **inductive charger** that may be

> **inductively coupled to an inductively rechargeable hearing aid having a rechargeable battery**; wherein energy may be transferred from the charger to the hearing aid by the use of **inductive transfer**…

Ex. 1021, Fig. 5 and col. 4:2-22; *see* Ex. 1002, ¶¶ 70-71.

Like Maltan, Saaski relates to hearing aid prosthesis devices, and is thus in "the same field of endeavor." Furthermore, Saaski is "reasonably pertinent to the particular problem" with which the inventors of Maltan were involved, since it expressly addresses problems of replacing batteries of an external hearing aid component, and suggests solutions. Saaski is therefore analogous prior art. *See* Ex. 1002, ¶¶ 72-73; *Intri-Plex* at 30.

Saaski was cited to the Examiner of Maltan, but the Examiner never considered it. *See* Ex. 1001, page 2; Ex. 1004, 1006. The Examiner overlooked that in contrast to the various prior art references she relied on, *see in detail supra* V., Saaski discloses an <u>external</u> hearing aid system with a <u>permanently integrated</u> battery that can be recharged *in situ* by <u>inductive charging</u>. *See* Ex. 1002, ¶ 74; *in detail* IX.B.

The Examiner never considered these highly material prior art teachings, which render the challenged claims unpatentable (*see* IX.B and IX.C). Given the Examiner's oversight, the Director should not deny institution under 35 U.S.C. § 325(d). *See Advanced Bionics* at 8 ("…whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims") and 8 n.9 ("An example of a material error may include misapprehending or overlooking specific teachings of the relevant prior art where those teachings impact patentability of the challenged claims."); *Becton, Dickinson* at 18, factor (e) ("whether petitioner has pointed out sufficiently how the Examiner erred in its evaluation of the asserted prior art ").

D. The Applicant Admitted Prior Art

Maltan expressly depicts and describes prior art cochlear implant systems in Figures 1-2, both labeled "Prior Art," and the related descriptions in col. 3:21-24 and 3:47-4:55, as well as col. 1:22-28. These figures and descriptions were also contained in the Provisional Application to which Maltan claims priority. *See* Ex. 1001; Ex. 1002, ¶¶ 75-76; Ex. 1003, Figs. 1-2, paras. 2, 19-20, 27-34.

"A statement in a patent that something is in the prior art is binding on the applicant and patentee for determinations of anticipation and obviousness." *Constant v. Advanced Micro-Devices, Inc.*, 848 F.2d 1560, 1570 (Fed. Cir. 1988). The subject matter described in Figures 1-2 and col. 1:22-28, 3:21-24, and 3:47-4:55 of Maltan are therefore admitted prior art (the "Applicant Admitted Prior Art" or "AAPA"). *See In re Nomiya*, 509 F.2d 566, 571 (CCPA 1975); *Intri-Plex* at 21 ("We are not persuaded by Saint-Gobain's argument that Admitted Prior Art falls outside of the ambit of Section 311(b)."); *One World Techs., Inc. v. The*

Chamberlain Group, Inc., IPR2017-00126, Paper 56 at 35-41 (PTAB Oct. 24 2018) ("AAPA can be used to challenge claims in an *inter partes* review…").

As part of its discussion of the prior art, Maltan incorporates by reference, in broad and unequivocal language, U.S. Patents 5,603,726 (Ex. 1007); 5,824,022 (Ex. 1014); 6,219,580 (Ex. 1015); 6,289,247 (Ex. 1016); and 6,129,753 (Ex. 1028). *See* Ex. 1001, col. 4:17-23; Ex. 1003, para. 32. The subject matter of those patents is therefore part of the AAPA. *See Harari v. Lee*, 656 F.3d 1331, 1335-36 (Fed. Cir. 2011) (statement "The disclosures of the two applications are hereby incorporate[d] by reference" held to incorporate the entire disclosures of the two applications); *Advanced Display Sys., Inc. v. Kent State Univ.*, 212 F.3d 1272, 1282 (Fed. Cir. 2000) ("Material not explicitly contained in the single, prior art document may still be considered for purposes of anticipation if that material is incorporated by reference into the document."); *Liebel-Flarsheim Co. v. Medrad, Inc.*, 481 F.3d 1371, 1381-82 (Fed. Cir. 2007).

The AAPA pertains to "the same field of endeavor" as Maltan, cochlear implant systems, and is analogous prior art. *See* Ex. 1002, ¶ 77; *Intri-Plex* at 30.

During examination of Maltan, the Examiner did not mention the AAPA. *See* Ex. 1004, 1006. As described above, the focus of the prosecution history was the power management features, such as a permanently integrated rechargeable power source in an external sound processor. The AAPA does not describe these power management features, and Petitioner does not rely on it for those features. As described below, Petitioner relies on the typical cochlear implant features described in the AAPA, combined with the power management features of Petersen, Zilberman and/or Saaski. The Examiner never considered those combinations. *See* Ex. 1004, 1006; Ex. 1002, ¶ 79.

Although the Examiner relied on prior art such as Schulman and Crosby, the Maltan applicants' arguments regarding that prior art related to their power management (*see* V.A) and do not overlap with Petitioner's arguments that rely on the AAPA for the typical cochlear implant features. Under these circumstances, *Beckton Dickinson* factor (d) ("the extent of the overlap between the arguments made during examination and the manner in which petitioner relies on the prior art") leads to the conclusion that the Director should <u>not</u> deny institution under 35 U.S.C. § 325(d). *See Becton, Dickinson* at 17-18.

VII. PERSON OF ORDINARY SKILL IN THE ART

Given Maltan's field and goals (*see supra* IV), the applicable art is the design of cochlear implant systems, in particular their power management. The problems encountered with that power management relate to common issues of the electrical and biomedical engineering, such as types of power sources, charging mechanisms, and related design options. Furthermore, the prior art generally shows typical cochlear implant systems (*see*, *e.g.*, AAPA; Exs. 1008, 1024) as well as power management strategies such as rechargeable batteries, charging through direct electrical contacts, and inductive charging (*e.g.*, Petersen, Zilberman, Saaski, Ex. 1027). *See* Ex. 1002, ¶¶ 80-82.

Therefore, a person of ordinary skill in the art at the time of the invention ("POSA") had (a) at least a bachelor's degree in electrical engineering, biomedical engineering, physics, or a related field, and (b) at least three years of experience in developing biomedical devices, with a working knowledge of (i) typical cochlear implant systems and (ii) power management of biomedical devices, including rechargeable batteries, charging through direct electrical contacts, and inductive charging. A higher level of education would substitute for less work experience, and vice versa. *See* Ex. 1002, ¶ 83.

VIII. CLAIM CONSTRUCTION

No terms require express construction; all claim terms recited in Maltan should be given their plain and ordinary meaning. 37 C.F.R. § 42.104(b)(3).

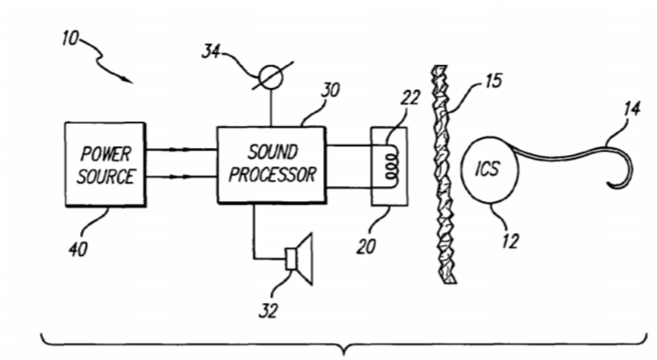
IX. GROUNDS FOR UNPATENTABILITY

A. Ground 1: Claims 1-24 are Obvious Over the AAPA and Petersen

As shown below, the combination of the AAPA and Petersen renders claims 1-24 of Maltan obvious under 35 U.S.C. § 103, because it discloses all limitations of those claims, and because a POSA would have been motivated to combine the

AAPA and Petersen with a reasonable expectation of success. *See* Ex. 1002, ¶¶ 85-154.

1. Independent Claim 1 – Electrical Contact Charging

1.1	
A cochlear implant system, comprising: an implantable cochlear stimulator;	AAPA • Col. 3:47-50: "Referring first to FIG. 1, a block diagram of a prior art cochlear implant system 10 is shown. The system 10 includes an **implantable cochlear stimulator (ICS) 12**…"  FIG. 1 PRIOR ART • *See also* incorporated U.S. Patents o 5,603,726 (Ex. 1007), Fig. 1, no. 12; col. 3:8-11, 4:24-27; o 5,824,022 (Ex. 1014), col. 1:56-57; 2:22-25; Figs. 1, 5, 6, no. 20; o 6,289,247 (Ex. 1016), col. 9:8-10.

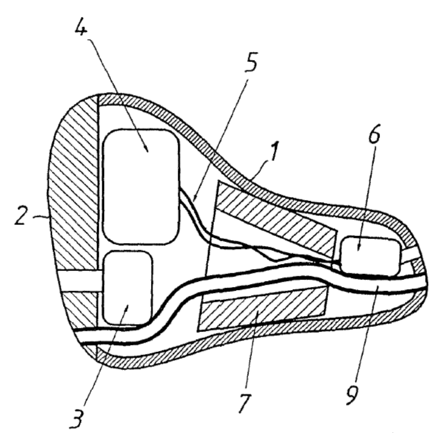
See Ex. 1002, ¶ 87.

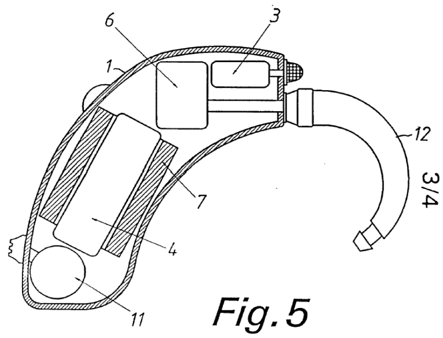
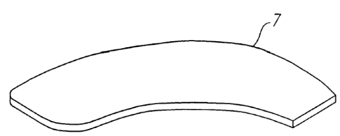
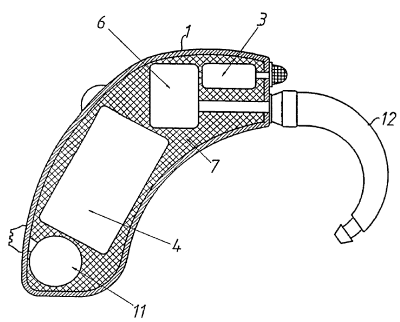
1.2	
an external sound processor including	AAPA • Col. 3:56-58: "**External** (not implanted) components of the system 10, also shown in FIG. 1, include a headpiece

	20, a **sound processor 30** and a power source 40."
	
	• *See also* Col. 1:22-25.
	
	• *See also* incorporated U.S. Patents
	  o 5,603,726 (Ex. 1007), col. 3:8-16;
	  o 5,824,022 (Ex. 1014), col. Col. 1:26-30, 1:41-43, 2:22-28, Fig. 1, no. 12; Figs. 5 and 6, no. 30;
	  o 6,289,247 (Ex. 1016), col. 9:4-6, 9:28-33.

	<u>Petersen</u> • Page 9:9-12: "…a **signal processing unit** (4) adapted to process signals from the microphone…" • Figs. 1-7 and page 3:11-21 ("in-the-ear" and "behind-the-ear" hearing aids, both worn externally)

See Ex. 1002, ¶ 88.

1.3	
a closed case,	<u>Petersen</u> • Page 3:30-4:2: "The hearing aid of the 'in-the-ear' type shown in Figure 1 comprises… a **housing 1**… the end situated towards the left is **closed by a cover 2**…"  Fig. 1

	• Page 6:6-10: “Figure 5 shows an example of a hearing aid of the ‘behind-the-ear’ type, in which the **housing 1**… is shaped as a curved box with generally flat sides…”  Fig. 5 • Page 6:21-26: “Figure 7 shows yet another example of a hearing aid of the "behind-the-ear" type, in which the battery 7 is plate-shaped and cut into shape so as to fit quite accurately the side wall in the housing 1 facing away from the viewer, or even fully or partly constitutes this side wall.”  Fig. 8  Fig. 7

Petersen describes and depicts a housing that is “*closed”* by a cover (in-ear, Fig. 1), a housing enclosing the entire device (behind-ear, Fig. 5), or a housing in which the battery fits in or constitutes the side wall (Fig. 7-8). In each case, the figures and corresponding descriptions show that there is no battery door or other mechanical latch, but that the housing is closed. The additional description of a permanently integrated battery which is recharged through either direct electrical contacts or inductive charging, and which is connected to the amplifier by soldered leads (*see* limitations 1.5-1.6, 10.5-10.6), all of which makes user-access unnecessary and pointless, further confirms that the housing has no battery removal door, and is closed. *See* Ex. 1002, ¶¶ 89-90.

However, even if Petersen's disclosure was not deemed explicit enough, it would at least have been obvious to a POSA to implement the housing in Petersen as a closed case without battery door. It would have been common sense to a POSA that if the battery is permanently integrated and recharged *in situ*, there is no need for a battery door, and the device can be reduced in size. That was also recognized in the prior art: For example, U.S. Patent No. 5,610,494 (Ex. 1029, issued 1997) also describes a hearing aid with an integrated, rechargeable battery (*id.*, col. 1:52-2:2, 2:15-18, 3:36-43), and states that "[c]onsequently, it is no longer necessary to manipulate the prosthesis, to open it in order to remove the storage battery, or to provide an unattractive flap on one of the walls of the body thereof." *Id.*, col. 2:2-5. A POSA would have recognized that that rationale equally applies to the sound processor of a cochlear implant system. And, the prior art also recognized the design goal to make the sound processor of a cochlear implant system smaller, providing motivation to remove battery doors. *See* Ex. 1014, col. 2:14-18 ("What is needed… is an external speech processor and corresponding headpiece that is small, unobtrusive, lightweight,…”). Therefore, it would at least have been obvious to a POSA to implement Petersen’s housing as a closed case without battery door. *See* Ex. 1002, ¶ 91.

1.4	
a sound processor circuit,	AAPA • Col. 4:43-49: … to make reliable electrical contact with the **sound processing circuits housed within the main body portion of the sound processor 30'**.” • *See also* col. 4:1-4. • *See also* incorporated U.S. Patents o 5,603,726 (Ex. 1007), col. 4:42-64, Fig. 1; o 5,824,022 (Ex. 1014), col. 1:48-50, 5:10-18, 7:30-44
	Petersen • Page 9:9-12: “…a **signal processing unit** (4) adapted to process signals from the microphone (3)…”

See Ex. 1002, ¶ 92.

1.5	
a rechargeable power source permanently and integrally housed within the closed case,	Petersen • Page 4:26-31: “Looking at Figure 1 makes it possible to realize that the **battery 7 cannot readily be exchanged**... It is not, however, intended that the battery 7 is to be replaced with short intervals, being as it is a **rechargeable battery**.” • Page 5:8-12: “Since the **battery 7 is intended to be placed more or less permanently in the housing 1**, the usual contact means necessary in the case of replaceable batteries are not required, because the battery 7 can be **connected to the amplifier 4 through e.g. simple**

	soldered leads."

Petersen's battery is rechargeable and permanently placed in the housing, which is underscored by its connection to the amplifier by soldered leads. *See* Ex. 1002, ¶¶ 93-94.

1.6	
and at least one electrical contact electrically connected to the rechargeable power source and embedded within or carried on an exterior surface of the closed case such that the at least one electrical contact is exposed outside the closed case;	<u>Petersen</u> • Page 5:14-29: "Since the battery 7 is of the rechargeable type, there is… a need for being able to connect it to a suitable charging device. Such a connection can preferably be achieved by means of **contact members**… **on the outside of the housing or - better still - the cover 2**, adapted to be connected releasably with corresponding contact members connected to or placed on a suitable charging device… [W]hen the hearing aid is placed in or on the charging device in a predetermined position…, connections between the **current-supplying** means in the charging device and the battery 7 will be established." • Page 6:34-7:3: "[T]he connection means, with which the hearing aid and the charging device are connected to each other, can be of the **galvanic type**, i.e. based on **direct contact between conductors**…"

Petersen describes recharging of the battery by way of electrical contacts on the outside (and thus "exposed outside") of the housing or its cover. *See* Ex. 1002, ¶¶ 95-96.

1.7	
a coil operably connected to the sound processor circuit.	<u>AAPA</u> • Col. 4:1-4:6: "The sound processor 30 receives sound signals through the microphone 32 and processes such

	signals to convert them to stimulation signals… The resulting stimulation signals are then applied to a **coil 22** in the headpiece 20." • *See also* incorporated U.S. Patents o 5,603,726 (Ex. 1007), col. 4:29-33, Fig. 1, no. 20; o 5,824,022 (Ex. 1014), col. 1:52-56, Fig. 5, no. 104; o 6,289,247 (Ex. 1016), col. 9:28-33.

The coil described in the AAPA is operably connected to the sound processor circuit because it receives stimulation signals from the sound processing circuit. *See* Ex. 1002, ¶¶ 97-98.

2. Independent Claim 10 – Inductive Charging

Limitations 10.1-10.5 are identical to limitations 1.1-1.5. *See* appended Claim Listing and charts above.

10.6	Prior Art
and a power coil operably coupled to the rechargeable power source, that selectively receives power from an external charging source and recharges the rechargeable power source when the sound processor is in proximity to the external charging source; and	Petersen • Page 7:4-7:7: "[I]t is also possible to **transfer electrical energy** for charging the battery by means of an **alternating electromagnetic field** produced by the **charging device** and intercepted in the hearing aid by a **coil** with an associated rectifier."

Like the recited limitation of Maltan, Petersen describes inductive charging of its rechargeable battery. The description of the transfer of electrical energy by means of an alternating electromagnetic field, which is intercepted by a coil in the hearing aid, refers to inductive charging that is selectively enabled by coupling of the magnetic fields between two coils; it requires that the coil be in proximity to the external source so that it can receive sufficient power from the external source's coil that generates the alternating magnetic field. *See* Ex. 1002, ¶¶ 104-105; *Atlas Powder Co. v. Ireco Inc.*, 190 F.3d 1342, 1347 (Fed. Cir. 1999) ("Under the principles of inherency, if the prior art necessarily functions in accordance with, or includes, the claimed limitations, it anticipates.").

Limitation 10.7 is identical to limitation 1.7. *See* appended Claim Listing and charts above.

3. Independent Claim 18 – Electrical Contact Charging + Charging Station

Limitations 18.1-18.5 are identical to limitations 1.1-1.5; 18.6 is identical to 1.7, and 18.7 is identical to 1.6. *See* appended Claim Listing and charts above.

18.8	Prior Art
and a base station that charges the rechargeable power source.	Petersen • Page 5:14-29: "Since the battery 7 is of the rechargeable type, there is, of course, a need for being able to connect it to a suitable **charging device**… [W]hen the hearing aid is placed in or on the charging device in a predetermined position…, **connections between the current-supplying means in the charging device and the battery** 7 will be

	established." • Page 6:34-7:7: "[I]t is also possible to transfer electrical energy for **charging the battery** by means of an **alternating electromagnetic field produced by the charging device** and intercepted in the hearing aid by a coil with an associated rectifier.…"

Petersen describes a charging device, a "base station" in Maltan's diction, that charges the rechargeable battery, either through a direct electrical connection or through inductive charging. *See* Ex. 1002, ¶¶ 114-115.

4. Independent Claim 24 – Charging Station

Limitations 24.1-24.2 are identical to limitations 1.1-1.2. *See* appended Claim Listing and charts above.

24.3	
a closed case that does not include a battery removal door,	*See* limitation 1.3.

As explained in the context of limitation 1.3, the housing described in Petersen does not have a battery removal door. *See* Ex. 1002, ¶ 119.

Limitations 24.4-24.5 are identical to limitations 1.4-1.5; 24.6 is identical to 1.7, and 24.7 is identical to 18.8. *See* appended Claim Listing and charts above.

5. Dependent Claims 2, 11, and 19 – Power Signal

2.1/11.1/19.1	
A cochlear implant system as claimed in claim 1/10/18,	*See* claim 1/10 /18.

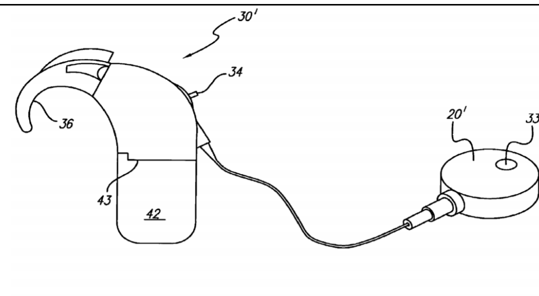
2.2-4/11.2-4/19.2-4	
wherein the implantable cochlear stimulator receives power signals; the sound processor circuit generates a power signal; and the coil transfers the power signal from the sound processor circuit to the implantable cochlear stimulator.	<u>AAPA</u> Col. 1:25-28: "The two components are linked through RF communication, and **operating power for the implant is supplied by the sound processor and transmitted inductively**." Col. 4:1-16: "The resulting **stimulation signals** are then applied to a **coil 22** in the headpiece 20. The coil 22 of the headpiece 20 is coupled… to another coil… in the ICS [Implantable Cochlear Stimulator] 12, thereby allowing the **stimulation signals to be received by the ICS**. The stimulation signals typically comprise a **carrier signal** (which, when received in the ICS is rectified and used to provide **operating power** for the ICS circuits)…" • *See also* incorporated U.S. Patents o 5,603,726 (Ex. 1007), col. 4:29-33, 5:2-11, 5:28-31, 5:42-47 o 5,824,022 (Ex. 1014), col. 9:22-42.

See Ex. 1002, ¶ 125.

6. Dependent Claims 3, 12, and 20 – Headpiece

3.1/12.1/20.1	
A cochlear implant system as claimed in 1/10/18, further comprising:	*See* claim 1/10/18.

3.2/12.2/20.2	
a headpiece that carries the coil and	<u>AAPA</u>

a microphone.	 ***FIG. 2*** PRIOR ART • Col. 4:5-6: "The resulting stimulation signals are then applied to **a coil 22 in the headpiece 20**." • Col. 4:30-32: "A **microphone may be carried within the headpiece 20'**…" • *See also* incorporated U.S. Patents o 5,603,726 (Ex. 1007), col. 4:27-33; o 5,824,022 (Ex. 1014), col. 1:41-44, 1:52-56, Fig. 1, nos. 14, 18.

See Ex. 1002, ¶ 127.

7. Dependent Claims 4, 13 and 21 – Stimulation Signals

4.1/13.1/21.1	
A cochlear implant system as claimed in claim 1/10/18,	*See* claim 1/10 /18.

4.2-4/13.2-4/21.2-4	
wherein the external sound processor includes a microphone that receives sound signals and converts	<u>AAPA</u> • Col. 4:1-16: "The sound processor 30 receives sound signals through the microphone 32 and processes such signals to convert them to stimulation signals in accordance with a selected speech processing mode that is

them into electrical signals; the sound processor circuit receives the electrical signals from the microphone and converts them into a stimulation signal; and the coil transfers the stimulation signal from the sound processor circuit to the implantable cochlear stimulator.	programmed into the sound processor. The resulting stimulation signals are then applied to a coil 22 in the headpiece 20.The coil 22 of the headpiece 20 is coupled… to another coil… in the ICS 12, thereby allowing the stimulation signals to be received by the ICS." • *See also* incorporated U.S. Patents o 5,603,726 (Ex. 1007), 4:29-33, 4:42-64; o 5,824,022 (Ex. 1014), 1:23-39, 1:45-56; o 6,289,247 (Ex. 1016), 9:43-49.

See Ex. 1002, ¶ 129.

8. Dependent Claim 5 – Remote Control

5.1	
A cochlear implant system as claimed in claim 1,	*See* claim 1.

5.2	
further comprising: a remote control unit that electromagnetically communicates with the external sound processor.	<u>AAPA</u> • *See* incorporated U.S. Patent No. 5,824,022 (Ex. 1014), o Col. 2:36-42: "[T]he user controls the sounds he or she 'hears' with the ICS through the **RCU [remote control unit]**, which RCU (when turned ON) is electronically **coupled to the BTE [behind-the-ear] processor through an FM link**. Through the RCU, the user may control, e.g., the operating mode, volume,

	sensitivity, and microphone location of the BTE speech processor." o See also Fig. 4-5, no. 50, and col. 5:37-6:22, 7:7-14, 7:33-39, 7:57-8:3

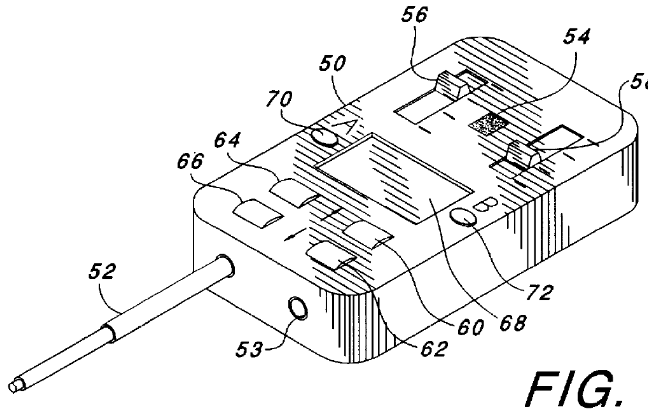


FIG. 4

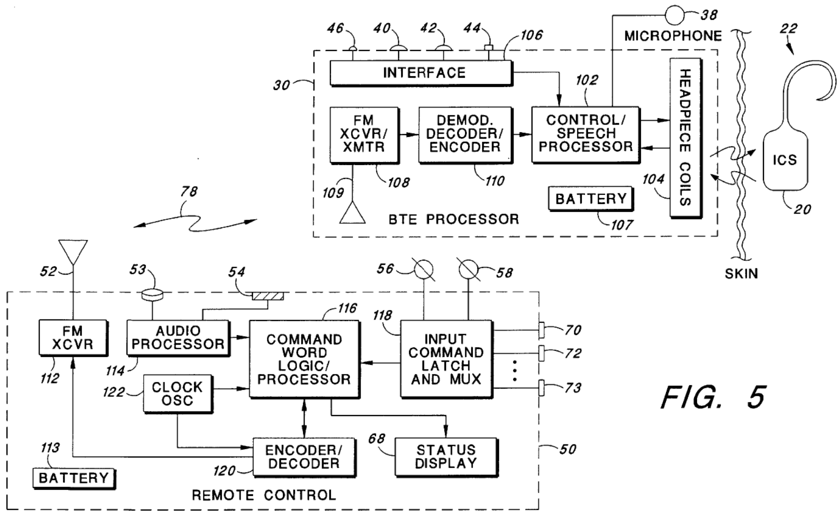


FIG. 5

U.S. Patent 5,824,022, incorporated by reference in the AAPA, describes a remote control unit that communicates over an FM- or other RF-based link, i.e., electromagnetically, with the sound processor. *See* Ex. 1002, ¶¶ 131-132.

Even if U.S. Patent 5,824,022 was not considered part of the AAPA, it would have been obvious to a POSA to improve the AAPA with the remote control of that patent. Maltan describes that "typically included as part of the sound processor 30 are manual controls 34, usually in the form of knobs or buttons, that *allow the user to adjust certain parameters of the sound processor 30*." Ex. 1001, col. 3:59-62. A POSA would have understood that this function could be accomplished by the remote control of U.S. Patent 5,824,022 instead of "knobs or buttons," and would have been well capable to adapt the electronics in the sound processor to process the remote control's commands, since the concept of adjusting an electronic device by remote control had long been well known (e.g., from television sets). A POSA would have therefore had a reasonable expectation of success when combining the AAPA with the remote control of U.S. Patent 5,824,022, both of which would continue to perform the same functions; the sound processor's parameters are merely adjusted by way of remote control instead of knobs or buttons, and a POSA would have predicted this result. Even if U.S. Patent 5,824,022 was not considered part of the AAPA, therefore, the combination of the AAPA with the remote control of U.S. Patent 5,824,022 was nothing more than the combination of known elements according to known methods to yield predictable results. *See* Ex. 1002, ¶ 133; *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007).

9. Dependent Claims 6 and 14 – No Battery Removal Door

6.1/14.1	
A cochlear implant system as claimed in claim 1/10,	*See* claim 1/10.

Limitations 6.2/14.2 are identical to limitation 24.5, and limitations 6.3/14.3 are identical to limitation 24.3. *See* appended Claim Listing and charts above.

10. Dependent Claims 7, 15, and 22 – Electrode Array

7.1/15.1/22.1	
A cochlear implant system as claimed in claim 1/10/18,	*See* claim 1/10/18.

7.2/15.2/22.2	
wherein the implantable cochlear stimulator includes an electrode array that applies electrical stimulation to tissue and nerves within the cochlea.	<u>AAPA</u> • Col. 3:48-53: "The system 10 includes an implantable cochlear stimulator (ICS) 12 to which an **electrode array** 14 is attached. The electrode array 14 includes a multiplicity of electrode contacts (not shown) through which **electrical stimulation may be applied to tissue and nerves within the inner ear (cochlea)** of a user of the device." • *See also* incorporated patents o U.S. Patent No. 5,603,726 (Ex. 1007), col. 5:12-18; o U.S. Patent No. 5,824,022 (Ex. 1014), col. 1:30-39, 1:52-63, Figs. 1 and 5, nos. 22, 24; o U.S. Patent No. 6,289,247 (Ex. 1016), col. 9:8-20; o U.S. Patent No. 6,129,753 (Ex. 1028), col. 1:59-64, 7:42-46.

See Ex. 1002, ¶ 138.

11. Dependent Claim 8 – Plurality of Contacts in Electrode Array

8.1	
A cochlear implant system as claimed in claim 7,	*See* claim 7.

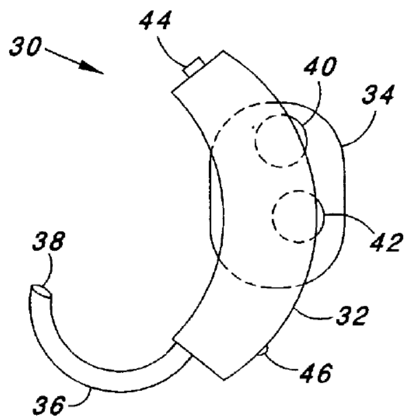
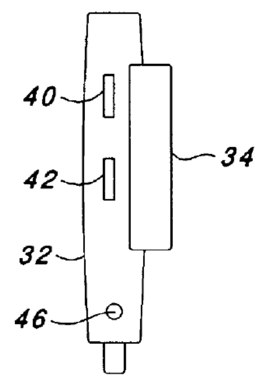
8.2	
wherein the electrode array comprises a plurality of electrode contacts.	AAPA • Col. 3:48-53: "The electrode array 14 includes a **multiplicity of electrode contacts** (not shown) …" • *See also* citations to incorporated patents in 7.2.

See Ex. 1002, ¶ 140.

12. Dependent Claims 9, 16, and 23 – Coil in Closed Case

9.1/16.1/23.1	
A cochlear implant system as claimed in claim 1/10/18,	*See* claim 1/10/18.

9.2/16.2/23.2	
wherein the coil is housed within the closed case.	AAPA • *See* incorporated U.S. Patent No. 5,824,022 (Ex. 1014), o col. 5:18-21: " Some of the electronics, including the coils used to inductively couple the BTE processor 30 with an ICS (not shown) may be **housed in a headpiece** assembly 34, which is **affixed to the case** 32." o col. 10:48-51: "Further, it is seen that the external speech processor and headpiece comprise **one integral unit** that may be worn

	comfortably and unobtrusively behind the ear…"  FIG. 3A  FIG. 3B

U.S. Patent 5,824,022, incorporated by reference in the AAPA, describes that in typical cochlear implant systems, "[t]he cable 16, which must connect the processor 12 with the headpiece 14, is particularly a source of irritation and self-consciousness for the user. What is needed, therefore, is an external speech processor and corresponding headpiece that is small, unobtrusive, lightweight, and which eliminates the need for the troublesome interconnecting cable 16 between the speech processor and the headpiece." It then describes that the headpiece, which houses a transmitter coil, and the sound processor are combined into an "integral unit." It thereby teaches to place the transmitter coil in the same unit as the sound processor, which is the import of claim 16. The motivation of making the speech processor and headpiece small, lightweight, and without a connecting cable, as described in U.S. Patent 5,824,022, would have led a POSA to modify the "integral unit" of that patent, so that all of the components, including the transmitter coil, are within one case, as opposed to two cases assembled as the "integral unit" taught by that patent – or, if U.S. Patent 5,824,022 was not considered part of the AAPA, modify the sound processor and headpiece of the AAPA, such that the components of the speech processor and the headpiece, including transmitter coil, would be in one case. Doing so would have been well within a POSA's creative skills, and the POSA would have had a reasonable expectation of success, since the modification merely involves changing the number and shape of the device's cases (one instead of two cases) and adjusting the arrangement of the components. *See* Ex. 1002, ¶¶ 143-144; *KSR*, 550 U.S. at 418.

13. Dependent Claim 17 – Cochlear Stimulator Coil and Electrode Array

17.1	
A cochlear implant system as claimed in claim 10,	*See* claim 10.

17.2	
wherein the implantable cochlear stimulator includes a cochlear stimulator coil and an electrode array.	AAPA • Col. 3:48-53: "The system 10 includes an implantable cochlear stimulator (ICS) 12 to which an **electrode array** 14 is attached."

	• Col. 4:7-10: "The coil 22 of the headpiece 20 is coupled… to another **coil (not shown) in the ICS 12**…" • *See also* incorporated U.S. Patents o 5,603,726 (Ex. 1007), col. 5:12-18, 5:42-47, Fig. 1; Fig. 2, no. 50; o 5,824,022 (Ex. 1014), col. 1:30-39, 1:52-63, Figs. 1, 5; o 6,289,247 (Ex. 1016), col. 9:8-33.

See Ex. 1002, ¶ 146.

14. Motivation to Combine the AAPA and Petersen with a Reasonable Expectation of Success

a) The prior art disclosed the same solutions to the same problems of replacing batteries in external hearing aid components as described in Maltan.

Petersen itself describes that batteries in hearing aids need to be replaced frequently, and "this is not made easier by their small size, giving many users problems in handling them." Ex. 1017, page 1:17-21. As explained above, Petersen describes the concepts of a permanently integrated battery, to be recharged either through direct electrical contacts on the device's surface or by inductive charging, and using a charging station, as alleviating this problem.

A POSA would have recognized that the replacement problem described in Petersen equally applies to cochlear implant sound processors, since those are similar to hearing aids in purpose, size, usage frequency (daily), and user demographics (many elderly users). Indeed, Maltan describes the same problem. *See* Ex. 1001, col. 1:36-39 (lack of manual dexterity in elderly users).

Petersen therefore provides motivation to use its concepts in a cochlear implant sound processor. *See* Ex. 1002, ¶ 148.

Furthermore, <u>Saaski</u> describes various problems with disposable batteries in hearing aids, including that (i) “bent, dirty, or corroded” “battery contacts in [the] battery compartments” “lead to malfunctioning;” (ii) during battery replacement, the “battery compartment door… or other components” may get damaged; (iii) elderly users “may lack the manual dexterity, visual acuity, or skill needed to be able to easily replace the hearing aid batteries on their own;” and (iv) small children could harm themselves “by accidentally swallowing the battery…” Ex. 1021, col. 1:63-2:36. As explained in Sections VI.C and IX.B, Saaski describes the concept of a permanently integrated battery, to be recharged by inductive charging, and using a charging station, as alleviating these problems.

A POSA would have recognized that the mentioned problems described in Saaski pertain to the *replacement* of batteries, whether they are disposable or rechargeable outside of the device, and that they equally apply to cochlear implant sound processors, since those are similar to hearing aids in purpose, size, usage frequency (daily), and user demographics (many elderly users). Indeed, several of the problems Saaski describes are equally described as the problems Maltan tries to solve. *See* Ex. 1001, col. 1:35-51 (lack of manual dexterity in elderly users, choking hazards for children, potential failure of latch or door mechanism).

Saaski therefore provides motivation to use its concept in a cochlear implant sound processor. *See* Ex. 1002, ¶¶ 149.

Furthermore, at the time of the invention, batteries in a typical cochlear implant speech processor needed to be replaced on a daily basis. *See* Ex. 1024 (issued in 2000) at 115 ("Battery life typically exceeds 12 to 16 hours, allowing patients to use their devices during the waking hours without the need for recharging or replacing the batteries."). This fact provided motivation to use *in situ* recharging, and a charging station for reliably and easily applying the charging mechanism, and thereby make the process of overnight power replenishment for the sound processor simple and user-friendly. *See* Ex. 1002, ¶ 150.

Moreover, as a device that is worn by the user on a daily basis, the prior art recognized the design goal to make the speech processor smaller, so that it is less inconvenient and less unsightly, providing motivation to remove battery doors and similar mechanical components necessary for replaceable batteries. *See* Ex. 1014, col. 2:14-18 ("What is needed… is an external speech processor and corresponding headpiece that is small, unobtrusive, lightweight,…"). *See* Ex. 1002, ¶ 151.

Thus, the prior art provided ample motivation and suggestion that would have led a POSA to combine a cochlear implant system with typical cochlear implant features, as described in the AAPA, with the concept of a "permanently and integrally housed" battery that is recharged *in situ* through either direct electrical contacts on the device's surface or inductive charging, as described in Petersen, and thereby arrive at the claimed invention of Maltan. A POSA would have known how to implement those combinations and would have expected them to work, since charging a power source through direct electrical contacts or inductive charging are part of the basic skill set of an electrical engineer, and nothing in the speech processor of a cochlear implant system makes these charging methods unsuitable for the specific application. *See* Ex. 1002, ¶ 152; *KSR*, 550 U.S. at 418.

b) A POSA would also have recognized that the operation of the typical cochlear implant features, such as the creation of stimulation signals by means of microphone and sound processing circuit, the transfer of those signals to the implanted portion, and the stimulation of the auditory nerve by means of the electrode array, is not dependent on which power management mechanism is chosen for the sound processor; as long as the sound processor *has* power – be it from replaceable batteries or *in situ* rechargeable batteries – the typical cochlear implant features operate in the same way and have the same functions.

Likewise, Petersen's battery, which is recharged *in situ* through either direct electrical contacts or inductive charging, the closed housing made possible thereby, and the related charging station would not change their respective functions either, when combined with the typical cochlear implant features of the AAPA. And as explained above, a POSA would have known how to implement those combinations and would have expected them to work.

The combination of the typical cochlear implant features of the AAPA with the power management features of Petersen was therefore nothing more than the combination of known elements according to known methods to yield predictable results. *See* Ex. 1002, ¶ 153; *KSR*, 550 U.S. at 416.

c) Furthermore, a POSA would have been familiar with the techniques of charging integrated batteries through direct electrical contacts or inductive charging.

Recharging integrated batteries through direct electrical contacts on the outside of a device was well-known from applications such as cordless telephones.

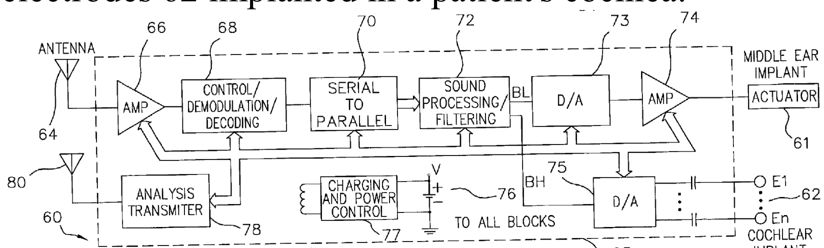
Inductive charging was used in consumer electronics, such a electric toothbrushes, as well as biomedical devices, such as cardiac pacemakers. It was even described in the prior art for powering a totally implanted cochlear implant system. *See* Ex. 1026, col. 2:51-58 ("[A]n electric battery can be integrated into the implant which… is recharged transcutaneously from the outside by inductive means.").

The AAPA describes a typical cochlear implant system using replaceable batteries, and Petersen describes an improved hearing aid device that employs the well-known techniques of charging through direct electrical contacts or inductive charging; a POSA would have been motivated and capable (*see supra*) of applying Petersen's power management techniques to the known cochlear implant system described in the AAPA, and would have recognized and expected that they would improve the system of the AAPA by alleviating the problems of replaceable batteries. The combination of the AAPA and Petersen is therefore nothing but the use of a known technique to improve a similar device in the same way and the application of a known technique to a known device ready for improvement to yield predictable results. *See* Ex. 1002, ¶ 154; *KSR*, 550 U.S. at 417.

B. Ground 2: Claims 10-17 and 24 are Obvious Over Zilberman and Saaski

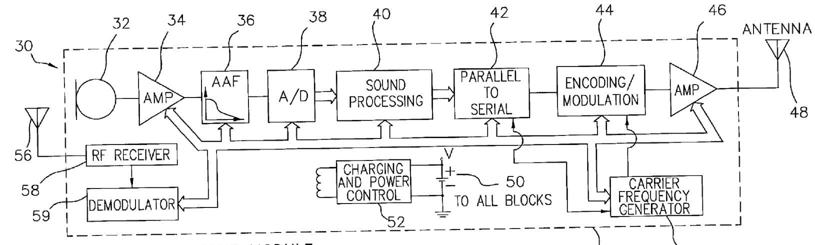
As explained below, the combination of Zilberman and Saaski renders claims 10-17 and 24 of Maltan obvious under 35 U.S.C. § 103, because it discloses all of the limitations of those claims, and because a POSA would have been motivated to combine Zilberman and Saaski with a reasonable expectation of success. *See* Ex. 1002, ¶¶ 155-223.

1. Claim 10

10.1	
A cochlear implant system, comprising: an implantable cochlear stimulator;	<u>Zilberman</u> • [0006]: "The present invention is directed to a system for enhancing hearing comprised of both a middle ear implant and a cochlear implant." • [0014]: "FIG. 2… illustrates an **implant module 60**… for driving… an array comprised of a plurality of electrodes 62 implanted in a patient's cochlea."  FIG. 2: IMPLANT MODULE (*Substantively same* Zilberman Provisional 2, 3, Fig. 2.)

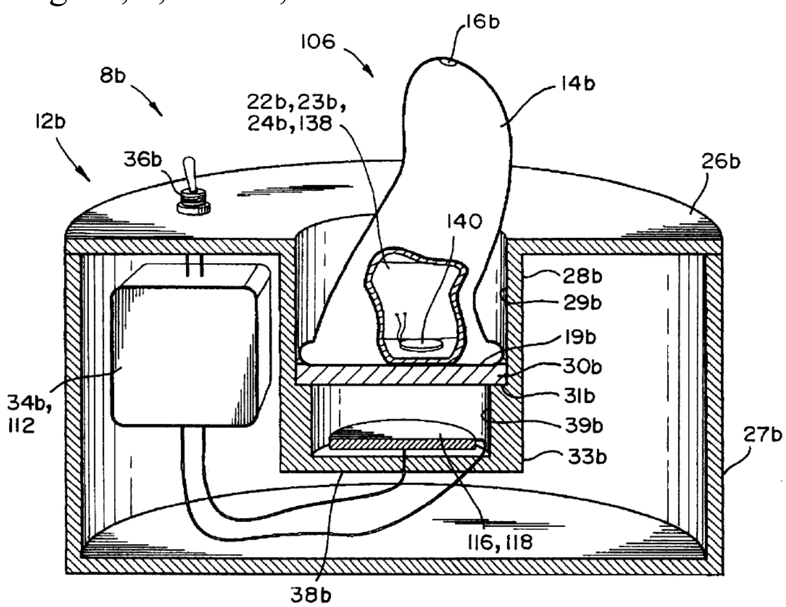
Implant module 60, which drives an electrode array implanted in the cochlea, is an "implantable cochlear stimulator." *See* Ex. 1002, ¶¶ 157-158.

10.2	
and an external sound processor including	<u>Zilberman</u> • [0011]: "FIG. 1… illustrates an exemplary **microphone module 30** intended to be either implanted in a patient's body or worn **externally**. The module 30 is comprised of a microphone 32, an amplifier 34, a filter 36, e.g., antialiasing, an analog to digital converter 38, a digital sound processing circuit 40, a parallel to serial converter 42, and an encoding/modulation transmitter circuit 44."

	 FIG. 1: MICROPHONE MODULE (*Substantively same* Zilberman Provisional, 2-3, Fig. 1.) • Claim 1: "a **sound processor** for supplying output signals…"
	<u>Saaski</u> • Col. 7:57-60: "[T]he hearing aid 10 may also comprise such conventional elements as a microphone, **a signal processor, an audio amplifier, related electrical circuitry**, and a loudspeaker, as is known in the art."

Zilberman's microphone module 30, which turns sound signals into electrical stimulation signals (see below), meets the "sound processor" limitation. *See* Ex. 1002, ¶¶ 159-160.

10.3	
a closed case,	<u>Zilberman</u> • [0011]: "All of the elements of FIG. 1 are preferably contained in a **housing 54 which is hermetically sealed** and suitable for implanting in a patient's body near to the middle ear and inner ear." (*Identical* Zilberman Provisional at 3.)
	<u>Saaski</u> • Col. 7:48-65: "The optically rechargeable hearing aid 10 may comprise a **shell 14** having a sound opening 16 in its

	upper end, and an optical window 18 in its base 19." • Col. 14:19-39: "…an inductively rechargeable hearing aid 10b… that may be the same as, or at least similar to, the optically rechargeable hearing aid 10…" • Col. 26:1-26:3: "Thus, over a period of five years a hearing aid may use only one of the test batteries 160…" • Figs. 1, 5, no. 14, 14b.  FIG. 5

Regarding Zilberman, hermetically sealed housings that are suitable for implanting in a patient's body, are air tight and closed, without any doors or openings that are removable, so they can protect the components inside against damage by external elements such as moisture or biological fluids. Zilberman's housing is therefore closed and has no battery removal door.

The "shell" 14 and 14b of Saaski is depicted in Figs. 1 and 5 as closed. By further describing the use of a rechargeable battery that is recharged *in situ* by inductive charging (*see infra* limitation 10.6) (or alternatively, by optical charging) and can last for a period of up to five years, the description in Saaski, too, makes clear that the "shell" is closed and has no battery removal door.

See Ex. 1002, ¶¶ 161-163.

10.4	
a sound processor circuit,	Zilberman • [0011]: "The module 30 is comprised of… a digital **sound processing circuit** 40…" (*Identical* Zilberman Provisional at 3.)
	Saaski • Col. 7:57-60: "[T]he hearing aid 10 may also comprise… a **signal processor, an audio amplifier, related electrical circuitry**, and a loudspeaker…"

See Ex. 1002, ¶¶ 164-166.

10.5	
a rechargeable power source permanently and integrally housed within the closed case,	Zilberman • [0011]: "The blocks of the microphone module 30 depicted in FIG. 1 are all powered by a **battery 50**. The battery is preferably of the **rechargeable** type, e.g., a lithium ion battery,… All of the elements of FIG. 1 are preferably contained in a housing 54 which is **hermetically sealed** and suitable for implanting in a patient's body near to the middle ear and inner ear." (*Substantively same* Zilberman Provisional at 3, Fig. 1)

	<u>Saaski</u> • Col. 1:12-13: "The rechargeable hearing aid may utilize any conventional **rechargeable battery**." • Col. 4:2-19: "…an inductive charger that may be inductively coupled to an inductively rechargeable hearing aid having a rechargeable battery; wherein energy may be transferred from the charger to the hearing aid by the use of inductive transfer …" • Col. 11:30-34: "[T]he hearing aid's rechargeable battery 24 may be any of the lithium based rechargeable batteries 160-160b (160, 160a and 160b) of FIGS. 10-19… • Col. 25:60-26:3: "[O]ver a period of five years a hearing aid may use only one of the test batteries 160 …" • *See also* col. 4:23-6:19, 18:49-33:22, and Figs. 10-22 (describing details of rechargeable batteries) • Fig. 1, no. 24; Fig. 5, no. 24b

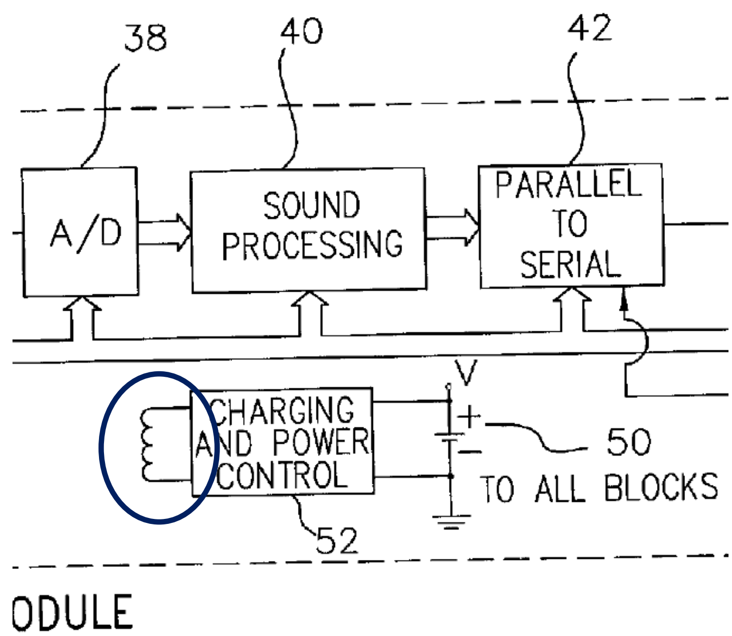
Zilberman's microphone module 30 is powered by a rechargeable battery 50. Battery 50 and its charging and power control circuit 52 are all hermetically sealed in housing 54. Because it is hermetically sealed and it is suitable for implanting in a patient's body, housing 54 is closed and does not have any doors, and "permanently and integrally" houses the "rechargeable power source."

Saaski describes the use of a rechargeable battery that is recharged *in situ* by inductive charging, can last for a period of up to five years, and is placed in a closed "shell" (*see supra*). Saaski thereby makes clear that the battery is not replaceable by the user in the normal course of using the device, but is permanently and integrally housed within the "shell."

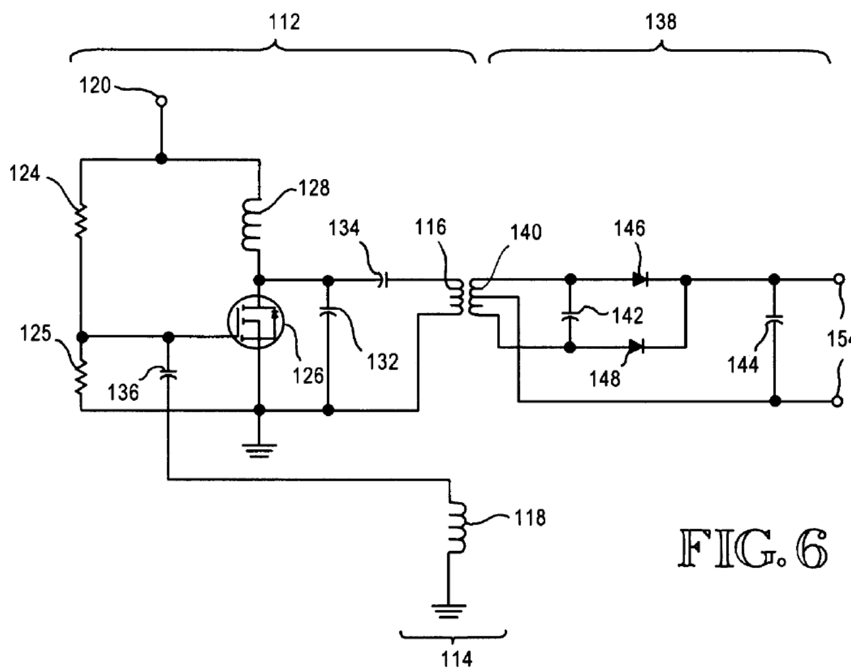
See Ex. 1002, ¶¶ 167-169.

<table>
<tr><th>10.6</th><th>Prior Art</th></tr>
<tr><td rowspan="2">and a power coil operably coupled to the rechargeable power source, that selectively receives power from an external charging source and recharges the rechargeable power source when the sound processor is in proximity to the external charging source; and</td><td><u>Zilberman</u>

• [0011]: "The battery is preferably of the rechargeable type, e.g., a lithium ion battery, which can be charged by charging and power control circuit 52 from, for example, energy extracted from an alternating magnetic field provided by an external source (not shown)."

• Fig. 1, no. 52:

(Substantively same Zilberman Provisional at 3, Fig. 1.)</td></tr>
<tr><td><u>Saaski</u>

• Col. 4:2-22: "Accordingly, the rechargeable hearing aid system of the present invention may comprise an inductive</td></tr>
</table>

	charger that may be inductively coupled to an inductively rechargeable hearing aid having a rechargeable battery; wherein energy may be transferred from the charger to the hearing aid by the use of inductive transfer, rather than by the use of electrical contacts. The inductive charger may comprise an inductive transmitting circuit and a hearing aid holder; while the inductively rechargeable hearing aid may comprise an inductive receiving circuit. During use of such a rechargeable hearing aid system, the inductive transmitting and receiving circuits may be inductively coupled to each other, to permit electrical energy from the inductive transmitting circuit to be inductively transferred to the inductive receiving circuit. Electrical energy induced in the inductive receiving circuit may then be used for recharging the hearing aid's rechargeable battery. The charger's hearing aid holder may hold the hearing aid in such a way that the inductive transmitting circuit and the inductive receiving circuit are properly positioned with respect to each other."  FIG. 6 Col. 14:46-15:17: "Turning now to FIG. 6, the inductive charger 12b may comprise a conventional **inductive**

	transmitting circuit 112; and the inductively rechargeable hearing aid 10b may comprise a conventional **inductive receiving circuit 138**. The inductive transmitting circuit 112 may comprise… **inductor 116** and… **inductor 118** that are inductively linked to… **inductor 140** in the inductive receiving circuit 138. … The inductively rechargeable hearing aid 10b's inductive receiving circuit 138 may comprise the **inductor 140**… … The resonant frequency of the circuit 112 is not fixed; and may be determined in part by the position of the **primary coil set 116, 118** with respect to the **secondary coil 140** of the inductive receiving circuit 138." Col. 15:37-43: "Preferably, **the transmitting and receiving inductors 116, 118, 140 may be located as close to each other as may be reasonably possible, for better energy transfer from the transmitting inductor 116 to the receiving inductor 140**."

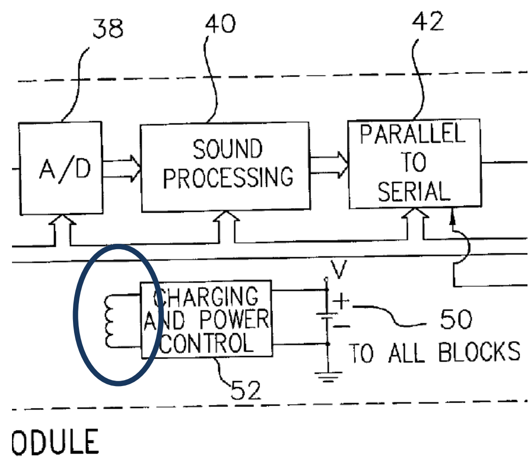
Zilberman describes inductive charging of its rechargeable battery. Zilberman describes the battery being charged by "charging and power control circuit 52," which is depicted in Fig. 1 as having a coil (the symbol, circled above in Fig. 1, is an internationally accepted and known standard electrical symbol, representing an inductor coil) – a "power coil" in Maltan's diction. Furthermore, the description of "energy extracted from an alternating magnetic field provided by an external source" specifically refers to inductive charging that is selectively enabled by coupling of the magnetic fields between two coils, and requires that the power coil be in proximity to the external source, so that it can receive sufficient power from the external source's coil that generates the alternating magnetic field. *See Atlas Powder*, 190 F.3d at 1347.

Saaski, too, describes inductive charging of the battery, and refers to inductor 140 in inductive receiving circuit 138. This receiving circuit is in the hearing aid. Inductor 140 is shown as a coil, described as the "secondary *coil* 140," and meets the "power coil" limitation of Maltan.

See Ex. 1002, ¶¶ 170-173.

<table>
<tr><th>10.7</th><th></th></tr>
<tr><td rowspan="2">a coil operably connected to the sound processor circuit.</td><td><u>Zilberman</u>

• [0011]: "The output of the transmitter circuit 44 is coupled through amplifier 46 to the antenna 48."

• Fig. 1, ref. no. 52.


(Substantively same Zilberman Provisional at 3, Fig. 1.)</td></tr>
<tr><td><u>Saaski</u></td></tr>
</table>

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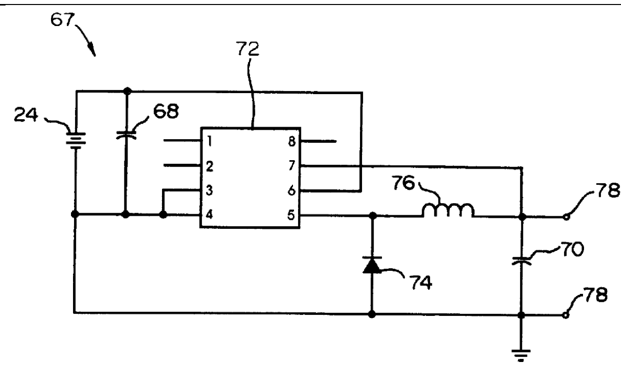
<tr>
<td></td>
<td>


FIG.7

• Col. 17:41-52: "One embodiment of the DC to DC voltage regulating circuit 23 is shown as the regulating circuit 67 in the electrical schematic of FIG. 7. … In FIG. 7, … the **inductor 76** may be a 680 µH inductor…"

• Col. 16:46-50: "The output DC voltage provided by the regulating circuit 23 may be selected to match that needed by the conventional audio amplifier and related circuitry in the particular hearing aid 10, 10a with which the regulating circuit 23 may be used."

• Col. 15:16-17"…the **secondary coil 140** of the inductive receiving circuit 138." *See further* quotations in 10.6.
</td>
</tr>
</table>

In Zilberman, two coils meet this limitation:

First, Zilberman's *antenna 48* is operably connected to the sound processor through the transmitter circuit 44 and amplifier 46. At the low frequencies where externally-powered implantable biomedical systems have to operate in order to reduce absorption of electromagnetic fields by tissue (well below 100MHz), coils are used as antennae for power and data transfer to, and reception by, implants; other types of antennae are not suitable. That is also confirmed by exemplary prior art references in the cochlear implant area, all describing and/or depicting transmitter/receiving coils; *see* Ex. 1001, col. 4:5-8 ("coil 22", "another coil" in ICS); Ex. 1007, col. 4:31-35 ("coils comprising the antenna 20"), Fig. 1; Ex. 1008, col. 8:48 ("receiving coil 5"), 9:22 ("coil 24"), Fig. 2; Ex. 1009, col. 12:57 ("coil 20"), 13:58 ("coil 52"), Fig. 2D; Ex. 1011, col. 9:23 ("coils 30"), 10:30 ("external transmitter coil 56"), Figs. 3-4; Ex. 1013, p. 2:1-15 ("external antenna transmitter coil"… "implanted antenna receiver coil"); Ex. 1014, col. 1:52-56 ("one or more coils… corresponding coils in an implanted receiver"); Ex. 1015, col. 11:6-10 ("internal antenna coil" and "external antenna coil"); Ex. 1016, col. 9:31-34 ("antenna coil in the ICS" and "external antenna coil"); Ex. 1024, 110 ("external transmitting coil" and "internal coil"). When one follows the teachings of Zilberman regarding transmitting "antenna 48" as well as "receiving antenna 64" in the implant module 60, a person of ordinary skill in the art would therefore necessarily use coils. Antennae 48 and 64 are therefore inherently coils. *Atlas Powder*, 190 F.3d at 1347.

Even if inherency was not found, however, it would at least be obvious for a POSA to implement Zilberman's antennae as coils, because for a POSA, it was common knowledge that coils are used as antennae for cochlear implant systems, as shown by the numerous exemplary prior art references cited above. *See e.g.*, *Randall Mfg. v. Rea*, 733 F.3d 1355, 1362 (Fed. Cir. 2013) (obviousness inquiry "'not only permits, but *requires,* consideration of common knowledge and common sense.").

Second, Zilberman discloses the above-discussed coil (Fig. 1 at no. 52) that receives power from the alternating magnetic field to recharge the battery and power up module 30, including the sound processing circuit. See limitation 10.6. That coil is operably connected to the sound processor circuit through the charging and power control circuit since it provides power to the sound processor circuit. Therefore, that coil, too, meets limitation 10.7.

In Saaski, too, two coils meet this limitation:

First, Saaski's hearing aid contains a voltage regulating circuit 23 that contains an inductor 76, which is a coil and depicted as such in Fig.7. That circuit regulates the output DC voltage from the battery to the circuitry; the coil is therefore "operably connected" to the sound processor circuit.

Second, Saaski's "secondary coil 140" is used to receive power from the external charging source to recharge the hearing aid battery which is the power source for the sound processing circuit. This means that the secondary coil 140, too, is "operably connected to the sound processor circuit".

See Ex. 1002, ¶¶ 174-184.

2. Claim 11

11.1	
A cochlear implant system as claimed in claim 10,	*See* claim 10.

11.2-11.4	
wherein the implantable cochlear stimulator receives power signals; the sound processor circuit generates a power signal; and the coil transfers the power signal from the sound processor circuit to the implantable cochlear stimulator.	Zilberman • [0013]: "The resulting digital signal produced by sound processing circuit 40 is then preferably converted to an analog signal and used to modulate an **RF carrier signal** in circuit 44. Alternatively, the carrier can be modulated in digital form and then converted to analog which is then applied to the power amplifier 46 and **sent to antenna 48**." • [0015]: "The implant module 60 includes… a **receive antenna 64 for communicating with the aforementioned antenna 48** of the microphone module 30…" (*Substantively also* Zilberman Provisional at 4.) • [0011]: "…an encoded and modulated **carrier radio frequency signal that is transmitted by the antenna 48**."

Zilberman describes the generation of a modulated RF carrier, which in addition to data includes power since all RF carriers contain energy/power. This RF carrier signal is transmitted through antenna 48, which is the coil of limitation 10.7, to the implant module 60. The generation and transfer of this modulated RF carrier signal to the implant, therefore, necessarily describes the generation and transfer of a power signal, as described in claim 11. *See* Ex. 1002, ¶¶ 186-187.

3. Claim 12

12.1	
A cochlear implant system as claimed in claim 10, further comprising:	*See* claim 10.

12.2	
a headpiece that carries the coil and a microphone.	Zilberman • [0011]: "The module 30 is comprised of a **microphone** 32, …, The output of the transmitter circuit 44 is coupled through amplifier 46 to the **antenna 48**. …All of the elements of FIG. 1 are preferably contained in a housing 54 … Alternatively, the housing 54 can be worn … **behind the patient's ear**." (*Identical* Zilberman Provisional at 2-3.)

Zilberman describes that its module 30 can be worn "behind the patient's ear." That is placement on the head, and module 30 of Zilberman therefore constitutes a headpiece. *See* Ex. 1002, ¶¶ 189-190. During prosecution, the Examiner made the same point with respect to Gibson, which the applicants did not dispute. *See* Ex. 1006, 398, 433-46.

4. Claim 13

13.1	
A cochlear implant system as claimed	*See* claim 10.

in claim 10,	

13.2-13.4	
wherein the external sound processor includes a microphone that receives sound signals and converts them into electrical signals; the sound processor circuit receives the electrical signals from the microphone and converts them into a stimulation signal; and the coil transfers the stimulation signal from the sound processor circuit to the implantable cochlear stimulator.	<u>Zilberman</u> • [0013]: "In use, **sound energy detected by microphone** 32 is, after filtering, preferably converted to digital form and **appropriately processed by sound processing circuit 40 to best mitigate the particular hearing impairment of the patient**. The **resulting digital signal** produced by sound processing circuit 40 is then preferably converted to an analog signal and used to modulate an RF carrier signal in circuit 44. Alternatively, the carrier can be modulated in digital form and then converted to analog which is then applied to the power amplifier 46 and **sent to antenna 48**." [0015]: "The implant module 60 includes… a **receive antenna 64 for communicating with the aforementioned antenna 48**…" (*Substantively same* Zilberman Provisional at 3-4.) • Claim 5: "a **microphone responsive to sound energy** incident thereon for producing an **electrical output signal** representative of said sound energy"

The signal produced by the sound processing circuit "to best mitigate the particular hearing impairment of the patient" is a stimulation signal which, after transfer to the implant module, is used to drive the electrode array implanted in the patient's cochlea. *See* Ex. 1002, ¶¶ 192-193.

5. Claim 14

14.1	
A cochlear implant system as claimed in claim 10,	*See* claim 10.

14.2	
wherein the rechargeable power source comprises a rechargeable battery; and	Zilberman *See* 10.5.
	Saaski *See* 10.5.

See Ex. 1002, ¶ 195.

14.3	
the closed case does not include a battery removal door.	Zilberman *See* 10.3.
	Saaski *See* 10.3.

As explained in the context of limitation 10.3., neither Zilberman's housing 54 nor Saaski's shell 14/14b has a battery removal door. *See* Ex. 1002, ¶¶ 196-197.

6. Claim 15

15.1	
A cochlear implant system as claimed in claim 10,	*See* claim 10.

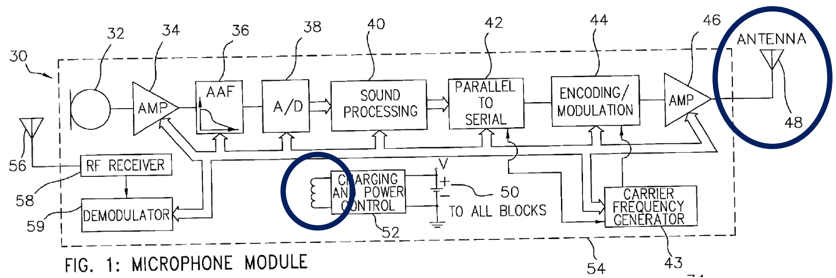
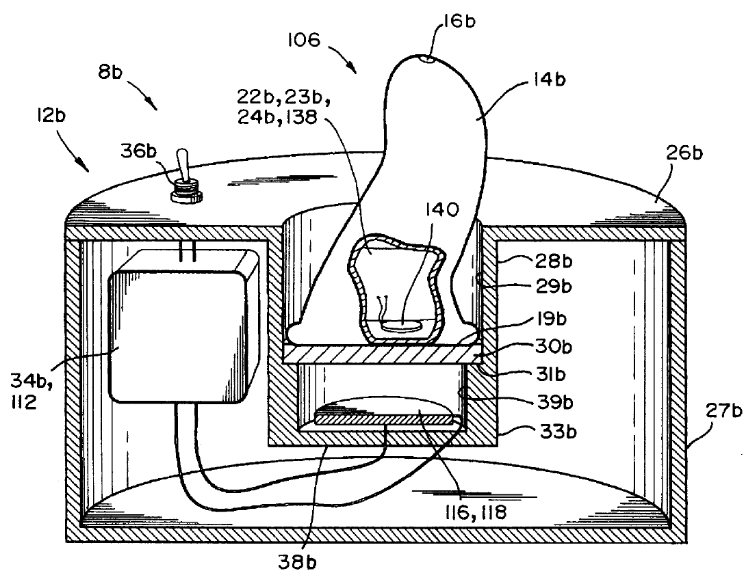
15.2	
wherein the implantable cochlear stimulator includes an electrode array that applies electrical stimulation to tissue and nerves within the cochlea.	Zilberman • [0004]: "Such [cochlear implant] systems are typically comprised of an implant housing containing implant electronics for driving an **array of electrodes** which are surgically inserted into the cochlea." (*Identical* Zilberman Provisional at 1.) • [0014]: ""FIG. 2… illustrates an implant module 60… for driving… an **array comprised of a plurality of electrodes** 62 implanted in a patient's cochlea." (*See also* Zilberman Provisional at 3) • Claim 1: "at least one electrode implanted adjacent to said patient's cochlea energizable to **stimulate said cochlea**" • Claim 7: "an electrically energizable **electrode array** implanted adjacent to a patient's cochlea"

The purpose of the electrode array in a cochlear implant system is to stimulate tissue and nerves in the cochlea; that is also the case in Zilberman. *See* Ex. 1002, ¶¶ 199-200.

7. Claim 16

16.1	
A cochlear implant system as claimed in claim 10,	*See* claim 10.

16.2	
wherein the coil is	Zilberman

housed within the closed case.	• [0011]: "FIG. 1… illustrates an exemplary microphone module 30… The output of the transmitter circuit 44 is coupled through amplifier 46 to the **antenna 48**. … **All of the elements of FIG. 1 are preferably contained in a housing 54 which is hermetically sealed**…"  FIG. 1: MICROPHONE MODULE (*Identical* Zilberman Provisional at 3; *see also id.*, Fig. 1.)
	<u>Saaski</u>  FIG.5 • Figs 1 and 5, nos. 23 and 23b (voltage regulating circuit) • Col.15:29-36: "Similarly, the inductive receiving circuit 138 may be located in any convenient location with the inductively rechargeable hearing aid 10b. For example, the **receiving inductor 140** may be located on the inside of the base 19b of the hearing aid 10b; while the rest of the

	inductive receiving circuit 138 may be part of the module comprising the battery management circuit 22, the **voltage regulating circuit 23**, and the rechargeable battery 24."

In Zilberman, Figure 1 is a functional diagram; the quoted text makes clear that antenna 48, one "coil" meeting limitation 10.7, is physically located within housing 54. Furthermore, as shown in Fig. 1 and the quoted text of Zilberman, charging coil 52 is also within housing 54.

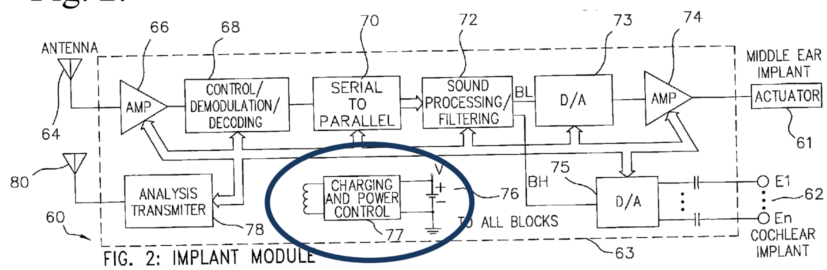
In Saaski, voltage regulating circuit 23 – with its inductor coil 76, which meets limitation 10.7 – is located within the hearing aid. Furthermore, receving inductor 140, which also meets limitation 10.7, is located within the hearing aid shell, too.

See Ex. 1002, ¶¶ 202-206.

8. Claim 17

17.1	
A cochlear implant system as claimed in claim 10,	*See* claim 10.

17.2	
wherein the implantable cochlear stimulator includes a cochlear stimulator coil and an electrode array.	Zilberman • [0015]: "The implant module 60 includes… a **receive antenna 64** for communicating with the aforementioned antenna 48 of the microphone module 30…" • [0015]: "…All of the blocks in FIG. 2 are intended to be driven by a battery 76 and charging circuit 77..."

	• Fig. 2.  (*Substantively same* Zilberman Provisional at 4) *See* 15.2 for the "electrode array."

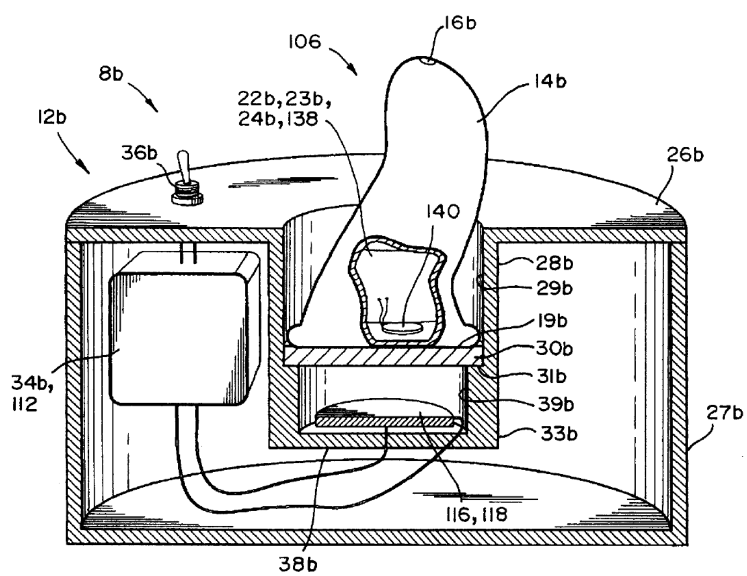
Zilberman's implant module 60 includes electrode array 62 and receiving antenna 64. As discussed in the context of limitation 10.7, receive antenna 64 is inherently a coil; and even if inherency was not found, it would at least be obvious for a POSA to implement receive antenna 64 as a coil. *See* in detail 10.7.

Furthermore, Zilberman shows a coil as part of "charging circuit 77" in its cochlear stimulator. Absent any indication in the patent that a "cochlear stimulator coil" is anything other than a coil included in the cochlear stimulator, that charging coil also meets the "cochlear stimulator coil" limitation.

See Ex. 1002, ¶¶ 208-211.

9. Claim 24

Limitations 24.1-24.2 are identical to 10.1-10.2; 24.3 is the same as 14.3; 24.4-24.5 are identical to 10.4-10.5, and 24.6 is identical to 10.7. *See* appended Claim Listing and charts above.

24.7	
a base station that charges the rechargeable battery.	Saaski Col. 4:2-22: "Accordingly, the rechargeable hearing aid system of the present invention may comprise an **inductive charger** that may be inductively coupled to an inductively rechargeable hearing aid having a rechargeable battery; wherein energy may be transferred from the charger to the hearing aid by the use of inductive transfer, rather than by the use of electrical contacts. The **inductive charger** may comprise an inductive transmitting circuit and a hearing aid holder... During use of such a rechargeable hearing aid system, the inductive transmitting and receiving circuits may be inductively coupled to each other, to permit electrical energy from the inductive transmitting circuit to be inductively transferred to the inductive receiving circuit. Electrical energy induced in the inductive receiving circuit may then be used **for recharging the hearing aid's rechargeable battery**."  FIG. 5 *See also* col. 8:34-65, 9:59-10:2, 15:22-28 (details of charger) and 15:44-52 ("any conventional inductive charger" as an alternative to the specific one described in Figs. 5-6)

As shown above, Saaski depicts and describes in detail a "base station" for charging the integrated rechargeable battery. *See* Ex. 1002, ¶¶ 218-219.

10. Motivation to Combine Zilberman and Saaski with a Reasonable Expectation of Success

a) As described above, Zilberman discloses, or at least renders obvious (10.7, 17.2), all of the limitations of claims 10-17. With respect to limitation 10.6, Zilberman describes that its battery "can be charged by charging and power control circuit 52 from, for example, energy extracted from an alternating magnetic field provided by an external source", and depicts that charging and power control circuit 52 as including a coil. As explained above, that disclosure describes inductive charging, as described in limitation 10.6.

However, if this disclosure was not explicit enough, a POSA would look to Saaski for further guidance on the details of implementing inductive charging, since Saaski also describes inductive charging of an external hearing prosthesis. Saaski describes the components and mechanism of inductive charging in detail, including coil sets that "may be located as close to each other as may be reasonably possible, for better energy transfer." *See* 10.6. A POSA would expect that the components and mechanism of inductive charging, as described in Saaski, could be successfully implemented in the system of Zilberman, since both are in the field of hearing aid prosthesis devices and describe the use of inductive charging for such devices – Saaski merely provides more details. *See* Ex. 1002, ¶¶ 220-221.

b) In implementing Zilberman's charging mechanism, the need for daily battery-recharging would have motivated a POSA to make the process of replenishing power for the sound processor simple and user-friendly, *see* IX.A.14.a, and to that end, would have combined the charging station described in Saaski with the system of Zilberman to arrive at the invention of claim 24 – and would have expected that combination to work (*see infra*). *See* Ex. 1002, ¶ 222; *KSR*, 550 U.S. at 418.

c) The charging station, so combined, would have the same function as in Saaski and would not change the functions of the remainder of the Zilberman-based system either. And, a POSA would have expected that combination to work; nothing in Zilberman prevents the use of a charging station to make the process of recharging convenient and user-friendly, and Saaski expressly states that the "holder" for the device in the charging station "may take on a variety of different constructions, depending on such factors as the size and shape of the particular hearing aid…" (Ex. 1021, col. 9:59-63) – that is, the charging station of Saaski could be adapted to the shape and size of the Zilberman-device. The combination of Zilberman with the charging station of Saaski was therefore nothing more than the combination of known elements according to known methods to yield predictable results. *See* Ex. 1002, ¶223; *KSR*, 550 U.S. at 416.

C. Ground 3: Claims 10-17 and 24 are Obvious Over the AAPA, Zilberman, and Saaski

As explained below, the combination of the AAPA, Zilberman, and Saaski renders claims 10-17 and 24 of Maltan obvious under 35 U.S.C. § 103, because it discloses all of the limitations of those claims, and because a POSA would have been motivated to combine the AAPA, Zilberman, and Saaski with a reasonable expectation of success. *See* Ex. 1002, ¶¶ 224-263.

1. Claims 10-17 and 24

As explained in Section IX.A, the AAPA discloses limitations 10.1, 10.2, 10.4, and 10.7 of independent claim 10, the additional limitations of dependent claims 11-13 and 15-17, and limitations 24.1, 24.2, 24.4., and 24.6 of claim 24. As explained in Section IX.B, Zilberman discloses, or at least renders obvious (10.7, 17.2), all of the limitations of claims 10-17, and limitations 24.1-24.6; and Saaski discloses limitations 10.2-10.7, 14.2-14.3, 16.2, and 24.2-24.7. *See* Ex. 1002, ¶¶ 226-254.

2. Motivation to Combine the AAPA, Zilberman, and Saaski with a Reasonable Expectation of Success

a) As described, (i) Petersen and Saaski itself provide motivation to use the concept of a permanently integrated battery, to be recharged by inductive charging, and using a charging station, to alleviate various problems with replaceable batteries, (ii) a POSA would have been motivated to use *in situ* recharging, and a charging station for reliably and easily applying the charging mechanism, to make the process of replenishing power for the sound processor simple and user-friendly, and (iii) the prior art recognized the design goal to make the speech processor smaller, providing motivation to remove battery doors and similar mechanical components. *See in detail* IX.A.14.a); Ex. 1002, ¶¶ 147-151, 255-257.

Thus, the prior art provided ample motivation and suggestion that would have led a POSA to combine a cochlear implant system with typical cochlear implant features, as described in the AAPA, with the concept of an integrated battery that is recharged *in situ* by inductive charging (which enables the removal of a battery door), as described in both Zilberman and Saaski – and in addition, with the use of the charging station described in Saaski, which a POSA would be motivated to include to make the recharging process simple and user-friendly and which could be adapted to "the size and shape of the particular hearing aid" (Ex. 1021, col. 9:59-63) – and thereby arrive at the claimed invention of Maltan. A POSA would have known how to implement this combination and would have expected it to work, since charging a power source by inductive charging is part of the basic skill set of an electrical engineer, and nothing in the speech processor of a cochlear implant system makes this charging method unsuitable for the specific application. *See* Ex. 1002, ¶¶ 258-259; *KSR*, 550 U.S. at 418.

b) A POSA would also have recognized that, as already explained (IX.A.14.b)), the operation of the typical cochlear implant features is not dependent on which power management mechanism is chosen for the sound processor; as long as the sound processor *has* power, the typical cochlear implant features operate in the same way and have the same functions. On the other hand, Zilberman or Saaski's battery that is recharged in situ by inductive charging, the closed housing made possible thereby, and Saaski's charging station would not change their respective functions either, when combined with the typical cochlear implant features of the AAPA. And as explained above, a POSA would have known how to implement the concept of inductive charging, including the use of Saaski's charging station, in a cochlear implant system, and would have expected the combination to work. Zilberman describes inductive charging, and if further guidance was needed, Saaski describes the components and mechanism of inductive charging in detail. *See* IX.B.10. The combination of the typical cochlear implant features of the AAPA with the power management features taught by Zilberman and Saaski was therefore nothing more than the combination of known elements according to known methods to yield predictable results. *See* Ex. 1002, ¶¶ 260-262; *KSR*, 550 U.S. at 416.

c) Moreover, as explained, a POSA would have been familiar with the technique of inductive charging. *See in detail* IX.A.14.c). The AAPA describes a typical cochlear implant system using replaceable batteries, and Zilberman and Saaski describe an improved cochlear implant system or hearing aid device, respectively, that employ the well-known technique of inductive charging; Saaski describes the components and mechanism of inductive charging in detail. A POSA would have been motivated and capable (*see supra*) of applying Zilberman and Saaski's power management techniques to the known cochlear implant system described in the AAPA. The combination of the AAPA, Zilberman, and Saaski is therefore nothing but the use of a known technique to improve a similar device in the same way and the application of a known technique to a known device ready for improvement to yield predictable results. *See* Ex. 1002, ¶ 263; *KSR*, 550 U.S. at 417.

X. CONCLUSION

For the foregoing reasons, Petitioner respectfully requests the Board institute proceedings and cancel claims 1-24 of Maltan.

Certification Under 37 C.F.R. § 42.24(d)

This Petition complies with 37 C.F.R. § 42.24. As calculated by Microsoft Word, this Petition contains 13,995 words, excluding the items listed in 37 C.F.R. § 42.24(a)(1).

Date: May 29, 2020

Respectfully Submitted,

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APPENDIX – CLAIM LISTING

1.1
A cochlear implant system, comprising: an implantable cochlear stimulator;
1.2
an external sound processor including
1.3
a closed case,
1.4
a sound processor circuit,
1.5
a rechargeable power source permanently and integrally housed within the closed case,
1.6
and at least one electrical contact electrically connected to the rechargeable power source and embedded within or carried on an exterior surface of the closed case such that the at least one electrical contact is exposed outside the closed case;
1.7
a coil operably connected to the sound processor circuit.

2.1
A cochlear implant system as claimed in claim 1,
2.2
wherein the implantable cochlear stimulator receives power signals;
2.3
the sound processor circuit generates a power signal;
2.4
and the coil transfers the power signal from the sound processor circuit to the implantable cochlear stimulator.

3.1
A cochlear implant system as claimed in 1, further comprising:
3.2
a headpiece that carries the coil and a microphone.

4.1
A cochlear implant system as claimed in claim 1,
4.2
wherein the external sound processor includes a microphone that receives sound signals and converts them into electrical signals;
4.3
the sound processor circuit receives the electrical signals from the microphone and converts them into a stimulation signal;
4.4
and the coil transfers the stimulation signal from the sound processor circuit to the implantable cochlear stimulator.

5.1
A cochlear implant system as claimed in claim 1,
5.2
further comprising: a remote control unit that electromagnetically communicates with the external sound processor.

6.1
A cochlear implant system as claimed in claim 1,
6.2
wherein the rechargeable power source comprises a rechargeable battery; and
6.3
the closed case does not include a battery removal door.

7.1
A cochlear implant system as claimed in claim 1,
7.2
wherein the implantable cochlear stimulator includes an electrode array that applies electrical stimulation to tissue and nerves within the cochlea.

8.1
A cochlear implant system as claimed in claim 7,
8.2
wherein the electrode array comprises a plurality of electrode contacts.

9.1
A cochlear implant system as claimed in claim 1,
9.2
wherein the coil is housed within the closed case.

10.1
A cochlear implant system, comprising: an implantable cochlear stimulator;
10.2
and an external sound processor including
10.3
a closed case,
10.4
a sound processor circuit,
10.5
a rechargeable power source permanently and integrally housed within the closed case,
10.6
and a power coil operably coupled to the rechargeable power source, that selectively receives power from an external charging source and recharges the rechargeable power source when the sound processor is in proximity to the external charging source; and
10.7
a coil operably connected to the sound processor circuit.

11.1
A cochlear implant system as claimed in claim 10,
11.2
wherein the implantable cochlear stimulator receives power signals;
11.3
the sound processor circuit generates a power signal;
11.4
and the coil transfers the power signal from the sound processor circuit to the implantable cochlear stimulator.

12.1
A cochlear implant system as claimed in 10, further comprising:
12.2
a headpiece that carries the coil and a microphone.

13.1
A cochlear implant system as claimed in claim 10,
13.2
wherein the external sound processor includes a microphone that receives sound signals and converts them into electrical signals;
13.3
the sound processor circuit receives the electrical signals from the microphone and converts them into a stimulation signal;
13.4
and the coil transfers the stimulation signal from the sound processor circuit to the implantable cochlear stimulator.

14.1
A cochlear implant system as claimed in claim 10,
14.2
wherein the rechargeable power source comprises a rechargeable battery; and
14.3
the closed case does not include a battery removal door.

15.1
A cochlear implant system as claimed in claim 10,
15.2
wherein the implantable cochlear stimulator includes an electrode array that applies electrical stimulation to tissue and nerves within the cochlea.

16.1
A cochlear implant system as claimed in claim 1,
16.2
wherein the coil is housed within the closed case.

17.1
A cochlear implant system as claimed in claim 10,
17.2
wherein the implantable cochlear stimulator includes a cochlear stimulator coil and an electrode array.

18.1
A cochlear implant system, comprising: an implantable cochlear stimulator;
18.2
an external sound processor including
18.3
a closed case,
18.4
a sound processor circuit,
18.5
and a rechargeable power source permanently and integrally housed within the closed case,
18.6
a coil operably connected to the sound processor circuit;
18.7
at least one electrical contact, embedded within or carried on an exterior surface of the closed case, electrically connected to the rechargeable power source;
18.8
and a base station that charges the rechargeable power source.

19.1
A cochlear implant system as claimed in claim 18,
19.2
wherein the implantable cochlear stimulator receives power signals;
19.3
the sound processor circuit generates a power signal;
19.4
and the coil transfers the power signal from the sound processor circuit to the implantable cochlear stimulator.

20.1
A cochlear implant system as claimed in 18, further comprising:
20.2
a headpiece that carries the coil and a microphone.

21.1
A cochlear implant system as claimed in claim 18,
21.2
wherein the external sound processor includes a microphone that receives sound signals and converts them into electrical signals;
21.3
the sound processor circuit receives the electrical signals from the microphone and converts them into a stimulation signal;
21.4
and the coil transfers the stimulation signal from the sound processor circuit to the implantable cochlear stimulator.

22.1
A cochlear implant system as claimed in claim 18,
22.2
wherein the implantable cochlear stimulator includes an electrode array that applies electrical stimulation to tissue and nerves within the cochlea.

23.1
A cochlear implant system as claimed in claim 18,
23.2
wherein the coil is housed within the closed case.

24.1
A cochlear implant system, comprising: an implantable cochlear stimulator;
24.2
an external sound processor including
24.3
a closed case that does not include a battery removal door,
24.4
a sound processor circuit,
24.5
and a rechargeable battery permanently and integrally housed within the closed case,
24.6
a coil operably connected to the sound processor circuit;
24.7
and a base station that charges the rechargeable battery.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that on May 29, 2020, pursuant to 37 C.F.R. §§ 42.6(e) and 42.105(a), true and accurate copies of the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 8,155,746, and its Exhibits 1001-1030, were served by Priority Mail Express on the following attorney of record listed on PAIR at the time of filing:

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and electronically to counsel of record in the related litigation, *MED-EL Elektromedizinische Geräte Ges.m.b.H. et al. v. Advanced Bionics et al.*, No. 1:18-cv-01530 (D. Del.):

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Dated: May 29, 2020

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