

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Samsung Electronics Co., LTD and Samsung Electronics America, Inc.,
Petitioners

v.

SpeakWare, Inc.,
Patent Owner

Case IPR2019-XXXXXX

U.S. Patent No. 6,397,186

**Declaration of Nathaniel Polish,
in Support of Petition for Inter Partes Review of
U.S. Patent No. 6,397,186**

Table of Contents

I.	Introduction.....	1
II.	Qualifications and Background	2
III.	Materials Considered	4
IV.	Legal Standards	5
	A. Claim Construction.....	6
	B. Obviousness Under 35 U.S.C. § 103.....	7
V.	Background on the State of the Prior Art	9
VI.	The ‘186 Patent.....	14
	A. Overview of the ‘186 Patent.....	14
	B. Summary of the Prosecution History of the ‘186 Patent	15
	C. Claim Construction of Terms of the ‘186 Patent	16
	D. Person of Ordinary Skill in the Art	16
VII.	Summary of Opinions on Unpatentability.....	18
VIII.	Salazar in View of Miyazawa (Combination 1A) or Salazar and Miyazawa in View of Bossemeyer (Combination 1B) Renders Obvious Claims 1-4, 7- 16, 19, and 20.....	19
	A. Background on Salazar.....	19
	B. Background on Miyazawa.....	22
	C. Background on Bossemeyer.....	24
	D. Rationale and Motivation to Combine Salazar and Miyazawa.....	25
	E. Rationale and Motivation to Combine Salazar-Miyazawa with Bossemeyer	32

F.	Claim 1	35
1.	[1p] “An audio signal activated control system for controlling appliances comprising:”	35
2.	[1a] “a microphone for receiving audio signals and converting said audio signals to electrical signals;”	38
3.	[1b] “a speech recognition system for receiving said electrical signals, said speech recognition system including a processor”	41
4.	[1c] “and having a low power sound activation mode for detecting the presence of said electrical signals”	47
5.	[1d] “and a speech recognition mode for converting said electrical signals to electrical representative signals, decoding said electrical representative signals”	50
6.	[1e] “and generating control signals for controlling one or more appliances,”	55
7.	[1f] “wherein in said speech recognition mode said processor decodes said electrical representative signals”	56
8.	[1g] “and wherein in said sound activation mode said processor is in a low power state,”	57
9.	[1h] “said speech recognition system configured to automatically switch from said sound activation mode to said speech recognition mode as a function of the amplitude of said electrical signals, and”	58
10.	[1i] “an appliance control circuit which includes a transmitter, said appliance control circuit configured to receive said control signals from said speech recognition system and generate and automatically transmit one or more appliance control signals to said one or more appliances.”	64
G.	Claim 2 — “The audio signal activated control system as recited in claim 1, wherein said transmitter is configured to wirelessly transmit	

	said one or more appliance control signals to said one or more appliances.”	66
H.	Claim 3 — “The audio signal activated control system as recited in claim 2, wherein said transmitter is an infrared transmitter.”	67
I.	Claim 4 — “The audio signal activated control system as recited in claim 2, wherein said transmitter is an RF transmitter.”	67
J.	Claim 7 — “The audio signal activated control system as recited in claim 1, wherein said low power state of said processor is a sleep state.”	67
K.	Claim 8 — “The audio signal activated control system as recited in claim 1, wherein in said speech recognition mode said processor operates at a higher operating frequency than in said low power state.”	68
L.	Claim 9 — “The audio signal activated control system as recited in claim 1, wherein said speech recognition system is further configured to automatically terminate said speech recognition mode and automatically switch to said low power sound activation mode.”	69
M.	Claim 10 — “The audio signal activated control system as recited in claim 9, wherein said speech recognition system is configured for automatically terminating said speech recognition mode after a predetermined period of time.	72
N.	Claim 11 — “The audio signal activated control system as recited in claim 9, wherein said speech recognition system is configured for automatically terminating said speech recognition mode after a period of time that is based upon the results of said decoding of said electrical representative signals.....	72
O.	Claim 12 — “The audio signal activated control system as recited in claim 9, wherein said speech recognition system is configured for automatically terminating said speech recognition mode based upon the results of said decoding of said electrical representative signals.”	74

P.	Claim 13 — “The audio signal activated control system as recited in claim 12, wherein said results include one or more predetermined errors detected during said speech recognition mode.”	75
Q.	Claim 14 — “The audio signal activated control system as recited in claim 1, wherein said control system further comprises a memory for storage of data associated with said appliance control signals.”	76
R.	Claim 15 — “The audio signal activated control system as recited in claim 1, wherein said control system further comprises a memory for storage of data associated with a plurality of said appliance control signals for controlling an appliance.”	77
S.	Claim 16 — “The audio signal activated control system as recited in claim 1, wherein said control system further comprises a memory for storage of data associated with a plurality of said appliance control signals for controlling a plurality of said appliances.”	78
T.	Claim 19 — “The audio signal activated control system as recited in claim 1, wherein said speech recognition system wherein in said speech recognition mode is further configured for decoding said electrical representative signals to define an appliance type, said appliance type defining said appliance to which said appliance control signals are transmitted by said appliance control circuit.”	79
U.	Claim 20 — “The audio signal activated control system as recited in claim 19, wherein said speech recognition system in said speech recognition mode is further configured for decoding said electrical representative signals to determine if said signals represent predetermined audible commands corresponding to control functions associated with said defined appliance type.”	81
IX.	Salazar and Miyazawa in View of Oppendahl (Combination 2A) or Salazar, Miyazawa and Bossemeyer in View of Oppendahl (Combination 2B) Renders Obvious Claim 5	82
A.	Background on Oppendahl	82
B.	Claim 5 — “The audio signal activated control system as recited in claim 1, wherein said speech recognition system further includes a user-adjustable sound activation sensitivity control configured to	

	enable a user to adjust the signal amplitude threshold level that must be exceeded by said amplitude of said electrical signals for automatically switching from said sound activation mode to said speech recognition mode.”	83
X.	Salazar and Miyazawa in View Reichel (Combination 3A) or Salazar, Miyazawa and Bossemeyer in View of Reichel (Combination 3B) Renders Obvious Claim 6	87
A.	Background on Reichel	87
B.	Claim 6 — “The audio signal activated control system as recited in claim 1, wherein said speech recognition system further includes a user-adjustable amplification circuit configured to enable the degree of amplification of said amplitude of said electrical signals to be varied.”	88
XI.	Salazar and Miyazawa in View in View of Clark (Combination 4A) or Salazar, Miyazawa and Bossemeyer in View of Clark (Combination 4B) Renders Obvious Claim 8	92
A.	Background on Clark	92
B.	Claim 8 — “The audio signal activated control system as recited in claim 1, wherein in said speech recognition mode said processor operates at a higher operating frequency than in said low power state.”	93
XII.	Salazar and Miyazawa in View of Douma (Combination 5A) or Salazar, Miyazawa and Bossemeyer in View of Douma (Combination 5B) Renders Obvious Claims 17 and 18.....	94
A.	Background on Douma.....	94
B.	Claim 17 — “The audio signal activated control system as recited in claim 1, wherein said speech recognition system further includes a programming mode to enable a user to define a control signal to be associated with a defined audible command, wherein in said speech recognition mode said speech recognition system generates said defined control signal for controlling one or more appliances if said electrical signals represent said defined audible command.”	95

C.	Claim 18 — “The audio signal activated control system as recited in claim 1, wherein said speech recognition system further includes a programming mode to enable a user to define a plurality of control signals to be associated with a defined audible command, wherein in said speech recognition mode said speech recognition system generates said defined plurality of control signals for controlling said one or more appliances if said electrical signals represent said defined audible command.”	98
XIII.	CONCLUSION.....	99

I. INTRODUCTION

1. I, Nathaniel Polish, submit this declaration to state my opinions on the matters described below.

2. I have been retained by Petitioners, Samsung Electronics Co., LTD and Samsung Electronics America, Inc., as an independent expert in this proceeding before the United States Patent and Trademark Office. Although I am being compensated at my usual rate of \$625.00 per hour for the time I spend on this matter, no part of my compensation depends on the outcome of this proceeding, and I have no other interest in this proceeding.

3. I understand that this proceeding involves U.S. Patent No. 6,397,186 (“the ‘186 patent”), and I have been asked to provide my opinions as to the patentability of the claims of the ‘186 patent. I understand that the application for the ‘186 patent was filed on December 22, 1999 as U.S. application no. 09/469,707. I also understand that a copy of the ‘186 patent has been provided as Exhibit 1001.

4. I understand that Google LLC, a third party, has filed IPR petitions challenging the claims of the ‘186 patent. As part of my analysis, I have considered Google’s IPR petitions and the declarations filed in support of them. I have applied my own judgment and expertise, and after reviewing the materials in Google’s Dr. Lipoff declarations, as well as conducting my own fact checking and consideration

of potential counterarguments, I have come to the same ultimate conclusions as Dr. Lipoff, as set forth in this declaration. For the sake of efficiency, I have incorporated parts of Dr. Lipoff's analysis with which I agree, into this Declaration.

5. This Declaration summarizes my opinions after that review and analysis, and if I am called to testify, I will testify as set forth below. I reserve the right to modify my opinions based on facts or issues raised during the course of the above proceeding as appropriate and allowed.

II. QUALIFICATIONS AND BACKGROUND

6. A detailed record of my professional qualifications, including a list of publications, awards, professional activities, and recent testimony either at trial or at deposition, is attached as Appendix A.

7. I expect to testify regarding my background, qualifications, and experience relevant to the issues in this litigation. I have a Ph.D. in Computer Science from Columbia University. In fact, I hold the following four degrees from Columbia, spanning the years 1980 to 1993:

- Ph.D. in Computer Science, May 1993, Thesis: *Mixed Distance Measures for the Optimization of Concatenative Vocabularies in Speech Synthesis*;
- M.Phil. in Computer Science, December 1989;
- M.S. in Computer Science, December 1987; and

- B.A. in Physics, Columbia College, May 1984.

8. For over twenty-five years, I have run a computer technology development firm that I co-founded, called Daedalus Technology Group. My primary business activity is the development of computer-related products. This activity involves understanding the business objectives of customers, designing products to suit their needs, and supervising the building, testing, and deployment of these products. I develop hardware and software as well as supervise others who do so.

9. Also, from time to time I found other companies in order to pursue particular product opportunities. I develop and ultimately sell these companies. Most of my business activity, however, is as a consulting product developer. From time to time I have also served as an expert witness on computer and software related cases. I am a named inventor on eight United States patents, and am a member of several professional societies, including the IEEE and ACM.

10. I have extensive experience in several areas relevant to this case. My doctoral work was in the area of computer speech. I have developed many systems that use both speech recognition and speech synthesis. In the late 1990s I started a company named Soliloquy to commercialize my technology in the area of speech access to databases. That work resulted in a patent. I have developed a number of systems that use speech recognition to control the system functions. One of the

more amusing systems that I developed for a client was a talking golf club. I am very familiar with the technologies at issue in these patents and the accused systems.

III. MATERIALS CONSIDERED

11. In forming my opinions, I have reviewed the following documents:

Exhibit No.	Title of Document
1001	U.S. Patent No. 6,397,186 to Bush (“ <i>Bush</i> ”)
1002	U.S. Patent No. 5,802,467 to Salazar (“ <i>Salazar</i> ”)
1003	U.S. Patent No. 5,983,186 to Miyazawa (“ <i>Miyazawa</i> ”)
1004	U.S. Patent No. 6,012,027 to Bossemeyer (“ <i>Bossemeyer</i> ”)
1005	U.S. Patent No. 5,008,954 to Oppendahl (“ <i>Oppendahl</i> ”)
1006	U.S. Patent No. 5,459,792 to Reichel (“ <i>Reichel</i> ”)
1007	U.S. Patent No. 6,425,086 to Clark (“ <i>Clark</i> ”)
1008	U.S. Patent No. 5,583,965 to Douma (“ <i>Douma</i> ”)
1010	Prosecution History of U.S. Patent Application No. 09/469,707 (‘186 patent)
1011	Prosecution History of U.S. Patent Application No. 10/168,935 (child of ‘186 patent)
1012	U.S. Patent No. 5,268,965 to Badie et al (“ <i>Badie</i> ”)
1013	WO 94/03020 to Bissonnette (“ <i>Bissonnette</i> ”)
1014	U.S. Patent No. 5,566,271 to Tomitsuka (“ <i>Tomitsuka</i> ”)
1015	U.S. Patent No. 6,112,103 to Puthuff (“ <i>Puthuff</i> ”)

Exhibit No.	Title of Document
1016	U.S. Patent No. 6,188,986 to Matulich (“ <i>Matulich</i> ”)
1017	U.S. Patent No. 6,606,280 to Knittel (“ <i>Knittel</i> ”)
1018	U.S. Patent 5,668,929 to Foster (“ <i>Foster</i> ”)
1019	U.S. Patent No. 6,584,439 to Geilhufe (“ <i>Geilhufe</i> ”)
1020	Excerpts from Newton’s Telecom Dictionary (15th ed. Feb. 1999)
1021	U.S. Patent No. 4,484,344 to Mai (“ <i>Mai</i> ”)
1022	U.S. Patent No. 5,276,765 to Freeman (“ <i>Freeman</i> ”)

IV. LEGAL STANDARDS

12. In forming my opinions and considering the subject matter of the ‘186 patent and its claims in light of the prior art, I am relying on certain legal principles that counsel in this case explained to me. My understanding of these concepts is summarized below.

13. I understand that the claims define the invention. I also understand that an unpatentability analysis is a two-step process. First, the claims of the patent are construed to determine their meaning and scope. Second, after the claims are construed, the content of the prior art is compared to the construed claims.

14. I understand that a claimed invention is only patentable when it is new, useful, and non-obvious in light of the “prior art.” That is, the invention, as

defined by the claims of the patent, must not be anticipated by or rendered obvious by the prior art.

15. For purposes of this declaration, I have been asked to opine on certain issues regarding the technology at issue, the level of ordinary skill in the art, the scope of the '186 patent claims, and obviousness. I have been informed of the following legal standards, which I have applied in forming my opinions.

A. Claim Construction

16. I understand that the United States Patent and Trademark Office interprets claim terms in an inter partes review proceeding under the same claim construction standard that is used in a United States federal court. I understand that under this standard, the meaning of claim terms is considered from the viewpoint of one of ordinary skill in the art at the time of the alleged invention.

17. I have been informed that claim terms are generally given their ordinary and customary meaning as understood by one of ordinary skill in the art in light of the specification and the prosecution history pertaining to the patent. I understand, however, that claim terms are generally not limited by the embodiments described in the specification.

18. I understand that in addition to the claims, specification, and prosecution history, other evidence may be considered to ascertain the meaning of claim terms, including textbooks, encyclopedias, articles, and dictionaries. I have

been informed that this other evidence is often less significant and less reliable than the claims, specification, and prosecution history.

B. Obviousness Under 35 U.S.C. § 103

19. I have been advised that a patent claim may be unpatentable as obvious under 35 U.S.C. § 103 if the differences between the subject matter patented and the prior art are such that the subject matter as a whole would have been obvious to a person of ordinary skill in the art at the time the invention was made. I have also been advised that several factual inquiries underlie a determination of obviousness. These inquiries include (1) the scope and content of the prior art; (2) the level of ordinary skill in the field of the invention; (3) the differences between the claimed invention and the prior art; and (4) any objective evidence of non-obviousness.

20. I have also been advised that example reasons to combine or modify prior art references that may support a conclusion of obviousness include:

- a. combining prior art elements according to known methods to yield predictable results;
- b. simple substitution of one known element for another to obtain predictable results;
- c. use of a known technique to improve similar techniques;

- d. combining elements in a way that would be “obvious to try,”
particularly when there exists a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions such that a person of ordinary skill in the art would have had good reason to pursue the known options within his or her technical grasp;
- e. design incentives or market forces that would prompt variations of known work if those variations were predictable to a person of ordinary skill in the art;
- f. a teaching, suggestion, or motivation in the prior art to combine or modify prior art references to arrive at the claimed subject matter;
and
- g. optimization of a recognized result-effective variable by a person of ordinary skill in the art if that optimization would be routine.

21. I am informed that there are also reasons that would prevent a person of ordinary skill in the art from modifying or combining prior art references. Examples of prior art references that a person of ordinary skill in the art would not combine or modify to achieve the claimed invention include: prior art references that teach away from one another; prior art references that teach away from the claimed invention; prior art references whose combination or modification would

change the principle of operation of either prior art reference; and prior art references whose combination or modification would render them inoperable or unsuitable for their intended purpose.

22. I am informed that in determining whether a person of ordinary skill in the art would combine or modify prior art references, the entire contents of each prior art reference must be considered, including parts of those references that would suggest against the proposed combination or modification.

V. BACKGROUND ON THE STATE OF THE PRIOR ART

23. I understand that the application for the '186 patent was filed on December 22, 1999. This section provides an overview of the state of the art of remote control technology for electronic equipment, and more specifically, voice-activated and voice-operated technology for remotely controlling appliances prior to that date. As I explain below, voice-activated and voice-operated systems were well known long before the '186 patent, as was using these systems to remotely control appliances.

24. As I discussed above in the summary of the '186 patent, the '186 patent admits that the prior art included voice-operated systems for controlling appliances. Indeed, such systems were extremely well-known prior to the '186 patent. In addition to the admitted prior art in the '186 patent, voice-operated remote control systems were described in great detail in other patents and printed

publications prior to December 22, 1999. For example, WO 94/03020 to Bissonnette, U.S. Patent No. 5,566,271 to Tomitsuka, U.S. Patent No. 6,112,103 to Puthuff, U.S. Patent No. 6,188,986 to Matulich, and U.S. Patent No. 6,606,280 to Knittel, all disclose systems that allow for voice-operated remote control of appliances.

25. As discussed below, I also understand that the applicant for the '186 patent attempted to distinguish the Patent Office's prior art by arguing that it all required a push-to-talk switch to switch from a low power mode to a speech recognition mode. Hands-free switching, however, was also well known in the art long before the filing date of the '186 patent. In addition to being disclosed by the references that I rely on for the prior art combinations below, this feature was ubiquitous in the prior art.

26. U.S. Patent 5,668,929 to Foster teaches a switch-free speech activated security system that includes a microphone for receiving verbal commands and actuating locks or other security devices in the home based on those commands. *Foster*, 2:33-43, 4:6-48, Fig. 2. The system includes a quiescent state where the processor is in a low-powered sleep mode, and can be activated by a user saying "an initiating word with a sufficient volume." *Foster*, 4:18-33. Thereafter, the processor analyzes the signal to detect the words spoken by the user. *Foster*, 4:33-38. Foster discloses that its invention can be completely hands free, without

the use for a button switch or other mechanical activation. *Foster*, 4:25-28. In fact, *Foster* provides several express motivations for eliminating physical buttons or switches, including that buttons are unsanitary, certain users with physical disabilities cannot use buttons, and sometimes users want to use a system when their hands are full and thus cannot use physical buttons. *Foster*, 2:16-23.

27. Another patent, U.S. Patent No. 6,584,439 to Geilhufe, for example, discloses a system for remotely controlling devices, including appliances, using voice. E.g., *Geilhufe*, Abstract. Geilhufe further discloses that adding buttons or switches to the system would increase cost and make the system more difficult to use. Thus, Geilhufe discloses that it is desirable to “eliminate all manual input . . . and remotely control devices without requiring specific buttons” to achieve “true hands-free operation.” *Geilhufe*, 2:50-67, 3:54-63, 14:53-55.

28. Additionally, voice activated switching without employing a push-to-talk switch was in widespread use and commonly known for many years in multiple applications prior to 1999. Two prior art terms of art that relate to voice activated switching without push-to-talk are “VOX (Voice Operated Exchange)” and “VAD (Voice Activity Detector).” Both VOX and VAD are essentially synonyms while the term VOX is generally applied to a wide variety of telecommunications and control systems while VAD is generally used to describe

mobile radio technologies such as those practiced under the GSM cellular mobile standard.

29. Newton's Telecom Dictionary from February 1999 makes clear that VOX supports non push-to-talk voice activation and, in the example given in the definition, explains that the purpose is provide a lower power state when voice is not present, in order to conserve power:

VOX Voice Operated eXchange. Your voice starts it. When you stop speaking, it stops. . . . Cellular phones also use VOX to save battery. A cellular phone without VOX is continuously transmitting a carrier back to the cell site the entire time your call is in progress. The VOX operation in smaller phones allows the phone to transmit only when you're actually talking. This reduces battery drain and enables handheld phones to operate longer on a smaller battery.

Newton's Telecom Dictionary (15th ed. Feb. 1999).

30. Another prior art patent from 1982, U.S. Patent No. 4,484,344 to Mai, describes VOX systems in its background section, demonstrating that they were well known long before the '186 patent:

Voice operated switches (VOX's) find a variety of applications in communication radio receivers. . . . Voice operated switches may also have a particular utility in controlling the application of power to a transmitter, or the like, such that the transmitter is powered up only during the reception of voice signals. It is apparent that the application

of power only during the useful period of a transmitter can result in substantial economical benefits.

Mai, 1:8-20.

31. The patent prior art also demonstrates that VAD-based systems were well known long before the '186 patent and supported the basic function of voice activation without any manual switch. For example, U.S. Patent No. 5,276,765 to Freeman, filed in 1989 and titled "Voice Activity Detection," explains that "[a] voice activity detector is a device which is supplied with a signal with the object of detecting periods of speech, or periods containing only noise." *Freeman*, 1:8-10. Similarly, U.S. Patent No. 4,672,669 to Desblache, filed in 1983 and titled "Voice Activity Detection Process and Means for Implemented Said Process" explains in its technical background section that:

[T]he method for detecting voice activity of a given speaker is based on measurement of the speech signal energy over short periods of time. The measured energy is then compared with a pre-specified threshold level. Speech is declared present if the measured energy exceeds the threshold, otherwise the period is declared idle, i.e. the concerned speaker is considered silent for said period of time.

Desblache, 1:30-39.

32. Thus, more than a decade before the priority date of the '186 patent, voice-activated switching was well known and in widespread deployment precisely

for the purpose of hand-free voice operation without employing a push-to-talk switch.

VI. THE '186 PATENT

A. Overview of the '186 Patent

33. The '186 patent discloses a sound-activated, universal remote system for controlling appliances. '186 patent, Abstract, 4:33-51. Using voice input, the system generates control signals that are transmitted via a radio frequency or infrared signal to a desired appliance. *Id.*, 8:17-38. Voice input is captured using a microphone, and one or more circuits convert and apply speech recognition methods to the captured voice signals. *Id.*, 7:22-32, 10:5-46.

34. The '186 patent admits, however, that these elements were well known in the prior art. For example, it concedes that the microphone used was conventional and commercially available. *Id.*, 7:33:43. And it admits that using computer processor technology to process signals received from the microphone and to perform its speech recognition techniques were all well known in the art. *Id.*, 10:10-21, 10:40-11:7, 23:16-28. The '186 patent also concedes that that its use of speech recognition to interact with appliances is not new, *id.*, 2:43-62, nor is the concept of providing a universal remote for multiple appliances, *id.*, 1:11-67. The '186 patent additionally discloses that the “continuous listening software routines” of its speech recognition mode are well known in the art, *id.*, 21:39-49 (citing Fig.

5, S508 through S517), as are its “signal amplification and triggering circuits,” *id.*, 19:57-20:19.

35. Instead, the ‘186 patent states that its purported benefit over prior art systems is providing a hands-free voice input for interacting with appliances. *Id.*, 2:7-42, 6:66-7:4, 8:36-38. The ‘186 patent discloses that this can be accomplished using two operating modes in the system: a speech recognition mode and a sound activation mode. *Id.*, 4:27-33, 7:4-15, 7:54-8:16. In the speech recognition mode, the system applies speech recognition to a captured voice signal to determine commands. *Id.*, 11:34-67. The sound activation mode is disclosed as a low-power sleep mode. *Id.*, 7:54-8:16. The system remains in this mode until a voice signal is received that exceeds a given threshold, triggering the speech recognition mode. *Id.* If a command is recognized from the captured voice signal, the system generates a corresponding control signal that is sent to an appliance. *Id.*, 8:1-16.

B. Summary of the Prosecution History of the ‘186 Patent

36. I have reviewed the prosecution history of the application that led to the ‘186 patent. In response to two office actions presented by the office during prosecution, the applicant distinguished its purported invention from the prior art based on a hands-free switching feature. Ex. 1010, 161-64, 190-93. In doing so, the applicant stated:

[I]n accordance with an important aspect of the invention, the push to talk switch is eliminated . . . , while at the same time preventing false operations of the controlled device due to background noise by detecting the amplitude of an input signal and switching to a speech recognition mode if the input signal amplitude exceeds a certain threshold.

Id., 192. The applicant did not rely on any other feature to distinguish the claims from the prior art.

C. Claim Construction of Terms of the ‘186 Patent

37. As I discussed above, I have been informed that for purposes of inter partes reviews, the standard for claim construction of terms within the claims of the patent is the same as that applied in federal district court litigation.

38. I have been asked for purposes of this declaration to assume that the preambles of independent claim 1 is limiting. I have been asked to assume that the claims terms otherwise have their plain and ordinary meaning to a person skilled in the art in light of the specification and the prosecution history.

D. Person of Ordinary Skill in the Art

39. I am informed that patentability must be analyzed from the perspective of “one of ordinary skill in the art” in the same field as the patents-in-suit at the time of the invention. I am also informed that several factors are considered in assessing the level of ordinary skill in the art, including (1) the types

of problems encountered in the art; (2) the prior art solutions to those problems; (3) the rapidity with which innovations are made; (4) the sophistication of the technology; and (5) the educational level of active workers in the field.

40. In my opinion, the field of art pertinent to the '186 patent includes technologies for remotely controlling electronic equipment, including voice-operated systems for remotely controlling appliances. *See* '186 patent, Title, 1:5-9 ("Field of Invention"). Moreover, in my opinion, one of ordinary skill at the time of the alleged invention of the '186 patent would have a minimum of a bachelor's in electrical engineering, or an equivalent field, and approximately two years of industrial or academic experiences working with voice-operated systems for remotely controlling appliances.

41. As of the priority date of the application for the '186 patent, I was at least a person of ordinary skill in the art. I am also familiar with the knowledge of the person of ordinary skill in the art as of the priority date of the '186 patent. I am able to opine on how the person of ordinary skill in the art would have understood the disclosure and claims of the '186 patent, the disclosures of the prior art, the motivation to combine the prior art, and what combinations would have been obvious to one of ordinary skill in the art.

VII. SUMMARY OF OPINIONS ON UNPATENTABILITY

42. In the analysis that follows, I identify the following combinations of prior art that, in my opinion, render obvious the '186 patent claims:

#	Combination of Prior Art References
1A/1B	Salazar in view of Miyazawa (1A), and Salazar and Miyazawa in view of Bossemeyer (1B) renders obvious claims 1-4, 7-16, 19, and 20 under 35 U.S.C. § 103.
2A/2B	Salazar and Miyazawa in view of Oppendahl (2A), and Salazar, Miyazawa and Bossemeyer in view of Oppendahl (2B) renders obvious claim 5 under 35 U.S.C. § 103.
3A/3B	Salazar and Miyazawa in view of Reichel (3A), and Salazar, Miyazawa, and Bossemeyer in view of Reichel (3B) renders obvious claim 6 under 35 U.S.C. § 103.
4A/4B	Salazar and Miyazawa in view of Clark (4A), and Salazar, Miyazawa, and Bossemeyer in view of Clark (4B) renders obvious claim 8 under 35 U.S.C. § 103.
5A/5B	Salazar and Miyazawa in view of Douma (5A), and Salazar, Miyazawa, and Bossemeyer in view of Douma(5B) renders obvious claims 17 and

#	Combination of Prior Art References
	18 under 35 U.S.C. § 103.

VIII. SALAZAR IN VIEW OF MIYAZAWA (COMBINATION 1A) OR SALAZAR AND MIYAZAWA IN VIEW OF BOSSEMEYER (COMBINATION 1B) RENDERS OBVIOUS CLAIMS 1-4, 7-16, 19, AND 20

43. In my opinion, the combination of Salazar and Miyazawa renders obvious each of claims 1-4, 7-9, 12-16, 19, and 20 (Combination 1A). Also, in my opinion Salazar, Miyazawa, and Bossemeyer renders obvious each of claims 1-4, 7-9, 12-16, 19, and 20 (Combination 1B).

A. Background on Salazar

44. Salazar discloses a universal remote system (including a handset and base station) that receives voice inputs to control appliances. *Salazar*, Abstract, 1:8-14, 2:11-26, Fig. 1b.

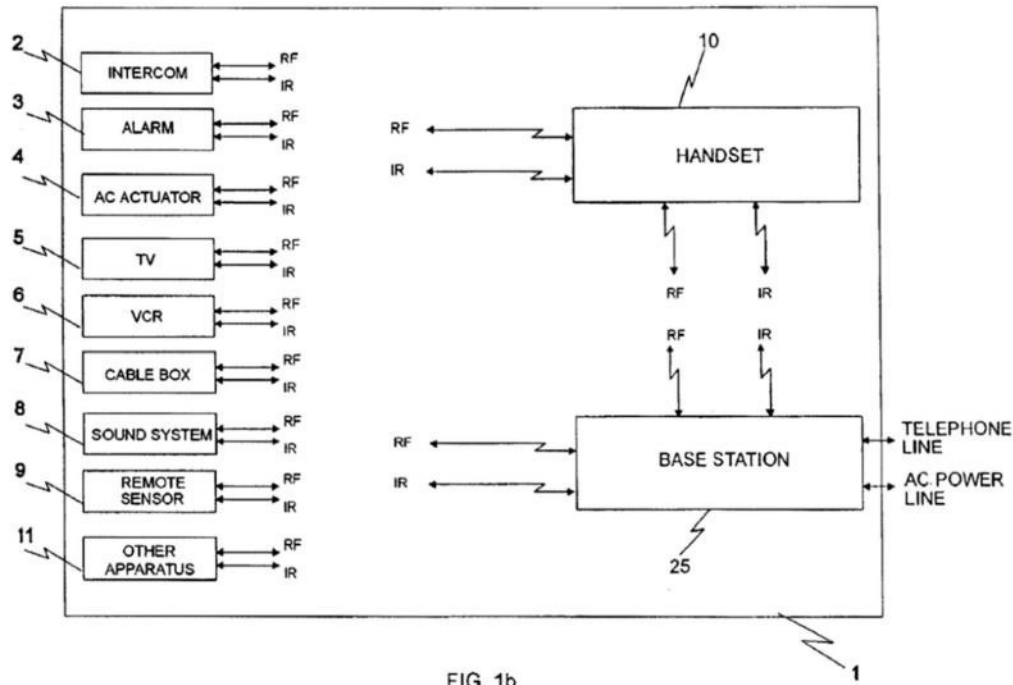


FIG. 1b

45. Salazar discloses that its handset and a base station each have a microprocessor (microprocessors 30/200), a wireless transceiver for sending radio frequency or infrared signals to appliances, a microphone, and one or more circuits for applying speech recognition to a received voice input and for generating corresponding command and control signals to appliances. *Id.*, 3:2-4, 3:15-40, 6:31-51, 22:35-37, Figs. 1b, 2-5. Salazar discloses that its speech recognition occurs in a “voice activated mode” that “may be selected with voice command input via [the] microphone.” *Id.*, 21:44-55. Salazar also discloses that its voice input and appliance control methods may be carried out by either of its handset or base station, independently, or by a combination of the two. *Id.* Figure 5, shown below, shows an example of the base station with a **microphone** that sends voice

signals to a **voice activated device IC**. *Salazar*, 24:36-45. The voice activated device IC performs speech recognition operations and transmits the recognized signals to the **microprocessor**. *Id.* The microprocessor then generates command and control signals and transmits commands to the appliances via **IR or RF transceiver circuitry**. *Id.* Figure 3 shows identical functionality for the handset. *Salazar*, 21:43-55.

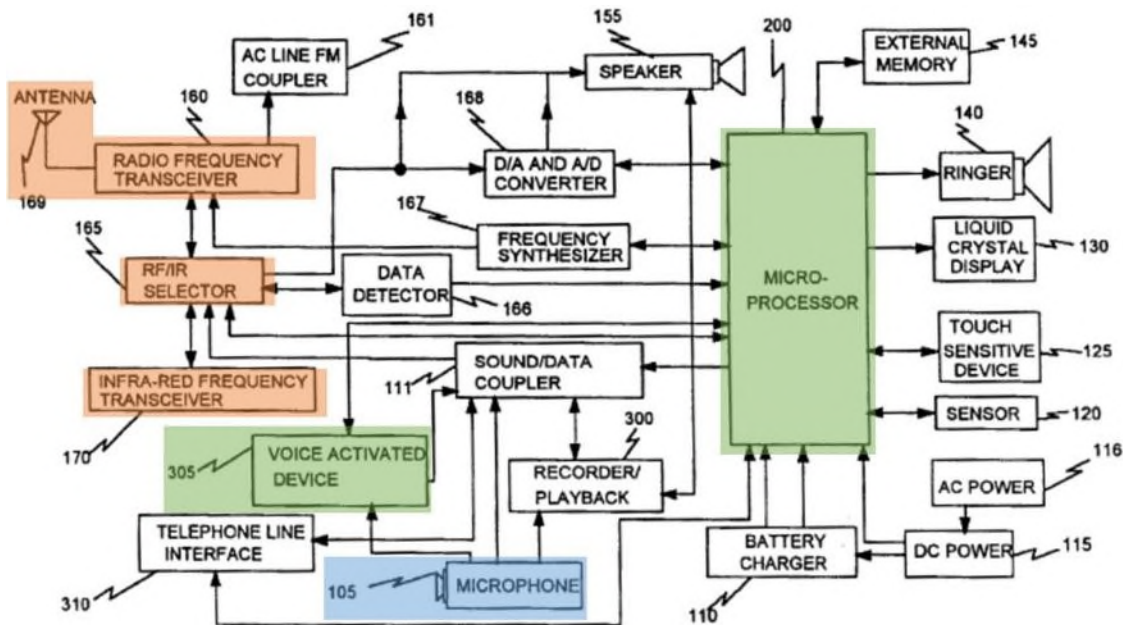


FIG. 5

46. To save power in its system, Salazar discloses a “stop mode” and a “battery save circuit 208” that activates and deactivates its microprocessor for periods of time, reducing battery drain. *Id.*, 18:30-41, 18:53-19:51. Salazar discloses that the microprocessor may be commanded to exit the stop mode using hardware interrupts. *Salazar*, 18:30-36.

B. Background on Miyazawa

47. Miyazawa discloses a voice-activated speech recognition system for interacting with devices. *Miyazawa*, Abstract, 1:30-34, 2:46-53, Fig. 1. Like Salazar, Miyazawa discloses a sound signal input unit 1 that includes a **microphone** (as well as an **amplifier, low-pass filter, and A/D converter**, as discussed below), a **CPU 10** that performs speech recognition to enable voice interaction, and an **input sound signal power detector 9**.

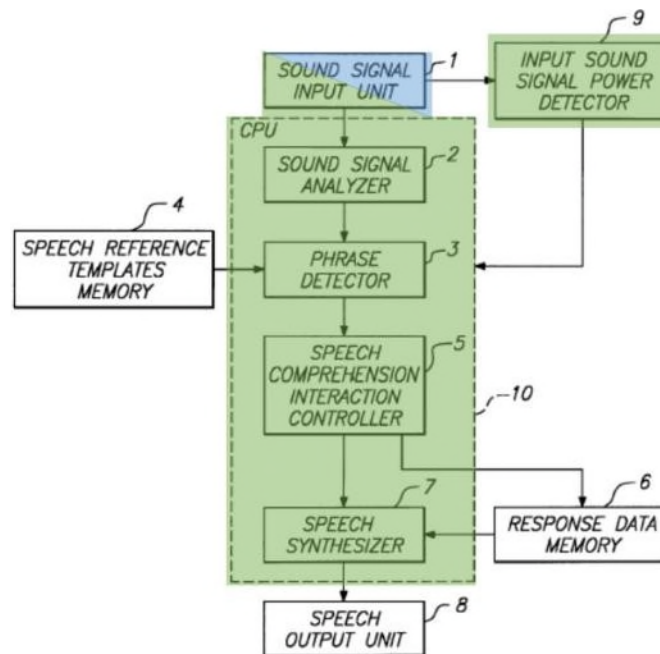
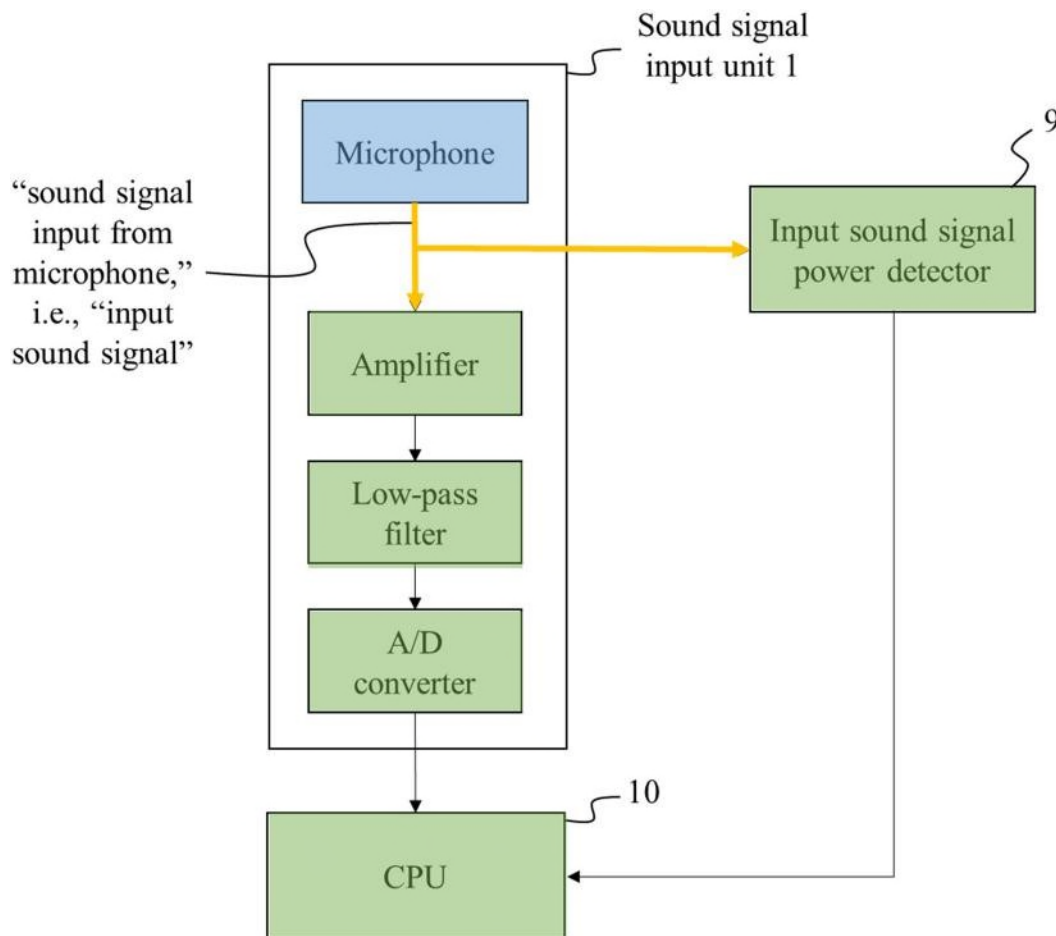


FIG.-1

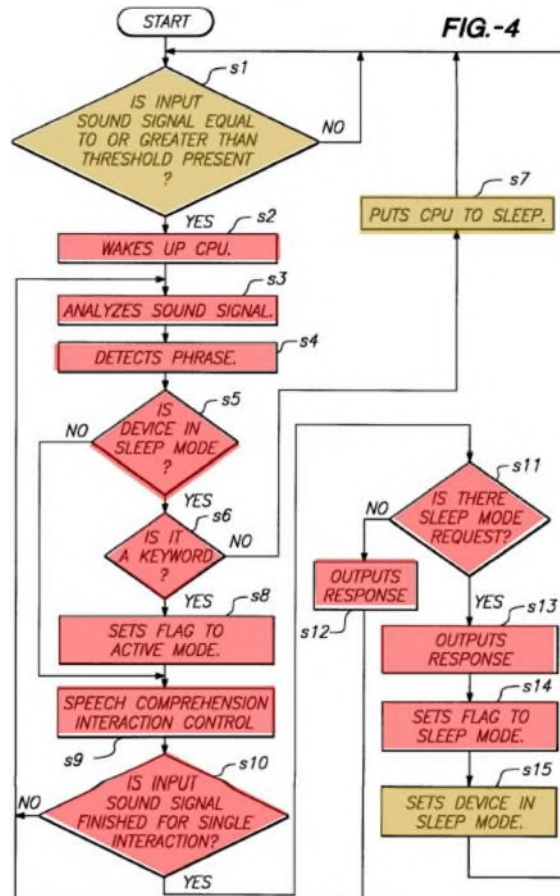
48. Miyazawa's Figure 1 does not show the elements of sound signal input unit 1 because, as Miyazawa explains, these elements were conventional, but Miyazawa discloses that "the sound signal input from the microphone is first passed through the amplifier and the lowpass filter" and then through an A/D

converter, as I have shown in a drawing below. *Miyazawa*, 6:38-56. Miyazawa also discloses that the input sound signal power detector 9 receives the same “input sound signal fetched by sound signal input unit 1.” *Id.*, 9:33-40, 9:64-67; *see also id.*, 3:13-17 (discussing “input sound signal power detector ... for detecting the volume, magnitude or amplitude of the input sound signals based on sound signal waveforms perceived by the sound signal input unit or capture device.”), 4:9-12.



49. The input sound signal detector 9 enables CPU 10 to switch between a **low-power sleep mode** and an **active speech recognition mode** based on the

volume, magnitude, or amplitude of input signals collected at the microphone, in order to conserve power. *Id.*, 2:56-3:28, 4:13-22, 10:2-29, Fig 4 (below).

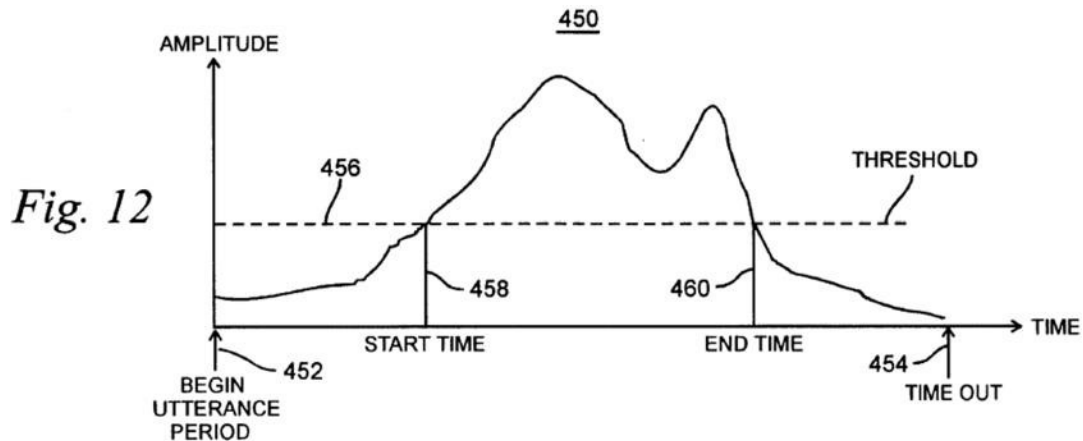


50. This switching occurs without requiring manipulation of a physical switch. *Id.*, 2:8-19, 11:33-42. Miyazawa discloses that its system may be used to interact with various devices, including interactive toy dolls, game machines, and electronic appliances. *Id.*, 14:4-27.

C. Background on Bossemeyer

51. Bossemeyer discloses an enrollment process for a speech recognition system. *Bossemeyer*, 1:17-39, 2:24-32. Bossemeyer discloses that its system

includes a microphone and a combination of hardware and software for receiving, converting, and analyzing voice signals received by the microphone. *Id.*, 2:33-58. During the enrollment process, Bossemeyer discloses that its system may request a user to provide a voice input, after which the system will monitor signals from the microphone to determine if an utterance is received. *Id.*, 8:51-62. The start of an utterance is determined if the amplitude of a received voice input crosses an amplitude threshold. *Id.*, 8:51-62, Fig. 12.



D. Rationale and Motivation to Combine Salazar and Miyazawa

52. In my opinion, one skilled in the art would have recognized the substantial overlap between Salazar and Miyazawa and found it obvious to combine their teachings. For example, both references relate to speech recognition systems for using voice inputs to interact with electronic devices, both disclose conserving power via mode-switching processors that have low power modes, and

both receive voice inputs without first requiring a user to activate a physical switch.

53. More specifically, Salazar's universal remote system includes a voice activated mode for recognizing voice inputs and creating commands for controlling various functionalities, including controlling external appliances. *Salazar*, 21:43-59, 24:37-51. In one embodiment, Salazar discloses that its voice activated mode may be selected by a voice command input via the microphone. *Id.*, 21:53-55. Salazar also discloses methods for reducing power consumption in its system. Specifically, Salazar discloses a "stop mode" and a "battery save circuit 208" that activates and deactivates its processor for periods of time to reduce power demands on its battery. *Id.*, 18:30-41, 19:1-51. Salazar further discloses that the microprocessor is activated and exits the stop mode in response to a hardware interrupt. *Id.* Salazar therefore discloses a low power mode, a voice activated mode, and receiving voice inputs without first requiring a user to activate a physical switch. Salazar, however, does not expressly disclose a low power circuit that enables its system to switch from its stop mode to its voice activation mode based on the amplitude of a received electronic signal from its microphone.

54. Miyazawa, however, discloses such a circuit and its functionality. Miyazawa discloses a voice-activated, speech recognition system for interacting with devices. Miyazawa's speech recognition system switches from a low-power

sleep mode (where the CPU is in a sleep state) to an active speech recognition mode (where the CPU performs speech recognition) based on the volume, magnitude, or amplitude of input signals collected at the microphone. *Miyazawa*, Abstract, 2:56-3:28. Miyazawa further explains that putting the CPU in the sleep mode in this manner is “well known in the computing arts.” *Id.*, 9:62-10:2. Miyazawa therefore discloses receiving voice inputs and switching modes without a physical switch to activate the system. *Id.*, 2:8-19, 11:33-42.

55. In my opinion one skilled in the art would have found it obvious to combine Miyazawa with Salazar to incorporate Miyazawa’s voice-activated processor mode switching (accomplished via its sound signal input unit 1, input sound signal power detector 9, and CPU 10) into Salazar’s voice-activated appliance control system in order to reduce power consumption—an expressly stated goal of both references.

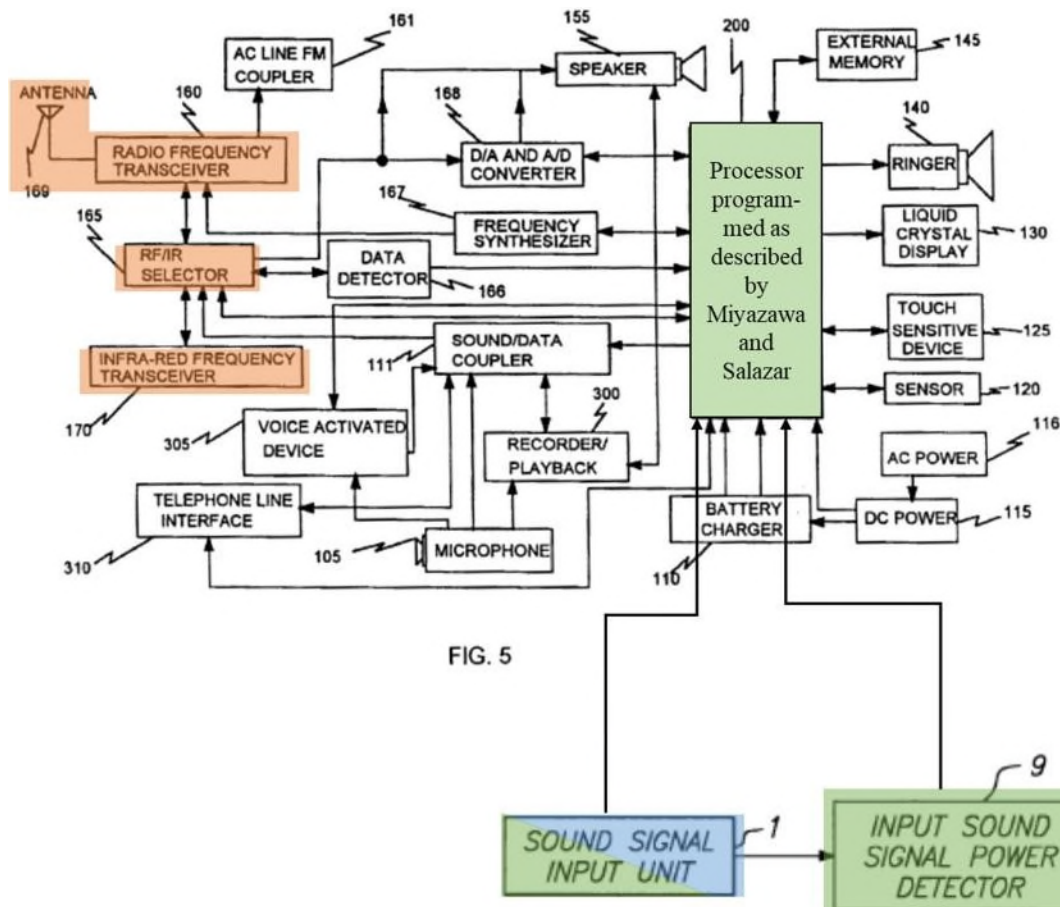
56. The person of ordinary skill in the art would have recognized that the combined Salazar-Miyazawa system would provide a universal remote system that switches from a lower power mode that does not process voice commands to a speech recognition mode, based solely on voice input detected using Miyazawa’s thresholding techniques. Combining Miyazawa with Salazar would have been nothing more than combining known techniques of voice-activated control with known battery-saving processor modes to yield the predictable result of a system

that uses voice inputs to switch between processor modes and maintains a low power mode until a voice command is received. This achieves the express goals of both Miyazawa and Salazar by reducing overall power requirements of its system, where Miyazawa discloses reducing power consumption specifically when no voice inputs are being provided and Salazar discloses a low power mode. A skilled artisan also would have immediately recognized the benefit of this combination because both Miyazawa and Salazar disclose devices that include finite power supplies and thus a need to preserve power.

57. The combined Salazar-Miyazawa system also would have been straightforward to implement because both receive voice inputs without a physical trigger, and both utilize a mode-switching processor, a microphone, and speech recognition hardware and software. Moreover, Salazar discloses that its processor switches out of the sleep state (“stop mode” in Salazar) based on a hardware interrupt, *Salazar*, 18:30-36, and one skilled in the art would have recognized that Miyazawa’s detection of a sound signal results in the output of a signal from sound signal power detector 9 would have been implemented as a hardware interrupt, a common processing technique.

58. While I have been informed by counsel that it is not necessary to bodily incorporate two references to demonstrate obviousness, in my opinion it also would have been obvious to physically incorporate Miyazawa into Salazar,

and I provide an example below to demonstrate. For example, one skilled in the art would have found it obvious to include the components and functionality from Miyazawa's sound signal input unit 1 and input sound signal power detector 9 into the Salazar system, as I've shown in the modified drawing below. Although I have used the base station Figure 5 as an example, my analysis applies equally to Figure 3 of Salazar (describing the handset) which includes substantively identical structure and functionality.



59. In this combination, Salazar's microphone 105 is either included in or replaced by Miyazawa's sound signal input unit 1, which includes its own

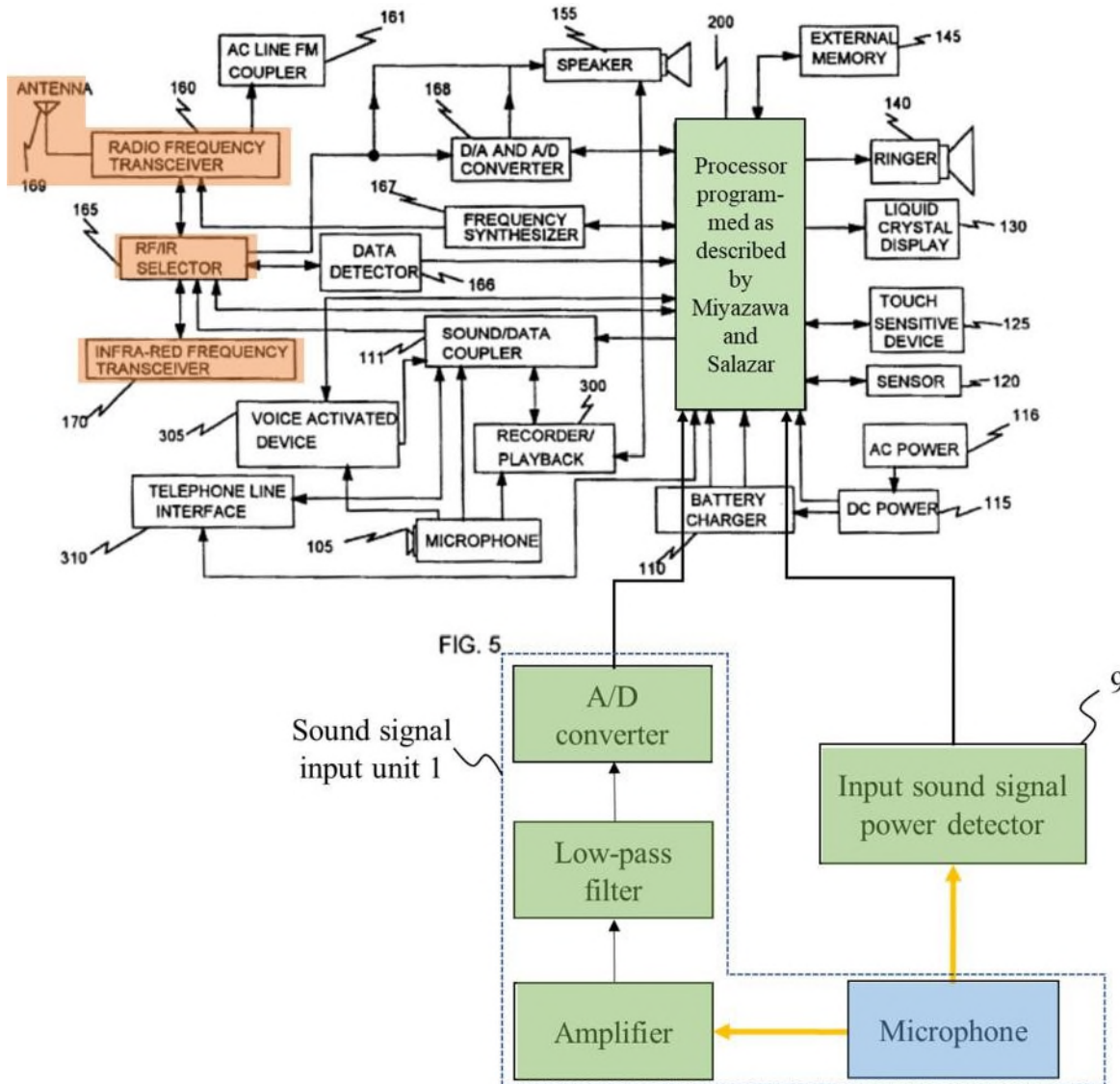
microphone. The correspondence between sound signal input unit 1, input sound signal power detector 9 and the processor/CPU are exactly as disclosed in Miyazawa Figure 1. In this manner, Miyazawa's input sound signal power detector 9 is connected to the processor/CPU to incorporate the power-saving mode switching disclosed in Miyazawa. As discussed, one skilled in the art would have been motivated to make that combination because it would have saved power as expressly contemplated by both references. Moreover, this would have been straightforward to implement because the sound signal power detector 9 would instruct the processor (which would include the functionality of Salazar and Miyazawa as discussed below) to switch between sleep and active modes using, e.g., hardware interrupts, as expressly contemplated by Salazar. The combination of Salazar and Miyazawa in this manner would therefore have been nothing more than combining two known elements (Salazar's voice control system and Miyazawa's voice-activated power mode switching) in a known manner (using hardware interrupts) to achieve a predictable result (reducing overall power consumption).

60. Moreover, in Salazar, the voice activated device IC performs speech recognition and analog to digital conversion. *Salazar*, 17:56-61. One skilled in the art would have found it obvious to replace this functionality with the sound signal input unit 1 (which performs A/D conversion) and the functionality disclosed in

Miyazawa's CPU (which performs speech recognition). It would have been obvious to program the Salazar-Miyazawa processor to perform speech recognition in addition to the other command generation and control functions taught by Salazar because Miyazawa teaches that multiple functionalities of the CPU can be consolidated into a single processor or broken out among multiple processors.

61. In my opinion one skilled in the art further would have been motivated by the cost-savings of removing voice activated device IC to implement the speech recognition at the CPU. In fact, Miyazawa discloses that processor-based speech recognition was conventional. *Miyazawa*, 6:49-57, 7:7-26. Thus, this modification would have been well known in the art and one skilled in the art would have been motivated to make it by the cost-savings associated with removing an unnecessary component from the Salazar-Miyazawa combination.

62. Moreover, as I discussed above, Miyazawa's sound signal input unit 1 includes multiple components and thus the revised drawing below expressly illustrates these multiple components to show the complete example combination of the Salazar-Miyazawa system. The two drawings are color coded to respond to the main elements of claim 1, a **microphone**, a **speech recognition system**, and an **appliance control circuit**.



E. Rationale and Motivation to Combine Salazar-Miyazawa with Bossemeyer

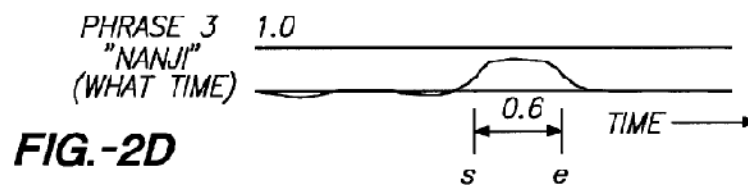
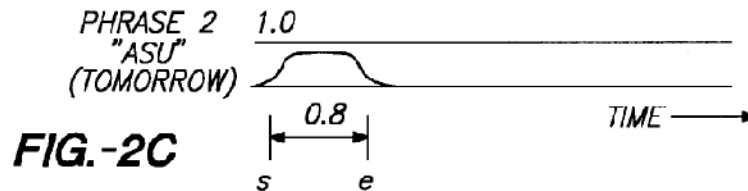
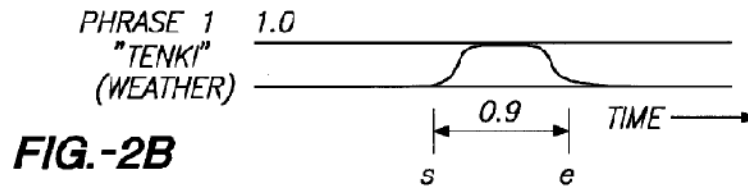
63. As described in greater detailed below in the claim analysis, in my opinion Salazar and Miyazawa collectively render obvious switching between a low-power sound activation mode and a speech recognition mode based on the amplitude of an electrical signal received from a microphone, specifically by comparing that amplitude to a threshold. To the extent SpeakWare or its expert

disagree with me, it is also my opinion that a skilled artisan would have found it obvious to combine Salazar and Miyazawa with Bossemeyer to provide such a system. Like Salazar and Miyazawa, Bossemeyer discloses a speech recognition system that, among other things, detects when an utterance is received from a user. Specifically, Bossemeyer discloses monitoring microphone signals and detecting an utterance when the amplitude of the signal exceeds a threshold.

64. A skilled artisan would have combined Bossemeyer with Salazar and Miyazawa because each relates to a speech recognition system that detects an utterance from a user. A skilled artisan would therefore have found it obvious to combine Bossemeyer's utterance amplitude threshold with Miyazawa's threshold-based mode switching because doing so would have been nothing more than combining known techniques of setting an utterance threshold in a speech recognition system in order to achieve the predictable result of a system that switches from a low power state to a speech recognition state using an amplitude of a signal. A skilled artisan also would not have been discouraged from using amplitude thresholding over Miyazawa's thresholding techniques because Miyazawa's and Bossemeyer's techniques amount to a design choice for utterance thresholding in a speech recognition system.

65. A skilled artisan would have been motivated to use Bossemeyer's amplitude thresholding in conjunction with Miyazawa's thresholding techniques

because Miyazawa suggests utilizing “the volume, magnitude or amplitude of input sound signals” to trigger its system to determine whether a keyword has been uttered by a user, and Bossemeyer explicitly discloses using an amplitude to detect an utterance from background noise. Indeed, a skilled artisan would have recognized that combining Bossemeyer with Miyazawa would have improved Miyazawa’s speech recognition techniques by setting the start and end points of an utterance and only processing voice signals that could be voice commands. In particular, Bossemeyer’s thresholding technique determines the start and end points of an utterance based on a voice signal exceeding a threshold for a given period of time. Combined with Miyazawa, Bossemeyer’s techniques would identify the most useful parts of a voice sample before applying Miyazawa’s speech recognition techniques (e.g., applying speech recognition to only those portions that exceed the threshold). This would further reduce power consumption in the combined system by only applying speech recognition to registered utterances and not background noise adjacent to the utterance. *Bossemeyer*, Fig. 12. A skilled artisan also would have recognized this boundary-setting technique as aligning with Miyazawa’s disclosure of analyzing the duration of a voice sample when determining a confidence level that a voice sample matches a stored word in its vocabulary. *See Miyazawa*, 7:27-37, 8:28-37, Figs. 2B-2D (below).



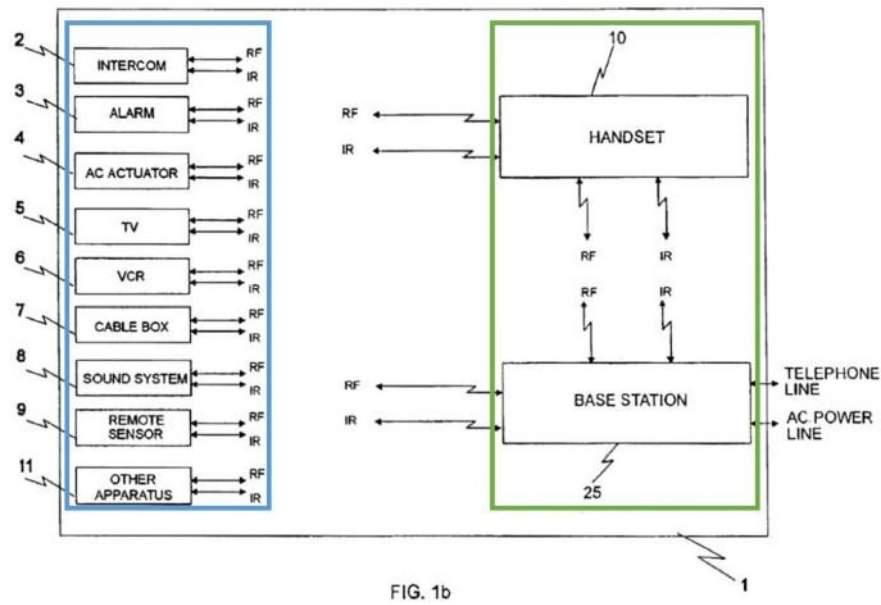
F. Claim 1

1. [1p] "An audio signal activated control system for controlling appliances comprising:"

66. As discussed above, I have assumed for purposes of my analysis that the preamble is limiting. In my opinion both Salazar and Miyazawa disclose element [1p].

67. Salazar discloses an **audio signal activated control system** for controlling **appliances**, as shown below in annotated Figure 1b of Salazar. Salazar discloses a microprocessor-based system that responds to voice signal commands and generates command or control signals for transmission to external devices, including home appliances. *Salazar*, Abstract; *see also id.*, 1:8-14, 1:50-55, 2:11-26, 3:15-40, 3:53-4:17, 4:44-5:15, 5:39-46, 5:62-67, 6:31-51, 7:14-8:30,

17:57-61, 21:43-58, 24:37-51, 25:39-50. Salazar discloses that its system may include both a mobile handset 10 (including microprocessor 30), and a stationary base station 25 (including microprocessor 200). *Salazar*, Figs. 1a-b, 3 (mobile handset 10), 5 (base station 25). In particular, in my opinion, each of the base station 25 alone, the handset 10 alone, and both the base station 25 and the handset 10 combined disclose the claimed audio signal-activated control system because Salazar discloses that the handset and the base station perform “substantially the same functions,” *Salazar*, 22:35-37, and can control appliances directly or in combination, *id.*, 6:31-51. Indeed, Salazar makes clear that its invention can function as either a remote handset or base station alone, or the combination of the two because both components function in substantially the same manner. *Salazar*, 2:66-3:4.



68. In my opinion, one skilled in the art would interpret Salazar as being useful and applicable for controlling all types of appliances, not necessarily the examples expressly disclosed on the left side of Fig. 1b. In fact, Salazar discloses that its system can control “all types of apparatus and/or appliances for home, business, medical or industrial use.” *Salazar*, 1:50-53. Salazar also discloses that its system can be used with a variety of home or business appliances, and provides a long list of additional examples. *Id.*, 25:39-50.

69. Miyazawa also discloses an audio signal activated control system for controlling devices, which include toys as well as appliances. Miyazawa discloses a processor-based “voice-activated interactive speech recognition device” that monitors voice inputs exceeding a defined volume threshold, analyzes the voice input, and generates an output based on the voice input. *See, e.g., Miyazawa*, Title, Abstract, 2:8-27, 2:46-54, Figs. 1, 4. Miyazawa discusses its detailed embodiments in the context of an interactive toy, but makes clear to one skilled in the art that its voice-activated system can be used in conjunction with “interactive game machines and electronic appliances that are used in every day life,” including “home electronics, computer subsystems, electronic appliances or similar devices.” *Id.*, 14:4-31. As I explained above in detail in the “Rationale and Motivation to Combine Salazar and Miyazawa” section, it would have been obvious to combine Salazar and Miyazawa.

70. In addition to the disclosures of Salazar and Miyazawa, I also note that the '186 patent concedes that audio signal activated control systems for controlling appliances were well known in the art. The '186 patent states that “[v]arious other systems are known which use speech recognition to control appliances,” providing citations to an exemplary prior art system. '186 patent, 2:43-50.

2. [1a] “a microphone for receiving audio signals and converting said audio signals to electrical signals;”

71. Salazar discloses that its handset (Fig. 3) and its base station (Fig. 5) have **microphones** for receiving audio signals and for converting the audio signals into electrical signals. *See, e.g., Salazar, Abstract, Figs. 3, 5:*

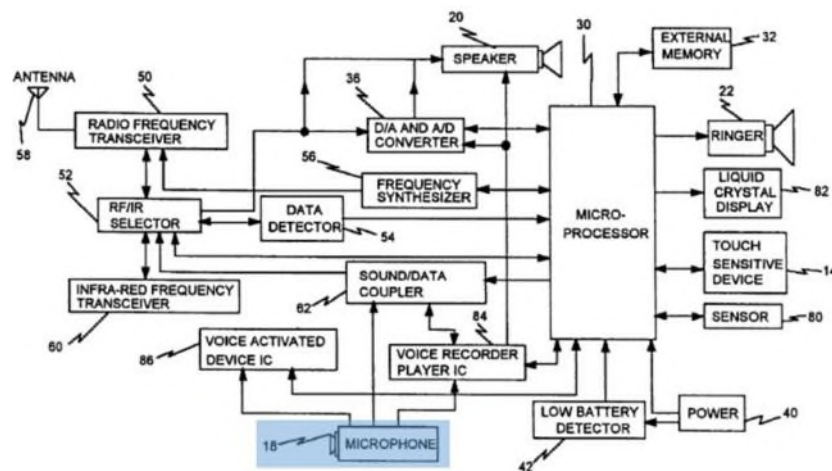


FIG. 3

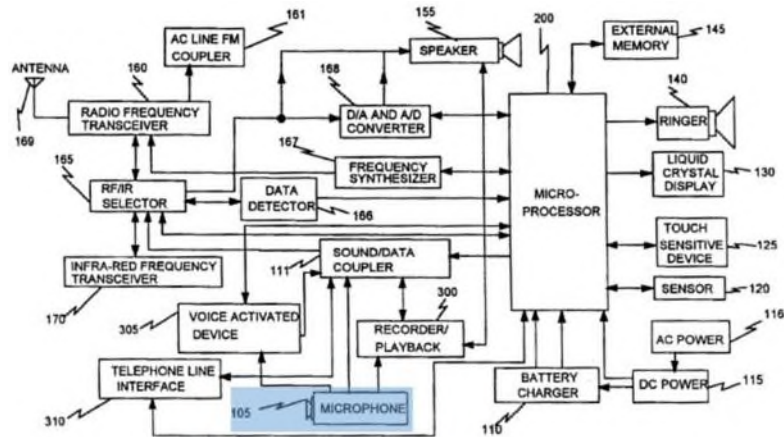


FIG. 5

72. Salazar discloses that “[v]oice command and/or control signals which are input via the microphone are detected by a voice activated device. The signals are converted into digital signals for input to the microprocessor.” *Salazar*, 3:32-60; *see also id.*, 17:37-65 (“In the voice activated embodiment, voice commands are input via microprocessor 18 to voice activated device IC 86 . . .”), 21:43-58, 24:37-51, Figs. 1, 2-5.

73. Miyazawa also discloses that its system includes a **microphone** for receiving audio signals and for converting the audio signals into electrical signals. *Miyazawa*, 6:20-57, Fig. 1. Specifically, sound signal input unit 1 includes a **microphone**. *Id.* I have shaded sound signal input unit part blue and part green to show that sound signal input unit 1 includes a microphone as well as other components which I explain in additional detail below.

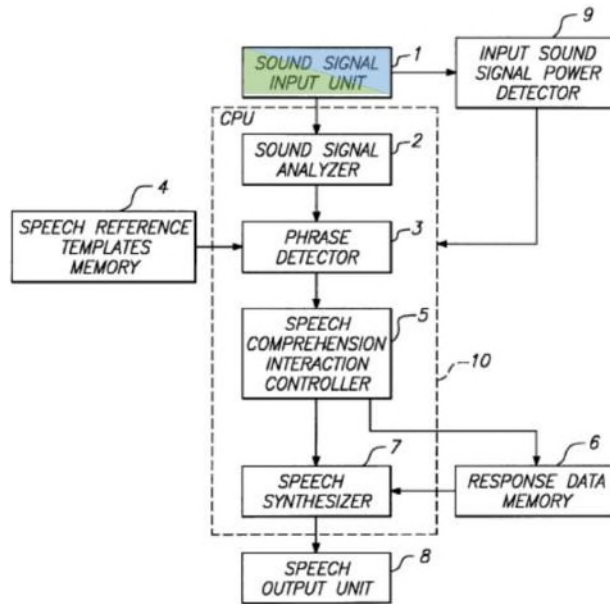


FIG. -1

74. One skilled in the art would have recognized that the microphones in Salazar and Miyazawa, which are conventional pieces of hardware, are transducers that convert received audio signals into electrical signals. This well-known function of microphones was described as being conventional in prior art patents such as U.S. Patent No. 5,268,965 to Badie et al., as well as many other patents, textbooks, and other publications, and was common knowledge to one skilled in the art. *E.g.*, *Badie*, 2:22-25 (“The operation of directional microphones is well known in the art. Sound waves directed at the front port are properly converted to electrical signals.”).

75. One skilled in the art would have recognized that the conventional microphones disclosed in each of Salazar and Miyazawa were interchangeable and would have found it obvious to use any one of these interchangeable, conventional

pieces of hardware in implementing the system. For example, substituting Miyazawa's microphone for Salazar's would have been nothing more than substituting one well-known component (Miyazawa's microphone) for a similar well-known component (Salazar's microphone) to achieve the predictable result of obtaining voice input and transducing it to an electrical signal—precisely the primary function of a microphone.

76. In fact, in addition to the disclosures of Salazar and Miyazawa, and the common knowledge of one skilled in the art, the '186 patent concedes that the microphone used in the claim invention is conventional and uses a commercially available microphone as an example. Specifically, the '186 patent explains that “[a] suitable microphone is . . . available from Lucent Technologies and described in detail in; ‘DM 1000 Component Directional Microphone’” ‘186 patent, 7:33-46. And it explains that this conventional microphone converts sound into an electrical audio output signal, consistent with the functionality of a conventional microphone. *Id.*

3. [1b] “a speech recognition system for receiving said electrical signals, said speech recognition system including a processor”

77. Both Salazar and Miyazawa disclose processor-based speech recognition systems for receiving said electrical signals and thus disclose this element.

78. Salazar discloses a **speech recognition system** that includes a “voice activated device IC 86” and “microprocessor 30” in its handset (Fig. 3), or “voice activated device IC 305” and “microprocessor 200” in its base station (Fig. 5). *Salazar*, Figs. 2-5, 17:57-61, 21:42-56, 24:37-51, 3:32-41, 53-60. These components perform speech recognition on the input sound or voice signals. *See, e.g., id.*, 17:57-61, 21:42-56, 24:37-51, 3:32-41, 53-60, Fig. 2-5. The microprocessors of the handset and the base station “control all their internal operations.” *Id.*, 3:15-31, 3:42-60. The voice activated device ICs 86/305 that are a part of Salazar’s speech recognition system receive the **electrical signals** from the **microphone**. *Id.*, Figs. 3, 5, 3:32-41, 3:53-60, 17:57-61, 21:42-56, 24:37-40.

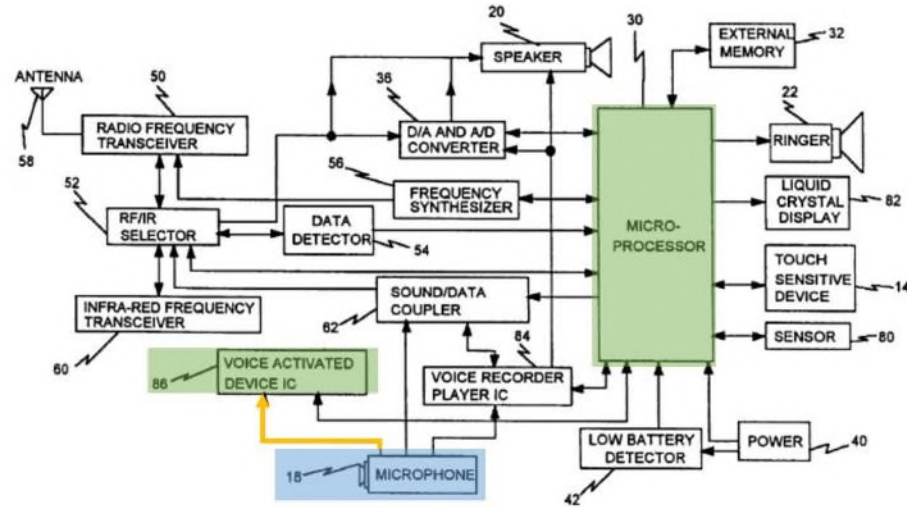


FIG. 3

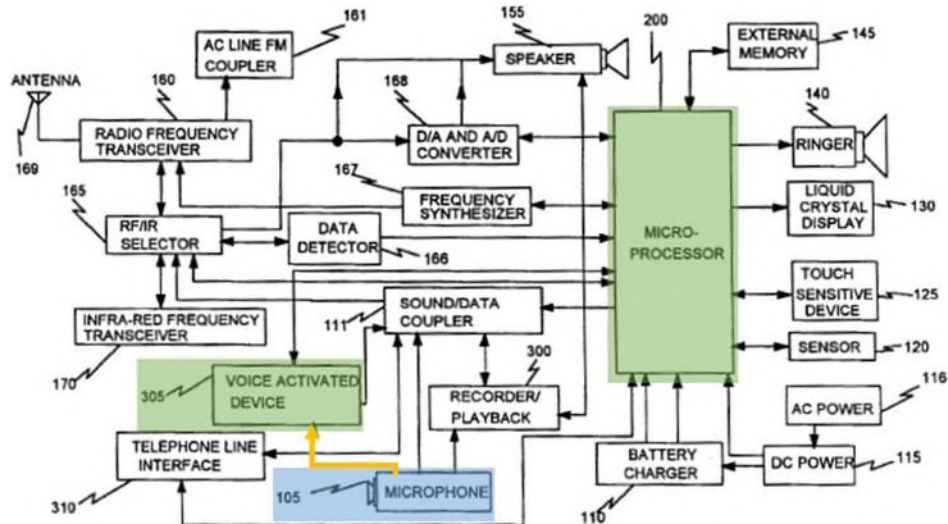


FIG. 5

79. Miyazawa also discloses a **speech recognition system** for receiving **electrical signals** from the **microphone**. Miyazawa's **speech recognition system** includes the **amplifier, low-pass filter, and A/D converter** in "sound signal capture unit 1", "input sound signal power detector 9," and "CPU 10." Miyazawa, 6:20-57, Fig. 1. Miyazawa further discloses that its "CPU 10" may

include multiple CPUs. *Id.*, 9:17-24. Input sound signal power detector 9 receives the “input sound signal (including noise) output by sound signal input unit 1.” *Id.*, 9:32-41, 9:64-67, 3:13-17, 4:9-12. The amplifier also receives the input sound signal from the microphone, as discussed above in the Background on Miyazawa. *See supra* Section VIII.B.

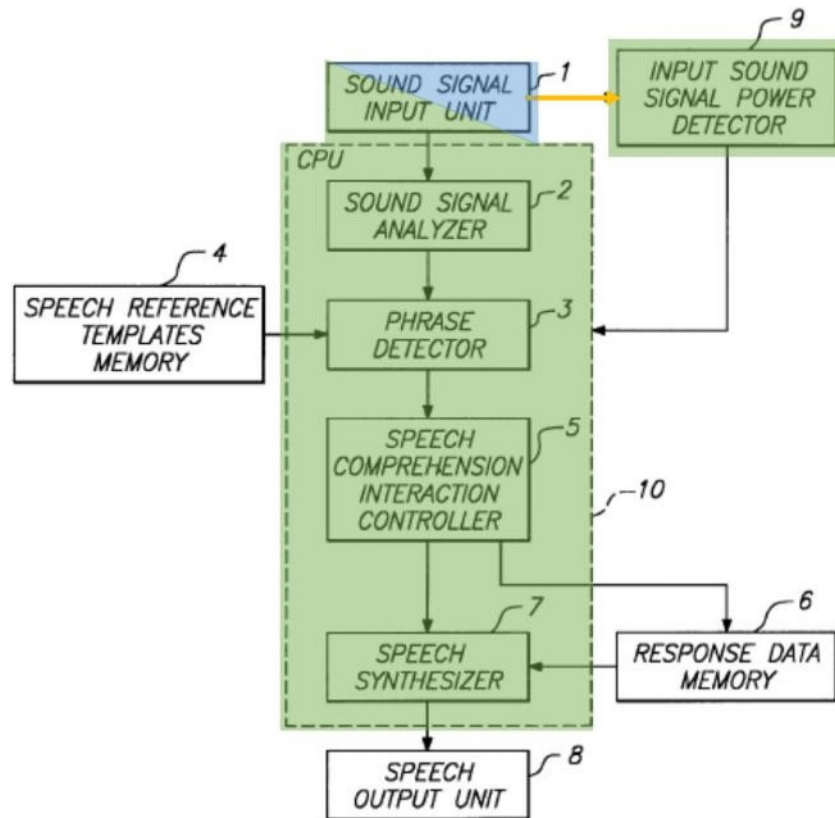
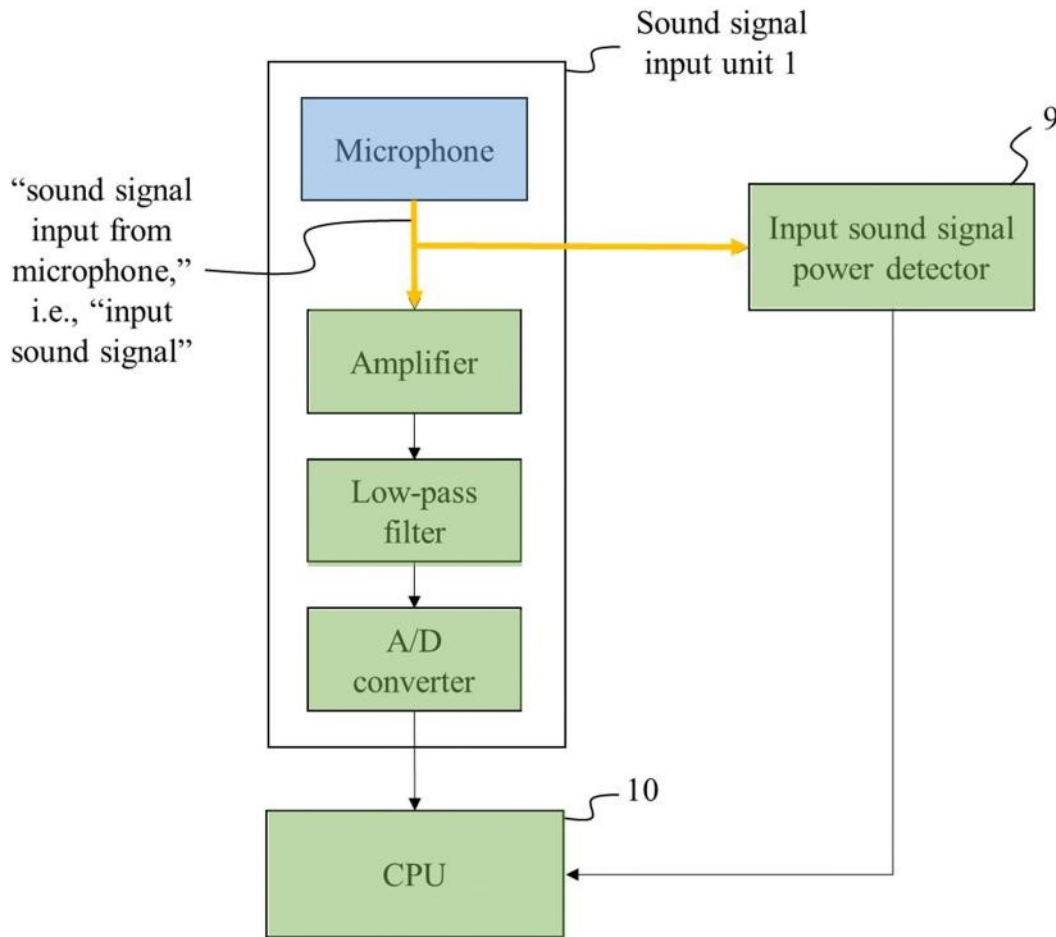


FIG. -1

80. As can be seen from the diagram that I first introduced in Section VIII.B, the **speech recognition system** in Miyazawa receives electrical signals from the microphone in two ways—first through input sound signal power detector 9 as discussed above, and second through the amplifier. Miyazawa’s

figures do not expressly show the elements below because, as Miyazawa explains, of the elements are conventional, but Miyazawa discloses that “the sound signal input from the microphone is first passed through the amplifier and the lowpass filter” and then through an A/D converter, as I have shown below. *Miyazawa*, 6:38-56. Moreover, Miyazawa discloses that the input sound signal power detector 9 does not receive the A/D converted signal, but instead receives the same “input sound signal fetched by sound signal input unit 1.” *Miyazawa*, 9:33-37, 9:64-67; *see also Miyazawa*, 3:13-17 (discussing “input sound signal power detector ... for detecting the volume, magnitude or amplitude of the input sound signals based on sound signal waveforms perceived by the sound signal input unit or capture device.”), 4:9-12.



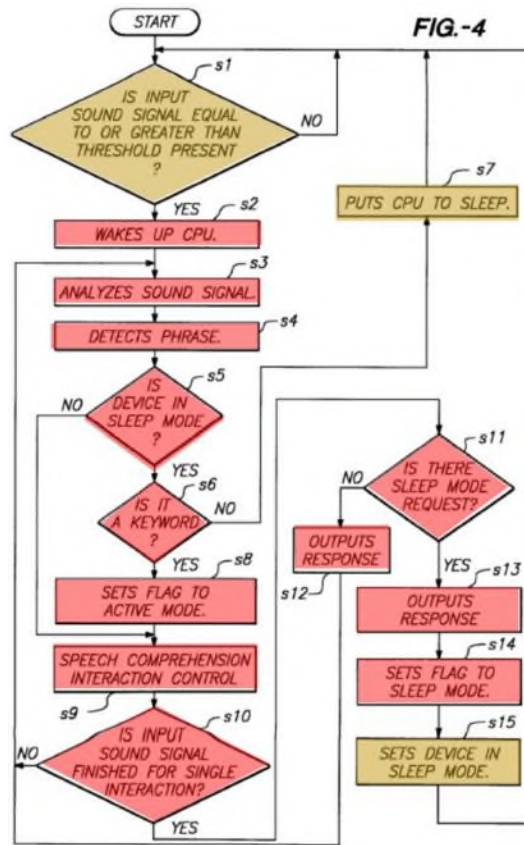
81. As I explained above in Section VIII.D, in my opinion one skilled in the art would have been motivated to combine Salazar and Miyazawa to achieve Miyazawa’s stated goal of hands-free switching from a low-power mode to a speech recognition mode within Salazar’s universal remote control system. In doing so, as I described above, one skilled in the art would have been motivated to combine the functionality of Miyazawa’s processor with that of Salazar’s processor to achieve the benefits of a single processor that performs both speech recognition (as disclosed in Miyazawa) and appliance control (as disclosed in

Salazar). Doing so would have added cost savings by reducing, for example, the need for Salazar's voice activated device IC.

82. In addition to the disclosures discussed above, the '186 patent admits that this element is well known: "The electronic elements of the speech recognition circuit 50 that process the microphone audio signal output received from the audio switching circuit 30 may be in the form of a microcontroller-based integrated circuit, IC chip 55. Such microcontroller-based ICs specifically designed for speech applications in consumer electronic products are well described in the prior art and are commercially available. . . ." '186 patent, 10:5-20. The patent also suggests that the type of processor used is not critical: "Alternatively, other microcontrollers can be used as well as digital signal processors." '186 patent, 10:20-21, 10:40-44.

4. [1c] "and having a low power sound activation mode for detecting the presence of said electrical signals"

83. Miyazawa discloses that its speech recognition system includes a **low power sound activation mode** for detecting the presence of the electrical signals from the microphone by disclosing a "sleep" mode that can be switched to an active mode based on detected electrical sound signals received from the microphone. *See Miyazawa*, Fig. 4, s1:



84. For example, Miyazawa explains that its speech recognition system “enable[s] the device to remain in a sleep mode and perform recognition operations only when a recognizable speech input is detected” *Miyazawa*, 2:46-53; *see also id.*, 2:8-18. Along these lines, Miyazawa discloses that the input sound signal power detector 9, which is a part of the speech recognition system, is “in communication with at least the sound signal input unit” (which includes the microphone), “for detecting the volume, magnitude or amplitude of input sound signals” in a “low-power sleep mode.” *Id.*, 3:13-27, 4:10-22; *see also id.*, 4:61-5:7. Miyazawa further explains that the “[i]nput sound signal power detector 9 . .

.detects the power of the input sound signal (including noise) output by the sound signal input unit 1” *Miyazawa*, 9:25-40.

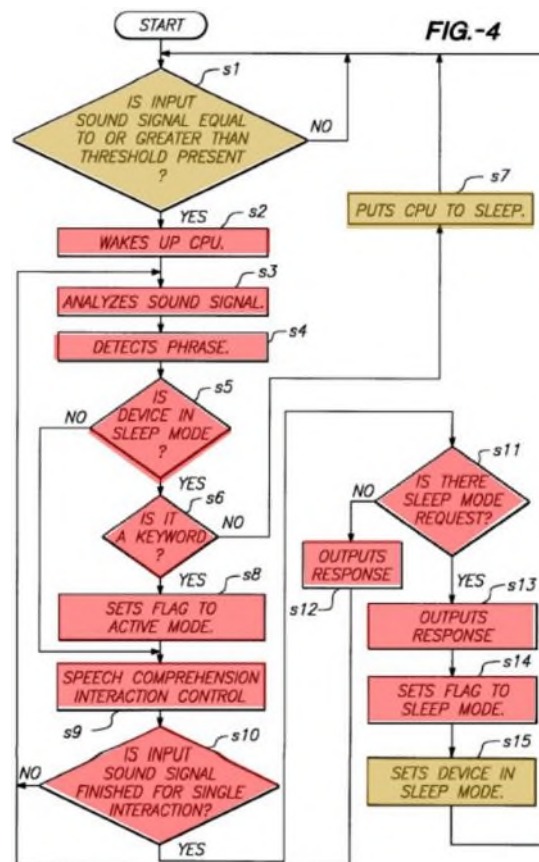
85. Regarding Fig. 4, reproduced above, Miyazawa explains that the speech recognition system may initially be set in a **sleep mode**. *Miyazawa*, 9:59-64. During this sleep mode, the sound signal power detect “remains active and ready to detect the power of the input sound signal fetched by sound signal input unit 1. However, the CPU 10 is placed in a non-active state or sleep mode, as is well known in the computing arts.” *Miyazawa*, 9:64-10:2. Miyazawa also describes the sleep mode as an “inactive, power-saving state.” *Miyazawa*, 11:50-67. In this non-active state, Miyazawa discloses that the sound signal power detector detects the presence of said electrical signals by “determin[ing] whether or not the power of the input sound signal is greater than a preset threshold” *Miyazawa*, 10:3-15; *see also id.*, 12:1-61, 13:37-51, Fig. 4.

86. As I explained above in Section VIII.D, in my opinion one skilled in the art would have been motivated to combine Salazar and Miyazawa to achieve Miyazawa’s stated goal of hands-free switching from a low-power mode to a speech recognition mode within Salazar’s universal remote control system. Doing so would have been nothing more than combining known techniques of voice-activated control with known battery-saving processor modes to yield the

predictable result of a system that uses voice inputs to switch between processor modes and maintains a low power mode until a voice command is received.

5. [1d] “and a speech recognition mode for converting said electrical signals to electrical representative signals, decoding said electrical representative signals”

87. In my opinion, Miyazawa also discloses the recited **speech recognition mode**, which starts at s2 of *Miyazawa* Fig. 4:

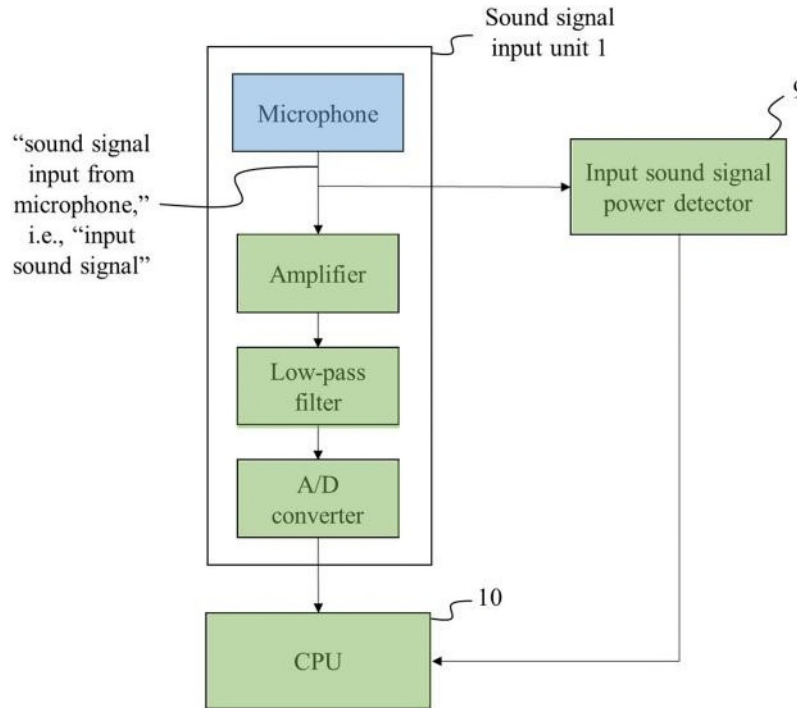


88. Miyazawa teaches that its speech recognition system “recognizes speech,” and that it includes a “sound signal analyzer 2, phrase detector 3, and speech reference templates memory 4,” among other components, for performing

speech recognition. *Miyazawa*, 1:30-35, 6:20-37, Fig. 1. As I described above, these components are a part of CPU 10, which is a part of Miyazawa's speech recognition system. Figure 4 and the accompanying description explains describes the process by which Miyazawa's system performs speech recognition upon being activated by voice input. *Miyazawa*, 6:1-2, 9:59-11:42.

89. Miyazawa further discloses that the speech recognition mode is for (a) "converting said electrical signals [received from the microphone] to electrical representative signals" and (b) "decoding said electrical representative signals," as recited in claim 1. First, Miyazawa discloses converting the received electrical signal from the microphone into a representative signal: "[t]he sound signal input from the microphone is first passed through the amplifier and lowpass filter and converted into an appropriate sound waveform. This waveform is converted into a digital signal . . . by the A/D converter, which is then sent to sound signal analyzer 2." *Miyazawa*, 6:38-49. Next, Miyazawa explains that sound signal analyzer 2 (and more generally, CPU 10) decodes the electrical representative signal it received by extracting a "multi-dimensional speech feature vector" and performing "matching and recognition operations." *Miyazawa*, 6:49-9:24, Figs. 1, 4 (s2-s6) (describing decoding embodiments). A skilled artisan would have understood the "decoding" of claim 1 to include applying speech recognition algorithms to a voice signal (e.g.,

performing “matching and recognition operations”) in order to determine if a word or phrase has been uttered.



90. In my opinion, Miyazawa’s description of converting and decoding is indistinguishable from the converting and decoding steps described in the ‘186 patent. The ‘186 patent discloses “[an] analog to digital converter (A/D) 57, preferably having an accuracy of at least 12 bits, is coupled to the output of the preamplifier 56 and *converts* the incoming audio waveform into *digital representations* of the incoming signal. The digital output of the analog to digital converter 57 is directed to the speech processing unit 58.” ‘186 patent, 11:39-45 (emphases added). This is the patent’s only discussion of “convert[ing]” electrical signals from a microphone into a “representation” of those signals. The ‘186 patent

next discloses that, after the audio waveform has been converted from an analog signal to a digital representation, controller 60 “executes recognition algorithm software to determine which voice command in the active recognition vocabulary set is the best match and was most likely spoken by the user.” *Id.*, 11:43-67, 12:64-13:30. In my opinion, one skilled in the art would have understood this process of determining which voice command corresponds to the representative signal to be within the plain meaning of the term “decoding.” Moreover, while the ‘186 patent does not use the word “decoding” to describe this process, the patent does not elsewhere describe any operation on a representation an electrical signal received from a microphone as being “decoding.” Thus, in my opinion, one skilled in the art would have recognized that, based on these disclosures, “converting” the electrical signals from the microphone includes at least converting the electrical signals into digital representations using an A/D converter. A skilled artisan also would have understood that “decoding” the electrical representative signals includes at least determining if the converted digital representations match a stored voice command.

91. This understanding is also consistent with dependent claims 11, 12, 19, and 20. For example, claim 20 further requires decoding said electrical representative signals to determine if the signals represent predetermined audible commands, which is precisely the process discussed in the above-cited sections of

the '186 patent. It is my understanding that based on the doctrine of claim differentiation, independent claim 1's decoding is presumed to at least fall within the scope of the decoding of dependent claim 20.

92. Salazar also discloses a speech recognition mode for performing the converting and decoding steps. Specifically, Salazar discloses that "voice commands are input via microphone 18 to the voice activated IC 86, which scans the voice signal with a pattern recognition algorithm [("decoding")]. Recognized commands are converted into digital signals that then go to microprocessor 30. [("converting")].” *Salazar*, 21:43-58; *see also id.*, 17:66-18:4 (handset), 24:37-51 (base station). Salazar, however, performs the decoding step first and the converting step second. To the extent PO asserts that the claims require converting the electrical signal and then decoding the converted electrical signal, Miyazawa expressly discloses a speech recognition mode that performs the two steps in that order, as discussed above.

93. As I explained above in Section VIII.D, in my opinion one skilled in the art would have been motivated to combine Salazar and Miyazawa to achieve Miyazawa's stated goal of hands-free switching from a low-power mode to a speech recognition mode within Salazar's universal remote control system. Doing so would have been nothing more than combining known techniques of voice-activated control with known battery-saving processor modes to yield the

predictable result of a system that uses voice inputs to switch between processor modes and maintains a low power mode until a voice command is received. Moreover, as I explained above in Section VIII.D and with regard to element [1b], it would have been obvious to one skilled in the art to modify Salazar's processor to include functionality of Miyazawa's CPU, including the decoding electrical representative signals. As discussed, one skilled in the art would have been motivated to do so by the potential cost-savings associated with eliminating the need for voice activated device IC and instead providing the functionality on the existing processor.

6. [1e] “and generating control signals for controlling one or more appliances,”

94. Salazar discloses that its speech recognition system generates control signals for controlling one or more appliances because Salazar discloses that the signals input to the microprocessor can be “converted into command and control signals for transmission via a radio frequency and/or infra-red transceiver to external appliances or apparatus.” *Salazar*, 3:53-60; *see also Salazar*, 6:31-51 (describing “remote command and control of appliances and/or apparatuses”). Salazar also discloses that the “command and control signals” are sent to and used to control various appliances. *Salazar*, 4:49-54, 4:65-5:9, 5:39-46, 25:39-50. Salazar further discloses that the microprocessors on each of the handset and the

base station generate the control signals. *Salazar*, 21:43-58 (explaining with regard to the handset that “[m]icroprocessor 30 processes the commands and generates the appropriate command and control signal for internal processing or for transmission . . .”), 24:37-51 (describing identical functionality for the microprocessor of the base station).

7. [1f] “wherein in said speech recognition mode said processor decodes said electrical representative signals”

95. My analysis for elements [1c] (“speech recognition system . . . including a processor”) and [1d] (speech recognition system (“having . . . a speech recognition mode for . . . decoding said electrical representative signals”) fully encompasses this claim element. Claim element [1f] adds that “said processor” decodes the electrical representative signals, but as I described above with regard to elements [1c, d] *Miyazawa* discloses a CPU that decodes the electrical representative signals (e.g., the digital representations of the received audio signals) received from the microphone. *Miyazawa*, 6:38-9:24, Figs. 1, 4 (s2-s12). Similarly, *Salazar* also discloses that its microprocessor based system performs the decoding, *see, e.g., Salazar*, 3:53-60, 17:57-61, 21:43-58 (handset), 24:37-51 (base station), and that the microprocessors of the handset and the base station “control all their internal operations,” *Salazar*, 3:15-31, 3:42-60. Bossemeyer additionally

discloses that its system, which includes a processor, performs the decoding.
Bossemeyer, 2:24-58.

8. [1g] “and wherein in said sound activation mode said processor is in a low power state,”

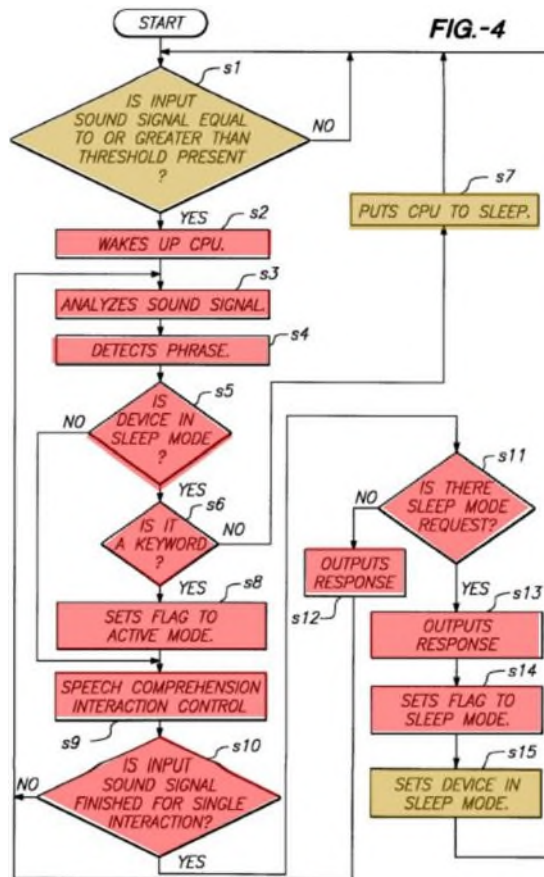
96. As I discuss above for element [1c], Miyazawa discloses a sleep mode that corresponds to the recited low power sound activation mode in the ‘186 patent. Claim element [1g] adds that “said processor is in a low power state” during the sound activation mode. Miyazawa also discloses this feature. For example, Miyazawa discloses that its CPU 10 is in a low power state during the sleep mode. For example, with regard to Figure 4, when the process begins at step s1, the device is in the sleep mode and, while the “input sound signal power detector 9 remains active and ready to detect the power of the input sound signal fetched by sound signal input unit 1,” “CPU 10 is placed in a non-active state or sleep mode, as is well known in the computing arts.” *Miyazawa*, 9:62-10:15; *see also id.*, 11:50-67 (explaining that “CPU 10 is in an inactive, power-saving state during the sleep mode”), 12:1-61. Miyazawa discloses that this sleep mode “minimize[s] power consumption,” because only the portions of the device that “consume small amounts of power” need to be active. *Miyazawa*, 2:46-53, 4:61-5:7. It would have been obvious to include Miyazawa’s low power state for the same power-conservation reasons discussed above. *See supra* Section VIII.D.

9. [1h] “said speech recognition system configured to automatically switch from said sound activation mode to said speech recognition mode as a function of the amplitude of said electrical signals, and”

97. Miyazawa discloses that the speech recognition system is configured to automatically switch from the **sound activation mode** to the **speech recognition mode** as a function of the amplitude of the electrical signals received from the microphone because it discloses its system automatically switches its CPU from the **sleep mode** to a **speech recognition mode** where the CPU is active based on whether the “input sound signal [received from its microphone] is equal to or greater than [a] threshold.” *Miyazawa*, Fig. 4, s1-s2 (below). As Figure 4 below shows, if the input sound signal is equal to or greater than a threshold, then the system wakes up the CPU (s2) and performs speech recognition (e.g., s3-6, 9-14).

98. In my opinion, a person of ordinary skill in the art would have understood that by waking up a CPU in order to analyze a sound signal at s2, Miyazawa’s system transitions from a low power sound activation mode to a speech recognition mode because CPU 10 is activated from an inactive state to perform speech recognition. Miyazawa’s speech recognition mode continues if a keyword is detected (s6) by CPU 10 performing speech recognition on incoming sound signals (s9 through s11 and back to s3). The system exits the speech

recognition mode if no keyword is detected in the initial sound signal (s6), or when a sleep mode request is determined (s11) and the system causes CPU 10 to return to sleep. This is consistent with claim 1, which recites “wherein in said sound activation mode said processor is in a low power state.” A skilled artisan would have understood that, to process a sound signal to determine if a keyword is present as provided in Miyazawa, CPU 10 is not in a “low power state.”



99. To the extent SpeakWare or its expert argue that Miyazawa’s mode switching occurs only after a keyword is determined, in my opinion Miyazawa still discloses switching based on the sound signals exceeding a predetermined

threshold. In particular, a skilled artisan would have understood that activating CPU 10 and determining a keyword before switching to be “automatically switch[ing] . . . as a function of the amplitude of said electrical signals” because the mode is switched without manual operation after the sound signals are equal to or greater than a threshold. Claim 1 is also an open-form claim that does not exclude the additional step of identifying a keyword in the threshold-exceeding signal before switching.

100. Miyazawa is also consistent with the ‘186 patent, which also describes the same keyword search operation after a threshold is exceeded. With reference Figures 5 and 6, the ‘186 patent discloses that its system when in a sound activation mode (S501, YES) may detect a sound exceeding a threshold (S502). ‘186 patent, 18:51-54, 20:6-11. Upon detecting the sound (S502), the system may enter the speech recognition mode (S505) and determine if a match can be found in the sound signal (S514). *Id.*, 20:52-56, 22:42-53. If no match is identified (S514, NO), returns the system to the sound activation mode (S517 (YES), S622). *Id.*, 23:51-64.

101. In my opinion, a skilled artisan also would have found it obvious to implement Miyazawa’s system to switch based on a threshold alone. Doing so would have been nothing more than applying known techniques of triggering in Miyazawa without the additional step of checking for a keyword. Such a

modification would have been well within the capabilities of a person of ordinary skill in the art and required simply foregoing one step in Miyazawa's process in favor of switching based on a threshold alone.

102. Miyazawa also discloses that this threshold detection that leads to the switching is performed "as a function" of the amplitude of the signal in at least two ways. First, Miyazawa expressly discloses that the amplitude itself is compared to a threshold to determine whether to exit the sleep mode. For example, Miyazawa discloses that the "input sound signal power detection for detecting the power, magnitude, *or amplitude of input sound signals.*" *Miyazawa*, 4:9-15 (emphasis added); *see also id.*, 3:12-17. It next discloses that "during [the] sleep mode, a determination is made *whether input sound signals*, as detected during input sound signal capture, *are at least at a predetermined threshold signal level* above the background noise." *Miyazawa*, 4:15-19 (emphasis added); *see also id.*, 3:18-25. One skilled in the art would have understood that Miyazawa's disclosure of detecting the "amplitude of input sound signals" and then determining whether the "input sound signals" are at a predetermined threshold signal level as comparing the amplitude to the threshold signal level. Moreover, one skilled in the art would have understood that the comparison to a threshold corresponds to s1 in Figure 4, which causes Miyazawa's system to wake up CPU 10 (s2) if the sound signal is equal to or greater than the threshold, as discussed above. One skilled in the art's

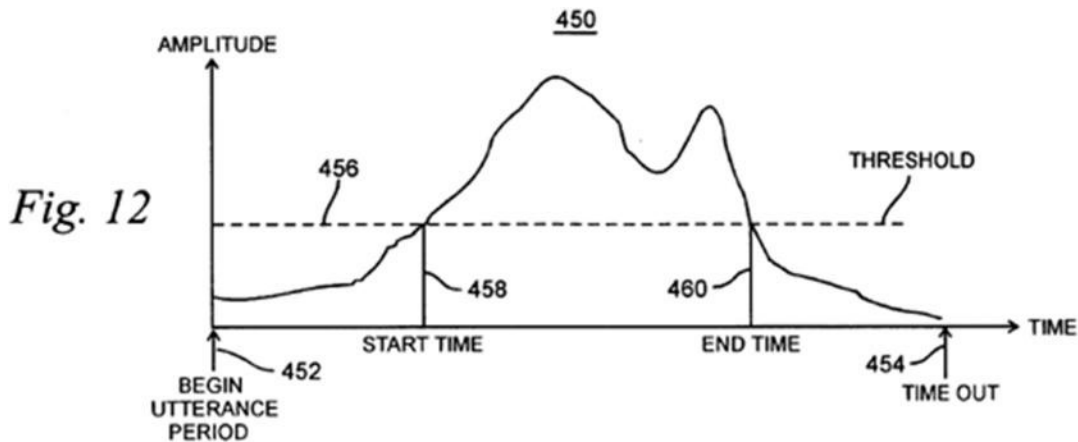
understanding would have been confirmed by the Abstract of Miyazawa, which discloses “bringing the CPU out of an initial sleep state upon detection of perceived voice exceeding a predetermined threshold volume level.” One skilled in the art would have understood that the predetermined threshold volume of a perceived voice corresponds to the amplitude of the electrical signal from the microphone. Similarly, Miyazawa discloses that “CPU 10 momentarily wakes up when a sound signal of at least a certain level is input.” *Miyazawa*, 11:58-60.

103. Second, in the same sections described above, Miyazawa also discloses detecting the “power” of the input sound signals and determining whether the input sound signals are at a predetermined threshold. *Miyazawa*, 3:12-25, 4:9-19. One skilled in the art also would have understood these portions as disclosing that the Miyazawa’s system compares the power of the input sound signals to a given threshold. Miyazawa also describes this process in additional detail in relation to Figure 4. For example, Miyazawa discloses that at step s1, “the input sound signal power detector 9 determines whether or not the power of the input sound signal is greater than a preset threshold th1,” and if it is, “CPU 10 wakes up (step s2),” i.e., enters the active speech recognition mode. *Miyazawa*, 9:62-10:29; *see also id.*, 12:1-15, 50-61.

104. As discussed above, one skilled in the art would have been motivated to combine Miyazawa’s known thresholding techniques with Salazar’s known

appliance control system to achieve the predictable result of decreasing power consumption in the system. *See* Section VIII.D.

105. In my opinion, Bossemeyer also discloses this feature. For example, Bossemeyer discloses determining the beginning and end points of an utterance based on the amplitude of signals received from its microphone against a threshold. *Bossemeyer*, 8:51-62, Fig. 12 (below).



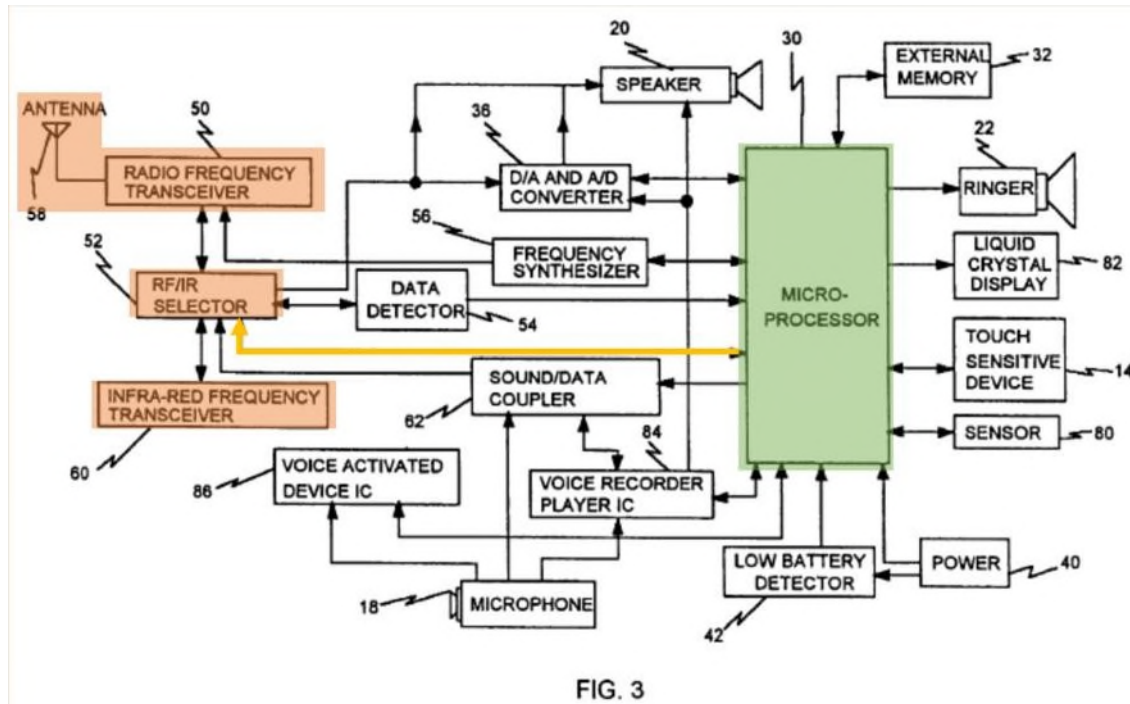
106. Bossemeyer explains that “[t]he amplitude [of a signal from the microphone] is monitored and when it crosses above an amplitude threshold 456 it is assumed that the utterance has started (start time) 458. When the amplitude of the utterance falls below the threshold, it is marked as the end time 460.” *Id.*, 8:51-62. In my opinion, one skilled in the art would have understood Bossemeyer’s amplitude threshold monitoring to be determining when an utterance occurs “as a function of the amplitude of said electrical signals.” Moreover, a skilled artisan would have incorporated Bossemeyer’s amplitude thresholding because, as

explained above, both relate to detecting an utterance and because Miyazawa at least suggests this approach. The result would have been nothing more than the combination of known techniques to yield the predictable result of switching processor modes based on a voice signal amplitude threshold.

10. [1i] “an appliance control circuit which includes a transmitter, said appliance control circuit configured to receive said control signals from said speech recognition system and generate and automatically transmit one or more appliance control signals to said one or more appliances.”

107. Salazar discloses the recited **appliance control circuit** because Salazar discloses a radio frequency transceiver 50 and IR transceiver 60 that receive the **command and control signals** from microprocessor 30 (part of the **speech recognition system**) for “internal processing *or for transmission.*” *Salazar*, 21:8-46 (emphasis added); *see also id.*, 24:37-51 (radio frequency transceiver 160 and IR transceiver 170 in base station). Salazar further discloses that the RF and IR transceivers are connected to the microprocessors via RF/IR selectors 52/165. *Id.*, Figs. 3, 5. Salazar also discloses that its handset (and/or base station) transmits infrared and IR control signals based on voice inputs to one or more appliances. *See id.*, 1:50-2:25, 3:15-40, 3:53-60, 4:49-64, 5:39-46. In my opinion, Salazar’s transceivers and selectors therefore receive the control signals from the speech recognition system (microprocessor) and generate and

automatically transmit, (by generating and transmitting IR or RF signals to communicate with a particular appliance), an appliance control signal to one or more appliances.



108. This is consistent with the disclosure of the '186 patent. As an example of an appliance control circuit, the specification discloses an “infrared signal controlling circuit 70” that receives “signals for controlling the appliance” from speech recognition circuit 50 and is part of a “wireless transmitter,” ‘186 patent, 8:9-38, similar to Salazar’s disclosure of infrared and RF transceivers discussed above. In fact, as the specification admits, that in this regard “the present invention utilizes conventional infrared remote control microcontroller-based technologies, including the conventional universal appliance code libraries that are

familiar to those skilled in the art. '186 patent, 8:24-28, 32:30-40. In my opinion, the claimed appliance control circuit is not limited to using appliance code libraries, but if it were, the '186 patent admits these were well known. *Id.*, 32:30-40. Moreover, Salazar also discloses using such libraries because Salazar discloses using command control sets to send commands to various different devices. *See Salazar*, 7:34-8:34; *see also id.*, 7:34-17:36 (describing the use and storage of code sets in detail).

G. Claim 2 — “The audio signal activated control system as recited in claim 1, wherein said transmitter is configured to wirelessly transmit said one or more appliance control signals to said one or more appliances.”

109. In my opinion, Salazar discloses this element because it discloses using IR and RF transmitters to transmit the control signals to the appliances. wirelessly transmits its command and control signals to an appliance. *Salazar*, Abstract, 1:50-2:17, 2:27-46, 3:53-4:18, 4:49-64, 5:10-15, 7:34-8:16, 17:37-45, 21:43-58, 24:37-51, 25:39-50, Figs. 3, 5. One skilled in the art would have known that both IR and RF were wireless technologies. Moreover, Salazar expressly discloses wirelessly sending control signals to the appliances. *Salazar*, Abstract, 4:49-64, 5:10-15, 25:39-50.

H. Claim 3 — “The audio signal activated control system as recited in claim 2, wherein said transmitter is an infrared transmitter.”

110. As discussed with regard to claims 1 and 2, Salazar discloses that the transmitter is an infrared transmitter. *Salazar*, Abstract, 1:50-2:17, 2:27-46, 3:53-4:18, 4:49-64, 5:10-15, 7:34-8:16, 17:37-45, 21:43-58, 24:37-51, 25:39-50, Fig. 3, 5.

I. Claim 4 — “The audio signal activated control system as recited in claim 2, wherein said transmitter is an RF transmitter.”

111. As discussed with regard to claims 1 and 2, Salazar discloses that the transmitter is an RF (radio frequency) transmitter. *Salazar*, Abstract, 1:50-2:17, 2:27-46, 3:53-4:18, 4:49-64, 5:10-15, 7:34-8:16, 17:37-45, 21:43-58, 24:37-51, 25:39-50, Fig. 3, 5.

J. Claim 7 — “The audio signal activated control system as recited in claim 1, wherein said low power state of said processor is a sleep state.”

112. Miyazawa discloses this feature because it discloses that CPU 10 is in a sleep mode until a sound signal from the microphone registers above a threshold level. For example, Miyazawa describes “bringing the CPU out of an initial sleep state upon detection of [a] perceived voice exceeding a predetermined threshold volume level” *Miyazawa*, Abstract. Similarly, with regard to Figure 4, Miyazawa discloses that “CPU 10 is placed in a non-active state or sleep mode, as is well known in the computing arts.” *Miyazawa*, 9:67-10:2. Miyazawa also

describes putting “CPU 10 [] in an inactive, power-saving state during the sleep mode” reduces power consumption. *Miyazawa*, 11:50-67. Also with regard to Figure 4, Miyazawa discloses putting both the CPU 10 and the device generally into sleep mode. *Miyazawa*, 11:27-28.

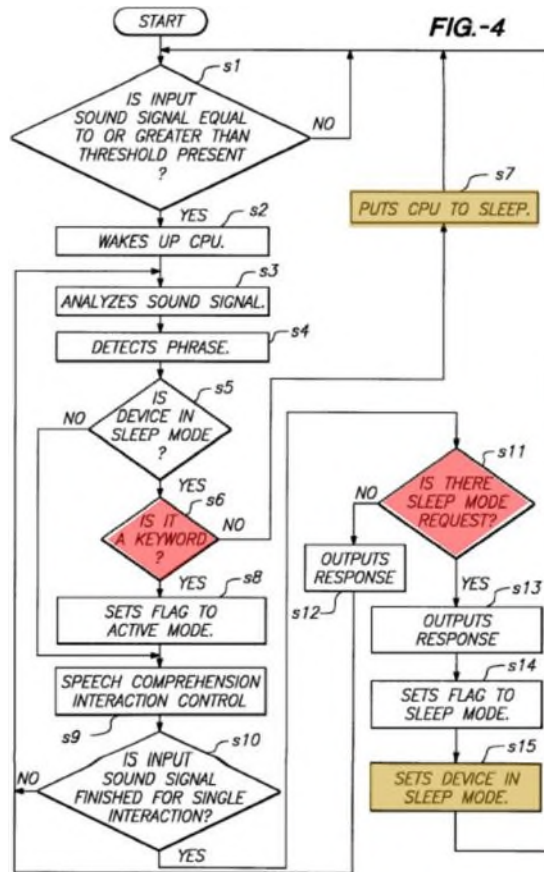
K. Claim 8 — “The audio signal activated control system as recited in claim 1, wherein in said speech recognition mode said processor operates at a higher operating frequency than in said low power state.”

113. In my opinion, Miyazawa discloses the additional feature in claim 8 because it discloses that its CPU is inactive when in sleep mode and wakes up in its active mode. *Miyazawa*, 11:43-67 (“CPU 10 is in an inactive, power-saving state during the sleep mode, and only sound signal capture unit 1 and input sound signal power detector 9 are in the active state. In conventional speech recognition devices, power consumption by an active mode CPU 10 is substantial in order to handle complex speech recognition tasks.”); *see also id.*, Abstract, 2:30-53, 3:13-28, 4:10-22, 4:55-5:7, 9:25-10:2, 10:41-47, Fig. 4. In my opinion, one skilled in the art understand that an “active” processor operates at a higher operating frequency than in an “inactive,” low power state, if in the inactive state the processor is not operating at all. For example, one skilled in the art would have understood Miyazawa’s disclosure of an “inactive power-saving state” as requiring

the processor to either be operating at a frequency of zero or at a lower frequency than when in the active state.

L. Claim 9 — “The audio signal activated control system as recited in claim 1, wherein said speech recognition system is further configured to automatically terminate said speech recognition mode and automatically switch to said low power sound activation mode.”

114. Miyazawa discloses that the speech recognition system is configured to automatically terminate said speech recognition mode and automatically switch to said low power sound activation mode in two ways. First, Miyazawa disclosing that its CPU is reset to a sleep state once it is determined the voice signal does not contain a “keyword,” as shown in steps s6 and s7 of Figure 4, below.



115. As I discussed above with regard to claim 1, at step s6, Miyazawa's speech recognition system is in an active speech recognition mode. However, upon determining that the input speech does not contain a key word, (s6, NO), Miyazawa discloses that the CPU is put into a sleep mode (s7). *Miyazawa*, 10:30-47; *see also Miyazawa*, 11:43-67 ("In the present invention, CPU 10 momentarily wakes up when a sound signal of at least a certain level is input. However, even when the input sound signal turns out to be a speech signal, CPU 10 immediately goes inactive if that speech signal is determined not to be one of the recognizable phrases.") One skilled in the art would have understood that

putting the CPU to sleep immediately upon detecting the absence of a key word, without human intervention, discloses “automatically” terminating the speech recognition mode and automatically switching to the low power sound activation mode.

116. Second, Miyazawa discloses putting the CPU (and the device generally) to sleep upon receiving a “sleep mode request.” *Miyazawa*, 11:14-32, Fig. 4, s11-15. Miyazawa explains that one way the system interprets a “sleep mode request” is if the “speaker is *quiet for a specified duration*,” i.e., if no voice input is detected, or if the speaker says “Be quiet” or “Good night.” *Miyazawa*, 9:51-58 (emphasis added), 11:14-20. If one of these events occurs, Miyazawa discloses that the “device and CPU 10 go into the sleep mode (step s15).” *Miyazawa*, 11:14-29. In my opinion, one skilled in the art would have understood that switching to the sleep mode based on lack of an input for a specified duration or based on receipt of a purely audible input discloses “automatically” terminating the speech recognition mode and “automatically” switching to the low power sound activation mode because it involves limited human interaction. Claim 12 confirms my understanding of the plain meaning of “automatically” in the context of the ‘186 patent because it requires “automatically” terminating the speech recognition modes based upon the results of decoding the electrical representative signals (i.e., the signals representing voice input).

M. Claim 10 — “The audio signal activated control system as recited in claim 9, wherein said speech recognition system is configured for automatically terminating said speech recognition mode after a predetermined period of time.

117. In my opinion, Miyazawa discloses this feature for the reasons discussed above with regard to claim 9 because Miyazawa discloses that the CPU is reset to a sleep state if it is determined that the “speaker is *quiet for a specified duration*,” i.e., after a predetermined period of time where no voice input is detected. *Miyazawa*, 9:51-58 (emphasis added), 11:14-20.

N. Claim 11 — “The audio signal activated control system as recited in claim 9, wherein said speech recognition system is configured for automatically terminating said speech recognition mode after a period of time that is based upon the results of said decoding of said electrical representative signals.

118. In my opinion, Miyazawa discloses this feature for the reasons discussed above with regard to claim 9, because Miyazawa discloses that the CPU is reset to a sleep state if it is determined that the “speaker is *quiet for a specified duration*,” i.e., after a predetermined period of time where no voice input is detected. *Miyazawa*, 9:51-58 (emphasis added), 11:14-20. In this case, Miyazawa discloses terminating said speech recognition mode after a “period of time that is based upon the results of said decoding of said electrical representative signals” because the specified duration must be while the “speaker is quiet,” i.e., when the decoding determines no voice input is detected in the electrical representative signals for a period of time. In other words, the period of time to terminate

Miyazawa's speech recognition mode is dependent on whether voice is detected in the decoded electrical representative signals. If the decoded signals from the microphone detect silence for a specified duration (s11, Figure 4), then the device is reset to a sleep mode (s13-s15, Figure 4). In my opinion, a person of ordinary skill in the art would have understood that determining silence for a specified period of time discloses a period of time that is based upon the results of said decoding of said electrical representative signals. That is, Miyazawa discloses returning to a sleep mode based on decoding silence for a specified time. Therefore reaching the specified time is dependent on the voice signal being decoded as silence. This is consistent with the '186 patent specification which explains that "[t]he sound activation time-out counter tracks elapsed time between attempts made by the speech recognition circuit 50 to recognize sounds and if a predetermined time value TMAX elapses between recognition attempts, the speech recognition circuit software initiates a routine to enter sound activation mode and changes the logic states of the previously described control register bits." '186 patent, 20:52-21:5.

119. A person of ordinary skill in the art also would have understood Miyazawa disclosing this feature for a second reason when a voice signal is detected before Miyazawa's specified duration runs out at s11 of Figure 4. If a voice signal is received that, when decoded, is not a sleep mode request or silence,

then the total period of time before the speech recognition mode is terminated will be longer because the specified duration before terminating the speech recognition mode will reset. For example, Miyazawa explains with reference to Figure 4 that if a sleep mode request is not received in step 11 in the form of a specific command or silence, the process returns to step 3 to analyze a sound signal. *Miyazawa*, 10:58-11:32 (performing steps s11, s12, s3, s4, s8, s9, and s10 in order if no sleep mode request is determined). Miyazawa therefore discloses basing the “period of time” before terminating the speech recognition mode on the decoding of electrical representative signals.

O. Claim 12 — “The audio signal activated control system as recited in claim 9, wherein said speech recognition system is configured for automatically terminating said speech recognition mode based upon the results of said decoding of said electrical representative signals.”

120. For the same reasons discussed above regarding claim 9, Miyazawa discloses this feature because it discloses that its CPU is reset to a sleep state once it is determined the voice signal does not contain a “keyword,” that a speaker has not input speech for a specified duration, or that an audible sleep mode request was uttered. *See, e.g., Miyazawa*, 11:43-67 (“In the present invention, CPU 10 momentarily wakes up when a sound signal of at least a certain level is input. However, even when the input sound signal turns out to be a speech signal, CPU 10 immediately goes inactive if that speech signal is determined not to be one of

the recognizable phrases.”); *see also id.*, Abstract, 2:30-53, 3:13-28, 4:10-22, 4:55-5:7, 9:25-10:2, Fig. 4. Each of these determinations are based on the results of decoding the electrical representative signals.

P. Claim 13 — “The audio signal activated control system as recited in claim 12, wherein said results include one or more predetermined errors detected during said speech recognition mode.”

121. For the same reasons discussed above regarding claims 9 and 12, Miyazawa discloses this feature because it discloses that its CPU is reset to a sleep mode if a keyword is not recognized from a voice input. As shown in s6 and s7 of Fig. 4, Miyazawa analyzes an incoming sound signal that is above a given threshold to determine if a keyword has been uttered, and returns its CPU to sleep mode if no keyword is registered. *See Miyazawa*, 10:30-47, 7:59-8:38.

122. In my opinion a person of ordinary skill in the art would have recognized that “one or more predetermined errors detected” in claim 13 includes at least a failure to recognize a keyword in an incoming sound signal. This is consistent with the disclosure in the ‘186 patent of counting a number of recognition errors and using this counter to switch from the speech recognition mode to the sound activation mode. *See* ‘186 patent, 20:52-22:53. The specification states that “[t]he recognition error counter tracks the number [of] attempts made by the speech recognition circuit 50 to recognize sounds for which

no match is identified.” *Id.*, 20:65-21:1. The specification further explains a “match” in the context of matching a voice signal to a known reference command. *See id.*, 22:31-41 (“the acquired unknown [voice] pattern is analyzed by the speech recognition circuit controller 60, utilizing a recognition algorithm stored in its ROM 61, to determine[] if it can be classified as a match with any of the reference commands within the active recognition vocabulary set and if the likelihood of correctly recognizing the unknown pattern exceeds a predetermined threshold in a step S513. The result of this comparison is identified in a step S514.”). If a match is not identified, then the recognition error counter is incremented by 1, and if the value of the recognition counter exceeds a threshold TMAX, then the speech recognition circuit 50 switches to the sound activation mode. ‘186 patent, 22:42-53.

Q. Claim 14 — “The audio signal activated control system as recited in claim 1, wherein said control system further comprises a memory for storage of data associated with said appliance control signals.”

123. Salazar discloses that its system includes a memory, including memories both internal to and external to Salazar’s microprocessors 30/200. *E.g.*, *Salazar*, 7:4-7, 8:12-34, 22:36-60, Fig. 3 (microprocessor 30, external memory 32), Fig. 5 (microprocessor 200, external memory 145). Salazar also discloses that these memories store data associated with the appliance control signals, including

the control signals to control appliances such as televisions, VCRs, and cable boxes. *See generally Salazar*, 7:34-17:36 (describing the use and storage of code sets in detail); *see also id.*, 8:22-34 (explaining that various memories “store a finite set of parameters that may be used to recreate and generate signals corresponding to a desired command code set” and that “each command code set includes a set of signals that may be employed to transmit a specific command to an infra-red receiver located in an electronic device that is being controlled”).

R. Claim 15 — “The audio signal activated control system as recited in claim 1, wherein said control system further comprises a memory for storage of data associated with a plurality of said appliance control signals for controlling an appliance.”

124. Salazar discloses the additional features of claim 15 for the same reasons discussed above with regard to claim 14. Moreover, Salazar expressly discloses that “[e]ach command code set comprises a set of signals, wherein each signal is utilized to perform an available function.” *Salazar*, 7:34-54. Using a television as an example, Salazar disclose that the available functions may include “channel up, channel down, volume up, volume down, mute, and power ‘on’ and ‘off.’” *Id.* Therefore, in my opinion, Salazar expressly discloses that the code sets stored in memory include data associated with a plurality of the appliance control signals for controlling an appliance.

- S. Claim 16 — “The audio signal activated control system as recited in claim 1, wherein said control system further comprises a memory for storage of data associated with a plurality of said appliance control signals for controlling a plurality of said appliances.”**

125. Salazar discloses the additional features of claim 16 for the same reasons discussed above with regard to claims 14 and 15. Moreover, in addition to disclosing storing data associated with a plurality of signals for controlling an appliance, Salazar discloses storing data associated with a plurality of signals for controlling a plurality of appliances. For example, Salazar discloses that the code set stored for the functions on a television made by manufacturer A will be different than the code set stored for the functions on a television made by manufacturer B. *Salazar*, 7:46-52. Moreover, Salazar discloses that manufacturer A may also make multiple models of TV sets that each have their own command code sets. *Salazar*, 7:52-54. Salazar further describes the memory requirements for storing code sets for “substantially all major brands of various devices,” and discloses methods for reducing the memory requirements of the system. *Salazar*, 7:55-8:30.

- T. Claim 19 — “The audio signal activated control system as recited in claim 1, wherein said speech recognition system wherein in said speech recognition mode is further configured for decoding said electrical representative signals to define an appliance type, said appliance type defining said appliance to which said appliance control signals are transmitted by said appliance control circuit.”**

126. In my opinion, the additional features recited in claim 19 would have been obvious to one skilled in the art in view of the teachings of Salazar. Salazar discloses that its handset is configured to communicate using command and control signals with various devices, including TVs, VCRs, and cable boxes, and is configured to communicate using different protocols to control their operations. *Salazar*, 7:34-54. To do so, Salazar discloses using a “command code set [that] includes a set of signals that may be employed to transmit a specific command to an infra-red receiver located in the appliance being controlled.” *Id.*, 8:31-34. Each command code set is different for each device because, as Salazar explains, similar commands for different appliances may require different signals based on their manufacturer or other differences. *Id.*, 7:46-54. Salazar further discloses that its handset receives voice inputs, analyzes those inputs with a pattern recognition algorithm, and recognizes commands in order to generate command and control signals that can be transmitted wirelessly to an appliance via IR or RF. *Id.*, 21:43-58, 24:36-51. In my opinion, a person of ordinary skill in the art would have understood and would have recognized that in order to control the correct

appliance (and apply the correct code set) in Salazar's speech recognition mode, Salazar's system would decode the received signals to define an appliance type.

127. Moreover, even if Salazar were not required to decode the received signals, in my opinion, it would have been obvious to modify Salazar to do so. In particular, Salazar discloses a "home entertainment embodiment" in which a "touch sensitive device 14 has mode and function selection sensitive areas that when touched causes microprocessor 30 to generate the appropriate command and control signals for the appliance." *Id.*, 21:7-26. Salazar further contemplates providing a display in order for a user to select "pre-programmed icons representing other external apparatus" in order to switch modes and designate a particular appliance to control. *Id.*, 20:22-40. In my opinion, one skilled in the art would have understood that it would have been obvious to use voice commands in order to switch between different appliance types. This is evidenced at least by Salazar itself, which discloses using voice control in lieu of pressing buttons for various options. Given Salazar's express disclosure of selecting a "voice activated device mode" through voice only, it would have been a natural extension to switch between appliance types using voice only, in addition to providing buttons or touchscreen displays to accomplish this task. Doing so would have been nothing more than substituting known touch inputs for known voice inputs to yield the predictable result of switching modes by voice only, as expressly contemplated by

Salazar and expressly disclosed by Miyazawa. This straightforward substitution of known elements would have been well within the grasp of one skilled in the art.

- U. **Claim 20 — “The audio signal activated control system as recited in claim 19, wherein said speech recognition system in said speech recognition mode is further configured for decoding said electrical representative signals to determine if said signals represent predetermined audible commands corresponding to control functions associated with said defined appliance type.”**

128. In my opinion, the additional features of claim 20 would have been obvious to one skilled in the art for the same reasons as I discuss above regarding claim 19, from which claim 20 depends. Further, Salazar discloses this element by disclosing that its handset is configured to generate command and control signals to communicate with various devices, including TVs, VCRs, and cable boxes, and that each of these “may require a command code set that includes various signals to remotely control various available functions such as channel up, channel down, volume up, volume down, mute, and power ‘on’ and ‘off’”. This command code set may have a different set of signals than another command code set employed for a TV set made by manufacturer B. In the alternative, manufacturer A may employ different command code sets for its own various models of TV sets.” *Salazar*, 7:34-54. Salazar further discloses that command and control signals may be generated by voice input. *Id.*, 21:43-58. Salazar thus discloses decoding electrical representative signals to determine if the signals represent predetermined audible

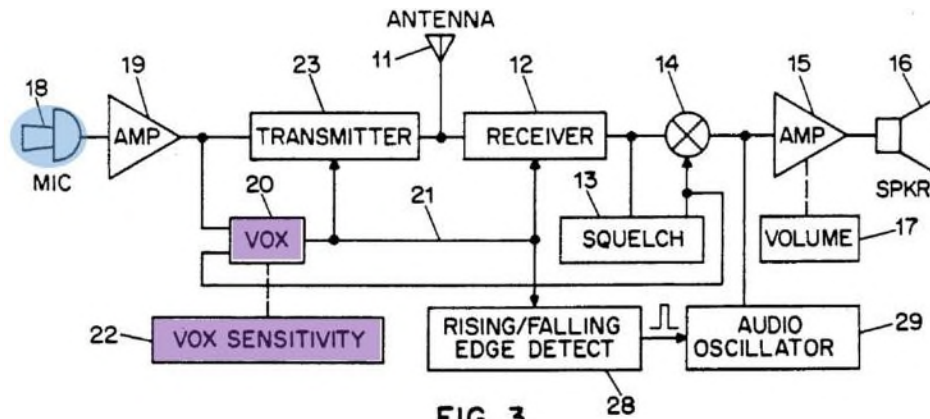
commands corresponding to control functions associated with a defined appliance type.

IX. SALAZAR AND MIYAZAWA IN VIEW OF OPPENDAHL (COMBINATION 2A) OR SALAZAR, MIYAZAWA AND BOSSEMEYER IN VIEW OF OPPENDAHL (COMBINATION 2B) RENDERS OBVIOUS CLAIM 5

129. In my opinion, the combination of Salazar, Miyazawa, and Oppendahl renders obvious claim 5 (Combination 2A). Also, in my opinion Salazar, Miyazawa, Bossemeyer, and Oppendahl renders obvious claim 5 (Combination 2B).

A. Background on Oppendahl

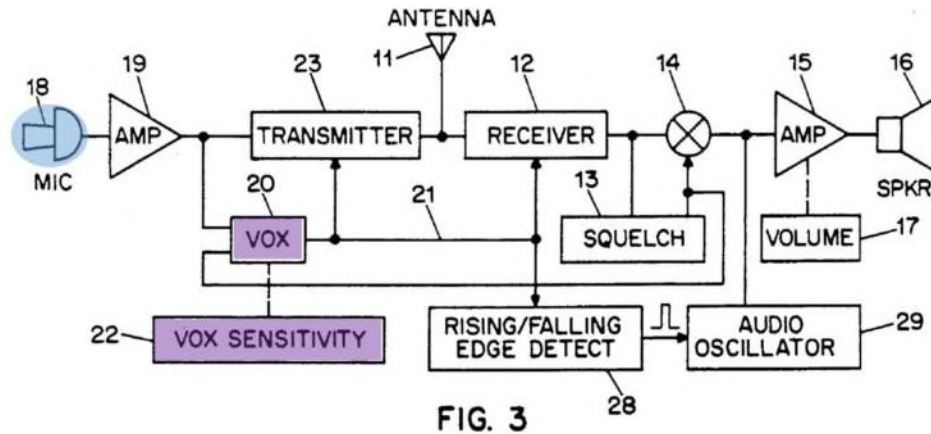
130. Oppendahl discloses a voice operated switch, or VOX, that switches from a voice receive mode to a voice transmit mode based on voice inputs received by a **microphone**. *Oppendahl*, Abstract, 1:22-41, Fig. 3(below). Oppendahl's system provides notifications to a user in transmit mode and enables the user to adjust the **"VOX threshold"** for switching between the voice receive and voice transmit modes using a **"VOX sensitivity control 22."** *Id.*, 4:4-24, 4:38-48. Oppendahl discloses that these features reduce instances of false triggers and "open-mike" events. *Id.*, 1:42-53, 2:10-14, 3:20-29. This reduces unnecessary battery drain in its system. *Id.*, 3:20-28.



B. Claim 5 — “The audio signal activated control system as recited in claim 1, wherein said speech recognition system further includes a user-adjustable sound activation sensitivity control configured to enable a user to adjust the signal amplitude threshold level that must be exceeded by said amplitude of said electrical signals for automatically switching from said sound activation mode to said speech recognition mode.”

131. In my opinion, claim 5 would have been obvious based on Salazar and Miyazawa in combination with Oppendahl (Combination 2A) or Salazar, Miyazawa, Bossemeyer in combination with Oppendahl (Combination 2B). Miyazawa discloses switching between a speech recognition mode and a low power sound activation mode based on voice signals exceeding a threshold. *See* [1h]. Bossemeyer similarly discloses setting a threshold for registering a spoken utterance based on an amplitude of a sound signal. *See* [1h]. Oppendahl discloses a user-adjustable threshold for recognizing an utterance in a hands-free VOX transceiver. *See* Oppendahl, Abstract, Fig. 3, 1:22-53, 4:17-24 (“The **VOX threshold** may be adjusted by the user by **VOX sensitivity control 22**”). A skilled artisan would have understood that a sensitivity control for manually setting the

sensitivity of a VOX transceiver would be a user-adjustable sound activation sensitivity control that enables a user to adjust the threshold at which an utterance will be detected.



132. In my opinion, one skilled in the art would have combined the teachings of Oppendahl with those of Salazar, Miyazawa, and Bossemeyer. Each reference relates to voice-activated systems. Moreover, Oppendahl and Miyazawa both recognize the same problems with voice-activated systems, and provide similar solutions. These include recognizing that battery drain is a problem in such systems, and that false-positive voice triggers can be ameliorated using an adjustable detection threshold before registering an utterance.

133. VOX systems are well-known speech recognition systems for triggering an operation based solely on voice input. In my opinion, one skilled in the art would have found it obvious to incorporate the features of a VOX system in Oppendahl into the voice-activated appliance control system in Salazar and

Miyazawa (and Salazar, Miyazawa, and Bossemeyer), because doing so would have been nothing more than combining known elements of similar systems into one system according to known methods to yield predictable results. Here, it would have been obvious to one skilled in the art to incorporate Oppendahl's adjustable trigger threshold into the Salazar-Miyazawa or Salazar-Miyazawa-Bossemeyer system because it would allow a user to manually set the threshold for switching from a sleep state to a speech recognition state. This would predictably allow a user to manually adjust a threshold up or down to prevent false triggers if the threshold is set too low in a high noise environment, or false negatives if the threshold is set too high in low noise environment. While Oppendahl considers this feature in the context of an "open-mike" event, applying the same manual threshold adjustment to the Salazar-Miyazawa or Salazar-Miyazawa-Bossemeyer system would prevent false mode switching. This fulfills the goals of Oppendahl as well as Salazar, Miyazawa, and Bossemeyer by employing techniques to reduce power consumption in a speech recognition system.

134. In my opinion, incorporating Oppendahl's manual adjustment would further have been nothing more than combining known elements in the speech recognition arts (for example, Oppendahl's manually adjustable potentiometer and the speech recognition systems of Salazar, Miyazawa, and Bossemeyer) to yield the predictable Salazar-Miyazawa system with an adjustable trigger threshold.

Those of skill in the art would have been well aware of VOX systems and Oppendahl's manually adjustable potentiometer. Incorporation of this feature in Oppendahl into Salazar-Miyazawa would have been well within the grasp of a skilled artisan and would predictably result in a system that could be adjusted based on user input to reduce false triggers.

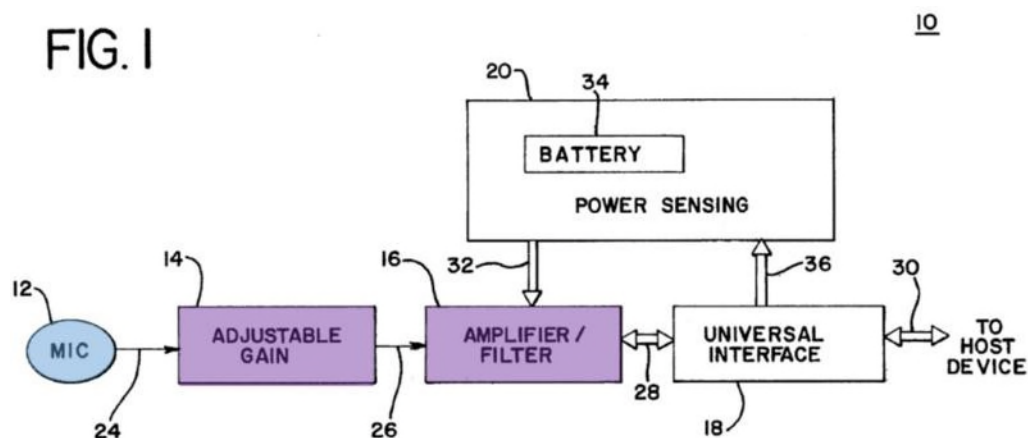
135. A skilled artisan would have also understood that a manual adjustment would complement Miyazawa's automatic threshold adjusting methods. *See generally Miyazawa*, Figs. 5A, B and accompanying text. In particular, Miyazawa discloses increasing a threshold based on an initial trigger that fails to return a recognized keyword in a received voice sample. *Id.*, 12:24-37. However, Miyazawa does not disclose how this method would reduce the threshold after subsequent false triggers and threshold increases. A manual adjustment would compensate for a threshold being automatically set too high and, in an environment with varying noise levels, would allow for manually lowering the threshold when the noise level is low and the user's voice inputs are not being registered by the system. Incorporating this manual control would add redundancy to the automatic process of Miyazawa and enable a user to compensate for triggering errors in a variable noise environment. A user would also be able to anticipate in advance a high or low noise period and preemptively set the threshold to an appropriate level.

**X. SALAZAR AND MIYAZAWA IN VIEW REICHEL (COMBINATION 3A) OR
SALAZAR, MIYAZAWA AND BOSSEMEYER IN VIEW OF REICHEL
(COMBINATION 3B) RENDERS OBVIOUS CLAIM 6**

136. In my opinion, the combination of Salazar, Miyazawa, and Reichel renders obvious claim 6 (Combination 3A). Also, in my opinion Salazar, Miyazawa, Bossemeyer, and Reichel renders obvious claim 6 (Combination 3B).

A. Background on Reichel

137. Reichel discloses an adjustable audio input circuit for use with a voice recognition system. *Reichel*, 1:7-16. Reichel discloses that its system can compensate for inexpensive microphones by improving the signal that is received by a voice recognition system. *Id.*, 1:37-2:8, 2:38-52. Reichel's system includes a **microphone** and a **user-adjustable amplification circuit** that includes an adjustable gain control circuit 14 and an amplifier/filter circuit 16. *Id.*, 3:57-67, Fig. 1 (below).



138. The gain control circuit includes a potentiometer whose resistance can be “manually adjust[ed]” to allow the amplifier/filter circuit 16 to provide between

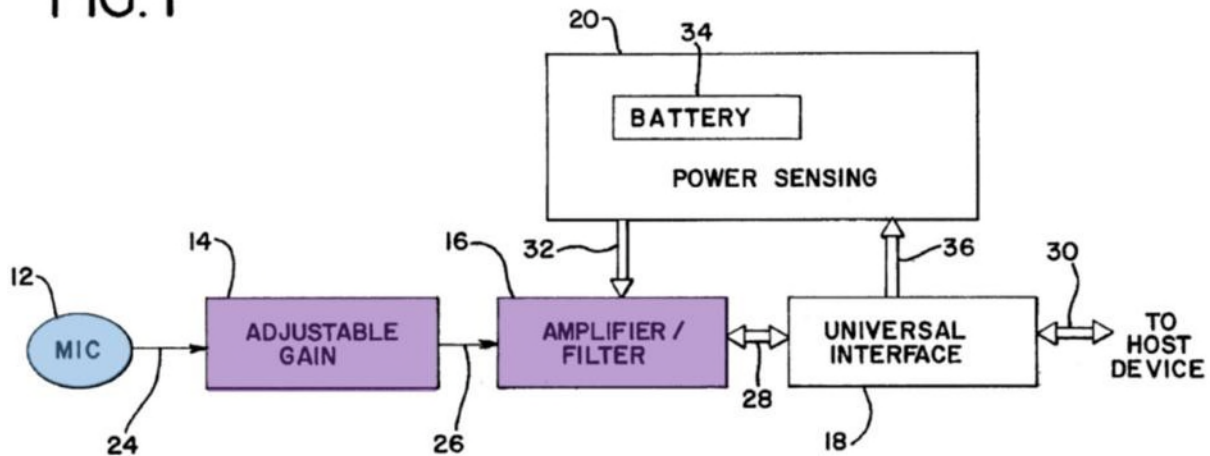
approximately 6 DB and 20 DB of gain. *Id.*, 4:36-53. Reichel's disclosure of a manually adjustable potentiometer is indistinguishable from the '186 patent's teaching of a "thumbwheel potentiometer" for performing an identical amplification function. *See* '186 patent, 17:19-27, 20:20-26. The adjustable gain (e.g., the potentiometer) serves as an input to the amplifier/filter circuit to control the level of amplification (or gain) applied to the microphone signal being sent to the host (e.g., a voice recognition system). *Reichel*, 4:36-53 ("The adjustable gain control circuit 14 includes the potentiometer VR in combination with a resistor R2 where R2 is shown as part of the amplifier/filter circuit 16").

B. Claim 6 — "The audio signal activated control system as recited in claim 1, wherein said speech recognition system further includes a user-adjustable amplification circuit configured to enable the degree of amplification of said amplitude of said electrical signals to be varied."

139. In my opinion, Reichel discloses the additional features of claim 6. As discussed, Figure 1 of Reichel discloses a voice recognition system with a **user-adjustable amplification circuit (adjustable gain 14 and amplifier/filter 16)** configured to enable the degree of amplification of said amplitude of said electrical signals (received from the **microphone (mic 12)**) to be varied.

FIG. 1

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140. Reichel discloses that the adjustable gain control circuit 14 includes a potentiometer whose resistance can be “manually adjust[ed]” to allow the amplifier/filter circuit 16 to provide between approximately 6 DB and 20 DB of gain. Reichel, 4:36-53. This disclosure of a manually adjustable potentiometer is, in my opinion, indistinguishable from the ‘186 patent’s teaching of a “thumbwheel potentiometer” for performing an identical amplification function.

141. In my opinion, one skilled in the art would have recognized that one way to adjust the sensitivity of a speech recognition system would be to, instead of (or in conjunction with) adjusting a triggering threshold for a speech recognition, adjust the gain/amplification of incoming signals relative to a threshold. One skilled in the art also would have recognized that it is known that speech and voice recognition systems would have benefitted from an amplified and filtered microphone signal, such as one that is “essentially linear or has a uniform energy

spectrum throughout the [useful] frequency range,” as taught by Reichel. *See Reichel*, 1:54-2:8. Reichel discloses this capability via adjustable amplification of a microphone signal used in a voice recognition system. From Reichel’s disclosure, a skilled artisan would have understood that amplifier-adjustable audio input circuits were well known at the time of the ‘186 patent.

142. Based on this understanding of the art, it is my opinion that it would have been obvious to one skilled in the art to combine Reichel’s manual amplification adjustment with the Salazar-Miyazawa or Salazar-Miyazawa-Bossemeyer system to adjust the microphone gain relative to Miyazawa’s and Bossemeyer’s triggering threshold. Doing so would have been nothing more than applying known techniques of microphone amplification to known systems of speech recognition in Salazar-Miyazawa or Salazar-Miyazawa-Bossemeyer. Reichel’s disclosure also would have suggested to one skilled in the art to incorporate its techniques into a speech recognition system because Reichel expressly disclose using its system in conjunction with a “voice recognition host.” *Reichel*, 1:7-16. While “voice recognition” in Reichel and “speech recognition” in Salazar and Miyazawa have their differences, a skilled artisan also would have understood systems supporting these two recognition methods enjoy substantial overlap and similar hardware configurations. Finally, a skilled artisan would not have been discouraged from a combination with Reichel based on Miyazawa’s

adjustable threshold because a skilled artisan would have recognized that an adjustable microphone input and a trigger threshold are not mutually exclusive—both may be adjusted to fine-tune the system to a trigger when an appropriate command is uttered. Electing to include one or the other, or both, is a system design choice that would have been obvious to implement to a skilled artisan.

143. Moreover, incorporating Reichel's adjustable gain would have been nothing more than combining known elements in the speech recognition/voice recognition arts (e.g., the user-adjustable amplification circuit of Reichel and the speech recognition systems of Salazar, Miyazawa, and Bossemeyer) to yield the predictable result of an adjustable amplification capability in the Salazar-Miyazawa or Salazar-Miyazawa-Bossemeyer systems. Those of skill in the art would have been aware of user-adjustable amplification circuits, and incorporation of this feature into Salazar-Miyazawa would have been straightforward for a skilled artisan.

144. Furthermore, according to an express goal of Reichel, incorporation of its gain adjustment into the Salazar-Miyazawa and Salazar-Miyazawa-Bossemeyer systems would have compensated for poorer microphone quality, allowing for more inexpensive microphones to be used in those systems. A skilled artisan therefore would have recognized that a lower quality microphone could be used in

the system, at lower expense, and would have used Reichel's gain adjustment to ensure proper input for speech recognition

XI. SALAZAR AND MIYAZAWA IN VIEW IN VIEW OF CLARK (COMBINATION 4A) OR SALAZAR, MIYAZAWA AND BOSSEMEYER IN VIEW OF CLARK (COMBINATION 4B) RENDERS OBVIOUS CLAIM 8

145. In my opinion, the combination of Salazar, Miyazawa, and Clark renders obvious claim 8 (Combination 4A). Also, in my opinion Salazar, Miyazawa, Bossemeyer, and Clark renders obvious claim 8 (Combination 4B).

A. Background on Clark

146. Clark discloses a system for dynamically controlling the frequency of a processor by adjusting its operating voltage. *Clark*, Abstract. Clark discloses that its system may include a processor and voltage regulator for reducing processor voltage in an "idle" or "sleep" mode, and then increasing the processor voltage to perform computationally-expensive tasks. *Id.*, 4:50-64, 5:40-6:2, 6:65-7:14, 7:26-56. Clark further discloses that its system may be utilized in voice recognition systems where the processor frequency may be lowered when the system is not in use and interrupted to raise the frequency when processing voice samples. *Id.*; *see also id.*, 1:18-24.

B. Claim 8 — “The audio signal activated control system as recited in claim 1, wherein in said speech recognition mode said processor operates at a higher operating frequency than in said low power state.”

147. As I discussed above with regard to claim 8 in Combination 1A, in my opinion, Miyazawa discloses the additional features recited in claim 8. To the extent Patent Owner or its expert disagrees, Clark discloses this feature by disclosing “idle” or “sleep” modes (a low power state) in which a processor is operational but at a lower frequency than in an active state. *See, e.g., Clark*, Abstract, 4:50-64, 5:40-6:59, 6:65-7:14, 7:26-56. Clark further discloses that its frequency methods may be used in microprocessor-based voice recognition systems to conserve power. *Id.*, 1:12-24, 5:40-45.

148. In my opinion, it would have been obvious to combine Clark with Salazar-Miyazawa and Salazar-Miyazawa-Bossemeyer to provide a low frequency sleep mode and a higher frequency speech recognition mode. Such a combination would have been nothing more than applying known techniques of processor control using input voltage to yield the predictable result of a processor that operates at a higher frequency when processing speech and at a lower frequency in a sleep mode. Moreover, a skilled artisan would have understood that Clark’s intended use in battery-operated devices, which generally employ voltage regulators, suggests that its methods of varying voltage to a processor to achieve a

frequency change would have been straightforward to implement into the battery-powered systems of Salazar, Miyazawa, and Bossemeyer. *See Clark*, 1:14-47, 2:65-3:52.

XII. SALAZAR AND MIYAZAWA IN VIEW OF DOUMA (COMBINATION 5A) OR SALAZAR, MIYAZAWA AND BOSSEMEYER IN VIEW OF DOUMA (COMBINATION 5B) RENDERS OBVIOUS CLAIMS 17 AND 18

149. In my opinion, the combination of Salazar, Miyazawa, and Douma renders obvious claims 17 and 18 (Combination 5A). Also, in my opinion Salazar, Miyazawa, Bossemeyer, and Douma renders obvious claims 17 and 18 (Combination 5B).

A. Background on Douma

150. Douma discloses a system and method for training a voice recognition system where the system receives both a first voice signal and an instruction signal representing an instruction, and processes the first voice signal to identify the instruction based on a second voice signal representing the same instruction. *Douma*, Abstract, 1:51-2:42, 4:17-5:16, 6:28-7:14, Figs. 2, 4. In particular, Douma discloses a training mode that listens to voice inputs, generates voice recognition data for the voice input, and stores it for future use. *Douma*, 4:29-54. The stored input is associated with instruction data, also entered by the user, for carrying out an action. *Douma*, 3:18-4:54. Douma also discloses a separate mode where a subsequent voice input is received, compared to the voice recognition data, and, if

there is a match, the computer 10 carries out the action corresponding to the instruction. 3:49-4:16, 4:49-5:32. Douma explains that its system may be used to control various functions for a wide variety of appliances such as printers, TVs, VCRs, consumer and office electronic devices, and home appliances. *Douma*, 3:49-4:16, 4:49-54, Fig. 1.

B. Claim 17 — “The audio signal activated control system as recited in claim 1, wherein said speech recognition system further includes a programming mode to enable a user to define a control signal to be associated with a defined audible command, wherein in said speech recognition mode said speech recognition system generates said defined control signal for controlling one or more appliances if said electrical signals represent said defined audible command.”

151. In my opinion, Douma discloses the additional features of claim 17. Douma discloses the recited programming mode. In Douma’s programming mode, Douma “enable[s] a user to define a control signal” because Douma discloses enabling a user to input instructions in the form of “instruction data” or an “instruction signal” (the instruction data/signal corresponds to the “control signal”) to the system. *Douma*, 1:55-56, 2:4-10, 3:18-36. Douma also discloses that the control signal is “associated with a defined audible command,” because Douma discloses that the voice recognition data, which is generated in response to a user’s entry of an audible command, is associated with and corresponds to the instruction data. *Douma*, 4:24-54, 5:38-43; *see also id.*, 1:53-59, 2:2:8-9.

152. In my opinion, Douma also discloses, in a speech recognition mode, generating the defined control signal if the electrical signals represent the defined audible command because Douma discloses generating and carrying out the instruction from the instruction data/signal if a second received voice input matches the voice recognition data that was associated with the instruction data/signal. 4:55-5:32. Moreover, Douma discloses that the instruction data/signals (the control signals), are for controlling appliances because Douma discloses that “[t]he computer 10 responds to received instruction data by carrying out an action,” and that the instruction data can be used to control “various function[s]” of a variety of other appliances such as printers, TVs, VCRs, and other consumer, office, and home appliances. *Douma*, 3:49-4:16, 4:49-54, Fig. 1.

153. In my opinion, one skilled in the art would have found it obvious to incorporate Douma’s programming mode into the Salazar-Miyazawa or Salazar-Miyazawa-Bossemeyer system in part because of the similarities between Douma and Salazar. As discussed, both references relate to controlling a plurality of functions in multiple appliances using voice commands. Moreover, Salazar discloses a programming mode for a universal remote using a touch-sensitive device. *Salazar*, 20:22-40, 23:6-22 (“Through a program function, a different set of external apparatus, such as garage door opener, can then be controlled via the touch sensitive device 125.”). Salazar furthermore discloses interacting with its

device via voice input instead of touch. *E.g., id.*, 21:43-58, 24:37-51. A skilled artisan would have recognized, based on Salazar's disclosure, that it would have been obvious to use Salazar's voice input feature to conduct the same operations it discloses via touch input, and Douma explicitly discloses this feature. In particular, as discussed above, Douma teaches a user-defined voice input is associated with a various instructions for controlling multiple devices.

154. Incorporating this feature into the Salazar-Miyazawa or Salazar-Miyazawa-Bossemeyer system would have been nothing more than the incorporation of a known voice input training technique in Douma into an appliance control system in Salazar for the purpose of allowing a user to program user-specific commands into a speech recognition system for controlling appliances. This would have had recognizable benefits including increasing user control and customization of the system, and would have substituted physical inputs with voice inputs when programming Salazar's device.

- C. **Claim 18 — “The audio signal activated control system as recited in claim 1, wherein said speech recognition system further includes a programming mode to enable a user to define a plurality of control signals to be associated with a defined audible command, wherein in said speech recognition mode said speech recognition system generates said defined plurality of control signals for controlling said one or more appliances if said electrical signals represent said defined audible command.”**

155. In my opinion, claim 18 would have been obvious for the same reasons discussed above with regard to claim 17. The only difference between the two claims is that claim 18 requires “a plurality of control signals” associated with the defined audible command and generating the “defined plurality of control signals.” The cited portions of Douma that I discussed above disclose these features. For example, Moreover, Douma discloses that the received inputs can be “instruction *data*” which is plural and thus discloses multiple control signals, as well as performing multiple actions in response to that data. *Douma*, 3:18-26, 3:50-59 (emphasis added). Douma also explains that “*various functions* of a TV40, a VCR 42, a high fidelity sound reproduction system 44 *and/or* a CD player are controlled by the computer 10 *in response to a voice command input* via the microphone.” *Douma*, 4:9-16 (emphases added). One skilled in the art would appreciate that in order to control various functions of multiple appliances with “a voice command input,” a plurality of control signals would need to be associated

with a defined audible command and subsequently generated in response to a match in Douma's system.

XIII. CONCLUSION

156. In signing this declaration, I understand that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I acknowledge that I may be subject to cross-examination in this case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

157. I declare that all statements made herein of my knowledge are true, that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Dated: May 30, 2019

By: 

Nathaniel Polish

APPENDIX A

NATHANIEL POLISH, Ph.D.
Daedalus Technology Group, Inc.
135 West 26th Street
New York, NY 10001
(212) 684-3890

business
experience
1980-present

President

Daedalus Technology Group, Inc. successor to NPS ASSOCIATES **NEW YORK, NY**
Co-founded computer consulting firm. Employs up to twenty people as needed.

clients
include:

Intellectual Property Consulting. Various anonymous clients. **NEW YORK, NY**
Consulting on patent valuation and strategy: Act as an advisor on technical and intellectual property matters to various clients. Developed intellectual property for various companies. 2001-present.

SpokenHub. **NEW YORK, NY**
Predictive dialer deployment and operation: During the 2012 election cycle assembled and ran a team of engineers to deploy, debug, and operate a large scale outbound calling server farm. This server farm supported hundreds of agents and millions of minutes of calling. 2012.

Risk Solutions International. **NEW YORK, NY**
Risk management: Developed technology platform to allow for complex question and answer sessions with airport managers. The results of the sessions then generated planning documents used in risk management. Results were published as part of a Transportation Research Board research program. 2011-2013.

SmartSystems/Specialty Acquirer. **NEW YORK, NY**
Advanced Transit fare collection: Founding member of board of directors. Advisor on technical and intellectual property matters. Developed intellectual property for the company. The company is engaged in the development and sale of advanced fare collection systems for mass transit using RFID technologies. 2004-present.

Skywi. **FORT WORTH, TX**
Wireless broadband: Founding board of directors member. Advisor on technical and intellectual property matters. The company provides a variety of wireless broadband services to semi-rural customers using mesh networks. 2004-2009.

Placecorp. **NEW YORK, NY**
Wireless text messaging system: Designed and developed a very large scale, multi-platform text messaging system. Acted as the lead technologist for a startup. In this capacity attended many venture capital meetings and developed all technical sections to the business plans. The system integrated advanced Interactive Voice Response (IVR) with email, paging, and SMS messaging. Oversaw and planned initial development of very small paging device to be manufactured in very high volume. 2000-2001.

Marketboy. **NEW YORK, NY**
Distributed market making system: Provided a range of services in the areas of product definition, specification, and implementation strategy. Marketboy was a distributed system that allowed prospective purchasers and vendors to make bid and ask offers for proposed transactions. 2000.

Savos. **NEW YORK, NY**
Telephone to streaming audio bridge: Developed, designed and deployed an industrial strength IVR system that allows users to access streaming media via their cell phones. The system supports up to 96 streams on a single chassis. Developed web based content management system and interface for customizable user preferences. 2000.

deliverENow.

NEW YORK, NY

Online delivery system: Developed a proof of concept prototype of online delivery system. This consisted of a stock clerk server written for Windows CE (Clio) with a CDPD network connection. It demonstrated how purchase and delivery information would be sent to an in-store stock person who prepares them for pickup by a member of the deliverENow courier network. Provided strategic technical advice. Served on board of advisors. Wrote technical specification of business and logistical components of the system. 2000.

Togglethis.

NEW YORK, NY

Animation distribution system: Developed critical components of initial version of email-delivered animation system. Components included MacroMedia Director Xtras as well as encryption functions. Developed tools to distribute and manage Togglethis's content, DTG built a custom UNIX email list-server. This server allowed Toggle administrators to create groups, upload episodes, and schedule the delivery of their content. Developed system architecture and language specification for the next version of the IC Engine, which drives the characters. 1998-1999.

JuniorNet.

BOSTON, MA

Children's on-line service: Designed, developed and lead the implementation of a large scale network system for delivery of children's entertainment and education content. Worked with the president and other key players to fit a technology strategy to corporate goals. System is required to serve from 200,000 to 1,000,000 subscribers and be supportable over three to five years. All project goals met within a \$1,000,000+ budget. 1997-2000.

One Click Charge.

NEW YORK, NY

Provide a wide range of consulting services starting with technology evaluation for the principal investor. Provided services in the areas of product definition, team formation and implementation strategy. Developed significant components of a substantial Internet micropayment and authentication system. 1998-2000.

Swatch.

WEEHAWKEN, NJ

Ticketing system: Implemented a radio frequency identification (RFID) based system for providing access to the 1998 Goodwill Games utilizing RFID tagged wristwatches. 1998-1999.

Instant Video Technologies, Inc./Burst.com

SAN FRANCISCO, CA

Burstware --. Designed and developed a series of products to deliver digital video and audio materials over wide-area internet using consumer grade computers. Products were designed to fit within the client's existing patent portfolio. 1995-1997.

Technical evaluation --. Provided technology strategy and evaluation services and acted as Technology Director. 1995-1997.

Assurenent.

BETHESDA, MD

Internet Insurance system --. Designed and developed a system for utilization of the Internet for the distribution and control of insurance agent support software. System can handle tens of thousands of simultaneous users. Member of Board of Directors. 1995-2002.

New Zealand Antarctic Project (NZAP) and US Antarctic Program (USAP).

ANTARCTICA

Penguin Weighbridge -- Designed, developed, and deployed system for tracking the comings and goings, weights, and Ids of Adelie penguins in their natural environment on three colonies on Ross Island, Antarctica. Systems run continuously for months in adverse conditions. System was upgraded and replaced in 2016. 1994-present.

Electronic Digital Documents, Inc.

NEW YORK, NY

Check Image Compression system --. 1995-1999.

American Veterinary Identification Devices, Inc.

NORCO, CA

AVID reader -- Designed and developed digital computer components of radio frequency identification system. Work involved imbedded microcontrollers and real-time digital signal

Nathaniel Polish

processing in very noisy environment. Designed communications protocols including encryption and error checking schemes. Product in high volume (50,000 unit) production. 1988-1995.

Bannon & Co.

BEVERLY HILLS, CA

Financial models -- Developed detailed financial model of business with 49 separate operating entities in six separate operating companies under two holding companies. Models included projections and actuals on a quarterly basis over ten years. 1993.

Technology valuation -- Provided technology evaluation and valuation services for private placement memoranda for technology companies. 1993.

Amprobe Instrument, Inc.

LONG ISLAND, NY

REMCON tester -- Designed and implemented product life-cycle test fixture for a new and innovative solid state switch. Test fixture used by Underwriters Labs for approval. 1988.

Personal Computer Card Corporation

NEW YORK, NY

Smart Cards -- Designed smart card reader/writer system. Performed general design and component selection and wrote software for smart card communications. System design implemented in commercial product. 1987.

The Dun & Bradstreet Corporation

NEW YORK, NY

Voice editing systems -- Designed and built all parts of four generations of interactive voice editing systems. Editing systems produce output used in extensive, high quality speech synthesis system that is part of larger information delivery system. The systems are built on networks of computers in a variety of programming languages and systems. The system involved interactive user interfaces, screen windows, signal processing, and voice file systems. 1982-1991.

1997-2001 **Co-Founder, Director and CTO**
I-RECALL, INC.

NEW YORK, NY

1996-1999 **Co-Founder, Director, CTO & Principal Product Designer**
SOLILOQUY, INC.

NEW YORK, NY

Natural language interfaces to databases: Co-founded in 1996 a company to provide next generation interfaces to structured databases. Developed prototype system using speech recognition and speech synthesis to provide access to music and ecommerce databases. Raised \$1.5 million in angel investments. Company has raised a total of \$8 million through a variety of institutional and individual investors. Hired replacement CTO and exited company in 1999.

1991-1992 **President & Principal Product Designer**
SIMPLICITY COMPUTING, INC.

NEW YORK, NY

Co-founded in 1991 a computer peripherals manufacturing company concentrating on portable products with international mass-market appeal. Main product: Simplicity Portable Drive, an IBMPC parallel port connected, portable disk storage system. Marketed domestically and in 25+ countries. Products marketed direct via telemarketers, trade shows, sales reps, and national advertising. Products distributed through dealers, distributors and national catalog houses. Company employed 10 people.

- Wrote business plan and raised \$350,000 startup funding
- Established marketing plans
- Directed marketing of products in trade shows, national advertisements and focus groups
- Managed employees
- Designed hardware and software for products
- Supervised hardware & software implementation teams. First units shipped less than six months from start of project.
- Supervised all aspects of manufacturing and testing process. Contracted with four manufacturing facilities and many suppliers for production.
- Supervised and established call-in customer support services

1989-1999 **President & CEO**
MEASUREMENT & CONTROL PRODUCTS, INC.

NEW YORK, NY

Nathaniel Polish

Founded in August 1989 an electronic products development company. M&CP designs, develops, markets and sells its own products through retail, wholesale and catalog channels domestically and abroad. All manufacturing is contracted. Company was profitable in its first year of operation.

Flagship product:

BitView -- Hand held RS-232 data communications diagnostic monitor. Invented, developed and produced hardware and software. Developed and oversaw implementation of marketing strategies, budgets, and business plans. Product currently in third production run.

Nathaniel Polish

education

1980-1993 **COLUMBIA UNIVERSITY** **NEW YORK, NY**
Ph.D. in Computer Science, May 1993,
Thesis: *Mixed Distance Measures for the Optimization of Concatenative Vocabularies in Speech Synthesis*.
MPhil in Computer Science, December 1989.
MS in Computer Science, December 1987.
BA in Physics, Columbia College, May 1984.

teaching positions

1997 **COLUMBIA UNIVERSITY** **NEW YORK, NY**
Adjunct Professor, Computer Science.
Advanced undergraduate course: *Artificial Intelligence*.

1989 **COLUMBIA UNIVERSITY** **NEW YORK, NY**
Graduate Lecturer, Computer Science.
Advanced undergraduate course: *Software Design*. Taught 68 advanced undergraduates. Supervised two teaching assistants. Students implemented full spreadsheet application under UNIX.

1984-1985 **CITY UNIVERSITY OF NEW YORK** **NEW YORK, NY**
Adjunct Professor, Experimental Psychology.
Graduate-level course: *Computer Methods in Experimental Psychology*.

publications and patents

- 2010** Michael L. Beigel, Nathaniel Polish, Steven R. Frank, and Robert E. Malm. Electronic Identification System with Improved Sensitivity. United States Patent 7,737,821B2. June 15, 2010.
- 2009** Silbernagl, Martin and Polish, Nathaniel. Learning Fare Collection System for Mass Transit. United States Patent 7,568,617. August 4, 2009.
- 2009** Silbernagl, Martin and Polish, Nathaniel. Learning Fare Collection System for Mass Transit. United States Patent 7,566,003. July 28, 2009.
- 2002** Beigel, Michael L.; Polish, Nathaniel; Frank, Steven R.; Malm, Robert E. Electronic identification system with improved sensitivity. United States Patent 6,472,975. October 29, 2002.
- 2002** Nathaniel Polish. Bilateral speech system. Speech dialogs for database access. United States Patent 6,430,531. August 6, 2002.
- 1999** Nathaniel Polish. System and method for distributing and managing digital video information in a video distribution network. United States Patent 5,963,202. October 5, 1999.
- 1993** Michael L. Beigel, Nathaniel Polish and Robert E. Malm. Multi-Mode Identification System. Fundamental RFID technology. United States Patent 5,235,326. August 10, 1993.
- 1991** Nathaniel Polish. Mixed Distance Measures for Synthetic Speech Evaluation. In *Proceedings of ICASSP-91*, Toronto, Canada, 1991.
- 1988** Nathaniel Polish. A Distributed Signal Processing Facility for Speech Research. In *Proceedings of AVIOS88*, San Francisco, CA. October 4-6 1988.
- 1987** Nathaniel Polish. Mixed Distance Measures for Optimizing Concatenative Vocabularies for Speech Synthesis: A Thesis Proposal. Columbia University Department of Computer Science technical report number CUCS-310-87, 1987.
- 1983** M. Morris, N. Polish, B. Zuckerman, and N. Kaifu. The Temperature of Molecular Gas in the Galactic Center Region. *The Astronomical Journal*, 88(8):1228-1235, August 1983.

Nathaniel Polish

research interests

Computer Speech, Distributed Systems, Interactive Environments.
Software Engineering, Systems Engineering, Technology Policy.
Knowledge-Based Approaches to Signal Processing.
Computational Physics, Non-Linear Dynamics.

professional societies

International Society for Electrical and Electronics Engineers (IEEE),
Association of Computing Machinery (ACM),
American Association for the Advancement of Science (AAAS).

other interests

Foreign Policy, Political Science, Long Distance Bicycling, United States Space Program.

grants

AT&T Special Projects Grant of \$25,000 for synthetic speech, 1986.

Financial support for Ph.D. work was provided by the New York State Science and Technology Foundation Center for Advanced Technology in Computers and Information Systems at Columbia University.

Santa Fe Institute Complex Systems Summer School, 2003. Month-long workshop in agent-based models, non-linear systems, and complexity.

1982-present

Technology development projects

Some technology development projects have included:

Wildlife Tracking Systems -- Implemented a remote monitoring system to track and weigh Adelie penguins on Ross Island, Antarctica. System was debugged on-site and made to function in adverse environmental circumstances. 1994-1997, 2016.

Internet Systems -- Implemented a LINUX Internet server with FTP and gopher services. Installed and Internet client for IBM/PC platform. 1994-1995.

Image Compression Technology -- Developed proof-of-concept system for a system to compress images of checks to very small file size. 1994.

Biomedical Systems -- Implemented a large biomedical system used in patient diagnostics.

Provided all necessary materials for Food and Drug Administration compliance. 1992-1993.

Synthetic Speech Systems -- Implemented and supported several generations of synthetic speech systems for commercial as well as research purposes. 1985-1999.

Graphics -- Developed high-speed drivers for several graphical devices and evaluated their applicability for interactive uses. Devices included: Vectrix, RAMTEK, Apple Lisa, and IBM Enhanced Graphic Adapter. 1983-1987.

Voice Boards -- Specified function requirements for several generations of high quality voice boards for Q-bus (PDP-11), Apple, MultiBus, and IBMPC bus. Developed high-speed drivers for each of the boards. 1982-1986.

Video Disk and Touch Screens -- Developed experimental interactive system utilizing computer controlled video disks and touch screens. 1982.

1994-present

Intellectual property projects

A separate document detailing intellectual property projects is available on request.

tools

Languages commonly used:

Pascal 1980-1988

C 1985-present.

Other languages used: C++, Lisp, Java and Python.

Assembler:

Intel 8048, 8051, 8088-pentium

Motorola 680xx

TI 320xx signal processors

Zilog Z8, Z80, PIC

Nathaniel Polish

Protocols include:

TCP/IP, UDP, RPC and NFS

Operating systems commonly used: UNIX, MSDOS, Windows and p-system.

In circuit emulators.

Database tools.

**contact
information**

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Academic and business references available upon request.

November 2016.



Nathaniel Polish, Ph.D. ♦ Daedalus Technology Group, Inc. ♦ polish@dtgroup.com

Summary of Experience in Intellectual Property Matters, as of February 2019

Date	Case and Jurisdiction	Work Product	Counsel, Nature of Case and Additional Notes
03/2018-02/2019	<i>Alarm.com et al v. SecureNet Technologies LLC</i> , Case No. 1:15-cv-00807-GMS In the United States District Court for the District of Delaware	Four expert reports on invalidity and non-infringement; analysis of source code; two depositions; testimony at trial.	Retained by Cooley, LLP (contact: Erik B. Milch) representing SecureNet Technologies. This case was a patent case involving home security products and internet technologies. I was handling both non-infringement and invalidity. We prevailed at trial.
01/2018-09/2018	<i>Ameranth, Inc. v. Pizza Hut, Inc., et al.</i> , Case No. 11-cv-1810 JLS In the United States District Court Southern District of California	Expert report and deposition.	Retained by Baker Botts, LLP (contact: Michael E. Knierim) representing Grubhub, Inc. and Seamless North America, LLC. This was a patent case involving data processing in the hospitality industry. I was asked to provide opinions concerning invalidity on a variety of grounds. We prevailed on a motion for summary judgment of unpatentability.
04/2018-present	<i>MModal Services Ltd. v. Nuance Communications, Inc.</i> Case No. 1:18-cv-00901-WMR In the United States District Court for the Northern District of Georgia Atlanta Division	Declaration regarding claim terms; deposition.	Retained by Weil, Gotshal & Manges LLP (contact: Sudip Kundu) representing Nuance Communications, Inc. This is a patent case involving speech recognition technology. I have prepared a report regarding certain claim terms. This case is ongoing.
04/2018-present	<i>BookIT Oy Ajanvarauspalvelu v. Bank of America Corporation and Bank of America, N.A.</i> Case No. 3:17-cv-02557-K In The United States District Court for the Northern District of Texas Dallas Division	Declarations regarding claim terms.	Retained by Winston & Strawn, LLP representing Bank of America. This is a patent case. I am involved with a number of invalidity issues. This case is ongoing.
08/2017-present	<i>Darren Pederson v. Apple Inc.</i> Case No. 1:12-cv-235530 In the Santa Clara County Superior Court	Declaration in support of opposition to class certification; deposition.	Retained by Morrison & Foerster LLP (contact: David M. Walsh) representing Apple, Inc. This is a class action case regarding the operation of Apple TV products. I am involved with a number of issues around class certification.

01/2017-present	<i>Koninklijke Philips N.V. et al. v. Acer Inc. et al.</i> Case No. 15-1170-GMS In the United States District Court for the District of Delaware		Retained by Venable LLP representing Koninklijke Philips N.V. et al.
03/2016-01/2018	<i>Doug Baird, Goug Hesse and Bob Schmitt on Behalf of Blinkmind, Inc. v. Joe Baird, Nathan Stratton, Michael Tessler, Exario Networks Inc, and Broadsoft, Inc.</i> Case No. 2015-16576 In The District Court of Harris County, TX, 270th Judicial District.	Analysis of source code and documents related to allegations of copying. Expert report; deposition.	Retained by Cooley LLP (contact: Jon Graves) representing Broadsoft. This case involves allegations of theft of trade secrets and copying. The case settled.
11/2015-06/2017	<i>Phoenix Technologies LTD. v. VMware, Inc.</i> Case No. 15- cv-014140-HSG In The United States District Court North District of California	Expert report regarding a number of issues having to do with issues related to the definition of terms; deposition; testimony at trial.	Retained by Cooley LLP (contact: Whitty Somvichian) representing Phoenix Technologies. This is a contracts matter involving copyright. I offered opinions related to the meaning of certain terms used in a contract.
05/2015-05/2015	<i>Chestnut Hill Sound, Inc. v. Apple Inc.</i> Case No.15-cv-261 (D. Del.) In The United States District Court for the District of Delaware	Declaration in support of Apple's opposition to preliminary injunction.	Retained by Desmarais, LLP (contact: Alan Kellman) representing Apple Inc. This is a patent matter involving control of multimedia streams in home entertainment networks.
04/2015-07/2016	<i>Mobile Telecommunications Technologies, LLC v. BlackBerry Corporation</i> Case No. 3:12-cv-01652-M (N.D. Tex.) In the United States District Court for the Northern District of Texas Dallas Division	Expert report on non- infringement and invalidity; deposition; testimony at trial.	Retained by McDermott Will & Emery (contact: Leigh Martinson) representing Blackberry. I am handling invalidity as well as non-infringement. This is a patent case involving a number of issues related to smartphones and messaging. Testified at trial. We prevailed.
03/2015-03/2017	<i>WAG Acquisition LLC v. Gatty S.a.r.l. et al</i> Case No. 2:14-cv-2832-ES-JAD (D. N.J.) In the United States District Court District of New Jersey	Declarations in four IPRs; deposition.	Retained by Baker & McKenzie LLP (contacts: Kevin O'Brien and Matt Dushek) representing the defendants. This is a patent matter involving streaming media. I submitted declarations in four IPRs in this case.
02/2015-02/2017	<i>Comcast Cable Communications LLC, et al. v. Sprint Communications Company L.P. et al.,</i> Case No. 2:12-cv-0859 (E.D. Pa)	Expert report on invalidity; deposition; testimony at trial.	Retained by McGuire Woods, LLP (contact: George J. Barry III) representing Sprint Inc. This is a patent matter involving the architecture of messaging servers in a cell phone network.
12/2014-05/2015	<i>Enterprise Systems Technologies S.a.r.l. v. Apple Inc.</i> C.A. No. 1:14-cv-00765-UNA In the United States District Court for the District of Delaware	Declaration submitted for IPR.	Retained by Ropes & Gray, LLP (contact: Stefan Geirhofer) representing Apple Inc. This was a patent matter involving a district court case, an ITC case, and an IPR. The technology mobile messaging. This case settled.

11/2014-04/2015	<i>Solocron Media, LLC v. Verizon Communications Inc., et al</i> Case No. 2:13-cv-1059 (E.D. Tex.) In the United States District Court Eastern District of Texas Marshall Division	Expert report on invalidity.	Retained by Wiley Rein, LLP (contact: Scott Felder) representing Verizon. This was a patent matter. I prepared a report on invalidity and assisted with a report on non-infringement. This case terminated favorably for Verizon before I was deposed.
10/2014-02/2015	<i>Recogni Corp, LLC v. Nintendo Co. Ltd. Et al</i> Case No. 2:12-cv-01873-RAJ In the U.S. District Court Western District of Washington		Retained by Orrick, Herrington & Sutcliffe LLP (Contact: Doc Daybell) representing Nintendo Co. Ltd.
07/2014-01/2016	<i>Aylus Networks, Inc. v. Apple Inc.</i> Case No: 3:13-cv-04700-EMC. In the United States District Court Northern District of California San Francisco Division	Declarations in support of claim construction as well as summary judgment; expert reports on non-infringement and invalidity; deposition.	Retained by DLA Piper (contact: Mark Fowler) representing Apple, Inc. I was handling non-infringement as well as invalidity. This was a patent matter involving control of multimedia streams in home entertainment networks. This case was dismissed on summary judgment favorable to Apple.
5/2014-10/2014	<i>Jobdiva, Inc. v. Monster Worldwide, Inc.</i> Case no: 13 Civ. 8229 (KBF) In the United States District Court for the Southern District of New York	Declaration on infringement; deposition.	Retained by Kirkland and Ellis (contact: James Marina) representing Jobdiva. This was a patent matter involving methods of search and display of resumes. I offered a declaration that was most of an expert report. This case settled.
12/2013-06/2014	<i>Straight Path IP Group, Inc., v. LG Electronics, Inc. et.al</i> C.A. No. 1:13-cv-00933 Investigation No. 337-TA-892	Expert report on non-infringement; deposition.	Retained by Finnegan (contact: Aidan Skoyles) representing LG Electronics, Inc. This was a patent matter regarding smart televisions. This case has been stayed.
11/2013-12/2013	<i>Glaxosmithkline, LLC. v. Genentech, Inc.</i> Case No: 10-799-GMS. In the United States District Court for the District of Delaware.	Expert report on an evidentiary matter; deposition.	Retained by Desmarais (contact: Xiao Li) representing GSK. I offered opinions regarding the quality of certain metadata information associated with several files at issue in the case.
9/2013-9/2014	<i>Profectus Technology LLC, v. Huawei Technologies Co. LTD, et al.</i> Case No. 6:11-cv-00474. In the United States District Court for the Eastern District of Texas Tyler Division	Expert report on non- infringement.	Retained by Baker Botts (contact: Tammy Pennington) representing Dell. This patent matter dealt with technologies used in electronic picture frames. This case settled.

9/2013-3/2014	<i>Black Hills Media v. Samsung, LGE et al., Certain Digital Media Devices, including Televisions, Blu-Ray Disc Players, Home Theater Systems, Tablets and Mobile Phones, Components Thereof and Associated Software.</i> Investigation No. 337-TA-882. United States International Trade Commission	Expert report on non- infringement; deposition; testimony at hearing.	Retained by Finnegan (contact: Houtan Esfahani) representing LGE.
6/2013-2/2015	<i>OpenText S.A. v. Alfresco Software LTD; Alfresco Software, Inc.; and Carahsoft Technology Corporation.</i> Case No. 2:13CV320AWA/LRL. In the United States District Court for the Eastern District of Virginia.	Expert reports on infringement and validity; depositions; tech tutorial.	Retained by Cooley, LLP (contact: Frank Pietrantonio) representing OpenText My patents were dropped from trial.
05/2013-present	<i>Hartford Fire Insurance Company v. Progressive Corporation and Progressive Casualty Insurance Company.</i> Case No. 1:12- cv-02444. In the United States District Court for the Northern District of Ohio Eastern Division.	Expert report on claim construction; deposition.	Retained by Baker Botts (contact: Robert Scheinfeld) representing Hartford. I am handling both infringement as well as validity.
10/2012-04/2013	<i>MobileMedia Ideas, LLC. v. HTC Corporation and HTC America, Inc.</i> In the United States District Court for the Eastern District of Texas, Marshall Division.	Expert reports; deposition.	Retained by Desmarais, LLC (contact: Alan Kellman) representing MMI. This is a patent dispute involving user interfaces to cell phones. I am handling both infringement and validity.
10/2012-04/2014	<i>Nokia Corporation, Nokia Inc., and Intellisync Corp v. HTC. Certain Electronic Devices, Including Mobile Phones and Tablet Computers, and Components Thereof.</i> Investigation No. 337-TA-847. United States International Trade Commission	Expert reports, depositions; testimony at hearing.	Retained by Desmarais, LLC (contact: Alan Kellman) representing Nokia. This was a patent dispute involving user interfaces to cell phones. I handled both infringement and validity. My patent was dropped from the case during the hearing.
09/2012-04/2017	<i>Intellectual Ventures I LLC et al. v. AT&T Mobility LLC et al.</i> Civil Action No. 12-CV-193-LPS (D.Del.)		Retained by Baker Botts (contact: Robert Maier) representing AT&T Mobility LLC.

8/2012-10/2015	<i>Potter Voice Technologies, LLC, v. Apple Inc et al.</i> CV 1:12-cv-01096-REB-CBS In The United States District Court for the District of Colorado.	Declaration in support of summary judgment; expert reports.	Retained by Cooley, LLP (contact: Timothy Teter) representing Apple Inc. This was a patent dispute involving Natural Language Processing on smartphones. I handled both infringement and validity. This case was favorably dismissed on summary judgment.
08/2012-10/2014	<i>OpenTV, Inc. v. <i>Netflix Inc.</i></i> Case No. 3:14-cv-01525 In the United States District Court for the District of Delaware	Declaration regarding a motion for summary judgment.	Retained by Kirkland & Ellis, LLP (contact: Matthew Topic) representing OpenTV. I submitted a declaration in opposition to a motion for summary judgment regarding section 101 issues.
08/2012-12/2012	<i>J2 Global Communications, Inc. v. EasyLink Services International Corp.</i> Case No. 09-4189-DDP (AJWx) In The United States District Court Central District of California Western Division.		Retained by Perkins Coie, LLP (contact: Timothy Carroll) representing EasyLink Corp. I handled both infringement and validity. This was a patent dispute regarding enterprise fax and messaging systems.
06/2012-8/2017	<i>EasyWeb Innovations, LLC v. <i>Twitter, Inc.</i></i> Civil Action No CV 11-4550-JFB-WDW. In The United States District Court for the Eastern District of New York.	Expert reports; deposition.	Retained by Desmarais, LLC (contact: Alan Kellman) representing EasyWeb. This is a patent dispute involving messaging technologies. I am handling both infringement and validity.
06/2012	Cisco	Declaration.	Retained by Haynes and Boone, LLP (contact: Andrew Ehmke) representing Cisco. This was an IPR case and I submitted a declaration in the matter.
02/2012-06/2014	<i>Emblaze LTD v. Apple Inc.</i> Case No 4:11-CV-01079 SBA. In The United States District Court for the Northern District of California.	Markman tutorial; Expert report on non-infringement; tech tutorial; testimony at trial.	Retained by Greenberg Traurig, LLP (contact: James DeCarlo) representing Apple, Inc. The case was ultimately tried by DLA Piper (contact: Mark Fowler). This was a patent dispute. The case involved technology for distribution of multimedia over the Internet. The trial concluded with the jury finding no infringement.
12/2011-04/2013	<i>Apple Inc. v. <i>Samsung Electronics Co, LTD.</i></i> Case No. CV12-00630 In The United States District Court for the Northern District of California San Jose Division.	Expert declaration; deposition.	Retained by Gibson Dunn, LLP (contact: Joshua Furman) representing Apple, Inc. This is a patent dispute involving multi-database search on a mobile device. I am handling both infringement and validity. We received a pre-trial injunction on the products in question.

12/2011-08/2012	<i>NorthMobile Tech, LLC v. Simon Property Group, Inc.</i> Case No. 3:11-cv-287 In The United States District Court Western District of Wisconsin.	Expert report; declarations.	Retained by Perkins Coie (contact: Timothy Carroll) representing Simon Property Group. This was a patent dispute involving a location based marketing application on smartphones. I am handling both infringement and validity. We prevailed pretrial.
11/2011-09/2015	<i>Oasis Research, LLC v. ADrive LLC, et al.</i> Case No. 4:10-CV-435-MHS-ALM In The United States District Court for the Eastern District of Texas Sherman Division.	Expert reports; deposition.	Retained by Desmarais, LLP (contact: Alan Kellman) representing Oasis Research LLC. I am handling both infringement and validity. This is a patent dispute regarding on line backup and storage. This case settled.
08/2011-06/2014	<i>Apple Inc and Next Software, Inc. v. Motorola, Inc. and Motorola Mobility, Inc.</i> Case No. 10-CV-662 (BBC) In The United States District Court for The Western District of Wisconsin	Expert reports.	Retained by Weil, Gotshal & Manges, LLP (contacts: Kevin Kudlac and Elizabeth Weiswasser) representing Apple, Inc. This was a patent dispute. The case involved technology for the interface of DSPs in cell phones. I handled both infringement as well as validity. This case was dismissed pretrial by Judge Posner.
06/2011-02/2012	<i>Creative Kingdoms, LLC and Medici Portfolio LLC v. Nintendo Co. Ltd. Certain video game systems and Wireless controllers and Components thereof.</i> Investigation No.337-TA-770 In The United States International Trade Commission	Expert report; deposition; testimony at hearing.	Retained by Cooley LLP (contacts: Tim Teter and Matthew Brigham) representing Nintendo Co. Ltd. This was a patent dispute. The case involved technology used in wireless and motion sensing controllers. I handled invalidity. We prevailed at the hearing.
02/2011-11/2011	<i>WiAv Solutions LLC v. Motorola Mobility, Inc, Nokia Corp., Nokia, Inc, Sony Ericsson Mobile</i> Civil Action No: 3:09-cv-447-LO In The United States District Court for The Eastern District of Virginia	Expert report; deposition.	Retained by Finnegan, Henderson, Farabow, Garrett & Dunner, LLP (contacts: Kenie Ho and Christopher Schultz) representing WiAv Solutions LLC. This was a patent dispute. The case involved technology for speech codecs used in GSM cell phones. I handled the infringement side of the case. This case settled.
08/2010-04/2011	<i>Apple Inc. v. Nokia Corporation and High Tech Computer Corp. (HTC). Certain Personal Data and Mobile Communications Devices and Related Software.</i> Investigation No. 337-TA-710 United States International Trade Commission	Expert reports; depositions; testimony at hearing.	Retained by Kirkland & Ellis LLP (contacts: Marc Sernel and Eric Hayes) representing Apple Inc. This was a patent dispute. The case involved technology for the interface of DSPs in cell phones. I handled both infringement as well as validity.

07/2010-11/2010	<i>ACQIS LLC v. Apro International, Inc., Clear Cube Technology, Inc., Dell Inc., Fujitsu Computer Systems Corp., Hitachi America, Ltd., Hewlett-Packard Co., International Business Machines Corp., NEC Corp. of America, NEX Computers, Inc., Sun Microsystems, Inc. and Super Micro Computer, Inc.</i> Case No. 6:06-cv-00148 In the United States District Court for the Eastern District of Texas	Expert report on invalidity and non-infringement.	Retained by Covington & Burling LLP (contact: Chris Martiniak) representing Hewlett Packard. This was a patent matter involving computer blade servers. The case settled.
04/2010-06/2010	<i>Illinois Computer Research LLC v. Harpo Productions, Inc. et al</i> Case Number: 1:2008cv07322 In The United States District Court for The Northern District of Illinois Eastern Division	Expert report; deposition.	Retained by Jackson Walker LLP (contacts: Michael Locklar and Charles Babcock) representing Harpo Productions, Inc. This was a patent dispute. The case involved technology for display of books on a website. This case settled.
02/2010-06/2010	<i>Motorola Inc. v. Research Motion Limited et al</i> <i>Certain wireless communication server system software, wireless handheld devices and battery packs.</i> Investigation No. 337-TA-706 United States International Trade Commission	Expert report.	Retained by Ropes & Gray (contacts: Paul M. Schoenhard and Steven Pepe) representing Motorola, Inc. This was a patent dispute. The case involved technology used in pagers and cell phones as well as their servers. This case settled.
08/2009-10/2010	<i>Balthaser Online, Inc. v. Network Solutions, LLC.</i> Civil Action No. 2:08-cv-430 In The United States District Court Eastern District of Texas Marshall Division	Expert report.	Retained by Dickstein Shaprio, LLP (contacts: Alfred R. Fabricant and Lawrence C. Drucker) representing Balthaser Online, Inc. This was a patent dispute. The case involved technology for the display of rich media applications on a web site. This case settled.
05/2009-05/2010	<i>Nuance Communications Inc. et al v. Tell me Networks Inc.</i> Case Number: 1:2006cv00105 In The United States District Court for The District of Delaware	Expert report.	Retained by McKool Smith (contacts: Luke F. McLeroy) representing Nuance Communications. This was a patent dispute. The technology involved techniques for using speech recognition in telephone information systems. This case ended in summary judgment for the defendant.
12/2008-12/2009	<i>TruePosition Inc. v. Andrew Corp, C.A.</i> Case No. 05-0747-SLR (D. Del) U.S. District Court for the District of Delaware	Declaration; expert report.	Retained by Kirkland & Ellis, LLP (contact: Avinash Lele) representing Andrew Corp, C.A. Patent infringement case concerning technology for determining location of a cell phone using information from several cell phone towers. I provided an analysis of a workaround approach.

10/2008-01/2010	RealTime Data LLC. v. Packeteer, Inc. Case No. 6:2008cv00144 U.S. District Court for the Eastern District of Texas	Expert report, depositions, trial prep.	Retained by Ropes & Gray, LLP (contact: Anthony Pastor) representing RealTime Data, LLC. Patent infringement case concerning data compression, storage, and transmission. This case settled on first day of trial.
10/2008-09/2009	Thomson Reuters (Scientific) Inc. v. David A. Von Moll, Comptroller of the Commonwealth of Virginia and George Mason University Civil Action No. CL2008-17114 Circuit Court of Fairfax County Virginia	Expert report.	Retained by Edwards Angell Palmer & Dodge LLP (contacts: Glenn Pudelka and Barry Kramer) representing Thomas Reuters (Scientific) Inc. Contracts dispute centered around allegations of reverse engineering of software. This case ended in summary judgment.
04/2008-12/2008	International Business Machines Corporation v. Asustek Computer, Inc. Certain Computer Products, Computer Components and Products contain Same. Investigation No. 337-TA-628 United States International Trade Commission	Expert reports, declarations, depositions, testimony at hearing.	Retained by Cadwalader Wickersham & Taft LLP (contacts: John Moehringer and Christopher Hughes) representing IBM in this matter. This was an US ITC investigation regarding infringement of a number of IBM patents by computers produced and sold by Asustek. The technology involved computer control of cooling systems for computers. I was involved with infringement as well as validity issues.
10/2007-05/2008	Lucent, Alcatel-Lucent, and Multimedia Patent Trust v. Microsoft Case no. 06-CV- 0684-H (LAB) U.S. District Court for the Southern District of California	Expert reports; depositions; testimony at trial.	Retained by Kirkland & Ellis LLP (representing Lucent Technologies) (contacts: Robert Appleby and John Desmarais) and Baker Botts, LLP (representing Alcatel-Lucent). I advised on infringement as well as validity of U.S. Patents 5,838,319 and 5,977,971. Gave trial testimony regarding invalidity of the '971 patent: jury found the patent was invalid.
03/2000-01/2009	National Music Publishers' Association et al. v. XM Satellite Radio Inc. Civil Action 06-CV-3733(LAK) In The U.S. District Court for the Southern District of New York		Retained by Gibson Dunn & Crutcher, LLP representing National Music Publishers' Association. Copyright dispute concerning the impact of various XM Satellite Radio products. I provided an analysis of source code and functionality of several XM devices.
06/2006-02/2007	Lucent v. Gateway, Microsoft, Dell Case no. 02-CV-2060-B (LAB) Case no. 03-CV-0699-B (LAB) Case no. 03-CV-1108-B (LAB) U.S. District Court for the Southern District of California	Expert reports; depositions; testimony at trial.	Retained by Kirkland & Ellis, LLP representing Lucent Technologies (contacts: Robert Appleby and John Desmarais). I worked on the infringement of Patents 5,341,457 and 5,627,938 as well as validity of these patents. At trial, I testified to regarding infringement of the '457, '938 and '080 patents. This matter concluded with a successful verdict and an award to Lucent of \$1.5 billion.

02/2006	<i>Board of Regents of the University of Texas v. Benq America Corp et al.</i> Civil Action No. A:05CA181 U.S. District Court for the Western District of Texas	Markman Hearing Testimony; Expert reports; deposition; tech tutorial.	Retained by Quinn Emanuel Urquhart Oliver & Hedges LLP (contacts: Evette Pennypacker and Kevin Johnson) representing Benq America et al. Patent infringement. For a Markman (claim construction) hearing, prepared and presented a technology tutorial and testified before a special master. Prepared reports and gave deposition regarding invalidity and inoperability technology in the patent at issue. Claim construction hearing led to summary judgment in Benq America's favor.
2006	<i>Telefonaktiebolaget LM Ericsson et al. v. Samsung Electronics Company Ltd.</i> Investigation No. 337-TA-577 U.S. International Trade Commission	Expert reports and depositions.	Retained by Kirkland & Ellis LLP (contacts: Bao Nguyen, Adam Gill and Michael Pieja) representing Samsung in several patent infringement claims brought by Ericsson. Claims involved technologies for messaging, speech encoding, and speech recording within various GSM cell phones. This case settled just prior to hearing.
07/2005-02/2006	<i>Encyclopedia Britannica Inc. v. Alpine Electronics of America Inc. et al.</i> Civil Action No. 05-359 U.S. District Court for the Western District of Texas	Expert report; deposition.	Retained by Baker Botts LLP (contact: David Wille) representing Encyclopedia Britannica, Inc. Patent infringement. Prepared report on the definiteness of certain claim terms, and was deposed on this matter. This case is ongoing but inactive.
2005-present	<i>Advanced Analytics Inc v. Citigroup Global Markets Inc.</i> Case No. 04 Civil 3531 (LTS) U.S. District Court for the Southern District of New York	Declarations and expert reports; deposition.	Retained by Cleary Gottlieb Steen & Hamilton LLP (contacts: David Williams and Chris Moore) representing Citigroup Global Markets, Inc. Theft of trade secrets. I have been involved in software analysis in this case. The case involved software used to price complex financial instruments. Refuting the claims required software analysis as well as statistical analysis of certain elements of the systems involved. This case pending.
05/2005-09/2005	<i>Atronic International GMBH v. SAI Semi-specialists of America Inc.</i> Case No. 03-CV-4892 (TCP) (MLO) U.S. District Court for the Eastern District of New York	Expert report; deposition.	Retained by Ford Marrin Esposito Witmeyer & Gleser, LLP (contact: Edward M. Pinter) representing Atronic International. Contracts dispute. I have acted primarily to rebut another witness regarding what would have been reasonable behavior for a customer of an electronic parts supplier. This case settled.
02/2005-03/2006	<i>Tivo Inc. v. Echostar Communications Corporation</i> Case No. 2-04cv01 DF U.S. District Court for the Eastern District of Texas	Expert report; deposition; testimony at trial.	Retained by Morrison & Foerster (contact: Karl Kramer) representing Echostar. This case involved digital video recorder (DVR) technology. My work focused on the invalidity of the Tivo patent. I found many pieces of prior art including complete systems that were presented at trial. Tivo prevailed at trial. Most of the claims were subsequently found invalid on re-exam. This case has been the subject of many appeals.

12/2004- 05/2006	<i>Foundry Networks Inc. v. Lucent Technologies Inc.</i> Case No. 2:04-CV-40 (TJW) (E.D. Tex.) U.S. District Court for the Eastern District of Texas	Expert reports.	Retained by Kirkland & Ellis LLP (contacts: Jenny Lee and Jeanne Heffernan) representing Lucent Technologies. I advised on infringement as well as validity of U.S. Patent 5,649,131. In addition to generating several reports, I supported the drafting of motions and declarations. This case settled shortly before trial.
07/2004- 01/2005	<i>Voice Capture Inc. v. Intel Corporation, Dialogic Corporation, and Nuance Communications, Inc.</i> No. 4:04-cv-40340 U.S. District Court for the Southern District of Iowa	Expert report.	Retained by Gary Cary (contact: Edward Sikorsky) representing Intel Corporation. The case involved Voice Capture's allegation of patent infringement by Intel in the area of interactive voice response systems. In producing an invalidity report on the patent, I analyzed the patent and prior art in great detail. I also provided an expert report on invalidity and an analysis of a rebuttal report. The case settled.
05/2004- 03/2005	<i>Dolby Laboratories Inc. v. Lucent Technologies Inc.</i> Case No. C 01-20709 JF (RS) U.S. District Court for the Northern District of California	Expert report.	Retained by Kirkland & Ellis, LLP (contact: Alan Kellman) representing Lucent Technologies. This case involved infringement of a number of Lucent's patents by Dolby's AC3 codec. The case settled.
03/2003	<i>Agere Systems Inc. v. <i>Broadcom Corporation</i></i> Civil Action No. 03-3138 U.S. District Court for the Eastern District of Pennsylvania	Expert report.	Retained by Kirkland & Ellis LLP (contacts: Bryan Hales and Edward Runyan). The case involved Agere's allegation of patent infringement by Broadcom in the area of speech compression used in various Broadcom telephone products. I analyzed the operation of a speech codec used in digital telephones; worked with counsel and other experts to prepare reports. This case settled.
10/2001	<i>AT&T Corp., v. <i>Microsoft Corporation</i></i> Civil Action No. 01 CV 4872 (WHP) U.S. District Court for the Southern District of New York	Expert reports; deposition; testimony at trial.	Retained by Cooley Godward Kronish LLP (contacts: Frank Pietrantonio and Stephen Neal) representing AT&T. The case involved AT&T's allegation of patent infringement by Microsoft in the area of speech compression. I analyzed the operation of three speech codecs and worked with counsel and other experts to prepare reports. I was deposed and gave testimony at trial. After the presentation of our case, the matter settled; details of the settlement are confidential. Elements of this case reached the U.S. Supreme Court.

2000	<i>Data System Analysis Inc. v. The Netplex Group Inc., Technology Development Systems Inc. and Xcellenet Inc.</i> Civil Action No. 97-4652 (JBS-RBK) U.S. District Court for the District of New Jersey	Expert reports; deposition.	Retained by Saul Ewing LLP (contact: Michael Lampert) representing Netplex. Data Systems Analysis (DSA) brought suit against Netplex in a contract matter regarding software claimed by both companies. I was retained to analyze the disputed software and determine a method for computing damages. My expert report found that “functionality” and “effort required to create” were both better metrics than “number of lines of software”, the measurement proposed by DSA. I was deposed for several days in this case, provided analysis of other expert reports and assisted in preparing counsel for depositions. This case settled.
01/1998-01/2001	<i>System Management Arts Inc. (SMARTS) v. Avesta Technologies Inc. and David Zager</i> 97 Civil 8101 (RWS) U.S. District Court for the Southern District of New York	Expert reports; deposition.	Initially retained by Kramer Levin Naftalis & Frankel, LLP (contact: Thomas H. Moreland) representing SMARTS. In early 2000 SMARTS retained Proskauer Rose, LLP (contact: Kenneth Rubenstein). The case involved a SMARTS patent in the area of automatic diagnostics of faults in communications networks. I analyzed an Avesta system with similar claimed capabilities and produced an expert report. I also gave deposition and participated extensively in technological analysis and strategic discussions of all aspects of the case. This case settled.
1997	<i>Knowledge Based Technologies Inc. v. International Business Machines Corp.</i> Case No. 96-9461 (JSR) U.S. District Court for the Southern District of New York	Expert reports; deposition.	Retained by Morris, Nichols, Arsht & Tunnell, LLP (contact: Karen Jacobs Loudon) representing Knowledge Based Technologies. Contract dispute regarding the application of fuzzy logic techniques. I generated an expert report that analyzed several forms of fuzzy logic software to determine whether the software was independently developed. I also was deposed in this case. This case settled.